

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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OIL INDIA LIMITED

BID DOCUMENT

Tender NO. : CGI 6122 P21

“Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters (PHQ) at Pipeline Headquarters (PHQ) Township, Oil India Limited (OIL), Guwahati Assam.”

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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OIL INDIA LIMITED
(A Government of India Enterprise)
CONTRACTS SECTION, PHQ
P.O.UdayanVihar- 781171, Guwahati, ASSAM

Sub: IFB No.CGI-6122-P21 Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters (PHQ) at Pipeline Headquarters (PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

Sir,

- 1.0 OIL INDIA LIMITED (OIL), a “Navaratna” Category, Government of India Enterprise, is a premier oil Company engaged in exploration, production and transportation of crude oil & natural gas with its Headquarters at Duliajan, Assam. Duliajan. Pipeline Department of OIL, having its Head Quarter at Noonmati, Guwahati, operates and maintains the cross country crude oil and product pipeline spreading across the state of Assam, West Bengal and Bihar.
- 2.0 In connection with its operations, Pipeline Department of OIL invites Local Competitive Bids(LCB) from competent and experienced service providers through OIL's e-procurement site for **‘Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam’** with the entire project expected to be completed within 36 months of award of contract. One complete set of Bid Document covering OIL's IFB for hiring of above services is uploaded in OIL's e-procurement portal. You are invited to submit your most competitive bid on or before the scheduled bid closing date and time through OIL's e-procurement portal under **Single Stage Two Bid** system.. For your ready reference, few salient points of the IFB (covered in detail in the Bid Document) are highlighted below:

IFB No./ Tender No.	CGI-6122-P21
a. Type of IFB.	Single Stage Two Bid System
b. Service	Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.
c. Bid Closing Date & Time.	As per online data
d. Bid(Technical) Opening Date & Time	As per online data
e. Priced Bid Opening Date &	Will be intimated to the eligible Bidders nearer the

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Time.	time.
f. Bid Submission Mode.	Bid to be uploaded on-line in OIL's E-Procurement portal.
g. Bid Opening Place.	Office of the GM-C&P, Contracts section, Pipe line Head Quarter, Oil India Ltd., P.O: Udayan Vihar, Narangi, Guwahati, District : Kamrup(M), Guwahati-781171, Assam, India.
h. Bid Validity.	120 days from bid Closing date.
i. Bid Security Amount	NIL
j. Bid Security Declaration Validity	150 days from bid closing date.
k. Amount and Validity of Performance Security.	Performance security @3% of annualized contract value is applicable against this contract.
l. Duration of the Contract.	Thirty Six (36) months from the date of issue of work order.
m. Bids to be addressed to.	GM-C&P, Contracts section, Pipe line Head Quarter, Oil India Ltd., P.O: Udayan Vihar, Narangi, Guwahati, District : Kamrup(M), Guwahati-781171, Assam, India.
n. Pre-Bid Conference Date.	As per online data
o. Last Date of receipt of Queries.	As per online data

- 3.0 **Pre-Bid Conference:** A pre-bid conference to explain Company's exact requirements and to reply queries of Bidders, if any, on the tender stipulations will be held on **the date specified online** in OIL's Pipeline Office at Pipe line Head Quarter, Oil India Ltd., P.O: Udayan Vihar, Narangi, Guwahati, District : Kamrup(M), Guwahati-781171, Assam, India. Maximum of two representatives of each bidder will be allowed to attend the pre-bid conference on producing authorization letter. Bidders interested to attend the Pre-Bid Conference should intimate General Manager (C&P), Oil India Limited, **Pipeline Headquarters(PHQ), Narangi** latest by two days prior to the specified online date.
- 4.0 **Integrity Pact:** The Integrity Pact must be uploaded in OIL's E-procurement portal along with the Technical Bid digitally signed by the same signatory who signed the Bid i.e. who is duly authorized to sign the Bid. If any Bidder refuses to sign Integrity Pact or declines to submit the Integrity Pact, their bid shall be rejected straightway. Uploading the Integrity Pact with digital signature will be construed that all pages of the Integrity Pact has been signed by the Bidder's authorized signatory who signs the Bid.
- 5.0 **GUIDELINES FOR PARTICIPATING IN OIL'S E-PROCUREMENT:**

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- 5.1 To participate in OIL's E-procurement tender, bidders should have a legally valid digital certificate **of Class 3 with Organizations Name** and **Encryption certificate** as per Indian IT Act from the licensed Certifying Authorities operating under the Root Certifying Authority of India (RCAI), Controller of Certifying Authorities (CCA) of India (<http://www.cca.gov.in>). **Digital Signature Certificates having "Organization Name" field as "Personal" are not acceptable.**
- 5.2 Bidders without having E-tender Login ID and Password should complete their online registration at least seven (7) days prior to the scheduled bid closing date and time of the tender. For online registration, Bidder may visit the OIL's E-tender site <https://etender.srm.oilindia.in/irj/portal>
- 5.3 Necessary Login ID & Password will be issued by OIL only after submitting the complete online registration by the Bidder. In the event of late registration/incomplete registration by Bidder, OIL INDIA LIMITED shall not be responsible for late allotment of User ID & Password and request for bid closing date extension on that plea shall not be entertained by Company.
- 5.4 Bids without EMD Declaration format shall be rejected. Late communication in this regards and request for bid closing date extension on that plea shall not be entertained by Company.
- 5.5 Parties, who do not have a User ID, can click on **Guest login button** in the OIL's E-portal to view the available open tenders. The detailed guidelines are available in OIL's e-procurement site (Help Documentation). For any clarification in this regard, Bidders may contact Mr. P. Barman, Manager (ERP-MM) at erp_mm@oilindia.in, Ph.: 03742804903/7192/7171/7178.
- 6.0 **QUERIES/CLARIFICATIONS ON THE TENDER:**
- 6.1 The prospective Bidders shall submit their queries/clarifications against the tender through E-mail addressed to GM-C&P, Contracts section, Pipe line Head Quarter, Oil India Ltd., P.O: Udayan Vihar, Narangi, Guwahati, District : Kamrup(M), Guwahati-781171, Assam, India and such queries must reach OIL's Contracts, PHQ office at Guwahati prior to 7 days of Pre-bid meeting. OIL shall provide clarifications on the date of pre-bid conference to only those queries received within this date. Replies will also be uploaded in OIL's e-tender portal. Queries / Clarifications against the tender received beyond the date as specified online will not be entertained and replied. OIL will not be responsible for non-receipt or late receipt of any Bidder's query in OIL's office. Bidders' queries may be forwarded to the following Officials.

For contractual matters

GM (Contracts)
OIL INDIA LIMITED
PO: UdayanVihar
Assam-781171, India
E-mail: ellora@oilindia.in

For Technical matters

GM (CIVIL)
OIL INDIA LIMITED
PO: UdayanVihar
Assam-781171, India
E-mail: gautamdass@oilindia.in

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Contact No. 91-0361-25945607 Contact No. 91-0361-25945280

7.0 **IMPORTANT NOTES:**

7.1 Bidders shall take note of the following important points while participating in OIL's e-procurement tender:

- i) The bid along with all supporting documents must be submitted through OIL's E-procurement site only except the following documents which shall be submitted manually by the Bidder in two copies in a sealed envelope super-scribed with OIL's IFB No., Bid Closing date and addressed to GM-C&P, Contracts section, Pipe line Head Quarter, Oil India Ltd., P.O: Udayan Vihar, Narangi, Guwahati, District : Kamrup(M), Guwahati-781171, Assam, India:

- a) Printed catalogue and Literature, if called for in the tender.
- b) Power of Attorney for signing the bid.
- c) Any other document required to be submitted in original as per tender requirement.

The above documents must be received at OIL's GM-C&P, Contracts section, Pipe line Head Quarter, Oil India Ltd., P.O: Udayan Vihar, Narangi, Guwahati, District : Kamrup(M), Guwahati-781171, Assam, India on or before 11.00 Hrs (IST) on the Bid Closing date failing which the bid shall be rejected. A scanned copy of the Bid Security declaration form shall also be uploaded by the Bidder along with their Technical Bid in OIL's E-procurement site.

- ii) Bid should be submitted on-line in OIL's E-procurement site before 11.00 AM (IST) (Server Time) of the bid closing date as mentioned and will be opened on the same day at 2.00 PM (IST) at the office of the GM (C&P) in presence of the authorized representatives of the Bidders.
- iii) If the digital signature used for signing is not of "Class -3" with Organizations name, the bid will be rejected.
- iv) The tender is invited under SINGLE STAGE-TWO BID SYSTEM . The Bidders shall submit both the "TECHNICAL" and "PRICED" bids through electronic form in the OIL's e-Procurement portal within the Bid Closing Date and Time stipulated in the e-Tender. The Technical Bid should be submitted as per Scope of Work & Technical Specifications along with all technical documents related to the tender and uploaded under **"Technical Attachment" Tab only. Bidders to note that no price details should be uploaded in "Technical Attachment" Tab Page. Details of prices as per Price Bid format/Priced bid can be uploaded as Attachment just below the "Tendering Text" in the attachment option under "Notes & Attachments" tab. A screen shot in this regard is given in the "Instruction to Bidder for Submission" file for guidance. Offer not complying with above submission procedure will be**

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rejected as per Bid Evaluation Criteria mentioned in Part-2, (III)-Commercial Criteria.

8.0 OIL now looks forward to your active participation in the IFB.

Regarding new bid submission procedure (effective from 12.04.2017 onwards), please refer **new vendor manual** available in OIL's E-tender Site:



Thanking you,

Yours faithfully,
OIL INDIA LIMITED

(Ellora P Mahanta)
General Manager (C&P)
For Chief General Manager (PLS)

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PART - 1

INSTRUCTIONS TO BIDDERS

1.0 Bidder shall bear all costs associated with the preparation and submission of bid. Oil India Limited, hereinafter referred to as Company, will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

A. BID DOCUMENTS

2.0 The services required, bidding procedures and contract terms are prescribed in the Bid Document. This Bid Document includes the following:

- (a) A Forwarding Letter highlighting the following points: (Page 2 to Page 6)
 - (i) Company's IFB No. & Type
 - (ii) Bid closing date and time
 - (iii) Bid opening date and time
 - (iv) Bid submission Mode
 - (v) Bid opening place
 - (vi) Bid validity, Mobilisation time & Duration of contract
 - (vii) The Bid Security declaration form with validity
 - (viii) The amount of Performance Guarantee with validity
 - (ix) Quantum of liquidated damages for default in timely completion of contract
- (b) Instructions to Bidders, (Part-1) (Page 7 to Page 21)
- (c) Bid Evaluation Criteria, (Part-2) (Page 22 to Page 38)
- (d) General Conditions of Contract, (Part-3, Section-I) (Page 39 to Page 70)
- (e) Scope of Work/ Special Conditions of Contract for Civil works (Part-3, Section-II) (Page 71 to Page 127)
- (f) Scope of Work/ Special Conditions of Contract for Electrical works & BMS, HVAC , Lift, Fire-Fighting, PHE, Solar PV panel (Part-3, Section-III) (Page 128 to Page 635)
- (g) Payment Terms-Part IV (Page 1505)
- (h) Company's Plants , Materials & Equipments (Part-V) (Page 1506)
- (i) Architectural tender Drawings (Part-VI) (Page 1506)
- (j) Safety Measures (Part-VII) (Page 1507)
- (k) Integrity Pact, (Part-VIII-Annexure-A1) (Page 1508 to Page 1512)
- (l) Price Bid Format, (Proforma-B) (Page 665 to Page 1502)
- (m) Bid Form, (Proforma-C) (Page 1515)
- (n) Statement of Compliance, (Proforma-D) (Page 1516)
- (o) Bid Security Declaration Form, (Proforma-E) (Page 1517)
- (p) Performance Security Form, (Proforma-F) (Page 1518 to Page 1519)
- (q) Undertaking on PBG, (Proforma-G) (Page 1520)
- (r) Proforma of Letter of Authority, (Proforma-H) (Page 1521)
- (s) Authorisation for Attending Bid Opening, (Proforma-I) (Page 1522)
- (t) Format for Certificate of Annual turnover & Net Worth (Proforma-J) (Page 1523)
- (u) General HSE Points (Appendix-A) (Page 1531 to Page 1532)
- (v) Procedure for obtaining labour license (Appendix-B) (Page 1533)

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- (w) Provisions for Purchase Preference Policy (linked with Local Content) (PP-LC) (Appendix-C) (Page 1534)
- (x) E-remittance -(Proforma-K & M) (Page 1527, 1524)
- (x) Undertaking towards submission of authentic information/documents as per Format vide Proforma-N. (Page 1528)
- (y) Certificate for Restriction of Procurement (Proforma-A) (Page 1513)
- (z) Labour safety provision –Part IX – (Page 636-Page 664)
- (Z.A) Undertaking related to labour wages Proforma-L. (Page 1525 to Page-1526)

- 2.1 The Bidder is expected to examine all instructions, forms, terms and specifications in the Bid Documents. Failure to furnish all information required in the Bid Documents or submission of a bid not substantially responsive to the Bid Documents in every respect will be at the Bidder's risk & responsibility and may result in the rejection of its bid.

3.0 TRANSFERABILITY OF BID DOCUMENTS:

- 3.1 Bid Documents are non-transferable. Bid can be submitted only in the name of the Bidder in whose name the Bid Document has been issued.
- 3.2 Unsolicited bids will not be considered and will be rejected straightway.

4.0 AMENDMENT OF BID DOCUMENTS:

- 4.1 At any time prior to the deadline for submission of bids, the Company may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bid Documents through issuance of an Addendum.
- 4.2 The Addendum will be uploaded in OIL's E-Tender Portal in the "Technical RFx Response" under the tab "Amendments to Tender Documents". The Company may, at its discretion, extend the deadline for bid submission, if the Bidders are expected to require additional time in which to take the Addendum into account in preparation of their bid or for any other reason. **Bidders are to check from time to time the E-Tender portal ["Technical RFx Response" under the tab "Amendments to Tender Documents"] for any amendments to the bid documents before submission of their bids. No separate intimation shall be sent to the Bidders.**

B. PREPARATION OF BIDS

- 5.0 LANGUAGE OF BIDS:** The bid as well as all correspondence and documents relating to the bid exchanged between the Bidder and the Company shall be in English language, except that any printed literature may be in another language provided it is accompanied by an official and notarised English translated version, which shall govern for the purpose of bid interpretation.

- 5.1 **BIDDER'S/AGENT'S NAME & ADDRESS:**

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Bidders should indicate in their bids their detailed postal address including the Fax/Telephone /Cell Phone Nos. and E-mail address. Similar information should also be provided in respect of their authorised Agents in India, if any.

6.0 DOCUMENTS COMPRISING THE BID:

Bids are invited under Single Stage Two Bid System. The bid to be uploaded by the Bidder in OIL's E-Tender portal shall comprise of the following components:

(A) TECHNICAL BID

- (i) Complete technical details of the services & equipment specifications with catalogue, etc. **(ANNEXURE-I)**
- (ii) Documentary evidence established in accordance with Clause 10.0 hereunder.
- (iii) Bid Security Declaration form in accordance, (Proforma-E).
- (iv) Copy of Bid-Form **without** indicating prices in (Proforma-C)
- (v) Statement of Compliance as per (Proforma-D)
- (vi) Copy of Priced Bid indicating prices (Proforma-B)
- (vii) Integrity Pact digitally signed by OIL's competent personnel as Annexure-A1 (Part-VIII), attached with the bid document to be digitally signed by the Bidder.
- (viii) Undertaking towards submission of authentic information/documents as per Format vide Proforma-M.

(B) PRICED BID

- (i) Bidder shall quote their prices in the following Proforma available in OIL's E-procurement portal in the **"Notes & Attachments" Tab**:
 - (1) Price-Bid Format as per Proforma-B
 - (2) Bid Form as per Proforma-C
- (ii) The Priced Bid shall contain the prices and any other commercial information pertaining to the service offered. Currency of quote shall be INR only.
- (iii) For convenience of the qualified Bidders and to improve transparency, the rates/costs quoted by bidders against OIL's e-tenders shall be available for online viewing by such Bidders whose price bids are opened by Company. A Bidder can view item-wise rates/costs of all other such peer bidders against the tender immediately after price bid opening, if the e-tender is floated by Company with PRICE CONDITION. In case the Price-Bid is invited by Company through attachment form under "Notes & Attachment" (i.e. NO PRICE Condition), Bidder must upload their detailed Price-Bid as per the prescribed format under "Notes & Attachment", in addition to filling up the "Total Bid Value" Tab taking into account the cost of all individual line items and other applicable charges like freight, tax, duties, levies etc. Under NO PRICE condition (i.e. Price Bid in attachment form), the "Total Bid Value" as calculated & quoted by the Bidders shall only be shared amongst the eligible bidders and Company will not assume any responsibility whatsoever towards calculation errors/omissions therein, if any. Notwithstanding to sharing the "Total Bid Value" or the same is whether filled up by the Bidder or not, Company will evaluate the cost details to ascertain the inter-se-ranking of bidders strictly as per the uploaded attachment and Bid Evaluation Criteria

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only. Online view of prices as above shall be available to the Bidders only up to seven (07) days from the date of Price-Bid opening of the e-tender.

7.0 BID FORM: The Bidder shall complete the Bid Form and the appropriate Price Schedule furnished in their Bid.

8.0 BID PRICE:

8.1 Prices must be quoted by the Bidders online as per the price bid format available in OIL's E- Tender Portal in "Notes & Attachment" Tab. Unit prices must be quoted by the Bidders, both in words and in figures.

8.2 Prices quoted by the successful Bidder must remain firm during its performance of the Contract and is not subject to variation on any account.

8.3 All duties and taxes including Corporate Income Tax, Personal Tax, Octroi/Entry Tax, other Cess/levies etc. except Goods and Service Tax (GST) payable by the successful Bidder under the Contract for which this Bid Document is being issued, shall be included in the rates, prices and total Bid Price submitted by the Bidder, and the evaluation and comparison of bids shall be made accordingly. For example, personal taxes and/or any corporate taxes arising out of the profits on the contract as per rules of the country shall be borne by the Bidder.

9.0 CURRENCY OF BID AND PAYMENT: A Bidder is expected to submit their bid in Indian Rupees. Currency once quoted will not be allowed to be changed.

10.0 DOCUMENTS ESTABLISHING BIDDER'S ELIGIBILITY AND QUALIFICATIONS:

10.1 These are listed in **BID EVALUATION CRITERIA (BEC), PART-2** of the Bid document.

11.0 BID SECURITY DECLARATION FORM:

11.1 THE BID SECURITY DECLARATION FORM is required to protect the Company against the risk of Bidder's conduct, failing which would result in banning of the Bidder as per Company's Banning Policy.

11.2 All the bids must be accompanied by THE BID SECURITY DECLARATION FORM as mentioned in the "Forwarding Letter" vide **Proforma-E** .

11.3 Any bid not secured in accordance with **sub-clause 11.2** above shall be rejected by the Company as non-responsive.

11.4 The Bidders shall extend the validity of the Bid suitably, if and when specifically advised by OIL, at the Bidder's cost.

11.5 The Bidder will be put under Banning list , if:

- i) The Bidder withdraws the bid within its original/extended validity.
- ii) The Bidder modifies/revise their bid suo-moto.

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- iii) Bidder does not accept the order/contract.
 - iv) Bidder does not furnish Performance Security Deposit within the stipulated time as per tender/order/contract.
 - v) If it is established that the Bidder has submitted fraudulent documents or has indulged into corrupt and fraudulent practice.
- 11.6 In case any Bidder withdraws their bid during the period of bid validity, the party shall be put in the Holiday List for a period upto two (02) years as the case may be as per Company's Banning Policy (available in OIL website).
- 11.7 **The copy of the "Bid Security declaration form (Proforma-E)" must be uploaded by Bidder along with the Technical bid in the "Technical Attachment" of OIL's E-portal.**
- 11.8 A bid shall be rejected straightway if **"Bid Security declaration form (Proforma-E)"** is not uploaded along with the Technical RFx. If the Bid Security validity is shorter than the validity indicated in Tender will be straightway rejected.

12.0 EXEMPTION FROM SUBMISSION OF BID SECURITY:

Bid security is exempted for this Tender. However, all the bidders shall be required to sign **"Bid Security declaration form (Proforma-E)" accepting that if they withdraw or modify their bids during the period of validity, or if they are awarded the contract and they fail to sign the contract, or to submit the performance security before the deadline defined in the LOA, they will be suspended for a period of two years. This suspension of two years shall be automatic without conducting any enquiry.**

13.0 PERIOD OF VALIDITY OF BIDS:

- 13.1 Bids shall remain **valid for 120** days from the date of closing of bid prescribed by the Company. **Bids of shorter validity will be rejected as being non-responsive.** If nothing is mentioned by the Bidder in their bid about the bid validity, it will be presumed that the bid is valid for 120 days from Bid Closing Date.
- 13.2 In exceptional circumstances, the Company may solicit the Bidder's consent to an extension of the period of validity. The request and the response thereto shall be made in writing through Fax or e-mail.

14.0 SIGNING OF BID:

- 14.1 Bids are to be submitted online through OIL's E-procurement portal with digital signature. The bid and all attached documents should be digitally signed by the Bidder using "Class 3" digital certificates with Organizations Name [e-commerce application (Certificate with personal verification and Organisation Name)] as per Indian IT Act 2000 obtained from the licensed Certifying Authorities operating under the Root Certifying Authority of India (RCAI), Controller of Certifying Authorities (CCA) of India before bid is uploaded. Digital Signature Certificates having "Organization Name" field

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other than Bidder's Name are not acceptable. However, aforesaid Digital Signature Certificates having Bidder's Name in the "Organization Name" field are acceptable. Bidder must also have Encryption Certificate along with Digital Signature Certificate (DSC) of Class III [Organization].

The bid including all uploaded documents shall be digitally signed by duly authorized representative of the Bidder holding a Power of Attorney to bind the Bidder to the contract.

If any modifications are made to a document after attaching digital signature, the digital signature shall again be attached to such documents before uploading the same. The Power of Attorney shall be submitted by Bidder as mentioned in Para 15.1 below.

The authenticity of above digital signature shall be verified through authorized CA after bid opening and in case the digital signature is not of "Class-3" with organization name, the bid will be rejected.

Bidder is responsible for ensuring the validity of digital signature and its proper usage by their employees.

- 14.2 The original and all copies of the bid shall be typed or written in indelible inks. Since bids are to be submitted ONLINE with digital signature, manual signature is NOT relevant. The letter of authorisation (as per **Proforma-H**) shall be indicated by written Power of Attorney accompanying the Bid.
- 14.3 Any person signing the Bid or any other document in respect of this Bidding Document or other relevant documents on behalf of the Bidder without disclosing his authority to do so shall be deemed to have the authority to bind the Bidder. If it is discovered at any time that the person so signing has no authority to do so, the Company (OIL) may, without prejudice to any other right or remedy, cancel his Bid or Contract and hold the Bidder liable to the Company (OIL) for all costs and damages arising from the cancellation of the Bid or Contract including any loss which the Company (OIL) may sustain on account thereof.
- 14.4 Any physical documents submitted by Bidders shall contain no interlineations, white fluid erasures or overwriting except as necessary to correct errors made by the Bidder, in which case such correction shall be initialled by the person or persons who has/have digitally signed the Bid.
- 14.5 Any Bid, which is incomplete, ambiguous, or not in compliance with the Bidding process will be rejected.

15.0 SUBMISSION OF BIDS

- 15.1 The tender is processed under Single Stage - Two Bid system . Bidder shall submit the Technical bid and Priced bid along with all the Annexure and Proforma (wherever applicable) and copies of documents in electronic form through OIL's e-procurement

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portal within the Bid Closing Date & Time stipulated in the e-tender. For submission of Bids online at OIL's E-Tender Portal, detailed instructions are available in **"HELP DOCUMENTATION"** available in OIL's E-Tender Portal. Guidelines for bid submission are also provided in the "Forwarding Letter". The Technical Bid is to be submitted as per Terms of Reference/Technical Specifications of the bid document and Priced Bid as per the Price Schedule. The Technical Bid should be uploaded in the "Technical Attachment" under "Techno-Commercial Bid" Tab Page only. Prices to be quoted as per Proforma-B should be uploaded as Attachment just below the "Tendering Text" in the attachment link under "Techno-Commercial Bid" Tab under General Data in the e-portal. **No price should be given in the "Technical Attachment", otherwise bid shall be rejected.** The priced bid should not be submitted in physical form and which shall not be considered. For details please refer "INSTRUCTIONS" documents. However, the following documents in one set should necessarily be submitted in physical form in sealed envelope super-scribing the "IFB No., Brief Description of services and Bid Closing/Opening Date & Time along with the Bidder's name" and should be submitted to GM-C&P, Contracts section, Pipe line Head Quarter, Oil India Ltd., P.O: Udayan Vihar, Narangi, Guwahati, District : Kamrup(M), Guwahati-781171, Assam, India on or before 11.00 Hrs (IST) on the bid closing date indicated in the IFB:

- i) Power of Attorney for signing of the bid digitally
- ii) Any other document required to be submitted in original as per bid document requirement.
- iii) Printed catalogue and literature if called for in the bid document if required.

Documents sent through E-mail/Fax/Telephonic method will not be considered.

- 15.2 All the conditions of the contract to be made with the successful Bidder are given in various Sections of the Bid Document. Bidders are requested to state their compliance to each clause as per Proforma-D of the bid document and in case of non-compliance, if any, the same to be highlighted in the Proforma-D and the same should be uploaded along with the Technical Bid.
- 15.3 Timely delivery of the documents in physical form as stated in Para 15.1 above is the responsibility of the Bidder. Bidders should send the same through Registered Post or by Courier Services or by hand delivery to the Officer in Charge of the particular tender before the Bid Closing Date and Time. Company shall not be responsible for any postal delay/transit loss.
- 15.4 Bids received through the e-procurement portal shall only be accepted. Bids received in any other form shall not be accepted.

16.0 INDIAN AGENT/REPRESENTATIVE/RETAINER/ASSOCIATE: Not Applicable.

17.0 DEADLINE FOR SUBMISSION OF BIDS:

- 17.1 Bids should be submitted online as per the online tender submission deadline. Bidders will not be permitted by System to make any changes in their bid/quote after the bid submission deadline is reached.

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- 17.2 No bid can be submitted after the submission dead line is reached. The system time displayed on the e-procurement web page shall decide the submission dead line.
- 17.3 The documents in physical form as stated in Para 15.1 must be received by Company at the address mentioned above on or before 11.00 Hrs (IST) on the scheduled Bid Closing Date. Timely delivery of the same is the responsibility of the Bidders.
- 18.0 LATE BIDS:** Bidders are advised in their own interest to ensure that their bids are uploaded in system before the closing date and time of the bid. The documents in physical form if received by the Company after the deadline for submission prescribed by the Company shall be rejected and shall be returned to the Bidders in unopened condition immediately.
- 19.0 MODIFICATION AND WITHDRAWAL OF BIDS:**
- 19.1 The Bidder after submission of Bid may modify or withdraw its Bid prior to Bid Closing Date & Time.
- 19.2 No Bid can be modified or withdrawn subsequent to the deadline for submission of Bids.
- 19.3 No Bid can be withdrawn in the interval between the deadline for submission of Bids and the expiry of the period of Bid Validity specified by the Bidder on the Bid Form. Withdrawal of a Bid during this interval shall be debarred from participation in future tenders of OIL and shall be put in the Holiday List for a period upto two (02) years as the case may be as per Company's Banning Policy.
- 20.0 EXTENSION OF BID SUBMISSION DATE:** Normally no request for extension of Bid Closing Date & Time will be entertained. However, OIL at its discretion, may extend the Bid Closing Date and/or Time due to any reasons.
- 21.0 BID OPENING AND EVALUATION:**
- 21.1 Company will open the Technical Bids, including submission made pursuant to clause 19.0, in presence of Bidder's representatives who choose to attend at the date, time and place mentioned in the Forwarding Letter. However, an authorisation letter (as per **Proforma-I**) from the Bidder must be produced by the Bidder's representative at the time of Bid Opening. Unless this Letter is presented, the representative will not be allowed to attend the Bid Opening. The Bidder's representatives who are allowed to attend the Bid Opening shall sign a register evidencing their attendance. Only one representative against each Bid will be allowed to attend. In technical bid opening, only "Technical Attachment" will be opened. Bidders therefore should ensure that technical bid is uploaded in the "Technical Attachment" Tab Page only in the E-portal.
- 21.2 In case of any unscheduled holiday or Bandh on the Bid Opening Date, the Bids will be opened on the next full working day. Accordingly, Bid Closing Date / time will get extended up to the next working day and time.

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- 21.3 Bids which have been withdrawn pursuant to clause 19.0 shall not be opened. Company will examine bids to determine whether they are complete, whether requisite Bid Security declaration format have been furnished, whether documents have been digitally signed and whether the bids are generally in order.
- 21.4 At bid opening, Company will announce the Bidder's names, written notifications of bid modifications or withdrawal, if any, and such other details as the Company may consider appropriate.
- 21.5 Normally no clarifications shall be sought from the Bidders. However, for assisting in the evaluation of the bids especially on the issues where the Bidder confirms compliance in the evaluation and contradiction exists on the same issues due to lack of required supporting documents in the Bid (i.e. document is deficient or missing), or due to some statement at other place of the Bid (i.e. reconfirmation of confirmation) or vice-versa, clarifications may be sought by OIL. In all the above situations, the Bidder will not be allowed to change the basic structure of the Bid already submitted by them and no change in the price or substance of the Bid shall be sought, offered or permitted.
- 21.6 Prior to the detailed evaluation, Company will determine the substantial responsiveness of each bid to the requirement of the Bid Documents. For purpose of these paragraphs, a substantially responsive bid is one, which conforms to all the terms and conditions of the Bid Document without material deviations or reservation. A material deviation or reservation is one which affects in any way substantial way the scope, quality, or performance of work, or which limits in any substantial way, inconsistent way with the Bid Documents, the Company's right or the Bidder's obligations under the contract, and the rectification of which deviation or reservation would affect unfairly the competitive position of other Bidders presenting substantial responsive bids. The Company's determination of Bid's responsiveness is to be based on the contents of the Bid itself without recourse to extrinsic evidence.
- 21.7 A Bid determined as not substantially responsive will be rejected by the Company and may not subsequently be made responsive by the Bidder by correction of the non-conformity.
- 21.8 The Company may waive minor informality or nonconformity or irregularity in a Bid, which does not constitute a material deviation, provided such waiver, does not prejudice or affect the relative ranking of any Bidder.

22.0 OPENING OF PRICED BIDS:

- 22.1 Company will open the Priced Bids of the technically qualified Bidders on a specific date in presence of representatives of the qualified Bidders. The technically qualified Bidders will be intimated about the Priced Bid Opening Date & Time in advance. In case of any unscheduled holiday or Bandh on the Priced Bid Opening Date, the Bids will be opened on the next working day.

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22.2 The Company will examine the Price quoted by Bidders to determine whether they are complete, any computational errors have been made, the documents have been properly signed, and the bids are generally in order.

22.3 Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price (that is obtained by multiplying the unit price and quantity) the unit price shall prevail and the total price shall be corrected accordingly. If there is a discrepancy between words, and figures, the amount in words will prevail. If any Bidder does not accept the correction of the errors, their Bid will be rejected.

23.0 CONVERSION TO SINGLE CURRENCY: Not Applicable.

24.0 EVALUATION AND COMPARISON OF BIDS: The Company will evaluate and compare the bids as per **BID EVALUATION CRITERIA (BEC), PART-2** of the Bid Document.

24.1 **DISCOUNTS / REBATES:** Unconditional discounts/rebates, if any, given in the bid will be considered for evaluation.

24.2 Post bid or conditional discounts/rebates offered by any Bidder shall not be considered for evaluation of bids. However, if the lowest Bidder happens to be the final acceptable Bidder for award of contract, and if they have offered any discounts/rebates, the contract shall be awarded after taking into account such discounts/rebates.

24.3 **LOADING OF FOREIGN EXCHANGE:** There would be no loading of foreign exchange for deciding the inter-se-ranking of domestic Bidders.

24.4 **EXCHANGE RATE RISK:** Since Indian Bidders are now permitted to quote in any currency and also receive payments in that currency, Company will not be compensating for any exchange rate fluctuations in respect of the services.

24.5 **REPATRIATION OF RUPEE COST:** Not Applicable.

25.0 CONTACTING THE COMPANY:

25.1 Except as otherwise provided in **Clause 21.0** above, no Bidder shall contact Company on any matter relating to its bid, from the time of the bid opening to the time the Contract is awarded except as required by Company vide **sub-clause 21.6**.

25.2 An effort by a Bidder to influence the Company in the Company's bid evaluation, bid comparison or Contract award decisions may result in the rejection of their bid.

D. AWARD OF CONTRACT

26.0 AWARD CRITERIA:

26.1 The Company will award the Contract to the successful Bidder whose bid has been determined to be substantially responsive and has been determined as the lowest

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evaluated bid, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.

27.0 COMPANY'S RIGHT TO ACCEPT OR REJECT ANY BID:

- 27.1 Company reserves the right to accept or reject any or all bids and to annul the bidding process and reject all bids, at any time prior to award of contract, without thereby incurring any liability to the affected Bidder, or Bidders or any obligation to inform the affected Bidder of the grounds for Company's action.

28.0 NOTIFICATION OF AWARD:

- 28.1 Prior to the expiry of the period of bid validity or extended validity, Company will notify the successful Bidder in writing by registered letter or by fax or E-mail (to be confirmed in writing by registered / couriered letter) that its Bid has been accepted.
- 28.2 The notification of award will constitute the formation of the Contract.
- 28.3 Upon the successful Bidder's furnishing of Performance Security pursuant to Clause below, the Company will promptly notify each un-successful Bidder.

29.0 PERFORMANCE SECURITY:

- 29.1 Performance security @3% of annualized contract value is applicable against this contract. PBG amount and validity mentioned in the LOA shall be submitted by the successful bidder within 30 days of issuance of Letter of Award as per **Proforma-F** and must be in the form of a Bank Guarantee from any schedule Indian Bank or Any Branch of an International bank situated in India and registered with Reserve Bank of India as scheduled foreign bank in case of domestic Bidder.

Bank Guarantee issued by a Bank, amongst others, must contain the following particulars of such bank:

- a) Full address.
- b) Branch Code.
- c) Code Nos. of the authorized signatory with full name and designation.
- d) Phone Nos., Fax Nos., E-mail address.

The domestic Bidders will have to submit the Bank Guarantee from any of the scheduled banks and on non-judicial stamp paper of requisite value as per the Indian Stamp Act, purchased in the name of the issuing banker.

The Performance Bank Guarantee shall be denominated in the currency of the contract.

- 29.2 The Performance Bank Guarantee specified above must be valid as mentioned in the LOA. The Performance Bank Guarantee will be discharged by Company not later than 30 days following its expiry. In the event of any extension of the Contract period, Bank Guarantee should be extended by Contractor by the period equivalent to the extended period.

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- 29.3 The Performance Bank Guarantee shall be payable to Company as compensation for any loss resulting from Contractor's failure to fulfil its obligations under the Contract.
- 29.4 The Performance Security will not accrue any interest during its period of validity or extended validity.
- 29.5 Failure of the successful Bidder to comply with the requirements of **clause 29.0 and/or 30.0** and their sub-clauses shall constitute sufficient grounds for annulment of the award and forfeiture of the Performance Security. In such an eventuality, the party shall be put in the Holiday List for a period upto two (02) years as the case may be as per Company's Banning Policy.
- 29.6 Bidders are requested to advise the Bank Guarantee issuing bank to comply with the following and ensure to submit, the receipt of the copy of SFMS message as sent by the issuing bank branch, along with the original Bank Guarantee in OIL's office.

The bank guarantee issued by the bank must be routed through SFMS platform as per following details:

- (a) "MT 760 / MT 760 COV for issuance of bank guarantee
- (b) "MT 760 / MT 767 COV for amendment of bank guarantee

The above message/ intimation shall be sent through SFMS by the BG issuing bank branch to Axis Bank, Guwahati Branch, IFS Code- UTIB0000140, Branch Address – Axis Bank Ltd, Guwahati Branch, chibber House , G S Road, dispur, Assam , PIN- 781005."

30.0 SIGNING OF CONTRACT:

- 30.1 At the same time as the Company notifies the successful Bidder that its Bid has been accepted, the Company will either call the successful Bidder for signing of the agreement or send the Contract Form provided in the Bid Documents, along with the General & Special Conditions of Contract, Technical Specifications, Schedule of Rates incorporating all agreements agreed between the two parties.
- 30.2 The successful Bidder shall sign and date the contract and return it to the Company after receipt of LOA. Till the contract is signed, the LOA issued to the successful Bidder shall remain binding amongst the two parties.
- 30.3 In the event of failure on the part of the successful Bidder to sign the contract, OIL reserves the right to terminate the LOA issued to the successful Bidder and invoke the Performance Security if submitted by the successful Bidder. The party shall also be put in the Holiday List for a period upto two (02) years as the case may be as per Company's Banning Policy.

31.0 FURNISHING FRAUDULENT INFORMATION/DOCUMENTS:

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- 31.1 If it is found that a Bidder/contractor has furnished fraudulent information / documents, the Performance Security shall be forfeited and the party shall be banned for a period of 3 (three) years from the date of detection of such fraudulent act besides the legal action as per Company's Banning Policy.

32.0 CREDIT FACILITY:

- 32.1 Bidders should indicate clearly in the Bid about availability of any credit facility inclusive of Government to Government credits indicating the applicable terms and conditions of such credit.

33.0 MOBILISATION ADVANCE PAYMENT: Not Applicable.

34.0 INTEGRITY PACT:

- 34.1 OIL shall be entering into an Integrity Pact with the Bidders as per format enclosed vide **Annexure-A1** of the Bid Document. The Integrity Pact has been duly signed digitally by OIL's competent signatory and uploaded in the OIL's e-portal. The Integrity Pact shall be uploaded by the Bidder (along with the technical Bid) duly signed by the same signatory who signed the Bid i.e. who is duly authorized to sign the Bid. Uploading the Integrity Pact in the OIL's E-portal with digital signature will be construed that all pages of the Integrity Pact has been signed by the Bidder's authorized signatory who has signed the bid. **If any Bidder refuses to sign Integrity Pact or declines to submit the Integrity Pact, their bid shall be rejected straightway.**
- 34.2 OIL has appointed SHRI SUTANU BEHURIA, IAS (Retd.), , SHRI RUDHRA GANGADHARAN, IAS (RETD.) and SHRI OM PRAKASH SINGH, IPS (RETD.), , as Independent Monitors (IEM) for a period of 3 (three) years to oversee implementation of Integrity Pact in OIL . Bidders may contact the Independent External Monitors for any matter relating to the IFB at the following addresses:

A. SHRI SUTANU BEHURIA, IAS (Retd.),
E-mail: sutanu2911@gmail.com

B. SHRI RUDHRA GANGADHARAN, IAS (RETD.),
Ex-Secretary, Ministry of Agriculture
(e-mail id : rudhra.gangadharan@gmail.com)

C.SHRI OM PRAKASH SINGH, IPS (RETD.),
Former DGP, Uttar Pradesh
E-mail: Ops2020@rediffmail.com

35.0 LOCAL CONDITIONS:

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- 35.1 It is imperative for each Bidder to be fully informed themselves of all Indian as well as local conditions, factors and legislation which may have any effect on the execution of the work covered under the Bidding Document. The Bidders shall be deemed, prior to submitting their bids to have satisfied themselves of all the aspects covering the nature of the work as stipulated in the Bidding Document and obtain for themselves all necessary information as to the risks, contingencies and all other circumstances, which may influence or affect the various obligations under the Contract.

No request will be considered for clarifications from the Company (OIL) regarding such conditions, factors and legislation. It is understood and agreed that such conditions, factors and legislation have been properly investigated and considered by the Bidders while submitting the Bids. Failure to do so shall not relieve the Bidders from responsibility to estimate properly the cost of performing the work within the provided timeframe. Company (OIL) will assume no responsibility for any understandings or representations concerning conditions made by any of their officers prior to award of the Contract. Company (OIL) shall not permit any Changes to the time schedule of the Contract or any financial adjustments arising from the Bidder's lack of knowledge and its effect on the cost of execution of the Contract.

- 36.0 SPECIFICATIONS:** Before submission of Bids, Bidders are requested to make themselves fully conversant with all Conditions of the Bid Document and other relevant information related to the works/services to be executed under the contract.

- 37.0 CUSTOMS DUTY:** Not Applicable.

- 38.0 PURCHASE PREFERENCE:** Purchase Preference will be applicable as per latest Govt. Guidelines. Bidders to take note of the same and quote accordingly. It is Bidder's responsibility to submit necessary documents from the Competent Authority to establish that they are eligible for purchase preference against this tender.

- 39.0 PRICE PREFERENCE:** Not Applicable.

- 40.0 PURCHASE PREFERENCE ON LOCAL CONTENT:** Purchase preference policy-linked with Local Content (PP - LC) notified vide letter no. O-27011/44/2015-ONG-II/FP dated 25.04.2017 of MoP&NG shall be applicable in this tender. Bidders seeking benefits, under Purchase Preference Policy (linked with Local Content) (PP-LC) shall have to comply with all the provisions specified in **Appendix-C** and shall have to submit all undertakings / documents applicable for this policy.

- 41.0** General Health, Safety and Environment (HSE) aspects shall be as per the terms set forth in Appendix-A of the tender document.

- 42.0** Procedure for obtaining Labour License under Contract Labour (R&A) Act, 1970 & Central Rules-1971 shall be as per terms set forth in Appendix-B of tender document.

- 43.0** The User Manual provided on the e-portal on the procedure How to create Response for submitting offer may be referred for guidance.

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- 44.0** Bidder must submit undertaking towards submission of authentic information/documents as per Format vide PROFORMA-M
- 45.0** Reference is invited to the office memorandum F.No. 6/18/2019-PPD dated 23rd July,2020 (order - public Procurement no.1) and clarification to order procurement no. 1 vide order (Public Procurement no. 3) dated 24th July'2020 issued by Public Procurement Division, Department of Expenditure, Ministry of Finance, where Govt. of India restricts public procurement from a country which shares a land border with India. Bidders are advised to refer to this memorandum and submit their bids in compliance to the same. **Bidders must also submit an undertaking as per Proforma-A on their Company letterhead along with their technical bid.**

END OF PART – 1

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PART - 2

BID EVALUATION CRITERIA (BEC)

BID EVALUATION CRITERIA (BEC) /BID REJECTION CRITERIA (BRC)

(A) BID EVALUATION CRITERIA (BEC):

1. All the documents related to BEC must be submitted along with the Techno-Commercial Bid. Otherwise, the bid will be considered as non-responsive and rejected.
2. Interested bidders shall have to submit the following documents to qualify for opening of the Price Bid:

1.0 TECHNICAL CRITERIA.

- (i) **EXPERIENCE:** Bidder should have the experience of at least one successfully completed similar work in the North Eastern States of value not less than INR **45,10,19,000.00** in any Central / State Govt. Departments / PSUs / Govt. Autonomous bodies or Public Limited Companies listed in the stock exchange duly supported with TDS certificate in evidence of the value of work in last seven (07) years reckoned from the Original bid closing date. Submission of documentary evidence of Public Limited Company listed in stock exchange is the responsibility of bidder. The project for which the above experience is claimed, should have been satisfactorily completed and / or handed over / commissioned prior to the original date of bid closing. The bidder shall furnish necessary documentary evidences in the form of experience certificate(s) issued by the organization to whom such service has been rendered or a copy of contract/work order and completion certificate/ payment certificate issued by the client against the said contract, failing which the offer will be rejected. The certificates should contain at least the following information:
 - a) Tender/ Contract/Work Order Number with date
 - b) Description of the job
 - c) Work Period / Completion date
 - d) Executed Value of contract

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(Satisfactory supply/completion/installation report (if submitted) should be issued on client's official letterhead with signature and stamp.)

Note:

I) 'Similar Works' means Civil work comprising—RCC framed multi-storied Institutional/Residential/Industrial building including services like electrification, Sanitary & Water Supply, Drainage and waste management, HVAC, Fire-fighting & Site development etc. from Central / State Govt. Departments / PSUs / Govt. Autonomous bodies or Public Limited Companies listed in the stock exchange duly supported with TDS certificate in evidence of the value of work. Submission of documentary evidence of Public Limited Company listed in stock exchange is the responsibility of bidder.

II) Experience of repairing / maintenance nature of above will not be considered for evaluation.

III) SIMILAR work executed by a bidder for its own organization / subsidiary will not be considered as experience for the purpose of meeting BEC.

- (ii) **Green Or Smart Building Experience:** The bidder should have successfully executed at least one RCC Framed Multi-storied Building which is either Green Building / OR Smart Building having Building Management System (BMS) (having Access Control Management with CCTV, EPABX, IT infrastructure) in the last 7 (seven) years to be reckoned from the original Bid closing date of this tender irrespective of value of the job successfully completed under Central / State Govt. Departments / PSUs / Govt. Autonomous bodies or Public Limited Companies listed in the stock exchange. Documentary proof/ Certificate from Central / State Government Departments / PSUs / Govt. Autonomous bodies or Public Limited Company listed in stock exchange having duly accredited by GRIHA/IGBC/ LEED/ EDGE shall be submitted by the bidder. The project for which the above experience is claimed, should have been satisfactorily completed and / or handed over / commissioned prior to the original date of bid closing. The bidder shall furnish necessary documentary evidences in the form of experience certificate(s) issued by the organization to whom such service has been rendered or a copy of contract/work order and completion certificate/payment certificate issued by the client against the said contract, failing which the offer will be rejected. The certificates should contain at least the following information:

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For Green Building:

- a) Tender/ Contract/ Work Order Number with date
- b) Description of the job
- c) Work Period / Completion date
- d) Executed Value of contract
- e) Certificate issued from GRIHA/IGBC/ LEED / EDGE

(Satisfactory supply/completion/installation report (if submitted) should be issued on client's official letterhead with signature and stamp.)

For Smart Building:

- a) Tender/ Contract/Work Order Number with date
- b) Description of the job
- c) Work Period / Completion date
- d) Executed Value of contract
- e) In respect of execution of smart building, Contract/Work order should clearly mention about Building Management System (BMS) [Access Control Management with CCTV, EPABX, IT infrastructure etc].

(Satisfactory supply/ completion/installation report (if submitted) should be issued on client's official letterhead with signature and stamp.)

- iii. The bidder must possess a valid electrical contractor's license issued / endorsed by Electrical Licensing Board of Govt. of Assam or else have tie up with an electrical Firm / contractor holding valid aforementioned license. The bidder or their collaborators must have experience in internal electrification works in Office. Residential Building during last seven (7) years reckoned from the original bid closing date of this tender. In case of collaboration with any firm as mentioned above, the bidder must furnish an MoU entered into with the collaborator towards providing the requisite service as per the terms of the contract.
- iv. Joint Venture / Consortium: Joint Ventures / consortium are not permitted.
- v. If the bidder is executing works /contract which is still running and the contract value/quantity executed prior to original date of bid submission is equal to or more than the amount as mentioned in para 1 (i) above, such experience will also be taken in to consideration, provided that bidder has submitted satisfactory service execution certificate Issued by the user.

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1.1 EQUIPMENT DEPLOYMENT CRITERIA:

- a) Bidder shall comply for deploying the minimum numbers of equipment as per Annexure-I of Bid Document.
- b) Bidder shall own the critical equipments as per quantity mentioned in *Annexure-I enclosed* with bid. Otherwise the equipment may be hired/ leased by the bidder. In case of owned equipment, the bidder shall submit authentic document to establish that they own the equipment specified above. The bidder has to submit the proof of ownership and working condition of equipment with the bid. Bidders are required to submit documentary evidence of ownership of the equipment as indicated below:
 - (i) The bidder shall submit either of the following documents to establish that they own the equipment. Registration certificate issued by regulating authority or Insurance coverage or Certificate from Chartered Accountant, certifying that the bidder owns the equipment and the same are available for the Project.
Or
For equipment to be purchased: - Purchase order duly accepted by equipment supplier and with equipment delivery to project site, meeting the equipment deployment schedule.
 - (ii) Certificate from Chartered Engineer certifying that the bidder own equipment are under good health and working condition.
 - (iii) For hired/leased equipment Bidder shall submit commitment letter from the supplier agency on the availability of equipment in good working condition as per list enclosed in bid.

2.0 FINANCIAL CRITERIA

- a) Annual Financial Turnover of the bidder during any of preceding three financial/accounting years from the original bid closing date should be at least **₹15,03,39,733.00**
- b) Net worth of firm/bidder must be equal to or more than **₹4,51,01,920.00** as per immediate preceding audited financial year result.
- c) Considering the time required for preparation of Financial Statements, if the last date of preceding financial / accounting year falls within the preceding six months reckoned from the original bid closing date and the Financial Statements of the preceding financial / accounting year are not available with the bidder, then the financial turnover of the previous three financial / accounting years excluding the preceding financial /accounting year will be

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considered. In such cases, the Net worth of the previous financial / accounting year excluding the preceding financial / accounting year will be considered. However, the bidder has to submit an affidavit/undertaking certifying that the balance sheet/Financial Statements for the preceding financial year (as the case may be) has actually not been audited so far.

Notes:

For proof of Annual Turnover & Net worth any one of the following document must be submitted along with the bid: -

- i) A certificate issued by a practicing Chartered/Cost Accountant (with Membership Number, UDIN and Firm Registration Number), certifying the Annual turnover & Net worth as per format prescribed in PROFORMA-J.

OR

- ii) Audited Balance Sheet along with Profit & Loss account.

- d) In case the bidder is a Central Govt. Organization/PSU/State Govt. Organization/Semi-State Govt. Organization or any other Central/State Govt. Undertaking, where the auditor is appointed only after the approval of Comptroller and Auditor General of India and the Central Government, their certificates may be accepted even though FRN is not available. However, bidder to provide documentary evidence for the same.

e) **WORKING CAPITAL**

- (i) The bidder should have minimum working capital equal or more than **₹4,51,01,920.00**, as per immediate preceding audited financial year result.
- (i) In case working capital is short, the bidder can supplement the same through line of credit from a scheduled commercial bank having net worth more than 100 crores as per enclosed **PROFORMA-XI**.
- (ii) In the event of award, the contractor shall open a project specific account in a nationalized bank located in Guwahati where the project will be executed. The contractor shall deposit an amount equal to 10% of the annualized contract value within 15 days from the date of issue of Letter of Award(LOA).
- (iii) All payment against the contract shall be remitted to the project specific account. Any withdrawal from this account shall be only after the first payment against the contract is made by Oil India Limited(OIL).

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(iv) At any point of time the minimum balance after first remittance by OIL against invoice from the contractor shall remain 5% of the annualized contract value.

(vi) In addition to above the bidder should submit a financial resource / cash flow plan for execution of the contract.

Note: Working Capital shall mean “Current Assets minus Current Liabilities” as per latest year’s audited annual Financial Statements

(d) **BID CAPACITY:** The bidding capacity of the contractor should be equal to or more than ₹30,06,79,467.00. The Bidding Capacity shall be worked out by the following formula:

Bidding Capacity=[A x1.5]-B

Where,

A= Maximum annual turnover in any one of the preceding three (3) financial years.

B= Commitments in the next twelve (12) months from the date of expiry of the bid validity as per **Annexure-A**

ANNEXURE - A DECLARATION BY BIDDER REGARDING CONCURRENT COMMITMENT:

I/ We aged years on of do hereby solemnly affirm and declare as follows for and on behalf of the Firm:					
LIST OF EXISTING COMMITMENT AND ONGOING WORK					
Sl. No.	Name of Works	Client Name & Address	Work Order Value (INR)	Work Executed till date of submission of bid (INR)	Amount of balance work which may fall for execution during the period of 12 months from the date of expiry of the bid validity (INR)
					(4-5)
1	2	3	4	5	6
	Balance commitments in 12 month from the date of expiry of the Bid Validity				INR
	It is certified that the above particulars furnished are true and correct. If any information given is found to be misleading at a later date, OIL will have the authority to take necessary action as per provision of the Contract and as per laid down procedure of the Company (OIL).				
SIGNAND STAMP OF BIDDER (AUTHORISED SIGNATORY HAVING POWER OF ATTORNEY)					
Note: Accuracy level of balance commitments as per total of column 6 above should be within +/- 10%.					

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- (e) **DEBT EQUITY RATIO:** Debt equity ratio of the bidder should not be more than **2:1**.
Debt equity ratio shall mean long term borrowings/ Net-worth.

Note: In case the financial statements submitted by the bidder are in currencies other than INR, BC selling rate declared by State Bank of India prevailing on one day prior to bid closing date shall be considered for converting it into INR.

- (f) **GST Registration:** The Bidder should have GST Registration. GST Registration Certificate shall be submitted with the tender document.
- (g) **EPF Registration:** Preferably agency should have EPF registration. In case EPF registration is not there, the agency should obtain EPF registration on allotment of work. In case of failure, OIL India Ltd./OIL INDIA will deduct EPF & deposit as per EPF norms.

3.0 COMMERCIAL EVALUATION CRITERIA.

- 1.0 Bids are invited under **SINGLE STAGE TWO BID SYSTEM**. Bidders shall quote accordingly. **Please note that no price details should be furnished in the Technical (i.e. Unpriced) bid.** The “Unpriced Bid” shall contain all techno-commercial details except the prices, which shall be kept blank. The “Price Bid” must contain the price schedule and the bidder’s commercial terms and conditions. Bidder not complying with above submission procedure will be rejected. Bids shall be submitted under single stage Two Bid System i.e. Technical Bid and Priced Bid separately in the OIL’s e-Tender portal. The Technical Bid is to be uploaded as per Scope of Work & Technical Specification of the tender in “Technical Attachments” Tab and Priced Bid uploaded in the “Notes & Attachments” Tab. Bids shall be rejected outright if the prices are indicated in the technical bids. Bids not conforming to this two-bid system shall be rejected outright.
- 2.0 Bid security/EMD is not required against the tender. However, **Bid Security Declaration** is required and same must be submitted along with technical bid. The Bid Security Declaration format is attached vide **PROFORMA-E**. Any bid not accompanied with Bid Security Declaration (As per Format) will be rejected without any further consideration.
- 3.0 MSME Bidders are also required to furnish the **Bid Security Declaration as per format in Proforma -E**.
- 4.0 The prices offered will have to be firm through delivery and not subject to variation on any account. A bid submitted with an adjustable price will be treated as non-responsive and rejected.

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- 5.0 **Validity of the bid shall be minimum 120 days from the final Bid Closing date. Bids with lesser validity will be rejected.**
- 6.0 All the Bids must be Digitally Signed using Class III digital certificate (e-commerce application) with 'Certificate Type: **Organization Certificate**' as per Indian IT Act obtained from the licensed Certifying Authorities operating under the Root Certifying Authority of India (RCAI), Controller of Certifying Authorities (CCA) of India. The bid signed using other than "Class 3" and "Organization" digital certificate, will be rejected.
- 7.0 Successful bidder will be required to furnish a **Performance Bank Guarantee @ 03%** of the order value.
- 8.0 The bid documents are non-transferable. Bid can only be submitted in the name of the bidder in whose name the User ID and Password have been issued & purchased the tender document online.
- 9.0 Bids containing incorrect statement will be rejected.
- 10.0 No offers should be sent by Telex, Cable, E-mail or Fax. Such offers will not be accepted.
- 11.0 The following points are deemed as "non-negotiable" and offer shall be rejected straightaway without seeking clarification:
- i. Validity of bid shorter than validity indicated in the tender.
 - ii. Bid Security declaration not received as per format
(**As per PROFORMA-E**)
 - iii. In case the party refuses to sign Integrity Pact.
- 12.0 Bidder must accept and comply with the following clauses as given in the Bid Document, failing which bid shall be liable for rejection:
- a. Firm price
 - b. EMD / Bid Bond Bid Security Declaration
 - c. Scope of work
 - d. Specifications
 - e. Price schedule
 - f. Delivery / completion schedule
 - g. Period of validity of bid
 - h. Liquidated Damages
 - i. Performance bank guarantee / Security deposit

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- j. Guarantee of material / work
- k. Arbitration / Resolution of Dispute
- l. Force Majeure
- m. Applicable Laws
- n. Integrity Pact, if applicable

13.0 To ascertain the inter-se-ranking, the comparison of the responsive bids will be made.

13.1 In case of identical lowest offered rate by more than 1 (one) bidder, the selection of priority1 and priority 2 bidder will be made by draw of lots amongst the parties offering the same lowest price. The tender shall be awarded to priority 1 bidder only, but if priority1 bidder fails to accept the LOI/found non-eligible/fails to execute the job, then Company reserves the right to award the same to priority 2 bidder after taking management approval for the same.

14.0 PRICE SCHEDULE:

Bidder shall submit the Price Break up as per Annexure DD. Bidders should fill up the annexure, sign and upload under “Notes & Attachments” > “Attachments” only. Evaluation of offers shall be done on as per price bid format.

14.1 Comparison of offers shall be done on as per PROFORMA-B Contract shall be awarded to the L1 bidder evaluated as per the price bid format.

14.2 If there is any discrepancy between the unit price and the total price, the unit price will prevail and the total price shall be corrected. Similarly, if there is any discrepancy between words and figure, the amounts in words shall prevail and will be adopted for evaluation.

14.3 Price bids of only those bidders will be opened whose offers are found to be techno-commercially acceptable.

14.4 Purchase Preference (Linked with Local Content) (PP-LC) is applicable against this tender. Bidders to note that Ministry of Petroleum & Natural Gas, Government of India implemented PPLC Policy to provide Purchase Preference (linked with local content) by notification no. Ref. FP-20013/2/2017-FP-PNG dtd.17.11.2020 and amended from time to time. Bidders are requested to take note of the same and to submit their offers accordingly wherever applicable. The bids shall be evaluated as per applicability of policy.

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15.0 The Integrity Pact is applicable against this tender. OIL shall be entering into an Integrity Pact with the bidders as per format enclosed vide **Annexure A1-(Part-VIII)** of the tender document. This Integrity Pact proforma has been duly signed digitally by OIL's competent signatory. The proforma has to be returned by the bidder (along with the technical bid) duly signed (digitally) by the same signatory who signed the bid, i.e., who is duly authorized to sign the bid. Uploading the Integrity Pact with digital signature will be construed that all pages of the Integrity Pact has been signed by the bidder's authorized signatory who sign the Bid. The name of the OIL's Independent External Monitors at present are as under:

- a. Shri Sutanu Behuria, IAS (Retd.),
E-mail: sutanu2911@gmail.com
- b. Shri Rudhra Gangadharan, IAS (Retd.); Ex-Secretary,
Ministry of Agriculture
E-mail id: rudhra.gangadharan@gmail.com
- c. Shri Om Prakash Singh, IPS (Retd.),
Former DGP, Uttar Pradesh
E-mail: Ops2020@rediffmail.com

16.0 No press advertisement will be published regarding amendment to Bidding Document or extension of Bid Closing Date. The same will be uploaded in OIL's website and informed to all prospective bidders who have received the bidding documents. Bidders to keep themselves updated.

17.0 Other terms and conditions of the enquiry shall be as per General Terms and Conditions for LCB Tender. However, if any of the Clauses of the Bid Rejection Criteria / Bid Evaluation Criteria (BEC/BRC) mentioned here contradict the Clauses in the General Terms & Conditions of LCB Tender of the tender and/or elsewhere, those mentioned in this BEC/BRC shall prevail.

18.0 Bid Documents / User Id & Password for OIL's E-Tender portal are not transferable.

19.0 Any bid received in the form of Physical document/ Telex/Cable/Fax/E-mail will not be accepted.

20.0

20.0 There should not be any indication of price in the Un-priced Techno-Commercial Bid. If there is any indication of price in the Un-priced Techno-Commercial Bid, Such Bid will be rejected straightway.

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21.0 Bidder must accept and comply with the following provisions as given in the tender document. Deviations to such provisions shall make the bid liable for rejection.

- a. Firm price
- b. Bid Security Declaration (As per **PROFORMA-E**)
- c. Scope of work
- d. Specifications
- e. Price schedule
- f. Delivery / completion schedule
- g. Period of validity of bid
- h. Liquidated Damages
- i. Performance bank guarantee / Security deposit
- j. Guarantee of material / work
- k. Arbitration / Resolution of Dispute
- l. Force Majeure
- m. Applicable Laws
- n. Integrity Pact

22. OTHER CONFIRMATIONS FROM BIDDER:

While submitting bid, bidder will have to provide categorical confirmation to below requirements; otherwise his/her /their bid will be rejected.

- a) The successful Bidder is required *to open a separate account* with any scheduled/nationalized bank in Guwahati wherein all receipts and payments in respect of the Contract are to be routed through this account only.
- b) The Running Account (RA) bills of the contractor will be processed when the monthly bank account statement are submitted to OIL along with the bill and it established that the withdrawn money has been utilized only for the project work. Along with each RA bill the Contractor will have to submit the proof of payments being made to its sub-vendors and sub-contractors.
- c) If during the course of the project execution, it is established that the project progress is getting affected due to non-payment by Contractor to its sub-vendors and sub-contractors than OIL will have the right to make direct

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payments to these sub-vendors and sub-contractors from main contractor RA bill final payable amount (after effecting statutory deductions as applicable) at total and risk and cost of main Contractor.

- d) The bidder will not be able to use this account for entering into any type of mortgage/loan/factoring arrangement with other financial institutions during the course of the contract execution with OIL without the written consent of OIL.

23. VERIFICATION BY INDEPENDENT INSPECTION AGENCIES:

- a) The Bidders have to get verified and certified the various documents required against BEC/BRC of the tender by anyone of the following Independent Inspection Agencies and submit the duly certified Inspection Certificate by the Inspection Agencies along with the Technical Bid of the Tender:
- (i) M/s. RINA India Pvt. Ltd.
 - (ii) M/s. Dr. Amin Controller Pvt. Ltd.
 - (iii) M/s. Germanischer Lloyd Industrial Services GmbH (DNV GL-Oil & Gas)
 - (iv) M/s. TÜV SÜD South Asia Pvt. Ltd.
 - (v) M/s. IRCLASS Systems and Solutions Private Limited
 - (vi) M/s. Gulf Lloyds Industrial Services (India) Pvt. Ltd.
 - (vii) M/s. TUV India Private Limited
 - (viii) M/s. TÜV Rheinland (India) Pvt. Ltd.
 - (ix) M/s. Bureau Veritas (India) Private Limited.

All Charges of the Third-party Independent Inspection Agencies towards verification of bidder's documents and certification thereof shall be borne by the respective bidders and Payments on account of above inspection, verification and certification shall be made directly by the Bidder to the Inspection Agency(s). OIL will not be responsible for any payment dispute between Bidders and Third Party Inspection Agencies.

- b) As mentioned above, Bidder(s) have to submit the verified documents along with the Technical Bids. Bid submitted with un-verified supporting documents shall not be normally considered. However, in case a bidder submits its bid alongwith all relevant supporting documents as per BEC/BRC without getting all/some of them verified by the designated Independent Inspection agency, such bid can be provisionally considered provided it is accompanied by an

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Undertaking by the Bidder on their official letterhead to submit the duly verified copies/verification certificate within seven (7) days of actual bid opening. Company will neither send any reminder nor seek any clarification in this regard from such bidders, and the bid **will be rejected outright** if the bidder fails to submit the verified copies/verification certificate within seven (7) days of actual bid opening at its own risk and responsibility. If a bidder does not submit the undertaking towards submission of third party certification within 7 days from date of Bid Closing date, but certified document reaches us within the cut-off date of above seven (7) days, then such bids shall be considered.

- c) The detailed methodology of inspection / verification of documents followed by the agencies are provided in Instruction To Bidder (ITB) at appropriate Clause

PROFORMA XI

Format for Line of Credit from Scheduled commercial bank

Confirmation from the bank for the availability of unutilized line of credit:

We (Name of bank) having our registered office at hereby confirm the company M/s. (bidder) having registered office at is having account with our bank. Presently the credit limits of the company are as under:			
	Item	INR	
Sanctioned Line of Credit			
Utilized Line of Credit			
Balance Line of Credit			

We further confirm that we are scheduled commercial bank having Net Worth more than 100 Crs.

Authorized Signatory of Bank

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ANNEXURE-I

List of major Plant and Machinery in possession of the firm

S. No.	Name of Plant & Machinery / equipment	Minimum Required site	No. Others (As & at when required)
A	B	C	D
1.	Excavator		01
2.	JCB	01	
3.	Dozer		01
4.	Dumper/Tipper	04	
5.	Truck	02	
6.	Tractor with trolley	01	
7.	Water Tanker	01	
8.	Batching Plant : Capacity (50 Cum/Hr.)	01	
9.	Transit Mixer	02	
10.	Site Mixers with weigh batcher	02	
11	Skip Hoist/Tower Crane	01	
12	Dewatering / WaterPumps	02	
13	Survey Equipment:		
	a) Total Stn,		01
	b)Theodolite		
	c) Level instruments	02	
14	Details of Steel Shuttering, Staging & props materials	6000 Sqm	
15	Placer Boom/ Concrete Pump Set assembly		01
16	Hand Vibrator	10	
17	Welding Machine	04	
18	DG Set 40 KVA	01	
	** Any other machinery (if required) as per site conditions shall be arranged by the contractor		

Note:

- * *In case of any arrangement for getting the equipment on lease, etc., authenticated proof of the same is to be submitted.*

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LIST OF EQUIPMENT FOR FIELD TESTING LABORATORY

A. For Building Works:

1. Balances

- (i) 7 kg. to 10 kg. capacity, Semi-Self indicating type-Accuracy 10 gm.
- (ii) 500 gm. capacity, Semi-Self indicating type-Accuracy 1 gm.
- (iii) Pan Balance- 5 kg. Capacity, accuracy 10 gm.

2.Ovens-Electrically operated, thermostatically controlled upto 110°C Sensitivity 1°C.

3. Sieves: as per IS 460-1962.

- (i) I.S. Sieves -450mm internal dia of sizes 100 mm, 80 mm, 63mm, 50 mm, 40 mm, 25 mm, 20 mm, 12.5 mm, 10 mm, 6.3 mm, 4.75mm complete with lid and pan.
- (ii)IS Sieves- 200mm internal dia. (brass frame) consisting of 2.36mm, 1.18mm, 600 microns, 425 microns, 300 microns, 212 microns, 150 microns, 90 microns, 75 microns with lid and pan.
- 4.** Sieve shaker capable of 200 mm and 300 mm dia sieves, manually operated with timing switch assembly.
- 5.** Equipment for slump test- Slump Cone, Steel Plate, tamping rod, steel scale, scoop.
- 6.** Dial gauges 25 mm travel- 0.01 mm/division. Least count -2nos.
- 7.**100 tonnes compression testing machine (electrical-cum manually operated) with 6 Cube Moulds,
- 8.** Graduated measuring cylinders 200 ml capacity-3 Nos.
- 9.** Enamel trays (for efflorescence test for bricks).
 - (i) 300 mm × 250 mm × 40 mm — 2 nos.
 - (ii) Circular plates of 250 mm dia — 4 nos.

**** Note:** All the mandatory test equipment as per CPWD shall be installed/provided at Site.

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Proforma- E

BID SECURITY DECLARATION

To,
OIL INDIA LIMITED
PIPELINE HEADQUARTER, Guwahati, ASSAM, INDIA

Whereas (herein after called 'the Bidder') has submitted their Bid No. dated..... against OIL INDIA LIMITED, GUWAHATI, ASSAM, INDIA (hereinafter called the Purchaser)'s tender No..... for the supply of
(hereinafter called 'the Bid') KNOW ALL MEN by these presents that if I/We withdraw or modify our Bid during the period of validity, or if I/We are awarded the contract and I/We fail to sign the contract, or to submit a performance security before the deadline defined in the NIT / Purchase Order, then I/We shall be suspended for the period of two (2) years. This suspension of two years shall be automatic without conducting any enquiry.

Signature & Seal of the Bidder

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ANNEXURE-J**CERTIFICATE OF ANNUAL TURNOVER & NET WORTH**

TO BE ISSUED BY PRACTISING CHARTERED ACCOUNTANTS' FIRM ON THEIR LETTER HEAD

TO WHOM IT MAY CONCERN

This is to certify that the following financial positions extracted from the audited financial statements of M/s..... (Name of the Bidder) for the last three (3) completed accounting years upto**(as the case may be)** are correct.

YEAR	TURN OVER In INR (Rs.)	NET WORTH In INR (Rs.)

Place:

Date:

Seal:

Membership No. :

Registration Code. :

Signature

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PART-3

SECTION-I

GENERAL CONDITIONS OF CONTRACT

1.0 DEFINITIONS:

1.1 In the contract, the following terms shall be interpreted as indicated:

- (a) "The Contract" means agreement entered into between Company and Contractor, as recorded in the contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein;
- (b) "The Contract Price" means the price payable to Contractor under the contract for the full and proper performance of its contractual obligations;
- (c) "Company" or "OIL" means Oil India Limited;
- (d) "Contractor" means the Contractor performing the work under this Contract.
- (e) "Contractor's Personnel" means the personnel to be provided by the Contractor to provide services as per the contract.
- (f) "Company's Personnel" means the personnel to be provided by OIL or OIL's Contractor (other than the Contractor executing the Contract). The Company representatives of OIL are also included in the Company's personnel.
- (g) "Contractor's items" means the equipment, materials and services, which are to be provided by Contractor or to be provided by Company at the expense of the Contractor, which are listed in Tender Document under Terms of Reference and Technical Specifications.
- (h) "Company's items" means the equipment, materials and services, which are to be provided by Company at the expense of Company and listed in the Contract.

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- (i) "Company Representative" means the person or persons appointed and approved from time to time by the Company to act on its behalf for overall coordination and project management purpose.
 - (j) "The Work" means each and every activity required for the successful performance of the services described in Section II, the Terms of Reference.
 - (k) "Day" means a calendar day of twenty-four (24) consecutive hours beginning at 07:00 hrs. and ending at 07:00 hrs.
 - (l) "Party" means either the Company or Contractor as the context so permits and, as expressed in the plural, shall mean the Company and Contractor collectively.
 - (m) "Site" means the land and other places, on/under/ in or through which the works are to be executed by the Contractor and any other land and places provided by the Company for working space or any other purpose as designated hereinafter as forming part of the Site.
 - (n) "Gross Negligence" means any act or failure to act (whether sole, joint or concurrent) by a person or entity which was intended to cause, or which was in reckless disregard of or wanton indifference to, avoidable and harmful consequences such person or entity knew, or should have known, would result from such act or failure to act. Notwithstanding the foregoing, Gross negligence shall not include any action taken in good faith for the safeguard of life or property.
 - (o) "Wilful Misconduct" means intentional disregard of good and prudent standards of performance or proper conduct under the Contract with knowledge that it is likely to result in any injury to any person or persons or loss or damage of property.
 - (p) "Affiliate" means any Person Which Controls, or is Controlled by, or under common Control with a Party; "Control" in this context means ownership of more than fifty percent (50%) of the shares of a Person and/or the right to appoint majority directors on Board by contract or otherwise.
 - (q) "Co-venturers" shall mean any co-venturers with the Company from time to time having an interest in either the PSC and/or a Joint and/or associated contracts for the purposes of exploration and production in Operating
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Contract the Operating Area and on whose behalf the Company would be deemed to have entered into this Contract.

2.0 EFFECTIVE DATE, MOBILISATION TIME/DE-MOBILIZATION TIME, DATE OF COMMENCEMENT OF THE CONTRACT AND DURATION OF CONTRACT:

2.1 EFFECTIVE DATE OF CONTRACT: The contract shall become effective as of the date Company notifies the Contractor in writing that it has been awarded the contract. This date of issuance of Letter of Award (LOA) by the Company will be the Effective Date of Contract.

2.2 MOBILISATION/De-MOBILISATION TIME OF THE CONTRACT: Not Applicable.

2.3 DATE OF COMMENCEMENT OF CONTRACT: The contractor has to commence the site works against after issuance of commencement notice/Formal Work Order by OIL which shall be issued at least 2 weeks ahead of formal commencement date. All necessary pre-commencement formalities with OIL / Govt. authorities shall be initiated immediately after receipt of LoA. The contractor has to ensure that all necessary equipment, machinery, tools and manpower are available at site within 14 days of the intimation for commencement of work from OIL as mentioned in the commencement notice/Formal Work Order.

2.4 DURATION OF CONTRACT: The contract shall be valid for a period of **Thirty Six (36)** months from the Date of Commencement of the Work.

3.0 GENERAL OBLIGATIONS OF CONTRACTOR: Contractor shall, in accordance with and subject to the terms and conditions of this Contract:

3.1 Perform the work described in the Terms of Reference (Part-3, Section-II) in most economic and cost effective way.

3.2 Except as otherwise provided in the Terms of Reference and the Special Conditions of the Contract, provide all labour as required to perform the work.

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3.3 Perform all other obligations, work and services which are required by the terms of this contract or which reasonably can be implied from such terms as being necessary for the successful and timely completion of the work.

3.4 Contractor shall be deemed to have satisfied himself before submitting their bid as to the correctness and sufficiency of its bid for the services required and of the rates and prices quoted, which rates and prices shall, except insofar as otherwise provided, cover all its obligations under the contract.

3.5 Contractor shall give or provide all necessary supervision during the performance of the services and as long thereafter within the warranty period as Company may consider necessary for the proper fulfilling of contractor's obligations under the contract.

4.0 **GENERAL OBLIGATIONS OF THE COMPANY:** Company shall, in accordance with and subject to the terms and conditions of this contract:

4.1 Pay Contractor in accordance with terms and conditions of the contract. The period of time for which each rate shall be applicable shall be computed from and to the nearest an hour. The rates contained in the Contract shall be based on Contractor's operation being conducted on a seven (07) days week and a twenty-four (24) hours work day. Under the Contract, Contractor will be entitled to the applicable rate defined in Schedule of Rates. These rates are payable when the required condition has existed for a full 24 hours' period. If the required condition existed for less than 24 hours, then payments shall be made on pro-rata basis.

4.2 Allow Contractor access, subject to normal security and safety procedures, to all areas as required for orderly performance of the work.

4.3 Perform all other obligations required of Company by the terms of this contract.

5.0 PERSONNEL TO BE DEPLOYED BY CONTRACTOR

5.1 Contractor warrants that it shall provide competent, qualified and sufficiently experienced personnel to perform the work correctly and efficiently.

5.2 The Contractor should ensure that their personnel observe applicable company and statutory safety requirement. Upon Company's written

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request, Contractor, entirely at his own expense, shall remove immediately any personnel of the Contractor determined by the Company to be unsuitable and shall promptly replace such personnel with personnel acceptable to the Company. Replacement personnel should be mobilized within ten (10) days from the date of issuance of notice without affecting the operation of the company.

5.3 The Contractor shall be solely responsible throughout the period of the contract for providing all requirements of their personnel including but not limited to, their transportation to & fro from field, en-route/ local boarding, lodging & medical attention etc. Company shall have no responsibility or liability in this regard.

5.4 Contractor's key personnel shall be fluent in English language (both writing and speaking).

6.0 WARRANTY AND REMEDY OF DEFECTS

6.1 Contractor warrants that it shall perform the work in a professional manner and in accordance with their highest degree of quality, efficiency, and with the state of the art technology/inspection services and in conformity with all specifications, standards and drawings set forth or referred to in the Technical Specifications. They should comply with the instructions and guidance; which Company may give to the Contractor from time to time.

6.2 Should Company discover at any time during the tenure of the Contract or till the Unit/equipment/tools are demobilised from site that the work does not conform to the foregoing warranty, Contractor shall after receipt of notice from Company, promptly perform any and all corrective work required to make the services conform to the Warranty. Such corrective Work shall be performed entirely at Contractor's own expenses. If such corrective Work is not performed within a reasonable time, the Company, at its option may have such remedial Work performed by others and charge the cost thereof to Contractor subject to a maximum of the contract value payable for the defective work which needs corrective action which the Contractor must pay promptly. In case Contractor fails to perform remedial work, or pay promptly in respect thereof, the performance security shall be forfeited.

6.3 The Company's engineer shall have power to –

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- (a) Reduce the rates at which payments shall be made if the quality of the work, although acceptable, is not up to the required standard, set forth in the Company's standard specifications which have been perused and fully understood by the Contractor.
- (b) Order the Contractor to remove any inferior materials from the work site and to demolish or rectify any work of interior workmanship, failing which the Company's engineer may arrange for any such work to be demolished or rectified by any other means at the Contractor's expense.
- (c) Order the Contractor to remove or replace any workman whom he (the engineer) considers incompetent or unsuitable. The engineer's opinion as to the competence and suitability of any workmen engaged by the Contractor shall be final and binding on the Contractor.
- (d) Issue to the Contractor from time to time during the progress of the work such further drawings and instructions as shall be necessary for the purpose of proper and adequate executions and maintenance of the works and the Contractor shall carry out and be bound by the same.
- (e) Order deviations of this Agreement after obtaining approval from the Company's Management. All such deviation orders shall be in writing and shall show the financial effect, if any, and whether any extra time is to be allowed. The rates to be applied for such deviation order shall be as per DSR/DAR.

7.0 CONFIDENTIALITY, USE OF CONTRACT DOCUMENTS AND INFORMATION:

7.1 Contractor shall not, without Company's prior written consent, disclose the contract, or any provision thereof, or any specification, plan, drawing pattern, sample or information furnished by or on behalf of Company in connection therewith, to any person other than a person employed by Contractor in the performance of the contract. Disclosure to any such

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employed person shall be made in confidence and shall extend only so far, as may be necessary for purposes of such performance with prior permission from Company. However, nothing hereinabove contained shall deprive the Contractor of the right to use or disclose any information:

- (a) which is possessed by the Contractor, as evidenced by the Contractor's written records, before receipt thereof from the Company which however the Contractor shall immediately inform to Company; or
- (b) which is required to be disclosed by the Contractor pursuant to an order of a court of competent jurisdiction or other governmental agency having the power to order such disclosure, provided the Contractor uses its best efforts to provide timely notice to Company of such order to permit Company an opportunity to contest such order subject to prior permission from Company.

7.2 Contractor shall not, without Company's prior written consent, make use of any document or information except for purposes of performing the contract.

7.3 Any document supplied to the Contractor in relation to the contract other than the Contract itself remain the property of Company and shall be returned (in all copies) to Company on completion of Contractor's performance under the Contract if so required by Company.

7.4 During this Contract, Company and its employees, agents, other contractors, sub-contractors (of any tier) and their employees etc. may be exposed to certain confidential information and data of the Contractor. Such information and data shall have held by the Company, its employees, agents, other contractors, sub-contractors (of any tier) and their employees in the strictest Confidence and shall not be disclosed to any other party except on a need to know basis.

7.5 However, the above obligation shall not extend to information which:

- i) is, at the time of disclosure, known to the public which Contractor shall immediately inform Company;
- ii) is lawfully becomes at a later date known to the public through no fault of Contractor subject to Contractor's undertaking that no information has been divulged by them to the public;

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- iii) is lawfully possessed by Contractor before receipt thereof from Company which should be immediately informed to Company;
 - iv) is developed by Contractor independently of the information disclosed by Company which should be shared with the Company;
 - v) Contractor is required to produce before competent authorities or by court order subject to prior permission from Company;

8.0 **TAXES:**

8.1 Tax levied on Contractor as per the provisions of Indian Income Tax Act and any other enactment/rules on income derived/payments received under the contract will be on Contractor's account.

8.2 Contractor shall be responsible for payment of personal taxes, if any, for all the personnel deployed in India by Contractor.

8.3 The Contractor shall furnish to the Company, if and when called upon to do so, relevant statement of accounts or any other information pertaining to work done under the contract for submitting the same to the Tax authorities, on specific request from them in accordance with provisions under the law. Other than the information provided by the Contractor, the Contractor shall not be responsible for any inaccurate information provided by the Company to the Tax authorities and the Company shall indemnify the Contractor for all claims, expenses, costs or losses of any nature arising from such inaccuracy. Contractor shall be responsible for preparing and filing the return of income etc. within the prescribed time limit to the appropriate authority.

8.4 Prior to start of operations under the contract, the Contractor shall furnish the Company with the necessary documents, as asked for by the Company and/ or any other information pertaining to the contract, which may be required to be submitted to the Income Tax authorities at the time of obtaining "No Objection Certificate" for releasing payments to the Contractor.

8.5 Corporate income tax will be deducted at source from the invoice at the specified rate of income tax as per the provisions of Indian Income Tax Act

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as may be in force from time to time and Company will issue TDS Certificate to the Contractor as per the provisions of Income Tax Act.

8.6 Corporate and personnel taxes on Contractor shall be the liability of the Contractor and the Company shall not assume any responsibility on this account.

8.7 All taxes and levies other than GST and customs duty on purchases and sales made by Contractor shall be borne by the Contractor.

8.8 **Goods and Services Tax (GST):** The quoted price should be exclusive of GST and the GST as applicable shall be to the Company account. The GST amount on the taxable part of the services provided by the Contractor shall be paid by the Company as per provisions of the GST Act. Bidder should take note of the following while submitting their offer in GST regime.

GOODS AND SERVICES TAX:

G1. "GST" shall mean Goods and Services Tax charged on the supply of material(s) and services. The term "GST" shall be construed to include the Integrated Goods and Services Tax (hereinafter referred to as "IGST") or Central Goods and Services Tax (hereinafter referred to as "CGST") or State Goods and Services Tax (hereinafter referred to as "SGST") or Union Territory Goods and Services Tax (hereinafter referred to as "UTGST") depending upon the import / interstate or intrastate supplies, as the case may be. It shall also mean GST compensation Cess, if applicable.

G2. The quoted price shall be deemed to be inclusive of all taxes and duties except "Goods and Services Tax" (hereinafter called GST) (i.e. IGST or CGST and SGST/UTGST applicable in case of interstate supply or intra state supply respectively and GST compensation Cess if applicable).

G3. Contractor/vendor shall be required to issue tax invoice in accordance with GST Act and/or Rules so that input credit can be availed by OIL (Oil India Limited)/Client. In the event that the contractor / vendor fails to provide the invoice in the form and manner prescribed under the GST Act read with GST Invoicing Rules thereunder, OIL / Client shall not be liable to make any payment on account of GST against such invoice.

G4. GST shall be paid against receipt of tax invoice and proof of payment of GST to government. In case of non-receipt of tax invoice or non-payment of GST by the contractor/vendor, OIL shall withhold the payment of GST.

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- G5. GST payable under reverse charge for specified services or goods under GST act or rules, if any, shall not be paid to the contractor/vendor but will be directly deposited to the government by OIL/Client.
- G6. Where OIL/client has the obligation to discharge GST liability under reverse charge mechanism and OIL/client has paid or is /liable to pay GST to the Government on which interest or penalties becomes payable as per GST laws for any reason which is not attributable to OIL/client or ITC with respect to such payments is not available to OIL/client for any reason which is not attributable to OIL/client, then OIL/client shall be entitled to deduct/ setoff / recover such amounts against any amounts paid or payable by OIL/Client to Contractor / Supplier.
- G7. The Supplier shall always comply with the requirements of applicable laws and provide necessary documents as prescribed under the Rules & Regulations, as applicable from time to time. In particular, if any tax credit, refund or other benefit is denied or delayed to OIL / Project Owner due to any non-compliance / delayed compliance by the Supplier under the Goods & Service Tax Act (such as failure to upload the details of the sale on the GSTN portal, failure to pay GST to the Government) or due to non-furnishing or furnishing of incorrect or incomplete documents by the Supplier, the Supplier shall be liable to reimburse OIL / Project Owner for all such losses and other consequences including, but not limited to the tax loss, interest and penalty.
- G8. Notwithstanding anything contained anywhere in the Agreement, in the event that the input tax credit of the GST charged by the Contractor / Vendor is denied by the tax authorities to OIL / Client for reasons attributable to Contractor / Vendor, OIL / client shall be entitled to recover such amount from the Contractor / Vendor by way of adjustment from the next invoice. In addition to the amount of GST, OIL / client shall also be entitled to recover interest at the rate prescribed under GST Act and penalty, in case any penalty is imposed by the tax authorities on OIL / Project Owner.
- G9. TDS under GST, if applicable, shall be deducted from contractor's/vendor's bill at applicable rate and a certificate as per rules for tax so deducted shall be provided to the contractor/vendor.
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G10. The Contractor will be under obligation for charging correct rate of tax as prescribed under the respective tax laws. Further the Contractor shall avail and pass on benefits of all exemptions/ concessions available under tax laws.

G11. The contractor will be liable to ensure to have registered with the respective tax authorities and to submit self-attested copy of such registration certificate(s) and the Contractor will be responsible for procurement of material in its own registration (GSTIN) and also to issue its own Road Permit/ E-way Bill, if applicable etc.

G12. In case the bidder is covered under Composition Scheme under GST laws, then bidder should quote the price inclusive of the GST (CGST & SGST/UTGST or IGST). Further, such bidder should mention "Cover under composition system" in column for GST (CGST & SGST/UTGST or IGST) of price schedule.

G13. OIL/client will prefer to deal with registered supplier of goods/ services under GST. Therefore, bidders are requested to get themselves registered under GST, if not registered yet. However, in case any unregistered bidder is submitting their bid, their prices will be loaded with applicable GST while evaluation of bid. Where OIL/client is entitled for input credit of GST, the same will be considered for evaluation of bid as per evaluation methodology of tender document.

G14. GST (GOODS & SERVICE TAX) (TRANSPORTATION CHARGES, SUPERVISION / TRAINING, SITE WORK):

The quoted Prices towards Transportation, Supervision, Training, Site Work, AMC shall be inclusive of all taxes & levies except Goods & Service Tax (GST).

Goods & Service Tax (GST) as billed by the Supplier shall be payable at actuals by Owner subject to Contractor furnishing proper tax invoice issued in accordance with Goods & Service Tax (GST) rules to enable Owner to take input tax credit as per Govt. Rules 2004 on Goods & Service Tax (GST) paid.

Goods & Service Tax (GST) shall not be payable, if the requirements as specified above are not fulfilled by the Supplier. In case of non-receipt of above, Owner shall withhold the payment of Goods & Service Tax (GST).

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In case of Foreign Bidders, where foreign bidder does not have permanent establishment in India, for supervision/training services by foreign supervisor at Project Site, Goods & Service Tax (GST) shall be paid by Owner to tax authorities.

G15. Documentation requirement for GST

The vendor will be under the obligation for invoicing correct tax rate of tax/duties as prescribed under the GST law to Owner/OIL, and pass on the benefits, if any, after availing input tax credit.

Any invoice issued shall contain the following particulars-

- a) Name, address and GSTIN of the supplier;
- b) Serial number of the invoice;
- c) Date of issue;
- d) Name, address and GSTIN or UIN, if registered of the recipient;
- e) Name and address of the recipient and the address of the delivery, along with the State and its code,
- f) HSN code of goods or Accounting Code of services;
- g) Description of goods or services;
- h) Quantity in case of goods and unit or Unique Quantity Code thereof;
- i) Total value of supply of goods or services or both;
- j) Taxable value of supply of goods or services or both taking into discount or abatement if any;
- k) Rate of tax (IGST,CGST, SGST/ UTGST, cess);
- l) Amount of tax charged in respect of taxable goods or services (IGST,CGST, SGST/ UTGST, cess);
- m) Place of supply along with the name of State, in case of supply in the course of inter-state trade or commerce;
- n) Address of the delivery where the same is different from the place of supply and
- o) Signature or digital signature of the supplier or his authorised representative.

GST invoice shall be prepared in triplicate, in case of supply of goods, in the following manner-

- a) The original copy being marked as ORIGINAL FOR RECIPIENT;
- b) The duplicate copy being marked as DUPLICATE FOR TRANSPORTER and
- c) The triplicate copy being marked as TRIPLICATE FOR SUPPLIER.

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In case of any advance given against any supplies contract, the supplier of the goods shall issue Receipt Voucher containing the details of details of advance taken along with particulars as mentioned in clause no. 15. (a), (b), (c), (d), (g), (k), (l), (m) & (o) above.

G16. GENERAL REMARKS ON TAXES & DUTIES:

In view of GST Implementation from 1st July 2017, all taxes and duties including Excise Duty, CST/VAT, Service tax, Entry Tax and other indirect taxes and duties have been subsumed in GST. Accordingly reference of Excise Duty, Service Tax, VAT, Sales Tax, Entry Tax, E1/E2 Forms, and any other form of indirect tax except of GST mentioned in the bidding document shall be ignored.

8.9 Oil India Ltd., PHQ, ASSAM GST provisional ID No. :18AAACO2352C1ZW

9.0 INSURANCE:

9.1 The Contractor shall arrange insurance to cover all risks in respect of their personnel, materials and equipment belonging to the Contractor or its subcontractor (if applicable) during the currency of the contract including the third party items/consumables. For materials/equipment belong to the Contractor or its sub-contractor, Contractor may self-insure the same.

9.2 Contractor shall at all time during the currency of the contract provide, pay for and maintain the following insurance amongst others:

- a) Workmen compensation insurance as required by the laws of the country of origin of the employee.
- b) Employer's Liability Insurance as required by law in the country of origin of employee.
- c) General Public Liability Insurance or Comprehensive General Liability insurance covering liabilities including contractual liability for bodily injury, including death of persons, and liabilities for damage of property. This insurance must cover all operations of Contractor required to fulfil the provisions under this contract.
- d) Contractor's equipment used for execution of the work hereunder shall have an insurance cover with a suitable limit.
- e) Automobile Public Liability Insurance covering owned and hired automobiles used in the performance of the work hereunder, with bodily injury limits and property damage limits as governed by Indian Insurance regulations.

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f) Public Liability Insurance as required under Public Liability Insurance Act 1991, "if applicable".

9.3 Any deductible set forth in any of the above insurance shall be borne by Contractor.

9.4 Contractor shall furnish to Company prior to commencement date, certificates of all its insurance policies covering the risks mentioned above.

9.5 If any of the above policies expire or are cancelled during the term of this contract and Contractor fails for any reason to renew such policies, then the Company will renew/replace same and charge the cost thereof to Contractor. Should there be a lapse in any insurance required to be carried out by the Contractor for any reason whatsoever, loss/damage claims resulting there from shall be to the sole account of Contractor.

9.6 Contractor shall require all of his sub-Contractor to provide such of the foregoing insurance coverage as Contractor is obliged to provide under this Contract and inform the Company about the coverage prior to the commencement of agreements with its sub-Contractors.

9.7 All insurance taken out by Contractor or their sub-contractor shall be endorsed to provide that the underwriters waive their rights of recourse on the Company and to the extent of the liabilities assumed by Contractor under this Contract.

9.8 Contractor shall obtain additional insurance or revise the limits of existing insurance as per Company's request in which case additional cost shall be to Contractor's account.

10.0 **CHANGES:**

10.1 During the performance of the work, Company may make minor change to take care of any supplementary work within the general scope of this Contract including, but not limited to, changes in methodology, and minor additions to or deletions from the work to be performed. Contractor shall perform the work as changed. Changes of this nature will be affected by written order by the Company.

10.2 If any change result in an increase in compensation due to Contractor or in a credit due to Company, Contractor shall submit to Company an

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estimate of the amount of such compensation or credit in a form prescribed by Company. Such estimates shall be based on the rates shown in the Schedule of Rates. Upon review of Contractor's estimate, Contractor shall establish and set forth in the Change Order the amount of the compensation or credit for the change or a basis for determining a reasonable compensation or credit for the change. If Contractor disagrees with compensation or credit set forth in the Change Order, Contractor shall nevertheless perform the work as changed, and the parties will resolve the dispute in accordance with Clause 13 hereunder. Contractor's performance of the work as changed will not prejudice Contractor's request for additional compensation for work performed under the Change Order.

11.0 **FORCE MAJEURE:**

- 11.1 In the event of either party being rendered unable by 'Force Majeure' to perform any obligation required to be performed by them under the contract, the relative obligation of the party affected by such 'Force Majeure' will stand suspended for the period during which such cause lasts. The word 'Force Majeure' as employed herein shall mean acts of God, war, revolt, agitation, strikes, riot, fire, flood, sabotage, civil commotion, road barricade (but not due to interference of employment problem of the Contractor), acts of government of the two parties, which makes performance impossible or impracticable and any other cause, whether of kind herein enumerated or otherwise which are not within the control of the party to the contract and which renders performance of the contract by the said party impossible.
- 11.2 Upon occurrence of such cause and upon its termination, the party alleging that it has been rendered unable as aforesaid thereby, shall notify the other party in writing within seventy-two (72) hours of the alleged beginning and ending thereof, giving full particulars and satisfactory evidence in support of its claim.
- 11.3 Should 'force majeure' condition as stated above occurs and should the same be notified within seventy-two (72) hours after its occurrence the 'force majeure' rate shall apply for the first fifteen (15) days. Parties will have the right to terminate the Contract if such 'force majeure' conditions continue beyond fifteen (15) days with prior written notice. Should either party decide not to terminate the Contract even under such condition, no payment would apply after expiry of fifteen (15) days force majeure period unless otherwise agreed to.

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12.0 TERMINATION:

12.1 TERMINATION ON EXPIRY OF THE TERMS (DURATION): This contract shall be deemed to have been automatically terminated on the expiry of duration of the contract, thereof.

12.2 TERMINATION ON ACCOUNT OF FORCE MAJEURE: Either party shall have the right to terminate this Contract on account of Force Majeure as set forth in Article 11.0 above.

12.3 TERMINATION ON ACCOUNT OF INSOLVENCY: In the event that the Contractor or its collaborator at any time during the term of the Contract, becomes insolvent or makes a voluntary assignment of its assets for the benefit of creditors or is adjudged bankrupt, then the Company shall, by a notice in writing have the right to terminate the Contract and all the Contractor's rights and privileges hereunder, shall stand terminated forthwith.

12.4 TERMINATION FOR UNSATISFACTORY PERFORMANCE: If the Company considers that, the performance of the Contractor is unsatisfactory, or not up to the expected standard, the Company shall notify the Contractor in writing and specify in details the cause of the dissatisfaction. The Company shall have the option to terminate the Contract by giving 15 days' notice in writing to the Contractor, if Contractor fails to comply with the requisitions contained in the said written notice issued by the Company.

12.5 TERMINATION DUE TO CHANGE OF OWNERSHIP & ASSIGNMENT: In case the Contractor's rights and /or obligations under this Contract and/or the Contractor's rights, title and interest to the equipment/ material, are transferred or assigned without the Company's consent, the Company may at its absolute discretion, terminate this Contract.

12.6 TERMINATION DUE TO NON-AVAILABILITY OF EQUIPMENT/PERSONNEL: If at any time during the term of this Contract, breakdown of Contractor's equipment results in Contractors being unable to perform their obligations hereunder for a period of 15 successive days, Company at its option, may terminate this Contract in its entirety without any further right or obligation on the part of the Company, except for the

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payment of money then due. No notice shall be served by the Company under the condition stated above.

12.7 Notwithstanding any provisions herein to the contrary, the Contract may be terminated at any time by the company on giving 15 (fifteen) days written notice to the Contractor due to any other reason not covered under the above clause from 12.1 to 12.6 and in the event of such termination the Company shall not be liable to pay any cost or damage to the Contractor except for payment of services as per the Contract up to the date of termination including the Demob cost, if any.

12.8 **CONSEQUENCES OF TERMINATION:**

In all cases of termination herein set forth, the relative obligations of the parties to the Contract shall be limited to the period up to the date of termination. Notwithstanding the termination of this Contract, the parties shall continue to be bound by the provisions of this Contract that reasonably require some action or forbearance after such termination.

12.9 Upon termination of this Contract, Contractor shall return to Company all of Company's items, which are at the time in Contractor's possession.

12.10 In the event of termination of contract, Company will issue Notice of termination of the contract with date or event after which the contract will be terminated. The contract shall then stand terminated and the Contractor shall demobilize their personnel & materials.

13.0 **SETTLEMENT OF DISPUTES AND ARBITRATION:**

13.1 **Arbitration (Applicable for Suppliers/Contractors other than PSU) :**

Except as otherwise provided elsewhere in the contract, if any dispute, difference, question or disagreement arises between the parties hereto or their respective representatives or assignees, in connection with construction, meaning, operation, effect, interpretation of the contract or breach thereof which parties are unable to settle mutually, the same shall be referred to Arbitration as provided hereunder:

1. A party wishing to commence arbitration proceeding shall invoke Arbitration Clause by giving 30 days' notice to the other party. The notice invoking arbitration shall specify all the points of dispute with details of the amount claimed to be referred to arbitration at the time of invocation of

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arbitration and not thereafter. If the claim is in foreign currency, the claimant shall indicate its value in Indian Rupee for the purpose of constitution of the arbitral tribunal.

2. The number of arbitrators and the appointing authority will be as under:

Claim amount (excluding claim for interest and counter claim, if any)	Number of Arbitrator	Appointing Authority
Up to INR 5 Crore	Sole Arbitrator	OIL
Above INR 5 Crore	3 Arbitrators	One Arbitrator by each party and the 3rd Arbitrator, who shall be the presiding Arbitrator, by the two Arbitrators.

3. The parties agree that they shall appoint only those persons as arbitrators who accept the conditions of the arbitration clause. No person shall be appointed as Arbitrator or Presiding Arbitrator who does not accept the conditions of the arbitration clause.
4. Parties agree that there will be no objection if the Arbitrator appointed holds equity shares of OIL and/or is a retired officer of OIL/any PSU. However, neither party shall appoint its serving employees as arbitrator.
5. If any of the Arbitrators so appointed dies, resigns, becomes incapacitated or withdraws for any reason from the proceedings, it shall be lawful for the concerned party/arbitrators to appoint another person in his place in the same manner as aforesaid. Such person shall proceed with the reference from the stage where his predecessor had left if both parties consent for the same; otherwise, he shall proceed de novo.
6. Parties agree that neither shall be entitled for any pre-reference or pendent-lite interest on its claims. Parties agree that any claim for such interest made by any party shall be void.
7. The arbitral tribunal shall make and publish the award within time stipulated as under:

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Amount of Claims and counter claims(excluding interest)	Period for making and publishing of the award(counted from the date of first meeting of the Arbitrators)
Up to INR 5 Crore	Within 8 months
Above INR 5 Crore	Within 12 months

The above time limit can be extended by Arbitrator, for reasons to be recorded in writing, with the consent of the other parties.

8. If after commencement of the arbitration proceedings, the parties agree to settle the dispute mutually or refer the dispute to conciliation, the arbitrators shall put the proceedings in abeyance until such period as requested by the parties.
9. Each party shall be responsible to make arrangements for the travel and stay etc. of the arbitrator pointed by it. Claimant shall also be responsible for making arrangements for travel/stay arrangements of the Presiding Arbitrator and the expenses incurred shall be shared equally by the parties. In case of sole arbitrator, OIL shall make all necessary arrangements for his travel, stay and the expenses incurred shall be shared equally by the parties.
10. The Arbitration shall be held at the place from where the contract has been awarded. However, parties to the contract can agree for a different place for the convenience of all concerned.
11. The Arbitrator(s) shall give reasoned and speaking award and it shall be final and binding on the parties.
12. Subject to aforesaid, provisions of the Arbitration and Conciliation Act, 1996 and any statutory modifications or re-enactment thereof shall apply to the arbitration proceedings under this clause.
- 13.2 **Arbitration clause for Settlement of commercial disputes between Central Public Sector Enterprises (CPSEs) inter se and CPSE(s) and Government Department(s)/Organizations(s) - Administrative Mechanism for Resolution of CPSEs Disputes (AMRCD).**
In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts inter se and also between

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CPSEs and Government Departments/Organizations (excluding disputes concerning Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD as mentioned in OPE OM No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22-05-2018.

The venue of all arbitrations under both 13.1 and 13.2 will be **Guwahati, Assam**. The award made in pursuance thereof shall be binding on the parties.

14.0 **NOTICES:**

14.1 Any notice given by one party to other, pursuant to this Contract shall be sent in writing or by email and confirmed in writing to the applicable address specified below:

a) **Company**

OIL INDIA LIMITED
PIPELINE HEAD QUARTER,
OIL INDIA LIMITED,
P.O: UDAYAN VIHAR,
GUWAHATI-781171
EMAIL : ellora@oilindia.in
PHONE:0361-2595601

b) **Contractor**

FAX NO. :
EMAIL:
PHONE:

14.2 A notice shall be effective when delivered or on the notice's effective date, whichever is later.

15.0 **SUBCONTRACTING/ASSIGNMENT:**

15.1 Contractor shall not subcontract, transfer or assign the contract, in full or any part under this contract, to any third party(s). Except for the main services under this contract, Contractor may sub-contract the petty support services subject to Company's prior approval. However, Contractor shall be fully responsible for complete execution and performance of the services under the Contract.

16.0 **MISCELLANEOUS PROVISIONS:**

16.1 Contractor shall give notices and pay all fees at their own cost required to be given or paid by any National or State Statute, Ordinance, or other Law

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or any regulation, or bye-law of any local or other duly constituted authority as may be in force from time to time in India, in relation to the performance of the services and by the rules & regulations of all public bodies and companies whose property or rights are affected or may be affected in any way by the services.

16.2 Contractor shall conform in all respects with the provisions of any Statute, Ordinance of Law as aforesaid and the regulations or bye-law of any local or other duly constituted authority which may be applicable to the services and with such rules and regulation public bodies and Companies as aforesaid and shall keep Company indemnified against all penalties and liability of every kind for breach of any such Statute, Ordinance or Law, regulation or bye-law.

16.3 During the tenure of the Contract, Contractor shall keep the site where the services are being performed reasonably free from all unnecessary obstruction and shall store or dispose of any equipment and surplus materials and clear away and remove from the site any wreckage, rubbish or temporary works no longer required. On the completion of the services, Contractor shall clear away and remove from the site any surplus materials, rubbish or temporary works of every kind and leave the whole of the site clean and in workmanlike condition to the satisfaction of the Company.

16.4 Key personnel cannot be changed during the tenure of the Contract except due to sickness/death/resignation of the personnel in which case the replaced person should have equal experience and qualification, which will be again subject to approval, by the Company.

17.0 LIQUIDATED DAMAGES AND PENALTY FOR DEFAULT:

17.1 Time is the essence of this Contract. In the event of the Contractor's default in timely completion of the project within the stipulated period, the Contractor shall be liable to pay liquidated damages @ 1/2% of contract value, per week or part thereof of delay subject to maximum of 7.5%. Liquidated Damages will be reckoned from the expiry date of the scheduled completion date. Liquidated Damages shall be applicable on the value of delayed item(s) provided the item(s) delayed are not critical for commissioning and final utilization of the work. If, however, the item(s) delayed in completion are critical for commissioning and final utilisation of the work then the contractor will be liable to pay liquidated damages by

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way of penalty at the rate of 1/2% (Half percent) per week of delay of the total contract cost subject to a maximum of 7.5% of total contract cost. Decision of Engineer-in-Charge shall be binding in this regard.

17.2 The parties agree that the sum specified above is not a penalty but a genuine pre-estimate of the loss/damage which will be suffered by OIL on account of delay/breach on the part of the Contractor and the said amount will be payable without proof of actual loss or damage caused by such delay/breach and without any demur and shall not be open for any dispute whatsoever.

17.3 Liquidated Damages are to be recovered from the final bill & not from the running bills. In case adequate amount may not be available in the final bill, necessary recovery can be made from previous bill(s) or Performance security submitted by the contractor.

18.0 **PERFORMANCE SECURITY:**

The Contractor has furnished to Company performance security of value and validity as mentioned in the Letter of Award. The performance security shall be payable to Company as compensation for any loss resulting from Contractor's failure to fulfil their obligations under the Contract. In the event of extension of the Contract period, the validity of the bank guarantee shall be suitably extended by the Contractor. The bank guarantee will be discharged by Company not later than 30 days following its expiry.

19.0 **ASSOCIATION OF COMPANY'S PERSONNEL:** Company's engineer will be associated with the work throughout the operations. The Contractor shall execute the work with professional competence and in an efficient and workman like manner and provide Company with a standard of work customarily provided by reputed IP Survey Contractors to major international oil companies in the petroleum industry.

20.0 **LABOUR:** The recruitment of the labour shall be met from the areas of operation and wages will be according to the rates prevalent at the time which can be obtained from the District Authorities of the area. The facilities to be given to the labourers should conform to the provisions of labour laws as per contract Labour (Regulation and Abolition) Act, 1970.

21.0 **LIABILITY:**

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- 21.1 Except as otherwise expressly provided, neither Company nor its servants, agents, nominees, Contractors, or sub-contractors shall have any liability or responsibility whatsoever to whomsoever for loss of or damage to the equipment and/or loss of or damage to the property of the Contractor and/or their Contractors or sub-contractors, irrespective of how such loss or damage is caused and even if caused by the negligence of Company and/or its servants, agent, nominees, assignees, contractors and sub-Contractors. The Contractor shall protect, defend, indemnify and hold harmless Company from and against such loss or damage and any suit, claim or expense resulting there from.
- 21.2 Neither Company nor its servants, agents, nominees, assignees, Contractors, sub-contractors or its Affiliates or Covertures shall have any liability or responsibility whatsoever for injury to, illness, or death of any employee of the Contractor and/or of its Contractors or sub-contractor irrespective of how such injury, illness or death is caused and even if caused by the negligence of Company and/or its servants, agents nominees, assignees, Contractors and sub-contractors. Contractor shall protect, defend, indemnify and hold harmless Company from and against such liabilities and any suit, claim or expense resulting there from.
- 21.3 The Contractor hereby agrees to waive its right of recourse and further agrees to cause its underwriters to waive their right of subrogation against Company and/or its underwriters, servants, agents, nominees, assignees, Contractors and sub-contractors for loss or damage to the equipment of the Contractor and/or its sub-contractors and/or their employees when such loss or damage or liabilities arises out of or in connection with the performance of the contract limited to the Contractor's liabilities agreed to under this Contract.
- 21.4 The Contractor hereby further agrees to waive its right of recourse and agrees to cause its underwriters to waive their right of subrogation against Company and/or its underwriters, servants, agents, nominees, assignees, Contractors and sub-contractors for injury to, illness or death of any employee of the Contractor and of its contractors, sub-contractors and/or their employees when such injury, illness or death arises out of or in connection with the performance of the contract limited to the Contractor's liabilities agreed to under this Contract.
- 21.5 Except as otherwise expressly provided, neither Contractor nor its servants, agents, nominees, Contractors or sub-contractors shall have any
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liability or responsibility whatsoever to whomsoever for loss of or damage to the equipment and/or loss or damage to the property of the Company and/or their Contractors or sub-contractors, irrespective of how such loss or damage is caused and even if caused by the negligence of Contractor and/or its servants, agents, nominees, assignees, Contractors and sub-contractors. The Company shall protect, defend, indemnify and hold harmless Contractor from and against such loss or damage and any suit, claim or expense resulting there from.

21.6 Neither Contractor nor its servants, agents, nominees, assignees, Contractors, sub-contractors shall have any liability or responsibility whatsoever to whomsoever for injury or illness, or death of any employee of the Company and/or of its Contractors or sub-contractors irrespective of how such injury, illness or death is caused and even if caused by the negligence of Contractor and/or its servants, agents, nominees, assignees, Contractors and sub-contractors. Company shall protect, defend indemnify and hold harmless Contractor from and against such liabilities and any suit, claim or expense resulting there from.

21.7 The Company agrees to waive its right of recourse and further agrees to cause its underwriters to waive their right of subrogation against Contractor and/or its underwriters, servants, agents, nominees, assignees, Contractors and sub-contractors for loss or damage to the equipment of Company and/or its contractors or sub-contractors when such loss or damage or liabilities arises out of or in connection with the performance of the contract.

21.8 The Company hereby further agrees to waive its right of recourse and agrees to cause it underwriters to waive their right of subrogation against Contractor and/or its underwriters, servants, agents, nominees, assignees, Contractors and sub-contractors for injury to, illness or death of any employee of the Company and of its Contractors, sub-contractors and/or their employees when such injury, illness or death arises out of or in connection with the performance of the Contract.

22.0 **LIMITATION OF LIABILITY:** Notwithstanding any other provisions herein to the contrary, except only in cases of wilful misconduct and / or criminal acts,

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- (a) Neither the Contractor nor the Company (OIL) shall be liable to the other, whether in Contract, tort, or otherwise, for any consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs.
 - (b) Notwithstanding any other provisions incorporated elsewhere in the contract, the aggregate liability of the Contractor in respect of this contract, whether under Contract, in tort or otherwise, shall not exceed 50% of the Contract Price, provided however that this limitation shall not apply to the cost of repairing or replacing defective equipment by the Contractor, or to any obligation of the Contractor to indemnify the Company with respect to Intellectual Property Rights.
 - (c) Company shall indemnify and keep indemnified Contractor harmless from and against any and all claims, costs, losses and liabilities in excess of the aggregate liability amount in terms of clause (b) above.

23.0 INDEMNITY AGREEMENT:

23.1 Except as provided hereof Contractor agrees to protect, defend, indemnify and hold Company harmless from and against all claims, suits, demands and causes of action, liabilities, expenses, cost, liens and judgments of every kind and character, without limit, which may arise in favour of Contractor's employees, agents, contractors and sub-contractors or their employees on account of bodily injury or death, or damage to personnel/property as a result of the operations contemplated hereby, regardless of whether or not said claims, demands or causes of action arise out of the negligence or otherwise, in whole or in part or other faults.

23.2 Except as provided hereof Company agrees to protect, defend, indemnify and hold Contractor harmless from and against all claims, suits, demands and causes of action, liabilities, expenses, cost, liens and judgments of every kind and character, without limit, which may arise in favour of Company's employees, agents, contractors and sub-contractors or their employees on account of bodily injury or death, or damage to personnel/property as a result of the operations contemplated hereby, regardless of whether or not said claims, demands or causes of action arise out of the negligence or otherwise, in whole or in part or other faults.

24.0 INDEMNITY APPLICATION: The indemnities given herein above, whether given by Company or Contractor shall be without regard to fault or to the negligence of either party even though said loss, damage, liability, claim,

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demand, expense, cost or cause of action may be caused, occasioned by or contributed to by the negligence, either sole or concurrent of either party.

24.1 The Contractor shall not make Company liable to reimburse the Contractor to the statutory increase in the wage rates of the contract Labour appointed by the Contractor. Such statutory or any other increase in the wage rates of the contract Labour shall be borne by the Contractor.

24.2 The Contractor shall not engage Labour below 18 (eighteen) years of age under any circumstances. Persons above 60 (sixty) years age also shall not be deployed except Manager / Superintendent.

24.4 Moreover, the Contractor should obtain and produce in advance to commencement of Work all statutory certificates/licenses required for commencement of work against the contract. The Contractor employing 20 (twenty) or more workmen on any day of the preceding 12 (twelve) months shall be required to obtain requisite license at his cost from the appropriate Licensing Officer before undertaking any contract work. The Contractor shall also observe the rules and regulations framed under the Contract Labour (Regulations & Abolition) Act.

25.0 **ENTIRE CONTRACT:** This Contract contains the entire agreement between the Parties and supersedes any previous understandings, commitments, agreements or representations whatsoever, oral or written, pertaining to the subject matter hereof, provided that nothing in this Clause (Entire Contract) shall have effect to exclude or restrict the liability of either Party for fraud or fraudulent misrepresentation.

26.0 **RECORDS, REPORTS AND INSPECTION:** The Contractor shall, at all times, permit the Company and its authorized employees and representatives to inspect all the Work performed and to witness and check all the deliverables and tests made in connection with the said work. The Contractor shall keep an authentic, accurate history and logs reasonable times for inspection by the Company's designated representatives and its authorized employees and representatives. The Contractor shall provide the Company designated representatives with a weekly written report, on form prescribed by the Company showing details of work during the preceding week. The Contractor shall not, without Company's written consent allow any third person(s) access to the said records, or give out to any third person information in connection therewith.

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27.0 INSPECTION OF MATERIALS

27.1 INSPECTION BY COMPANY: The Company shall have the right to inspect and reject for any valid cause any items, equipment, material furnished by Contractor for its use in the work related to contract and Contractor shall replace or repair at its sole expense such items so rejected with items free of defects, to the satisfaction of the Company.

28.0 ROYALTY AND PATENTS: Not Applicable.

29.0 CUSTOMS DUTY: Not Applicable.

30.0 DEMOBILISATION: The Contractor shall arrange for and execute demobilization of the Tools/Equipment/ Spare/ Accessories/Manpower etc. upon receipt of notice for demobilization from Company. Demobilization shall mean completion / termination of the contract and shall include equipment/tools/accessories, including the manpower, unutilized spares and consumables at the cost of the contractor. Demobilization shall be completed by Contractor within 15 days of issue of demobilization notice by Company.

31.0 PAYMENTS, MANNER OF PAYMENT, RATES OF PAYMENT:

31.1 Company shall pay to the Contractor during the term of the Contract the amount due from time to time calculated according to the Schedule of Rates. No other payments shall be due from company unless specifically provided for in the Contract.

31.2 MANNER OF PAYMENT: All payments due by Company to Contractor hereunder shall be made at Contractor's designated bank. Bank charges, if any will be on account of the Contractor.

31.3 Payment of any invoices shall not prejudice the right of Company to question the validity of any charges therein, provided Company within one year after the date of payment shall make and deliver to Contractor written notice of objection to any item or items the validity of which Company questions.

31.4 Contractor shall send invoice to company on the day following the end of each month for all daily or monthly charges due to the contractor.

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31.5 Contractor shall submit three (03) sets of all invoices duly super scribed 'Original' and 'Copy' as applicable to the Company for processing payment. Separate invoices for the charges payable under the contract shall be submitted by the Contractor for foreign currency and Indian currency.

31.6 Payment of monthly invoices, if undisputed, shall be made within 30 days following the date of receipt of invoice by Company.

31.7 Company shall within 30 days of receipt of the invoice notify the Contractor of any item under dispute, specifying the reasons thereof, in which event, payment of the disputed amount may be withheld until settlement of the dispute, but payment shall be made of any undisputed portion on or before the due date. This will not prejudice the company's right to question the validity of the payment at a later date as envisaged in Clause 31.3 above.

31.8 The acceptance by Contractor of part payment on any billing not paid on or before the due date shall not be deemed a waiver of Contractor's rights in any other billing, the payment of which may then or thereafter be due.

31.9 Payment of final demobilization charges shall be made if applicable within 45 days on receipt of invoice by Company accompanied by the following documents from the Contractor:

- a) Audited account up to completion of the contract.
- b) Tax audit report for the above period as required under the Indian Tax Laws.
- c) Documentary evidence regarding the submission of returns and payment to taxes for the personnel engaged by the Contractor or by its Sub-contractor.
- d) Any other documents as required by applicable Indian Laws.

In case, no demobilization charges are payable, the documents mentioned above will have to be submitted by the Contractor before release of the final payment by the Company. A certificate from Chartered Accountant on (a), (b) & (c) above will suffice

31.10 Contractor shall maintain complete and correct records of all information on which contractor's invoice are based up to 2 (two) years from the date of last invoice. Such records shall be required for making appropriate adjustments or payments by either party in case of subsequent audit query / objection.

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31.11 Provident Fund: The Contractor if covered under the P.F Act and if the contract cost is inclusive of P.F., must ensure strict compliance of provisions of Provident Fund and Miscellaneous Provisions Act, 1952 in addition to the various Acts mentioned elsewhere in this contract. Any Contractor found violating these provisions will render themselves disqualified from any future tendering. As per terms of the contract, if applicable, the Contractor must deposit Provident Fund Contribution (covering Employee's & Employer's share) with the competent authority monthly under their direct code. The Contractor shall be required to submit documentary evidence of deposit of P.F. Contribution to the Company. In case of failure to provide such documentary evidence, the Company reserves the right to withhold the amount equivalent to 13.36% P.F. Contribution on wage component.

32.0 APPLICABLE LAW:

32.1 The Contract shall be deemed to be a Contract made under, governed by and construed in accordance with the laws of India for the time being in force and shall be subject to the exclusive jurisdiction of Courts situated in Guwahati, Assam.

32.2 The Contractor shall ensure full compliance of various Indian Laws and Statutory Regulations, to the extent applicable, as stated below, but not limited to, in force from time to time and obtain necessary permits/ licenses etc. from appropriate authorities for conducting operations under the Contract:

- a) The Factory Act 1948-as applicable to safety and employment conditions.
- b) The Minimum Wages Act, 1948.
- c) The Oil Mines Regulations, 2017.
- d) The Workmen's Compensation Act, 1923.
- e) The Payment of Wages Act, 1963.
- f) The Payment of Bonus Act, 1965.
- g) The Contract Labour (Regulation & Abolition) Act, 1970 and the rules framed thereunder.
- h) The Employees Pension Scheme, 1995.
- i) The Interstate Migrant Workmen Act., 1979 (Regulation of employment and conditions of service).
- j) The Employees Provident Fund and Miscellaneous Provisions Act, 1952.
- k) AGST Act

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1) The Goods and Service Tax Act,2017.

or

any other Acts or Statute not here in above specifically mentioned having bearing over engagement of workers directly or indirectly for execution of work. The Contractor shall not make the Company liable to reimburse the Contractor for the statutory increase in the wage rates of the Contract Labour appointed by the Contractor. Such Statutory increase in the wage rates of Contract Labour shall be borne by the contractor.

The Contract shall be deemed to be a Contract made under, governed by and construed in accordance with the laws of India for the time being in force and shall be subject to the exclusive jurisdiction of **Courts situated in Guwahati**

32.3 **EXPATRIATE PERSONNEL**: Not Applicable.

33.0 **SUBSEQUENTLY ENACTED LAWS**: Subsequent to the date of bid closing, if there is a change in or enactment of any law or change in application or enforcement or interpretation of existing law by any governmental authority or public body, which results in addition/ reduction in cost to Contractor on account of the operation contemplated under the Contract, the Company/Contractor shall reimburse the Contractor/pay Company for such additional/reduced costs actually incurred/saved by Contractor, subject to the submission of documentary evidence by Contractor/Company.

34.0 **SET-OFF**: Any sum of money due and payable to the Contractor (including Performance Security refundable to them) under this or any other Contract may be appropriated by OIL and set-off against any claim of OIL (or such other person or persons contracting through OIL) for payment of a sum of money arising out of this contract or under any other contract made by the Contractor with OIL (or such other person or persons contracting through OIL).

35.0 **WITHHOLDING**: Company may withhold or nullify the whole or any part of the amount due to Contractor, after informing the Contractor of the reasons in writing, on account of subsequently discovered evidence in order to protect Company from loss on account of: -

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- a) For non-completion of jobs assigned as per Scope of Work and Special Conditions of Contract.
- b) Contractor's indebtedness arising out of execution of this Contract.
- c) Defective work not remedied by Contractor.
- d) Claims by sub-Contractor of Contractor or others filed or on the basis of reasonable evidence indicating probable filing of such claims against Contractor.
- e) Failure of Contractor to pay or provide for the payment of salaries/wages, contributions, unemployment compensation, taxes or enforced savings with-held from wages etc.
- f) Failure of Contractor to pay the cost of removal of unnecessary debris, materials, tools, or machinery.
- g) Damage to another Contractor of Company.
- h) All claims against Contractor for damages and injuries, and/or for non-payment of bills etc.
- i) Any failure by Contractor to fully reimburse Company under any of the indemnification provisions of this Contract. If, during the progress of the work Contractor shall allow any indebtedness to accrue for which Company, under any circumstances in the opinion of Company may be primarily or contingently liable or ultimately responsible and Contractor shall, within five days after demand is made by Company, fail to pay and discharge such indebtedness, then Company may during the period for which such indebtedness shall remain unpaid, with-hold from the amounts due to Contractor, a sum equal to the amount of such unpaid indebtedness.

Withholding will also be effected on account of the following: -

- i) Order issued by a Court of Law in India.
- ii) Income-tax deductible at source according to law prevalent from time to time in the country.
- iii) Any obligation of Contractor which by any law prevalent from time to time to be discharged by Company in the event of Contractor's failure to adhere to such laws.
- iv) Any payment due from Contractor in respect of unauthorised imports.

When all the above grounds for withholding payments shall be removed, payment shall thereafter be made for amounts so with-hold.

Notwithstanding the foregoing, the right of Company to withhold shall be limited to damages, claims and failure on the part of Contractor, which is

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directly/indirectly related to some negligent act or omission on the part of Contractor.

36.0 **WAIVER:** Any delay in exercising and any omission to exercise any right, power or remedy exercisable by the Company under this contract shall not impair such right, power or remedy nor shall any waiver by the Company of any breach by the Contractor of any provision of this contract prevent the subsequent enforcement of that provision by the Company or be deemed a waiver by the Company of any subsequent breach by the Contractor.

37.0 **INGRESS AND EGRESS AT LOCATION:**

37.1 The Company shall provide the Contractor, if required, requisite certificates for obtaining rights of ingress to, egress from locations where jobs are to be performed, including any certificates required for permits or licenses for the movement of the Contractor's personnel/equipment. Should such permits/licenses be delayed because of objections of concerned authorities in respect of specific Contractor's person(s), such person (s) should be promptly removed from the list by the Contractor and replaced with acceptable person (s).

38.0 **GENERAL HSE GUIDELINES:**

38.1 For General guidelines with respect to Health, Safety and Environmental Aspects Appendix – A to be referred.

39.0 **POLLUTION:** Not Applicable.

40.0 **DEFECT LIABILITY PERIOD:** The defect liability for the property and all the items shall be 12 months from the date of actual completion or end of Work Order period whichever is later unless otherwise specifically mentioned and as certified by Engineer-In-Charge. During defect liability period, all corrective works shall be performed entirely at Contractor's own expenses. In case if such corrective works are not performed within a reasonable time after instructions, the Company at its discretion, may have such remedial works carried out through third party at the risk and cost of contractor. The costs so incurred shall be deducted from contractor's bill or Retention money/ performance security.

41.0 **FISHING:** Not Applicable.

END OF SECTION – I, Part – 3

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SECTION – II, PART-3

SPECIAL CONDITIONS OF THE CONTRACT:

GENERAL

The following special conditions shall be read in conjunction with General Conditions of contract, if there are any provisions in these Special Conditions, which are at variance with the provisions of General Conditions of Contract, the provisions in these special Conditions shall prevail.

(1) The work in general shall be carried out as per OIL/CPWD/MOST specification updated with correction slips issued up to last date of submission of tender.

(2) For items not covered under OIL/CPWD/MOST Specification, as above, the work shall be done as per latest relevant ISI /BIS Codes of practice.

1.0 The Contract means the documents forming the tender and acceptance thereof and the agreement executed between the competent person on behalf of OIL INDIA LIMITED and the contractor, together with the documents referred to therein including these conditions, the specifications, designs, drawings and instructions issued from time to time by the Engineer-in-Charge and all these documents taken together, shall be deemed to form one contract and shall be complementary to one another.

1.1 The work will be executed as per drawings "GOOD FOR CONSTRUCTION" to be released by OIL INDIA LIMITED unless otherwise specified elsewhere in the tender documents.

1.2 In the contract, the following expressions shall, unless the context otherwise requires, have the meaning, hereby respectively assigned to them.

1.3 DEFINITIONS

a) **ENGINEER-IN-CHARGE:** RCM-NPCC (PMC) shall be "ENGINEER-IN-CHARGE" for this work. You are requested to contact him immediately for further instructions regarding execution of this work/contract.

b) **DRAWINGS** mean the drawings referred to in the Bill of Quantities, specifications and any modifications of such drawings or such other drawings as may from time to time be furnished or approved by OIL INDIA LIMITED.

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- c)APPROVAL means approved in writing including subsequent written confirmation of previous verbal approval.
- d)WRITING means any manuscript typed written or printed statement under or over signature and
- e)MONTH means English Calendar month 'Day' means a Calendar day of 24 Hrs each.
- f)LANGUAGE: All documents & correspondence in respect of this contract shall be in English Language.
- g)BILL OF QUANTITIES or SCHEDULE OF QUANTITIES means the priced and completed Bill of Quantities or Schedule of Quantities forming part of the tender.
- h)PMC (Project Management Consultant): National Projects Construction Corporation (NPCC), A Company incorporated in India and having its registered office in Raja House, 30-31, Nehru Place, New Delhi-110019 is the Project management Consultant for this project.
- i)OWNER means OIL INDIA LIMITED

j)TENDER means the Contractor's priced offer to OIL INDIA LIMITED for the execution and completion of the work and the remedying of any defects therein in accordance with the provisions of the Contract, as accepted by the Letter of Intent or Award letter. The word TENDER is synonymous with Bid and the word TENDER DOCUMENTS with "Bidding Documents" or "offer documents". The headings in the clauses/ conditions of tender documents are for convenience only and shall not be used for interpretation of the clause/ condition.

Words imparting the singular meaning only also include the plurals and vice versa where the context requires. Words imparting persons or parties shall include firms, companies and other organizations having legal capacities.

2.0 LOCATION/APPROACH TO SITE

The proposed site is in within the OIL INDIA LIMITED PIPELINE HEADQUARTERS, GUWAHATI, ASSAM.

The total area of the plot is around 11000 sqm and the total area of the six-storied (G+5) building is 19,006 Square metre. The coordinates of the center of the above plot is N 26° 10' 10.08" & E 91° 49' 59.74" and at a distance of around 45 km from the airport at Guwahati and 9.00KM from Guwahati railway station.

3.0 SITE VISIT AND COLLECTING LOCAL INFORMATION

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Before tendering, the tenderer is advised to visit the site, its surrounding, access and satisfy themselves about the local conditions such as approach roads to the site, availability of water & power supply, application of taxes, duties and levies as applicable, nature of ground, soil and sub-soil condition, underground water table level, accommodations they may require etc., river regime, river water levels, other details of river, streams & any other relevant information required by them to execute complete scope of work. The tenderer may obtain all necessary information as to risks, contingencies & other circumstances (insurgencies etc.) which may influence or affect their tender. Tenderer shall be deemed to have considered site conditions whether he has inspected it or not and to have satisfied himself in all respect before quoting his rates and no claim or extra charges whatsoever in this regard shall be entertained / payable by the OIL INDIA LIMITED at a later date.

3.1 ACCESS BY ROAD

Contractor, if necessary, shall build temporary access roads to the actual site of construction for the works at his own cost to make the site accessible. The Contractor shall maintain the same in motor able condition at all the times as directed by Engineer- in-Charge at his own cost. The contractor shall be required to permit the use of any roads so constructed by him for vehicles of OIL INDIA LIMITED or any other agencies/ contractors who may be engaged on the project site, free of cost. Non-availability of access roads or approach to site, for the use of the contractor shall in no case condone any delay in the execution of work nor be the cause for any claim for compensation.

3.2 HANDING OVER & CLEARING OF SITE

3.2.1 The Contractor should note that area for construction may be made available in phases as per availability and in conjunction with pace of actual progress of work at site. The work may be required to be carried out in constrained situations. The work is to be carried out in such a way that the traffic, people movement, if any, is kept operative and nothing extra shall be payable to the contractor due to this phasing / sequencing of the work. The contractor is required to arrange the resources to complete the entire project within total stipulated time. Traffic diversion, if required, is to be done and maintained as per specification by the contractor at his own cost and the contractor shall not be entitled for any extra payment, whatsoever, in this regard.

3.2.2 The efforts will be made by the OIL INDIA LIMITED to handover the site to the Contractor free of encumbrances. However, in case of any delay in

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handing over of the site to the Contractor, the OIL INDIA LIMITED shall only consider suitable extension of time for the execution of the work. It should be clearly understood that OIL INDIA LIMITED shall not consider any revision in contract price or any other compensation whatsoever viz. towards idleness of Contractor's labour, equipment etc.

3.2.3 The Contractor shall be responsible for removal of all over-ground and under-ground structures (permanent, semi-permanent and temporary) and constructions from the site. The cost to be incurred in this regard shall be deemed to be included in the quoted rate of Bill of Quantities items and contractor shall not be entitled for any extra payment whatsoever, in this regard. The contractor, if required, shall demolish old structures on the proposed site, properly. The useful material obtained from demolition of structures & services shall be the property of the owner/OIL INDIA LIMITED and these materials shall be stacked in workmanship like at the place specified by the Engineer- in-charge.

3.2.4 If required, the contractor has to do site clearance, enabling work, barricading, diversion of Roads, shifting/ realignment of existing utility services, drains, nallahs etc. at his own cost as per direction of Engineer-in-charge and the contractor shall not be entitled for any extra payment whatsoever in this regard.

3.2.5 Necessary arrangements including its maintenance are to be made by the contractor for temporary diversion of flow of existing drain and road, as the case may be. The existing drain, road would be demolished, wherever required, with the progress of work under the scope of proposed project. The existing Road and Drain, which are not in the alignment of the said project but are affected and/ or need to be demolished during execution for smooth progress of the project, shall be rehabilitated to its original status and condition (including black topping) by the contractor at his own cost. The cost to be incurred by contractor in these regards shall be deemed to be included in the quoted rates of the Bill of Quantities items and contractor shall not be entitled for any extra payment whatsoever, in these regards.

3.2.6 The Contractor shall be responsible to co-ordinate with service provider/ concerned authorities for cutting of trees, shifting of utilities and removal of encroachments etc. and making the site un-encumbered from the project construction area required for completion of work. This shall include initial and frequent follow up meetings/ actions/ discussions with each involved service provider/ concerned authorities. The contractor shall not be entitled for any additional compensation for delay in cutting of trees, shifting of utilities and removal of encroachments by the service provider/ concerned authorities.

3.2.7 The information about the public utilities (whether over ground or underground) like electrical/ telephone/ water supply lines, OFC Cables, open

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drain etc. is the responsibility of contractor to ascertain the utilities that are to be affected by the works through the site investigation and collection of information from the concerned utility owners.

3.2.8 The contractor shall be responsible to obtain necessary approval from the respective authorities for shifting/ re-alignment of existing public utilities. OIL INDIA LIMITED shall only assist the contractor for liasoning in obtaining the approval from the concerned authorities. Take all measures reasonably required by the various bodies to protect their services and property during the progress of works. It shall be deemed to be the part of the contract and no extra payment shall be made to the contractor for the same. Shifting/ re-alignment of public utilities should be done without disturbing the existing one. New service lines should be laid and connected before dismantling the existing one.

3.2.9 Shifting/ re-alignment of existing public utilities shall be done by the contractor as per technical requirement of respective bodies or as per direction of Engineer-in-Charge. Shifting/ re-alignment of public utilities include all materials, labours, tools and plants and any other expenses whatsoever for the same. The cost to be incurred in this regard shall be deemed to be included in his quoted rates of BOQ items and the contractor shall not be entitled for any extra payment, whatsoever, in this regard. In case any of these services are shifted by the State Govt/ local authorities themselves for which deposit as per their estimates is to be made to them, the contractor shall deposit the same and the contractor shall be paid only at the rates quoted by them in BOQ for quantity specified in the BOQ, if such items are included in the BOQ irrespective of amount paid by him to the State Govt./ local authorities for execution of these works. In case such provision is not made in the BOQ or the quantity exceeds those specified in the BOQ, the same is deemed to be included in the rates quoted by him for other items in BOQ and nothing extra shall be payable to contractor on this account.

4.0 SCOPE OF WORK

4.1 The scope of work covered in this tender shall be as per the Bill of Quantities, specifications, drawings, instructions, orders issued to the contractor from time to time during the work. The drawings for this work, which may be referred for tendering, provide general idea only about the work to be performed under the scope of this contract. These may not be the final drawings and may not indicate the full range of the work under the scope of this contract. Drawings released as "GOOD FOR CONSTRUCTION" from time to time by the Engineer-in-charge and according be executed according to any

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additions/ modifications/ alterations/ deletions made from time to time, as required by any other drawings that would be issued to the contractor progressively during execution of work. It shall be the responsibility of the contractor to incorporate the changes that may be in this scope of work, envisaged at the time of tendering and as actually required to be executed.

4.2 The quantities of various items as entered in the "BILL OF QUANTITIES" are indicative only and may vary depending upon the actual requirement. The contractor shall be bound to carry out and complete the stipulated work irrespective of the variation in individual items specified in the bill of quantities.

5.0 ACCEPTANCE OF TENDER

5.1 Once the tenderer has given an unconditional acceptance to the tender conditions in its entirety, he is not permitted to put any remark(s)/conditions(s) in/ along-with the tender.

5.2 In case the condition 5.1 mentioned above is found violated at any time after opening of tender, the tender shall be summarily rejected.

5.3 OIL INDIA LIMITED reserves to itself the authority to reject any or all the tenders received without assigning any reason. The acceptance of a tender shall be effective w.e.f. the last date of submission of bids. OIL INDIA LIMITED also reserves the right to split the work among two or more parties at lowest negotiated rate without assigning any reason thereof. The contractor is bound to accept the portion of work as offered by OIL INDIA LIMITED after split up at the quoted/-negotiated rates.

6.0 TRANSFER OF BID DOCUMENTS

Transfer of bid documents purchased by one intending bidder to another is not permissible.

7.0 The OIL INDIA LIMITED reserves the right to award the work to a single party or to split the work amongst two or more parties as deemed necessary without assigning any reason whatsoever.

8.0 MOBILISATION OF MEN, MATERIALS AND MACHINERY:

8.1 All expenses towards mobilization at site and de-mobilization including bringing in equipment, work force, materials, dismantling the equipment,

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clearing the site etc. shall be deemed to be included in prices quoted and no separate payment on account of such expenses shall be entertained.

8.2 It shall be the responsibility of the Contractor to provide, operate and maintain all necessary construction equipment, scaffoldings and safety, gadget, lifting tackles, tools and appliances to perform the work in a workman like and efficient manner and complete all jobs as per the specifications and within the schedule time of completion of work. Further, contractor shall also be responsible for obtaining temporary electric and water connection for all purposes. The contractor shall also make standby arrangement for water & electricity to ensure un-interrupted supply.

8.3 It shall be the responsibility of the contractor to obtain the approval for any revision and/ or modification of work desired by him from OIL INDIA LIMITED before implementation. Also such revisions and/or modifications if accepted / approved by the OIL INDIA LIMITED shall be carried at no extra cost to OIL INDIA LIMITED.

8.4 The procurement and supply in sequence and at the appropriate time of all materials and consumable shall be entirely the contractor's responsibilities and his rates for execution of work shall be inclusive of supply of all these items.

8.5 It is mandatory for the contractor to provide safety equipment and gadgets to its all workers, supervisory and Technical staff engaged in the execution of the work while working. The cost of the above equipment/ gadgets is deemed to be included in the rates quoted by the contractor for the items & works as per Bill of Quantities and contractor shall not be entitled for any extra cost in these regard. The above norm is to be strictly complied with at site. In case the contractor is found to be deficient in providing Safety Equipment/ Gadgets in the opinion of Engineer-in-charge, the Engineer-in-charge at his option can procure the same at the risk & cost of contractor and provide the same for the use of worksite and shall make the recoveries from the bills of the contractor for the same. The decision of the Engineer-in-charge shall be final and binding on contractor in this regard.

8.6 All designs, drawings, bill of quantities, etc., shall be supplied to the contractor for works by OIL INDIA LIMITED in phased manner as the works progress. However, it shall be the duty and responsibility of the contractor to bring to the notice of the OIL INDIA LIMITED in writing as to any variation, discrepancy or any other changes required and to obtain revised drawings and designs and / or approval of the OIL INDIA LIMITED in writing for the same.

8.7 One copy of contract documents including drawings furnished to the contractor shall be kept at the site and the same shall at all reasonable times be available for inspection.

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8.8 All materials, construction plants and equipment etc. once brought by the contractor within the project area, will not be allowed to be removed from the premises without the written permission of the OIL INDIA LIMITED. Similarly, all enabling works built by the contractor for the main construction undertaken by him, shall not be dismantled and removed without the written authority of the OIL INDIA LIMITED.

9.0 INCOME TAX DEDUCTION

Income tax deductions shall be made from all payments made to the contractor including advances against work done, as per the rules and regulations in force, in accordance with the Income Tax Act prevailing from time to time.

10.0 Not applicable.

11.0 RATES TO BE FIRM

11.1 The Percentage / Item rates quoted by the tenderer shall be firm and fixed for the entire period of completion and till handing over of the work. No revision to Percentage /Item rates or any escalation shall be allowed on account of any increase in prices of materials, labour, POL and Overheads etc or any other statutory increase during the entire contract period or extended contract period.

11.2 The contractor shall be deemed to have inspected the site, it's surrounding and acquainted with the nature of the ground, accessibility of the site and full extent and nature of all operations necessary for the full and proper execution of the contract, space for storage of materials, constructional plant, temporary works, restrictions on the plying of heavy vehicles in area, supply and use of labour, materials, plant, equipment and laws, rules and regulations, if any, imposed by the local authorities.

11.3 The rates and prices given in the bill of quantities are for completed and finished items of works and complete in all respects. It will be deemed to include all constructional plant, labour, supervision, materials, transport, all temporary works, erection, maintenance, contractor's profit and establishment/ overheads, together with preparation of designs & drawings pertaining to casting yard, shop drawing, fabrication drawing (if required), staging form work, stacking yard, etc. all general risk, taxes excluding GST (if any), royalty ,duties, cess, octroi and other levies, insurance liabilities and obligations set out or implied in the tender documents and contract.

11.4 Unless otherwise specified in the Bill of Quantities (BOQ), the contractor has to make his own arrangement for dewatering/ bailing out of water, effluent including strutting, shoring etc at every stage of work wherever required

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including working under foul condition as per direction of Engineer-in-Charge at his own cost and the contractor shall not be entitled for any extra payment, whatsoever, in this regard.

11.5 If required to make work site suitable for execution, contractor shall have to clear jungle including of rank vegetation, grass, trees etc., clear & clean existing drains/ canals (including strutting, shoring and packing cavities) and dispose them out of the site up-to any lead and lift as per direction of Engineer-in-charge. The contractor should inspect the site of work from this point of view. Unless otherwise specified in the Bill of Quantities, the cost to be incurred in this regard shall be deemed to be included in his quoted rates of BOQ items and the contractor shall not be entitled for any extra payment in this regard.

11.6 If any temporary/ permanent structure is encountered or safety of such structure in the vicinity is endangered due to execution of the project, the contractor has to protect the structures by any means as per the directions of the Engineer - in - Charge. If any damage caused to any temporary or permanent structure(s) in the vicinity is caused due to execution of the project, the contractor has to make good the same by any means as per directions of the Engineer - in - Charge. The contractor should inspect the site of work from this point of view. The cost to be incurred in this regard shall be deemed to be included in his quoted rates of BOQ items and the contractor shall not be entitled for any extra payment in this regard.

11.7 ROYALTY: Contractor's quoted rate should include the royalty on different applicable items as per the prevailing Government rates. In case, owner is able to obtain the exemption of royalty from the state Govt., the contractor shall pass on the same to owner for all the items involving royalty. Any increase in prevailing rate of royalty shall be borne by the contractor at no extra cost to the owner.

12.0 ESCALATION/ PRICE VARIATION

No claim on account of any price variation / Escalation on whatsoever ground shall be entertained at any stage of works. All Percentage / item rates as per Bill of Quantities (BOQ) quoted by Contractor shall be firm and fixed for entire contract period as well as extended period for completion of the works. No escalation/price variation clause shall be applicable on this contract.

The rates and prices to be tendered in the bill of quantities are for completed and finished items of works and complete in all respects. It will be deemed to include all constructional plant, labour, supervision, materials, transport, all temporary works, erection, maintenance, contractor's profit and establishment / overheads, together with preparation of designs drawings pertaining to casting yard (if required). Staging from work, stacking yard, etc, all general

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risk, taxes, GST, insurance liabilities and obligations set out or implied in the tender documents and contract.

13.0 INSURANCE OF WORKS ETC.

Contractor is required to take contractor's all risk policy from an approved insurance and bear all costs towards the same for the full period of execution of works including the defect liability period for the full amount of contract against all loss of damage from whatever cause arising other than excepted risks for which he is responsible under the terms of the contract and in such manner that the contractor is covered during the period of construction of works and/or also covered during the period of defect liability for loss or damage: In case of contractual time extension, the insurance cover has to be suitably extended to cover the extended period.

- a. The work and the temporary works to the full value of such works.
- b. The materials, constructional plant, centring, shuttering and scaffolding materials and other things brought to the site for their full value.

Whenever required by OIL INDIA LIMITED, the contractor shall produce the policy or the policies of insurance and the receipts for payment of the current premiums.

14.0 INSURANCE UNDER WORKMEN COMPENSATION ACT

Contractor is required to take insurance cover under the Workman Compensation Act, 1923 amended from time to time from an approved insurance company and pay premium charges thereof. Wherever required by OIL INDIA LIMITED the contractor shall produce the policy or the policies of Insurance and the receipt of payment of the current premiums. In case of contractual time extension, the insurance cover has to be suitably extended to cover the extended period.

15.0 THIRD PARTY INSURANCE

Contractor is required to take third party insurance cover for an amount of 5% (five percent) of contract value from an approved insurance company for insurance against any damage, injury or loss which may occur to any person or property including that of OIL INDIA LIMITED, arising out of the execution of the works or temporary works. Wherever required by OIL INDIA LIMITED the contractor shall produce the policy or the policies of Insurance and the receipt of payment of the current premiums. In case of failure of the contractor to

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obtain contractors all risk policy, insurance under workman compensation act and third party insurance as described above within one month from the date of commencement of work, running account payments of the contractor shall be withheld till such time the contractor obtains the aforesaid insurance covers.

If the Contractor could not effect a comprehensive insurance cover against risks which he may be required to effect under the terms of the contract, then he shall give his attention to get the best insurance cover available and even in case of effecting a wider insurance cover than the one which the subsidiary of the General Insurance Company could offer, such an insurance is ought to be done after the Engineer-In-Charge's approval, by or through the subsidiary of the General Insurance Company.

The contractor has to obtain any insurance other than mentioned above and in the relevant clauses of GCC as applicable for the subject work.

16.0 Not Applicable.

17.0 LABOUR LAWS TO BE COMPLIED BY THE CONTRACTOR

The contractor shall obtain a valid license under the contract labour (R & A) Act 1970 and the contract labour Act (R&A) Central Rules 1971 and amended from time to time, and continue to have a valid license until the completion of the work including defect liability period. The contractor shall also abide by the provision of the child labour (Prohibition and Regulation) Act-1986 and amended from time to time. Any failure to fulfil this requirement shall attract the penal provisions of this contract arising out the resultant for non-execution of the work before the commencement of work.

17.1 No labour below the age of 18 years shall be employed on the work.

18.0 LABOUR SAFETY PROVISION

The contractor shall be fully responsible to observe the labour safety provisions.

19.0 OBSERVANCE OF LABOUR LAWS

19.1 The contractor shall be fully responsible for observance of all labour laws applicable including local laws and other laws applicable in this matter and

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shall indemnify and keep indemnified OIL INDIA LIMITED against effect or non-observance of any such laws. The contractor shall be liable to make payment to all its employees, workers and sub- contractors and make compliance with labour laws. If OIL INDIA LIMITED or the client/ owner is held liable as "Principal Employer" to pay contributions etc. under legislation of Govt. or Court decision in respect of the employees of the contractor, then the contractor would reimburse the amount of such payments, contribution etc. to OIL INDIA LIMITED and/ or same shall be deducted from the payments, security deposit etc. of the contractor.

19.2 The Contractor shall submit proof of having valid EPF registration certificate. In absence of the said certificate payment to the extent of 4.70% (four point seventy percent) of the value of the Running Account bill may be withheld by OIL INDIA LIMITED and shall be released only after the production of the EPF registration certificate from the concerned authorities. If it is incumbent upon OIL INDIA LIMITED to deposit withhold amount with EPF authorities, the withhold amount shall be deposited by OIL INDIA LIMITED with EPF authorities. In such a case OIL INDIA LIMITED shall not refund this withhold amount to the contractor even after the production of EPF registration certificate.

19.3 **BUILDING AND OTHER CONSTRUCTION WORKER'S ACT**

In order to govern welfare and working conditions of labourers engaged in construction activities, the Building and other Construction Workers' (Regulation of Employment and conditions of Service "RE&CS") Act, 1996 came into force. RE&CS Act'1996 is applicable in respect of building and other construction work. Wherever applicable, The CONTRACTOR shall strictly comply with the following provisions pertaining to RE & CS Act'1996.

- a. The CONTRACTOR must be registered with the concerned authorities under the Building and Other Construction Workers' (RE & CS) Act, 1996, or in case of non-registration ; the CONTRACTOR should obtain registration within one month of the award of contract.
- b. The CONTRACTOR shall be responsible to comply with all provisions of the Building and Other Construction Workers' (RE & CS) Act, 1996, the Building and Other Construction Workers' Welfare Cess Act, 1996, the Building and other Construction Workers' (RE & CS) Rules, 1998 and Building and other Construction Workers Welfare Cess Rules, 1998.
- c. Cess as per the prevailing rate, shall be deducted at source from bills of the CONTRACTOR by the Engineer-in-charge of the

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contract and remitted to the “Secretary, Building and Other Construction Workers Welfare Board” of the concerned State. The CONTRACTOR shall be responsible to submit final assessment return of the cess amount to the assessing officer after adjusting the cess deducted at source.

20.0 LAW GOVERNING THE CONTRACT

The Indian Laws shall govern this contract for the time being in force.

21.0 LAWS, BY LAWS RELATING TO THE WORK

The contractor shall strictly abide by the provisions, for the time being in force, of law relating to works or any regulations and bylaws made by any local authority or any water & lighting agencies or any undertakings within the limits of the jurisdiction of which the work is proposed to be executed. The contractor shall be bound to give to the authorities concerned such notices and take all approvals as may be provided in the law, regulations or bylaws as aforesaid, and to pay all fees and taxes payable to such authorities in respect thereof.

22.0 TECHNICAL STAFF FOR WORK

22.1 The contractor shall employ at his cost the adequate number of technical staff during the execution of this work depending upon the requirement of work. For this purpose, the numbers to be deployed, their qualification, experience as decided by OIL INDIA LIMITED shall be final and binding on contractor. The contractor shall not be entitled for any extra payment in this regard. The technical staff should be available at site, whenever required by OIL INDIA LIMITED to take instructions.

22.2 Within 15 days of letter of intent, the contractor shall submit a site organizational chart and Resume including details of experience of the Project-in-Charge and other staff proposed by him and shall depute them on the Project after getting approval from Engineer-in-Charge. If desired by the contractor at a later date, the Project-in-Charge and other staff whose resume is approved by OIL INDIA LIMITED can be replaced with prior written approval of OIL INDIA LIMITED and replacement shall be with equivalent or superior candidate only. Decision of Engineer-in-Charge shall be final and binding on the contractor. Even after approving the site organizational chart, the Engineer-in-Charge, due to nature and exigency of work, can direct the contractor to depute additional staff as per the requirement.

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The removal of such additional staff from the site shall only be with the prior written approval of Engineer-in-Charge. The contractor shall not be paid anything extra whatsoever on account of deployment of additional staff and decision of the Engineer- in-Charge shall be final and binding on the contractor.

The desired numbers of personnel for the project are as follows:

S.No .	Contract Value	Graduate Engineers Civil	Graduate Engineers Mechanical/ Electrical	Diploma Engineers Civil	Diploma Engineers Mechanical/ Electrical
1	More than 75.00 & Up to 100.00 Crore	5	2	6	3
2	More than 100.00Crore	6	3	8	4

22.3 In case the contractor fails to employ the staff as aforesaid he shall be liable to pay a reasonable amount not exceeding a sum of Rs. 40,000/- (Rupees forty Thousand only) for each month of default in the case of each Graduate Engineer and Rs. 25,000/- (Rupees twenty-five Thousand only) in the case of each Diploma Engineer. The decision of the Engineer-in-charge as to the number of Technical Staff to be adequate for the project and the period for which the required technical staff was not employed by the contractor and as to the reasonableness of the amount to be deducted on this account shall be final and binding on the contractor.

23.0 LAND FOR LABOUR HUTS/ SITE OFFICE AND STORAGE ACCOMMODATION

23.1 The contractor shall arrange the land for temporary office, storage accommodation and labour huts at his own cost and get the clearance of local authorities for setting up of labour camp and same is deemed to be included in

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the rates quoted by the contractor for the works. The contractor shall ensure that the area of labour huts is kept clean and sanitary conditions are maintained as laid down by the local authorities controlling the area. The labour huts shall be so placed that it does not hinder the progress of work or access to the worksite. Contractor shall give the vacant possession of the land utilised for this purpose back after completion of the work. The security deposit of the contractor shall be released only after contractor demolishes all structures including foundations and gives back clear vacant possession of this land.

23.2 In the event the contractor has to shift his labour campus at any time during execution of the work on the Instructions of local authorities or as per the requirement of the work progress or as may be required by OIL INDIA LIMITED , he shall comply with such instructions at his cost and risk and no claim whatsoever shall be entertained on this account.

23.3 FURNISHED OFFICE ACCOMMODATION & MOBILITY AND COMMUNICATION TO BE PROVIDED BY CONTRACTOR TO OIL INDIA LIMITED

The Contractor has to provide furnished Project office equipped with all facilities such as telephone, fax, internet, photocopier, computer/ laptop & printer along with operator, regular electric & purified drinking water supply and inspection vehicle etc. as per the requirement of the project. If the contractor fails to provide as above as per the satisfaction of E-I-C/ OIL an amount equal to 1 % of gross bill from all running account & final bill will be recovered.

The contractor shall also make sufficient arrangement for Photography/ Videography preferably by maintaining a camera/video camera at site so that video photographs can be taken of a specific activity at any point of time. The contractor shall also provide software like MS Project etc. for the purpose of preparing progress report etc.

The Contractor has to keep a vehicle with driver and sufficient fuel on standby mode for 24x7 to counter any emergency situation/ misshapen for immediate response.

23.4 The contractor shall make all arrangements for ground breaking ceremony/ inaugural function etc for the project as required and the cost towards it deemed to be included in his rates/offer.

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24.0 WATCHING AND LIGHTING

The contractor shall at his own cost take all precautions to ensure safety of life and property by providing necessary barriers, lights, watchmen etc. during the progress of work as directed by Engineer-in-Charge.

25.0 HEALTH & SANITARY ARRANGEMENTS

In case of all labour directly or indirectly employed in work for the performance on the contractor's part of this contract, the contractor shall comply with all rules framed by Govt. from time to time for the protection of health and sanitary arrangements for workers. Please refer to Annexure -HSE.

26.0 WORKMEN'S COMPENSATION ACT

The contractor shall at all times indemnify OIL INDIA LIMITED and Owner against all claims for compensation under the provision of workmen's compensation Act or any other law in force, for any workmen employed by the contractor or his sub-contractor in carrying out the contract and against all costs and expenses incurred by the OIL INDIA LIMITED therewith.

27.0 MINIMUM WAGES ACT

The contractor shall comply with all the provisions of the minimum wages Act, 1948, contract labour Act (R&A) 1970, and rules framed there under and other labour laws/local laws affecting contract labour that may be brought into force from time to time.

28.0 LABOUR RECORDS

The contractor shall submit by the 4th & 19th of every month to the Engineer-in-Charge a true statement, showing in respect of the second half of the proceeding month and the first half of the current month, respectively, of the following data: -

- a) The number of the labour employed by him (category-wise).
 - b) Their working hours.
 - c) The wages paid to them.
 - d) The accidents that occurred during the said fortnight showing the circumstances under which
 - e) they happened and the extent of damage and injury caused.
 - f) The number of female workers who have been allowed Maternity Benefits and the amount paid to them.
 - g) Any other information required by Engineer-in-Charge.
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29.0 RELEASE OF SECURITY DEPOSIT AFTER LABOUR CLEARANCE

Security Deposit of the work shall not be refunded till the contractor produces a clearance certificate from the Labour Officer. As soon as the work is virtually complete, the contractor shall apply for the clearance certificate to the Labour Officer under intimation to the Engineer-in-Charge. The Engineer-in-Charge, on receipt of the said communication, shall write to the Labour Officer to intimate if any complaint is pending against the contractor in respect of the work. If no complaint is pending, on record till after 3 months after completion of the work and/or no communication is received from the Labour Officer to this effect till six months after the date of completion, it will be deemed to have received the clearance certificate and the Security deposit will be released if otherwise due.

No interest shall be payable by the OIL INDIA LIMITED on the said amount covered under PBG/SD/ Other security deposits.

30.0 MEASUREMENTS OF WORKS

Unless otherwise mentioned in the bill of quantities the measurements of works shall be done as per MOST/ CPWD specifications (as specified in Technical Specification of the Tender) and if the same is not given in the CPWD / MOST Specifications, the same shall be measured as per latest relevant BIS codes in force. The quantity of steel reinforcement and the structural steel sections incorporated in the work shall be measured & paid on the basis of standard coefficients of sections as per BIS Codes of practice.

31.0 PAYMENTS

31.1 The bill shall be submitted by contractor each month on or before the date fixed by the Engineer-in-Charge for all works executed in previous months. The contractor shall prepare computerized bills using the program as approved by Engineer-in-Charge as per prescribed format/ pro-forma. The Contractor shall submit five numbers of hard copies and one soft copy of CD / pendrive for all bills.

31.2 All running payments shall be regarded as payments by way of advance against the final payment only and not as payments for work actually done and completed and / or accepted by OIL INDIA LIMITED and shall not preclude the recovery for bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the due performance of the Contract, or any part thereof, in this respect, or the accruing of any claim, nor shall it conclude, determine or affect in any way the powers of the OIL INDIA LIMITED under these conditions or any of them

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as to the final settlement and adjustments of the accounts or otherwise, or in any other way vary/ affect the contract. The contractor shall submit the final bill within three months of the completion of work, otherwise OIL INDIA LIMITED 's certificate of the measurement and of the total amount payable for the work accordingly shall be final and binding on contractor.

Each Running Bills should be accompanied by two sets of at-least 20 (twenty) photographs as per direction of Engineer-in-charge taken from various points depicting status of work as on Report/ Bill date along with Monthly Progress Report for the concerned month in the pro-forma to be given/ approved by Engineer-in-Charge. Intermittent progress Photographs as and when required shall also be provided by the Contractor at his own cost as per direction of Engineer-in-Charge. No payment of running account bill shall be released unless it is accompanied by progress photographs and Monthly Progress Report as above.

31.3 It is clearly agreed and understood by the Contractor that notwithstanding anything to the contrary that may be stated in the agreement between OIL INDIA LIMITED and the contractor; the contractor shall become entitled to payment only after OIL INDIA LIMITED has received the corresponding payment(s) from the client/ Owner for the work done by the contractor. Any delay in the release of payment by the client/ Owner to OIL INDIA LIMITED leading to a delay in the release of the corresponding payment by OIL INDIA LIMITED to the contractor shall not entitle the contractor to any compensation/ interest from OIL INDIA LIMITED .

32.0 WORK ON SUNDAYS, HOLIDAYS AND DURING NIGHT

For carrying out work on Sunday and Holidays or during night, the contractor will approach the Engineer-in-Charge or his representative at least two days in advance and obtain his permission. The Engineer-in-Charge at his discretion can refuse such permission. The contractor shall have no claim on this account whatsoever. If work demand, the contractor shall make arrangements to carry out the work on Sundays, Holidays and in two, three shifts with the approval of Engineer-in-Charge at no extra cost to OIL INDIA LIMITED .

33.0 NO IDLE CHARGES TOWARDS LABOUR OR P&M ETC.

No idle charges or compensation shall be paid for idling of the contractor's labour, staff or P&M etc. on any ground or due to any reason whatsoever. OIL INDIA LIMITED will not entertain any claim in this respect.

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34.0 WORK TO BE EXECUTED IN ACCORDANCE WITH SPECIFICATIONS, DRAWINGS AND ORDERS ETC.

The contractor shall execute the whole and every part of the work in the most substantial and workman like manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also conform exactly, fully and faithfully to the design, drawings and instructions in writing in respect of the work assigned by the Engineer-in-Charge and the contractor shall be furnished free of charge one copy of the contract documents together with specifications, designs, drawings.

The contractor shall comply with the provisions of the contract and execute the works with care and diligence and maintain the works and provide all labour and materials, tools and plants including for measurements and supervision of all works, structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these is specified or is reasonably inferred from the contract. The contractor shall take full responsibility for adequacy, suitability and safety of all the works and methods of construction.

35.0 DIRECTION FOR WORKS

35.1 All works to be executed under the contract shall be executed under the directions and subject to approval in all respects of the Engineer-in-Charge / OIL INDIA LIMITED who shall be entitled to direct at what point or points and in what manner the works are to be commenced and executed.

35.2 The Engineer-in-Charge and his representative shall communicate or confirm their instructions to the contractor in respect of the execution of work during their site inspection in a 'Works Site Order Book' maintained at the site office of Engineer-in-Charge. The contractor or his authorized representative shall confirm receipt of such instructions by signing against the relevant orders in the book.

36.0 ORDER OF PRECEDENCE OF DOCUMENTS

In case of difference, contradiction, discrepancy, dispute with regard to Conditions of Contract, specifications, Drawings, Bill of quantities and rates quoted by the Contractor and other documents forming part of the contract, the following shall prevail in order of precedence.

- i) Letter of Intent, Letter of Award, Work Order, Agreement along with statement of agreed variations and its enclosures.

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- ii) Bill of Quantity / Schedule of Quantities
 - iii) Special Condition of Contract.
 - iv) Technical specifications (General, Additional and Technical Specification) as give in Tender documents.
 - iv) General Conditions of Contract.
 - v) Drawings.
 - vi) CPWD specifications (as specified in Technical Specification of the Tender) update with correction slips issued up to last date of receipt of tenders.
 - vii) Relevant B.I.S. Codes.

37.0 TIME SCHEDULE & PROGRESS

37.1 Time allowed for carrying out all the works as entered in the tender shall be as mentioned in the Tender conditions. The Date of start of contract shall be reckoned 14 days after the date of issue of letter/FAX/E-mail of intent/acceptance of tender. Time shall be the essence of the contract and contractor shall ensure the completion of the entire work within the stipulated time of completion.

37.2 The contractor shall also furnish within 14 days of date of receipt of letter of Intent, a CPM network/ PERT chart/ Bar Chart along with quarterly milestones and resources plan for man, material & machinery to achieve the milestones for completion of work within stipulated time. This will be duly got approved from OIL INDIA LIMITED . This approved Network/ PERT Chart shall form a part of the agreement. Achievement of milestones as well as total completion has to be within the time period allowed.

37.3 Contractor shall mobilize and employ sufficient resources for completion of all the works as indicated in the agreed BAR CHART/Network. No additional payment will be made to the contractor for any multiple shift work or other incentive methods contemplated by him in his work schedule even though the time schedule is approved by the Engineer-in- Charge.

37.4 During the currency of the work the contractor is expected to adhere to the time schedule on miles stone and total completion and this adherence will be a part of Contractor's performance under the contract. During the execution of the work contractor is expected to participate in the review and updating of the Network/ BAR CHART undertaken by the OIL INDIA LIMITED . These reviews may be undertaken at the discretion of OIL INDIA LIMITED either as a periodical appraisal measure or when the quantum of work order on the contractor is substantially changed through deviation orders

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or amendments. The review shall be held at site or any of the offices of OIL INDIA LIMITED / owner / consultant at the sole discretion of OIL INDIA LIMITED . The contractor will adhere to the revised schedule thereafter. The approval to the revised schedule resulting in a completion date beyond the stipulated date of completion shall not automatically amount to a grant of extension of time to the contractor.

37.5 Contractor shall submit fortnightly/ Monthly (as directed by Engineer-in-Charge) progress reports (5 copies) on a computer based program (program and software to be approved by Engineer-in-Charge) highlighting status of various activities and physical completion of work.

37.6 The contractor shall send completion report with as built drawings and maintenance schedule to the office of Engineer-in-Charge, of OIL INDIA LIMITED in writing within a period of 30 days of completion of work.

38.0 WATER AND ELECTRICITY

The contractor shall make his own arrangement for Water & Electrical power for construction and other purposes at his own cost and pay requisite electricity and water charges. The contractor shall also make standby arrangement for water & electricity to ensure un-interrupted supply.

39.0 MATERIALS TO BE PROVIDED BY THE CONTRACTOR

The contractor shall, at his own expense, provide all materials, required including Cement & Steel for the works. The contractor shall at his own expense and without delay; supply to the Engineer-in- Charge samples of materials to be used on the work and shall get the same approved in advance. All such materials to be provided by the Contractor shall be in conformity with the specifications laid down or referred to in the contract. The contractor shall, if required by the Engineer-in- Charge furnish proof, to the satisfaction of the Engineer-in- Charge that the materials so comply.

The materials products used on the works shall be one of the approved makes/brands out of list of manufacturers / brands /makes given in the tender documents. The contractor shall submit samples /specimens out of approved makes of materials/products to the engineer in charge for prior approval. In exceptional circumstances engineer in charge may allow alternate equivalent makes / brands of products / materials at his sole discretion. The final choice of brand / make shall remain with the engineer in charge, whose

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decision in the matter shall be final and binding and nothing extra on this account shall be payable to the contractor.

Incase single brand / make are mentioned, other equivalent makes brands may be considered by the engineer in charge with prior approval .Incase of variance in CPWD's specification from approved products makes specification the specification of approved products make shall prevail for which nothing shall be paid extra to the contractor.

The contractor shall at his risk and cost, submit the samples of materials to be tested or analyzed and bear all charges and cost of testing unless specifically provided or otherwise elsewhere in the contract or specifications. The Engineer-in-Charge or his authorized representative shall at all times have access to the works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the works and the contractor shall afford every facility and every assistance and cost in obtaining the right and visit to such access.

The Engineer-in-Charge shall have full powers to require the removal from the premises of all materials, which in his opinion are not in accordance with the specifications and in case of default, the Engineer-in-Charge shall be at liberty to employ at the expense of the contractor, other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. The Engineer-in-Charge shall also have full power to require other proper materials to be substituted thereof and in case of default, the Engineer-in-Charge may cause the same to the supplies and all costs which may require such removal and substitution shall be borne by the contractor.

40.1 CEMENT AND CEMENT GODOWN

Cement shall be procured by Contractor confirming to BIS: 8112 Specification latest edition or higher Grade as directed by the Engineer-in-Charge. The cement shall be procured directly from the reputed manufacturers/ stockiest(s), which will have to be got approved from Engineer-in charge in advance. Relevant vouchers and test certificates will be produced as and when required. The cement shall be stored by the contractor in such suitable covered and lockable stores, well protected from climate and atmospheric affect. The cement godown shall be constructed by the contractor as per CPWD specifications at his own cost. The cement in bags shall be stored in godowns in easy countable position. Cement bags shall be used on first in first out

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basis. Cement stored for beyond 90 days will be required to be tested at contractors cost, before use in works.

40.2 STEEL & STEEL STOCKYARD

Steel confirming to BIS specifications (latest edition) shall be procured by the contractor directly from reputed manufacturers/producers as per approved list. The manufacturer has to give a certificate that the material supplied is not a re-rolled product. The contractor will produce relevant vouchers & test certificates. Re-rolled sections will not be allowed.

Reinforcement steel, structural steel shall be stored and stacked in such manner so as to facilitate easy identification, removal etc. The contractor shall take proper care to prevent direct contact between the steel and the ground/ water for which he shall provide necessary arrangement at his own cost including ensuring proper drainage of area to prevent water logging as per directions of the Engineer-in-Charge. Steel shall also be protected, by applying a coat of neat cement slurry over the bars for which no extra payment shall be made.

Test certificates for each consignment of steel shall be furnished and tests to be got carried out from the authorized laboratory as per the directions of Engineer-in-Charge, before incorporating the materials in the work.

41.0 SCHEDULE OF QUANTITIES / BILL OF QUANTITIES/ QUANTITY VARIATION

41.1 The work under this contract shall be carried out as per BOQ cum rate schedule. In case the description /specification as per BOQ are found to be incomplete OIL/CPWD/MOST specifications shall be followed. Quantities mentioned in the rate schedule are approx. only and liable for variation due to change of scope of work/variation in schedule of quantities, changes in design etc. The tenderers shall under take to execute actual quantities as per advise of Engineer-In -Charge and accordingly the final contract price shall be worked out on the basis of quantities actually executed at site in payments will also be regulated for the same. The quantities indicated against each item may vary to any extent and no compensation will be payable in variation of individual quantity to the extent sanction is available.

41.2 All items of work in the bill of quantities/ schedule of quantities shall be carried out as per the OIL/CPWD/MOST specifications, drawings and instructions of the Engineer-in-Charge and the rates shall include for supply of

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required materials including proper storage, consumables, skilled & unskilled labour, supervision and tools, tackles, plant & machinery complete as called for in the detailed specifications and conditions of the contract. The Contractor without the approval of the Engineer-in-Charge shall execute no item, which is not covered in the bill of quantities. In case any Extra/Substituted item is carried out without specific-approval, the same will not be paid.

42.0 ANTI-TERMITE TREATMENT & WATER PROOF TREATMENT

42.1 Pre-construction treatment shall be carried out in co-ordination with the building work and shall be executed in such a manner that the civil works are not hampered or delayed by the anti-termite treatment. The treatment shall be carried out as detailed in BIS: 6313 (Part-II) latest revision. The waterproof treatment shall be of type and specifications as given in the schedule of quantities.

42.2 The treatment against water-proofing of basement, roofs, water retaining areas and termite infestation shall be and remain fully effective for a period of not less than 10 (Ten) years to be reckoned from the date of expiring of the Defect Liability period, prescribed in the contract. At any time during the said guarantee period if OIL INDIA LIMITED finds any defects in the said treatment or any evidence of re-infestation, dampness, leakage in any part of buildings or structure and notifies the contractor of the same, the contractor shall be liable to rectify the defect or give re-treatment and shall commence the work or such rectification or re-treatment within seven days from the date of issue of such letter to him. If the contractor fails to commence such work within the stipulated period, OIL INDIA LIMITED may get the same done by another agency at the Contractor's cost and risk and the decision of the Engineer-in-Charge for the cost payable by the contractor shall be final and binding upon him.

42.3 Re-treatment if required shall be attended to and carried out by the Contractor within seven days of the notice from Engineer-in-Charge.

42.4 Engineer-in-Charge reserves the right to get the quality of treatment checked in accordance with recognized test methods and in case it is found that the chemicals with the required concentration and rate of application have not been applied, or the water proof treatment is not done as per specifications, the contractor will be required to do the re- treatment in accordance with the required concentration & specifications at no extra cost failing which no

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payment for such work will be made. The extent of work thus rejected shall be determined by Engineer-in-Charge.

42.5 Water proofing and anti-termite treatment shall be got done through approved / specialized agencies only with prior approval of Engineer-in-Charge.

42.5 a. The contractor shall make such arrangement as may be necessary to safe guard the workers and residents of the building against any poisonous effect of the chemicals used during the execution of the work.

42.6 During the execution of work, if any damage shall occur to the treatment already done, either due to rain or any other circumstances, the same shall be rectified and made good to the entire satisfaction of Engineer-In-Charge by the contractor at his costs and risks.

42.7 The contractor shall make his own arrangement for all equipment required for the execution of the job.

42.8 The contractor whose tender is accepted shall execute Guarantee Bond in the prescribed form as appended for guaranteeing the anti-termite treatment and water proof treatment.

43.0 INDIAN STANDARDS

Wherever any reference is made to any IS in any particular specifications, drawings or bill of quantities, it means the Indian Standards editions with the amendments current at the last date of receipt of tender documents.

44.0 CENTERING & SHUTTERING

Marine plywood only or steel plates of minimum thickness as approved by Engineer-in- Charge shall be used for formwork. The shuttering plates shall be cleaned and oiled after every repetition and shall be used only after obtaining approval of Engineer-in-Charge. The number of repetitions allowed for plywood and steel shuttering shall be at the discretion of Engineer-in-Charge depending upon the condition of shuttering surface after each use and the decision of Engineer-in-Charge in this regard shall be final and binding on the contractor. No claim whatsoever on this account shall be admissible.

45.0 PROPRIETARY MATERIALS

45.1 The following proprietary materials shall be brought to site after the approval of Engineer-in-Charge

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- a) Water Proofing Compound
 - b) Cement
 - c) Steel
 - d) Bitumen
 - e) Primer/Paints/Varnish etc.
 - f) Chemical for anti-termite treatment
 - g) Any other materials as per discretion of the Engineer-in-Charge.

45.2 The quantity of proprietary materials shall be measured and recorded in the Measurement books and signed by the Contractor and the Engineer-in-Charge as a check to ensure that the required quantities as required for execution of works as per specifications have to be brought to site for incorporation in the work.

45.3 Proprietary materials brought at site shall be stored as directed by Engineer-in-Charge and those already recorded in Measurement book, shall be suitably marked for identification.

45.4 The contractor shall ensure that the proprietary materials are brought to site in original sealed containers or packing bearing manufacturer's markings and brands (except where the quantity required is a fraction of the smallest packing). Materials not complying with this requirement shall be rejected. The empty containers of such proprietary materials shall not be destroyed/ disposed-off without the permission of Engineer-in-Charge.

45.5 The contractor shall produce receipted vouchers showing quantities of the materials to satisfy Engineer-in-Charge that the materials comply with the specifications. These vouchers shall be endorsed, dated and initiated by Engineer-in-Charge giving the contract number and name of work and a certified copy of each such voucher signed both by Engineer-in-Charge and the Contractor shall be kept on record.

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46.0 RECORDS OF CONSUMPTION OF MATERIALS

46.1 For the purpose of keeping a record of materials (Steel & Cement) received at site and consumed in works, the contractor shall maintain a properly bound register in the form approved by the Engineer-in-Charge, showing columns like quantity received and used in work and balance in hand etc. This register shall be signed daily by the contractor's representative and Engineer-in-Charge.

46.2 The register of material shall be kept at site in the safe custody of Engineer-in-Charge during progress of the work. This provision will not, however, absolve the contractor from the quality of the final product.

46.3 In case cement or steel quantity consumed is lesser as compared to the theoretical requirement of the same as per MOST/CPWD (as the case may be) specifications/ norms, the work will be devalued and/ or a penal rate (i.e. double the rate at which cement/ steel purchased last) recovery for lesser consumption of cement/ steel shall be made in the rates of the work done subject to the condition that the tests results fall within the acceptable criteria as per MOST/CPWD (as the case may be) specifications otherwise the work shall have to be dismantled and redone by the contractor at no extra cost.

In case of cement, if actual consumption is less than 98% of the theoretical consumption, a recovery shall be affected from the contractor's dues at the penal rate (Prescribed under relevant clauses of BIS Code) for the actual quantity, which is lower than 98% of theoretical consumption.

47.0 MATERIALS AND SAMPLES

47.1 The materials/ products used on the works shall be one of the approved make/ brands out of list of manufacturers/ brands/ makes given in the tender documents. The contractor shall submit samples/ specimens out of approved makes of materials/ products to the Engineer-in-Charge for prior approval. In exceptional circumstances Engineer-in-Charge may allow alternate equivalent makes/ brands of products/ materials at his sole discretion. The final choice of brand/ make shall remain with the Engineer-in-Charge, whose decision in this matter shall be final and binding and nothing extra on this account shall be payable to the Contractor.

47.2 In case no make or brand of any materials, articles, fittings and accessories etc. is specified, the same shall comply with the relevant Indian

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Standard Specifications and shall bear the ISI/BIS mark. The Engineer-in-Charge and the Owner shall have the discretion to check quality of materials and equipment to be incorporated in the work, at source of supply or site of work and even after incorporation in the work. They shall also have the discretion to check the workmanship of various items of work to be executed in this work. The contractor shall provide the necessary facilities and assistance for this purpose.

The above provisions shall not absolve the contractor from the quality of final product and in getting the material and workmanship quality checked and approved from the Engineer-in-Charge.

47.3 The contractor shall well in advance, produce samples of all materials, articles, fittings, accessories etc. that he proposes to use and get them approved in writing by Engineer-in-Charge. The materials articles etc. as approved shall be labeled as such and shall be signed by Engineer-in-Charge and the Contractor's representative.

47.4 The approved samples shall be kept in the custody of the Engineer-in-Charge till completion of the work. Thereafter the samples except those destroyed during testing shall be returned to the contractor. No payment will be made to the contractor for the samples or samples destroyed in testing.

47.5 The brands of all materials, articles fittings etc. approved together with the names of the manufacturers and firms from which supplies have been arranged shall be recorded in the site order book.

47.6 The contractor shall set up and maintain at his cost, a field-testing laboratory for all day- to-day tests at his own cost to the satisfaction of the Engineer-in-Charge. This field- testing laboratory shall be provided with equipment and facilities to carry out all mandatory field tests as per MOST/CPWD (as the case may be) specifications. The laboratory building shall be constructed and installed with the appropriate facilities; Temperature and humidity controls shall be available wherever necessary during testing of samples.

All equipment shall be provided by the Contractor so as to be compatible with the testing requirements specified. The Contractor shall maintain all the equipment in good working condition for the duration of the contract.

The Contractor shall provide approved qualified personnel to run the laboratory for the duration of the Contract. The number of staff and equipment available

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must at all times be sufficient to keep pace with the sampling and testing programme as required by the Engineer-in-charge.

The Contractor shall fully service the site laboratory and shall supply everything necessary for its proper functioning, including all transport needed to move equipment and samples to and from sampling points on the site, etc. The Contractor shall re- calibrate all measuring devices whenever so required by the Engineer-in-charge and shall submit the results of such measurements without delay. All field tests shall be carried out in the presence of Engineer-in-Charge or his authorized representative. All costs towards samples, materials, collection, transport, manpower, testing etc. shall be borne by the Contractor and are deemed to be included in the rates quoted by him in the bill of quantities.

48.0 TESTS AND INSPECTION

48.1 The contractor shall carry out the various mandatory tests as per specifications and the technical documents that will be furnished to him during the performance of the work.

All the tests on materials, as recommended by CPWD, MOST and relevant Indian Standard Codes or other standard specifications (including all amendments current at the last date of submission of tender documents) shall be got carried out by the contractor at the field testing laboratory or any other recognized institution/ laboratory, at the direction of the Engineer-in-Charge. All testing charges, expenses etc. shall be borne by the contractor.

All the tests, either on the field or outside laboratories concerning the execution of the work and supply of materials shall be got carried out by the contractor or Engineer-in-Charge at the cost of the Contractor.

48.2 WORKS TO BE OPEN TO INSPECTION

All works executed or under the course of execution in pursuance of this contract shall at all times be open to inspection and supervision of the Engineer-in-Charge and OIL INDIA LIMITED . The work during its progress or after its completion may also be inspected, by Chief Technical Examiner of Government of India (CTE) and/ or an inspecting authority of State Government of State in which work is executed and/or by third party checks by owner/ clients. The compliance of observations/ improvements as suggested by the Engineer-in-Charge /OIL INDIA LIMITED /CTE/ State authorities/

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Owners shall be obligatory on the part of the Contractor at the cost of contractor.

49.0 BORROW AREAS

The contractor shall make his own arrangements for borrow pits and borrow disposal areas including their approaches and space for movement of man, machinery, other equipment as required for carrying out the works. The contractor shall be responsible for taking all safety measures, getting approval, making payment of royalties, charges etc. and nothing extra shall be paid to the contractor on this account and rates quoted by the contractor for various items of bill of quantities shall deemed to include the same.

50.0 BITUMEN WORK

50.1 The contractor shall collect the total quantity of tar or bitumen required for the work as per standard formula, before the process of painting started and shall hypothecate it to the Engineer-in-Charge. Although the materials are hypothecated to Engineer-in-Charge the Contractor undertakes the responsibility for their proper watch, safe custody and protection against all risks. The materials shall not be removed from site of work without the consent of the Engineer-in-charge in writing.

51.0 CARE OF WORKS

From the commencement to the completion of works and handing over, the contractor shall take full responsibility for care thereof all the works and in case of any damage/loss to the works or to any part thereof or to any temporary works due to lack of Precautions or due to negligence on part of Contractor, the same shall be made good by the Contractor.

52.0 WORK IN MONSOON AND DEWATERING

The execution of the work may entail working in the monsoon also. The contractor must maintain labour force as may be required for the job and plan and execute the construction and erection according to the prescribed schedule. No special/ extra rate will be considered for such work in monsoon. The contractor's rate shall be considered inclusive of cost of dewatering required if any and no extra rate shall be payable on this account.

53.0 NO COMPENSATION FOR CANCELLATION/ REDUCTION OF WORKS

If at any time after the commencement of the work OIL INDIA LIMITED for any reason whatsoever is required to abandon the work or is not require the whole

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work thereof as specified in the tender to be carried out, the Engineer-in-Charge shall give notice in writing of the fact to the contractor, who shall have no claim to any payment of compensation whatsoever on account of any profit or advantage which he might have derived from the execution of the work in full, but which he did not derive in consequence of the full amount of the work not having been carried out or fore-closure, neither shall he have any claim for compensation by reason of any alterations having been made in the original specifications, drawings, designs and instructions which shall involve any curtailment of the work as originally contemplated. Provided that the contractor shall be paid the charges on the cartage only of materials actually and bonafide brought to the site of the work by the contractor and rendered surplus as a result of the abandonment or curtailment of the work or any portion thereof and then taken back by the contractor, provided however, that the Engineer-in-Charge shall have in all such cases the option of taking over all or any such materials at their purchase price or at local current rates whichever may be less.

54.0 RESTRICTION ON SUBLETTING

54.1 The contractor shall not sublet or assign the whole or part of the works except where otherwise provided, by the contract and even then only with the prior written consent of the Engineer-in-Charge and OIL INDIA LIMITED and such consent if given shall not relieve the contractor from any liability or obligation under the contract and he shall be responsible for the acts, defaults or neglects of any sub-contractor, his agents, servants or workman as full as if they were the acts, defaults or neglects of the contractor, his agent, servants or workman provided always that the provision of labour on piece work basis shall not be deemed to be a subletting under this clause.

54.2 The contractor may entrust specialized items of works to the agencies specialized in the specific trade. The contractor shall give the names and details of such firm whom it is going to employ for approval of Engineer-in-Charge. These details shall include the expertise, financial status, technical manpower, equipment, and resources and list of works executed and on hand of the specialist agency.

55.0 PROHIBITION OF UNAUTHORISED CONSTRUCTION & OCCUPATION

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No unauthorized buildings, construction of structures should be put up by the contractor anywhere on the project site, neither any building built by him shall be un-authorized occupied by him or his staff.

56.0 CO-ORDINATION WITH OTHER AGENCIES

Work shall be carried out in such a manner that the work of other Agencies operating at the site is not hampered due to any action of the Contractor. Proper Co-ordination with other Agencies will be Contractor's responsibility. In case of any dispute the decision of Engineer-in-Charge shall be final and binding on the contractor. No claim whatsoever shall be admissible on this account.

57.0 SETTING OUT OF THE WORKS

The contractor shall be responsible for the true and proper setting out of the works and for the correctness of the position, levels, dimensions and alignment of all parts of the works. If at any time during the progress of works, shall any error appear or arise in the position, levels, dimensions or alignment of any part of the works, the contractor shall at his own expenses rectify such error to the satisfaction of Engineer-in- charge. The checking of any setting out or of any line or level by the Engineer-in-Charge shall not in any way relieve the contractor of his responsibility for the correctness.

58.0 NOTICE BEFORE COVERING UP THE WORK

The contractor shall give not less than seven days notice before covering up or otherwise placing beyond the reach of measurement any work, to the Engineer-in- charge in order that the same may be inspected and measured. If any work is covered up or placed beyond the reach of Inspection/ measurement without such notice or his consent being obtained the same shall be uncovered at the contractor's expenses and he shall have to make it good at his own expenses.

59.0 SITE CLEARANCE

The contractor shall ensure that the working site is kept clean and free of obstructions for easy access to job site and also from safety point of view. Before handing over the work to the Engineer-in-Charge and OIL INDIA LIMITED the contractor shall remove all temporary structures like the site offices, cement godown, stores, labour hutments etc., scaffolding rubbish, left

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over materials tools and plants, equipments etc., clean and grade the site to the entire satisfaction of the Engineer-in-charge. If this is not done the same will be got done by Engineer-in-Charge and OIL INDIA LIMITED at his risk and cost.

The contractor shall clean all floors, remove cement/ lime/ paint drops and deposits, clean joinery, glass panes etc., touching all painter's works and carry out all other necessary items of works to make the premises clean and tidy before handing over the building, and the Percentage rates quoted by the contractor shall be deemed to have included the same.

60.0 VALUABLE ARTICLES FOUND AT SITE

All gold, silver and other minerals of any description and all precious stones, coins, treasure, relics, antiques and all other similar things which shall be found in, under or upon the site, shall be the property of the owner/ Government and the contractor shall duly preserve the same to the satisfaction of Engineer-in-charge and shall from time to time deliver the same to such person or persons indicated by the OIL INDIA LIMITED .

61.0 MATERIALS OBTAINED FROM DISMANTLEMENT TO BE OWNER'S PROPERTY

All materials like stone, boulders and other materials obtained in the work of dismantling, excavation etc. will be considered owner/ government property and may be issued to the contractor by the owner/ OIL INDIA LIMITED , if required for use in this work at rates approved by Engineer-in-Charge and OIL INDIA LIMITED or the contractor may be asked to dispose these items at his cost.

62.0 SET-OFF OF CONTRACTOR'S LIABILITIES

Engineer-in-Charge shall have the right to deduct or set off the expenses incurred or likely to be incurred by it in rectifying the defects and/or any claim under this agreement against the Contractor from any or against any amount payable to the contractor under this agreement including security deposit and proceeds of performance guarantee.

63.0 MATERIALS PROCURED WITH THE ASSISTANCE OF OIL INDIA LIMITED

If any material for the execution of this contract is procured with the assistance of OIL INDIA LIMITED either by issue from its stores or purchase made under

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orders or permits or licenses obtained by OIL INDIA LIMITED , the contractor shall hold and use the said materials economically and solely for the purpose of this contract and shall not dispose them without the permission of Engineer-in-charge. The contractor, if required by the OIL INDIA LIMITED , shall return all such surplus or unserviceable materials that may be left with him after the completion of the contract or at its termination on whatsoever reason, on being paid or credited such price as the OIL INDIA LIMITED shall determine having due regard to the conditions of materials.

64.0 ALTERATION IN SPECIFICATION, DESIGN & DRAWING

64.1 The Engineer-in-Charge shall have power to make any alterations in, omissions from, additions to or substitutions for, the original specifications, drawings, designs and instructions that may appear to him to be necessary during the progress of the work, and the contractor shall carry out the work in accordance with any instructions which may be given to him in writing signed by the Engineer-in-Charge and such alterations, omissions, additions, or substitutions shall not invalidate the contract and any altered, additional or substituted work which the contractor may be directed to do in the manner above specified as part of the work shall be carried out by the contractor on the same conditions in all respects on which he agreed to do the main work.

If any alteration, amendment or modification of the Specifications shall necessitate any additional, altered or substituted items of Work that are not covered in the Price Schedule, the remuneration for such additional, altered or substituted items of Work that are not covered in the Price Schedule shall be determined by the Engineer-in-Charge in the following manner:

(i) If it is possible to derive the rate(s) for such additional altered or substituted items of Work from any of the items of Work covered in the Price Schedule, the rate(s) for such additional altered or substituted items of Work shall be the rate(s) arrived at on the basis of such derivation. The opinion of the Engineer-in-Charge as to whether the rate(s) for the additional altered or substituted items of Work can be derived from the rate(s) of items already covered in the Price Schedule shall be final and binding on the Contractor.

(ii) If, in the opinion of the Engineer-in-Charge, it is not possible to derive the rate(s) for the additional altered or substituted items of Work from any of the items of the Work covered in the Price Schedule, then the rate(s) for such items of Work shall be determined by taking:

(a) The issue rate(s) of materials supplied by Owner, if applicable;

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- (b) Materials supplied by the Contractor and incorporated in the Permanent Works at the rate(s), if any, specified in the Price Schedule;
 - (c) Labour cost at rate(s) for labour, if any, specified in the Price Schedule;
 - (d) If the additional altered or substituted items of Work involve the use of any material or labour not covered in the Price Schedule, for the purpose of determining the rates under sub-paragraph (b) and/or (c) above, the prevailing market rate(s) shall be taken into account for determining the rate(s) of such materials and/or labour and an additional 15% (fifteen percent) shall be added to the market rate(s) to cover the Contractor's, supervisions, overheads and profits.
 - (e) The opinion of the Engineer-in-Charge as to the quantity or quality of materials and/or labour involved in executing the additional altered or substituted items of Work or as to whether the additional altered or substituted items of Work involve the use of materials and/or labour that are not covered in the Price Schedule and if not, as to the market rate(s) that shall be applicable shall be final and binding on the Contractor.

64.2 Abnormally High Rated Items (AHR Items):

In item rates contract where the quoted rates for the items exceed 50% of the owners/ estimated rates, such items will be considered as Abnormally High Rated (AHR) items and payment of AHR items beyond the SOR stipulated quantities shall be made at the least of the following rates:

- (i) Rates as per SOR, quoted by the contractor.
- (ii) Rates of the item which shall be derived as follows:
 - a. Based on rates of machine and labour as available from the contract (which includes contractor's supervision, profit, overhead and other expenses).
 - b. In case rates are not available in the contract, rates will be calculated based on prevailing market rates of machine, material and labour plus 15% to cover contractor's supervision, profit, overhead & other expenses.

65.0 ACTION AND COMPENSATION PAYABLE IN CASE OF BAD WORK

If it shall appear to the Engineer-in-Charge or his authorized subordinate in charge of the work or to the Chief Technical Examiner or to any other inspecting agency of Government/ State Government/ Owner where the work is being executed, that any work has been executed with unsound, imperfect, or unskilful workmanship or with materials of any inferior description, or that any materials or articles provided by him for the execution of the work are unsound or of a quality inferior to that contracted for or otherwise not in

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accordance with the contract, the contractor shall on demand in writing which shall be made within six months of the completion of the work from the Engineer- in-Charge specifying the work, materials or articles complained of notwithstanding that the same may have been passed, Certified and paid for forthwith rectify, or remove and reconstruct the work so specified in whole or in part as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own proper charge and cost, and in the event of his failing to do so within a period to be specified by the Engineer-in-Charge in his demand aforesaid, then the Contractor shall be liable to pay compensation at the rate of one per-cent of the estimated amount put to tender for every day not exceeding ten days, while his failure to do so shall continue and in the case of any such failure, the Engineer- in-Charge may rectify or remove and re-execute the work or remove and replace with others, the material or articles complained of as the case may be at the risk and expense in all respects of the contractor.

66.0 POSSESSION PRIOR TO COMPLETION

66.1 OIL INDIA LIMITED shall have the right to take possession of or use any completed or partially completed work or part of the work. Such possession or use shall not be deemed to be any acceptance of any work not completed in accordance with the contract agreement.

If such prior possession or use by OIL INDIA LIMITED delays the progress of work an equitable adjustment in the time of completion will be made and the contract agreement shall be deemed to be modified accordingly. The decision of OIL INDIA LIMITED in this case shall be final binding and conclusive.

66.2 When the whole of the works or the items or the groups of items of work for which separate periods of completion have been specified have been completed the contractor will give a notice to that effect to the Engineer-in-Charge in writing. The Engineer in- Charge shall within 7 days of the date of receipt of such notice inspect the works and either the Engineer-in-Charge issues to the contractor a completion certificate stating the date on which in his opinion the works were completed in accordance with the contract or gives instructions in writing to the contractor specifying the balance items of work which are required to be done by the contractor before completion certificate could be issued. The Engineer-in-Charge shall also notify the contractor of any defect in the works affecting completion.

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66.3 The contractor shall during the course of execution prepare and keep updated a complete set of 'as built' drawings to show each and every change from the contract drawings, changes recorded shall be countersigned by the Engineer-in-Charge and the contractor. Four copies of 'as built' drawings shall be supplied to Engineer-in-Charge & OIL INDIA LIMITED by the contractor within 30 days of the completion. All costs incurred in this respect shall be borne by the contractor only.

67.0 TIME ESSENCE OF CONTRACT & EXTENSION FOR DELAY

The time allowed for execution of the Works as specified in the terms of contract or the extended time in accordance with these conditions shall be the essence of the contract. The execution of the works shall commence from the 14th Day or such time period as mentioned in letter of Intent/ award after the date on which the OIL INDIA LIMITED issues written orders to commence the work. If the Contractor commits default in commencing the execution of the work as aforesaid, the Executing Agency shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the earnest money absolutely.

67.1 Within 14 (Ten) days of Letter of Intent, the Contractor shall submit a Time and Progress Chart (CPM/ PERT/ Quantified Bar Chart) along with quarterly milestones and resources plan for man, material & machinery to achieve the milestones and get it approved by the Engineer-in-Charge. The Chart shall be prepared in direct relation to the time stated in the contract documents for completion of items of the works. It shall indicate the forecast (mile-stones) of the dates of commencement and completion of various items, trades, sections of the work and may be amended as necessary by agreement between the Engineer-in-Charge/OIL INDIA LIMITED and the Contractor within the limitations of time stipulated in the Contract documents, and further to ensure good progress during the execution of the work.

67.2 If the work(s) is delayed by:

- i) Force-majeure or
- ii) Abnormally bad weather, or
- iii) Serious loss or damage by fire, or

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(iv) Civil commotion of workmen, strike or lockout/lockdown, affecting any of the trades employed on the work, is beyond the Contractor's control, then upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the Engineer-in-Charge but shall nevertheless use constantly his best endeavours to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Engineer-in- Charge to proceed with the works.

67.3 Request for extension of time, to be eligible for consideration, shall be made by the contractor in writing within fourteen days of the happening of the event causing delay on the prescribed form (Attached as Annexure-Format for Extension of Time).

The Contractor will indicate in such a request the period for which extension is desired. In any such case Engineer-in- Charge & OIL INDIA LIMITED may give a fair and reasonable extension of time for completion of work. Such extension shall be communicated to the Contractor by the Engineer-in- Charge in writing, within 01months of the date of receipt of such request

68.0 WITHHOLDING AND LIEN IN RESPECT OF SUMS DUE FROM CONTRACTOR

68.1 Whenever any claim or claims for payment of a sum of money arises out of or under the contract against the contractor, OIL INDIA LIMITED shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the security, if any, deposited by the contractor and for the purpose aforesaid, OIL INDIA LIMITED shall be entitled to withhold the security deposit, if any, furnished as the case may be and also have a lien over the same pending finalization or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the contractor, OIL INDIA LIMITED shall be entitled to withhold and have a lien to retain to the extent of such claimed amount or amounts referred to above, from any sum or sums found payable or which may at any time thereafter become payable to the contractor under the same contract or any other contract with OIL INDIA LIMITED pending finalization or adjudication of any such claim.

68.2 It is an agreed term of the contract that the sum of money or moneys so withheld or retained under the lien referred to above by the Engineer-in-Charge and OIL INDIA LIMITED will be kept withheld or retained as such by the Engineer-in-Charge and OIL INDIA LIMITED till the claim arising out of or

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under the contract is determined by the competent court and that the contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to above and duly notified as such to the contractor. For the purpose of this clause, where the contractor is a partnership firm or a limited company, the Engineer-in-Charge and OIL INDIA LIMITED shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to any partner/limited company, as the case may be whether in his individual capacity or otherwise.

68.3 LIEN IN RESPECT OF CLAIMS IN OTHER CONTRACTS:

Any sum of money due and payable to the contractor (including the security deposit returnable to him) under the contract may be withheld or retained by way of lien by the Engineer-in-Charge and OIL INDIA LIMITED against any claim of the Engineer-in-Charge and OIL INDIA LIMITED in respect of payment of a sum of money arising out of or under any other contract made by the contractor with the Engineer-in-Charge and OIL INDIA LIMITED . It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the Engineer-in-Charge and OIL INDIA LIMITED will be kept withheld or retained as such by the Engineer-in-Charge and OIL INDIA LIMITED or till his claim arising out of the same contract or any other contract is either mutually settled or determined by the arbitration clause or by the competent court, as the case may be, and that the contractor shall have no claim for interest or damages whatsoever on this account or on any other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the contractor.

69.0 DEFECTS LIABILITY PERIOD

The contractor shall be responsible for the rectification of defects in the works for a period of twelve months from the date of taking over of the works by the Owner/ Client. Any defects discovered and brought to the notice of the contractor forthwith shall be attended to and rectified by him at his own cost and expense. In case the contractor fails to carry out these rectifications, the same may without prejudice to any other right or remedy available, be got rectified by Engineer-in- Charge and OIL INDIA LIMITED at the cost and expense of the contractor.

70.0 SUSPENSION OF WORKS

(a) The contractor shall, on receipt of the order in writing of the Engineer-in-charge, suspend the progress of the works or any part thereof for such time

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and in such manner as the Engineer-in-charge may consider necessary for any of the following reasons:

- i) On account of any default on part of the contractor, or
- ii) For proper execution of the works or part thereof for reason other than the default of the contractor, or
- iii) For safety of the works or part thereof.

The contractor shall, during such suspension, properly protect and secure the work to the extent necessary and carry out the instructions given in that behalf by the Engineer-in-charge.

(b) If the suspension is ordered for reasons (ii) and (iii) in sub-para (a) above.

- i) The contractor shall be entitled to an extension of the time equal to the period of every such suspension plus 25%. No adjustment of contract price will be allowed for reasons of such suspension.
- ii) In the event of the Contractor treating the suspension as an abandonment of the Contract by OIL INDIA LIMITED, he shall have no claim to payment of any compensation on account of any profit or advantage which he may have derived from the execution of the work in full.

71.0 TERMINATION OF CONTRACT ON DEATH OF CONTRACTOR

Without prejudice to any of the right or remedies under this contract if the contractor dies, the Engineer-in-charge & OIL INDIA LIMITED shall have the option of terminating the contract without compensation to the contractor.

72.0 CLARIFICATION AFTER TENDER SUBMISSION

Tenderer's attention is drawn to the fact that during the period, the bids are under consideration, the bidders are advised to refrain from contacting by any means, OIL INDIA LIMITED and/or his employees/ representatives on matters related to the bid under consideration and that if necessary, OIL INDIA LIMITED will obtain clarifications in writing or as may be necessary. Duly authorized Tender Scrutiny Committee does the tender evaluation and process of award of works and this committee is authorized to discuss and get clarification from the tenderers.

73.0 ADDENDA/ CORRIGENDA

Addenda/Corrigenda to the tender documents may be issued prior to the date of opening of the tender to clarify or effect modification in specification and/or contract terms included in various tender documents. The tenderer shall

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suitably take into consideration such Addenda/Corrigenda while submitting his tender. The tenderer shall return such Addenda/ Corrigenda duly signed and stamped as confirmation of its receipt and submit along with the tender document. All addenda/ Corrigenda shall be signed and stamped on each page by the tenderer and shall become part of the tender and contract documents.

74.0 QUALITY ASSURANCE PROGRAMME

To ensure that the services under the scope of this contract are in accordance with the specifications, the Contractor shall adopt Quality Assurance Programme to control such activities at the necessary points. The contractor shall prepare and finalise such Quality Assurance Programme within 14 days from letter of intent. Engineer-in- Charge shall also carryout quality audit and quality surveillance of systems and procedures of Contractor's quality control activities. A Quality Assurance Programme of Contractor shall generally cover the following:

- a) His organization structure for the management and implementation of the proposed Quality Assurance Program.
- b) Documentation control system.
- c) The procedure for purpose of materials and source inspection.
- d) System for site controls including process controls.
- e) Control of non-conforming items and systems for corrective actions.
- f) Inspection and test procedure for site activities.
- g) System for indication and appraisal of inspection status.
- h) System for maintenance of records.
- i) System for handling, storage and delivery.
- j) A quality plan detailing out quality practices and procedures, relevant standards and Acceptance levels for all types of work under the scope of this contract.

The Contractors in the formats appended hereto shall submit all the quality reports. Checklist enclosed here in this document shall be followed while

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carrying out Construction activities (items). If any item is not covered by the Checklist/ Formats appended hereto, the Format for the same may be developed and submitted to Engineer-in-Charge for approval and the same shall be adopted. These filled in formats shall be prepared in two copies and duly signed by representatives of contractor and Engineer-in- Charge. All the costs associate with Printing of Formats and testing of materials required as per technical specifications or by Engineer-in-charge shall be included in the Contractor's quoted rates in the Schedule/ Bill of quantities.

75.0 APPROVAL OF TEMPORARY / ENABLING WORKS

The setting and nature of all offices, labour camp, huts, access road to the work areas and all other temporary works as may be required for the proper execution of the works shall be subject to the approval of the Engineer-in-charge.

All the equipment, labour, material including cement, reinforcement and the structural steel required for the enabling/ temporary works associated with the entire Contract- shall have to be arranged by the Contractor only. Nothing extra shall be paid to the Contractor on this account and the percentage rates quoted by the Contractor for various items in the Bill of Quantities shall be deemed to include the cost of enabling works.

76.0 CONTRACT COORDINATION PROCEDURES, COORDINATION MEETINGS AND PROGRESS REPORTING

The Contractor shall prepare and finalize in consultation with Engineer-in-Charge, a detailed contract coordination procedure within 14 days from the date of issue of Letter of Intent for the purpose of execution of the Contract.

The Contractor shall have to attend all the meetings at any place in India at his own cost with OIL INDIA LIMITED , Owners/ Clients or Consultants of OIL INDIA LIMITED / Owner/ Client during the currency of the Contract, as and when required and fully cooperate with such persons and agencies involved during these discussions. During the execution of the work, Contractor shall submit at his own cost a detailed Monthly progress report to the Engineer-in-charge by 3rd day of every month. The format of monthly progress report shall be as approved by Engineer-in-Charge.

77.0 The contractor if required shall demolish old structures on the proposed site properly. The useful material shall be the property of the owner /OIL INDIA LIMITED and these materials shall be stacked in workmanship like at the place specified by the Engineer-in-Charge.

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80.0 The contractor shall provide safety equipment and gadgets to all their workers, Supervisors and technical staff engaged in the execution of the work while working. The equipment and gadgets shall also be provided to OIL INDIA LIMITED by the contractor at his own cost for use of OIL INDIA LIMITED officials and /or workforce.

The cost of the above equipments /gadgets shall be included in the rates quoted by the contractor for the items & works as per bill of Quantities and contractor shall not be entitled for any extra cost in this regard. The above norm is to be strictly complied with at site .In case the contractor is found to be deficient in providing safety equipment/ gadgets in opinion of Engineer-in-Charge, the Engineer-in- Charge at his option can procure the same at the risk & cost of contractor and provide the same for the use at work site and shall make the recoveries from the bills of the contractor for the same. The decision of the Engineer-in- Charge shall be final and binding on contractor in this regard.

78.0 If required, the contractor has to do site clearance, enabling work, barricading, shifting / realignment of existing utility services etc at his own cost and the contractor shall not be entitled for any extra payment whatsoever in this regard.

79.0 In case of any sort of anomalies and/or typing error in the nomenclature, rates, & Description etc. of the items indicated in the Price bid / BOQ of scheduled items must be read as per respective schedule such as DSR-2016.

80.0 All drawings shall at all times be properly correlated before executing any work. However, in case of any discrepancy in the item given in the schedule of the quantities appended with the tender and architectural drawings relating to relevant item, the former shall prevail unless and otherwise given in writing by the Engineer-in- Charge.

81.0 The contractor shall comply with proper and legal orders and directions of the local or public authority or municipality and abide by their rules and regulations and pay all fees and charges which he may be liable.

85.0 The rate of all items in which use of cement is involved inclusive of all charges for curing.

82.0 Third Party Quality Assurance (TPQA)during the period of Construction if Engineer-in-charge need so (Stage wise) from IIT/NIT/GEC have to be done by Construction agency and report for the same have to submit to Engineer-in-Charge.

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83.0 The rate quoted by the contractor shall be deemed to be inclusive of all charges of TPQA.

84.0 The stamp duty if any on the contract agreement levied by the Government or any other statutory body shall be paid by the contractor.

85.0 It shall be the responsibility of the contractor to submit 6 sets of as built drawings, service drawings etc. to Engineer-in- Charge / OIL INDIA LIMITED after completion of work with the consultation of engaged architect by OIL INDIA LIMITED.

86.0 Contractor will be responsible for obtaining connections of water, sewerage and electricity from the concerned authority to ensure their proper commissioning so that no defects in operation of connections exist, by carrying out necessary tests etc.

87.0 As the building is to be executed as Green Building, hence, the contractor has to consider all the guidelines for execution of the project with reference to Annexure- GREEN BUILDING. All the statutory clearance, certificates need to be obtained from concerned authority before execution of the same.

88. Labour safety provisions to be followed as per **Annexure-Labour Safety Provision.**

89. Specification of works enclosed herewith separately.

90. List of brands/makes will be adopted as per "Annexure- List of Approved Make" only for those items for which Brand/Makes are not mentioned in the BOQ and the "specification of work" above.

91. Any changes in drawing/design if required, will be approved by the PMC in consultation with OIL INDIA LIMITED before implementing the same.

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Annexure- GREEN BUILDING

Specific Conditions of Contract relating to Environmental Clearance & "GRIHA Rating of Integrated Habitat Assessment (GRIHA Rating System" Which are to be complied by the Construction Contractor(s) for the Project and the Role of the PMC will be to ensure implementation of the same at site)-

Environmental Clearance

The following provision for the Environmental clearance will have to be adhering to during execution of the project.

i. All required sanitary and hygienic measures should be in place before starting construction activities and to be maintained throughout the construction phase.

ii. A first Aid room will be provided in the project both during construction and operation of the project.

iii. Adequate drinking water and sanitary facilities should be provided for construction workers at the site. The safe disposal of wastewater and solid wastes generated during the construction phase should be ensured.

iv. Provision should be made for the supply of fuel (kerosene or cooking gas); utensils such as pressure cookers etc. to the labourers during construction phase.

v. All the labourers to be engaged for construction should be screened for health and adequately treated before engaging them to work at the site.

vi. All the topsoil excavated during construction activities should be stored for use in horticulture / landscape development within the project site.

vii. Disposal of muck during construction phase should be not create any adverse effect on the neighbouring communities and be disposed taking the necessary precaution for general safety and healthy aspects of people, only in approved sites with the approval of competent authority.

viii. Construction spoils, including bituminous material and other hazardous materials, must not be allowed to contaminate watercourses and the dump sites for such materials must be secured so that they should not leach into the ground water.

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- ix. The diesel generator sets to be used during construction phase should be low sulphur diesel type and should conform to E (P) Rules prescribed for air and noise emission standards.
 - x. Vehicles hired for bringing construction materials to the site should be in good condition and should conform to applicable air and noise emission standards and should be operated only during non-peak hours.
 - xi. Ambient noise levels should conform to residential standards both during day and night. Incremental pollution loads on the ambient air and noise quality should be closely monitored during construction phase.
 - xii. Fly ash should be used as building material in the construction as per the provisions of Fly Ash Notification of September, 1999 and amended as on August, 2003.
 - xiii. Water demand during construction should be reduced by use of pre-mixed concrete, curing agents and other best practices referred.
 - xiv. Adequate measures to reduce air and noise pollution during construction keeping in mind CPCB norms on noise limits.
 - xv. Provisions should be made for housing of construction labour at appropriate locations on the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structure to be removed after the completion of the project.
 - xvi. Proper erosion and sedimentation control plan at site.
 - xvii. Top soil preservation, wheel washing/gravel pit facility, Sedimentation basin during construction to be proposed

Griha Rating of Integrated Habitat Assessment (GRIHA)

The building is proposed to be registered for obtaining GRIHA Rating from GRIHA Secretariat under MNRE scheme. The contractor is required to execute the work in a befitting manner to obtain the GRIHA rating.

1. Special conditions for Griha rating:-
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- a) The contractor shall prepare scheme for the approval of Engineer-in-charge for obtaining Griha rating in the criterions relevant to the execution of work.
 - b) The contractor shall plan and execute the work in a manner to preserve and protect the landscape during construction and shall arrange the materials/equipment and follow the procedure as per criterion 2 of the Griha rating as applicable.
 - c) The contractor shall appoint/engage consultant/ consultancies to provide technical guidance and supervise the work for obtaining Griha rating pertaining to the criterion related to the execution of work.
 - d) The contractor shall preserve the top soil layer for supporting vegetative growth.
 - e) The contractor shall comply with NBC norms on construction safety, health and sanitation as per criterion 8.
 - f) The construction activity shall be done in a befitting manner and the contractor shall adopt measures to prevent air pollution at site in compliance with criterion 9 of GRIHA rating as applicable.
 - g) The contractor shall comply with all the instructions and schemes for execution of green building.
 - h) The contractor shall provide sedimentation basin & wheel washing facility at site during execution of project.
 - i) Noting shall be paid extra for fulfilment of all these conditions except (d) of 44.1 for which joint measurements shall be taken at site and work done shall be paid on the basis of rates worked out on the terms of the agreement.

2. Pre-construction Stage

Construction Vehicles, Equipment and Machinery:

- All vehicles, equipment and machinery to be procured for construction will conform to the relevant Bureau of India Standard (BIS) norms.

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- Emission from the vehicles must conform to environmental norms.
- Dust produced from the vehicular movement and other site activities can be mitigated by sprinkling of water.
- Noise limits for construction equipments will not exceed 75 dB(A), measured at one meter from the edge of the equipment in free area, as specified in the Environment Protection Act,1986, schedule VI part E, as amended on 19th May,1993. The maximum noise levels near the construction site should be limited to 65 dB (A) Leq (5 min) in project area.

3. Construction Stage

a) Construction Wastes Disposal

- i)The pre-identified dump locations will be a part of solid waste management plan to be prepared by the Contractor in consultation with Engineer-in- charge.
- ii)Contractor will get approved the location of disposal site prior to commencement of the excavation on any section of the project location.
- iii)Contractor will ensure that any spoils of material will not be disposed off in any municipality solid waste collection bins.

b) Procurement of Construction Materials

- i)All vehicles delivering construction materials to the site will be covered to avoid spillage of materials and maintain cleanliness of the roads.
- ii)Wheel Types of all vehicles used by of the contractor, or any of his subcontractor or materials supplies will be cleaned and washed clear of all dust/mud before leaving the project premises.
- iii)Contractor will arrange for regular water sprinkling at least twice a day (i.e. morning and evening) for dust suppression of the construction sites and unpaved roads used by his construction vehicles.

c) Pollution

i. Water Pollution

- The Contractor will take all precautionary measures to prevent the wastewater during construction to accumulate anywhere.

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- The wastewater arising from the project is to be disposed off in the manner that is acceptable to the Engineer-in-charge.

ii. Air and Noise Pollution

- Contractor will use dust screens and sprinkle water around the construction site to arrest spreading of dust in the air and surrounding areas.
- Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that emission levels comply with environmental emission standards/norms.
- For controlling the noise from Vehicles, Plants and Equipments, the Contractor will confirm the following:
 - i. All vehicles and equipment used in construction will be fitted with exhaust silencers.
 - ii. Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced.
 - iii. Noise emission from compactors (rollers) front loaders, concrete mixers, cranes (movable), vibrators and saws should be less than 75 dB(A).
 - iv. As per the standards/guidelines for control of Noise Pollution from Stationary Diesel Generator (DG) sets, noise emission in dB(A) from DG Set (15-500 KVA) should be less than $94 + 10 \log_{10} (\text{KVA})$. The standards also suggest construction of acoustic enclosure around the DG Set and provision of proper exhaust muffler with insertion loss of minimum 25 dB(A) as mandatory.

4. The following provisions shall be maintained by the contractor at site:-

4.1 Provide minimum level of sanitation/safety facilities for construction workers to ensure the health and safety of the workers during construction, with effective provisions for the basic facilities such as sanitation, drinking water and safety equipments or machinery.

- i. All the workers should be wearing helmet and shoes all the time on site.
- ii. Masks and gloves should be worn whenever and wherever required.
- iii. Adequate drinking water facility should be provided at site, adequate number of decentralized latrines and urinals to be provided for construction workers.
- iv. Full time workers residing on site should be provided with clean and adequate temporary hutment. Crèche/Day-care facility should be provided to young children of labourers residing on site. First aid facility should also be provided.

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- v. Overhead lifting of heavy materials should be avoided. Barrow wheel and hand-lift boxes should be used to transport materials onsite. Tobacco and cigarette smoking should be prohibited onsite.
 - vi. All dangerous parts of machinery are well guarded and all precautions for working on machinery are taken.
 - vii. Maintain hoists and lifts, lifting machines, chains, ropes and other lifting tackles in good condition.
 - viii. Use of durable and reusable formwork systems to replace timber formwork and ensure that formwork where used is properly maintained.
 - ix. Ensure that walking surfaces or boards at height are of sound construction and are provided with safety rails and belts. Provide protective equipment such as helmets.
 - x. Provide measure to prevent fire. Fire extinguisher and buckets of sand to be provided in fire-prone area and elsewhere.
 - xi. Provide sufficient and suitable light for working during night.
 - xii. Ensure that measures to protect workers from materials of construction, transportation, storage and other dangers and health hazards are taken.
 - xiii. Ensure that the construction firm/division/company have sound safety policies.
 - xiv. Comply with the safety procedure, norms and guidelines (as applicable) as outlined in NBC 2005 (BIS 2005c).
 - xv. Adopt additional best practices and prescribed norms as in NBC 2005 (BIS 2005).

4.2 Identify roads on-site that would be used for vehicular traffic. Update vehicular roads (if these are unpaved) by increasing the surface strength by improving particle size, shape and mineral type that make up the surface base. Add surface gravel to reduce source of dust emission. Limit amount of fine particles (smaller than 0.075mm) to 10-20%. Limit vehicular speed on site 10km/h.

4.3 All material storages should be adequately covered and contained so that they are not exposed to situations where winds on site could lead to dust/particulate emissions.

4.4 Spills of dirt or dusty materials will be cleaned up promptly so the spilled material does not become a source of fugitive dust and also to prevent of seepage of pollutant laden water into the ground aquifers. When cleaning up the spill, ensure that the clean-up process does not generate additional dust. Similarly, spilled concrete slurries or liquid wastes should be

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contained/cleaned up immediately before they can infiltrate into the soil/ground or runoff in nearby areas.

4.5 Ensure on:

- i. Any dusty material.
- ii. Areas where demolition work is carried out. Any Unpaved main road and.
- iii. Areas where excavation or earth moving activities are to be carried out.

4.6 The contractor shall ensure the following:

- i. Cover and enclose the site by providing dust screen, sheeting or netting to scaffold along the perimeter of a building.
- ii. Covering stockpiles of dusty material with impervious sheeting.
- iii. Covering dusty load on vehicles by impervious sheeting before they leave the site.
- iv. Transferring, handling/storing dry loose materials like bulk cement and dry pulverized fly ash inside a totally enclosed system.
- v. Spills of dirt or dusty materials will be cleaned up promptly so that the spilled material does not become a source of fugitive dust and also to prevent seepage of pollutant laden water into the ground aquifers. When cleaning up the spill, ensure that the clean-up process does not generate additional dust. Similarly, spilled concrete slurries or liquid wastes should be contained/cleaned up immediately before they can infiltrate into the soil/ground or runoff in nearby areas.
- vi. Clear vegetation only from areas where work will start right away.
- vii. Vegetate/mulch areas where vehicles do not ply.
- viii. Apply gravel/landscaping rock to the areas where mulching/paving is impractical

4.7 Adopt measures to prevent air pollution in the vicinity of the site due to construction activities. There is no standard reference for this. The best practices should be followed (as adopted from international best practice documents and codes).

4.8 Provide hoardings of not less than 3m height along the site boundary, next to a road or other public area.

4.9 The contractor will provide experienced personnel with suitable training to ensure that these methods are implemented. Prior to the commencement of any work, the method of working, plant equipment and air pollution control system to be used on- site should be made available for the inspection and approval of the Engineer-in- Charge to ensure that these are suitable for the project.

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4.10 Employ measures to segregate the waste on-site into inert, chemical or hazardous wastes. Recycle the unused chemical/hazardous wastes such as oil, paint, batteries and asbestos. The inert waste is to be disposed off to Municipal Corporation/local bodies dump yard and landfill sites. Preserve and protect landscape during construction Following provisions shall be made at site by the contractor to preserve and protect landscape.

4.11 Nothing shall be paid on this account unless specifically provided for in the BOQ. To preserve the existing landscape and protect it from degradation during the process of construction. Select proper timing for construction activity to minimize the disturbance such as soil pollution due to spilling of the construction material and its mixing with rainwater. The construction management plan including soil erosion control management plan shall be prepared accordingly for each month and got approved from the Engineer In-Charge. The application of erosion control measures includes construction of gravel pits and tyre washing bays of approved size and specification for all vehicular site entry/ exits, protection of slopes greater than 10%. Sedimentation Collection System and run-off diversion systems shall be in place before the commencement of construction activity. Preserve and protect the existing vegetation by not-disturbing or damaging to specified site areas during construction. The trees that are identified to be retained on site are protected during the construction period using the following measures:

- i. The damage to roots is prevented during trenching, placing backfill, driving or parking heavy equipment. The dumping of trash, oil, paint and other material is detrimental to plant health.
- ii. These activities should be restricted to the areas outside of the canopy of the trees.
- iii. The trees are not used for support; their trunks should not be damaged by cutting and carving by nailing posters and advertisements or in any other way.
- iv. The lighting of fires or carrying out heat or gas emitting construction activity within the ground covered by canopy of the trees is not permitted. The young trees of saplings identified for preservation within the construction site must be protected using tree guards of approve specification.
- v) The grades of soil should be maintained around existing vegetation. Unless specifically directed by the Architect/Engineer -in - Charge.
- vi) Maintenance activities should be performed, as and when needed, to ensure that vegetation remain healthy.

4.12 Staging is dividing a construction area into two or more sections to minimize the area of soil that will be exposed at any given time. Staging should be done to separate undisturbed land from land disturbed by construction

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activity and material storage. A CAD plan to be submitted identifying the areas of sites, which shall be disturbed for the construction activity and apart from these other areas on site should not be disturbed. Measures should be followed for collecting drainage water run-off from construction areas and material storage sites and diverting water flow away from such polluted areas. Temporary drainage channels and perimeter dike/swale should be constructed to carry the pollutant laden water directly to the treatment device or facility (municipal sewer line). The plan should indicate how the above was accomplished on site well in advance of the commencement of the construction activity.

- i. The Contractor should follow the construction plan as proposed by the architect/landscape consultant to minimize the site disturbance such as soil pollution due to spilling. Use staging and spill prevention and control plan to restrict the spilling of the contaminating material on site. Protect top soil from erosion by collection storage and reapplication of top soil, constructing sediment basin, contour trenching, mulching etc.
- ii. Spill prevention and control plans should clearly state measures to stop the source of the spill. Measures to contain the spill and measures to dispose the contaminated material and hazardous wastes. It should also state the designation of personnel trained to prevent and control spills.
- iii. Hazardous wastes include pesticides, paints, cleaners and petroleum products.

4.13 A soil Erosion and Sedimentation Control Plan (ESCP) should be prepared prior to construction and should be applied effectively. Measures for prevention of top soil are given below:

- i. Top Soil should be stripped to a depth of 20 cm from the areas proposed for buildings, roads, paved areas and external services. It should be stockpiled to a maximum height of 40 cm in designated areas and reapplied during plantation of the proposed vegetation. The top soil should be separated from the sub soil debris and stones larger than 50 mm in diameter. The stored top soil may be used as finished grade for planting areas post construction or cordoned off undisturbed areas on site. Stockpiled top soil should not be compacted to help process of aeration. It should be stabilized on the top by temporary seeding or plastic sheets to avoid wind and water erosion.
 - ii. Sedimentation basin, a temporary dam or basin at the lowest convenient point of the site should be constructed for collecting, trapping and storing sediment produced by the construction activities. A flow detention facility must also be constructed for reducing peak run-off rates. This would also allow most of the sediments to settle before the run-off is directed towards the outfall.
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 iii. Contour trenching is to be provided which an earth embankment or ridge- and-channel arrangement constructed parallel to the contours, along the face of the slope, at regular intervals on the lengths and slopes greater than 10% (1:10). They are used for reducing runoff velocity, increasing the distance of overland run-off flow. They are also used to hold moisture and minimize sediment loading of surface runoff.

4.14 Prepare the list of trees to be felled with reference to the tree survey, Compensate the loss of vegetation (trees) due to the construction activity by compensatory plantation. Replant same native and/or non-invasive species, which existed on the site before elimination, in the proportion of 1:3 (as per the suggestion of the landscape consultant).

4.15 The contractor shall prepare and submit 'Spill prevention and control plans' before the start of construction, clearly stating measures to stop the source of the spill, to contain the spill, to dispose the contaminated material and hazardous wastes, and stating designation of personnel trained to prevent and control spills. Hazardous wastes include pesticides, paints, cleaners, and petroleum products.

4.16 The contractor shall ensure that no constructions leach (Ex: cement slurry) is allowed to percolate into the ground. Adequate precautions are to be taken to safeguard against this including reduction of wasteful curing processes, collection, basic filtering and reuse. The contractor shall follow requisite measures for collecting drainage water run-off from construction areas and material storage sites and diverting water flow away from such polluted areas. Temporary drainage channels, perimeter dike/swale, etc. shall be constructed to carry the pollutant-laden water directly to the treatment device or facility (municipal sewer line).

4.17 All lighting installed by the contractor around the site and at the labour quarters during construction shall be CFL bulbs of the appropriate illumination levels. This condition is a must, unless specifically prescribed.

4.18 All paints, adhesives and sealants should comply with the VOC limits prescribed by GRIHA, as follows:

Table 1- VOC limits for paints, adhesives and sealants

Paints VOC limit (g/l)

Non-flat paints 150

Flat (Mat) paints 50

Anti-corrosive/anti-rust paints 250

Varnish 350

Adhesives VOC limit (g/l)

Wood flooring Adhesive 100

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Tile adhesives 65

Indoor carpet adhesives 50

Wood 30

4.19 All the building materials and systems used on site must be as per the specifications and approved makes by the consultants.

4.20 All required certificates explaining the properties of the building material/system needs to be obtained from the manufacturer/vendor as required by the green building rating authority.

i. The final certificates would be produced after the approval of green building consultant with necessary due diligence.

ii. The purchase orders of all the materials made with the manufacturers/authorized vendors should be maintained and shall be provided for the process with due diligence upon request.

4.21 Water saving measures as suggested by the consultants need to be followed on site.

4.22 Any other site management measures suggested by the green building consultant shall be followed on site.

4.23 The contractor shall submit to the Engineer-in-Charge after construction of the buildings, a detailed as built quantification of the following:

- i. Total materials used,
- ii. Total top soil stacked and total reused,
- iii. Total earth excavated,
- iv. Total waste generated,
- v. Total waste reused,
- vi. Total water used,
- vii. Total electricity consumed, and
- viii. Total diesel consumed.

4.24 The contractor shall submit to the Engineer-in-Charge, before the start of construction, a site plan along with a narrative to demarcate areas on site from which top soil has to be gathered, designate area where it will be stored, measures adopted for top soil preservation and indicate areas where it will be reapplied after construction is complete.

4.25 Evidence for the implementation of the all the above required measures shall be provided to the green building consultant in the form of photographs and templates (as provided) which is required for the submission to the green building rating authority (GRIHA).

Note: In addition to the above, the Contractor has to strictly adhere to the instructions/ guidelines laid down by TERI (The Energy and Resources Institute), who has also been engaged by OIL INDIA LIMITED as a consultant to achieve the desired Green Building rating/status (minimum 3 star GRIHA Rating).

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Annexure- HSE

HSE Points: The following Health Safety & Environment(HSE) points to be complied by the Construction Contractor(s) for the Project and the Role of the PMC will be to ensure implementation of the same at site)-

1. Contractor to align the HSE management system in line with OIL's HSE management system. All applicable rules, regulations, standards and guidelines are to be followed. To comply with all applicable safety, health and environment standards, rules, regulations and orders issued by competent authority pertaining to the assigned activities.
2. Contractor to ensure that workforce deployed is adequately qualified, trained and in state of health to commensurate with the requirements of the job.
3. Contractor supervisors & workers need to be trained as per the applicable statutory requirement / standards and guideline. No person should be employed in any work at a workplace unless that person has received the necessary information, instruction and training so as to be able to do the work competently and safely. The documentation of such training imparted to all its employees should be maintained and produced for verification as required.
4. All contractor workers must undergo the medical examination and submit fitness certificate prior to commencement of work in the installations. The documentation of such medical examination carried out should be maintained and produced for verification as required.
5. All necessary Personal Protective Equipment (PPE) are to be provided by the contractor to its worker as per OIL's requirement.
6. Contractor to ensure that all Tools, Tackles and Machinery being used are properly tested as per Act (and record to be maintained) and are in sound working conditions.
7. Contractor shall arrange for workmen compensation insurance, third party liability insurance, registration under ESI, PF act, Building & Construction Workers Regulation etc. as applicable.

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8. Any compensation arising out of the job carried out by the Contractor whether related to pollution, Safety or Health will be paid by the contractor only.

End of Part-3, Section-II

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Part-3, Section-III

TECHNICAL SPECIFICATIONS: BMS WORK FOR CoEES AND PHQ BUILDING

AT NARENGI OIL CAMPUS

BMS System

1. Scope of Work

Design of Building Management System for Monitoring & Controlling various equipment of Building.

2. Objective

BMS will be provided for complete system to monitor and control various equipment. BMS will use latest available technology to comply to our requirement. The BMS will interface between system- wide facilities for the provision of data required to assist in the management of a terminal building facilities into a computer based system.

To provide user friendly BMS system.

To provide BMS system that can monitor & control various building equipment.

3. System Description

- a. The operator workstations will provide user-friendly graphical-based Man Machine Interface to the operators for the monitoring and control of equipment.
- b. One set of single screened operator and maintenance workstation will be provided

4. Performance Specification

Each DDC will be sufficiently equipped with input/output points including a minimum of 10% spare capacity. The BMS Servers provided will be able to handle all required input/output points including a 15% spare capacity.

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5. Following will be controlled and monitored using BMS

- (i) HVAC System
- (ii) Lighting
- (iii) Electrical power distribution system
- (iv) Backup DG power system
- (v) UPS power system
- (vi) Fire detection and fire fighting system
- (vii) Lift / Escalators
- (viii) Water treatment and management / plumbing

6. BMS system will be with following system software packages

- (i) Complete system operation software
- (ii) Graphics software
- (iii) Energy management system software
- (iv) Alarm indication software.
- (v) Maintenance package.

7.System description

7.1 General

7.1.1 Building automation and control system requirements System requirements

General requirement: - Include a digital (DDC) building technology control system to operate technical equipment in buildings. The system must be able to carry out comprehensive measuring, control, optimization, and monitoring functions. All applications deployed are tested, documented, and used multiple times. The possibility for free programming of individual system components should be available to individually modify customer-specific requests. The software shall be capable of doing Online engineering i.e. Zero Downtime of software during any modification of Graphics.

System up-to-datedness

Product lifecycle: - The system provider must offer a transparent product lifecycle to ensure the required consistency. All equipment offered for this project must be contained in the current product portfolio. The existing

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system environment must allow for easy and smooth integration of devices and extensions.

System continuity: - Products employed must be labeled with a brand for a global standard that secures the interaction of products from various manufacturers. Products bearing these brands can also be employed together when manufactured at an interval of more than 10 years.

Architecture

Three system levels:- A building automation and control system featuring system architecture as per ISO EN 16484-3 is required. The three system levels must be interconnected via communications.

- Management level
- Automation level (automation stations/individual room control)
- Field level (field devices)

Automation stations: - The system offered must provide largely decentralized intelligence to achieve high operational and plant availability. The devices are autonomous components that can independently execute assigned automation and control.

Implement third-party systems: - Third-party systems must be able to be integrated on both management and automation levels to ensure full system consistency. Default interfaces must be provided. Third-party protocol implementation must be possible and require little effort. To do this, all hardware and software required for integration, all required services, clarifications with other technical and mechanical building installations, interface testing, data transmission testing, data point generation/integration as well as plant picture creation, backup, test protocol generation and specific documentation must be included in total costs.

Location-independent operation: - The building automation and control system technology must allow for location-independent operation and management of all messages and trends on all available types and views for the entire building automation and control system.

Consistency

Uniform system:- The supplier must prove that the required functions originate from a single manufacturer and using one automation and control system, where the hardware and software are developed in a

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manner that allow for simply modification while operational for subsequent function extensions or changes.

Implement new data points: -Building automation and control must be coherent to ensure possibility of future extensions and changes. This means that data points must be acquired once only, and then be provided automatically as needed to operator units and management level.

Integration of open standards

General

Interfaces: -The building automation and control system must be extendible to ensure long-term operation and provide all standard interfaces commonly available on today's market.

Implement via BACnet: -Default protocols and suitable physical communications media must guarantee interoperability (ISO standard). Use only listed protocols and communications media. Third-party systems are integrated via BACnet. Provide only data required to efficiently and economically operate building services plants.

Integrate fire detection systems: - Fire detection system BACnet-based.

BACnet-based fire detection systems supporting BACnet BIBB AE-LS-B as well as objects LifeSafetyPoint and LifeSafetyZone as per the PICS (Protocol Implementation Conformance Statement) document must be able to be integrated for best deployment of a building automation and control system. The following functions must be supported:

- Alarms and events from the fire detection system must be identified clearly and unambiguously.
- Signaling device states must be displayed as per the BACnet standard.
- Instruction texts must be able to be added to detectors and zones.
- Situational and floor plans as well as dynamic symbols must be able to be used for visualization.
- A technical hierarchy, e.g. building, building part, zone, detector, must be provided to the operator for ease of operation.

Integrate Modbus devices: - Decentralized integration of third-party devices via Modbus.

Modbus-capable devices must be able to be connected to a BACnet-capable automation station via decentralized interface module for bidirectional data exchange. The automation station provides the following functions:

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- Event-oriented communication
- Peer-to-Peer (cross communication)
- Alarm and message processing, distribution to local operator units and building automation and control system.
- Scheduler program with weekdays
- Calendar function
- Local trend recording in device buffer (long-term trend). Integrate via OPC: -Integrate third-party devices via OPC

OPC servers must be able to be connected to a BACnet network for bidirectional data exchange.

The integration required must form a high-performance link between OPC and BACnet via presentation as OPC client in OPC and BACnet server in BACnet. The function extends far beyond simple mapping and transfer of OPC items to BACnet. The following functions must be ensured to achieve the required openness.

- Direct mapping of OPC items to BACnet objects, for display and operation by BACnet clients.
- Grouping of OPC items to create standard integrated BACnet objects.
- Event-driven transfer of alarms in the BACnet network
- Trend server with its own data maintenance for trendlog objects.
- Cross communications (peer-to-peer) with other BACnet servers

Integrate third-party devices via OPC: -The system must be OPC Foundation tested and certified and must be able to integrate and process, but also to provide real-time data as OPC data points. The System processing must include Alarming, Trending, Scheduling, and Reporting and allow cross communication with other integrated devices.

The System must be support the OPC specification:

- OPC Data Access

Power failure

Data backup:- The data must be saved for extended periods of time in case of power failure or extensions or removal of automation stations. The

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applications and all vital operating parameters (including setpoints, scheduler values, etc.) must not be lost due to a power outage. Other operating values such as alarms, trend data, etc. must be capable of being saved locally on the automation station.

System time

Time format:- Time synchronization in BACnet: UTC time (coordinated universal time). The building automation and control system must have a uniform system time. To this end, a time master supporting BACnet BIBB DM-UTC-A as per the PICS document must be defined. The time master must receive the DCF77, GPS or Internet NTP signal and provide it synchronized to all remaining system devices.

Subsystem autonomy: -The automation stations must autonomously run their own time if the time master fails. The building automation and control time must be resynchronized automatically after the time master becomes available again.

Self monitoring and self diagnosis

Watchdog: - The building automation and control system must monitor itself to always know its latest and current status. A watchdog function helps detect and signal failed system devices and restarts them in a defined mode. Self diagnosis: -Self diagnosis must be available to quickly detect errors. It must provide information on system function and load. E.g. CPU and memory load must be displayed.

General plant operating states

Overview of operating modes

There are five higher operating modes for all plants:

- Local emergency operation without automation station functionality (direct via I/O module or directly on the control panel as agreed to with owner).
- Local manual operation with automation station functionality (control panel in the control panel).
- Local - manual operation via visualization on the management level (all functions on the local automation station are set to Auto).
- Scheduler program under the condition that all plants are enabled for automatic operation.
- Automatic detection.

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All control functions of the automation stations must be set to and remain on automatic for highest plant availability, if a plant or aggregate is switched to MANUAL. In individual cases, automatic mode must change over to this unit in case of redundancies when a plant or aggregate is switched off locally. All safety and interlocking functions must take highest priority for operation independent of operating mode.

Automatic detection: -The plants of the building automation and control system are switched on and off either automatic or dependent on time or event. The following functions apply to the actual plant descriptions. All control loops, safety and interlocking functions must be guaranteed to work regardless of operating mode.

Controlled via scheduler program:- All plants must be set to automatic for this operating mode. The plants of the building automation and control system must be switched on and off by individual use via a day, week, month, or annual scheduler program.

Manual operation: - Different options are required for manual operation.

- Manual operation via management level (remote operation)
 - Manual operation via local operator unit or laptop directly at the control panel.
 - Manual operation via operator unit or directly at the control panel.
- Manual operation generally is possible only if the corresponding automation station is running. Manual operation allows for manually overriding scheduled plant switchings. Plants switched off by schedule can be switched on via plant switching command. Manual control of the plant switching command is equal to automatic control, i.e. the scheduled control is retained for as long as the scheduler remains active. Search & Replace function must allow for Mass Changes in parameters can be done across the entire installed system (eg. Operating hours change, set point etc)

Energy efficiency & references to applicable standards.

General: - The building is constructed under strict energy guidelines. The control technology deployed must contain all functions required to efficiently consume energy.

Energy efficiency class "C" as per EN 15232:- Standard EN15232 serves as the basis for energy efficiency functions. The system supplier must prove

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that the functions are as described by the standard. This tender was established based on Class C criteria.

Requirements from EN 50001 placed on building automation and control system. The processes defined in standard ISO 50001 to improve energy efficiency must be supported by the data from the building automation and control system. In other words, all required data and information, measurement and analysis functions as well as outputs and display must be provided in accordance with this standard.

Energy efficiency monitoring and Evaluation.

Support of eu.bac guidelines, part 4. Energy monitoring and evaluation is required for the entire building automation and control system. The basis forms the eu.bac guidelines - EEBACS Certification Scheme, Certifying Energy Efficiency of Building Automation and Control Systems, at first delivery and during the lifetime, Part 4: Specification of Key Performance Indicators.

Management level: - Visualize quality state. A violation of the energy efficiency limits values for monitored measured values on the management level must be displayed using colors or symbols. Easy to interpret symbols provide the operator with a quick overview on the state of monitored plants, components, etc. Bar charts or pie charts or similar are still required for display of the overall state of monitored plants or the entire building. The operator must recognize how many (in percentages) of the total number of monitored measured values are in the quality state "good" or "bad", or, however, monitoring and evaluation is disabled. The quality state indicates whether the monitored measured value is within or outside the energy-efficient range. Violations of monitored limit values are displayed on the one hand through the quality state "bad" and, on the other, assessed as an indication that resulted through a fault operation, manual intervention, error or false or incorrect parameterization, in non-energy-efficient operation of components, aggregate or plants, ultimately resulting increased consumption (electricity, water, natural gas, etc.). An individual weighting of the calculation of resulting quality states must be possible since multiple measured values can be evaluated within a building or plant. The parameters for weighting, monitoring, evaluating and forming the quality state can be set based on read and write access rights. As an alternative: Make possible the simple navigation to an appropriate user program.

Automation level: - Key performance indicators on the automation level. Monitoring and evaluation of measured values for primary plants

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(components and plant parts, software/program/system functions, setpoints, et.) must occur directly on the automation level. Monitoring and evaluation is intended to recognize unfavorable operations of plants/components early on and thus lower or optimize energy consumption and wear and tear.

Monitoring and evaluating analog measured values. The following monitoring and evaluation must be able to be implemented for analog measured values (sensors, setpoint, modulating control of valves, dampers, variable speed drives, etc.):

- Determine the minimum value (lowest value) within a defined timeframe.
- Determine the maximum value (lowest value) within a defined timeframe.
- Determine the average value (lowest value) within a defined timeframe.
- Determine the linger period (in hours) during which the measured value moves between freely definable limit values.
- Determine deviation that the measured value deviated from the upper and lower setpoint within a defined timeframe.

The determined value is monitored to a minimum and maximum and displayed as quality state for breach and/or exceeding thereof. The value from the current timeframe is displayed; the value from the previous timeframe is also displayed and made available to the trend data. The evaluation ceases for a fault to the measured value (sensor interrupt, module fault, etc.), until the measured value once again assumes a reliable state. This fact must also be recognizable in the trend data.

Monitoring and evaluation of digital and multi-stage measured values. Digital measured values (messages, switching commands, operating modes, etc.) must be definable as key performance indicators and make possible the following evaluation and monitoring:

- Determine the runtime (operating hours) within a defined timeframe.
- Determine the switch-on frequency within a defined timeframe.
- Determine the runtime (operating hours) for each stage within a defined timeframe.
- Determine the switch-on frequency for each stage within a defined timeframe.

The determined value is monitored to a minimum and maximum and displayed as quality state for breach and/or exceeding thereof. The value from the current timeframe is displayed; the value from the previous timeframe is also displayed and made available to the trend data. The evaluation ceases for a fault to the measured value (sensor interrupt, module fault, etc.), until the value once again assumes a reliable state. This fact must also be recognizable in the trend data.

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Monitoring and evaluating metered values: - Metered values (consumption meters, pulse meters, etc) must be definable as key performance indicators and make possible the following evaluation and monitoring. Determine the difference value (consumption value within a defined timeframe. The determined value is monitored to a minimum and maximum and displayed as quality state for breach and/or exceeding thereof. The value from the current timeframe is displayed; the value from the previous timeframe is also displayed and made available to the trend data. The evaluation ceases for a fault to the measured value (sensor interrupt, module fault, etc.), until the value once again assumes a reliable state. This fact must also be recognizable in the trend data.

Evaluation over different timeframes:- Monitoring and evaluation must be able to occur over definable timeframes (annually, monthly, weekly, daily, hourly, 15-minutes).

Weighting of monitoring and evaluation criteria:- Since an aggregate or component may include multiple evaluations, it is required to be able to weigh them so that they are included differently in the calculation of the resulting quality state.

1.1.1 Engineering tools and Engineering efficiency

Engineering efficiency

System and tool platform:- Creating solutions must be as efficient as possible, i.e. programming on construction sites; use of pre-defined application blocks, fast exchange of standard functions, etc. The goal is to achieve the maximum required level of flexibility at as little expense as possible.

Preloaded application on devices.

Applications portfolio. Prefabricated and tested must be loaded in a fix manner on the devices prior to commissioning. They can be used in the basic functions without the use of additional engineering tools.

Harmonized tools and workflows.

Consistent tools:- Uniform data and functions must be used by the building automation and control system in a consistent manner throughout all tools to achieve a high level of data consistency. In other words, all data is only entered once in the system. Consistent tool processes avoid a manual exchange of data (Import/Export).

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Transparency for customers.

Data backup:- A data backup concept must be presented that provides the current state of a project in a form that is useable and complete to the customer. It includes raw data from plants, applications, engineering data (e.g. DP, labeling, links, parameters), documentation.

Customer changes. The technical operator at the customer must be able independently make simple changes to the project. Potential training proposals must be appended to the bid.

1.1.2 Corporate performance. Performance for implementation.

Performance on communication network.

Establish communications network: - The required communications network is part of the building automation and control system's scope of delivery. All control, monitoring, and communications tasks must run on this network. The communications network comprises all three system levels.

- Management level
- Automation level.
- Field level.

The approved network concept must be documented in full and handed over operational.

Supplier support: - The supplier must have all expertise and capacity required to support and advise the expert planner on hardware and network structure definition in dependence of the selected operating concept.

Engineering offerings

Offerings on programming: - The contractor provides all services to successfully operate the specified plants and systems. This includes:

- General review and detailed requirements listing by the expert planner.
- Detailed listing of the functions and specifications listed in this document.
- Present a detailed communications concept.
- Work required to engineer or parameterize the building automation and control system.
- Edit and program all required control, operating, signaling and logging functions including system-related programming.
- Create data point list featuring all entries required by standards.
- Review and implement the described measuring concept.
- Set switching times, setpoints, and control parameters as per the targets

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defined and agreed to with the expert planner.

- Review the device application with regard to adherence to targets, especially regarding the described energy efficiency.
- Document the project concerning functions, communications, system topology, and control panels/panels.

Offerings on commissioning

The contractor provides all services to successfully commission the specified plants and systems. This includes:

- Create configuration and parameterization lists.
- Review and ensure working communications across the entire building automation and control system including all devices on the network.
- Check network load and resulting reaction times.
- Test the modules and automation stations, all inputs and outputs including associated documentation (cold commissioning).
- Test the safety functions for control and processing algorithms (e.g. with regard to technical and mechanical installations interaction and simulated operating failure or faults).
- Unambiguous labeling of all network components, user address, and/or operating materials.
- Comprehensive data point test including review of all connected sensors and actuators.
- Check all cabling in the building for adherence to installation guidelines.
- Check all bus terminators and voltage supply.
- Setting of required configuration parameters.
- Commission the connected sensors and/or actuators together with the other mechanical and electrical installations.
- Review of planned automation functions as per specifications.
- Log set and measured values.
- Log required function for energy efficiency.

Final documentation: - A final, comprehensive documentation must be provided following building automation and control system acceptance. To create such documentation, the system must allow for complete and current data export. As a result, the complete data set must be able to be exported any time featuring up-to-date data.

Offerings for training: - The contractor provides all services to train maintenance staff. This includes the following topics.

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- Structure, properties, and functions of the installed building automation and control system.
- Training on all operating options. (Room operation, emergency switch, control switch, operator units, management level, etc.).
- Detailed operation of all management station functions. (Reports, analyses, trends, interpretation of alarms, alarm handling, data backup, etc.).
- Troubleshooting and diagnosis on system and plants.
- Adapt simple functions, implementation of updates, etc.

Service offerings: - Service covering all electrical and mechanical installations. This project contains several, individual electrical and mechanical installations. The supplier must therefore be able to offer a comprehensive service concept covering all types of building installations. Possible service offerings must be documented and submitted together with the bid.

1.2 Management level

1.2.1 Management level requirements General

General: - All information comes together at the management level. The management level is the graphical, interactive interface for the operator to the automation station and the integrated plants and plant parts. The operator can display, query, process, save, or print any plant information via the peripheral units at the management level. System operation must be simple, i.e. dialog-driven. The plants are displayed in synoptic images and the values and states are presented and displayed dynamically. Special programs are used for higher control, optimization functions, maintenance and energy management.

Operating system for building automation and control system: - All data servers, operator workspaces etc. for the building automation and control system must be compatible with the current, common 64-bit Windows operating system. As a result, the current Windows version (at least 6 months after release by Microsoft) must be supported as well as the previous version as a minimum. Adjustment to the customer network is targeted. The building automation and control system must thus be able to be installed on any commonly available PC environment.

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Data exchange via various subsystems: - If several subsystems are used, various data must be exchanged between the automation stations (outside temperature, demand and coordination signals, etc.).

Automate recurring tasks: - The building automation and control system must take care of recurring tasks to lower the operator's workload. This includes, for example, cyclical report generation triggering, plant release at various conditions, or automatic adjustment of setpoints or alarm limits.

Designed for use with fire life safety systems (UL certified): - The management station must have passed performance and environmental tests by the Underwriters Laboratories (UL). To combine the comfort and fire life syfe system, the management station must provide all the relevant functions:

- Visualize and treat events
- Graphically monitor and control the life safety system
- Know where to start as highest priority events are highlighted.
- Directly navigate to the triggering element of an event.
- Quickly navigate to custom operator instructions and graphical display of event locations.
- Store and retrieve fire alarm system activity data.
- Distribute fire monitoring and control capabilities across the network of the management stations.
- Provide Operating Procedure checklists to guide the operator, under stress conditions, during the treatment of life safety events.
- Send out automatic remote notification of responders through email.
- View and schedule automatic history reports.

SCADA platform: The management station must be based on a SCADA plattform, which must be fully compliant with the BACnet B-AWS profile. It must enable the integration of any type of building equipment, such as HVAC and lighting.

Help functions: The software shall provide an online, context-sensitive help, including an index, glossary of terms, and the capability to search help via keyword or phrase.

Single Client License concept: Easy configurable client as the same can be used as Desktop or Web client in Floating configuration.

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Hardware requirements

Minimum hardware requirement (Plants from +/- 2'000 up to +/- 20'000 data points)

A client / server system for large sites is required. The hardware and software environment must fulfill the the following definition:

- Type: Server 19" Rack
- Processor:
 - 1x Xeon E5-2690 or
 - 2x Xeon E5-2690
- HDD: 4x Seagate Constellation 2 SAS 2000GB 7.2k Hot Plug SED
- Graphic Card:
 - On-board video graphics or
 - AMD Radeon 7750 1GB or
 - Nvidia GeForce GT 610 1GB
 - RAM: 32GB DDR3-1333 4x 8GB

Recommended software environment

- Windows Server 2008 R2, 64bit Edition
- MS SQL 2008 R2 Standard or
- MS SQL 2008 R2 Enterprise

Network requirements

- Local Network
- 1000 Mbps up/down
- Latency <10ms

Range defined

- 1 server
- Max 50 clients (10 Installed + 40 Remote/Web)
- Max 4 drivers
- Max 64 Cameras

Additional: System must be to extent with a dedicated SQL server if a high data throughput is required.

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Minimum hardware requirements (plants with greater safety requirements)
Hardware requirements as redundant server system

The PC at the management level as a redundant server system must have hardware satisfying the described requirements.

- 5 GB of available RAM.
- GB RAM.
- Windows 2008 Server.
- Dual Xenon (or equivalent) at 2.8 GHz.
- NAS or SAN.
- VMware ESX 3.5.

Multi-Monitor Support-(Max 4 Nos):- 4 Simultaneous views of critical systems , Reduction of client workstation licensing & hardware cost.

1.2.2User profiles

Plant overview

Individual view: - Individual, specific, or own views must be able to be set up to broaden plant overview. These views must cover various electrical and mechanical installations or follow geographic or organizational criteria and must allow personalized hierarchical “tree” views that represent the workstation, control systems, geographical facility layouts, and mechanical equipment relationships.

User privileges: - The building automation and control system must allow users to define, change, or delete predefined reactions as per their user privileges.

Multi language possibility:- The user interface must be able to support minimal three languages simultaneously in one system.

Related Items:- Information of any data point available in multiple pages, Access to trend, scheduler, reports, data sheets"

1.2.3Graphics

General

Operator interface to CAD system: - The operator interface shall allow users to access the various system schematics and floor plans via a

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graphical penetration scheme, menu selection, point alarm association. Graphics software shall permit the importing of CAD symbol, or scanned pictures for use in the system.

Operating messages: - Operating messages must be able to be displayed and evaluated at the management level. Graphics shall be capable of displaying the status of points that have been overridden by a local priority switch, for points that have been designed to provide a field local priority override capability.

Full graphics mode: - A fully graphic management level featuring ergonomic images must be available. The system must be designed for operation, monitoring, optimization, and logging of all connected automation stations in real-time.

Graphics creation: - User shall be able to add/delete/modify system graphics and state text for digital points, from standard user interface without the need of any external or specialized tools.

Navigation: - The navigation through various graphic screens shall be optionally achieved through a hierarchical “tree” structure. Graphics viewing shall also include dynamic pan zoom capabilities and include the ability to switch between multiple layers with different information on each layer.

Vector Graphics & Multi-layer with Depth support: - The system must support for Autocad import of plan with Zoom In & Zoom Out facility through scroll mouse feature & must Enable simplified and un-cluttered view of all utilities (FAS, ACS, CCTV etc) on any typical floor plan.

Dynamic 3D & HD Graphics: - Must support for Dynamic 3D & HD Graphics symbols for better clarity, aesthetics, effective use of change in display technology

Pictures: - Graphic symbols and standard: - The plant pictures must satisfy ergonomic needs of operators. The displayed graphic symbols must correspond to the generally valid standard for HVAC symbols (DIN 19227) and ASHRAE guidelines. Symbols must be supported as two or three dimensional graphics. Capability to create color graphic floor plan displays and system schematics for each piece of mechanical equipment, including, but not limited to, air handling units, chilled water systems, hot water boiler systems, and room level terminal units. Associated prints of standard plant pictures must thus be added to the bid.

Object-oriented graphics: - The building automation and control system must offer dynamic, high-resolution graphics. The graphics must be

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object-oriented. Each symbol must be able to display several states in the same, consistent format. At the same time, several views must be able to be open concurrently, and all views must be updated dynamically.

Continuous update and display: - Measured values, setpoints, user settings, and alarms must be displayed immediately and continuously. State changes must be indicated via symbol, e.g. using animation or changing the color, in general, however, graphic presentation, or text.

1.2.4Energy management

Energy measuring functions

Energy and quantity measurements: - The management level must allow for carrying out various evaluations and analyses of energy consumption in the building. After reviewing the data, aggregates not working efficiently or rooms not operated optimally must be easily identified. To this end, the system must be able to process and calculate the listed measurement units.

Examples:

Energy:

- Instantaneous value of output in: kW
- Metered value in energy in: kWh

Volumes:

- Volume flow values in: m³
- Instantaneous volume flow values in: l/s.
- Instantaneous volume flow values in: m³/h.

Operating and consumption data reports: - Complete processing and presentation of operating and consumption data in the form of a graphical report is required for the highest possible availability and optimal use of technical installations in buildings. The following reports and functions must be created and supported:

- Energy consumption reports.
- Energy cost reports.
- Weighted consumption report.
- Adjusted heating degree day report.
- Energy efficiency report.
- CO₂ emissions report.
- Display format (line, steps, 3D line, and 3D steps, various colors,

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automatic or set scaling of y-axis, zoom).

- The generated reports must be printable.
- The operating and consumption data must be recorded autonomously in the automation station using BACnet trendlog objects. This data may not be lost due to short-term management station failure.

In addition, it must be possible to evaluate reports and data generated by comparing the data to previous years. Several reports (with max. 10 data series) must be able to be created and saved for each of the above report templates. Operators must be able to manually start reports, add a scheduler program or create new reports based on templates regardless of their user rights.

1.2.5 Scheduler programs

General

Scheduler programs: - At least eight switching times (On/Off) per day must be possible via operator units (local or management level) to achieve reasonable plant control. The following schedules must be supported:

- Binary: e.g. on/off.
- Analog: e.g. setpoint profile.
- Multistate: e.g. room operating modes Protection/Economy/Comfort.

Special days

must be able to be edited at the management level via two different ways:

- Via calendar.
- Via direct special day entry in scheduler program.

Navigation from plant picture to scheduler program: - Every currently used plant picture must offer user- friendly scheduler program operation.

Management via central scheduler programs: - Operate all scheduler programs online from the management level to achieve consistent, transparent operation of all integrated systems and subsystems.

Scheduler program types

Customized scheduler program: - The user can customize the schedule defining the operating mode for each plant. Switching times are defined via

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weekly schedule. Overriding recurring weekly schedules via local or global exceptions as well as operation via any operator unit must be possible.

Customized calendar: - Local or global calendar exceptions must be able to override the plant-specific weekly scheduler program. Equal calendars must be assigned priority over each other. Calendar operation must be possible via all operator units.

1.2.6 Building automation and control system operation

Multiuser-System with online services

Create calendar online: - Calendar programs must be able to be remotely created online to provide service personnel a high level of flexibility.

Create scheduler online: - Scheduler programs must be able to be remotely created online to provide service personnel a high level of flexibility.

Online creation of offline trends: - Trends, that also trend offline, must be able to be remotely created online to provide service personnel a high level of flexibility.

Multiple, concurrent users: - Multiple users must be able to work concurrently on various workspaces on the building automation and control system for efficient and comprehensive work. Plants must simultaneously be analyzed and e.g. monitored or operated via a remote station.

Security

Access protection: - Different persons maintain and operate the plant. For this reason, passwords must be assigned to authorized persons to guarantee transparency for tracking or authorization purposes. A minimum of four different rights must be assignable.

- Administrator.
- Program and graphics creation
- Operation to change or adjust setpoints.
- Guest.

Windows authentication: - The building automation and control system's password administration must be consistent with the customer's IT guidelines. In other words, corporate customer guidelines must also apply to the building automation and control system. As a result, password administration and related properties must be equal to standard Windows

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login and shall "follow" the operator to any workstation logged onto.

Closed Mode Operations: - The software should have an option to disable to use other windows applications such as Microoft Office tools, access to local drives ets to ensure Secure operations - The BMS server/PC must be prevented to be used as a general purpose PC by the users.

Operating functions

Central setpoint shift: - The setpoints in the rooms must be adjustable and shiftable for effective and clear room operation for the rooms as a whole and individually via the building automation and control system.

1.2.7 Alarm handling

General

Alarm function: - The automation station contains an image of the physical data points. Each data point must be alarmable. Parameterization via operator units must be possible. The alarms either do not require acknowledgement, i.e. they come and go without acknowledgement, or must be acknowledged or reset and acknowledged.

Alarm message: - Alarms from the automation station must be displayed on the operator units within 1 second. Alarms must be acknowledged or acknowledged and reset dependent on access rights. Delay times (e.g. feedback supervision, triggering of differential pressure monitor, filter) must be changeable via operator units.

Alarm suppression: - Lower priority messages, undesired reactions from objects or entire plants must be capable of being suppressed during commissioning, plant servicing or automation station start up.

System safety

High availability: - High availability is required of the building automation and control system. Data availability must be increased and any fail times massively reduced.

Alarm generation

Message handling:- Both types of alarm management (Intrinsic Reporting/Algorithmic Reporting) are supported as recipients. Alarms from automation stations are received at the management level, but not generated based on a change to Present_Value or Status_Flags in the automation station. All alarms are displayed when the management level is started.

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- Intrinsic: Each BACnet object is alarmable.
- Algorithmic: Limit value supervision.

Management Station Alarms: - Must be possible to create Alarms for third party systems.

Alarm routing

Media, independence, formats: - Current alarms may need to be routed independent of media at certain times to a central service (Printer, email). To do this, various formats must be available (CSV, XLS, PDF). There shall be no limit to the number of points that can be configured for remote notification of alarm conditions and no limit on the number of remote devices which can receive messages from the system.

Alarm message escalation list: - System must be configurable to send messages to an individual person or group of people and shall be configurable to send different messages to different remote devices based on alarm message priority level. It must be able to send also to an escalation list so that if the first device does not respond, the message is sent on to a second device after a configurable time has elapsed.

Acknowledgment

Operator units for acknowledgement: - After user rights are assigned, all alarms (alarms and faults, errors) must be acknowledgeable from all operator units. This helps to trace alarms. A time stamp and assignment (based on user account) is required. This includes:

- Local acknowledgement (control panel, automation station).
- Management level.
- Remote operating equipment.

Alarm management strategy: - The software shall allow the user to configure the alarm management strategy for each point. The editor shall provide the ability for editing the point database directly online with the Building Controllers. The operator interface software shall also provide the capability to perform bulk modification of point definition attributes to a single or multiple user-selected points.

Assisted treatment of alarms: - The system should support for Guided operations for any event so as to reduce the human error while handling the alarms must be possible to configure Predefined & fast intervention steps for faster response.

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Alarm display

Color display: - Incoming alarms must be colored for quick and easy interpretation. Both order and state as well as alarm priority must be recognizable. The alarm window must be displayed as per operator needs. Alarm window displays must be added to the bid.

Alarm message content: - The message texts must contain all information necessary to allocate and resolve the error. This includes at least the following attributes:

- Clear text.
- Control panel name
- Plant name
- Priority (min. 16 different priorities).
- Time.
- Status (acknowledged, unacknowledged).
- Instructions on how to resolve the problem must be available in the background.

Filter alarms: - The building automation and control system must offer alarm filtering. Filtering must be possible by alarm lists or priorities. Alarms are displayed in popup windows. Step-by-step instructions on handling each alarm help the building automation and control system operator to find a solution.

1.2.8 Event management

Event Routing and sorting: - Event Routing shall allow the user to send event notification to selected printers or workstation location(s) based on event severity, or point type. The List must have the ability to list and sort the events based on event status, point name, ascending or descending activation time.

Event Notification: - Event Notification shall be presented to each workstation in a tabular format application, and shall include the following information for each event: name, value, event time and date, event status, priority, acknowledgement information, and alarm count. Each event shall have the ability to sound an audible notification based on the category of the event.

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Event acknowledge: - Directly from the Event List, the user shall have the ability to acknowledge, silence the event sound, print, or erase each event. The interface shall also have the option to inhibit the erasing of active acknowledged events, until they have returned to normal status. The user shall also have the ability to navigate to all information related to a selected point in order to command, launch an associated graphic or trended graphical plot, or run a report on a selected point directly from the Event List.

1.2.9 Report generation

Reports

Report generation: - The system must spontaneously (snapshot) generate predefined reports (real-time and historical data) to provide vital plant data at any time. These reports must be printable or exported to third-party spreadsheet software and as PDF file. The data must be editable in other programs (Microsoft Excel, or Microsoft Access) for further analysis.

Standard report templates: - Templates help generate comprehensive reports without much effort. Atleast three different report templates must be available.

- Reports to record alarm and fault states.
- Reports to record logbook entries.
- Reports to record plant and building panels states
- List of all points currently in override status
- List of all disabled points
- List of alarm strategy definitions
- Point totalization report
- Point Trend data listings
- Initial Values report
- User activity report
- Event history reports
- Customized report templates: - The system must allow for creating specific report templates to meet individual report generation requirements, which also may include plant and trend graphics.

1.2.10 Remote operation

Operating options

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Internet access: - The building automation and control system must offer an Internet solution via Microsoft IIS (Internet Information Server). The management level programs must be mapped to APS (Active Server Pages) and optimized for Microsoft Internet Explorer.

Terminal server: - Users must be able to remotely operate and engineer plants regardless of location via a terminal server function. This openness, of course, may in now way impact plant safety.

General requirement for operating: - The Web based interface shall provide the same functionalities as those available at any other workstation, including operation and configuration capabilities. All operator interface functions must be available in clients running in a browser, installed client console, or Windows desktop app.

Via web browser: - Users must be able to remotely operate and engineer plants regardless of location with the same user interface. This openness, of course, may in no way impact plant safety. The client must run in a browser as a Full Trust client application

Dedicated Desktop Installed client: - Users must be able to remotely operate and engineer plants regardless of location. This openness, of course, may in now way impact plant safety. The client must run as a fully installed software installation that can lockdown desktop space and prevent the ability for the software to be minimized or covered by other applications.

Windows Desktop APP: - Users must be able to remotely operate and engineer plants regardless of location with the same user interface. This openness, of course, may in no way impact plant safety. An app must be downloaded to the client from the server PC that runs like an installed application, and must be automatically updated whenever new apps are available at the server.

1.2.11Trend data

Analyses

Simultaneous, multiple trends: - Multiple trend views must be possible simultaneously to provide a comprehensive plant overview. Standard plants from medium to higher complexity (as in this project) require a simultaneous display of up to 10 trend curves on the current page view to assess the plants. Multiple trend curves must thus be recorded at the same time.

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Freely assign trend data: - For greatest possible flexibility, operators must be able to assign and thus record max 4 additional data points individually for each plant. The assignment must be carried out from the management station.

Decentralized data storage: - None of the trend data may be lost during communications failure to achieve gap-free trend documentation. For this reason, all trend data must be created and saved to the automation station. After communications are restored, all values saved on the management station must be updated automatically.

Intermediate storage of history data: - Trend data are collected in the automation station and transferred to the management level after a specific time has expired or specific number of data has been recorded. Trend data may not be lost if the management station is unavailable temporarily.

Trend comparison: - To make analysis of changed conditions in different times, the system must provide a time shifted trend view.

1.3 Automation level

1.3.1 Requirements at the automation level

General

Automation station standard: - Automation stations must be intelligent. They must be autonomous. They must be built to go from high decentralization into small units (DDC). Automation stations must be freely programmable and feature graphical programming optimized for building automation and control. The following functions must be available: Control, measure, signal at various priorities and by event, monitor, alarm, count, calculate, schedule, save trend values, and log as per DIN EN ISO 16484-5. BACnet server (automation stations) certificates must be added to the bid.

System design: - Manufacturer must prove that they have various scalable automation stations to ensure optimal automation station design.

Associated system documentation must be added to the bid and included in system evaluation. Documentation must show that the hardware (DDC and I/O modules) is designed optimally for the number of the required data points.

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Delineation, automation to management level: - All management level functions must be fully engineered in the automation station to increase plant availability. Delineation is defined to ensure that no additional engineering is required at the management level (BACnet client).

Delineation, Room automation to management level: - All management level functions must be fully engineered in the room automation station to increase plant availability. Delineation is defined to ensure that no additional engineering is required at the management level (BACnet client).

Specifications: - The DDC controller to be 32 bit controller with BTL certification. The decentralised small units (DDC) to have UIO concept for configuration of inputs & outputs to suite the project specific requirement and the last minute changes at site.

The CPU frequency of 100 for controller upto 22 IO's & 133 MHz for 36 IO's and above with RTC & having Bacnet/LON OR Bacnet/Ethernet IP having SDRAM of 16MB to 64MB & Flash Memory for 22 IO's & 36 IO's respectively. 8 MB to 16MB for 22 IO's & 36 IO's respectively. Maximum IO for small units to support upto 36 IO's.

The DDC to be capable of accepting inputs of 0-10 VDC; PT1000; NTC 10K; LG-Ni1000. The same to have agency compliances like EN 60730-1; EN 50491-x; EN 60730-5-2/-5-3; CE 2004/108/EC; CE 2006/95/EC; UL916; FC PART15, CLASS B; ISO 14001; ISO 9001 .Each decentralised small units (DDC) should be capable of being operated through room units to a maximum of 5 nos via PPS2 interface for various operations apart from portable operating terminal(POT).

1.3.2 Operation concept at automation level

Local operation

General:- Local operation with access for the corresponding automation station, or network operation via BACnet to all or selected automation stations, or simple room operation must be available.

Operator and monitoring units

Local operator and monitoring unit: - Local operation must be possible via a locally usable operator unit. All vital operating parameters of the automation station must be displayed in clear text. All current plant values, setpoints, and parameters must be displayed on the operator units. All operator units must be configured to allow for acknowledging maintenance and fault messages.

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Networkable operator and monitoring unit: - Plant operation must be possible both locally and via management level. Local operation must be location-independent and allow for maintenance staff work from any automation station or be integrated in the control panel door. Operation must allow for access to all values (current values, setpoints, parameters, maintenance and fault messages) without special engineering as well as plant-specific composition of vital values. Operation must allow for graphic display of weekday and exception programs, heating curves and trends set up individually.

Graphical plant operation via network-capable touch panel: - A network touch panel operates the building management system. They must inform the operator without log on using plant graphics on the present state of the plant. Multiple plants must be able to be operate via touch panel. Is must be capable of displaying and acknowledging alarms. The operator should be informed about faults directly by a common alarm display via faults even when the display is switched off. At the same time, functions to control the plant must be supported, so that plants must be able to be graphically operated and displayed using select data points, schedulers as well as trend views. A capacitive display is used to operate. The touch panel as be added as an integral component of the overall system via a scalable web interface as well as a pleasant form of polished aluminum frames. User name and password is required to run functions that can change to plant settings in order to protect the plant.

Web operation independent of hardware: - A web interface, independent of hardware, operates the building management system. The entire user interface must be optimized for finger operation. To ensure operation not tied to a location, web operation must also support, for example, off-the-shelf tables (Android, i OS App, Microsoft) or notebooks. It must be capable of operating multiple plants as well as display and acknowledge alarms. At the same time, functions to control the plant must be supported, so that plants must be able to be graphically operated and displayed using select data points, schedulers as well as trend views. User name and password is required to run functions that can change to plant settings in order to protect the plant. Existing, system touch panels must be able to be integrated, or devices able to use standard web browser functions without further upgrades.

Operation via web browser or mobile clients: - Vital functions must be viewable regardless of plant location. To this end, access is required via

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mobile clients (mobile phone, pocket PC, PDA, etc.) to all actual values and setpoints, plants and operating states.

Online trends: - Local operator units must support temporary recording of trend data to allow local operators to record a trend at the control panel for diagnostic purposes.

1.3.3 I/O modules General

Construction: - As highly flexible I/O modules are needed for complex and large technical equipment in buildings, they must be composed individually for each plant. To this end, modules must be configurable for various signal types, grouped, labeled per channel with clear text, two-sided readable, and distributed or set across several control panels/panels. The entire module electronics must be protected by a stable plastic housing against touch and soiling.

Diagnostic function: - A status diagnosis for each channel is required to quickly locate installation or plant errors. The status is displayed by LED or on the module.

LED display: - The color of the status LED must be configurable to correspond with message type to provide an easy overview in the control panel. Feedback: green, maintenance: yellow, warning: red.

Remote I/O modules: - Remote I/O modules must be able to be used for small plants or parts thereof to keep the size and number of control panels/panels as low as possible. The modules must be able to be as far as 200 m from the automation station. The maximum number of data points edited this way may only be limited by the maximum capacity of the automation station.

Isolating terminal functionality: - The electronic modules must have isolating terminals to simplify hardware tests and commissioning. As a result, connected field devices can be measured at the test plug sockets without module electronics influence. At the same time, the connection terminals must act as cabinet/panel terminal strips. If the bidder cannot provide proof for this function, all inputs and outputs must be run via separate isolating terminals. The resulting costs must be included in the unit prices.

Connection

Short-circuit proof: - Field devices and motors must be connected directly without requiring coupling relays or other proprietary hardware. All

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terminals are protected against short circuit and incorrect wiring using AC/DC 24 V. Field device errors must be recognized and displayed reliably to retain high plant availability.

Broken wire interlock: - Interlocks (hardware) and fault messages must be designed for possible wire breaks or loose terminals under closed-loop rules, i.e. the automation station then has status "1" OK (closed monitoring loop) or no fault, and status "0" (interrupted monitoring loop) or fault.

Connect field devices

Field device standards: - The automation stations or I/O modules must support all common sensors (e.g. temperature, humidity) and actuators (valves, damper actuators) without requiring additional conversion hardware. The bidder must provide proof that the field devices used for the project were tested under the entire system and documented accordingly.

Use of I/O modules on the automation level: - Functionality for the I/O system must be implemented on the automation level.

1.3.4 Updates and adaptations Updates

Changes during operation: - Customer-specific plant programs must allow for minor adjustments without having to switch off unrelated plants and without changing set parameters and setpoints.

Changes to applications during operation: - Minor program changes must be able to be introduced without operational interruptions.

Adaptations

Access via system network: - Operators must be able to enter adapted parameters, setpoints, times etc. in each automation station via the system network under their password.

1.4 Communication

1.4.1 Standard BACnet / AMEV

DIN EN ISO 16484-5 / AMEV

BACnet conformance and BTL logo: - The BACnet servers (automation stations) used must support at least BACnet standard Version 1, Revision

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10 (1.10) or higher. In addition, a test must be carried out successfully in a neutral testing laboratory (conformance testing) and the automation stations must have the BTL logo.

B-AWS (management station): - Management stations must match the BACnet Profile B-AWS (Advanced workstation) as per the BTL Listing.

B-BC (automation station): - Automation stations must match the BACnet Profile B-BC (Building Controller) as per the BTL Listing.

AMEV AS-A and AS-B (automation station): - Automation stations must meet the AMEV profile AS-A and AS-B as per AMEV guidelines "Bacnet 2011"

B-AWS (management station): - Management stations must match the BACnet Profile B-AWS (Advanced workstation) as per the BTL Listing and also specified in ANSI / ASHRE 135 guideline. It must also support the BACnet Life Safety Points and BACnet Life Safety Zones functionality

ONVIF video standard: - The system must be able to implement Video streams of IP cameras. The presentation in "video wall" modus must be supported.

Conformance declaration

Protocol implementation and conformance declaration (PICS): - Manufacturer self-declaration PICS is required prior to executing work to gain information on the type of communication for the building automaton and control system.

Communication via LonTalk

BACnet over LonTalk: - The automation stations must allow for communication via LonTalk and work on simple two-wire cabling in a freely selectable bus topology with a total possible length of 900 m. Ethernet/IP must serve as the backbone.

Communication via BACnet / IP

BACnet/IP: - The automation stations (room automation stations as well) must support BACnet/IP communication (as per the standards described previously) for later system-independent plant extensions.

BACnet/IP(v4-v6) to BACnet/MS/TP: - The automation station must be able to integrate, using a router manufactured by the same vendor, the MS/TP protocol via BACnet/IP.

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BACnet/IP(v4-v6) to BACnet/MS/TP or BACnet/LonTalk: - The automation station must be able to integrate, using a router manufactured by the same vendor, the BACnet/MS/TP protocol via BACnet/IP as well as BACnet/LonTalk.

BACnet/IPv4 to BACnet/IPv6: - The building management system must be able to connected the BACnet/IPv4 protocol with BACnet/IPv6 protocol using a router manufactured by the same vendor.

BACnet LonTalk to BACnet MS/TP: - The building management system must be able to connected the BACnet/LonTalk with BACnet/MS/TP protocol using a router manufactured by the same vendor.

1.4.2 Physical structure Network structure

Structure: - The offered network must be flexible and allow for all types of networks (line, star, ring, tree, etc.) to satisfy all owner/operator needs.

Cable types: - The manufacturer must add to the bid any requirements for specific types of cable, cable installation, or diameters etc., if the manufacturer or offered bus topology require them.

1.4.3 Building automation and control system - Automation stations

Openness

Extendibility: - Integrating existing technical equipment without additional conversion hardware (existing, open system, or other standardized bus systems such as BACnet or third-party) in the new environment is a vital task. The same applies to LonTalk, DALI, or KNX integration.

Integration of third-party systems: - If possible, the same communication protocol must be used as for the existing technical equipment in the building to integrate third-party systems (refrigeration machines, lighting and building automation and control systems, etc.). Building automation and control systems not offering this integration as specified must include and clearly declare any additional conversion hardware (gateways) in their price.

Open and neutral communication via BACnet: - Automation stations are connected to the management level via communication bus. System structure must allow open, neutral and manufacturer-independent communication. Communications must take place in principle via BACnet

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even if proprietary communications would be possible based on the automation stations used. Intermediate OPC servers are not allowed.

Engineering interface via the network or remote: - Access over the network, VPN, or modem is required for maintenance and diagnostics purposes.

1.4.4 Automation station - Automation station Standard protocol

Uniform protocol: - Communication must also be standardized even between individual modules and automation stations. All devices must communicate on the same protocol on the entire room level.

1.4.5 Automation station - Field level

Field device connection.

Connect field devices: - The automation stations or I/O modules must support all common sensors (e.g. temperature, humidity) and actuators (valves, damper actuators, lighting control, blinds drives) without requiring additional conversion hardware. The bidder must provide proof that the field devices used for the project were tested under the entire system and documented accordingly.

Use of communicative field devices: - Communicative field devices are required to achieve simple cabling and consistent communication structures.

Connect communicating field devices: - Common manufacturers must be integratable to connect third- party devices and subsystems. (E.g. communicating pumps, Modbus subsystems, M-bus capable heat meters, etc.)

Third-party system connection: - A interface is required to connect various devices that supports communication protocols such as Modbus, M-Bus, Genibus and USS.

Support of Plug&Play commissioning: - The communications protocol used on the field level must support "Plug&Play", i.e. commissioning must be able to be conducted by a person without tools other than a PC/notebook without expensive software tools.

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Number of supported communicative field devices: - The communications protocol used on the field level must support at least 30 communicative field devices for each controller with the use of gateways.

1.5 Field level

1.5.1 Requirements at the field level Product range

Field level contents: -

The field level comprises all measuring sensors, actuators, transmitters and energy measuring devices used to control, regulate, monitor, and optimize plants. The bidder is expected to provide all required field devices from own production to the installer to provide a harmonized plant image. The associated field device product range overview must be added to the bid.

1.5.2

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Actuators for ventilation and air conditioning plants General

Mechanical strength: - Robust and long-lived actuators are required for reliable operation of ventilating plants.

Connecting cable: - Actuators are required to have color and number-coded connecting cables to prevent wiring mistakes.

Axis attachment: - The actuators must allow for fast mounting to maintain ventilation plants optimally at reasonable costs.

Damper positioning display: - Damper actuators must be equipped with an easily visible optical position indication for clear and visual check of the damper position.

Auxiliary functions: - Auxiliary functions such as auxiliary switches, position feedback, etc., are supplied mounted in the housing.

Disposal: - Actuators must be easily disposable. Manual adjustment

Actuators are equipped with manual adjustor or disengagement function.

1.5.3 Actuators for fire dampers

Security

Demand: - Fire dampers are intended to provide protection against plant damage and/or personal injury. Periodic function checks guarantee highest safety. Motorization and position feedback is therefore a must. Fire

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dampers must guarantee secure closure in emergencies for the entire product life. All fire damper actuators as a rule must have a spring return actuator.

1.5.4 Sensors

General

Product line consistency: - As part of uniform plant design, all sensors must originate from the same manufacturer with recognizable, consistent appearance. All sensors must be CE-approved. For the final documentation, data sheets must be provided for all sensors used.

Reverse voltage protection: - The sensors must have reverse voltage protection to reduce error sources during electrical connection of the sensors.

Test functions: - The sensors must have a test function to ensure commissioning on a tight construction schedule. Allowing errors and faults to be recognized during point test or for analytic purposes during operation

Environmental declaration: - Proof for the materials used in the sensors must be provided if requested by the building owner. In addition, packing materials must be disposed of in an environmentally compatible manner.

Sensor connection: - For cabling, it must be noted in principle that disturbances occur the longer the wiring runs in parallel and the smaller the distance between lines. Use shielded cabling in environments subject to strong EMC. Use twist pair wiring for customer power lines as well as signal lines.

Sensor types:-

Temperature sensor

Outside air sensor: - Outside air sensors must allow for high-quality temperature measurements to promote efficient and ecologically meaningful control. A temperature measuring concept including wind and solar radiation is required.

Duct sensor: - Sensors acquiring temperature values via mean value acquisition are required to retain the necessary flexibility for sensor integration in air ducts.

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Humidity sensor

Outside sensor: - Only maintenance-free sensors are used. The supplier must provide proof that the offered sensors feature compensation of inherent temperature. The sensor build must ensure protection against dust.

Duct sensor: - Only maintenance-free sensors are used. The supplier must provide proof that the offered sensors feature compensation of inherent temperature. The sensor build must ensure protection against dust.

Air quality sensor

Duct sensor: - Duct sensors may not feature additional duct mounting housings or other sealing masses for exchange during operation. Installation depth must be seamlessly adjustable to achieve a small product range. The sensor's design does not require sophisticated orientation to the flow direction in the duct.

Pressure sensor

Absolute pressure sensor: - Robust sensors ideal for measuring static and dynamic overpressure at intensive load changes are required for pressure control of liquids and gases. The related sensor build must ensure that the sensors are immune against humidity and temperature deviations in the long term.

Differential pressure sensor: - Sensor with highly stable membrane are required to monitor differential pressure of air and non-aggressive gases. Robust sensors ideal for measuring static and dynamic overpressure at intensive load changes are required for pressure control of liquids and gases. The related sensor build must ensure that the sensors are immune against humidity and temperature deviations in the long term.

Flow sensor

Flow monitor: - For flow monitoring of liquids, sensors of fiberglass reinforced plastic or in robust gun metal. The sensors must be constructed to be insensitive to contamination and have a high level of media resistance. Multiple configurations for the output signal must be possible to permit matching to a specific application.

Flow switch: - Maintenance-free sensors with reed contact are specified to monitor the flow of liquids. The sensors must be deployable to a wide nominal range to optimize application. The reed contact must be a

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proximity switch. The set switching point must be stable and independent of pressure.

Air velocity sensor: - The sensor used must be immune to contamination regardless of the flow direction. However, these sensors must be able to be adapted to various velocity measuring ranges without auxiliary tools to avoid measuring accuracy disadvantages. Multiple configurations for the output signal must be possible to permit matching to a specific application.

1.5.5 Valves and actuators

General

Own development and assembly competence: - The bidder provides proof that owns development competence is available to quickly and comprehensively adapt to new market requirements. It is important that both development and manufacture are from one bidder to ensure fast and consistent advanced development of the products.

CAD / CAE symbols: - The manufacturer must provide 2D and/or 3D CAD models in a standardized format for all valve-actuator combinations to ensure efficient pipe planning.

Backward compatibility between actuator and valve: - The valve and actuator supplier must ensure 100% backward compatibility for valve and actuator to simplify service planning and warehousing and ensure trouble free, future exchange.

VDI3805 symbols: - The manufacturer must provide the data sets under VDI 3805 for all valve-actuator combinations to ensure efficient pipe planning.

Requirements for valves and actuators

Mechanical requirements

Robust actuators: - Overload-proof actuators with robust components and easy-to-operate manual adjustment must be used for reliable operation.

Documentation: - Documentation for mounting and commissioning staff in the respective country's language must be added to the product to ensure smooth mounting and plant commissioning.

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Manual adjustment: - The actuators must be equipped with tool-free manual adjustment for efficient service and secure emergency operation during plant faults.

Maintenance: - Robust and long-lived actuators are a must to ensure maintenance-free operation. Electrical requirements

Energy consumption: - Actuators with the lowest possible power consumption should be used to achieve environmentally-friendly and energy-efficient plant operations. (The power consumption data must be documented),

The following upper limits are defined for electromotive and electro-hydraulic actuators: Actuators for valves up to DN50: 20 VA.

Actuators for valves up to DN65 to DN150: 25 VA.

Declarations

European standards: - The supplier must provide proof for adherence to the specific European standards for valves and actuators. (EMC Guideline)

RoHS / environmental declaration: - Only actuating devices conformant to RoHS and with an environmental declaration provided by the manufacturer may be used to ensure environmentally- compatible plant design.

Combination valves

Automatic differential pressure controller: - Valves must have differential pressure control to simplify installation and hydraulic balancing.

Treatment and primary distribution

Direct-mounted rotary actuators

General: - Use only direct-mounted actuators with integrated console for globe valves and butterfly valves to ensure efficient, trouble-free mounting. Thanks to the integrated console, there are not too many parts at the mounting location and errors due to wrong consoles are avoided.

Product range accessories: - The bidder provides proof of the fact that he/she has a comprehensive range of accessories allowing for flexible functional extensions any time. This aims at keeping the actuator range manageable for users, and ensures that standard functionality is not influenced by unused functionality. At the same time, the standard product does not include extra costs for other functions.

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Kvs value gradation: - The bidder must offer a valve product range that ensures high efficiency in hydraulic circuits based on highly incremented kvs values. Optimal valve gradation is required based on exact adjustment of the volume flow at lowest possible pressure drop. In addition to operating energy savings for the hydraulic circuit, exact sizing must also ensure energy efficiency for hot and cold water generation by reaching optimized operating points more quickly.

Nominal widths: - The following valve-actuator combinations with the following runtime/nominal width gradations must be used for control tasks to optimize energy efficiency. Actuators for valves up to DN50: Actuators for valves from DN65 to DN150: 120 sec

Nominal pressure levels: - The bidder must offer a large range of valves for various nominal pressure levels in his/her own product range, and be able to mix the products without problems.

Operating and status indications: - The actuators used must have easy to understand visual operating and status indications. The movement of an actuator must be possible as well as from a certain distance (some meters) to simplify function checks. Operating state of continuous actuators must displayed externally via Leeds, to allow less training personnel to quickly localize a plant or actuator error.

Direct-mounted rotary actuators ISO5211: - For efficient, trouble-free mounting and compact installation, use only direct-mounted rotary actuators with connection as per ISO 5211. Thanks to the integrated console, there are not too many parts at the mounting location and errors due to wrong consoles are avoided.

Uniform valve interface: - The must document that it has a defined valve actuator interface to protect the investment in the plant.

Electrical requirements

Flexible voltage supply: - All actuators can be operated on both 24 VAC and VDC to achieve flexible application of actuators in the plant and to avoid double actuator warehousing.

Real electric positioning feedback messages: - Valves must offer real feedback to ensure reliable position indication/plant monitoring.

Position signal provisioning: - The selected actuators must be able to be operated on 0-10 V or 4-20 mA for the positioning signal even under critical EMC conditions.

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Position indication / operating state indication: - Actuators offering possible position feedback for efficient plant monitoring and quick troubleshooting from the management level must be provided.

Mechanical requirements

Runtimes: - Actuators with very short positioning times, preferably faster than 5 seconds, must be used to optimize energy efficiency in very fast control paths.

Drinking water conformance: - Only DVGW (German Technical and Scientific Association for Gas and Water) certified valves may be used for valves in drinking water plants.

Connection types: - For optimal selection, various mechanical connection types are required for flexible installation. The valves must be delivered with flanges, external or internal threads (external threaded valves including screwed fittings) and comprehensive recommendations and instructions for various mounting systems.

Operation & mounting: - Uniform operation of all actuators: - trouble-free commissioning and efficient operation is guaranteed through uniform and user-friendly operation of all rotary and stroke actuators.

Tool-free manual adjustment: - The actuators must be equipped with tool-free manual adjustment for efficient service and secure emergency operation during plant faults

Manual adjustment with two operating modes: - Manual adjustment must be both temporary (reset to automatic occurs automatically) as well as permanent (reset to automatic only upon user request) to allow for optimum use during each project phase (commissioning and service).

Robust manual adjustment: - Manual adjustment must be designed to preclude damage to the actuator and activated valve, even for unintended operation.

Integrated actuator bracket for quick mounting: - Use only stroke actuators with integrated brackets for efficient and trouble-free mounting; for quick mounting using one tool. Mechanical adjustments, that cause an error, are not allowed.

Easy extension of functionality with a comprehensive offering of accessories:- The bidder provides proof of the fact that he/she has a comprehensive range of accessories for actuators allowing for flexible

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functional extensions any time. This aims at keeping the actuator range manageable for users, and ensures that standard functionality is not influenced by unused functionality. At the same time, the standard product does not include extra costs for other functions.

Easy-to-handle actuator accessories: - Accessories should be designed to simplify mounting and planning/logistics so they can be used on all actuators in the product range requiring as few parts as necessary for mounting.

Protection functions

Fail-safe function (safety of persons): - The bidder must guarantee fail-safe functionality for the entire valve-actuator range. The valve must mechanically move to the defined fail-safe position in the event of a power failure. The bidder must provide proof that the valves used are certified accordingly as part of the final project documentation.

Fail-safe function (safety of assets):- The bidder must guarantee fail-safe functionality for the entire valve-actuator range. The valve must mechanically or electrically move to the defined fail-safe position in the event of a power failure.

1) Room Temperature Sensor:

Sensing Element : Pt1000
 Range of Use : 0...50 °C
 Degree of protection : IP 30 to IEC 529
 Output Signal : Resistive Output
 Environmental conditions :
 Temperature : 0...50 °C
 Humidity : <85 % r. h.

2) Room Temperature & RH Sensor:

Sensing Element : NTC 10k (Temperature), capacitive sensing element (Humidity)
 Range Of Use : 0...50 °C / - 35...+ 35 °C / - 40. . +70 °C (Temperature), 0... 100 % relative humidity
 Degree of protection : IP 30 as per IEC 60529
 Output Signal : DC 0...10 V for both (Temperature and Humidity)
 Power supply : AC 24 V $\pm$ 20 %, 50/60 Hz
 Accuracy : $\pm$ 0.8 K (15...35 °C), $\pm$ 3 % r. h. (30...70 % r. h.)
 Approval : CE, UL 873, and C-Tick

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Environmental conditions : Temperature: -15...50 °C; Humidity: <95 % r. h.

3) Duct Temperature Sensor:

Sensing Element : Pt1000
 Range of Use : - 50...+ 80 °C
 Degree of protection : IP 42 to IEC 529
 Output Signal : Resistive Output
 Probe Length : 400mm
 Environmental conditions : Temperature: - 40...+ 70 °C; Humidity: 5...95 % r. h.

4) Duct Temperature & RH Sensor:

Sensing Element : NTC 10k (Temp), capacitive sensing element (Humidity)
 Range of Use : 0...50°C/ -35...+35 °C /- 40...+70°C (Temperature), 0..100% r. h.
 Degree of protection : IP 54 as per IEC 60 529
 Output Signal : DC 0...10 V for both (Temperature and Humidity)
 Power supply : AC 24 V $\pm$ 20 %, 50/60 Hz
 Accuracy : $\pm$ 0.8 K (15...35 °C), $\pm$ 3 % r.h (30...70 % r.h.)
 Approval : CE, UL 873, and C-Tick
 Environmental conditions : Temperature: -25...70°C; Humidity: <95 % r. h.

5) Water Temperature Sensor:

Sensing Element : Pt1000/LG-Ni1000
 Range of Use : -30...+130 °C
 Degree of protection : IP 42
 Output Signal : Resistive Output
 Thermo well : 100/150mm Length
 Time constant : approx. 30s (With Protection Pocket)
 Immersion rod : Stainless steel
 Environmental conditions : Temperature: -40...70°C; Humidity: <5...95 % r.h.

6) Duct Differential Pressure Sensor (Air)

Sensing Element : Piezo-resistive
 Range of use : 0...200 Pa/ 0...250 Pa/ 0...500 Pa
 Degree of protection : IP 42 as per IEC 60 529

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Power supply	: AC 24 V $\pm$ 15 %, 50/60 Hz
Output Signal	: DC 0...10 V
Accuracy zero point)	: < $\pm$ 0.1 % FS / °C (at 20°Ambient, TC
Overload Pressure	: 5,000 Pa
Medium temperature	: 0...70 °C
Pressure connection	: PVC nipples $\square$ 6.2 mm
Approval	: CE, C-Tick, ROHS
Accessories probes	: consisting of 2 m plastic tubes, 2 air duct
Environmental conditions (without condensation)	: Temp: -25...70°C; Humidity: <90 % r.h.

7) Room Differential Pressure Sensor (Air)

Sensing Element	: Piezo-resistive
Range of Use	: $\pm$ 50 Pa/ $\pm$ 100 Pa
Degree of protection	: IP 42 as per IEC 60 529
Output Signal	: DC 0...10 V
Power supply	: AC 24 V $\pm$ 15 %, 50/60 Hz
Accuracy point)	: < $\pm$ 0.1 % FS / °C (at 20°Ambient, TC zero
Overload Pressure	: 5,000 Pa
Medium temperature	: 0...70 °C
Pressure connection	: PVC nipples $\square$ 6.2 mm
Approval	: CE, C-Tick, ROHS
Accessories probes	: consisting of 2 m plastic tubes, 2 air duct
Environmental conditions (without condensation)	: Temp: -25...70°C; Humidity: <90 % r. h.

8) Air Differential Pressure Switch (Air):

Sensing Element	: spring-loaded diaphragm
Range of Use	: 50...500 Pa
Degree of protection	: IP 54 as per IEC 60 529
Output Signal	: Single-pole change-over, multi-layer
contact (AC 250 V, max. 5 A res.)	
Overload Pressure	: 7500 Pa
Cycle Time	: > 1 micro switching cycle
Approval	: CE, UL94, C-Tick, DVGW approval
Accessories probes	: consisting of 2 m plastic tubes, 2 air duct

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Environmental conditions : Temp: -30...85 °C; Humidity: <90 %
r.h.(without condensation)

9) Water Pressure Sensor:

Sensing Element : Piezo-resistive
Range of Use : 0...10 bar
Degree of protection : IP 65 to EN 60 529
Output Signal : DC 0 ...10 V
Power supply : AC 24 V $\pm$ 15 %, 50/60 Hz
Rupture Pressure : 3 x scale end value of measuring range
(FS)
Medium Temperature : - 40...+ 80 °C
Accuracy : < $\pm$ 0.6 % FS
Approval : CE, C-Tick
Accessories : Mounting kit 1 m copper capillary line, both
ends prefabricated ready for connection
Thread adapters and terminal nuts.
Pressure connection : G1/ 8" or G1/2" outer threading.
Environmental conditions : Temperature: -40...80 °C; Humidity:
insensitive to condensation

10) Water Differential Pressure Sensor:

Sensing Element : ceramic sensor
Range of Use : 0...10 bar
Degree of protection : IP 65 to IEC 60 529
Output Signal : DC 0 ...10 V
Power supply : AC 24 V $\pm$ 15 %, 50/60 Hz
Overload Pressure : 8 bars
Medium Temperature : - 15...+ 85 °C
Accuracy : < $\pm$ 0.4 % FS
Approval : CE, C-Tick
Accessories : Mounting kit 1 m copper capillary line,
both ends prefabricated ready for
connection Thread adapters and terminal
nuts
Pressure connection : G1/ 8" or G1 /2" outer threading.
Environmental conditions : Température:-15...85°C; Humidity:<90%
r. h. (non-condensing)

11) Water Flow Switch:

Suitable media : All liquids (not suitable for ammonia)

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Pipe Diameter	: DN 20....200
Switching capacity	: max. AC 230 V, 1A, 26 VA
Degree of protection	: IP 65 per EN 60 529
Output Signal	: Reed contact
Nominal pressure	: 25 bars
Medium Temperature	: -20. ..110 °C
Approval	: CE
Environmental conditions	: Température : -20...80 °C; Humidity: <95 % r. h

12) **Air Velocity Sensor:**

The sensor measures a point, i.e., it measures the values at a specific location in the flow profile.

Principle	: Anemometric measurement
Range Of use	: 0.5 m/s, 0...10 m/s, and 0...15 m/s
Output Signal	: DC 0...10 V or 4.. .20 mA
Operating Voltage	: AC/DC 24 V $\pm$ 20 %, 50/60 Hz
Degree of protection	: IP 42
Medium Temperature	: -20...110 °C
Approval	: CE
Environmental conditions	: Temp: -10...+45 °C; Humidity: <95 % r.h.

13) **Modulating Valves:**

Threaded	: Up to 40mm
Flanged	: > or Equal 50mm
PN Rating	: PN16
Valve Body	: bronze up to 40mm, Grey cast iron for 50mm & above
Δp max across the valve	: Minimum 175Kpa
Two Way/ 3-Way	: As per BOQ
Stem	: Stainless steel
Medium temperature	: +1 . . .95 °C
Environmental conditions	: Temperature: -10...55 °C; Humidity: 5...95% r.h.

14) **Valve Actuator:**

Type	: Electromotoric up to 65mm, Electrohydraulic for 80mm and above
Operating voltage	: AC 24 V $\pm$ 20 % 50 or 60 Hz
IP Rating	: IP54
Type of Signal	: Modulating DC 0.10V

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Nominal stroke : **5.5mm** upto 40mm dia;**20mm** for 50,65,80mm Dia; **40mm** for 100,125,150mm Dia.valves
 Manual Override : YES
 Approval : CE
 Environmental conditions : Temperature: -5. . .50 °C; Humidity: 5...95% r.h.

15) Damper Actuator (FireDamper Actuator On/Off)

Type : Rotary version with spring return
 Operating voltage : AC 24 V $\pm$ 20 % 50 or 60 Hz
 IP Rating : IP54
 Type of Signal : Two-position control
 Torque : 7NM (1.5SQM damper Area) or 18NM, (3SQM Damper Area)
 Runtime for rotary angle 90° : 90s
 Closing time with return spring : 15s
 Manual Override : YES
 Round / square shaft : 6.4...20.5 / 6.4...13 mm (7NM)
 Round / square shaft : 8...25.6 / 6...18 mm (18NM)
 Approval : CE, C-Tick
 Environmental conditions : Temperature: -32...+70°C; Humidity: <95 % r.h.

16) Damper Actuator (Modulating)

Type : Rotary version without spring return
 Operating voltage : AC 24 V $\pm$ 20 % 50 or 60 Hz
 IP Rating : IP54
 Type of Signal : DC 0...10V
 Torque : 5NM (0.8SQM damper Area); 10NM,(1.5SQM Damper Area);15 NM (3SQM Damper Area)
 Runtime for rotary angle 90° : 150s
 Manual Override : YES
 Round / square shaft : 6.4...20.5 mm / 6.4...13 mm (I5NM)
 Approval : CE, C-Tick
 Environmental conditions : Temperature: -32...+70 °C; Humidity: <95 % r.h.

17) Butterfly Valves:

Valve Body : Grey cast iron
 PN Rating : PN 16 to EN1333
 Permissible operating pressure : 1600 kPa (16 bar)

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Angle of rotation : 90° (to end stop)
 Medium temperature : -10. . . 120 °C
 Permissible media : chilled water, low temp hot water, high temp hot water, Brine
 Approval : CE

18) Butterfly Valve Actuator:

Type : Electromotoric rotary actuators
 Type of Signal : 3-position
 Operating voltage : AC 230 V $\pm$ 15%(3-position)
 Operating voltage : AC 24 V $\pm$ 20% (DC 0.10V, Modulating) if included in BOQ
 Type of Signal : DC 0...10V if included in BOQ
 IP Rating : IP54 as per EN 60529
 Positioning times : 120s
 Manual Override : YES
 Approval : CE, UL
 Environmental conditions : Temperature: -15...+55 °C; Humidity: 5.95 % r.h

1.5.6 Installation:

System shall be installed by the controls supplier. BACS vendor shall submit their system architecture schematic with necessary cabling/conduiting drawings for this specific project with the data sheets of the individual components that has been taken into account in the design.

1.5.7 Programming, testing and commissioning:

The entire system shall be programmed, tested and commissioned by the BACS vendor using qualified and trained personnel with necessary service tools/software that has been provided by the factory/principal manufacturer. They shall co-ordinate as necessary with the other equipment supplier, wherever 3rd party integrations are required to successfully bring their data to the BACS Workstation.

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1.5.8 Training

Necessary training shall be conducted by the BACS contractor and shall utilize IOM manuals, data sheets and as-built drawings and necessary documentation; Operator training shall be carried out for a minimum period of six hours including a site familiarization of the facility, various critical functioning of the BACS, data recovery, transfer & storage, text editing and graphics, review of sequence of operation.

BACS Specifications

Preparation of reports and modifying the same for presentation to management, trouble shooting of various important functions, password control; the training shall be done immediately upon system completion and handing over.

One copy of the draft O & M manual shall be submitted for review that will have all the necessary data sheets and drawings (in A3 sizes) immediately upon the commissioning of the project; copies of O&M manual shall be submitted after review and finalization with all the necessary data sheets of the equipment and components supplied and installed with as-built drawings and commissioning data sheets.

1.5.9 Warranty

All component, system software, parts and assemblies supplied by the BACS contractor shall be guaranteed against defects in materials and workmanship for a period of one year from the owner's acceptance date. All corrective software modifications made during warranty service periods shall be updated on all user documentation and on user and manufacturer archived software disks.

Labour to troubleshoot, repair, reprogram, or replace system components including all the cost of the components (landed at site) shall be furnished by the BACS contractor at no extra charge at site to the owner during the warranty period.

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1.5.10 Drawings:

BACS vendor shall submit working drawings for all their works at site including conduiting, cable layouts, cable schedule and DDC panel details; contractor shall also submit all data sheets, graphics layout of the screen for approval; Submittal shall be done within a week of the award of contract with all the necessary details like system architecture, conduiting & cable routing, DDC enclosure panel drawings with all necessary wiring terminations etc., necessary co-ordination shall be done along with other vendors for smooth execution of the project.

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<u>LIST OF APPROVED MAKES – BMS SYSTEM</u>		
S. No.	Equipment/Material	Approved Manufacturer
A	Controller/Software	
1	Central Control BMS Server	IBM/HP/DELL/LG/Samsung/Philips
2	132 Column 240 CPS Printer	HP/Canon/Epson
3	Building management System	Siemens/Carrier ALC/Honeywell Trends
4	Building Management Web Based Server Software	Siemens/Carrier ALC/Honeywell Trends
5	Programmable & Application Specifier Controller (DDC)	Siemens/Carrier ALC/Honeywell Trends
6	System Intergration Units for 3RD Party software Integration	Siemens/Carrier ALC/Honeywell Trends
7	Enclosure for DDC Controller	Rittal/Siemens/Schneider/BCH/Equivalent
B	Sensor & Field Devices	
1	Immersion type temperature sensors	Siemens/Honeywell Trends/ALC/Dwyer/Greystone
2	Ultrasonic BTU Meter/Flow Meter	Siemens/Honeywell/L&G/Schneitech
3	Outside T+RH Sensor	Siemens/Honeywell Trends/ALC/Dwyer/Greystone
4	Differential pressure Switch Air	Siemens/Honeywell Trends/ALC/Dwyer/Greystone
5	Differential pressure Switch Water	Siemens/Honeywell Trends/ALC/Dwyer/Greystone
6	Differential Pressure Sensor-Air/Water	Siemens/Honeywell Trends/ALC/Dwyer/Greystone
7	Room/Duct Type Temp Sensor	Siemens/Honeywell Trends/ALC/Dwyer/Greystone
8	Room/Duct Type Temp + RH Sensor	Siemens/Honeywell Trends/ALC/Dwyer/Greystone
9	Pressure Sensor Water	Siemens/Honeywell Trends/ALC/Dwyer/Greystone
10	Water Level Switches	Veskler/Flipro/ABB/Dwyer
11	Flame Proof Level Transmitter	Veskler/Flipro/ABB/Dwyer

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12	DC Voltage /Current/Power Factor Transducer	L&T/ABB/Meco/Dwyer/Omicron
13	Current Relay	L&T/ABB/Omicron/Meco/Dwyer
14	CO Sensor/CO2 Sensor	Dwyer/MSR Germany/Greystone/Honeywell
15	PH Analyser/ TDS Analyser/ Water Hardness	Hach/Forbes Marshall/ABB/Omicron
C	Wiring & Conduiting	
1	Signal Cable , PVC Insulated , tinned Copper	Polycab/Skytone/Finolex/Bonton/Lapp /Fusion Polymer
2	Lan Cable	D-Link/Belden/Delton/Digilink/Molex/Lapp
3	PVC Conduit of 20 & 25 mm dia	BEC/AKG/RMCON
4	MS/GI Conduit of 20 & 25 mm dia	BEC/AKG/RMCON
5	NETWORKING PASSIVE	PENDUIT/AVAYA/LEGRAND/DLINK
6	Networking- ACTIVE	CISCO/JUNIPER/EXTREME/AVAYA/D LINK
7	LAN PASSIVE (CABLE/IO'S/PATCH CORDS/ FACE PLATE/ JACK PANEL) & OFC COMPONENTS	LEVITON/SYSTIMAX/PANDUIT/DLINK / POLYCOM / LEGRAND

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Electrical works

MATERIAL SPECIFICATION

S/No	ITEM
(A)	MATERIAL SPECIFICATIONS
1	UPS SYSTEM
2	DATA &TELECOM – TELECOM COMPONENTS, FIBER OPTICS CABLE & COMPONENTS
3	<u>A</u>CTIVE COMPONENTS - NETWORKING SWITCH SPECIFICATIONS
4	VIDEO SURVEILLANCE SYSTEM
5	ACCESS CONTROL SYSTEM
6	CABLE TV DISTRIBUTION SYSTEM
7	DG SETS
(B)	SPECIAL CONDITIONS
(C)	LIST OF APPROVED MAKE / BRANDS / MANUFACTURERS
(D)	BILL OF QUANTITIES

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MATERIAL SPECIFICATIONS

1.0 UPS SYSTEM

GENERAL

This specification covers the requirements of three-phase, **UPS System units as per configuration** defined in the Schedule of Quantities.

2.0 DESIGN PREREQUISITE

THE UPS SHALL BE DESIGNED TO MEET THE FOLLOWING PARAMETERS

INCOMING POWER SUPPLY - 3 phase 3 Wire TP

OUTGOING POWER SUPPLY - 3 phase 4 wire TP and N

IN CASE THE STATIC BY PASS IS REQUIRED TO BE ENABLED A SEPARATE INCOMING POWER SUPPLY FOR ONLY THE BY PASS AT 3 PHASE 4 WIRE TP and N SHALL BE PROVIDED.

THE NEUTRAL FOR THE UPS OUTPUT SHALL BE CREATED AT THE UPS AND SHALL NOT BE INTERCONNECTED OR CARRIED FORWARD FROM THE MAINS NEUTRAL.

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3.0	Standards and Codes	The equipment/ system shall conform to the latest version of following Standards and Codes • Indian Electricity Act 2003 • Indian Electricity Rules 1956 • IEC Standard 62040 for UPS Safety: • Europe : EN 500091-1 • USA/Canada: UL1778 - Standards for Uninterruptible Power Supply Equipment. Emission and Immunity: • Europe: EN 500091-2 • USA/Canada: FCC Class

4.0	Environmental Requirements		
4.1		Storage ambient temperature.	(-) 50 to (+) 70 ⁰
4.2		Operating Ambient temperature Continuous operation	Zero to (+) 30 ⁰ C
4.3		Relative Humidity	0-95%, non condensing
4.4		Humidity clause	IEC 7212-1

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5.0	UPS Operation	The UPS shall be suitable for the following operational modes Normal operation: The rectifier/ inverter combination shall operate to continuously regulate and supply power to the critical load. The Inverter/battery charger shall derive power from the AC Input source and supply DC Power to float-charge the battery. Battery: Upon failure of the AC Input source, the critical load shall continue to be supplied by the Inverter and battery without any switching. The Inverter shall obtain its power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the AC Input source. Recharge: Upon restoration of the AC input source, the Inverter/battery charger shall simultaneously recharge the battery and regulate and supply power to the critical load. Energy Economy Mode : - In the event of partial load, energy management software shall switch off the required number of module to maintain the efficiency of complete system at more than 75%. When load increases upto full demand required number of modules shall be switched ON automatically without affecting the operation. Static By pass Mode Transferring the load to mains supply and vice versa without interruption in power to the critical load. No re-booting of microprocessor shall take place after transfer and retransfer of critical load. Maintenance By Pass mode For service and maintenance only and shall be used

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		for supplying the load directly from the mains supply, while the UP1S is isolated for maintenance. • Parallel operation: UPS modules shall be capable of running in parallel operation for increased capacity or for redundant operation. The parallel board shall ensure proper control of parallel units and proper load sharing. One parallel board shall be provided for each unit connected in parallel and each load should have dual data cable to avoid single point of failure.
6.0	UPS safeties	Low Battery Voltage Protection: To prevent total discharge or damage to the battery, the UPS shall transfer to standby operation when the battery voltage reaches a set minimum voltage level (programmable). If AC input source has not returned within 10 minutes after “low battery” shutdown, the UPS shall electronically disconnect DC Power from the battery to avoid deep discharge.
7.0	Technical Parameters	
7.1	General	The UPS Systems shall operate in conjunction with the building electrical system to provide power conditioning, back-up power protection, and power distribution for the critical loads. The UPS shall comply to the following parameters • Double conversion online, • Space vector modulation based technology as defined in IEC standard continuous operation, • Solid-state • The system shall be classified as VFI-SS-III as per IEC 62040 such that UPS output is independent of supply mains voltage and frequency variations • Suitable for parallel redundant system operation on a common DC bus or with separate DC for each unit, and shall provide proportional load sharing.
7.2	Technical	Technical parameters of the system are listed in

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	performance	Annexure-I. Tenderers' confirmation of compliance or otherwise shall be filled in against each item in this annexure.
8.0	Construction and Design Specifications	
8.1	Rectifier	a. Power supply - public mains supply or from the standby generating set. b. Function to rectify input AC to DC and supply both the inverter and the battery system. c. The power section is constructed using SCR/ IGBT technology to achieve system technical specifications as specified. d. Residual ripple of the battery charging current shall be reduced to < 1% as per EUROBAT tolerances by appropriate smoothing devices in the battery link circuit. e. All rectifier regulation and control functions shall be digital to perform the following functions: • Voltage regulation of the DC voltage link circuit with a constant voltage • Rectifier blocking during a mains failure and automatic restart on restoration of the mains supply or after starting the standby generating set; with adjustable soft start characteristic • Rectifier current limiting Battery Charging and monitoring • Automatic charger with I/U characteristic in accordance with DIN 41773 • Battery charging current limiting • Battery boost charge: changeover from 10-hour charging current to 5-hour charging current • Automatic equalizing charge stage when the battery voltage falls below the set value • Temperature-dependent final charging voltage using an additional temperature sensor on the battery unit • Battery trip characteristic to prevent exhaustive discharge with very small battery currents • Continuous battery- and battery-fuse-automatic • Monitoring of the battery and the mains voltage • Temperature-controlled battery charging extends the

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		life of the battery • Battery management and monitoring • The integral battery trip characteristic provides reliable protection against exhaustive discharge • Cyclical battery tests indicate the current status Manual Controls • Manual switch-off of battery charging from the operator control panel should be possible when Running the standby generating set • Manual equalizing charge stage for a period that is individually adjustable by the user in the LC Display of the operator control panel Indications • The battery monitor indicates residual battery capacity and establishes for how long the load can be supplied. A message is generated if this is less than an adjustable residual run time.
8.2	Inverter	a. Power Supply from rectifier in normal operation and battery in the event of a mains failure. b. The inverter generates a three-phase system with controlled voltage and frequency and supplies the load. c. The power section shall be constructed using IGBT technology and output stages of the inverter shall be pulse-width modulated at high variable frequency in order to obtain an exact sinusoidal output voltage, even with a non-linear load, with a frequency accuracy of $\pm 1\%$ for line commutation and $\pm 0,001\%$ for self-commutation. d. Regulation shall be microprocessor-controlled achieve voltage tolerance as specified during 100% load changes. e. It shall be ensured that synchronicity between the reference sine signal and the bypass network is continuously available in the parallel standby position. f. The inverter comprises the following main components: • Fully-transistorised three-phase inverter bridge employing IGBT technology • Output filter capacitors for reducing the distortion

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		factor to < 1% for a linear load and < 3% for a non-linear load. • Outgoing contactor for connecting and disconnecting the inverter output • Inverter controller for monitoring and control
8.3	Static Switch (automatic bypass)	a. Function automatically transfer load without a break to the mains supply in the event of a UPS rectifier/inverter failure or maloperation such that set tolerances are exceeded in any predefined parameter. b. On recovery to normal conditions, the bypass shall automatically return to inverter operation without a break . c. The static switch consists of dual thyristor modules for uninterruptible changeover from inverter operation to bypass operation. d. Manual changeover shall be selectable if required and this too shall be without a break e. The rated output of the automatic bypass shall correspond to the total output of the UPS system. f. In the parallel mode with other UPS modules, each module shall have its own automatic mains bypass. g. The bypass mode must be capable of being disabled if required. h. It shall be possible to provide a separate in feed to the by pass circuit.
8.4	Maintenance Bypass	The maintenance bypass shall supply the load from the bypass source while the UPS is isolated for maintenance. A UPS input, output maintenance bypass and bypass switch shall be housed in the UPS cabinet. Each switch shall be monitored and controlled by the UPS.
8.5	Display and Controls	
8.5.1	Displays	• A 4 x 20 character microprocessor-controlled LCD display unit shall be located at the front of the UPS cabinet. • The display unit shall consist of an alphanumeric display with backlight, an alarm LED, and a touch key pad. • The display unit shall display the following UPS operational status ➤ Normal operation, load power xxx% ➤ Battery operation, time xxx minutes.

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		➤ Bypass operation. ➤ Standby The display unit shall provide following indications • LED indications for load level battery autonomy.
8.5.2	Metered parameters	The unit shall display the metered parameters as listed out in serial no. 10.1 of Technical Parameters And Compliance Statement enclosed as annexure-I
8.5.3	Alarms	The unit shall display a log of all active alarms.
8.5.4	Event Log	The unit shall display a time and date-stamped log of the 250 most recent UPS status and alarm events.
8.5.5	Controls	• Controls as listed out in serial no. 10.3 of Technical Parameters and Compliance Statement enclosed as annexure-I shall be provided on the display unit: • UPS On and Off push Buttons: Momentary UPS on and off push buttons shall be provided in a user accessible compartment. Upon activation of the on push button, the UPS shall automatically connect to UPS output to the critical load. Upon activation of the off push button, the UPS shall remove power from the critical load.
8.5.6	Potential Free Contacts	The UPS shall be equipped with two potential free contacts: Additional potential free contacts as specified in the Schedule of Quantities shall be provided.
8.5.7	Communications Interface	Communication ports listed out in serial no. 10.6 of Technical Parameters And Compliance Statement enclosed as annexure-I. It shall be possible to use two or more ports simultaneously.
8.5.8	Battery Charger temperature compensation	For units with external batteries, the battery charger temperature compensator shall monitor the temperature in the battery cabinet.
8.5.9	Remote UPS Monitoring	It shall be possible to remotely monitor the UPS via either RS-232 / RS-485 or contact closure of the UPS and an existing computer system. The UPS manufacturer shall have available interface kits to support remote monitoring systems listed out in serial no. 10.8 of Technical Parameters And Compliance Statement enclosed as

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		annexure-I.
8.5.10	CNMP Adapter	A Web-Enabled SNMP adapter shall allow one or more network management systems (NMS) to monitor and manager the UPS in TCP/IP network environments. The management information base (MIB) shall be provided in DOS & UNIX formats, The SNMP interface adapter shall be connected to the UPS via the RS232 serial port.
8.6	Battery	
8.6.1	Battery Capacity and calculations	The battery capacity shall be as per Schedule of Quantities. Tenderer shall provide support design calculations for selection of battery sizing and capacity.
8.6.2	Batteries type	• Batteries shall be VRLA type • Design Lifetime: minimum 5 years • DC ripple : Max. 2 %
8.6.3	Battery Function Monitor	Battery function monitor shall monitor and define battery capacity. It shall be possible to program the unit to perform an automatic battery test every 90 days to test the condition of the battery.
8.6.4	Battery disconnect	For units with external batteries, a external MCCB Box shall be provided for protection and isolation of the battery bank from the rest of the system.
8.6.5	Quality Control	During manufacture, each battery cell shall be clearly identified as to the cell type, voltage, and capacity. All cells in the battery should have been tested during manufacture to verify 100% system capacity. Design and manufacture of the batteries shall be done under a quality assurance program controlled and documented by written policies procedures or instruction.
8.7	Fault Diagnosis	For rapid and efficient fault diagnosis an electronic diagnostic system shall be provided comprising • Event recorder which stores the last 1200 events in plain text in chronological order with date and time • Status LEDs on the controller board • DSO (digital storage oscilloscope) software provides the service engineers with a graphical display of all relevant input and output variables at optional test points.

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		The information shall remain permanently stored, even with the power supply switched off.
8.8	Enclosure	The UPS shall be housed in a freestanding enclosure with provision for cable entry for all incoming and outgoing cables from top only. All service accesses shall be from the front. The UPS cabinet shall be powder coated with the manufacturers standard colour. The cabinet shall be equipped for fork truck lifting.
8.8.1	Forced Ventilation	Details of forced ventilation if required shall be furnished alongwith the tender.
8.8.2	Dimensions and weights	Overall dimensions of the UPS systems as also the battery banks shall be furnished. The weight of the UPS units and battery banks shall also be furnished for checking structural floor loading.
9.0	General Specifications	
9.1	Mean time between failures	MTBF shall be Field-proven minimum of 200,000 hours. MTBF calculation for parallel redundant system shall be furnished alongwith the tender.
9.2	Modular Sub-assemblies	For ease of maintenance and service, UPS units shall have field replaceable modular sub-assemblies.
9.3	Materials	All materials comprising the UPS units shall be new, of current manufacture, and shall not have been in prior service except as required during factory testing. The UPS unit shall not contain any PVC components
10.0	Testing at Manufacturers Works	The tests indicated below but not limited to shall be carried out on the final product at the manufacturers works. The Owner/ Consultant reserve the right to witness these tests and appropriate notice shall be given by the manufacturer. The UPS shall be give specific dispatch clearance by the Owner. Consultant after satisfactory completion of all desired tests

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		10.1 Load Tests Measurement of the following parameters para 10.1.1 under varying loads para 10.1.2 indicated below 10.1.1 Parameters • Voltage Regulation Output Line to Neutral voltages (R, Y, B) • Voltage Regulation Output Line to Line voltages (R-Y, Y-B, B-R) • Line Currents (R, Y, B) • Phase Shift (R, Y, B) • Voltage Distorsion (R, Y, B) • Input Power and power factor (R, Y, B) • Output Power and Power Factor (R, Y, B) • Percentage Efficiency 10.1.2 Load Conditions • Load 10% Power factor Unity • Load 25% Power factor 0.9 lagging • Load 25% Power factor 0.9 leading • Load 50% Power factor 0.9 lagging • Load 50% Power factor 0.9 leading • Load 100% Power factor 0.9 lagging • Load 100% Power factor 0.9 leading 10.2 Transfer Power from Mains to Inverter and vice versa • Output Voltage, Output Current and Bypass current oscillograms during Full load Manual Transfer from Mains to Inverter • Output Voltage, Output Current and Bypass current oscillograms during Full load Manual Transfer from Inverter to Mains • Output Voltage, Output Current and Bypass current oscillograms during Full load automatic Transfer from Mains to Inverter • Output Voltage, Output Current and Bypass

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		current oscillograms during Full load Automatic Transfer from Inverter to Mains 10.3 Dynamic Step Loads • Output Voltage and Current oscillograms during dynamic step load from 0% to full load 100% • Output Voltage and Current oscillograms during dynamic step load from full load 100% to 0% load 10.4 Overload Test The following overload tests shall be carried out • Load Rate 110% - Duration 60 minutes • Load Rate 125% - Duration 10 minutes • Load Rate 150% - Duration 1 minute
10.0	Installation and After Sales Service	The tenderer shall have a service organization available consisting of factory trained field service personnel to • Perform installation, testing, commissioning and startup of the equipment at the site. • Perform preventive maintenance, and servicing • offer service support 24 hours a day, 7 days a week, 365 day a year • provide spare parts 24 hours a day, 7 days a week, 365 days a year SLA shall be 2 hr response time and 4 hr resolution time for all the UPS units.
11.0	Annual Maintenance Contract	The tenderer shall offer a comprehensive routine, preventative and breakdown maintenance contracts (AMC) for the UPS and the battery system as defined in Schedule of Quantities.
12.0	Training	The tenderer shall provide training of the Clients operating and maintenance staff at no extra price. A UPS

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		training workshop shall be conducted at the customers site by the tenderer and shall include a combination of lecture and practical instructions. The service training workshop shall include instruction about safety procedures, UPS operational theory, subassembly identification and operation, system controls and adjustment, preventive maintenance, and trouble shooting.

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Annexure-I

UPS SYSTEM

TECHNICAL PARAMETERS & COMPLIANCE STATEMENT
(To be filled up and enclosed alongwith the tender)

Sl No.	Parameter	Requirement as per tender	Compliance or otherwise shall be confirmed against each item by the tenderer
1	Manufacture of UPS	Name & Address of manufacturing units to be indicated.	
2(a)	Technology	Double conversion, pulse width modulated with SCR rectifier and IGBT based Inverter and digitally controlled.	
2(b)		Compliance to IEC 62040	
2(c)		Compliance to classification VFI-SS-III IEC 62040	
2(d)		Insulation group (over voltage) category 2 as per DIN / VDE 0110	
2(e)		Radio interference suppression as per EN 50091-2	
3(a)	Environmental requirement	Storage ambient temperature (-)50 to 70deg C	
3(b)		Operating ambient temperature 0 to 30 deg C	

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3(c)		Relative humidity	
3(d)		Air requirement with 100% load	
3(e)		Protection class IP 20 as per DIN/VDE 0470 Part-II / IEC 529	
4.	System rating		
4.1	System Configurations	As per schedule of quantities	
4.2	Upgradeable	Provision of adding additional UPS units in parallel redundant mode with existing units. Tenderer to indicated maximum number of similar rating of units that can be provided in parallel redundant mode.	
5	Operating Parameters		
5.1	Input voltage rating	380/400/415 V (user selectable) 3 phase, 4 wire + ground (site adjustable)	
5.2	Input voltage range	+15% to (-) 20%	
5.3	Input frequency	50 Hz $\pm$ 10%	
5.4	Input power factor	Greater than 0.9	
5.5	Power Walk in	0-100% within 20 milli sec.	
5.6	Input current distortion	Less than 5% THD If not, please confirm	

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		inclusion of cost of active filter	
5.7	Output voltage rating	380/400/415 V user selectable 3 phase 4 wire + ground	
5.8	Output voltage regulation		
5.8.1		±1% steady state for a static 100% unbalanced load	
5.8.2		Unbalanced load and dynamic at load step 0-100% (±) 3%	
5.9	Output frequency	± 0.05 Hz	
5.10	Output power factor	0.8 minimum	
5.11	Output harmonic distortion		
5.11.1		1% THD maximum and 1% any single harmonic for a 100% linear load.	
5.11.2		2% THD maximum for a 100% non-linear load	
5.12	Crest Factor:	3 : 1	
5.13	Maximum non linear loading	100%	
5.14	Voltage Transient Response		
5.14.1		± 1% for a 50% load step.	
5.14.2		±3% for a 100% load step.	
5.14.3		Recovery Time < 20 msec	
5.15	Phase Displacement		
5.15.1		120 degrees ±1 degree for balanced load	
5.15.2		120 degrees ±1 degree for 50% unbalanced load.	
5.15.3		120 degrees ±2 degree for	

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		100% unbalanced load.	
5.16	Overload Capability		
5.16.1		110% for 60 minute in normal operation.	
5.16.2		125% for 10 minutes in normal operation.	
5.16.3		150% for 30 seconds in battery operation.	
5.16.4		125% continuously in bypass operation.	
5.16.5		1000% for 10 milliseconds in by pass operation.	
5.17	AC to AC efficiency including isolation transformer at nominal input voltage with batteries fully charged in double conversion mode		
5.17.1		At 100% linear load,	
5.17.2		At 75% linear load	
5.17.3		At 50% linear load	
5.18	Operating cost	Calculation for round the clock (7x 24x 365) @Rs. 6/kWH to be furnished.	
5.19	Acoustical Noise with 50% /100% load	< 70 dB(A) of noise, typical, measured at 1 meter from the operator surface.	
5.20	Output wave form	Pure sine wave	
5.21	Heat loses	To be furnished.	
5.22	MTBF of the system	Minimum 200,000 hours	
6.0	Automatic integral static bypass	To be provided	
7.0	Maintenance by	To be provided	

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	pass		
8.0	Automatic restart	Upon restoration of mains AC power, after a mains AC power outage and complete battery discharge, the UPS shall automatically restart and resume supplying power to the critical load and the battery charger shall automatically recharge the battery.	
9.0	Output Isolation Transformer	To be provided. Rating of transformer to be indicated.	
10.0	Display and control		
10.1	Metered parameters		
10.1.1		Input AC voltage (line-to-line, three-phase simultaneous).	
10.1.2		Input AC Current (line-to-neutral, three-phase simultaneous).	
10.1.3		Output AC voltage (line-to-line, three-phase simultaneous).	
10.1.4		Output AC Current (line-to-neutral, three-phase simultaneous).	
10.1.5		Output frequency	
10.1.6		Battery voltage	
10.1.7		Battery Current (charge/discharge).	
10.1.8		Battery temperature	
10.1.9		Output Peak current.	
10.2	Event log	Display a log of status and	

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		alarm events to be provided.	
10.3	Controls		
10.3.1		Set the alphanumeric display language to English	
10.3.2		Display or program the time and date	
10.3.3		Enable or disable the automatic restart feature.	
10.3.4		Transfer to or from static bypass operation.	
10.3.5		Transfer or to from forced battery operation.	
10.3.6		Program the unit for economy operation.	
10.3.7		Program the battery charger	
10.3.8		Calculate battery back-up time	
10.3.9		Test battery condition on demand	
10.3.10		Program the unit to periodically test battery condition.	
10.3.11		Program voltage and frequency windows	
10.3.12		Calibrate metered parameters	
10.3.13		Enable or disable adaptive slew rate. Set maximum slew rate.	
10.3.14		Adjust set points for different alarms.	
10.3.15		Program the remote shutdown contact (enable/disable remote shutdown, polarity display).	
10.3.16		Set the delay for the common fault contact.	
10.3.17		Program the unit for soft start for use with a generator.	

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10.4	Push buttons	ON/OFF push buttons to connect or disconnect critical loads to be provided	
10.5	Potential free contacts	Two contacts to be provided.	
10.6	Communication interface board	For following ports. • RS232 serial port. • RS485 serial port. • COM-PORT with the following normally open or normally closed potential free contacts: - UPS on. - Static bypass operation. - Battery operation - Battery low	
10.7	Charger temp. compensator.	To be provided	
10.8	Remote UPS monitoring kits	To support following systems to be provided • Microsoft windows 3.1, 3.11 • Microsoft Windows 95 • Microsoft Windows NT • OS/2 • Netware 3.12, 4.1, 4.11 • Apple • DECVMS • DG-UX • Silcon Graphics • DEC OSF/1 • SCO UNIX • SCO XENIX • SVR4 • Interface • Unix Ware	

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		• SUN Solaris • SUN OS • IBM AIX • HP-UX	
10.9	Protection	Output fully isolated from input	
		Built in overload	
		Built in short circuit	
		MCCB protection at input	
		Over temperature sensing circuit	
10.10	Alarms	Mains fail	
		Low battery	
		Over load	
		UPS on bypass	
		UPS on battery	
10.11	Software capability	The UPS shall be capable to communicate with network operating system and shall be capable of doing safe shutdown of critical load by means of a auto shutdown software.	
10.12	SNMP / Web management	To be provided as standard	
11.0	Battery parameters		
11.1	Type	Valve Regulated Lead Acid (VRLA) SMF	
11.2	Make	Exide / Panasonic / Global Yuasa / Amar raja	
11.3	Battery charger	Current limiting max voltage 2.33 volts per cell	
11.4	Battery backup	For each unit as per Schedule	

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		of Quantities	
11.5	Max. charging current	10% of AH rating.	
11.6	Battery rating for each UPS in VAH	To be furnished Calculations in support of rating selected to be provided.	
12.0	Overall weight and dimensions		
12.1	Overall dimensions		
	UPS system	To be furnished	
	Battery bank	To be furnished	
	Floor loading kg/m ²	To be furnished	
12.2	Overall Weight		
	UPS system	To be furnished	
	Battery bank	To be furnished	
13.0	Cable connections		
13.1	Cable cross section	• Input • Bypass • Battery • Output	
13.2	Cable connection	From above	
13.3	Accessibility	From front	
14.0	Service and After sales service		
14.1		Availability in city of site location	
14.2		Service support available round the clock.	
4.3		Spare parts available round the clock.	
14.4	SLA	Response time 2 hr time	
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MATERIAL SPECIFICATIONS

1.0 FIBRE OPTIC CABLE AND COMPONENTS

2.0 Data & Telecom – Telecom Components, Fiber Optics Cable & Components

2.1 FIBER OPTIC CABLE AND COMPONENTS

SM = Single Mode & MM = Multi Mode as applicable

Eligibility Criteria for Passive OEM:

- OEM should have at least One RCDD certified person sitting in India whose services can be utilized for the project.
- OEM should have stood at no. 1 position at least once in structured cabling market from last 10 years.(supporting documents required)
- OEM should have members participating in International Standard Bodies like EIA/TIA, ISO/IEC (Supporting documents required)
- OEM should be a member of Telecommunications Industry Association (TIA) Information and Communications Technology (ICT) Companies ICT Green Initiative to support energy efficient environment
- OEM should have technology development program partnership with minimum of 3 Active networking (Switches and Routers) OEM's globally.(Reference required)

Specifications of Fiber Optic Cabling System

Type	Single mode OS2 fiber cabling system from one OEM (Cables + Components)
Networks Supported	1/10G. All passive components must be from same OEM (Copper + Fiber)
Standard Compliance	ITU-T G.652 (A,B,C and D), IEC - 60793-2-50, TIA/EIA 492CAAB

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Performance Testing	Must have ETL verified fiber Channel compliance to ANSI/TIA568 -C.0 for OS2
Warranty	25-year systems warranty; Warranty to cover Bandwidth of the specified and installed cabling system

2.1.1 FIBER OPTIC CABLE

SR. No	Generalize Specification for Single Mode Fiber Cable:
1	All Passive Components should be from the same OEM.
2	The cabling should be certified to have application support warranty for next 25 years.
3	The entire fiber component must support standard applications like 10BASE-X, 100BASE-X, 1000BASE-X, and 10GBASE-X.
4	Passive components should adhere to Standard and references like International Electro technical commission (IEC): 60793-1/60794-1-2 and ISO/IEC 11801:2002.
Fiber Optic Cable Single Mode 6 / 12 Core Outdoor Use - OS2	
1	General Features
	Fiber cable should be Single Mode. Suitable for Outdoor (Duct) Local Area Network Systems.
	Should have excellent Water Proof Layer & Good Moisture Resistance.
	Central Unitube with jelly compound.
	Glass yarns in between Steel tape & Unitube.
	Fiber cable should support standard ITU-T: REC G.652D and Telecordia
2	Mechanical Characteristics
	Fiber cable outer diameter should be 4F to 12F 9 mm +/- 0.3, 24F 15 mm +/- 0.3
	Thickness of the Jacket should be 1.8mm +/- 0.2.
	Should have 3000N/100mm Crush Load (IEC 60794-1-2-E3).
	Bend Radius (IEC 60794-1-2-E11 & E6) should be Short Term 20D in mm and Long Term 10D in mm.
	Proof Test - The entire fiber length is subjected to a tensile stress of 100Kpsi (0.7Gpa). This is equivalent to 1% strain.
3	Geometrical Properties
	Mode field diameter 9.2um ±0.4

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	Clad Diameter 125um ± 0.7
	Cladding Non-Circularity $\leq 1.0\%$
	Mode field Concentricity Error ≤ 0.8 um
	Coating Diameter 245 ± 10 um
	Coating / Cladding Concentricity Error ≤ 12.0 um
4	Chromatic Dispersion
	At 1285 - 1330nm should be ≤ 3.5 ps/nm.km
	At 1270 - 1340nm should be ≤ 5.3 ps/nm.km
	At 1550nm should be ≤ 18.0 ps/nm.km
	Zero Dispersion Wavelength should be 1302nm to 1322nm
	Zero Dispersion Slope should be ≤ 0.092 ps/nm ² .km
5	Other Characteristics
	Maximum Attenuation at 1310nm should be ≤ 0.36 dB/km.
	Maximum Attenuation at 1550nm should be ≤ 0.22 dB/km.
	Maximum Attenuation between 1285-1330nm should be ≤ 0.38 dB/km.
	Point discontinuity at 1310nm and 1550nm should be ≤ 0.1 dB.
	Maximum PMD at 1310nm and 1550 nm should be ≤ 0.2 ps/sqrt km.
	Fiber cutoff wavelength should be 1160nm to 1320nm.
	Cabled Cutoff Wavelength should be ≤ 1260 nm.
	Fiber curl should be at ≥ 4.0 m.
	Macro bend loss should be ≤ 0.5 dB at 32mm Mandrel Diameter, 1 turn and 1550nm wavelength.
	Macro bend loss should be ≤ 0.05 dB at 50mm Mandrel Diameter, 100 turn and 1310nm wavelength.
	Coating Strip Force should be 1.3N to 5.0N.
	Dynamic Fatigue Typical should be ≥ 20 nd.
	Environmental Characteristics
	Operating Temperature should be -20 deg C to +60 deg C.
	Storage Temperature should be -40 deg C to +60 deg C.
	Water Immersion (23 $\pm$ 2 deg C) Induced Attenuation should be ≤ 0.05 dB/km.
	Heat Aging (85 $\pm$ 2 deg C) Induced Attenuation should be ≤ 0.05 dB/km.

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Fiber Optic Cable Single Mode 24 Core Outdoor Use - OS2		
1	Cable Type	24 core, Single Mode, Armored, Loose-tube, Gel filled (Multi tube construction - Minimum 6 Tubes Cable)
2	Fiber Type	Single Mode, 9 / 125, 250 micron primary coated buffers. UL Listed fiber
3	Fiber core must be	As per Telecordia GR20, ITU-T G652D, IEC-60793-2-50, TIA/EIA 492-CAAB
4	No of cores	24 core - Raw fiber core make must be Corning - ISO 11801 - OS2
5	Aarmor	Corrugated Steel Tape Armor
6	Cable Construction Type	BELLCORE GR 20 / IEC 794-1 - Loose tube Corrugated steel tape (0.155mm Min)CSTA provided with FRP Rod as strength members
7	Outer Jacket Construction	High density polyethylene, anti - termite, anti - rodent suitable for direct burial application. Jacket must be UV Stabilized.
	@ 1310nm	< = 0.35 dB/Km
	@1500nm	< = 0.20 dB/Km
	Max Tensile Load	>= 2670 N
8	Maximum Crush resistance	3000N
9	Operating Temperature	-40 deg C to +60 deg C
10	Test Parameters	Must pass the following : - IEC794-1-E1, IEC794-1-E2, IEC794-1-E3, IEC794-1-E4, EIA-455-104, IEC794-1-E7, IEC794-1-E10, IEC794-1-E11, IEC794-1-F5
12	Marking:	The cable has identification marking at regular intervals of 1 meter which will be of permanent nature. The accuracy of the sequential marking will be within +/- 0.5%.
13	Multi Channel requirement	The fiber cable must have been designed to provide optimum performance from 1265nm to 1625nm making it suitable for 16 – channel Course Wavelength Division Multiplexing (CDDM) applications.
14	Cable / Component	All fiber cables and components must be from one OEM/

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2.1.2 12/24/48 PORT SINGLE MODE FIBER LIU

SR. No.	Fiber Optic Light Interface Unit 12/24/48 Port Rack Mount
1	LIU Features
	Fiber optic LIU should include with LIU Box itself, Adapter Panel and Adapters as per requirement.
	Have sufficient slots for accommodate Simplex/duplex 12/24/48 number LC adapters individually.
	Should be 1U 19 inch rack mountable.
	Aluminium base material for light mounting.
	Should have Splice Tray & Cable Spool provision inside LIU.
	Accessory kit consists of cable ties; mounting ear screw earthling and spiral wrap tube.
	Panel cover should be slide out for easy maintenance.
	Removable Rear & Front cover for better access to interior of LIU.
	Should have Rubber fiber slotted bracket built-in, metal splice shelf to protect the fibers.
	Should capable of storing up to 3 meters of 900 μ m tight buffered fiber per adapter.
2	Adapter Plate Features
	Plate made from Cold rolled steel materials.
	Suitable for LC adapters
3	Adapter Features
	All LC adaptors should be Simplex/Duplex type. Adapters should have compact design & high precision, which perform well under various circumstances & maintain good plug retention strength.
	Should have Telcordia, TIA/EIA and IEC compliance.
	The sleeves are basically recommended zirconia split type, the phosphor bronze split
	Insertion Loss should be ≤ 0.20 dB for Zirconia Sleeve
	Sleeve/Ferrule Withdrawal Force should be 2.0N ~ 5.9N for SC/1.0N ~ 2.5N

2.1.2 Fiber Optic Patch Cable (LC-LC)

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SR. No.	Fiber Optic Duplex Patch Cord LC-LC with 3 Meter Length
1	Features
	Fiber optic patch cord with two core fiber cable terminated with SC/LC connector at one end and LC connector at other end.
	The terminated connectors in assemblies are designed to and are compatible with industry standards (EIA/TIA, IEC, ANSI, NTT and Telcordia).
	Should have good geometrical characteristics of apex offset & radius of curvature & fiber height.
	Should be 100% inspected for optical characteristics & fiber end face finish.
	Patch cord length requires – 3 meters Duplex.
2	Performance Characteristics
	Should have Corning single-mode G652D, G657A, G657B optic fiber.
	Typical Insertion Loss should be $\leq 0.2\text{dB}$, Max. 0.3dB .
	Return Loss should be $\text{PC} \geq 45\text{dB}$, $\text{UPC} \geq 50\text{ dB}$, $\text{APC} \geq 60\text{dB}$
3	Mechanical Characteristics
	Should have Ceramic Connector Ferrule.
	Apex Offset should be $< 50\mu\text{m}$.
	Fiber height should be $\pm 100\text{nm}$.
	Repeatability should be $\leq 0.2\text{dB}$, 1,000 times mating cycles.
	Working Temperature should be -40 degree Celsius to $+ 85$ degree Celsius.

2.1.3 Fiber Optic Simplex Pigtail LC with 1.5 Meter Length

SR. No.	Pigtail LC with 2 Meter Length
	Fiber Optic Simplex Pigtail LC With 1.5 Meter Length
1	Features
	Fiber optic patch cord with one core fiber cable terminated with LC connector at one end and open at other end.
	The terminated connectors in assemblies are designed to and are compatible with industry standards (EIA/TIA, IEC, ANSI, NTT and Telcordia).

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	Should have good geometrical characteristics of apex offset & radius of curvature & fiber height.
	Should be 100% inspected for optical characteristics & fiber end face finish.
	Pigtail length requires – 1.5 meter Simplex.
2	Performance Characteristics
	Should have Corning single-mode G652D, G657A, G657B optic fiber.
	Typical Insertion Loss should be $\leq 0.2\text{dB}$, Max. 0.3dB .
	Return Loss should be $\text{PC} \geq 45\text{dB}$, $\text{UPC} \geq 50\text{ dB}$, $\text{APC} \geq 60\text{dB}$
3	Mechanical Characteristics
	Should have Ceramic Connector Ferrule.
	Apex Offset should be $< 50\mu\text{m}$.
	Fiber height should be $\pm 100\text{nm}$.
	Repeatability should be $\leq 0.2\text{dB}$, 1,000 times mating cycles.
	Working Temperature should be -40 degree celcius to $+ 85$ degree celcius.

ALL FIBER NETWORKING COMPONENTS MUST BE FROM A SINGLE MANUFACTURER.

MANUFACTURER SHALL WARRANT THE COMPONENTS AND INSTALLATION FOR A PERIOD OF 15 YEARS WITH TEST RESULTS.

THE MANUFACTURER SHALL HAVE ELABORATE PRODUCT & INSTALLATION SUPPORT SYSTEM WITH TOLL-FREE TELEPHONE CONTACT NUMBERS AVAILABLE 24 X 7.

2.2 TELECOM COMPONENTS

2.2.1 CATEGORY 6 UTP CABLE

SR. No	Minimum Specifications / Functionalities / Capabilities	
1	Type	Unshielded twisted pair cabling system, TIA / EIA 568-C.2 Category 6 Cabling system
2	Network support	Supports ultrahigh speed data networks such as Gigabit Ethernet (1000 Base-T and 1000 Base-TX) and beyond.

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3	TIA / EIA 568-B.1	ETL Verified, UL Listed and UL channel verified- All three Certificates are mandatory
4	IEEE 802.3ab	Zero-bit Error, ETL verified
5	Warranty	25-year systems warranty; Warranty to cover Bandwidth of the specified and installed cabling system, and the installation costs. Site certificate must be issued by OEM
6	Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR for 4-connector channel
7	Manufacturer	All passive cabling must be from same OEM
8	Conductors	23 AWG solid bare copper
9	Insulation	Polyethylene
10	Jacket	LSZH
11	Filler	PE
10	Approvals	UL Listed and UL Channel verified ETL verified to TIA / EIA Cat 6
11	Frequency tested up to	600 MHz minimum
12	Outer dia	6.2 mm
13	Packing	Box of 305 meters
14	shipping weight	305m reel in a box 24kg
15	Impedance	100 Ohms + / - 15 ohms
16	Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR
17	Delay Skew:	45ns Max
18	Impedance:	100 ± 15 Ohms
19	Current Rating:	1.5 A Max
20	Conductor DC Resistance:	66.5Ω/km
21	Voltage:	150VAC
22	NVP	67%
23	Propagation delay:	535ns/100m @250MHz
24	Mutual	5.6nF/100m Nominal

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	Capacitance:	
25	Insulation Resistance:	500 MΩ Minimum
26	Dielectric Strength:	1000 V RMS
27	Contact Resistance:	10 mΩ Max
28	Fire Propagation Test	UL 1581 VW1, IEC 60332.1, EN0256-2-1

2.2.2 CATEGORY 6 MODULAR PATCH PANEL, (24 PORTS – 1U)

SR. No	Minimum Specifications / Functionalities / Capabilities
	UTP angled Jack Panel UL listed, loaded with 24 nos. UTP ports for PCB based IO Jacks (RJ45, TIA-568C Category-6, Installation and Termination of all 24 nos. Category-6 UTP Cable
1	Minimum Specifications
1.1	Shall be loaded with individually replaceable 24 nos. Category-6 I/O Jacks complying with TIA-568.C.2
1.2	Shall be 19" rack mountable , angled and of 1U height & complete with all mounting accessories, UL listed
1.3	Shall have labels for identification of ports
1.4	Should have integrated bonding bar for grounding individual jacks
1.5	Shall be RoHS Compliant
1.6	Shall have minimum 25-Year Extended Product Warranty and System Warranty
1.7	Shall be having a 6 port module construction for better cable dressing at the rear
1.8	Shall have Comprehensive port numbering on front
1.9	Shall be suitable for loading unshielded & shielded jacks for different category systems (CAT 6 & CAT 6A)

2.2.3 CATEGORY 6 INFORMATION OUTLET (IO)

SR.No	Minimum Specifications / Functionalities / Capabilities

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	PCB based Information Outlet (I/O) RJ45, TIA-568C Category-6, Termination of Category-6 UTP Cable, UL listed
1	Minimum Specifications
1.1	Shall conform to Category-6 as per the EIA/TIA-568C.2
1.2	Shall support network line speeds up to 1 Gbps
1.3	Shall have RJ-45 type connector with strain relief for securing IDC contacts from external forces. Shall have a feature to maintain the bend radius of the cable while entering the jack.
1.4	Shall have minimum durability of 750 mating cycles and 200 termination cycles
1.5	Shall Snap into standard faceplates, surface-mount boxes, consolidation point boxes, and Modular Panels.
1.6	Shall be mountable either at 90 degrees (straight) or 45 degrees (angled) in any faceplate.
1.7	Shall be certified by independent labs like ETL/GHMT for compliance to EIA/TIA-568C.2, (Report required).
1.8	Shall be RoHS Compliant.
1.9	Shall have minimum 25-Year Extended Product Warranty and system warranty

2.2.4 FACE PLATE FOR INFORMATION OUTLET (SINGLE / DUAL)

SR. No	Minimum Specifications / Functionalities / Capabilities
	Faceplate Single/ Dual/ Quad Port (Work Area End)
1	Minimum Specifications
1.1	Shall be Single/ Dual/ Quad Port (RJ45) square plate, dimension as per commercially available modular office furniture.
1.2	Shall have spring shuttered front access for preventing ingress of dust
1.3	Shall be supplied with Gang Box of the same size by System Integrator or OEM
1.4	Shall have Write on labels in transparent plastic window along with the plate
1.5	Shall have Screw hole covers along with the plate
1.6	Shall be able to support variety of jacks – UTP and STP information outlets

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2.2.5 CATEGORY 6 PATCH CORD (3 FEET / 7 FEET)

SR. No	Minimum Specifications / Functionalities / Capabilities
	Cat 6 UTP LSZH Patch Cable (Patch cord) , TIA-568C Category-6, UL-listed
1	Minimum Specifications
1.1	Length shall be available in 1/2/3/5 meters or equivalent length in feet as per requirement considered in Estimate Proposal
1.2	All patch cords shall conform to Category 6 & conductor shall be stranded for better flexibility
1.3	Shall support network line speeds up to 1 Gbps
1.4	Shall have RJ-45 jacks with transparent plugs at both the ends
1.5	All patch cords shall be factory crimped and packed
1.6	Shall be RoHS Compliant
1.7	Shall have LSZH jacket for safety measures
1.8	Shall have a transparent / clear boot
1.9	Shall support applications such as 155 Mbps ATM, token ring & VOIP.
1.10	Shall have minimum 25-Year Extended Product Warranty and system warranty
1.11	Colors- Blue, Grey, Yellow, Red & Orange

2.3 19” FLOOR STANDING NETWORKING ENCLOSURES (22U TO 42U USABLE HEIGHTS)

- Construction shall be high strength robust aluminum extruded frame structure with ventilation slots on the sides and top & bottom covers with provision to mount 4 fans on top cover (The Vertical Profiles which forms the frame of the racks are extruded Aluminum type).
 - The Other parts / components except the Vertical Profiles are made of CRCA Steel.
 - CRCA steel used is “IS 513 Gr D” standard
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- The Thickness of the CRCA sheets used for Doors is 1.2mm and for Side Panels is 1mm.
- Fully adjustable 19" equipment mounting angles
- The cabinet shall be made of high impact CRCA steel as per IS 513 Gr D standard and design confirming to DIN 41494 or EIA 310D standards.
- Top/ Bottom Covers and Side panels shall be of sheet steel and powder coated
- Vertical 19" metric panel mounts and door trims shall be of sheet steel and powder coated
- The top and bottom covers shall be provided with number of 50mm and 75mm round cable knockouts for cable entry and cable knockouts shall be edge protected with rubber grommets.
- Perforation - for full / split perforated doors the style should be "Honeycomb" type of perforation for maximum air circulation and stiffness .The perforation area should be 70% of the total door area.
- Cabinet can be capable of dismantling and reassemble at the site.
- Locks Options – options shall be available such as slam lock - common key or unique key, Swing handle lock, Digital Keypad operated locks, Biometric locks.
- Side Panels – must contain slam latches for locking purpose and option of providing slam locks, if required.
- Two pairs of 19" Equipment mounting angles with mounting holes conforming to IEC 2973
- Front Glass door made of toughened glass, tinted with easily detachable hinges.
- Two Pair of slotted vertical cable channel shall be provided at front and back for managing cables

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- Lockable industrial grade castors with foot brakes
- Rack shall be supplied with 4 x 90 CFM fans at top, or optionally 250cfm
- Rack shall be supplied with equipment mounting hardware in pack of 100s such as mounting nuts and screws either 12-24 or M6 type as applicable
- Minimum 2 nos. of 8 x 5/15 Amps power supply sockets, 2 nos. of vertical cable managers and 2 no. of 19" 1U size horizontal cable managers.
- Finish – cabinet shall be black or grey epoxy powder-coated of durable quality. The Powder coating of the racks is as per Nano Technology process with "Zirconium Coating".
- Load carrying capacity – between 500 – 750 kg
- Product must be UL listed and certified for use in Information Technology or Communication Equipment
- Manufacturer must be at ISO standard plants/facility.
- Environmental safety – the rack must be RoHS compliant.
- EIA standard pattern design with 12-24 tapped holes (EIA-310-E compliant) or EIA standard pattern design with 3/8" (9.5mm) square punches for Cage Nuts for mounting
- Dimensions – at least 42U usable height, 800mmW x 1000mmD or 1000mmW x 1000mmD
- Powder Coating –
 - Powder Coating min 80 Microns with scratch resistance properties.
 - Rack to be powder coated with Nano ceramic pre-treatment process using a zirconium coat

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- The Powder coating process should be ROHS compliant
- Powder coating thickness shall be 80 to 100 microns
- The Metal Enclosures/Racks must have unit prices for its individual knocked down items such as - 42U x 800mmW x 1000mmD main frame, glass front door, perforated/vented steel rear door, vented side panels (2), 4 x 90cfm fans tray and fans, 8x5A/15A power strip, 1U Cable Manager, Sliding Shelf, Rotating Shelf, Cantilever Shelf, Heavy Duty Stationery Shelf, Castors, Vertical manager/runner, hardware and any other such accessory. It must be possible to configure the enclosure as per specific needs for a customized installation for every rack.

2.4 19" FLOOR STANDING NETWORKING ENCLOSURES (15U USABLE HEIGHTS)

- Floor Mount single section 2 fan provision 15U 600W*600D
- Should have Minimum 4 Nos. 230v AC Fans 90 CFM
- Should have Minimum 2 Nos. A/C Box 6 Socket 5/15 amp metal
- Should have Minimum 2 Nos. Cable Manager Metal (1U)
- Should have Minimum 2 Nos. 19" Cantilever tray -1U

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3. ACTIVE COMPONENTS - NETWORKING SWITCH SPECIFICATIONS

DESCRIPTION & DESIGN

- It is a high performance networking design keeping in mind real time applications and reliability.
- Key considerations for network are - gigabit connectivity to each user from the server room to various users/departments/devices in a topology consisting of a central switch followed by the distribution and edge/access switches.
- The network shall have a mix of components for supporting PoE+ as well as non-PoE devices.
- A robust fiber optics based backbone is being provided. It shall be based on ring topology using single mode fiber optics cable. The vendor shall ensure that the networking switches shall be populated with the necessary transceivers for achieving this design objective.
- Several applications are proposed to run on this network – IP-based voice communications supporting voice-data-video, network based cameras and storage, integrated audio-video, video conferencing, interactive learning, integrated building management systems and important services integration such as fire detection.
- All Switches and Wireless Access Points be from same OEM.
- All Wireless Access Points asked in RFP should be fully compatible to existing Wireless LAN Controllers.
- All Switches asked in RFP should be fully compatible with existing switches.
- All Switches, Wireless Access Points and Existing Wireless LAN Controllers should have capability to manage, configure and troubleshoot from existing Network management system with a single pane of glass.

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- All SFP and SFP+ should be from same OEM as of switches.
- OEM for equipment like Switches and Wireless Access Points should be listed in the leaders quadrant of the Gartner Magic Quadrant.

**1.1. TYPE-1 SWITCH (DISTRIBUTION SWITCH)
LAYER 3- 24 Ports SFP+**

S/N	Performance Specification / Parameter	Compliance (Yes/No)
1	General Hardware and Interface requirements	
1.1	Switch should have minimum 24 nos. SFP+ ports and should be upgradable to 2 nos. of 40 Gig QSFP ports.	
1.2	Switch should have minimum 480 Gbps of stacking bandwidth with dedicated stacking ports and cables with minimum 4 switch in stack.	
1.3	Switch should have 1:1 redundant internal power supply.	
1.4	Power supply modules, fan modules and transceivers modules should be hot swappable.	
2	Performance Requirements	
2.1	Switch shall have minimum 640 Gbps of switching fabric and 450 Mpps of forwarding rate.	
2.2	Shall have minimum 24K MAC Addresses.	
2.3	Shall have minimum 1K Active VLANs.	
2.4	Shall have minimum 8K IPv4 and IPv6 unicast routes.	
2.5	Shall have minimum 4K IPv4 and IPv6 multicast groups.	
2.6	Shall have minimum 2K IPv4 and IPv6 QoS and Security ACLs.	
2.7	Shall have minimum 24K netflow entries.	
2.8	Shall have static routing, OSPFv2, OSPFv3 and BGPv4.	
2.9	Shall have policy based routing and virtual routing and forwarding feature.	

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2.10	Shall have Protocol-independent multicast (PIM) for IP multicast routing is supported, including PIM sparse mode (PIM-SM)/PIM dense mode (PIM-DM)/PIM sparse-dense mode and source-specific multicast (SSM).	
3	IEEE Standards	
3.1	Should support IEEE Standards of Ethernet: IEEE 802.1D, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1p, 802.1Q, 802.3, 802.3u, 802.3ab, 802.3z.	
4	Quality of Service (QoS) requirements	
4.1	Switch shall have 802.1p class of service, IP differentiated service code point (DSCP) and cross stack QoS.	
4.2	Switch shall have committed information rate, rate limiting and flow based rate limiting.	
4.3	Switch shall have minimum 8 egress queues per port and strict priority queuing.	
5.	System Management and Administration	
5.1	Switch should support SSHv2, SNMPv2c, SNMPv3, NTPv3 and NTPv4.	
5.2	Switch should support AAA using RADIUS and TACACS+.	
5.3	Switch should support port security, DHCP snooping, Dynamic ARP inspection, IP Source guard, BPDU Guard, Spanning tree root guard and IPv6 First Hop Security.	
5.4	Switch should support software upgrades via TFTP or FTP.	
5.5	Switch should support IPv4 and IPv6 ACLs, VLAN , Port and Time based access list with time ranges.	
5.6	Switch shall have Switch Port Analyzer (SPAN) and Remote Switch Port Analyzer (RSPAN) .	
5.7	Switch shall have secure VTP with MD5 protocol or equivalent secure protocol to reduce administrative burden of configuring VLANs on multiple switches in turn eliminating the	

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	configuration errors & troubleshooting in secure manner.	
5.8	Switch shall have Layer 2 trace route for ease of troubleshooting by identifying the physical path that a packet takes from source to destination.	
5.9	Switch shall have Internet Group Management Protocol (IGMP) Snooping for IPv4 and IPv6, MLD v1 and v2 Snooping and Multicast VLAN Registration protocol.	
5.10	Switch shall have per port broadcast, multicast and unicast storm control.	
5.11	Switch shall have Unidirectional Link Detection Protocol (UDLD), Aggressive UDLD, Link Aggregation Control Protocol (LACP), Port Aggregation Protocol (PAgP) and Dynamic Trunking Protocol (DTP).	
5.12	Switch should support Time Domain Reflector (TDR) feature to diagnose and resolve cabling problems.	
5.13	Switch should be Software Defined Networking Ready with Openflow protocol support.	
6	Regulatory Compliance	
6.1	Switch shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards for Safety requirements of Information Technology Equipment.	
6.2	Switch shall conform to EN 55022 Class A/B or CISPR22 Class A/B or CE Class A/B or FCC Class A/B Standards for EMC (Electro Magnetic Compatibility) requirements.	
7	Evaluation Compliance	
7.1	Switch / Switch's Operating System should be tested and certified for EAL 2/NDPP or above under Common Criteria Certification.	
7.2	Switch should be IPv6 Certified/IPv6 logo ready.	

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1.2. TYPE-2 EDGE SWITCH (ACCESS SWITCH)

L2- 24 Ports with 2xSFP+ Uplinks Ports

S/N	Performance Specification / Parameter	Compliance (Yes/No)
1	General Hardware and Interface requirements	
1.1	Switch shall have minimum 24 nos. 10/100/1000 Base-T ports and additional 2 nos. SFP + uplink ports.	
1.2	Switch shall dedicated slots/ports for minimum 48 Gbps of stacking bandwidth with dedicated stacking ports and cables with minimum 8 switch in stack.	
1.3	Switch should support internal/external redundant power supply.	
2	Performance Requirements	
2.1	Shall have minimum 88 Gbps of switching fabric and 65 Mpps of forwarding rate.	
2.2	Shall have minimum 12K MAC Addresses.	
2.3	Shall have minimum 1K Active VLANs.	
2.4	Shall have minimum 1K IPv4 and IPv6 multicast groups.	
2.5	Shall have minimum 1K IPv4 and IPv6 QoS and Security ACLs.	
3	IEEE Standards	
3.1	Should support IEEE Standards of Ethernet: IEEE 802.1D, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1p, 802.1Q, 802.3, 802.3u, 802.3ab, 802.3z, 802.3az.	
4	Quality of Service (QoS) requirements	
4.1	Switch shall have 802.1p class of service, IP differentiated service code point (DSCP) and cross stack QoS.	
4.2	Switch shall have committed information rate, rate limiting and flow based rate limiting.	
4.3	Switch shall have minimum 8 egress queues per port	

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	and strict priority queuing.	
5.	System Management and Administration	
5.1	Switch should support SSHv2, SNMPv2c, SNMPv3, NTPv3 and NTPv4.	
5.2	Switch should support AAA using RADIUS and TACACS+.	
5.3	Switch should support port security, DHCP snooping, Dynamic ARP inspection, IP Source guard, BPDU Guard, Spanning tree root guard and IPv6 First Hop Security.	
5.4	Switch should support software upgrades via TFTP or FTP.	
5.5	Should support 802.1x authentication and accounting with Dynamic VLAN assignment.	
5.6	Switch should support IPv4 and IPv6 ACLs, VLAN , Port and Time based access list with time ranges.	
5.7	Switch Shall have Switch Port Analyzer (SPAN) and Remote Switch Port Analyzer (RSPAN) .	
5.8	Switch shall have secure VTP with MD5 protocol or equivalent secure protocol to reduce administrative burden of configuring VLANs on multiple switches in turn eliminating the configuration errors & troubleshooting in secure manner.	
5.9	Switch shall have Layer 2 trace route for ease of troubleshooting by identifying the physical path that a packet takes from source to destination.	
5.10	Switch shall have Internet Group Management Protocol (IGMP) Snooping for Ipv4 and Ipv6, MLD v1 and v2 Snooping and Multicast VLAN Registration protocol.	
5.11	Switch shall have per port broadcast, multicast and unicast storm control.	
5.12	Switch shall have Unidirectional Link Detection Protocol (UDLD), Aggressive UDLD, Link Aggregation Control Protocol (LACP), Port Aggregation Protocol (PagP) and Dynamic Trunking Protocol (DTP).	
5.13	Switch shall have Time Domain Reflector (TDR) feature to diagnose and resolve cabling problems.	
5.14	Switch should be Software Defined Networking Ready with Openflow protocol support.	

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6	Regulatory Compliance	
6.1	Switch shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards for Safety requirements of Information Technology Equipment.	
6.2	Switch shall conform to EN 55022 Class A/B or CISPR22 Class A/B or CE Class A/B or FCC Class A/B Standards for EMC (Electro Magnetic Compatibility) requirements.	
7	Evaluation Compliance	
7.1	Switch / Switch's Operating System should be tested and certified for EAL 2/NDPP or above under Common Criteria Certification.	
7.2	Switch should be IPv6 Certified/IPv6 logo ready.	

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1.3. TYPE-3 EDGE SWITCH (ACCESS SWITCH)

L2- 24 Ports PoE/PoE+ with 2xSFP+ Uplinks Ports

S/N	Performance Specification / Parameter	Compliance (Yes/No)
1	General Hardware and Interface requirements	
1.1	Switch shall have minimum 24 nos. 10/100/1000 Base-T ports with PoE+ capability and minimum 370W of PoE Power and additional 2 nos. SFP + uplink ports.	
1.2	Switch shall dedicated slots/ports for minimum 48 Gbps of stacking bandwidth with dedicated stacking ports and cables with minimum 8 switch in stack.	
1.3	Switch should support internal/external redundant power supply.	
2	Performance Requirements	
2.1	Shall have minimum 88 Gbps of switching fabric and 65 Mpps of forwarding rate.	
2.2	Shall have minimum 12K MAC Addresses.	
2.3	Shall have minimum 1K Active VLANs.	
2.4	Shall have minimum 1K IPv4 and IPv6 multicast groups.	
2.5	Shall have minimum 1K IPv4 and IPv6 QoS and Security ACLs.	
3	IEEE Standards	
3.1	Should support IEEE Standards of Ethernet: IEEE 802.1D, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1p, 802.1Q, 802.3, 802.3u, 802.3ab, 802.3z, 802.3az, 802.3af, 802.3at.	
4	Quality of Service (QoS) requirements	
4.1	Switch shall have 802.1p class of service, IP differentiated service code point (DSCP) and cross stack QoS.	
4.2	Switch shall have committed information rate, rate limiting and flow based rate limiting.	
4.3	Switch shall have minimum 8 egress queues per port and strict priority queuing.	

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5.	System Management and Administration	
5.1	Switch should support SSHv2, SNMPv2c, SNMPv3, NTPv3 and NTPv4.	
5.2	Switch should support AAA using RADIUS and TACACS+.	
5.3	Switch should support port security, DHCP snooping, Dynamic ARP inspection, IP Source guard, BPDU Guard, Spanning tree root guard and IPv6 First Hop Security.	
5.4	Switch should support software upgrades via TFTP or FTP.	
5.5	Should support 802.1x authentication and accounting with Dynamic VLAN assignment.	
5.6	Switch should support IPv4 and IPv6 ACLs, VLAN , Port and Time based access list with time ranges.	
5.7	Switch Shall have Switch Port Analyzer (SPAN) and Remote Switch Port Analyzer (RSPAN) .	
5.8	Switch shall have secure VTP with MD5 protocol or equivalent secure protocol to reduce administrative burden of configuring VLANs on multiple switches in turn eliminating the configuration errors & troubleshooting in secure manner.	
5.9	Switch shall have Layer 2 trace route for ease of troubleshooting by identifying the physical path that a packet takes from source to destination.	
5.10	Switch shall have Internet Group Management Protocol (IGMP) Snooping for Ipv4 and Ipv6, MLD v1 and v2 Snooping and Multicast VLAN Registration protocol.	
5.11	Switch shall have per port broadcast, multicast and unicast storm control.	
5.12	Switch shall have Unidirectional Link Detection Protocol (UDLD), Aggressive UDLD, Link Aggregation Control Protocol (LACP), Port Aggregation Protocol (PagP) and Dynamic Trunking Protocol (DTP).	
5.13	Switch shall have Time Domain Reflector (TDR) feature to diagnose and resolve cabling problems.	
5.14	Switch should be Software Defined Networking Ready with Openflow protocol support.	
6	Regulatory Compliance	
6.1	Switch shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards for Safety requirements of Information Technology Equipment.	

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6.2	Switch shall conform to EN 55022 Class A/B or CISPR22 Class A/B or CE Class A/B or FCC Class A/B Standards for EMC (Electro Magnetic Compatibility) requirements.	
7	Evaluation Compliance	
7.1	Switch / Switch's Operating System should be tested and certified for EAL 2/NDPP or above under Common Criteria Certification.	
7.2	Switch should be IPv6 Certified/IPv6 logo ready.	

1.4. Stacking Module for Layer 2 Switches

S/N	Performance Specification / Parameter	Compliance (Yes/No)
1	General Hardware and Interface requirements	
1.1	Should have 2 dedicated stacking ports.	
1.2	Should have minimum 48 Gbps of stacking capability with each stacking port.	
1.3	Should have dedicated stacking cables.	
1.4	Should be from same OEM of access switches.	

1.5. 10 Gig SFP Modules (SMF)

S/N	Performance Specification / Parameter	Compliance (Yes/No)
1	General Hardware and Interface requirements	
1.1	Connector types LC	
1.2	10G Base-LR	
1.3	Support 10 Gbps upto 10 KM on SMF	
1.4	Should be from same OEM of switches.	

1.6. 1 Gig SFP Modules (SMF)

S/N	Performance Specification / Parameter	Compliance

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		ce (Yes/No)
1	General Hardware and Interface requirements	
1.1	Connector types LC	
1.2	1000 Base-X	
1.3	Support 1 Gbps upto 10 KM on SMF	
1.4	Should be from same OEM of switches.	

1.7. Wireless Access Point (Indoor)

S/N	Performance Specification / Parameter	Compliance (Yes/No)
1	Access Points proposed must include radios for 2.4 GHz and 5 GHz with 802.11ac Wave 2 with ceiling mount options.	
2	Access point must support flexible Dynamic Frequency Selection across 20Mhz, 40Mhz, 80MHz and 160Mhz wide channels to combat performance problems due to wireless interference. And when radar is detected, it should be able to identify the exact 20 Mhz channel & should be able to block that channel only	
3	Access point must have an additional USB port for future use.	
4	Access point should have 2x10/100/1000 Ethernet and serial/console port.	
5	Must support 4X4 multiple-input multiple-output (MIMO) and three spatial stream.	
6	Must support the physical rate of 2.6 Gbps on 5GHz radios.	
7	The access point should have a capability to enable both the radios on 5Ghz for serving the client thereby increasing the bandwidth capacity to 5.2 Gbps per access point.	
8	Must support minimum of 23dbm of transmit power on both 2.4 Ghz & 5GHz Radio.	
9	The AP must be capable of optimizing the SNR exactly at the position where 802.11a/g/n/ac client is placed (beamforming) without requiring any support or feedback	

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	from clients, hence it should work with all 802.11a/g/n/ac clients.	
10	Should have detecting and classifying non-Wi-Fi wireless transmissions while simultaneously serving network traffic.	
11	Should support configuring the access point as network connected sensor to access any network location covered by the access point to get real-time Spectrum analysis data.	
12	Must incorporate radio resource management for power, channel, coverage hole detection and performance optimization.	
13	Must have -90 dB or better Receiver Sensitivity.	
14	Must support Proactive Key Caching and/or other methods for Fast Secure Roaming.	
15	Must support Management Frame Protection.	
16	Should support locally-significant certificates on the APs using a Public Key Infrastructure (PKI).	
17	Must operate as a sensor for wireless IPS.	
18	Should support non-Wi-Fi detection for off-channel rogues and Containment for both radio while serving the client simultaneously.	
19	Access Points must support Hardware-based encrypted user data and management traffic between controller and Access point for better security.	
20	AP model proposed must be able to be both a client-serving AP and a monitor-only AP for Intrusion Prevention services.	
21	Mesh support should support QoS for voice over wireless.	
22	Must be plenum-rated (UL2043).	
23	Must support 16 WLANs per AP for SSID deployment flexibility.	
24	Must continue serving clients when WAN link to controller is back up again, should not reboot before joining	
25	The APs must support centralized wireless mode with the use of a controller, but the APs must also support operation in autonomous mode without the presence of any controller, when needed.	
26	When operated in remote AP mode, the AP must not disconnect any clients when the connection to the controller fails or in the case the failed connection has been restored again.	
27	When operated in remote AP mode, the AP must be able to	

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	authenticate new users with local radius server directly at the AP itself in case of link failure to controller.	
28	Access point should able to do the spectrum scanning for WiFi and non-WiFi interference for both on-channel and off-channel at all 20Mhz ,40Mhz, 80Mhz and 160Mhz channels	
29	Must support telnet and/or SSH login to APs directly for troubleshooting flexibility.	
30	Must support Power over Ethernet)/ power injectors.	
31	802.11e and WMM	

1.8. Wireless Access Point (Indoor)

S/N	Performance Specification / Parameter	Compliance (Yes/No)
1	Access Points proposed must include radios for both 2.4 GHz and 5 GHz.	
2	AP should support dual band antenna ports.	
3	Must support wall and pole mount options.	
4	Must support 2X2 multiple-input multiple-output (MIMO) with two spatial streams	
5	Must support 802.11ac, Wave 2 and backward compatible with 802.11n standards	
6	Must support 80 MHz wide channels in 5 GHz.	
7	Must support WAP enforced load-balance between 2.4Ghz and 5Ghz band.	
8	Must support upto 29 dbm or higher of transmit power	
9	Access point should 802.11ac, 802.11n and 802.11a/b/g Beam forming	
10	The Wireless Backhaul/Mesh shall operate in 5Ghz	
11	Support Encrypted and authenticated connectivity between all backhaul components	
12	Access point should have multiple wired uplink interfaces including 10/100/1000BASE-T Ethernet autosensing (RJ-45) and a build-in SFP port	
13	Should have console port	
14	Wireless AP should support beam forming technology to improve downlink performance of all mobile devices, including one-, two-, and three-spatial-stream devices on 802.11ac without taking the inputs from client.	

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15	Wireless AP Should able to detect and classify non-Wi-Fi wireless transmissions.	
16	Must incorporate radio resource management for power, channel, coverage hole detection and performance optimization	
17	Access point shall support powering from AC /DC/ PoE/PoE+.	
18	Access point shall support pole, wall and Cable strand mounting options.	
19	The equipment shall support up to 100 MPH sustained winds and 165 MPH wind gusts.	
20	The Access point shall be IP67 and NEMA rated	
21	The Access point shall support operating temperature of - 40 to 65°C	
22	802.11e and WMM	
23	WiFi Alliance Certification for WMM and WMM power save	
24	Must support Reliable Multicast to Unicast conversion to maintain video quality at AP level	
25	Must support QoS and Video Call Admission Control capabilities.	
26	Must support Spectrum analysis including @ 80 MHz	
27	Same model AP that serves clients must be able to be dedicated to monitoring the RF environment.	
28	Should support mesh capabilities for temporary connectivity in areas with no Ethernet cabling.	
29	Must support 16 WLANs per AP for BSSID deployment flexibility.	
30	Must support telnet and SSH login to APs directly for troubleshooting flexibility.	

NOTE: Access Point License Upgrade for Existing WLC

1	License for asked nos. of access points to upgrade for Existing WLC 8510	

1.9. TELEPHONY – IP PbX

NOTE: Upgrade for Existing IP PbX with Hardware SIP Phones.

4.0 VIDEO SURVEILLANCE SYSTEM

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GENERAL

- The Surveillance System Components must be TCP/IP based components working on the same backbone network as the Data Network (LAN).
- Must have mix of IP Cameras as specified in this document.
- Must have the Video Analytics and monitoring software capable of meeting the requirements mentioned in this document. The video analytics has to be server based system with capability to interact with third party VMS systems.
- Must have the network based storage for the specified time and quality as specified.
- Must be scalable in terms of equipment (no. of cameras) as well as features (Analytics).
- True open platform functionality is an essential aspect of this specification; cameras from different OEMs must be able to integrate seamlessly with the specified 3rd party VMS platforms without any loss of features' functionality. Similarly, specified VMS platforms must also be able to integrate with a variety of cameras from different manufacturers.
- Cameras and VMS system shall be from different OEMs to ensure open-ness of solution and to avoid dependency on any single brand.
- Camera vendors shall be direct original equipment manufacturers.
- All cameras must be with wide dynamic range and True D/N capability with removable IR cut filter.

a. Full High Definition (HD), True Day/Night, Network PTZ Rapid Outdoor PTZ Camera

GENERAL REQUIREMENTS:

- The camera shall be a FHD Rapid Dome PTZ camera supporting triple streaming code simultaneously generating and transmitting JPEG and two

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independent H.264 (preferably High Profile) video streams which are different in resolutions and frame rates.

- The camera shall utilize a 1/3-type CMOS/CCD/MOS sensor of approx. 2.0 Megapixel and have a True day/night capability.
 - The camera shall be capable of 360 degree pan rotation and a minimum tilt range of -14° to 180°, designed for ceiling mount operation.
 - The camera shall incorporate a built-in 30X optical, auto-focus zoom lens, and shall have 12X digital zoom capability.
 - The camera shall be able to automatically sequence through the preset positions in programmable sequence, i.e., preset tours.
 - The camera shall produce a high quality picture with a minimum illumination of 0.6 lux in color mode or 0.07 lux in B/W mode at F1.6 or better. It shall offer IR cut filter that switches on/off to enhance low-light sensitivity during B/W mode.
 - The camera shall be equipped with an intelligent Auto Backlight Compensation feature, mask settings and level adjustment capabilities to compensate for backlight by masking brighter areas.
 - The camera shall have feature to transform shadows and dark areas into natural and crisp images in real time.
 - The camera shall support automatic tracing white Balance Adjustment feature.
 - The Camera shall be capable of Advanced Auto Tracking function which will track and follow a single moving indoor target 10 feet from the camera and occupies approximately 10% of the field-of view, in indoor lighting conditions greater than 2 lux. The Advanced Auto Tracking function shall not require an external video processor to control the Network Camera. The Advanced Auto Tracking mode shall be able to be interrupted by manual operator control and automatically resume to its previous tracking mode after operator releases control.
 - The camera shall have the light control mode to select the environment, i.e., indoor or outdoor, in which it is to be used.
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- The camera shall have a 2D and 3D noise reduction capability which reduces AGC noise to provide clear images without motion blur.
 - The network interface shall be via an 8-pin RJ-45 connector, 10Base-T/100Base-TX Ethernet. Both IPv6 and IPv4 shall be supported.
 - The camera shall utilize JPEG and H.264 high profile compression. The maximum resolution for each codec shall be 1920 x 1080.
 - The camera shall be capable of generating HTML code for the video image, allowing for easy web page integration.
 - The camera shall be capable of supporting up to twelve (12) users simultaneously over the network.
 - The camera shall have the capability to stream JPEG and H.264 high profile video in TCP protocol H.264 in UDP (unicast/multicast) protocol.
 - The camera shall incorporate a built-in algorithm for intelligent motion detection capability. The Camera shall offer this feature with four configurable areas per scene and fifteen sensitivity levels adjustment capabilities.
 - The camera shall have 2 way audio feature where the Camera shall have built-in Audio input and output jacks and be capable of transmitting and receiving full duplex audio stream through the same Ethernet connection as the video. The audio shall be encoded using the G.726 or equivalent ADPCM standard.
 - The camera shall support the following network protocols: TCP/IP, UDP/IP, HTTP, HTTPS, RTSP, RTP, RTP/RTCP, FTP, SMTP, DHCP, DNS, DDNS, NTP, SNMP, UPnP
 - The camera shall support HTTPS client authentication.
 - The camera shall be compliant with the industry standard ONVIF (Open Network Video Interface Forum) specification with Profile S support.
 - The camera shall have user configurable port settings.
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- The camera shall have an email (SMTP) notification capability and in addition the Network Camera shall support the scheduled transfer of image data via FTP to an FTP server.
 - The camera shall have privacy zone masking which blocks out unwanted or prohibited area within the video image to protect privacy.
 - The camera software should include the IP Setup (including group camera management) program, Firmware Upgrade Tool, Privacy Masking Tool. The software shall be supplied with the camera as a standard accessory.
 - The minimum electronic shutter setting shall be 1/30 second, and a maximum of 1/10,000 sec.
 - The camera shall have 3 external I/O Terminals which can support alarm inputs/outputs or external Day/Night controls.
 - The camera shall be capable of limiting the bandwidth from 64 kbps to 8 Mbps in H.264 mode and also to operate without bandwidth limitation in JPEG format.
 - The Camera shall be capable of being configured to automatically transmit alarm images transfer via FTP file transfer and/or e-mail. In addition the Network Camera shall support the scheduled transfer of image data via FTP to an FTP server.
 - Terminal inputs, VMD alarms, and alarm commands shall be able to trigger actions such as memory recording, FTP file transfer, e-mail notification, alarm indications on web browser, alarm terminal output, and alarm command.
 - The camera shall also have a storage capability at device itself; it shall provide a memory card slot which can support up to a maximum of 64GB memory card that can cache images in the event of a network failure. The camera shall also support manual/alarm recording to the optional memory card. The camera shall provide notification of the remaining capacity of the memory card.

CAMERA LENS SPECIFICATIONS:

- The camera shall have an integrated minimum 30X auto-focus zoom lens.
 - Focal length shall be 4.3 to 129 mm with field of view coverage of 2° to 62°.
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- The aperture range for the lens shall be F1.6 to F4.7.

VIDEO-ELECTRICAL REQUIREMENTS:

- The camera input power shall be AC24V and PoE+.
- Power consumption for the camera shall be 55 watts maximum.

AUDIO REQUIREMENTS:

- The camera shall support bi-directional audio, using G.711 (64kbps) and G.726 (32kbps) codecs.
- It shall support audio modes OFF / Mic (Line) input / Audio output / Interactive (Half duplex) /Interactive (Full duplex)
- Authentication for Audio Level 1 only / Level 2 higher / All users
- The camera shall have mini-jack connectors accessible via pigtail to support external microphone and active speakers.

MECHANICAL REQUIREMENTS:

- The camera shall have 360° endless pan rotation and -14° to 180° tilt range. The unit shall be designed for ceiling mount operation.
 - The camera shall have maximum pan/tilt speeds of 300° per second in presets and minimum pan/tilt speeds of 0.07° per second. The camera shall have two hundred and fifty six (256) user defined presets.
 - The camera shall be vandal resistant. With IEC 62262 compliance.
 - The camera shall have inbuilt dehumidification feature to remove moisture from the camera.
 - The camera shall be outdoor rated for ingress protection of IP66 rating.
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b. IP BASED INDOOR/ OUTDOOR VERI-FOCAL DOME CAMERAS

SR NOS.	Parameter	Description
1	Image sensor & Minimum Effective Pixels (Resolution) or better	1/3" or better CMOS or Equivalent & Minimum (2 MP) FULL HD (1920*1080)
2	Electronic Shutter	1/30 to 1 / 10000 s or better
3	Min illumination/ light sensitivity (Colour) or better	Minimum 0.5 lux (30 IRE, F 1.2) or better
4	Min illumination/ light sensitivity (B/W)	Minimum 0.01 lux (30 IRE, F 1.2) & 0 Lux on IR on
5	Wide Dynamic Range	Required
6	Backlight Compensation	ON/OFF
7	IR Range	20-30 Meter
8	Focus	Automatic / Manual
9	Automatic Gain Control	Auto / Manual
10	Sharpness, Brightness, Contrast	functionality Required
11	Frame Rate	25 FPS for 1920 x 1080 at H.264 Compression or better
12	Varifocal Lens	3-9 Varifocal lens or better
13	Video	
	Day and Night functionality	Automatic, Color, Mono
	Video Resolution	Minimum 2 MP (1920 x 1080)
	Video Streams	Individually configurable 02 video streams (H.264, MJPEG)
	Intelligent Video	Motion detection, Tampering Alert
14	Compression	
	Dual H.264 (Recording & Viewing)	Required, Live stream 1080p should support min. 25 FPS and recording at lower resolution and frame rate or vice versa as may be configured.
15	Audio	
	Audio support	Required
	Audio Compression	Minimum G.711 or better AAC48KHz or better
	Two-way audio	Required
	Input / Output	01 IN & 01 OUT

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16	Network & Interface	
	Interface	RJ-45 for 10/100 base-T Ethernet
	Upgrade	Through web browser , online, firmware upgrade
	Network Protocols support	IPv4, IPv6, TCP/IP, HTTP, , DHCP, UDP, DNS, SMTP, RTP, RTSP, SNMP, UpnP, NTP, ICMP, IGMP,
	Alarm Event	Events / alerts send via FTP, HTTP, email, Pre-Post alarm video buffering.
	Alarm I/O	1 potential Free 1 In & 1 Out
	Compliance	ONVIF Profile S or betterB39
17	Security	
	Password Protection	Required
	HTTPS encryption	Required
	IEEE 802.1X	Required
18	General	
	Operational temperature °C	0°C to 50 °C
	Humidity	0 to 80% RH non-condensing
	IP rating	IP66, IK10
	Power	PoE (Up to 15.4 Watt) OR eAC24V/ DC12V, 100- 230VAC
	Certifications	CE, FCC, UL
19	Local Storage	
	SD card	Camera should support SD card up to 32 GB and the bidder shall provide a data card of 32GB with the device. In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged or can be merged manually as & when required with the server recording such that no manual intervention is required to transfer the SD card based recordings to server.

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c. IP BASED OUTDOOR VERI-FOCAL IR BULLET CAMERAS

SR NOS.	Parameter	Description
1	Image sensor & Minimum Effective Pixels (Resolution) or better	1/3" or better CMOS or Equivalent & Minimum (2 MP) FULL HD (1920*1080)
2	Electronic Shutter	1/30 to 1 / 8000 s or better
3	Min illumination/ light sensitivity (Colour) or better	Minimum 0.5 lux (30 IRE, F 1.2) or better
4	Min illumination/ light sensitivity (B/W)	Minimum 0.01 lux (30 IRE, F 1.2) or better
5	Wide Dynamic Range	120 dB or higher required
6	Backlight Compensation	ON/OFF
7	Lens	2.8-12mm Motorized Vari-focal DC-IRIS or Automatic.
8	Focus	Automatic / Manual
9	Automatic Gain Control	Auto / Manual
10	Sharpness, Brightness, Contrast	functionality Required
11	Frame Rate	25 FPS for 2560 x 1440 at H.264 Compression or better

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12	Video	
	Day and Night functionality	Automatic, Color, Mono
	IR illuminator	Illuminator may be Internal or external & visibility should be at least 50 m
	Video Resolution	Minimum 2 MP (1920 x 1080)
	Video Streams	Individually configurable 03 video streams (H.265, H.264, MJPEG)
	Intelligent Video	Motion detection, Tampering Alert
13	Compression	
	H.265/H.264/MJPEG (Recording & Viewing)	Required, Live stream 1080p should support min. 25 FPS and recording at lower resolution and frame rate or vice versa as may be configured.
14	Audio	
	Audio support	Required
	Audio Compression	Minimum G.711 or better AAC48KHz or better
	Two-way audio	Required
	Input / Output	01 IN & 01 OUT
15	Network & Interface	
	Interface	RJ-45 for 10/100 base-T Ethernet
	Upgrade	Through web browser , online, firmware upgrade
	Network Protocols support	IPv4, IPv6, TCP/IP, HTTP, , DHCP, UDP, DNS, SMTP, RTP, RTSP, SNMP, UpnP, NTP, ICMP, IGMP,
	Alarm Event	Events / alerts send via FTP, HTTP, email, Pre-Post alarm video buffering.
	Alarm I/O	1 potential Free 1 In & 1 Out
	Compliance	ONVIF Profile S or betterB39
16	Security	
	Password Protection	Required
	HTTPS encryption	Required
	IEEE 802.1X	Required
17	General	
	Operational temperature °C	0°C to 50 °C
	Humidity	0 to 80% RH non-condensing
	IP rating	IP66, IK10

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	Power	PoE (Up to 15.4 Watt) OR eAC24V/ DC12V, 100- 230VAC
	Certifications	CE, FCC, UL

18	Local Storage	
	SD card	Camera should support SD card up to 32 GB and the bidder shall provide a data card of 32GB with the device. In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged or can be merged manually as & when required with the server recording such that no manual intervention is required to transfer the SD card based recordings to server.

d. VIDEO MANAGEMENT SOFTWARE (VMS)

NOTE: Camera License Upgrade for Existing VMS

1	License for asked 120 nos. of Camera points to upgrade for Existing VMS	

e. VIDEO SURVEILLANCE STORAGE

Configuration & Specification for Storage System for Video Surveillance & Recordings on a 24 Hrs x 30Days Basis

1. High Availability

- The Proposed Solution should be a Storage System configured with dual, redundant controllers.
- Each Controller must have Intel Sandy Bridge Quad core CPU per controller or equivalent.

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- The Proposed Solution should be based on real time optimized operating system. (It should not be a general purpose OS)
- The Proposed Solution should support Online Microcode / OS Upgrades.
- Must provide five 9s availability (99.999%)

2. Investment Protection

- The proposed Storage should be none disruptively upgraded to 10G Ethernet, FC and FCoE protocols in future and managed by the same Unified Storage Management Software.
- Storage System quoted by the OEM should be in the Leaders Quadrant in the latest Gartner Magic Quadrant for Midrange and High End Modular Storage Arrays Report.

3. RAM, Scalability and HDD Support

- The controllers should have a minimum 30GB cache spread across dual controllers.
- The Proposed Solution should be scalable to more than 110 Drives in the same Storage Array without upgrading the controllers.

4. Host Connectivity and Storage Backend Disk Connectivity

- The offered storage shall be supplied with at least 8nos x 1G iSCSI Ports across dual Controllers for Host Connectivity.
- The array proposed should have a minimum of 4nos x 6Gbps 2.0 SAS backend architecture.

5. Total Aggregate Bandwidth

- The Proposed storage disk should ensure a minimum total aggregate bandwidth of 2500Mbps on a 90% write & 10% read application environment.

6. RAID Support

- All RAID types should be industry standard RAID and solution to be configured with RAID5 protection
- For every 30 disks, 1 no disk should be configured as Global hot spare.

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7. Management

- The Proposed Solution should support a browser based built in management. It should have SNMP support. (Traps, e-mail, MIB II)

8. Current Required Protocols

- The Proposed Solution must support and be configured for FC & iSCSI protocols.

9. Storage Capacity Requirements

- The Proposed Storage Array should be configured with Minimum 150TB Usable Capacity using SATA/NL-SAS Drives. The usable capacity is defined as the Net storage capacity available for the application stack, after deducting the penalties imposed by storage infrastructure requirements, disk and array formatting, RAID penalties, host OS and file system formatting including overheads or any other penalties which eat away usable disk space. Drives offered for the above capacity shall be of the Highest Capacity offered by the Vendor.
- The same Storage System should support 50% extra growth in terms of performance and capacity for future expansion without any controller upgrade.

10. Regulatory Model

- The device should have the following certifications - FCC Class A or CE Mark for immunity against electromagnetic emissions.

11. Safety and Quality Standards

- The device should have the following quality and safety standard certifications - CAN/ CSAC22.2-60950/UL60950.

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f. SERVERS AND CLIENTS FOR VIDEO SURVEILLANCE SYSTEM

- Server Hardware - Industry standard Intel based platform, rack mountable, redundancy architecture for critical hardware components, licensed Microsoft Server Operating system and requisite user licenses, licensed application suites, 2 x Quad Core Intel® Xeon® 5150, 2.66 GHz, 4 MB Cache, 1333 MHz FSB, 8 GB of RAM, 80 GB of storage or more, Additional hard drive(s) for video storage, Standard SVGA video card, 800 x 600 or higher screen resolution, 10/100/1000 Ethernet Network Interface Card, DVD ROM Drive.
- Client Hardware - Industry standard Intel based platform, rack mountable, redundancy based architecture for critical hardware components, licensed Microsoft Operating system and requisite user licenses, licensed application suites. Intel Core i7 2600 @ 3.4 GHz, 8 GB of RAM DDR3 ,80 GB SATA II hard drive for OS and VMS applications, NVidia GTX 570 or DirectX VA 2.0 compatible card with 1 GB of RAM , 1600 x 1200 or higher screen resolution , 100/1000 Ethernet Network Interface Card ,16x DVD+/- RW Drive.
- Recommended Operating Systems:
 - Microsoft® Windows 7/8 Professional or Ultimate 32-bit/64-bit
 - Server:» Microsoft® Windows Server® 2008 Standard Edition 64-bit » Microsoft® Windows Server® 2008 Enterprise Edition 64-bit
- Browser Requirements» Internet Explorer 6, 7 or 8 (for Web Clients)

g. LED DISPLAY

Sr. Nos.	General Features	Technical Specification Requirement	Compliance Yes / No
1	Screen size (inches)	Min 55 Inches	
2	Aspect Ratio	16:9	
3	Resolution	Min 1920X1080 pixels	
4	Brightness (cd/m2)	Min 350cd/m2	
5	Contrast Ratio	5000:1	
6	Panel Type	LCD VA Panel/E-LED	

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7	Viewing Angle (°)	Min 176°/176°	
9	Video Requirement	Max Input Resolution: 1920 x 1080@60Hz (RGB, HDMI) Video Input: DVI-D X 1, RGB X 1, HDMI X 2	
10	Connectivity Input	Digital : Main : Min HDMI(2), DVI-D (1) with HDCP for all input	
		Analog: Main : Mini D-sub 15-pin x 1 / Stereo Mini Jack (M3) x 1	
		Audio: Main : Audio In (L/R) with DVI-D and PC In	
		External Control: Main : RJ45(1), IR(1), D-sub 9-pin x 1, RS-232C Compatible	
11	Connectivity Output	Analog : Stereo Mini Jack (M3) x 1 or Equivalent	
		Audio : External Speaker - 20 Watt	
		External Control: RS232C(1), IR(1)	
13	Special Features	Display Zoom, Multiscreen, Orientation: Portrait/Landscap	
14	Standard & Certification	IEC60065, CISPR22 Class-B or Equivalent	
15	Power Requirement	Power Supply: 220-240V, 50/60Hz, Built-in Power, Power Consumption Typ.: Min Saving: 150W	

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5.0 ACCESS CONTROL SYSTEM - SPECIFICATIONS

5.1 Technical Specification for 16K Contactless Smart Cards

Sr.No	Technical Specifications Desired
1	The contactless smart card shall function as an access control card, used with access readers to gain entry to controlled portals and to hold identification information specific to the user.
2	The contactless smart card shall be a passive device, with an operating frequency of 13.56 MHz, and shall meet ISO 15693 and ISO 14443B2
3	The card shall contain a 64 bit unique serial number
4	Memory -16 Kbits (2Kbytes) EEPROM memory configured with 2 OR 16 application areas
5	Each application area shall contain a unique 64 bit diversified authentication key to reduce the risk of compromised data or duplicate cards. The contactless smart card and card reader shall require matching keys in order to function together. All radio frequency (RF) communication between card and reader shall be encrypted, using a secure algorithm
6	Wiegand card data, up to 84 bits in length, shall be encoded in Application Area 1 for use with access control systems
7	There should be compatibility with all available Access control formats (E.g. 26-bit, 32, 35-bit, 37-bit, 56-bit, and HID Corporate 1000 formats).
8	The contactless smart card will support programming and updating of custom applications after issue, using an appropriate reader/writer
9	Dimensions as per ISO 7810 specifications
10	Typical contactless smart card read ranges shall be 2.0-3.0" (5.0-7.6cm) with the proposed Reader.
11	Material and construction: PVC card materials. Card surface shall be glossy and of a material compatible with direct to card dye-sublimation or thermal transfer printing. Card construction shall meet durability requirements of ISO 7810
12	Operating Temperature: -40oF to 158oF (-40oC to 70oC)
13	Operating Humidity: 5% to 95% relative humidity non-condensing
14	Warranty of contactless smart cards shall be lifetime against defects in material and workmanship

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5.2 Technical Specification for Contactless Smart Card + Fingerprint Biometric Reader

Sr.No.	Technical Specifications Desired
1	Contactless smart card readers shall comply with ISO 15693, ISO 14443A (CSN), and ISO 14443B and shall read credentials that comply with these standards
2	The fingerprint reader shall read a fingerprint template(s) from an iCLASS credential and verify with a live finger placed on the fingerprint sensor, once verified, a pre-programmed access control identification number is transmitted back to the host panel, giving an audible and visual indication of a successful authentication
3	The fingerprint module shall be manufactured by Sagem and have the ability to withstand up to 10 k volts of EDS and continue uninterrupted operation
4	A 3x4 keypad which can provide supplemental PIN operation. The keypad shall provide the most popular industry formats including 4 bit or 8 bit bursts for every key press
5	Reader Should be configured as a dual-purpose reader/enroller, single purpose enroller-only or reader-only
6	Display: The backlit graphical LCD display offers a 60 x 18 mm viewing area, 120 x 32 resolution. It is factory preset to provide written instructions to the user.
7	Fingerprint sensor type: Optical
8	Resolution: 500 dpi, 256-bit gray scale, 18 x 22 mm sensor area
9	Timing: Card read < 0.5 sec Fingerprint capture < 2 sec, typical 1 sec Verification of captured finger < 1 sec
10	FAR < 0.01%, FRR < 0.01%
11	Data security with Credentials shall use 64-bit authentication keys to reduce the risk of compromised data or duplicate cards
12	The contactless smart card reader shall provide the ability to change operational features in the field through the use of a factory-programmed command card. Additionally, firmware may be updated by flashing the reader. Command card operational programming options shall include: a. Output configurations b. LED & Audio configurations c. Keypad configurations

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13	Contactless smart card readers shall provide the following programmable audio/visual indication: a. LCD display provides user feedback of reader operation b. An audio transducer shall provide various tone sequences to signify: access granted, access denied, power up, and diagnostics. c. A high-intensity light bar shall provide clear visual status (red/green/amber) that is visible even in bright sunlight.
14	Typical contactless smart card read range shall be 2" – 3" (5.0 – 7.6 cm)
15	Material: UL94 Polycarbonate
16	Operating voltage: 9 – 12 VDC, reverse voltage protected. Linear power supply recommended.
17	Current requirements: (average/peak) 350/520mA @ 12 VDC
18	Contactless smart card readers shall meet the following certifications: a. UL 294 b. Canada/UL 294 c. FCC Certification d. Canada Radio Certification e. EU and CB Scheme Electrical Safety f. EU – R&TTE Directive g. CE Mark (Europe) h. C-Tick (New Zealand/Australia/Taiwan)
19	Operating temperature: 32 to 113 degrees F (0 to 45 degrees C)
20	Operating humidity: 5% to 95% relative humidity non-condensing
21	Weatherized design suitable to withstand harsh environments
22	Warranty of contactless smart card bio reader shall be one year warrantee against defects in materials and workmanship

5.3 Technical Specification for Contactless Smart Card Reader

Sr.No	Technical Specifications Desired
1	The contactless smart card reader(s) shall be designed to securely read, interpret, and authenticate access control data from 13.56 MHz contactless smart card credentials
2	Customized security protection through support of the device-independent Secure Identity Object™ (SIO) portable credential methodology to provide enhanced security and performance features

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3	Unique read selection that enables reading of the Secure Identity Object™ (SIO) and standard iCLASS technologies
4	Participates in an advanced, bounded and trust-based security system utilizing the Trusted Identity Platform™ (TIP) architecture
5	Guaranteed compatibility to read all HID data formats and ensuring card-to-reader interoperability in multi-location installations and multi-card and reader populations when used with Genuine HID products
6	Backwards compatibility with legacy 13.56 MHz contactless smart card access control formats (E.g. 26-bit, 32, 35-bit, 37-bit, 56-bit, and HID Corporate 1000 formats). Compatibility across the product line shall be assured without the need of special programming
7	The contactless smart card reader shall be Secure Identity Object™ (SIO) enabled. The contactless smart card reader platform shall support the standards-based, device-independent Security Identity Object™ (SIO) portable credential methodology to ensure data authenticity and privacy. The SIO shall be able to reside on any number of identity devices, including iCLASS SE, MIFARE Classic SE, and MIFARE DESFire EV1 SE credentials
8	The contactless smart card reader shall be a certified end-point (TIP Node) within a Trusted Identity Platform™ (TIP) infrastructure. TIP shall provide a scalable, on-demand, secure identity delivery system that validates, registers and provides lifecycle management support for certified trusted end-point contactless smart card readers
9	The contactless smart card reader shall increase security by narrowing the possibility of unwanted configuration changes and denials of service. The contactless smart card reader shall utilize TIP-enabled secure configuration of contactless smart card readers with counters and uniquely diversified configuration cards
10	The contactless smart card reader shall utilize Secure Element Technology™ to protect keys and cryptographic functions to the international standard Evaluation Assurance Level (EAL) 5+.
11	The contactless smart card reader shall be configurable to utilize Velocity Checking to provide breach resistance against electronic attacks that invoke multiple improper authentication attempts
12	The contactless smart card reader shall be configurable to provide multiple hierarchical degrees of key compatibility for accessing the smart card access control data.
13	The contactless smart card reader shall simplify troubleshooting through Anti-passback Notification that the card has already been processed and it must be removed from reader field temporarily prior to processing again
14	The contactless smart card reader shall provide enhanced user feedback options through the use of clear and bright tri-colored LEDs configurable to

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	support any three color combinations (RGB - Red, Green, and Blue).
15	The contactless smart card reader shall enable backwards compatibility with legacy 13.56 MHz access control formats (E.g. 26-bit, 32, 35-bit, 37-bit, 56-bit, and HID Corporate 1000 formats).
16	The contactless smart card reader manufacturer shall provide global, off-the-shelf availability
17	Contactless smart card reader shall allow the reader firmware to be upgraded in the field without the need to remove the reader from the wall through the use of factory-provided Programming Cards
18	Contactless smart card reader shall allow for secure installation practices through mounting methods utilizing tamper resistant screws
19	Contactless smart card reader shall provide the ability to transmit an alarm signal via and integrated optical tamper switch if an attempt is made to remove the reader from the wall. The tamper switch shall be programmable to provide a selectable action to provide a selectable action compatible with various tamper communication schemes provided by access control panel manufacturers. The selectable action shall include one of the following: 1. The reader open collector line changes from a high state (5V) to a low state (Ground). 2. During a tamper state, the "I'm Alive" message is inverted.
20	Contactless smart card reader shall provide ability of an on-line "I'm Alive" message so the reader's functional health can be monitored at all times when paired with a compatible access control panel
21	The contactless smart card reader shall provide customizable reader behavior options either from the factory, or defined in the field through the use of pre-configured command cards. Reader behavior programming options shall include: 1. Audio/Visual Templates for card reads, and attack detection. 2. Velocity Check timing and thresholds 3. Optical tamper actions 4. RF scan delay 5. Hold Mode 6. Intelligent Power Management 7. Key diversifiers 8. Key rolling 9. CSN output configuration 10. Data Model prioritization 11. Default LED color

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	12. Hold mode
22	Contactless smart card reader shall provide the following programmable audio/visual indication: 1. An audio beeper shall provide various tone sequences to signify: access granted, access denied, power up, and diagnostics. 2. A high-intensity red/green/blue (RGB) light bar shall provide clear visual status. The light bar shall provide uniform distribution of light eliminating individual bright spots
23	Contactless smart card readers shall provide the following enhanced performance features a. The contactless smart card reader shall enable user prioritization of High-frequency/High-frequency credential reads. Technology prioritization shall synchronize a site's credential technology read priority to the access panel configuration while reducing unintended credential reads. b. The contactless smart card reader shall have the ability to provide consistent optimal read range by implementing an auto-tune function that adjusts for manufacturing tolerances to enhance consistency of performance from reader to reader. c. The contactless smart card reader shall be field programmable to provide secure upgrades for migration and extended lifecycle. d. The contactless smart card reader shall be designed as a system to provide optimal read range and read speed for increased access control throughput.
24	Contactless smart card reader shall provide enhanced environmental and sustainability features. a. The contactless smart card reader shall reduce power consumption by as much as 75% through the use of Intelligent Power Management (IPM) technology. b. The contactless smart card reader shall be manufactured with 10% recycled material to provide the potential of LEEDS building credits in new construction projects. c. Contactless smart card reader shall be fully compliant with Restriction of Hazardous Substances directive (RoHS) restricting the use of specific hazardous materials found in electrical and electronic products. The substances banned under RoHS are lead (Pb), mercury (Hg), cadmium (Cd), hexavalent chromium (CrVI), polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE). d. Contactless smart card reader shall be manufacturers with 10.5% (Pigtail)

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	and 11% (Terminal Strip).
25	Contactless smart card reader shall comply with the following 13.56MHz-related standards to ensure product compatibility and predictability of performance: a. ISO 15693 b. ISO 14443A c. ISO 14443B
26	Contactless smart card reader shall be suitable for global deployment by meeting worldwide radio and safety regulatory compliance including: a. UL294 (US) b. cUL (Canada) c. FCC Certification (US) d. IC (Canada) e. CE (EU) f. C-tick (Australia, New Zealand) g. SRRC (China) h. MIC (Korea) i. NCC (Taiwan) j. iDA (Singapore)
27	Contactless smart card reader shall provide the following typical contactless read ranges: a. 2.8" (7.1 cm) reading SIO on iCLASS SE Card b. 1.6" (4.1 cm) reading SIO on MIFARE DESFire EV1 SE Card c. 2.6" (6.6 cm) reading SIO on MIFARE Classic SE Card d. 1.5" (3.8 cm) reading SIO on iCLASS SE Tag or Fob e. 1.2" (3.0 cm) reading SIO on MIFARE Classic SE Tag or Fob
28	Operating voltage: 5 – 16 VDC, reverse voltage protected. Linear power supply recommended
29	Current requirements and power consumption: 1. 45 mA (Standard Power Mode) 2. 25 mA (Intelligent Power Management Mode) 3. 75 mA (Peak Current Draw) 4. 0.7 W (Standard Power Mode @ 16VDC) 5. 0.4 W (Intelligent Power Management Mode @ 16VDC)
30	Material: UL94 Polycarbonate
31	Operating temperature: -31 to 150 degrees F (-35 to 65 degrees C)
32	Operating humidity: 5% to 95% relative humidity non-condensing
33	Storage Temperature: -67 to 185 degrees F (-55 to 85 degrees C)

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34	Weatherized design suitable to withstand harsh environments with a certified rating of IP55
35	The contactless smart card reader shall provide a lifetime warranty against defects in materials and workmanship

5.4 Technical Specification for Access Control System Controller

Sr.No.	Technical Specifications Desired
1	Should Provide an open architecture family of interface devices that provides a complete and fully functional hardware/firmware infrastructure for access control software host systems.
2	The controllers shall communicate with a host system by using industry standard TCP/IP protocol, over 10/100 Mbps Ethernet, Internet.
3	The controller should be based on ARM 9260processor 200 MHz Microcontroller running the Linux Operating System
4	The controller should have 2G NAND flashmemory with 64m SDRAM which gives 99999 transactions & 125000 card holder which can expand upto 250000 card holders
5	A networked controller / reader interface that supports two Wiegand or Clock and Data card / PIN readers, and provides a TCP/IP connection to a Host system.
6	TCP/IP connections shall be used for high speed connection to host and connectivity to existing and new Ethernet network cabling.
7	Fully featured access control hardware and firmware infrastructure for host-based access control software applications.
8	The products shall not be a proprietary product of the manufacturer of the host access control software application, and must have the ability to migrate to an alternative manufacturer's host access control software application by remote reconfiguration or firmware upgrade and without intervention from the original controller manufacturer. Controller Should Support Multiple Applications from various manufacturers.
9	Should provide full distributed processing of all access control functions. The unit shall provide fully functional off line operation when not actively communicating with the host access control software application; performing all access decisions and event logging. Upon connection with the host access control software application, the networked door controller or networked controller/reader shall upload all buffered off-line transactions (minimum of 5,000) to the host software.
10	Should provide diagnostics and configuration operations through connection

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	to a local laptop computer
11	Products shall be warranted against defects in materials and workmanship for 18 months
12	Visual Indicators - Power LED to indicate that sufficient DC voltage is being provided to the unit. solid green to indicate successful communications to downstream devices, red flash to indicate a failed communications attempt, solid red to indicate no communications.
13	The Controller shall be compatible with the following: 1. Microsoft Windows 7, XP and any other Host System supporting TCP/IP networked interface 2. TCP/IP (using applicable IEEE standards) 3. Category 5 Cable, using RJ-45 connectors 4. Wiegand Standard or Long Card Formats or C&D Output Readers (up to 128-bit data) 5. ODBC Systems and any other data storage systems whose data can be translated for transport over TCP/IP interface. 6. Host systems with HID web browser API or DLL software installed
14	The controller should be able to report supervised inputs/alarms with 255 priorities
15	The Controller shall be designed to have a lifetime of ten years based on normal usage levels and environmental conditions. This shall include components such as batteries, real time clocks and non-volatile memory
16	Regulatory Compliance a. UL Standards 1. The Controller should provide input monitoring and reporting functions meeting applicable UL 1076 Proprietary Burglar Alarm System standards as a UL Recognized system component, including specific requirements for speed of reporting time, verifying communications with field hardware, detection of substitution of similar field hardware device, four-state alarm monitoring. 2. The Controller Should meet applicable UL294 Access Control standards as a UL Recognized system component, including criteria for false accepts/rejects, attack resistance and electrical safety. b. CE Mark - The Controller should meet European CE Mark standards for electrical safety and RF emissions.

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17	The Controller Should have communications Indicator LEDs, which flash whenever communications occur between the interface unit and an upstream device. The communication LED flash codes are as follows: 1. Communications TO the upstream device is green flashing. 2. Communications FROM the upstream device is red flashing. 3. Absence of one color indicates that communications are occurring in one direction only. 4. Absence of flashing indicates a communications failure.
18	The Controller Should have a voltage indicator LED on the interface unit, which shall indicate that sufficient DC voltage is being provided to the unit.
19	The Controller should be capable of using beepers in the connected (HID and possibly other) readers to indicate door held/forced, PIN Retry Error, Tamper Alarm, Communications Failure, AC Power Failure, Battery Failure, etc.
20	The Controller should include a dedicated input for enclosure tamper configurable to be supervised or unsupervised.
21	The Controller should have configurable inputs for AC Failure and Low Battery/ Battery Presence, which are compatible with Supervised DC supplies which monitor the AC Input Voltage and Battery Voltage and report status using two dry contact relay outputs.
22	Mounting a. The Controller should be capable of mounting on any flat wall surface, using the appropriate fasteners. They shall be directly mountable in their standard plastic housings, or they shall be mountable in a stacked configuration on non-conductive standoffs inside a customer supplied utility box. b. The Controller should be installed indoors, inside a secure area, such as in a utility closet or on a wall above a suspended ceiling. c. The Controller should include 4 mounting screws and an installation manual.
23	The Controller should work using customer-supplied 12VDC regulated Power Supply, with Battery Backup and Input Surge protection, and AC Failure and Battery Low contact outputs.
24	The Controller should be be capable of operation from 0° to 50° C (32° to 120° F), 0-95% RH, Non-condensing.
25	The Controller should be capable of installation in an indoor environment, or otherwise protected in a NEMA-4 Rated Enclosure.

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26	General Functional Description 1. The Access Controller should control cardholder access to secured areas. 2. The Access Controller should monitor and report access control activity. 3. The Access Controller should monitor and report input status changes pertaining to intrusion alarms. 4. The Access Controller should monitor and report the integrity of all network devices, circuits and communications. 5. The Access Controller should control various electrical and annunciation devices. 6. The Access Controller should enable a host system to allow a human operator to acknowledge and respond to alarm conditions. 7. The Access Controller should enable a host system to allow a human operator to configure the network and obtain configuration and historical reports. 8. The Access Controller should enable a host system to allow an operator to manually unlock and lock doors, and to shunt or unshunt input points.
27	Functional Description for Access Control Access Schedules and Holidays a. The Controller should provide access control based on access groups, which shall consist of groups of readers and schedules which can be named and assigned to cardholders. b. The Controller should allow cardholder to have one or more access control schedules consisting of a valid time period for valid days of the week, for a given reader (or group of readers). c. The Controller should provide a time schedule for each week day (Sunday through Saturday) and the cardholder shall also have a time schedule for up to 255 Holiday Groups, allowing Holidays to be assigned different schedules than those normally used for a given day of the week. d. The Controller should allow a list of Holiday calendar dates and types to be entered into the networked controller. e. The Controller should allow any card to have a start and end date in addition to access groups such that the card shall be denied access outside the start-end period. f. The Controller should Schedules to be assigned to other functions such as input group suppression or output group activation

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28	Door Monitoring and Control a. The Access Controller should provide configurable inputs to monitor and report door position to the host. b. The Access Controller should suppress door monitor input alarm reporting during a valid access transaction for the duration of the lock relay time plus the alarm shunt time. c. The Access Controller should interpret Door Forced and Door Held Open as two distinct alarm conditions. d. The Access Controller should send status change data to the Host in real time, if the Door Monitor senses a forced door (a door opened without using a card, PIN, REX or Host command), and, if configured as a Forced Door Alarm, the local Aux Relay shall be activated until turned off from the Host (even if the door is re- closed). e. The Access Controller should maintain a forced door alarm until cancelled by the host. f. The Access Controller should have a configurable delay for door forced reporting. g. The Access Controller should send a Door Held status change to the Host, if the Door Monitor senses a door held open beyond the relay + shunt time + reporting delay time, and (if configured as a Door Held Alarm) the local Aux Relay shall be triggered and latched until the door is re-closed. VertX shall provide a user defined reporting delay time to reduce false alarms. h. The Access Controller should have a configurable delay for door held reporting.
29	Local Relays a. The controller should have one relay per reader, which defaults to be a door lock relay, but shall be configurable as a general purpose relay. b. The controller should have a second relay per reader, which can be configured for one of the following functions: off, door forced alarm; door held alarm, door forced and door held alarm, communication failure alarm, or general purpose. c. The controller should allow the Aux Relay to be configured to control an annunciator for both Door Held and Door Forced conditions by providing two different default annunciation patterns: for Door Held the relay shall be activated 100ms every 2 seconds, and for Door Forced the relay shall be activated for ½ second on, ½ second off. d. The controller should allow the Aux Relay to be configured as a Shunt relay, such that it shall bypass a door contact connected to a separate alarm system during the Access/Alarm shunt time period.

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30	Extended Access Time a. The controller should be capable of providing configurable normal and extended access times. b. The controller should be configurable such that any designated card may have extended access time at readers also configured to provide extended access times. A second relay may also be actuated to control a powered door opener.
31	Reader Beeper Control a. The controller should be capable of causing the readers to beep upon detecting a door forced or door held condition. b. The controller should be capable of causing the readers to emit a distinctive beep upon denial of access. c. The controller should be capable of causing the readers to emit a distinctive beep upon entry of an invalid PIN. d. The controller should be capable of using the readers beeper and LED to annunciate AC Failure, Battery Failure, and Enclosure Tamper alarm states.
32	Parity Checking - The controller should perform parity checking on card data, and shall notify the network device on parity failure.
33	PIN Processing a. The controller should allow Card/PIN readers to be configurable to require Card+PIN, PIN only, Card or PIN, or Card only. b. The controller should provide PIN Suppression schedules, so that an HID or certain other PIN/Card readers can operate in Card-only mode on a scheduled basis, such as during the day when higher security is not required. c. The controller should be capable of signaling the cardholder with an alternating red/green LED on an HID or certain other card readers when a Card is presented and PIN is also required. d. The controller should invoke a configurable PIN Error lockout period of up to 99 seconds, which shall prevent the reader from being used after a configurable number of incorrect PINs have been attempted.
34	Anti-Tailgating - The controller should be capable of invoking the Relay Timer and Alarm Shunt timer to be cancelled 100 ms after the Door Monitor input senses that the door is closed.
35	Facility Code Only - The Controller should be configurable to provide access on the basis on facility code only when communications with the network interface are lost; alternately the reader interface shall be configurable to deny access to all when communications with the network interface are lost.

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36	REX Processing a. The controller should include a Request to Exit (REX) Input for each controlled door, which is used to suppress the Door Monitor alarm, and optionally, unlock the lock for an authorized entrance or exit without the use of a card. b. The controller should allow the Green LED at the associated reader to be suppressed during REX activation, to avoid alerting potential intruders when the door has been unlocked from the inside
37	Anti-Passback a. The controller should allow Anti-Passback to be implemented in one of two modes: Real and Timed. b. When implemented in Real mode: 1. The controller should provide that when Real Antipassback is implemented, each cardholder's APB status can be defined as IN, OUT, UNDEFINED and EXEMPT. 2. The controller should allow an area to be defined by reader-controlled entrances and exits. Readers may be designated as IN or OUT readers. 3. The controller should deny access to a card which is re-used at an IN reader prior to badging at an OUT reader. Alternatively, the family of products can be configured to grant access while logging an Anti-Passback violation at an IN reader, subsequently denying access when the cardholder attempts to exit the Anti-Passback area at an OUT reader. c. When implemented in Timed Anti-Passback mode: 1. The controller should provide timed antipassback, which prevents a card from being used in a reader (or group of readers) until a configurable timer expires. 2. The controller should allow any cardholder to be designated exempt from Anti-passback.
38	Area Control a. The controller should provide Area Control, such that readers which control cardholder access or egress to a contiguous area and/or perimeter are logically associated in software. b. The controller should keep track of which cardholders have entered or left an area. c. The controller should be capable of denying access based on incorrect progression of cardholders through controlled areas.

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39	Card Formats a. The Controller should be capable of accepting multiple card formats, allowing multiple existing card populations to be merged into the same network. b. The controller should be able to accept card format files downloaded from the host. C. The Controller should be able to accept 253 types of formats at a time.
40	Visitor Control - The controller should allow cardholders to be designated as visitor cards, which shall be assigned to an escort card such that badging by visitors shall also require an escort badging to obtain access
41	Card Control - The controller should allow keypad commands to lock or unlock the door –through command entry
42	Functional Description for Input Point Monitoring a. The Controller should provide Input Points to monitor switch contact status changes. All inputs shall be capable of being supervised, with a specified resistor value wired both in series and parallel with the switch and a voltage applied to the circuit, allowing an input to be reported in any of three states: Normal, Off-Normal and Alarm. b. The Controller should also provide two-state inputs that report either OPEN or SHORT as the active state. 2. Input Point Groups a. The Controller should provide input points that can be logically grouped in software to allow simultaneous control. b. The Controller should enable input reporting of any point or group of input points to be suppressed on a Scheduled basis. For example, this can be used to disarm intrusion or door-open detectors during the day. 3. Input Point Status a. The Controller should provide input points that shall be configurable such that the normal or off normal state of any given input can be set for NO or NC devices. b. The Controller should provide input points that shall be configurable to match the EOL resistance used with any input. c. The Controller should allow the host system to query the digital representation of the DC voltage present at any input. d. The Controller should allow status changes to be reported to the Host in 0.5 Seconds or less. (This may be subject to Network conditions.)

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43	Network Communications a. The networked controller should have TCP/IP connectivity. b. The controller models should send a periodic "I'm Alive" message to the host at configurable intervals. d. The controller should have a firewall which can be used to restrict access thru the TCP/IP port. e. The controller should be capable of deploying AES 256 with symmetrical key encryption for all communications between the controller and host(s) system(s).
44	Reader Supervision - The controller should be capable of monitoring a periodic Reader Supervision message from a reader with this capability, and shall send a reader offline message to the Host, if the message is not received in the event of reader failure or tampering.
45	Clock Synchronization - The controller should allow all networked controllers to be synchronized with the Host. Time Sync shall be sent automatically at regular intervals.
46	Host Control Commands Support by the Access Controller a. The Controller should be able to execute operator or system commands received via the Network from the Host, including: 1. Open Door – specify doorname – unlocks door, shunts associated alarm, for locally programmed unlock times -- door relocks automatically when timers expire -- overrides any restrictions 2. Open a Group or list of doors – same as open door – specify door group or list 3. Open all Doors – same as above 4. Unlock Door (or group/list, or All doors)– specify door(s) – unlocks doors indefinitely -- usually used in an emergency situation -- overrides any restrictions 5. Lock Door (or group/list, or All Doors) – resets Unlock Door --overrides any current/pending “door unlock by time schedule” controlled at the interface level 6. Set Output Relay – latch a relay, or group/list of relays indefinitely 7. Reset Output Relay (or group/list) 8. Suppress Input Point (or group/list) – disable reporting/logging from a specified input points 9. Un-suppress Input Point (or group/list) 10. Reset Various Local Alarm conditions (as annunciated by aux relay or reader beeper) including: a. PIN Code error count

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	b. Door Held c. Door Forced
47	b. The controller should allow the Host System to query any local database for status or configuration information. c. The Controller should contain persistent application and data storage, allowing them to be reprogrammed from the Host if necessary. d. The Controller should be capable of receiving a command from the Host system operator which shall manually override any locally-invoked relay condition, in either latched or timed mode. e. The Controller should be capable of receiving a command from the Host system operator which shall manually override the condition of any Aux relay. It shall also be capable of enabling, disabling or resetting any individual alarm. f. The Controller should be capable of receiving a command from the Host system operator which shall manually activate or release the Hold line on any connected reader having the Hold feature. g. The Controller should allow the Host system to query any reader, output or input interface as to the application file revision, EEPROM file revision, ID number, and type. h. The Controller should allow the Host to set time of day on all Network Gateways, to view add or modify card records, to control outputs, to get input or output status, to write to the EEPROM, to read local memory, to get A/D values, to upload the current messages or all messages in the Event log, to clear the event file, to reload the card database, to reload access configuration files, to get or set I/O linker inputs, to reboot any interface. i. The Controller should report the current state of each input and output upon query from the host.

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48	Event Logger The Controller should be capable of sending the following event messages to the host system: 1. Access Granted 2. Access Granted PIN only 3. Extended Access Granted 4. Deny Access Card not found 5. Deny Access Door Schedule Not Valid 6. Deny Access Unknown Reader 7. Deny Access Card Deleted from database 8. Deny Access PIN not found 9. Deny Access PIN deleted from database 10. Deny Access Wrong PIN used 11. Deny Access Timed Antipassback violation 12. Deny Access Real Antipassback violation 13. Deny Access Real Antipassback violation at Exit Reader 14. Deny Access Area Violation 15. Deny Access Area Violation at Exit Reader 16. Deny Card Access – Not in Door Group
49	The controller should be capable of sending the following alarm messages to the host system: 1. Door Forced 2. Door Held 3. Tamper Failure 4. Tamper Alarm 5. Battery Failure 6. Battery Alarm 7. AC Failure 8. AC Alarm 9. REX Door Bit 10. REX Door Alarm The controller should have configurable command priorities for each event type. The controller should optionally be encrypted to prevent data from being intercepted or simulated by an intruder

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50	The Controller should be capable of supporting cardholder databases of the following sizes: a. Without database changeover capabilities: 1. 44,000 using standard memory 2. 150,000 using 16MB socketed DIMM expansion memory 3. 250,000 using 32MB socketed DIMM expansion memory b. With database changeover capabilities: 1. 22,000 using standard memory 2. 75,000 using 16MB socketed DIMM expansion memory 3. 125,000 using 32MB socketed DIMM expansion memory
51	The Controller should receive and drive execution of all real time commands from the host
52	The networked controller should allow local connection of a laptop computer for diagnostics, verification, display or change of card database, configuration database, and transaction history via the TCP/IP or diagnostic port
53	The networked controller should upload all buffered transactions to the Host when communications are restored
54	The networked controller should incorporate a processor running a Linux operating system. The controller shall provide an interface via Windows® DLL and a direct-communication OPIN® API for integration to host-based access control applications
55	The networked controller should provide on-board persistent memory to allow program updates to be downloaded directly via the network
56	The controller should have the following IO connections: a. Two (2) Readers, in one of the following configurations: 1. Two (2) Wiegand interface readers with or without PIN keypads 2. Two (2) Clock-and-Data readers 3. Two (2) Keypad readers b. Two (2) Door Monitor switch/contact inputs c. Two (2) Request-to-Exit device inputs d. AC Fail (if provided by power supply) Monitor input e. Battery Fail (if provided by power supply) Monitor input f. Enclosure Tamper Monitor input
57	The Controller should have non-latching relay outputs for the following: a. Two (2) door locking devices (configurable) b. Two (2) auxiliary devices (door held/forced alarm, alarm shunt,

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	communication failure, or general purpose)
58	The controller should have local processing capabilities as follows: a. Alarm Shunt and Strike relay timing and latching functions b. Access control decisions based on facility code (degraded mode) c. Simple input/output linking on the same V100 d. LED / Beeper control during Card + PIN and other transactions
59	Enclosure Material: UL94 Polycarbonate
60	Power Supply Requirements - 160 mA @ 12-18 VDC (with no readers connected)
61	Operating Environment - Indoors or customer supplied NEMA-4 rated enclosure
62	Temperature - 32° to 122° F (0° to 50° C)
63	Humidity - 5% to 95% relative, non-condensing
64	Certifications UL 294 and UL 1076 Recognized Component, FCC Class A Verification, EMC, CE Mark,

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6.0 CABLE TV DISTRIBUTION SYSTEM

6.1 SCOPE

The scope of work shall cover supply, installation, commissioning and testing of :

- Television cables
- Television wiring in conduits

6.2 CONDUITS

Conduits shall be as given below :

- The conduit shall generally be as specified in the BOQ.

6.3 INSTALLATION

- The connection at the splicer/junction boxes shall be made with end sockets as to achieve minimum contact resistance.
- The final branch connections with single cables in conduits and the maximum number of cables in each conduit shall be as follows :

•	Conduit diameter	Max. No. of cables
	Inch / mm.	
	1" / 25	2/3 nos. RG 6 /11
	1¼" / 32	6 Nos. RG 6 /11

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DG SETS

1. GENERAL

Work covered by this contract shall conform to latest CPCB norms effective from July 1, 2004 & up to date include design, manufacture, supply, transportation, delivery, installation, testing and commissioning of automatic start direct coupled Diesel Generator Sets suitable for continuous round the clock operation at up to rated output with permissible overload along with associated works. PLC based DG control Panel for Automatic operation of the DG sets is incorporated in the Main LT Panel. Items included (but not limited to) in the contract are abstracted as below.

- a) Diesel engines directly coupled with alternators mounted on a rigid fabricated steel base frame with resilient antivibration mountings.
- b) Water cooling system including cooling towers, pumps, piping and controls.
- c) Exhaust piping with Silencer to provide 25 dBA insertion loss
- d) Electric starting equipment including batteries and battery chargers.
- e) Fuel supply system with out Bulk Oil Storage and automatically operated Fuel Transmission System.
- f) Acoustic treatment of DG room
- g) Statutory approvals including permission from Electric Supply Authority for operation of DG sets, clearance from Electrical Inspector, approval from Pollution Control Board and necessary approvals from Department of Explosive.
- h) Coordination with PLC logic panel manufacturer

2. STANDARDS

- The equipment offered shall conform to the latest revision of relevant Indian or British Standard (BSS.) and Codes together with the requirements of the Local Supply Authority and Department of Explosive etc.

3. ENGINE AND ACCESSORIES

3.1 Engine

The engine shall have the following characteristics:

Type	-	Suitable for generating set application, turbo charged, multi-cylinder, cold starting. The engines shall be provided with electronic fuel injection system
Cycle	-	Four stroke.
Speed	-	1,500 r.p.m.
Speed Variation	-	Within 2% for operation between 10% and 100% load
Method of Starting	-	Battery

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Net site output - The engine shall be suitable to deliver the stipulated rating under ambient conditions given in clause 3.3 special conditions of contract as net output.

The engine rating shall be stated in the tender in accordance with the latest revision of relevant I.S. or B.S codes. Adequate precautions shall be taken to safeguard the sets against low lubricating oil pressure, high water temperature, overspeed and overcurrent.

3.2 Fuel Consumption

The engine shall be suitable for satisfactory operation on H.S.D. as locally available. The tenderers shall declare the guaranteed fuel consumption in liters/hr, in accordance with relevant I.S. or B.S codes. at 50%, 75% and 100% of rated load at 0.8 pf. Fuel consumption shall be low so as to deliver minimum 4 units per liter at 75% load.

Such guaranteed fuel consumption is also to be expressed in liters per unit (after supplying the requirements of auxiliaries) at 50%, 75% and 100% of rated load at 0.8 pf.

If guaranteed fuel consumption is exceeded, the Contractor shall make such modifications or alterations as are necessary to bring the consumption to within the guaranteed figures.

Tolerance of + 5% as defined in BSS-649-1958 shall be allowed.

3.3 Lubricating Oil Consumption

The tenderers shall state the guaranteed lubricating oil consumption in liters per hour.

3.4 Governing

The governor shall be of electronic type **Governor of Class A1 as per ISO 3046/BS5514 with actuator shall be provided as per standard design of manufacturer.** . The governor shall be capable of regulating the speed of the engine within the limits approx. 10% of the rated speed within 4 sec due to the sudden application or removal of full load.

3.5 Mounting And Foundations

The engine and direct coupled alternator shall be rigidly secured to a common rigid base frame fabricated from MS sections. The DG set shall be placed on the RCC Floor with GERB or any other approved make antivibration mountings. A lifting hook of required capacity shall be provided above the finalized location of the DG set to facilitate installation and subsequent maintenance of the DG sets. The design of mounting

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arrangements with antivibration mountings shall be as recommended by the DG manufacturers and shall be such that a maximum of 5% vibrations are transmitted to the building structure. The tenderer shall confirm the type and make of mountings offered and the vibration isolation efficiency in the tender. All rigid pipe / bus bar connections to the DG set shall be made through flexible couplings.

3.6 Exhaust System

3.6.1 Silencer

The engine shall be fitted with Critical Silencers of design approved by manufacturer to provide minimum 25 dBA insertion loss through the Silencers.

3.6.2 Exhaust Piping

Silencer outlets shall be connected to exhaust piping carried to the top of the building through shafts provided for the purpose. Exhaust piping shall be fabricated as per IS from MS pipes of size suitable to limit back pressure to within permissible limit. **Tenderer shall submit design calculation in support of the back pressure being within limits along with the tender.**

It is important to ensure that the surface temperature of the exhaust piping does not exceed 50°C. For this purpose, the entire length of exhaust piping shall be insulated with minimum 125 mm thick layer of mineral wool or white glass fiber wool (96 kg /m³ density) held with chicken wire mesh covered with 0.80 mm (24 SWG) thick aluminium cladding as required. Flanged joints in the exhaust piping shall be covered with removable insulation at suitable intervals for permitting access to the joint if and when required.

Exhaust piping shall be connected to the engine by means of flexible section or an expansion joint and shall also be graded to a drain pocket inside the building (to drain-out water due to condensation and entry of rain water in the exhaust). The pocket shall be fitted with a drain cock.

Provision of testing port shall be provided on exhaust pipe line.

3.6.2.1 Sampling provision in the D.G exhaust system shall be made

Port type : Pitot tube, temperature and sampling probe are to be inserted together in to the sampling port for monitoring purposes.

Sampling port should be standard flanged pipe of 0.10 m inside diameter (ID) with 0.15-m bolt circle diameter. An easily removable blind flange should be provided to close the port when not in use. Port should be installed at a

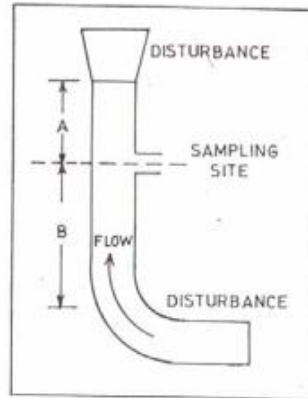
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height between 0.90 m and 1.2 m above the floor of the working platform.

Location of sampling point : To ensure laminar flow, sampling ports shall be located minimum 8 times chimney diameter down stream and 2 times upstream from any flow disturbance.



3.7 Air Filters

The engine air intake shall be fitted with a substantial air cleaner of oil bath/ paper element type. The filter shall be suitable for operation under dusty conditions.

3.8 Crank Case Breather

The crankcase breather outlet of the engine shall be fitted with a filter cap capable of preventing entry of dust.

3.9 Fuel And Lubricating Oil Filters

Filter for fuel and lubricating oil systems shall be of simplex type. Lubricating oil filters shall be of an efficient full flow type of ample capacity and suitable for use with detergent oils. They shall be capable of removing all foreign matter above a particle size of 5 microns.

3.10 Lubricating Oil System

The engine shall be of the totally enclosed type and fitted with a positive pressure system of lubrication to all working parts. Lubricating oil shall be circulated in the engine by an engine driven pump. There shall be no moving part requiring lubrication by hand prior to the starting of the engine or while in operation.

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3.11 Safety Controls

The engine shall be complete with all controls to render the operation of the engine reliable and totally safe including but not restricted to the following

- **Low Lubricating Oil Pressure**

Pressure sensors shall be fitted such that in the event of a fall in the lub oil pressure, an alarm and indication shall be actuated. In addition, the engine shall be automatically shut down in the event of lub oil pressure dropping to a predetermined low value. Potential free contacts for conveying the signal to BMS shall be provided

- **High Water Temperature**

An alarm shall be given if the close loop engine jacket cooling water temperature exceeds safe limits stipulated by the engine manufacturer due to any reason (including low level of water in secondary cooling system cooling tower). The engine shall be shut down when a pre-determined set water temperature is reached. Potential free contacts for conveying the signal to BMS shall be provided

- **Over Speed**

Speed control shall be so arranged that a 12-1/2% increase over normal rated speed shall cut off fuel supply, thus stopping the engine. Potential free contacts for conveying the signal to BMS shall be provided

- **Overload Protection**

The engine shall be adequately protected against operating under overload conditions. The requirements shall be met by the provision of a fixed overload limit stop on the fuel pump rack control rod to prevent the set being subject to a load exceeding the site rating plus 10%. Potential free contacts for conveying the signal to BMS shall be provided

3.12 Accessories, Instruments and Safety Controls for Engine

Accessories, instruments and safety controls to be provided with the engine shall be (but not limited to) as below. All accessories shall be of design compatible with the design and /or operation of the engine.

a. Accessories:

Flywheel with flywheel housing
Coupling with guard.
Mechanical guarding of all moving parts
Air cleaner oil bath/paper element type.
Corrosion resistor.

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- Heat exchanger.
- Governor - electronic.
- Fuel injection
- Fuel filter
- Lub. oil filter.
- Automotive Batteries 24 V, 360 AH with leads and float cum boost battery charger along with battery stand painted with acid proof black paint with minimum 3mm thick rubber mat below the battery
- Stainless Steel Bellows
- Exhaust Silencer
- Interconnection wiring, cabling and piping as required
- Set of standard tools
- Anti-vibration mounting pads.

b. Instruments and Gauges:

- Lub. oil pressure gauge.
- Water temperature gauge.
- Battery charging ammeter.
- Hour meter (digital) to show total engine hours run 10,000 hr capacity
- R.P.M. indicator of the tachometer type (digital)
- Starting switch with key

c. Safety controls for

- Low lub oil pressure
- High water temperature
- Over speed Protection/Speed Governor
- Audio visual alarm

3.13. Compatibility & Coordination With PLC / BMS

A microprocessor based PLC panel for Automatic Mains Failure, Auto Changeover/ Interlocking and Auto Load Searching & Auto Load Management Functions of the DG sets is incorporated in the Main LT Panel of the system. All parts of the DG set installation shall be compatible for being integrated with the PLC operation. The Contractor shall coordinate the work for achieving a fully coordinated and trouble free operation of the DG sets and their sub-systems through the PLC panel.

3.14 Alternator

The Alternator shall have the following characteristics

Type	- Brushless, rotating field design alternator rated for 660 volt / 50 Hz complying to IS 4722-1992, BS 5000 Part-III and IEC 34.

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Excitation system	-	Permanent magnet generator (PMG) powered excitation system
Speed	-	1500 RPM
Net Site Output	-	Rated continuous at ambient conditions and as per schedule of quantities.
Voltage Regulation	-	Within 0.5% of the rated voltage
Overload	-	More than 10% of the nominal for 1 hour every 12 hours without exceeding permissible temperature rise.
Harmonics	-	Maximum 1% between phase and neutral and total maximum 3%

Construction

The alternator shall be of air ventilated screen protected drip proof design with IP 23 protection having adequate air intake / outlet areas to enable designed air quantity to flow within permissible pressure drop. The dynamic balancing of the rotor assembly shall be carried out as per IS 12075 : 1987 and BS 6861 Part-I Grade-II to ensure vibration limit to be within as per IS 12075 or BS 4999. Double bearing alternator shall be provided with substantial bed plate with engine / generator mounting pads to ensure a good base for accurate alignment. A flexible coupling, designed to suit the specific engine – generator combination shall be provided to minimize torsional effects. The alternator shaft and coupling shall be designed to withstand torsional vibrations even at certain critical speed. The terminal arrangement of the alternator of DG sets shall be suitable for receiving a bus duct with flexible interconnection with rubber bellows . The termination details shall be finalized in coordination with the electrical contractor and got approved from (consultant) before execution. All alternator neutral shall be solidly earthed and each neutral and body shall be connected to 2 nos copper plate earth stations by means of 50 mm x 6 mm copper strip.

The combined Engine Alternator unit shall be mounted on a common rigid fabricated base frame. The alternator shall have its windings star connected with the neutral connection brought out to a separate terminal. The alternator shall fully comply with the latest Standard BS 2613 and BS 269 in respect of winding insulation and fast response to maintain steady voltage.

Temperature Rise

The maximum temperature rises of the various components of the alternator shall not exceed those permitted under I.S. with full output and under the ambient temperature conditions specified

Rating

The alternator shall be continuously rated to deliver the rated output at 0.8 pf lagging, on a 3 phase 4 wire 415 volts 50 cycle system with neutral solidly earthed. The earthing system conforming to Indian TNS.

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Alternator Insulation

The alternator should have class H insulation suitable to withstand tropical conditions.

4. WATER COOLING SYSTEM

The engine shall be provided with a heat exchanger for closed loop primary cooling water circuit circulated by an engine driven pump for jacket cooling of the engine. The secondary water cooling circuit of the heat exchanger shall be cooled through a cooling tower by monoblock centrifugal pumps. Soft water (as recommended by the manufacturers) shall be used for initial fill and make up water for secondary cooling circuit and for initial fill of primary cooling circuit. In addition, the primary closed loop cooling circuit shall be dosed with corrosion inhibitors recommended by the engine manufacturer to minimize engine jacket corrosion/scaling. All equipment of the cooling system (heat exchanger, pumps, cooling tower) shall be of specifications and design recommended by the engine manufacturer for reliable and trouble free operation. Tenderers shall provide design data in support of equipment selection along with the tender.

4.1 Pumps

4.1.1 Construction

Monoblock or horizontal split casing pumps as per schedule of quantities shall be as per IS:1520-1660, IS:9079 : 1989, IS:325 : 1996 and shall be of the following construction unless otherwise specified:

Casing	Cast Iron
Impeller	Bronze
Shaft	High Tensile steel
Bearings	Heavy duty Ball/Roller Bearings.
Base Frame	Fabricated MS
Flanges	Conforming to ISS 1536/1960
Packing	Graphited Asbestos/Mechanical seal
Speed	1500 RPM
Drive Motor	TEFC

Drive motor ratings, if shown, are tentative and tenderers shall select their motors taking into account of the maximum BHP of the pump plus transmission losses if any. Motors shall be supplied with matching starters unless otherwise stated.

Pumps and motors shall be mounted on a single base frame and directly driven through flexible coupling in case of horizontal split casing pumps.

4.1.2 Accessories And Fittings

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Following accessories shall be provided with each pump in addition to standard accessories :

- a) Coupling guard for horizontal split casing pumps.
- b) Lubrication fittings
- c) Test and/or air vent cocks.

Following fittings shall be provided with each pump in addition to standard fittings :

- a) Suction and discharge shut off valves and discharge check valves
- b) Suction and discharge pressure gauges not less than 100mm dia and of the appropriate rating with brass gauge cocks etc.
- c) 25mm GI gland with gland packing or mechanical seal

4.1.3 Installation

Pump sets shall be mounted on a common rigid frame and shall be installed on inertia block/vibration isolators, as per manufacturers recommendations. All items including, foundation bolts, vibration isolators etc. required for proper installation shall be provided by the contractor.

Pump-sets shall preferably be factory aligned, wherever necessary, site alignment shall be done by competent persons. Before the foundation bolts are grouted and the couplings are bolted, the bed plate levels and alignment results shall be submitted to the Project Manager.

4.1.4 Testing

Tenderers shall submit the performance curves of pumps supplied by them. They shall also check the capacity and total head requirements of each pump to match his own piping and equipment layout.

On completion of the entire installation, pumps shall be tested, wherever possible, for their discharge, head, flow rate & BHP. Where it is not possible at least the discharge, head and BHP (as measured on the input side) shall be field tested. Test results shall correspond to the performance curves.

4.1.5 Painting

After complete installation and testing, pumps, accessories and fittings shall be given two coats of approved finishing paint.

4.2 Cooling Tower

Cooling tower shall be suitable for outdoor installation. Cooling tower shall be vertical, induced/forced draft, counter/cross flow type in fibre glass reinforcement /plastic construction, complete with fan, motor, surface and

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spray section, eliminators, bird screen and steel supports. The colour of the cooling tower shall be as approved by Consultant /Owner.

13 Capacity :

The cooling tower capacities shall be compatible with DG sets.

- Side casing :

Casing shall be made of FRP having smooth surface for minimum resistance to air flow. It shall have sufficient structural strength to withstand high wind velocities and vibration. The casing shall be installed within the fibreglass reinforced basin. The tower supporting structure shall be made out of hot dip galvanized tubular frame.

2.0 Cold water basin :

Cold water basin shall be of fibreglass reinforced sump of sufficient depth on which cooling tower super structure shall be supported.

Basin fittings shall include but not restricted to the following:

- i. Bottom outlet.
- ii. Screened suction assembly fixed to the casing.
- iii. Drain at under side of suction side sheet.
- iv. Overflow fixed to inside of casing side sheet.
- v. Ball type automatic make-up water valve.
- vi. Sensor for low level alarm.

- Distribution system :

Warm water distribution system shall comprise of header and branch arms system or open pan gravity flow system.

6 Fillings :

Fillings shall be made of corrosion proof material (PVC) and rigid film in modular packs and arranged in square/rectangular form. These shall be arranged in such a manner as to ensure negligible resistance to air flow and to eliminate back water spots and prevent fouling through scales that may form. In order to reduce carry-over losses through entrainment of moisture drops in air stream, high efficiency PVC tubular drift eliminator shall also be provided.

- Mechanical equipment :

Fan shall be of axial flow type, light-weight rotor fitted with multiple aerofoil blades. The entire fan assembly shall be statically and dynamically balanced. Fan shall be direct driven motor suitable for operation on 415+/-10% volts, 3 phase, 50 cycles AC supply of approved make, totally enclosed, fan-cooled, weather proof construction, designed and selected to operate in humid air stream. Fan shall be protected by fan guard and shall be easily accessible for inspection and maintenance. A service ladder shall also be provided for greater convenience. The mechanical equipment assembly shall be adequately supported on a

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rugged steel base welded to tubular support assuring vibration free operation. Fan guard shall be provided to prevent birds from nesting during idling periods.

The cooling tower shall be procured of the colour, strictly in accordance with written approval of Project Manager.

4.3. Piping

4.3.1 Piping Materials

Unless otherwise specified, pipes shall be Medium class MS (black steel) as per IS 1239 suitable for welded joints.. Wherever so specified, medium class GI pipes with screwed joints could be used for pipes upto 50 mm dia.. MS/GI pipes shall be of makes as per approved list. Pipes shall be given one primary coat of rust inhibiting paint before being installed.

Fittings shall be new and from approved manufacturers, Fittings shall be of pressure ratings suitable for the piping system. Flanges shall conform to IS 6392-1971. Supply of flanges shall include bolts, nuts, washers, gaskets etc., as required. All equipment and valve connections shall be through welded flanges.

Gate valves and check valves shall conform to IS:780/1969. Gate valves shall have non-rising spindles unless otherwise specified. Valves up to 40 mm dia.. shall have gun metal body and valves of more than 40 mm dia.. cast iron body unless otherwise specified.

Butterfly valves shall conform to BS:5155, MSS SP 67 & API 609. The valves shall be suitable for flow in either direction and seal in both directions. The valve shall be of integral moulded design.

Strainers shall be Y type or Pot type as per schedule of quantities and /or as required with CI or fabricated steel bodies. Strainers shall have removable bronze screen with 3mm perforations. All strainers shall be provided with equal size isolating valves so that the strainer may be cleaned without draining the system.

Pressure gauge shall be not less than 100 mm dia dial and of appropriate range and be complete with shut off gauge cocks etc.. and shall be duly calibrated before installation.

Pressure gauges shall be provided at the following locations:

- a) Suction and discharge of pumps.
- b) Inlet and outlet of heat exchangers.

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Care shall be taken to protect pressure gauges during pressure testing.

Thermometers shall be either 100 mm dia dial or direct reading industrial type of appropriate range duly calibrated before installation.

Thermometers shall be installed in separable wells.

Thermometers shall be provided at the following locations:

- Dial type thermometers on supply and return of heat exchangers.

4.3.2 Piping Installation

The Contractor, on award of work, shall prepare detailed working drawings showing the piping route, typical sections, location and detail of fittings, valves, strainers and instruments. The planning of piping system shall take existing wall and ceiling openings, if any, into consideration. Piping layout shall take due care for expansion and contraction in pipes.

Piping shall be installed only after thorough cleaning. Pipes shall be cut square. Proper edge preparation with 'V' grooves shall be done and edges grinded before welding. Sufficient gap shall be maintained. Electrodes of approved makes only shall be used for welding and tacking.

Pipes shall be supported from floor /wall mounted or ceiling suspended supports at an interval of maximum 2 mtrs unless otherwise states/approved. Supports shall be designed to withstand the weight of pipes, fittings and fluid in motion. Pipe supports shall be of steel, adjustable for height and primer coated with rust preventive paint and finish coated with 2coats of enamel paint of approved colour codes. Where pipes and clamps are of dissimilar material, a gasket shall be provided in between. Pipe hangers shall be fixed on walls and ceilings by means of dash fasteners. Piping suspended from ceilings shall be provided with AV mountings. Vertical risers shall be parallel to walls and column lines and shall be straight and in plumb. Risers passing from floor to floor shall be supported at each floor by clamps or collars attached to pipe and with a 12mm thick ribbed rubber pad or any other approved resilient material. Where pipes pass through the terrace floor, suitable curbing shall be provided to prevent water leakage. Risers shall also have a suitable concrete pipe support at the lowest point.

Pipe sleeves of 50mm or larger diameter shall be provided wherever pipes pass through wall and the annular space filled with felt and finished with retaining rings.

Insulated piping shall be supported in such a manner as not to put undue pressure on the insulation.

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Piping shall be pitched towards drain points. Drain outlets shall be provided at all low points in the piping system with 25 mm dia pipe (for upto 300 mm dia water pipe) with gate valves of equal size with rising spindels . Drain outlets shall be connected through equal size GI pipe to the nearest drain or floor waste.

All piping buried directly in ground shall be provided with a coat of primer paint after surface preparation over which rust preventing tape (Pipekote 4 mm) shall be wrapped.

4.3.3 Testing

Entire piping system after installation shall be flushed with clean water to ensure thorough inside cleaning of the system. All piping shall be tested to hydrostatic test pressure of at least one and a half times the maximum operating pressure, but not less than 7 Kg/Sq cm for a period of not less than 24 hours. All leaks and defects in joints revealed during the testing shall be rectified to the satisfaction of the Project Manager .

Piping required subsequent to the above pressure test shall be retested in the same manner.

Systems may be tested in sections and such sections shall be securely capped.

The Project Manager shall be notified well in advance by the contractor of his intention to test a section of piping and all testing shall be witnessed by the Project Manager or his authorised representative.

The Contractor shall make sure that proper noiseless circulation of fluid is achieved through all coils and other heat exchange equipment in the system concerned. If proper circulation is not achieved due to air bound connections, the Contractor shall rectify the defective connections. He shall bear all the expenses for carrying out the above rectifications including the tarring-up and re-finishing of floors, walls etc. as required.

No insulation shall be applied to piping until the completion of the pressure testing to the satisfaction of the Project Manager .

The Contractor shall provide all materials, tools, equipment, instruments, services and labour required to perform the test, and shall ensure that the plant room and other areas are cleaned up and spill over water is removed. And also ensure that there is no flooding of water.

After the piping has been installed, tested and run for at least ten days of eight hours each, the piping shall be given two finish coats, 3 mils each of approved color and shade.

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5. FUEL OIL SYSTEM

Diesel oil shall be stored in an underground bulk oil tank of capacity as stipulated in Schedule of Quantities having facilities for oil tanker delivering oil and pumping of the oil for transferring it to the DG room. Fuel transfer pumps with flame proof motors shall pump the diesel oil into buffer tank provided at ceiling level of DG room. The buffer tank shall be provided with low and high level electronic sensors to actuate the automatic operation of the fuel transfer pump. The oil from buffer tank shall be transferred to the day fuel tanks of individual DG sets by gravity flow.

5.1 Approvals & Clearances

The entire installation showing clearly the schematic arrangement, details of installation of bulk oil storage tank, bill of material etc. shall be as per the requirements of the Department of Explosives following approval / clearances shall be obtained..

- Before commencement of work - approval of shop drawing of the entire installation including details of installation of bulk oil storage tank, bill of material etc shall be obtained from the Department of Explosives by the Contractor.
- After commencement of work - Clearance of the installation for use by Engineer-in-Charge

5.2 Bulk Fuel Storage Tanks

- Construction

The Bulk Fuel Storage Tanks shall be suitable for storing HSD. The tanks shall conform to IS 10987 - 1992 and shall be suitable for underground installation. Tanks shall have dished ends and shall be fabricated from 6 mm thick boiler quality plates conforming to IS 2002 - 1982. Tanks shall be designed for a pressure of 0.05 Pa when full of water. Tanks shall be fabricated by welding. Welding procedure and qualification of welders shall be as specified in IS 9595-1980 and IS 817-1966. Cylindrical shell be of full penetration butt belt welded construction End plates shall be attached to the shell by double fillet welds.

- Accessories

The tanks shall be provided with all standard accessories, nozzles and appurtenances as indicated below.

- a. Lifting lugs - 2 nos per tank
 - b. Earthing bosses - 2 nos per tank
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- c. 1 nos. 600 mm dia manhole with hinged, gasketed, lockable cover and provided with a removable access ladder to go into the tank. 1 no. 500 mm dia manhole with hinged gasketed lockable cover for ventilation.
 - d. 80 mm NB fill pipe running down to within 100 mm of the tank bottom and with end chamfered at 45 Deg.
 - e. Suction connection suitable for 50 mm NB suction pipe
 - f. Dip connection with brass screwed cover and fitted with internal perforated pipe running down to within 100 mm of the tank bottom. A calibrated 12 mm square brass dip rod shall be provided.
 - g. Properly supported minimum 4 m high vent pipe shall be provided. Open end shall be covered with 2 layers of non rusting metal wire gauge having minimum 11 meshes per linear centimeter. The vent pipe shall be prevented from rain by a suitable hood or by bending it downwards. A flame arrestor of type and make approved by the department of explosives shall be provided in the vent pipe to prevent outside fire to reach the stored oil
 - h. Spare appurtenance for 40 mm dia NB pipe suitably closed with solid flange

5.3 Fuel Transfer Pump

The fuel transfer pump for transfer of oil from bulk oil tank to buffer tank in DG room (automatic in operation) shall be a positive displacement pump of rotary gear type, of rating as per schedule of quantities. The drive motor shall be of flame proof construction. The pump panel shall also be of flame proof construction with IP-42 ingress protection.

5.4 Daily Service Fuel Tank and Buffer Tank

Day fuel tanks of 990 litres capacity and Buffer tank of 600 litres capacity shall be provided. The tank shall be fabricated from not less than 5 mm M.S. Sheet. A removable cover of ample size with lock shall be provided to permit access to the tank interior. The tank shall be provided with all required appurtenances like inlet and outlet connections, drain connection, overflow connection etc. Fuel level indicator with low and high level visual shall be provided. The day tanks shall be floor/wall supported on steel support 300 mm above FFL. Buffer tanks shall be wall mounted at ceiling level. Buffer tank shall also be provided with automatic level sensors as per BOQ for automatic operation of fuel transfer pumps. Outlet valves from all storage tanks shall be located at easily accessible points so as to facilitate immediate shutting off of the fuel supply incase of emergency.

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5.5 Pipes and pipe fittings

The MS pipes shall be of minimum Medium class). Makes of pipes and pipe fittings shall be as stipulated in the list of approved makes and as approved by Project Managers.

5.5 Earthing of oil storage & transmission system

All fuel oil pipe lines, valves, pumps, tanks and associated equipments shall have electrical continuity. The electrical continuity shall be checked and tested by suitable ohm meter and the test result recorded. Since the fuel piping specially the part directly buried in ground is provided with elaborate protective coating against corrosion, this continuity testing shall be carried out before application of the protective coating including the primer paint but immediately after installation of the piping system and its pressure testing. Since the continuity will not be available wherever there is a flanged joint because of insulated gasket in between, such joints shall be bonded to form a continuous electrical path and the entire pipeline shall be effectively connected to earth.

For ensuring the tanker delivering oil to be also earthed, the 2 ends of the whole pipe shall be jointed through flexible cabling through effective clamping devices.

6. ENGINE AUXILIARIES AND WIRING

All engine auxiliaries shall be checked and tested for proper operation. Wiring between the engine auxiliaries and the DG control logic panel shall be provided with copper conductor PVC insulated 1100 V grade armoured cables. Loop earthing as required shall be provided.

7. STARTING BATTERY AND BATTERY CHARGER

7.1 24 Volt DC Batteries

24 volt batteries for each set shall comprise of standard lead acid stationary batteries consisting of required no. of cells, each of 2 volts, to build up AH capacity as required for satisfactory starting of diesel engines. One hour rate of discharge to attain voltage of 1.85 volt per cell to 2 volts shall be provided. Battery shall be complete with inter cell connectors and acid level indicating floats. Battery cells shall conform to IS 1651 with up to date amendments. The electric start battery shall be of adequate capacity for 10 successive starts. Time delay relay shall be incorporated to provide a rest period of 1 – 5 sec (adjustable) before each successive start and a time by period of 19 -100 sec. (adjustable) before the system lock out due to failure of the 5th start to crank up the engine . The battery bank shall be provided with the following accessories.

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- Battery stand
 - Set of connectors with ends take off suitable for connections.
 - Cell insulator and stand insulators
 - Spring type hydrometer
 - Thermometer with specific gravity correction scale
 - Cell testing voltmeter
 - Set of tools consisting of spanners, rubber syringe, acid resisting funnel and acid resisting tube of 2 litres capacity – one set
 - Potential free contacts for conveying signals to BMS.

7.2 Battery Charging Equipment (Trickle and Boost Charging)

Battery trickle and boost charge required capacity designed to operate on single phase 230 volts, 50 cycles supply system and suitable for charging current shall be provided as a part of PLC panel. The battery charger shall be provided with the following accessories.

- AC and DC “ON” and “OFF” switches with MCB & no HRC fuses
- Indicating lamps for indicating mains “ON” and battery charging
- Ballast to give charging
- Single phase double wound (copper conductor) impregnated natural air cooled mains transformer for rectifier stack.
- Rotary switch to give step control.
- Single phase full wave bridge connected silicon rectifier stack
- Digital ammeter to indicate charging current
- Digital voltmeter with a selector switch to measure the battery/charger voltage
- Silicon blocking diodes connected to a suitable tap to maintain continuity of DC supply.
- AC and DC contactors of suitable rating as required.

All the components for battery charger shall be adequately rated and housed in a well ventilated sheet steel cubicle with input and output terminals. Proper cable glands shall be provided for incoming and outgoing cables.

8. RADIO INTERFERENCE

All equipment provided under this specification shall be so designed that it will not cause interference with radio equipment. In the event of the inherent characteristics of the equipment being such that radio interference is possible, efficient devices to nullify the same shall be provided. Suppressers shall be as per the relevant I.S./B.S. Standards.

10. NOISE AND EMISSION LEVELS

Noise from DG sets as also emission levels of pollutants in exhaust shall comply with the requirements of and Environmental (Protection) Second Amendment Rules 2002 notified as per Central Government Notification

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dated May 17, 2002 as implemented by Central Pollution Control Board. The noise emission level shall also comply to the relevant up to date Euro norms.

11. **ACOUSTIC TREATMENT**

Maximum permissible sound pressure level for the DG sets shall be 75 dBA (as per CPCB norms) at 1 m from the DG room with doors closed. The acoustic treatment shall achieve minimum 25 dBA insertion loss or meeting the ambient noise standards whichever is higher. If the ambient noise is higher, the performance of acoustic treatment shall be checked for noise reduction upto actual ambient noise level, preferably at night times. The measurement of insertion loss shall be done at different points at 0.5 m from the DG room and then averaged.

Walls and ceiling of DG room shall be acoustically treated by means of minimum 75 mm thick mineral wool of 64 kg/m³ density to achieve an insertion loss of minimum 25 dBA and a sound level of max. 75 dBA at 1 m from DG room. The mineral wool insulation shall be in the form of 1.72 m x 0.76 m (4 ft x 2.5 ft). The mineral Wool Insulation slab shall be provided inside a grid frame work comprising of 40 mm W x 75 mm H channels fabricated from 20 gauge GI sheet. The lined insulation slabs shall be clad with perforated 26 gauge GI sheet having 40% open area screwed to the GI frame work.

Acoustic doors (sliding type) for DG room comprising of ISMC 100 frame clad on both sides with 0.5 mm thick MS sheets with cavity fill of required thickness (minimum 75 mm) density to achieve a reduction (insertion loss) of minimum 25 dBA (max 75 dBA at 1 m from DG room) including Neoprene gaskets between MS sheet cladding and frame, self lubricating sliding mechanism (rollers/ball bearing) in MS channels in floor and on top, and heavy duty hardware/locking mechanism etc.

In case the desired reduction in sound level to achieve max 75 dBA outside DG room at 1 m distance (with doors closed) is not achieved with the above treatment, the Contractor shall provide additional thickness of acoustic insulation of the same or modified density to achieve the required reduction in sound level without any extra cost.

DG contractor shall also coordinate with DG room ventilation Contractor regarding acoustic treatment of fresh air inlets and exhaust outlets to achieve the desired reduction in sound level outside the DG room.

11 **TOOLS :**

The contractor has to provide/arrange all the required tools for installation, operation and maintenance of the DG set upto DLP.

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12. **PRE-COMMISSIONING CHECKS**

All standards checks including the ones elaborated in the specifications to ensure that the installation of the DG sets and associated systems has been carried out satisfactorily shall be done on completion of installation. These shall include.

- DG sets
 - Checking of piping interconnections
 - Checking electrical interconnections
 - Checking of insulation resistance
 - Checking of earthing
 - Checking of instruments and controls.
 - Checking of alignment
 - Checking of vibration transmission to building a structure.
 - Checking of expansion joints.
- Cooling water system
 - Checking of piping interconnections
 - Checking electrical interconnections
 - Checking of insulation resistance of electric motors with pumps
 - Checking of earthing
 - Pressure testing of piping
- Exhaust system
 - Checking of silencer operation
 - Checking of surface temperature of exhaust piping
- Fuel system
 - Checking of automatic operation of fuel transfer pumps.

13.0 **INSPECTION AND TESTING**

a) **Performance Tests**

b) **Trial Run/- Running in period**

a) **Performance Tests:**

DG set will be tested on load of unity power factor for the rated kW rating. During testing, each of the DG sets covered under scope of work, shall be operated for a period of 12 hrs on the rated kW at DG set's kW rating including one hour on 10% overload after continuous run of the 12 hrs. During testing all controls/operating safeties will be checked and proper record will be maintained. Any defect / abnormality noticed during testing

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shall be rectified. The testing shall be declared successful only when no abnormality /failure are noticed during testing.

The DG set will be cleared for dispatch to the site only when testing is declared successful by authorised representative / Engineer in charge.

The contractor will arrange staff/fuel/POL for test run at his cost.

b) Trial run / Running in period.

After successful testing of the DG set, a trial run at available load will be carried out for 120 hrs or 15 days whichever is earlier at site after installation of DG sets. The DG set will be operated and a log of all relevant parameters will be maintained during this period. The arrangement of staff for trial run/running in period will be made by the contractor. However, diesel shall be provided by the Owner. The contractor will be free to carry out necessary adjustments. The DG set will be said to have successfully completed the trial run, if no break down or abnormality /unsatisfactory operation at any component of the entire installation included in the scope of work of the contract occurs during this period. After this the DG sets will be made available for beneficial use. After the DG set has operated without any major break down/trouble, it shall be taken over by the Owner subject to guarantee clause of the contract. This date of taking over of DG set, after trouble free operation during the trial run. /running in period, shall be the date of acceptance/ taking over

It is the prerogative of the owner to wave off the inspection at manufacturer place

However, In case the performance test of the DG sets are to be carried out at site of work, DG set shall be operated for a period of 4 Hrs as explained above with a running period trial run to be carried out for 120 Hrs or 15 days whichever is earlier.

14. GUARANTEED TECHNICAL PARTICULARS

Guaranteed technical particulars in format enclosed as Annexure-I, I.1 and I.2 of these specifications shall be filled in by the tenderer and enclosed **along with** the tender. Tenders not complying with this requirements are liable to be rejected

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ANNEXURE-A

1. BREAK DOWN MAINTENANCE

The Contractor shall also undertake to provide a comprehensive breakdown service whereby qualified technicians shall attend to each breakdown as soon as practicable after a breakdown is reported and carry out immediate remedial work at a reasonable speed according to the nature of the breakdown. Any faulty equipment or components shall be quickly replaced.

In circumstance such that the Contractor fails to attend the breakdown within four normal working hours after notification of the breakdown and where remedial work is interrupted during normal working hours for purposes other than obtaining replacement parts, the employer reserves the right to order such action as may be necessary to expedite completion of remedial work which shall be at the Contractors expense without abrogation of the Contractors responsibilities

2. GENERAL

The Contractor shall keep sufficient spare parts during the maintenance period to ensure that replacement work for defect can be carried out immediately

A competent engineer shall be provided to investigate the fundamental cause of a fault temporary quick fix solution will not be accepted.

The employer shall at his discretion, take action to recover all losses incurred rising from the failure of the contract to perform the duties either wholly or in part as detailed in this section

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Annexure - I**TECHNICAL PARTICULARS**

(Technical particulars to be filled in by Contractor and to submit before the execution of work)

DG SETS TECHNICAL PARTICULARS

ITEM	Confirmations or Comments or data shall be furnished by Contractor against each item
	500 kVA
Diesel Generating Set	
Packager of DG Set	
DG set Ratings	
• Prime Rating of the DG set based on continuous operation for 365 days in a year at varying loads over an ambient of 50° C • Stand by Ratings • Over load – Confirmation of suitability for 10% overload capacity for 1 hour on 12 hours – over and above the governor capacity.	
Diesel Engines	
Make	
Model	
Type of Cooling	
Aspiration	
Air cleaner type.	
Fuel / Lub Oil Filter Type	
Governor type and class	
Fuel pump.	
Confirmation of suitability of commercial zero hardness soft water for cooling.	
Max. engine water temperature	
Lub oil pressure	
Fuel Consumption	

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ITEM	Confirmations or Comments or data shall be furnished by Contractor against each item
	500 kVA
Fuel consumption in litres/hr	
60% load	
80% load	
100% load	
Fuel consumption figures vis-a-vis Alternator electrical output – Units/litre	
60% load	
80% load	
100% load	
Suitability for locally available HSD	
Suitability of operation of DG set on cheaper fuel like LDO etc.	
Lub oil consumption	
Lub oil consumption at 100% load	
Alternator	
Make	
Enclosure type with IP ratings	
Insulation class	
Temperature Rise under continuous operation	
Excitation unit	
Voltage Regulation no load to full load	
Wave form distortion on full load	
Radio Interference	
Telephone Interference	
Stator winding thermistor with trip	
Space heater	
Instrument and Controls	
Instruments :	
Oil temperature gauge	
Oil pressure gauge	
Water temperature gauge	
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ITEM	Confirmations or Comments or data shall be furnished by Contractor against each item
	500 kVA
Battery charging ammeter.	
Hour meter to show total engine hours run - 10,000 hr capacity	
R.P.M. indicator .	
Indication lamps	
Low battery voltage	
Emergency stop	
High water temperature	
Low lub oil pressure	
System ready	
Safety controls	
Safety control – low lub. oil pressure	
Safety control - high engine temperature.	
Safety Control – Overspeed	
Emergency Engine Stop Push button	
Antivibration mounting	
Make	
Vibration Isolation Efficiency	
Exhaust system	
Exhaust silencer type	
Number of Silencers provided	
Exhaust pipe diameter, material and thickness	
Temperature of flue gases at exhaust manifold	
Guaranteed Temperature on external face of exhaust pipe insulation	
Exhaust stack height - alongwith back pressure calculation	

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ITEM	Confirmations or Comments or data shall be furnished by Contractor against each item
	500 kVA
Noise Limit (Pollution Norms)	
Confirmation of compliance to noise limits stipulated in Central Government Notification dated May 17, 2002 to comply with Environmental Protection Second Amendment Rule 2002 or latest amendment in Pollution norms laid by Statutory authority	

Signature of Contractor

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Annexure – 1.2

DG SETS – EMISSION LEVELS – at 100% load

DG Rating	ITEM	Guaranteed Emssion Level	Guaranteed emission level of the engine offered to be filled in by the tenderer
			500 kVA
	CO	< 3.5 g/kW-Hr	
	PM	< 0.3 g/kW-Hr	
	Smoke Limitation	< 0.7 m	
19 kW upto 75 Kw	NOx + HC	< 4.7 g/kW-Hr	
	CO	< 3.5 g/kW-Hr	
	PM	< 0.3 g/kW-Hr	
	Smoke Limitation	< 0.7 m	
75 kW upto 800 kW	NOx + HC	< 4.0 g/kW-Hr	
	CO	< 3.5 g/kW-Hr	
	PM	< 0.2 g/kW-Hr	
	Smoke Limitation	< 0.7 m	

Signature of Contractor

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SECTION B

SPECIAL CONDITIONS OF CONTRACT FOR DG SET

1.0 SCOPE :

The scope of all items in LV sub-system is SITC – Supply, Installation, Testing and Commissioning.

The agency that is bidding for the total project shall be called as “LV Integrator”.

All and entire responsibility towards the successful execution of the LV sub-systems of the project shall remain with the LV Integrator.

The entire SITC scope of all items falling under LV sub-systems shall be executed by a single LV Integrator.

The LV Integrator shall be certified and authorized to supply, commission and provide services at site as may be required, including warranty and post-warranty support, as being the Original Equipment Manufacturer’s authorized partner for the project. The LV Integrator shall have to formally submit the Manufacturer’s Authorization as per the prescribed format annexed to this specification before commencement of the work.

The OEMs whose products are getting commissioned should have service centers for service and support of their respective products, preferably with toll-free nos. The OEMs whose products are getting commissioned by LV Integrator shall be direct manufacturers having their manufacturing facility.

The passive components of fiber optic cables and fiber optic components, options and accessories shall be from a single manufacturer / make / brand (As specified in the tender).

The passive cabling system consisting of fiber optic cables and accessories, the active networking components, i.e., networking switches and other such equipments, the Pbx/communication systems shall be installed by a manufacturer’s certified partner.

The fiber optics cabling system shall be duly certified with test reports submitted by the manufacturer or their authorized partners for a period of 25 years minimum.

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The active components of networking and distribution such as networking switches, their options and modules shall be also from a single manufacturer/make/brand, to ensure that software and firmware images and functionality is identical. The upgrades or enhancement of core/operating software images and firmware & management applications for switches, options and modules shall be free (without any extra cost) to the client for the entire life cycle of these switches.

For all LV systems, the core software, operating software, application software and GUI etc. shall be of the latest versions. The upgrades and enhancements of the software images, core software and firmware for all network or networkable devices - such as controllers, interfaces, network camera, ip telephones, pabx, fire alarm panels, PA main units etc. - shall be free (without any extra cost) to the client for the entire life cycle of these products.

The LV Integrator carrying out the SITC of Works shall provide defects-free supply, commissioning and operation of goods supplied by them for a period of 12 months from the date of hand-over, to be called as Warranty Period. During this period any goods and items supplied by them developing defects or becoming non-operational and downgraded in service shall be replaced free of any cost to the client. Such items shall include goods, software and applications and any other such items becoming a part of total solution.

At the end of execution or at the time of hand-over, for all equipments that are covered in SITC, the integrator shall transfer all warranties and guaranties from OEM – original equipments manufacturer – to the client. The respective OEMs shall be bound to honour any and all warranties, guaranties and support commitments as agreed and committed by the LV Integrator.

The LV Integrator is advised to provide technical datasheets and specification sheets for approval for all items prior to initiating any supply. Any items having deviations, in absence of specific approval from Client / Architect / Consultant shall be returned whether installed or uninstalled at the risk, liability and expense of the LV Integrator.

The LV Integrator is advised to inform the Client / Architect / Consultant of any specific requirements for equipments such as heat dissipation, earthing, ventilation etc. before supply so as to incorporate the same at site by other agencies.

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At the time of project hand-over, the Client shall nominate personnel for O&M of LV systems. The LV Integrator shall depute a qualified and well trained engineer to impart proper training to client personnel on all aspects of operation, use, programming, administration and management of items under SITC scope.

The LV Integrator shall operate in complete cooperation with other agencies and contractors or their sub-contractors to achieve harmony of work and maintaining the overall functionality of each systems and aesthetics.

The LV Integrator is advised to specifically use items only from the make list and provide information on compliance of performance specifications.

The LV Integrator shall not use any unknown or local items as a substitute for listed brands and makes that may degrade system performance.

Make of components required to be used by LV Integrator to complete the installation, if not mentioned anywhere, shall be required to be GET APPROVED from Client / Architect / Consultant in writing before installation.

The LV Integrator shall submit the sample of each item / component of above mentioned approved make for the approval of the Client / Architect / Consultant.

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MANUFACTURER'S AUTHORIZATION (MAF)

MAF Letter Format (On OEM Letter head with seal)

Date: _____

To,

<<< NAME OF CLIENT/ORGANIZATION>>_____

Subject: Manufacturer's Authorization Certificate

Tender Ref.: << PLEASE SPECIFY SPECIFIC TENDER REF.NO.>>

Dear Sirs,

This is with reference to the above mentioned Tender.

We hereby authorize <<NAME AND ADDRESS OF INTEGRATOR>> to offer our range of product in their tender bids. Being authorized <<NAME AND ADDRESS OF INTEGRATOR>> may make techno-commercial and commercial proposal for this tender.

Upon being awarded the work <<NAME AND ADDRESS OF INTEGRATOR>> are authorized to install and commission our range of products falling under <<SECTION/PRODUCT CATEGORY>> of this tender.

We as Original Electronic Manufacturers will provide all the techno-commercial and service support necessary to <<NAME AND ADDRESS OF INTEGRATOR>>for this project during the commissioning phase of the equipment's and until hand-over.

We also confirm that the items would be serviceable during the warranty period of 12 months and for at least five years thereafter.

Thanking and assuring best of our services at all times.

Yours faithfully

(Seal & Signature)

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SECTION C

LIST OF APPROVED MAKE / MANUFACTURER

SL NO	ITEM	APPROVED MAKES OF MATERIAL
PART A	ELECTRICAL DISTRIBUTION	
1.1	MS CONDUITS ISI EMBOSSSED BLACK ENAMELLED /GALVANIZED	NEW INDIA CONDUIT, AKG, BEC
1.2	MS/GI CONDUIT ACCESSORIES SUPERIOR TYPE AS PER APPROVED SAMPLES	SHARMA SALES CORPN.,SUPER SALES CORPN.
1.3	PVC RIGID CONDUIT AND ACCESSORIES ISI EMBOSSSED	POLYPACK , PRECISION, AKG, BEC, ANCHOR
1.4	PVC FLEXIBLE CONDUIT AND ACCESSORIES	AKG, PMA-SSK
1.5	MS RACEWAYS AND RACEWAY ACCESSORIES.	MM ENETERPRISES, MEM ENTERPRISES, INDIANA
1.6	CABLE TRAYS	MM ENETERPRISES, MEM ENTERPRISES, INDIANA
2	WIRES, CABLES AND CABLE ACCESSORIES	
2.1	WIRES	
2.1.1	1100 VOLT GRADE FRLS PVC INSULATED STRANDED COPPER CONDUCTOR WIRES	HAVELLS, FINOLEX, KEI, POLYCAB
2.2	1100 VOLT GRADE CABLES	
2.2.1	1100 VOLTS GRADE FR PVC CONTROL CABLES	HAVELLS, FINOLEX, KEI, POLYCAB
2.2.2	1100 VOLT GRADE XLPE INSULATED COPPER CONDUCTOR CABLES	HAVELLS, FINOLEX, KEI, POLYCAB
2.3	11 KV GRADE POWER CABLES	
2.3.1	11000 VOLT GRADE XLPE INSULATED, FR ALUMINIUM CONDUCTOR ARMOURED CABLES	HAVELLS, FINOLEX, KEI, POLYCAB

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SL NO	ITEM	APPROVED MAKES OF MATERIAL
2.4	CABLE ACCESSORIES	
2.4.1	1100 VOLT DOUBLE COMPRESSION BRASS CABLE GLANDS	DOWELLS, PEECO,COMET,SIEMENS
3	WIRING ACCESSORIES	
3.1	MODULAR GRID PLATE WIRING ACCESSORIES (SWITCHES, SOCKET OUTLETS BELLS ETC.) WITH BOXES.	LEGRAND MOSAIC, SCHNEIDER CLIPSAL OPALE, HONEYWELL WRAPAROUND PLUS, PHILIPS CPL OBSESSION, NORTH WEST (WIPRO)
3.2	METAL CLAD SOCKET OUTLETS WITH BOXES	SIEMENS, LEGRAND, NEPTUNE
3.3	WEATHER PROOF PLUGS AND SOCKETS (IP 65 / 66)	NEPTUNE, LEGRAND LEXIC, SIEMENS
3.4	DAYLIGHT AND OCCUPANCY SENSORS	SCHNEIDER ELECTRIC, WIPRO, HONEYWELL,LEGRAND, HAGER
4.	DISTRIBUTION EQUIPMENT	
4.1	SWITCHGEAR	
4.1.1	MCB'S/RCCB'S	LEGRAND, ABB, SCHNEIDER ELECTRIC MULTI 9 HAGER, L&T
4.1.2	EARTH LEAKAGE CIRCUIT BREAKER	LEGRAND, ABB, SCHNEIDER ELECTRIC MULTI 9 HAGER, L&T
4.1.3	TIMERS DISTRIBUTION BOARDS	LEGRAND LEXIC, ABB, SCHNEIDER ELECTRIC HAGER, L&T
4.1.4	DISTRIBUTION BOARDS	LEGRAND, ABB, SCHNEIDER ELECTRIC, HAGER L&T
4.2	LT 415 VOLT DISTRIBUTION EQUIPMENT	
4.2.1	MOULDED CASE CIRCUIT BREAKERS, MOTOR PROTECTION CIRCUIT BREAKER	ABB TMAX, LEGRAND, SIEMENS (3VL), L&T D SINE SCHNEIDER NSX SERIES
4.2.2	SWITCH FUSE UNITS AND ISOLATORS	L&T, SIEMENS, ABB, SCHNEIDER
4.2.3	CHANGE OVER SWITCH / ISOLATORS	SOCOMEK , ABB, HH ELCON
4.2.4	AIR CIRCUIT BREAKER	ABB EMAX, SIEMENS 3 WL,

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SL NO	ITEM	APPROVED MAKES OF MATERIAL
		SCHNEIDER MG MASTER PACT NW, L&T U POWER, LEGRAND
4.2.5	POWER/AUXILIARY, CAPACITOR CONTROL CONTACTORS, OVERLOAD RELAYS	ABB, SIEMENS SINEX, L&T SCHNEIDER TELEMECANIQUE
4.2.6	MPP HEAVY DUTY CAPACITORS	NEPTUNE DUCATI, EPCOS, SCHNEIDER MEHER MDXL, ABB – CLMD
4.3	ACCESSORIES	
4.3.1	PROTECTION RELAYS ELECTROMECHANICAL	AREVA, ABB, L&T,
4.3.2	PROTECTION RELAYS NUMERIC	AREVA, ABB, SIEMENS, L&T
4.3.3	APFC RELAY 3 PHASE	L&T, ABB, CONZERV, DUCATI NEPTUNE
4.3.4	SINGLE PHASE PREVENTER, OVERLOAD RELAYS	L&T, SIEMENS, ABB, SCHNEIDER ELECTRIC,
4.3.5	CURRENT TRANSFORMER	GILLBERT & MAXWELL, PRECISE, AE,
4.3.6	CONTROL / POTENTIAL TRANSFORMER	GILLBERT & MAXWELL, PRECISE, AE, MATRIX
4.3.7	PUSH BUTTONS, INDICATING LAMPS LED	SCHNEIDER, SIEMENS, RAAS, VAISHNO, TEKNIK,
4.3.8	SELECTOR SWITCHES	CL & T SALZER, BCH, SIEMENS, KAYCEE,
4.3.9	INSTRUMENTS – ANALOGUE	L&T RISHAB, AE,
4.3.10	DIGITAL METERS	SCHNEIDER, SECURE, NEPTUNE DUCATI
5.0	LT 415 VOLT SWITCHBOARDS	
5.1	LT PANELS	TRICOLITE ELECTRICAL INDUSTRIES, ADLEC AMBIT, ADVANCE PANEL & SWITCHGEAR, EAP
5.2	SANDWICH TYPE BUS DUCTS	CONTROL & SWITCHGEAR, HENIKWON, GODREJ, L&T, SCHNEIDER, LEGRAND
6.0	UPS	EMERSON, MGE, SOCOMAC
PART B	SUBSTATION	
1.	6.6 KV SUBSTATION EQUIPMENT	
1.1	6.6 KV VACUUM SWITCHGEAR	SIEMENS, ABB, SCHNEIDER, L&T
1.2	6.6 KV POTENTIAL	PRAGATI, KAPPA, JYOTI

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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SL NO	ITEM	APPROVED MAKES OF MATERIAL
	TRANSFORMER	
1.3	11 KV/433 VOLT VACUUM IMPREGNATED DRY TYPE TRANSFORMER	VOLTAMP,CROMPTON, KIRLOSKAR,ABB
PART C	MISCELLANEOUS EQUIPMENT	
1	MISCELLANEOUS SUB STATION EQUIPMENT	
1.1	INSULATING MATS TO IS :15652	PREMIER POLYFORM, JYOTI
1.2	CO2 FIRE EXTINGUISHERS	VIJAY FIRE, MINIMAX, CEASEFIRE, SAFEX, SAFEGUARD, ZENITH
PART D	LIGHTING MANAGEMENT SYSTEM	
1.1	CONTROLLERS, CONVERTERS	BEL HELVAR, TRIDONIC ATCO, SCHNEIDER ELECTRIC PHILIPS, DYNALITE
1.2	DIMMER PANELS	BEL HELVAR, TRIDONIC ATCO, SCHNEIDER ELECTRIC PHILIPS, DYNALITE
1.3	LIGHT FIXTURES	PHILIPS, LIGHTING TECHNOLOGIES, REGENT WIPRO, OSRAM ,TRILUX, DECON
1	DG SETS	
1.1	DIESEL ENGINES	CUMMINS, CATERPILLAR, MTU, PERKINS, VOLVO
1.2	ALTERNATOR	STAMFORD, MARATHON, KEC, NGEF, JYOTI AVK
PART -E	CCTV	
3	CAT6 COMPONENTS AND ITS ACCESSORIES	COMMSCOPE-SYSTIMAX , DIGILINKSCHNEIDER, MOLEX , PANDUIT-PANNET , TYCO,POLYCAB, FINOLEX
4	FIBER OPTICS COMPONENTS (DATA & VOICE/TELECOM, SINGLE MODE AND/OR	COMMSCOPE-SYSTIMAX , DIGILINK SCHNEIDER, MOLEX , PANDUIT-PANNET , TYCO

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	MULTIMODE) – CABLES, LIUS, SHELVES, PIGTAILS, PATCH-CORDS, CONNECTORS, COUPLERS, SPLICES	
5	CORE SWITCHES AND BLOCK/CLUSTER DISTRIBUTION SWITCHES AND THEIR FIBER INTERFACE MODULES AND OPTICS TRANSCEIVERS. ALL THESE COMPONENTS SHALL BE FROM A SINGLE OEM.	CISCO, DELL, HP
6	ACCESS/EDGE SWITCHES, NMS MANAGEMENT TOOLS, SINGLE MODE OR MULTIMODE FIBER OPTIC TRANSCEIVERS, LICENSES ETC. ALL THESE COMPONENTS SHALL BE FROM A SINGLE OEM.	CISCO, DELL, HP
7	INDUSTRIAL ETHERNET SWITCH INCL. POWER SUPPLIES, SINGLE MODE OR MULTIMODE FIBER OPTIC TRANSCEIVERS, LICENSES ETC.	CISCO, DELL, HP
8	WIRELESS ACCESS POINTS, WIRELESS CONTROLLER, WIRELESS LICENSES ETC. ALL THESE COMPONENTS, SHALL BE FROM A SINGLE OEM.	CISCO, DELL, HP
9	FIRE DETECTION & ALARM SYSTEM	NOTIFIER, XLS3000, EDWARDS, SIEMENS, HONEYWELL
10	2 X 1.5 SQ. MM. FRLS FLEXIBLE CABLE FOR FIRE DETECTION & ALARM SYSTEM & PUBLIC ADDRESS SYSTEM	FINOLEX, HAVELL'S, POLYCAB, KEI
11	CCTV / VIDEO-SURVEILLANCE CAMERAS – FIXED DOME, FIXED CS-MOUNT/BOX, IR-BULLET	PANASONIC, PELCO, SONY, HONEYWELL, AXIS, BOSCH
12	VMS SOFTWARE APPLICATION/ANALYTICS FOR CCTV/VIDEO-SURVEILLANCE	GENETEC SECURITY CENTER, HONEYWELLDVM, MILESTONE
13	SERVER HARDWARE FOR CCTV (VMS), IBMS AND ACCESS CONTROL SYSTEM	DELL, HP, IBM

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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14	STORAGE FOR CCTV	DELL, EMC2, HP-COMPAQ, IBM, NETAPP
15	LED DISPLAYS	PANASONIC, SAMSUNG, SHARP, SONY
16	DDC CONTROLLER	HONEYWELL-COMFORTPOINT, JOHNSON CONTROLS, L&T
17	IMMERSION TEMPERATURE SENSOR (WITH THERMO WELL) - WATER APPLICATION	GREYSTONE, HONEYWELL, JOHNSON CONTROLS, TRANE
18	DIFFERENTIAL PRESSURE SWITCH – AIR APPLICATION	GREYSTONE, HONEYWELL, JOHNSON CONTROLS, TRANE
19	DUCT TYPE TEMPERATURE SENSOR	GREYSTONE, HONEYWELL, JOHNSON CONTROLS, TRANE
20	MULTISTRAND COPPER CABLE - 4 X 0.5 SQ. MM. & 6 X 0.5 SQ. MM.	FINOLEX, HAVELL'S, POLYCAB ,KEI
21	SWITCHING EQUIPMENT, SCALER, WIRELESS PRESENTATION GATEWAY.	AMX, KRAMER, CRESTRON, EXTRON
22	LED DISPLAY	PANASONIC, SAMSUNG, SHARP, SONY
23	HDMI CABLES	KLOTZ, KRAMER, AMX, CRESTRON
24	VGA CABLE	KRAMER, CRESTRON, KLOTZ, KRYSTAL
25	NETWORKING RACKS, DATA CENTRE RACKS, DISTRIBUTION RACKS – FROM SIZES 15U TO 42U	APW-VERO PRESIDENT, RITTAL, PANDUITPANNET
26	SPEAKERS	BOSCH-EV, BOSE, RCF, MARTIN AUDIO, TANNOY
27	AMPLIFIER	BOSCH -EV, BOSE, RCF, LABGRUPEN
28	SPEAKER, MICROPHONE CABLE	KRAMER, KLOTZ, KRYSTAL, BELDEN
29	RACKS – NETWORKING, SERVER, AV	APW-VERO PRESIDENT, RITTAL, PANDUIT PANNET
30	ACCESS CONTROL SYSTEM SOFTWARE	DDS, GENETEC, LENEL, HONEYWELL, MATRIX
31	ACCESS CONTROL SYSTEM CONTROLLER	DDS, GENETEC, LENEL, HONEYWELL, MATRIX
32	SMART CARD AND BIO METRIC READERS	DDS, GENETEC, LENEL, HONEYWELL, MATRIX
33	ELECTRO MAGNETIC LOCK	BEL, ALGATEC

END OF MATERIAL SPECIFICATIONS

END OF E&C SPECIFICATIONS

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HVAC SPECIFICATION**SYSTEM DESIGN DATA****1. INTRODUCTION**

Oil India Limited building is to be constructed in Guwahati. It consist of one level parking in basement & ground plus five floors for office use. There is an auditorium located at ground floor. Services areas are located in basement like AC plant room, LT panel room etc.

This document describe the Design Basis for HVAC & Building Management System for this building.

2. OBJECTIVE

- 2.1 To provide year round Air-conditioning, ventilation & pressurization system for the entire complex.
- 2.2 To provide Air-conditioning system which consumes lesser energy and having flexibility in operation.
- 2.3 Which occupies minimum valuable space for installing equipments.
- 2.4 Which provides individual control in each and every space of occupants to result in further power saving.
- 2.5 Which provides required indoor Air quality with conservation of energy.
- 2.6 Which is user friendly.
- 2.7 The Air-conditioning system which is environment friendly.

3. SCOPE OF WORK

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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- 3.1 Design of complete air-conditioning system for Ground plus five floors including auditorium complete in all respect including chillers, pumps, AHUs, piping, ducting, grills, insulation etc.
 - 3.2 Design of ventilation system in basement & services areas complete in all respect as per NBC & local fire authority requirement.
 - 3.3 Design of complete pressurization system of staircases, lifts, lift lobbies & other life safety system including smoke extraction of various floors as per NBC & local fire authority requirement.

4. ABBREVIATIONS

PAC	Precision Air Conditioning
DX	Direct Expansion
VRV	Variable Refrigerant Volume
AHU	Air Handling Unit
MERV	Minimum Efficiency Reporting Value
ASHRAE	American Society of Heating Refrigerating and Air-conditioning Engineers
ISHRAE	Indian Society of Heating Refrigerating and Air-conditioning Engineers
ECBC	Energy Conservation Building Code
IS	Indian Standard
DB	Dry Bulb
WB	Wet Bulb
RH	Relative Humidity
Wt	Watt
Kw	Kilo Watt
Sq.ft	Square Foot
ACPH	Air Change Per Hour
CFM	Cubic Foot per Minute
F/A	Fresh Air
(W+S)	Working + Standby.
Ph	Phase
DC	Direct Current
AC	Alternating Current
TR	Ton of Refrigeration
ADP	Apparatus Dew Point
BMS	Building Management System
PUF	Poly Urethane Foam

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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VFD	Variable Frequency Drive
AMCA	Air Movement and Control Association
HRW	Heat Recovery Wheel
RPM	Rotation Per Minute
KWH	Kilo Watt Hours
ARI	Air conditioning and Refrigeration Institute
SMACNA	Sheet Metal and Air-conditioning Contractor's National Association
HVAC	Heating Ventilation and Air-conditioning
VCD	Volume Control Damper
VFD	Variable Frequency Drive
COP	Coefficient Of Performance
GI	Galvanized Iron
DCV	Demand Control Ventilation

5. GENERAL DATA

5.1	Application	:	Comfort Air-conditioning
5.2	Latitude	:	26.15 ° North
5.3	Longitude	:	91.74 ° East

6. BASIS OF DESIGN

6.1	Outside Conditions	Summer Monsoon Winter	32.2°C DB ; 25.6°C WB 31.1°C DB ; 27.8°C WB 11.1°C DB ; 10.55°C WB (As per ASHRAE Standard)
6.2	Inside Conditions		23.8 ° CDB+/-1 ° C, RH < 65% (As per ASHRAE Standard)
6.3	Light	All Areas	As per ECBC
6.4	Equipments	Cafeteria Cabins Rooms Auditorium Office/Workstation Gym Server/UPS Room	1000 watts. 250 watts. 250 watts. 5.0 Kw 125 watts./computer 5.0 Kw 4.0 Kw

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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6.5	Occupancy	Cabins	4 people per Cabin
		Rooms	3 people per Cabin
		Office	60 sqft./person
		Gym	30 sqft./person
		Cafeteria/Auditorium/ Other Areas	As per architectural layout
6.6	Fresh Air	All Areas	As per ASHRAE Standard 62.1.2007
6.7	Ventilation	All Areas	As per NBC
6.8	Kitchen Ventilation	All Areas	As per Requirement
6.9	Roof Insulation		All the roof exposed to sun will have under deck or over deck insulation carried out by other agency.

7. FACTOR DETAIL

7.1 Heat Transfer Co- Efficient (BTU / Hr. x FT² x °f)

7.1.1 Glass	:	0.56
7.1.2 Wall	:	0.38
7.1.3 Insulated exposed slab	:	0.14
7.1.4 Floor	:	0.21

7.2 Respiration Heat (BTU / Hr.) of People

7.2.1 Sensible heat	:	250 BTU/Hr
7.2.2 Latent heat	:	200 BTU/Hr
7.2.3 Sensible heat (For Gym)	:	710 BTU/Hr
7.2.4 Latent heat (For Gym)	:	1090 BTU/Hr

7.3 Other Factors

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

7.3.1	1 kwh	:	3410 BTU / hr.
7.4.2	Sensible heat safety	:	5%
7.5.3	Latent heat safety	:	5%
7.5.4	Glass Shading Coefficient	:	0.28

8. CODES & STANDARDS

Following codes and standards will be used.

- 8.1 ASHRAE Standard – 62.1.2010 Ventilation for Acceptable Indoor Air Quality.
- 8.2 ECBC – 2007 – Energy conservation building code.
- 8.3 ARI – Air-conditioning and Refrigerant institute.
- 8.4 NBC – National Building Code 2005.
- 8.5 IS – Relevant IS Codes.
- 8.6 ISHRAE HANDBOOK
- 8.7 CPWD – General Specifications of HVAC, 2017

9. GREEN BUILDING FEATURES

Following codes and standards will be used.

- 9.1 High COP chillers will be used.
- 9.2 AHUs with VFD will be used.
- 9.3 CFC & HCFC free refrigerants will be used.
- 9.4 All motors will be IE-3 rated.
- 9.5 Variable primary pumping will be used.
- 9.6 Fresh Air using HRW or DCV will be used

10. ESTIMATED REQUIREMENT

Based on above design data, the estimated requirements are as follows.

S. No.	Description	Area	Air Quantity	Plant	System
		SQFT	CFM	TR	TR
	GROUND FLOOR				
1	Sample Preparation	845	1065	2.1	2.2

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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2	Stores	385	338	0.6	0.6
3	BMS Room	240	667	1.2	1.2
4	Cafeteria	1992	2846	11	11.1
5	Office 1	533	672	2	2
6	Cabin 1	60	119	0.3	0.3
7	Cabin 2	60	119	0.3	0.3
8	Cabin 3	60	119	0.3	0.3
9	Cabin 4	60	119	0.3	0.3
10	Cabin 5	60	220	0.4	0.4
11	Cabin 6	114	125	0.4	0.4
12	Cabin 7	114	125	0.4	0.4
13	Cabin 8	114	238	0.5	0.5
14	Cabin 9	114	238	0.5	0.5
15	Cabin 10	60	112	0.3	0.3
16	Cabin 11	60	112	0.3	0.3
17	Cabin 12	60	119	0.3	0.3
18	Cabin 13	60	119	0.3	0.3
19	Cabin 14	60	218	0.4	0.4
20	Office 2	205	176	0.6	0.6
21	Cabin 15	82	117	0.3	0.3
22	Cabin 16	150	253	0.6	0.6
		SQFT	CFM	TR	TR
23	Cabin 17	147	251	0.6	0.6
24	Cabin 18	57	96	0.3	0.3
25	Cabin 19	61	97	0.3	0.3
26	Cabin 20	196	336	0.9	0.9
27	Workstations	603	458	1.2	1.2
28	Cabin 21	70	99	0.3	0.3
29	Cabin 22	70	99	0.3	0.3
30	Cabin 23	70	99	0.3	0.3
32	Hall	2402	3374	11	11.3
33	Cutout Full Height	4036	13641	23.4	24.4
34	Lobby 1	919	652	1.9	1.9
35	Lift Lobby	188	116	0.3	0.3
36	Mini Conference	987	1155	3.5	3.5
37	Visitors	785	1185	3.2	3.2
38	Lobby 2	3657	2635	7.5	7.5
39	Office 3	162	338	0.7	0.7
40	Corridor	2508	1102	3.4	3.4
41	Room 1	154	385	0.7	0.7
42	Room 2	154	376	0.7	0.7

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

43	Room 3	123	309	0.6	0.6
44	Room 4	123	315	0.6	0.6
45	Auditorium	3873	6773	23	23
46	Backstage	658	1191	2.9	2.9
47	Auditorium Corridor	2472	3200	9	9.1
	SUB-TOTAL :	29963	46518	120	121.6
	FIRST FLOOR				
1	Shale Labs	4854	8307	27.8	28.7
2	Dust Producing 1	113	156	0.5	0.5
3	Geochemical Lab	3816	6345	22	22.2
4	Wet Lab 2	244	609	1.8	1.8
5	Office	560	610	1.7	1.7
6	Cabin 1	149	136	0.4	0.4
7	Cabin 2	149	141	0.4	0.4
8	Cabin 3	149	313	0.6	0.6
9	Cabin 4	87	114	0.3	0.3
10	Cabin 5	87	114	0.3	0.3
11	Cabin 6	87	114	0.3	0.3
12	Cabin 7	87	114	0.3	0.3
S. No.	Description	Area	Air Quantity	Plant	System
		SQFT	CFM	TR	TR
13	Cabin 8	87	206	0.4	0.4
14	Cabin 9	87	206	0.4	0.4
15	Cabin 10	149	141	0.4	0.4
16	Cabin 11	149	141	0.4	0.4
17	Cabin 12	149	296	0.6	0.6
18	Lift Lobby	217	112	0.3	0.3
19	Corridor	3400	1327	4.5	4.5
20	Dust Producing 2	116	104	0.3	0.3
21	Biostratigraphy Lab	5680	8390	31.9	31.9
	SUB-TOTAL :	20416	27996	95.6	96.7
	SECOND FLOOR				
1	Remote Sensing Lab	3730	5904	21.1	21.3
2	Conference Room	945	1165	2.6	2.7
3	Wet Lab	269	623	1.8	1.8
4	Dust Producing 1	122	105	0.4	0.4
5	Reservoir Lab	3662	5593	20.7	20.7
6	Dust Producing 2	116	104	0.4	0.4
7	Chemical Lab	5643	7528	30.1	30.1

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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8	Corridor	3729	1390	4.7	4.7
9	Cabin 3	113	125	0.4	0.4
10	Cabin 4	113	129	0.3	0.4
11	Passage 1	172	62	0.2	0.2
12	Passage 2	172	62	0.2	0.2
13	Cabin 5	113	119	0.4	0.4
14	Cabin 6	113	119	0.4	0.4
15	Cabin 7	113	119	0.4	0.4
16	Cabin 8	113	119	0.4	0.4
17	Cabin 9	113	129	0.3	0.4
18	Cabin 10	113	129	0.3	0.4
19	Cabin 11	177	316	0.6	0.6
20	Cabin 12	177	260	0.5	0.5
21	Cabin 13	177	260	0.5	0.5
22	Cabin 14	177	298	0.6	0.6
23	Lift Lobby	188	129	0.2	0.2
	SUB-TOTAL :	20360	24787	87.5	88.1

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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S. No.	Description	Area	Air Quantity	Plant	System
		SQFT	CFM	TR	TR
	THIRD FLOOR				
1	Workstations	2396	3423	7.3	7.3
2	TEA	585	884	3.4	3.4
3	Server Room	233	930	1.6	1.6
4	Gym	1204	3684	11	11.1
5	UPS Room	174	1034	1.6	1.7
6	ED Room	391	641	1.6	1.7
7	Cabin 1	137	131	0.4	0.4
8	Lobby 1	417	251	0.9	0.9
9	Lobby 2	375	288	1.1	1.1
10	Library	623	956	2.9	2.9
11	Conference Room	997	1077	3	3
12	DED Room	391	641	1.6	1.7
13	Cabin 2	137	131	0.4	0.4
14	Lobby 3	417	251	0.9	0.9
15	Cabin 3	113	125	0.4	0.4
16	Cabin 4	113	129	0.3	0.4
17	Passage 1	172	62	0.2	0.2
18	Passage 2	172	62	0.2	0.2
19	Cabin 5	113	119	0.4	0.4
20	Cabin 6	113	119	0.4	0.4
21	Cabin 7	113	119	0.4	0.4
22	Cabin 8	113	119	0.4	0.4
23	Cabin 9	113	129	0.3	0.4
24	Cabin 10	113	129	0.3	0.4
25	Cabin 11	177	316	0.6	0.6
26	Cabin 12	177	260	0.5	0.5
27	Cabin 13	177	260	0.5	0.5
28	Cabin 14	177	298	0.6	0.6
29	Lift Lobby	188	129	0.2	0.2
30	Corridor	3804	1435	4.7	4.7
31	Cabin 15	177	298	0.6	0.6
32	Cabin 16	177	290	0.6	0.6
33	Cabin 17	177	290	0.6	0.6
34	Cabin 18	177	514	0.9	0.9
35	Cabin 19	115	357	0.7	0.7
36	Cabin 20	96	116	0.3	0.3
37	Cabin 21	96	124	0.3	0.3
38	Cabin 22	96	116	0.3	0.3

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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		SQFT	CFM	TR	TR
39	Cabin 23	96	116	0.3	0.3
40	Cabin 24	96	116	0.3	0.3
41	Cabin 25	96	116	0.3	0.3
42	Cabin 26	96	154	0.4	0.4
43	Cabin 27	96	154	0.4	0.4
44	Office 1	722	529	1.6	1.6
45	Waiting	279	150	0.5	0.5
46	Conference	926	1046	3.2	3.2
47	Office 2	586	470	1.4	1.4
48	cabin 28	132	129	0.4	0.4
49	cabin 29	109	118	0.4	0.4
50	cabin 30	109	118	0.4	0.4
51	cabin 31	109	167	0.4	0.4
52	cabin 32	143	135	0.4	0.4
53	cabin 33	109	216	0.5	0.5
54	cabin 34	204	344	0.7	0.7
55	cabin 35	177	304	0.6	0.6
56	cabin 36	177	304	0.6	0.6
57	cabin 37	177	389	0.7	0.8
	SUB-TOTAL :	19975	25312	65.9	66.7
	FOURTH FLOOR				
1	Cabin 1	228	343	0.7	0.8
2	Cabin 2	224	494	0.9	1
3	Cabin 3	189	166	0.5	0.5
4	Cubicle-1 Vigilance	291	655	1.2	1.2
5	Lobby Vigilance	196	83	0.2	0.2
6	Server Room	158	1022	1.6	1.6
7	Cabin 4	127	146	0.4	0.4
8	Cabin 5	125	392	0.8	0.8
9	Cabin 6	125	325	0.7	0.7
10	Cabin 7	125	325	0.7	0.7
11	Cabin 8	125	332	0.7	0.7
12	Cubicles-2 Finance	1390	927	2.5	2.5
13	Lift lobby	217	92	0.2	0.2
14	Cabin-9	127	146	0.4	0.4
15	cabin-10	127	146	0.4	0.4
16	Cabin-11	136	311	0.6	0.6
17	Cabin-12	119	292	0.5	0.6
		SQFT	CFM	TR	TR
18	Cabin-13	122	293	0.5	0.6

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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19	Cabin-14	135	372	0.7	0.7
20	Cabin-15	126	274	0.6	0.6
21	Cabin-16	125	209	0.5	0.5
22	Cabin-17	125	187	0.5	0.5
23	Conference-1	281	509	1.3	1.3
24	Cabin-18	125	187	0.5	0.5
25	Cabin-19	125	187	0.5	0.5
26	Cabin-20	114	134	0.4	0.4
27	Cabin-21	114	134	0.4	0.4
28	Cubicles-3 Admin	2493	1228	3.7	3.7
29	CGM (M & M)	181	577	1.2	1.2
30	CGM (ADMIN)	179	355	0.9	0.9
31	CGM (COMMERCE)	181	355	0.9	0.9
32	CGM (PLM)	177	359	0.9	0.9
33	Cubicles-4 CGM	613	450	1.1	1.1
34	Cabin 22	137	131	0.4	0.4
35	Cabin 23	137	131	0.4	0.4
36	PLS Room	394	653	1.7	1.7
37	CMD Room	394	653	1.7	1.7
38	Conference-2	997	1002	2.9	2.9
39	Conference-3	682	653	2.4	2.4
40	Lobby-1	416	198	0.8	0.8
41	Lobby-2	315	209	0.8	0.8
42	Lobby-3	416	198	0.8	0.8
43	CGM (PLP)	171	351	0.9	0.9
44	CGM (F & A)	176	351	0.9	0.9
45	CGM (T & I)	176	351	0.9	0.9
46	CGM (OPS)	176	684	1.3	1.4
47	CGM (E & E)	163	387	0.9	0.9
48	CGM (CIVIL)	162	304	0.8	0.8
49	Cubicles-5 CGM	802	641	1.6	1.6
50	Cabin 24	134	138	0.4	0.4
51	Cubicles-6 PLANNING	351	216	0.6	0.6
52	TEA	587	914	2.7	2.8
53	Room	215	138	0.3	0.4
54	Corridor	3626	1436	4.4	4.5
	SUB-TOTAL :	19872	21746	55.2	56

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S. No .	Description	Area	Air Quanti ty	Plant	Syste m
		SQFT	CFM	TR	TR
	FIFTH FLOOR				
1	Cabin-1	128	397	0.7	0.8
2	Cabin-2	128	305	0.6	0.6
3	Cabin-3	134	340	0.6	0.7
4	Cabin-4	123	162	0.4	0.4
5	Cabin-5	123	162	0.4	0.4
6	Cubicle 1	673	839	1.8	1.8
7	Cabin-6	130	164	0.4	0.5
8	Cabin-7	130	164	0.4	0.5
9	Cabin-8	125	372	0.7	0.7
10	Cabin-9	125	306	0.6	0.6
11	cabin-10	125	306	0.6	0.6
12	Cabin-11	125	315	0.6	0.6
13	Cabin-12	125	162	0.4	0.4
14	Cabin-13	132	164	0.5	0.5
15	Cubicle 2	985	649	1.6	1.7
16	Lift Lobby	217	118	0.3	0.3
17	Cabin 14	136	318	0.6	0.6
18	Cabin 15	125	327	0.6	0.6
19	Cabin 16	125	327	0.6	0.6
20	Cabin 17	125	372	0.7	0.7
21	Cabin 18	119	233	0.6	0.6
22	Cubicle 3	1163	922	2.2	2.2
23	Tender Opening	791	897	2.6	2.6
24	Waiting	402	343	1.1	1.1
25	Lunch Room	309	407	1.3	1.3
26	Cabin-19	120	325	0.7	0.7
27	Cabin-20	143	355	0.8	0.8
28	Cabin-21	119	316	0.7	0.7
29	Cabin-22	132	494	1	1
30	Cabin-23	118	384	0.8	0.8
31	Cabin-24	118	384	0.8	0.8
32	Cabin-25	118	384	0.8	0.8
33	Cubicle 4	1552	1164	2.9	2.9
34	Cabin 26	125	326	0.7	0.7
35	Cabin 27	125	426	0.9	0.9
36	cabin 28	101	167	0.5	0.5
37	Cubicle 5	543	443	1.1	1.1
38	Cabin 29	118	165	0.5	0.5

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S. No .	Description	Area	Air Quantity	Plant	System
		SQFT	CFM	TR	TR
39	cabin 30	118	165	0.5	0.5
40	Cubicle 6	369	282	0.7	0.7
41	Drawing hall	386	698	1.6	1.6
42	cabin 31	124	340	0.8	0.8
43	cabin 32	125	341	0.8	0.8
44	cabin 33	124	340	0.8	0.8
45	Cabin 34	132	504	1	1
46	cabin 35	114	158	0.4	0.4
47	cabin 36	119	150	0.4	0.4
48	Cabin 37	114	149	0.4	0.4
49	Cabin 38	119	150	0.4	0.4
50	Cubicle 7	1056	819	2	2.1
51	Cabin 39	131	328	0.7	0.7
52	Cabin 40	118	299	0.6	0.6
53	Cabin 41	118	299	0.6	0.6
54	Cabin 42	132	560	1	1
55	Cabin 43	118	439	0.9	0.9
56	Cabin 44	118	438	0.9	0.9
57	Cabin 45	117	261	0.6	0.6
58	Cabin 46	121	159	0.4	0.5
59	Cubicle 8	1348	1004	2.6	2.6
60	TEA	587	987	2.9	2.9
61	Room	215	166	0.4	0.4
62	Corridor	3464	1778	5	5
	SUB-TOTAL :	19742	25218	59.5	60.2
	GRAND-TOTAL :	130328	171577	483.7	489.3

Total max. Cooling requirement = 420 Tons

Cooling requirement after 90% diversity = 380 Tons

Equipment proposed = 3 Nos 190 TR (2W+1S)

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11. SYSTEM DESIGN (HVAC)

11.1 MAIN PLANT

- 11.1.1 It is proposed to install central chilled water system to air-condition the above areas.
- 11.1.2 Main air-conditioning plant for above areas will be consists of 3 Nos. 190 TR (one standby) Water Cooled VFD Screw Chillers. Chiller will be design for 45°F outlet chilled water temperature & 55°F inlet chilled water temperature, condenser will be design for 90°F inlet water temperature & 97.5°F outlet water temperature. Fouling will be 0.00025 on chiller & 0.00075 on condenser. Chiller will be designed for COP & IPLV as per ECBC + requirement.
- 11.1.3 Primary variable pumping will be used. The main plant will be completed with 3 Nos. variable primary chilled water pumps (2 working & 1 standby), 3 Nos. condenser chilled water pumps (2 working & 1 standby), 3 Nos. induced draft type cross flow cooling towers (2 working & 1 standby). Motors for all pumps will be IE-3 rated.
- 11.1.4 All pumps will be double suction inline type or horizontal split casing type.
- 11.1.5 3 Nos. of cooling tower of capacity 240 TR each (one standby) will be used. All cooling towers will be cross-flow type with CTI certification & DB level not exceeding 75m at 3m distance. Motor for cooling tower will be IE-3 rated with weather proof protection.
- 11.1.6 Main plant will be located in the plant room in basement and cooling tower on terrace.
- 11.1.7 All plant room equipments will be controlled using plant manager procured from either pumps or chiller manufacturer.
- 11.1.8 Plant room will be provided with refrigerant leak detection
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system with at least three different modes of warning Low, Medium & High.

11.1.9 Piping and valves from pumps, chillers upto header will be with groove coupling and flange adaptors.

11.1.10 The system will be complete with electrical panel board with cabling & earthing.

11.2 AIR DISTRIBUTION SYSTEM

11.2.1 All areas will have independent air handling unit. All AHUs & HRWs will be double skin with 40mm thick PUF panels with 42kg/m³ density. All AHUs & HRWs kept in non- condition area will be with thermal brake profile.

11.2.2 All AHUs & HRWs will be variable speed type. All AHUs HRWs will be with direct driven plug fan with VFD.

11.2.3 All AHUs will be with single cooling coil of 6 rows.

11.2.4 All AHUs will be with PICB valve to regulate chilled water flow.

11.2.5 All AHUs/ HRWs will be with IE – 3 motors.

11.2.6 All AHUs & HRWs will be with MERV-8 pre filters and second bank of MERV-13 fine filters .

11.2.7 Individual areas being fed by single bigger AHU will be provided with VAVs for individual temperature control.

11.2.8 Factory fabricated G.I. sheet ducting will be used for non AC ducts, whereas ducts made out of glass wool board of thickness 25 mm will be used to supply conditioned air to various areas, supply and return grills / diffusers will be extruded aluminium powder coated.

11.2.9 All AC & HRW non-exposed ducts will be of 25mm thick

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duct board whereas exposed duct will be of GI with 25 mm thick nitrile rubber class 'O' insulation & UV Coating.

- 11.2.10 Acoustic lining will be installed upto 3m in AHUs & HRWs. All AHU & HRW rooms will be with acoustic lining. Duct acoustic lining will be with acoustic duct board of 25 mm thickness. AHU & HRW room acoustic will be with 25 mm thick rigid board of 70- 80 kg/m³ density.

11.3 PIPING SYSTEM

- 11.3.1 Piping will be 2 pipe system to provide cooling only.
- 11.3.2 Main plant will supply chilled water using insulated M.S.'C' Class piping. Whereas condenser piping will be M.S. 'C' class without insulation.
- 11.3.3 Chilled water insulated piping will be provided with insulation alongwith mechanical protection.
- 11.3.4 Piping will be designed for variable primary pumping.
- 11.3.5 Pipe risers in plant room from pumps & chillers upto headers will be with couplings & flange adapters.

11.4 FRESH AIR SYSTEM

- 11.4.1 Fresh air will be provided using heat recovery wheel units. Minimum efficiency of wheel will be 60%. In heat load calculations no benefit for same will be considered. For Areas where HRW supply is not possible, direct fresh air will be taken with motorized dampers to modulate using CO2 sensor.
- 11.4.2 Air quality will be maintained at 'Good Criteria' condition as per AQI-95 index of CPCB. HRW units will be with multistage filtration PM 10, PM 5.0, PM 2.5 along with 100 mm thick grid block chemical filters to absorb harmful gases Sox, Nox,

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H2S etc. & PHI cells to remove biological contamination, VOCs, bad odor. For AHUs being supplied by fresh air other than HRW, AHUs will be with grid block chemical filter 100 mm thick along with micro electrostatic filtration for PM 2.5 with 130mm depth..

11.5 VENTILATION & LIFE SAFETY SYSTEM

- 11.5.1 All basements will be mechanically ventilated. Exhaust will be provided using fire rated axial fans. Whereas make up fresh air will be provided using non fire rated axial fans. If fresh air fans are located in possible smoke area than these will be fire rated as well.
- 11.5.2 All basements, service areas, toilets etc. will be provided with mechanical ventilation as per NBC. All parking fire zones in basement will be 3000m² or less & minimum number of two zones per basement. Ventilation rate will be 12 ACPH for both exhaust & make- up fresh air. In first basement in zones where ramp is entering from ground floor fresh air can be considered from it.
- 11.5.3 Parking ventilation will be using jet fans. Whereas services areas ventilation will be duct type.
- 11.5.4 All Liftwell, lift lobbies & stairwells will be pressurized in case of fire as per NBC requirement.
- 11.5.5 Corridor & high occupancy area emergency smoke ventilation will be provided. Ventilation will be at 12 ACPH.
- 11.5.6 Fire dampers will be provided in AHU room / wall crossing and to isolate different floors & fire zones.
- 11.5.7 All ventilation fans will be vane axial fans except for areas like toilet & pantry.
- 11.5.8 Axial fan DB level will not be more than 80 db measured at 3m distance. Minimum fan efficiency will be 70%. In parking

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ventilation each fan room of a zone will have minimum of 2 fans. Jet Fans will be with 2D silencer on both side with dual speed motor & not exceeding 355mm Dia.

11.5.9 Axial & Jet fans will be AMCA certified for Air & Sound performance. In addition to this fire rated axial fans will be UL or CE certified for 2 hours of operation at 250° C temperature.

12. POWER REQUIREMENTS

Air Conditioning requires, **400 kw**, 3Ph, 415 Volts power supply.

Ventilation system will required **75 kw** 3Ph, 415 Volts power supply.

Pressurization systems will required **45 kw** 3Ph, 415 Volts power supply.

13. WATER REQUIREMENT

Air Conditioning will requires **35,000 litres** soft and filtered water per day.

GENERAL

1.1 INTRODUCTION

The system includes HVAC works for Oil Building at Guwahati.

1.2 SCOPE

These specifications cover the following types of air-conditioning, and ventilation:

- i) Central air-conditioning system
- ii) Mechanical ventilation system

Central air-conditioning system included in these specifications is by means of Screw/Scroll type compressors.

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These Specifications cover the equipments and materials for the system, their testing and/or inspection as may be necessary before their dispatch from their respective works, their delivery at site, all preparatory works, assembling, installation and adjustments, commissioning, final testing, putting in to operation, equipment capacity computation and handing over of the complete system.

1.3 RELATED DOCUMENTS

These Specifications shall be read in conjunction with the General conditions of contract, schedule of work, drawings and other documents connected with the work.

1.4 TERMINOLOGY

The definition of terms used in these specifications shall be in accordance with IS: 3615-"Glossary of terms used in refrigeration and air-conditioning".

1.5 COLOUR SCHEME FOR THE EQUIPMENTS AND COMPONENTS

- Color scheme for equipment like chilling unit, pumps, AHUs, cooling tower etc. shall be as per manufacturer's standard colour scheme.
- The scheme of color code painting of pipe work services for air conditioning installation shall be as per National building code and is indicated below:-

Description	Ground Colour	Lettering Colour	First Colour band
Condenser water piping	Sea Green	Black	French Blue
Chilled water piping	Sea Green	Black	Black
Central heating piping below 60°C	Sea Green	Black	Canary Yellow
Central heating piping 60°C to 100°C	Sea Green	Black	Dark Violet
Drain Pipe	Black	White	
Vent	White	Black	

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Valves and pipe line fittings	White with Black Handles	Black	
Belt guard	Black & Yellow diagonal strips		
Machine bases, Inertia Base Plinth	Charcoal grey		

- Color bands shall be 150mm wide, superimposed on ground color to distinguish type and condition of fluids. The spacing of band shall not exceed 4.0m.
- In addition to the color bands specified above all pipe work shall be legibly marked with black or white letters to indicate the type of service and the direction of flow identified as follows:

➤ Chilled water	:	CHW
➤ Condenser water	:	CDW
➤ Condensate	:	C

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III WATER CHILLING UNIT **(VFD SCREW)**

1. SCOPE

Supply, Installation, Testing & Commissioning of factory assembled single piece water-cooled liquid chiller with star-delta starter. Contained within the unit factory wiring, piping, controls, refrigerant charge (HFC-134a), refrigeration circuit, screw compressor, electronic expansion valves and equipment required prior to field start-up.

2. SCREW CHILLERS

The screw chilling machine with single compressor with single circuit shall consist of horizontal, semi-hermetic, direct driven low speed helical rotary compressors with screw, refrigerant cooled motor, oil separator , evaporator, water cooled condenser, factory mounted microprocessor based panel & VFD starter, interconnecting refrigerant piping, electronic expansion valve, controls and accessories to make it compact & efficient unit.

The compressor should have capacity control from 20% to 100%, making it suitable for varying load applications and efficient under part load conditions. The cost of VFD is to be included in the cost of unit. The Unit shall be refrigerant suction gas cooled so that the windings of semi-hermetic compressors is within limits i.e. during part operation when the suction gas is less, as an abundant precaution , liquid refrigerant is injected to the suction side of the compressor to cool the motor winding.

- 2.1 The screw compressor shall have a rotary mono/twin screw, and may be of open / Semi hermetic type. It shall be using refrigerant R134a.
- 2.2 The mono/twin rotary screw shall be manufactured from forged steel. The profile of screws shall permit safe operation upto a speed of 5000 RPM for 50 Hz operation. The compressor shall unload from fully loaded

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- to the minimum capacity by means of hydraulically actuated slide valve positioned over the screw rotor.
- 2.3 The compressor housing shall be of high grade cast iron, machined with precision, to provide a very close tolerance between the rotor(s) and the housing.
- 2.4 The rotor(s) shall be mounted on antifriction bearings designed to reduce friction and power input. There shall be multiple cylindrical bearings to handle the radial and axial loads.
- 2.5 There shall be built in oil reservoir to ensure full supply of lubricants to all bearings and a check valve to prevent backspin during shut down.
- 2.6 There shall be oil pump or other means of differential pressure inside the compressor for forced lubrication of all parts during startup, running and during shut down. An oil sump header shall be provided.
- 2.7 The open type compressor shall also have a suitable shaft seal, to prevent leakage of refrigerant.
- 2.8 The driving motor shall be squirrel cage type Semi hermetic/ Open type as required, protected against damage by means of built in protection devices.

3. **COMPRESSOR**

Unit shall have semi-hermetic inverter driven mono/twin-screw compressors with internal relief valve and check valve to avoid reverse rotation on shut down. Each compressor shall be equipped with a discharge shut-off valve. The discharge shall also be equipped with a muffler to reduce discharge gas pulsations. VFD Capacity control shall be provided, capable of reducing compressor capacity down to 20% of full load. Motor shall be cooled by suction gas and protected by internal winding temperature sensors. Compressor bearings shall be designed for minimum 73000 hours at maximum operating conditions. Lubrication oil system shall include pre-filter and external filter capable of filtration to 5 microns.

3.1 **Compressor motor**

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The electrical motor driving the compressor shall be VFD compatible and squirrel cage induction motor class 'F' insulation, Open dip proof for open type unit and totally enclosed (refrigerant cooled) for hermetic/ semi-hermetic unit.

- i. The motor shall be suitable for operation on $415 \pm 10\%$ volts, 3 phase, 50 HZ alternating current supply, unless otherwise specified.
- ii) The motor synchronous speed shall not exceed 3000 r.p.m.
- iii) Continuous BHP rating of the motor shall not be less than the maximum power requirement of the compressor and drive under specified design conditions

3.2 **VFD**

- i) The variable frequency drive (s) shall be pulse width modulation (PWM) type, microprocessor controlled design.
- ii) Enclosure shall be IP-54 protected for free standing VFD and NEMA1 in case of unit mounted VFD integral with main disconnect switch and semiconductor fuses and ventilated for installation or free-standing unit, depending on the ampere rating. A hand-off-automatic switch and speed potentiometer shall be mounted on the front of the enclosure. (VFD $\leq$ 90 KW-IP55 + MDS and VFD $>$ 90 KW – IP54 + MDS + Semiconductor fuses)
- iii) VFD shall utilize a diode bridge rectifier to convert three phase AC to a fixed DC voltage. VFDs employing power factor correction capacitors shall not be acceptable.
- iv) Drive will be PWM type utilizing IGBT
- v) The following customer modifiable adjustments shall be provided :
 - a. Accel time : 0.1 to 1800 seconds
 - b. Decel time : 0.1 to 1800 seconds
 - c. Minimum frequency : 0 HZ
 - d. Maximum frequency : 120 HZ
 - e. Analog input filter : 0.1 to 10 seconds
 - f. Analog output : 10 to 1 gain
 - g. Volts / Hertz ratio
- vi) Speed reference signal shall be customer delectable for 0-10 VDC or 4-20 mA.

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- vii) The VFD shall be suitable for working at the elevations up to 3300 feet above sea level without derating. Maximum operating ambient temperature shall not be less than 104 degrees F. VFD shall be suitable for operation in environments up to 95 % non-condensing humidity.
- viii) The VFD shall be capable of displaying the following information in plain English via a 40 character graphical, six line display:

- a. Frequency
- b. Voltage
- c. Current
- d. Kilowatts per hour
- e. Fault identification
- f. Percent torque
- g. Percent power
- h. RPM

- ix) Variable Frequency Drive shall also include the following standard features:

Current imbalance detector which monitors 3 phase motor current to provide the following protection:-

- Phase loss
- Phase reversal
- Phase imbalance
- Ground fault
- Shorted SCR
- Current flow while stopped protection.

* Diagnostic LED's shall be provided to indicate:

- Starter on
- Run (up to voltage)
- Phase correct
- Over temperature fault
- SCR gates energised
- Ground fault
- Current imbalance fault
- Current while stopped

4. **EVAPORATOR**

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Unit shall be equipped with a single evaporator. Evaporator shall be manufactured, tested and stamped in accordance with ASME/GB Pressure Vessel Code. The maximum refrigerant-side operating pressure will be 2100 kPa, and the maximum waterside pressure will be 1000 kPa. The evaporator shall be mechanically cleanable, shell-and-tube type with removable heads. Tubes shall be internally and externally grooved, seamless-copper, and shall be rolled into tube sheets. Shell shall be insulated with 19 mm closed-cell foam with a maximum K factor of 0.28. Evaporator thermal insulation shall be factory fitted. The evaporator shall have a drain and vent in each head. The evaporator shall incorporate an active refrigerant level control system to ensure optimum heat transfer performance under all load conditions. Design shall incorporate one refrigerant circuit. Chiller shall have only one water inlet & outlet connection with Victaulic couplings to avoid vibrations transmission and accept small misalignment. Evaporator shall be fitted with electronic auto setting water flow switch. Paddle switches or differential pressure switches shall not be acceptable. The chiller shall be of flooded type.

4.1 MATERIAL AND CONSTRUCTION

- i) The water chiller shall be horizontal, shell end tube type, designed, constructed and tested for the refrigerant specified in the tender specifications.
- ii) The chiller shall be designed for a working pressure on the refrigerant side suitable for the refrigerant offered, and on the water side for 10 kg./sq.cm. gauge.
- iii) The end plates of chiller shall be made of MS of thickness not less than 25mm.
- iv) The shell of the chiller shall be made of MS of thickness not less than 8 mm with electric fusion welded seams.
- v) The tubes shall be of seamless, hard drawn copper with a minimum tube wall thickness of 0.71 mm for plain tubes & minimum 0.63mm at the root of fins.
- vi) The tubes may be either plain or internally finned as per manufacturer's design.

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- vii) The tubes shall be rolled into grooves in the tube sheets and flared at ends.
 - viii) Intermediate tube supports of steel or polypropylene shall be provided at spacing not less than 1250 mm to prevent sagging / vibration of tubes.
 - ix) The chiller shall be smooth finished with one coat of paint as per manufacturing practice before the insulation is applied.
 - x) The chiller shall be sand blasted from both inside (before insertion of tubes) & outside.
 - xi) Sight glass to check the level of refrigerant

4.2 CONNECTIONS AND ACCESSORIES

The chiller shall be provided with the following connections and accessories and conforming to section "Refrigeration Piping" where applicable

- i) Refrigeration inlet and outlet connections
- ii) Liquid refrigerant float for level control expansion valve/ fixed or variable orifice
- iii) Pressure relief device
- iv) Charging connection with valve
- v) Eliminator plate
- vi) Drain and vent connections with valves
- vii) Water inlet and outlet connections
- viii) Proper oil return system
- ix) Flow switch/pressure switch/differential flow switch/ flow sensor in the water line(s)

4.3 PRESSURE TESTING

- i) The chiller shall be tested in the works to 1.5 times the maximum working pressure or 21 kg/sqcm (Pneumatic), whichever is higher.
 - ii) The water side of the chiller shall also be tested to a hydraulic pressure of 10 kg/sqcm at the works.
- Pressure test certificates shall be produced in respect of each chiller

5. **CONDENSER**

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Unit shall be equipped with a single condenser. Condenser shall be manufactured, tested and stamped in accordance with ASME/GB Code. The maximum refrigerant-side operating pressure will be 2100 kPa, and the maximum waterside pressure will be 1000 kPa. The condenser shall be mechanically cleanable shell-and-tube type with removable heads. Tubes shall be internally and externally grooved, seamless-copper, and shall be rolled into tube sheets. Design shall incorporate one refrigerant circuit and the oil separator. The condenser shall have a drain and vent in each head. Chiller shall have only one water inlet & outlet connection with victaulic couplings to avoid vibrations transmission and accept small misalignment.

5.1 MATERIAL AND CONSTRUCTION

- 1 The condenser shall be horizontal, shell and tube type, designed, constructed and tested for the refrigerant specified in the tender specifications.
- 2 The shell of the condenser shall be made of MS of thickness not less than 8mm, with electric fusion welded seams. The shell capacity shall be such as to hold 1.25 times the refrigerant charge in the machine of which the condenser is a part, under pumped down conditions.
- 3 The end plates of condenser shall be made of MS of thickness not less than 25mm.
- 4 The condenser shall be designed for a working pressure on the refrigerant side suitable for the refrigerant offered, and on the water side for 10 kg/sqcm gauge.
- 5 The tubes shall be of seamless hard drawn copper and finned, unless otherwise specified.
- 6 The minimum wall thickness shall be 1.0 mm with root thickness of 0.63 mm below the fins.
- 7 Intermediate tube supports of steel shall be provided at no more than 1250 mm intervals to prevent sagging and vibration of the tubes. The condensers shall have marine water boxes designed for multi pass flow.
- 8 The tubes may be provided with special tabulating arrangement to improve heat transfer where such an arrangement is a standard design of the manufacturer.
- 9 The condensers shall be provided with removable heads on either side made of cast iron or steel with neatly machined surface for effective jointing with the shell for easy accessibility for cleaning/replacement of the tubes. Suitable baffles shall be incorporated to achieve the required

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- number of passes. It should be possible to descale the tubes without disconnecting the water line connections, wherever marine water boxes have been specified in the tender documents.
- 10 The condenser shall be provided with baffle arrangement for preventing direct impingement of hot gas over the tubes and to enable even distribution of the gas over the tube bundles.
- 11 The condenser shall include necessary provision for sub-cooling of the refrigerant where the refrigerating machine is selected with such sub-cooling requirement. The arrangement shall be such that the cold water entering the condenser first cools the liquid refrigerant in the sub-cooler.
- 12 The condenser shall be sand blasted from both inside & outside.

5.2 CONNECTIONS AND ACCESSORIES

The condenser shall be provided with the following connections and accessories and conforming to Section "Refrigerant Piping" where applicable:

- i. Hot gas inlet and liquid outlet connections. The liquid line connections shall be provided with isolating valves.
- ii. Water inlet and outlet connections.
- iii. Pressure relief device.
- iv. Drain connection with valve for water side.
- v. Differential flow switch/ pressure switch/ flow switch/ flow sensor in the water line(s)

5.3 PRESSURE TESTING

- 1 The condenser shall be tested at the works to 1.5 times the maximum working pressure or 15 kg/sq.cm. (Pneumatic) whichever is higher.
- 2 The water side of the condenser shall also be tested to a hydraulic pressure of 10 kg./sq.cm. in the works.
- 3 Pressure test certificates shall be produced in respect of each condenser.

6. REFRIGERATION CIRCUIT

Refrigerant circuit components shall include, compressor, oil separator, high and low side pressure relief devices, compressor discharge and liquid line shutoff valves, refrigerant economizer, filter driers, moisture indicating sight glasses, long stroke electronic expansion device, and complete operating charge of both refrigerant HFC-134a and compressor oil.

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To facilitate service and maintenance and avoid refrigerant charge transfers, it must be possible to isolate the following components and systems independently: filter driers, oil filters, expansion devices and compressor.

- 6.1 Refrigerant piping shall be designed and installed so as to:
- i) Ensure circulation of adequate refrigerant at all loads.
 - ii) Ensure oil return to crank case of compressor positively and continuously.
 - iii) Keep pressure losses within limits, especially in suction lines.
 - iv) Prevent oil/liquid refrigerant from entering the compressor when the compressor is working as well as when it has stopped.
 - v) Prevent trapping of oil in evaporator or suction lines, which may return to the compressor in the form of slug.
- 6.2 Hot gas lines: Oil shall be entrained and carried by hot gas under all load conditions likely to be encountered in normal operation.
- 6.3 Liquid Lines:
- i) Liquid lines shall be designed to ensure that flashing of liquid refrigerant does not occur by minimizing the pressure drop suitably, by avoiding long vertical risers, and appropriate sub cooling.
 - ii) Each liquid line shall be provided with a permanently installed refrigerant drier of throw away or rechargeable type. The drier shall be installed in a valved line.
 - iii) Flow indicator (moisture indicating type) shall be installed on all liquid lines.
- 6.4 Suction Lines:
- a) Oil shall be entrained and carried by the suction gas under all conditions of load likely to be encountered in normal operation.
 - b) Piping shall be designed for a suitable velocity of refrigerant (similar to hot gas line) to ensure that oil will not separate from the gas and drain to the compressor in slugs.
 - c) The refrigeration system shall be equipped with controls for pump down system so that the evaporator and suction line are emptied before the compressor shuts off, thus preventing liquid refrigerant and oil from entering the compressor when restarted.
 - d) Refrigerant lines shall be sized to limit pressure drop between evaporator and condensing unit to less than 0.2 kg. per sq.cm. (3 psi).
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- 6.5 Isolating valve shall be provided to enable isolation of each compressor in case of multiple compressor units (as built in valves), strainer, drier and any other components as may be required for proper operation and maintenance.
- 6.5.1 Thermostatic expansion valve/float valve shall be provided in refrigerant circuit.

6.6 MATERIAL

- i) Refrigerant plumbing for chilling machine shall be of mild steel or wrought iron/copper to manufacturer's standards.
- ii) Fittings like bends, tees, sockets etc. shall be of wrought copper or forged brass and shall be suitable for the duty involved. Flare type compression fittings of forged brass shall be allowed upto 15 mm piping size. Tubes upto and including 15mm size may be bent to form 90 degree bends with inside radius not less than 3tube dia. For bigger sizes, bend fittings as mentioned above must be used.
- iii) Where specified in the tender specification, mild steel may be provided for refrigeration piping, with seamless MS tubes and fittings of heavy class conforming to IS: 1239. All liquid lines and instruments lines shall however be of copper only.
- iv) Valves shall be of the packed, back-seating type for both copper and MS refrigerant plumbing work, and these shall be of forged or cast brass construction.

6.7 PRESSURE TESTING

After completion of the piping installation, the entire chilling unit shall be pressure tested with dry nitrogen or any other inert gas at the following pressures for the particular refrigerant to be used:

Test pressure (Kg./Sq.cm. (Gauge))	
High pressure side	Low pressure side
20	8

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This test shall be carried out as follows:

- i) The system shall be charged with nitrogen or inert gas to 1.0 Kg./sq.cm. gauge and all joints shall be checked for leakage with a mixture of four part water, one part liquid soap and a small amount of glycerin. Leaks shall be marked, pressure released and repairs done. Brazed joints, which leak, shall be opened and redone. These shall not be repaired by addition of brazing alloy to the joints.
- ii) The system shall now be charged with nitrogen or the inert gas to the pressure specified in the above table and the process of locating leaks and repairs shall be repeated.

Final pressure test: After all the leaks have been repaired, the system shall be retested with the test pressure maintained for a period of not less than 8 hours. No measurable drop in pressure should be detected after the pressure readings are adjusted for temperature changes. Pressure Gauges, controls and compressors may be valved off during pressure testing.

7. **DIAGNOSTICS**

Display module shall be capable of displaying set points, system status including temperatures, pressures, current for each compressor, run time and percent loading.

The control system shall allow a quick test of all machine elements to verify the correct operation of every switch, circuit breaker, contactor etc. before the chiller is started.

8. **SAFETIES**

Unit shall be equipped with all necessary components, and in conjunction with the control system shall provide the unit with protection against the following:

- Reverse rotation.
- Low chilled water temperature.
- Low oil pressure (per compressor).
- Current imbalance.
- Compressor thermal overload

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- Automatic compressor unloading in case of excessive condensing temperature
 - High pressure.
 - Electrical overload.
 - Loss of phase.

Control shall provide separate general alert (minor incident) and alarm (circuit down) remote indication.

9. **ELECTRICAL CHARACTERISTICS**

Unit shall operate on 3-phase power supply without neutral. Control voltage shall be supplied by a factory-installed transformer. Unit shall be supplied with factory-installed electrical disconnect/isolator switch integrating main fuses. Unit shall have a factory installed star/delta starter as standard to limit electrical inrush current.

10. **CERTIFICATION**

The Rotary Screw Chilling machine must be ARI certified.

11. **FACTORY TESTING**

- i) Chillers will be performance tested at factory before dispatch. Performance test is not witnessed but the manufacturer would be required to submit the performance test certificates and get the same approved before dispatch of machines.
- ii) Testing Condition
100%, 75%, 50%, 25% - 4 point testing at constant condenser water temperature of 90 degF to check stable operation and efficiency of chiller
- iii) 100% load at AHRI condition to verify COP of chiller. (5th point)

IV COOLING TOWER

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1. **PRODUCTS**

1.1 **GENERAL**

Cooling towers shall be mechanical induced draft, cross flow, vertical discharge type of outdoor installation and shall be complete with main casing, suction strainer, fan, tower fill and support, support stand, stand pipe, and supports, motor and supports, access hot dipped galvanized ladders and any other appurtenances necessary for satisfactory operation. All parts shall be extensively prefabricated for simple field assembly.

The cooling towers shall be modular design, where the modules can be assembled to form a row of cooling towers.

1.2 **DESIGN PARAMETERS**

1.3 The cooling towers shall have a design life of 15 years.

1.4 The cooling tower design parameter shall be as follows: -

	a. Entering water temperature	:As Mentioned in scheduled of Quantities.	
	b. Leaving water temperature	:As Mentioned in scheduled of Quantities.	
	c. Ambient Wetbulb temperature	:As Mentioned in scheduled of Quantities.	
1.5	The type of tower	d. Drift loss < 0.005% e. Water Flow Rate	capacity and number of cells in the
	cooling tower shall be detailed in the schedule and/or as shown on the drawings.		

2. **FAN AND DRIVE**

The primary air delivery system for each cell shall consist of an electric motor, a multi-bladed axial type fan of belt driven and rigid unitized

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support. All components shall be corrosion resistant in 100% humidity climates.

Motors shall be one speed single winding, and specially insulated for cooling water duty. The load applied to the motors shall not exceed 90% of their nameplate rating.

Motors shall be located outside the fan stacks. The fan motor shall be a totally enclosed air over weather proof IP55 with Class F Insulation type suitable for 415 volts/3 phase/50 Hz power supply and shall be located outside the discharge air stream through a set of wedge belt. A belt cover shall be provided to protect the wedge belt and shall be of FRP construction.

Fans shall be composite multi-blade, axial type with appropriate twist and taper to produce the design airflow at high efficiency and low operating horsepower. The fans and all blades shall be fabricated with consistent moment weights to permit the change-out of individual blades without need for total re-balance. Hubs shall be fabricated of hot-dipped galvanized steel and ductible cast iron assembled with HDGS/316/304 stainless steel hardware. Hubs shall be statically balanced at the factory. All the components shall be fabricated of corrosion resistant materials throughout for long life when handling saturated air at high velocities. The construction material of the fan blade shall be FRP/Aluminum. Hot dipped galvanized fan guard shall be provided over the fan cylinder.

The wedge- belt shall be with fabric impregnated type design to B.S 1400 standard. Means for adjusting the belt tension shall be provided. Positives means of locking shall be employed in order to maintain tension during operation.

3. WATER DISTRIBUTION SYSTEM

Hot water shall be distributed to the fill in each cell via a system of open type gravity type basin. Each cell shall be provided with internal piping system with branched pipes to the hot water inlet ports above the FRP distribution basin and with provision for water balancing via the internal valve arrangement. (Internal piping optional.)

The piping system shall be sized for a flow velocity that will ensure equal flow at all the hot water inlet ports.

4. CELL PARTITIONS AND CASINGS

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The end main casing and water basin shall be FRP panel attached to tower columns with HDGS screw shank, self-tapping fasteners and self-sealing washers. Panel shall be lapped to shed water inwards to the tower. Vertical joints shall be lapped and sealed water tight.

5. **INFILL**

Infill shall be of ultra-violet rays treated polyvinyl chloride. The PVC infill shall be durable and highly efficient vacuum- formed type with patented intricate design to facilitate a good spread of water over the enhanced surface area against a cross flow of induced draft of air. The infill shall be incorporated with ribbed pattern on the opposite side to act as drift eliminator. Each PVC infill shall be of hanging type and come with integrated drift eliminators.

The entire top layer of infill is supported to prevent the weight of the top layer infill being imposed on the bottom layer. No imitation infill from nonauthorized JCI manufacturer is acceptable. The design shall be such that drift loss does not exceed 0.005% of the circulating water quantity.

6. **FAN DECK AND FAN STACKS**

The fan deck shall act as a maintenance platform and shall be constructed from hot dipped galvanized. Fan deck panels shall be supported by framing grits and shall have integral structural ribs. The fan deck design shall provide for air flow into fan stack without the need for field cutting. To minimize turbulence of air flow into the fan stack, fan deck protrusion into the fan stack opening shall not exceed 25mm. Deck shall be capable of supporting fan/motor replacement.

Fan stacks shall be moulded FRP with eased inlets to promote smooth airflow at blade at blade tips. The operating plane of the fan shall be at a level above the fan deck of at least 15% of the overall fan diameter. Fan tip clearance shall not exceed 0.5% of the fan diameter. If velocity fan stacks are used they shall have a minimum flare angel of 12 deg., with a maximum assumed velocity recovery of 75% of the different in average velocity pressure. Each fan stack segment shall be through- bolted to both the fan deck and a primary fan deck farming member. Fan stack connection and anchorage hardware shall be HDGS / 304/316 stainless steel.

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7. STRUCTURE

Tower framework shall consist of structural shapes of hot dipped galvanized steel.

All structural connections and splices shall be through-bolted using HDGS/ 316/304stainless steel machine bolts, nuts and washers. Glued connections of structure, decking, fan cylinders, or any other FRP component shall not be acceptable. Edges exposed in fabrication shall be thoroughly coated with polyester resin.

8. INSTALLATION

Cooling towers shall be assembled, rigged and installed in accordance with the manufacturer's recommendations to the satisfaction of the Employer's Representatives. The associated auxiliary structural support shall be supplied. Precautions shall be exercised throughout the assembly of cooling towers to minimize objectionable air-borne noise. Vibrations of the cooling towers must be effectively isolated from the structure of the building.

9. NAME PLATES AND MARKINGS

Nameplates shall be provide and shall be located at a convenient location for easy visibility.

The nameplate shall be inscribed with the following as a minimum requirement:-

- a. Manufacturer's name
- b. Item number
- c. Year of construction
- d. Design temperatures
- e. Design flow rate
- f. Fan motor kilowatt

10. SAFETY AND ACCESS

The tower shall be designed and equipped to provide comfortable, safe access to all components requiring routine inspection and maintenance.

An inspection door (internal walkway) shall be provided to gain entry into the tower to facilitate inspection and easy maintenance. Access ladder shall be installed on the tower permanently.

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11. NOISE LEVEL

The cooling tower shall be on the low operating noise type. Noise level shall not exceed 75db at 3m distance.

12. MISCELLANEOUS

Supply and install all ancillary including make-up water supply pipe from the makeup tank , quick fill and bleed offs facilities.

13. LADDER

All towers, whose height exceeds 2.5 mt. shall be provided with a ladder, made out of hot dipped galvanized M.S. Tubes.

V PUMPS

1. VERTICAL INLINE CLOSED/LONG COUPLED CONDENSER, PRIMARY VARIABLE WATER PUMPS

The Vertical In-Line (VIL) pump single stage, single type, with pump characteristics which provide rising heads to shut off, shall be supplied with a TEFC, 415/3/50 motor efficiency equivalent to IE3 and an IP55/UL Type 12 enclosure variable speed VFD.

The drive shall be integrated with the motor for a self-contained pump, motor and drive combination to ensure optimum component matching and protection from motor overloading at any operating point within the design or operating range.

Pump Construction:

Pump Casing - Cast Iron with PN16 flanges for working pressure to 12 bar at 65°C and Ductile Iron with PN25 flanges for working pressures to 25 bar at 65°C. Suction and discharge connections shall be flanged and the same size and shall be drilled and tapped for seal flush and gauge connections.

Impeller –

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The impeller shall be lead free cast Bronze (CuSn10 which is according to EN 1982) enclosed type with smooth surface finish for minimum frictional loss. This ensures high Efficiency. Impeller shall be keyed to the shaft and secured by impeller lock nut.

All impellers are dynamically balanced according to ISO 1940-1: Grade G6.3. The thrust balancing can be of balancing holes or back vanes.

Shaft - Provide Stainless Steel pump shaft.

Coupling - The pump coupling should be of close/long coupled type

Coupling to be designed to be easily removed on site to reveal a space between the pump and motor shafts sufficient to remove all mechanical seal components for servicing and replacement.

Mechanical Seals –

The liquid cavity shall be sealed off at the pump shaft by an internally-flushed mechanical seals ensure maximum seal face lubrication, heat dissipation and debris removal without vulnerable, external flush tubing and with carbon seal seat vs Silicon carbide seal ring, suitable for continuous operation at 248 Deg F (120 Deg C). The mechanical shaft seal has dimensions according to EN 12756.

Or

Shall be Stainless Steel multi-spring outside balanced type with Viton secondary seal, carbon rotating face and silicon carbide stationary seat. Provide a 316 stainless steel gland plate. Provide factory installed flush line with manual vent to purge air prior to pump start-up. All split coupled pumps shall be provided with a lower seal chamber throttle bushing to ensure seals maintain positively cooling and lubrication. Seal flush line accessories, if required to improve seal chamber cleanliness: Supply in the flush line to the mechanical seal a 50 micron cartridge filter and sight flow indicator, to suit the working pressure encountered. Filters shall be changed, by the installing contractor, after system is flushed and on a regular basis until turned over to the owner.

2. **INTEGRATED VARIABLE FREQUENCY DRIVE (VFD)**

1. Fundamental Requirements

VFD shall be of the VVC-PWM type providing near unity displacement power factor (cos Ø) without the need for external power factor Correction capacitors at all loads and speeds.

VFD shall incorporate DC link chokes for the reduction of mains borne harmonic currents to reduce the DC link ripple current thereby increasing the DC link capacitors lifetime.

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- VFD shall be CE Marked showing compliance with both the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EC. RFI filters shall be incorporated within the drive to ensure it meets the emission and immunity requirements of EN61800-3 to the 1st Environment Class C1 (EN55011 unrestricted sales class B).
2. **VFD and Motor Protection**
VFD and motor protection shall include: motor phase to phase fault, motor phase to ground fault, loss of supply phase, over voltage, under voltage, motor over temperature, inverter overload, over current. Over current is not allowed ensuring Intelligent variable speed. Units will not overload the motor at any point in the operating range of the unit.
 3. **User Interface**
VFD shall incorporate an integrated graphical user interface that shall provide running and diagnostic information and identify faults and status in clear English language. Faults shall be logged / recorded for interrogation at a later date.
It shall be possible to upload parameters from one VFD into the non-volatile memory of a computer and download the parameters into other drives requiring the same settings.
The keypad shall incorporate Hand-Off-Auto pushbuttons to enable switching between remote and manual control.
 4. **DPT Control Algorithm For Variable Pumps**
DPT control software shall be embedded in the Integrated Variable control unit to provide automatic speed control in variable volume systems without the need for pump mounted (internal/external) or remotely mounted differential pressure sensor. The default operating mode under DPT Control shall be 'quadratic pressure control' whereby head reduction with reducing flow will be according to a quadratic control curve. Control mode setting and minimum / maximum head set-points shall be user adjustable via the inbuilt programming interface.
 - 4.1 If the quantity of pumps in a system is 2 to 4-maximum, including any standby, a DPT controller shall be added to a pumping unit and set up at the factory to operate in parallel Sensor mode. The pump controls, which will be linked on site by the control contractor, will automatically stage the units, as appropriate, to maintain the best efficiency pumping and minimum operating cost. The standby unit will be brought into the rotation to exercise and equalize wear. The sequence of controls and
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- staging points will be submitted to the engineer for approval at the time of order.
5. Serial Communications
The VFD shall incorporate a USB port for direct connection to a PC and / or an RS485 connection with Modbus RTU protocol.
Optional protocols available should include Lon works and BACnet
6. Other Control Features
The VFD shall have the following additional features:
- Override for BMS
 - Manual pump control or closed loop PID control
 - Programmable skip frequencies and adjustable switching frequency for noise / vibration control
 - Auto alarm reset
 - Motor pre-heat function
 - Minimum three programmable digital inputs
 - Minimum one analogue inputs
 - One programmable analogue / digital output
 - Two volt-free contacts
3. **SYSTEM CONTROL – DPT CONTROL AND MULTIPLE PUMPS WITH PUMP LOGIC CONTROL.**
1. **Duty Pump & Standby pumps with DPT Control For Variable Pumps**
DPT Control shall allow the design parameters to be loaded into each integrated drive, including pump flow, pump head and minimum pressure setting. The minimum pressure setting is a value similar to a remote system sensor setting, if it were to be used. The DPT Control shall then set the pump control curve to control the pump in an identical manner as control with a remote sensor feedback. For DPT Control the remote system sensor is not required. The design parameters are to be entered into the integrated drive by means of the built-in graphical user interface.
2. Duty Pump & Standby pumps with Remote Sensor or building system (BMS) control
The remote differential pressure or flow sensor set-point value shall be loaded into each integrated drive. The drive shall then control the motor speed to satisfy the remote sensor setting. For BMS control the BMS is to provide the signal to the duty integrated drive to control the speed of the
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- motor. DPT Control is not required for either of these options and can be de-activated by means of the user interface or by making terminal connections.
3. **Multiple Pump System Control**
Supply a controller to control the pumps to satisfy all system sensor settings at the minimum speed possible and at maximum efficiency under any flow conditions. Pump curves showing the staging points to maintain maximum efficiency shall be supplied with the submittal data.
4. **Performance and Operating Logic**
1. The pump logic controller shall determine the most efficient combination of operating pumps, and pump operating speed based on feedback from the DP sensors at the remote loads. The pump logic controller shall respond to the most dissatisfied zone by increasing either, the number of operating pumps, or the pump speed. In the case where all zones are satisfied the pump logic controller shall respond by decreasing either, the number of operating pumps, or the pump speed so as to optimize the energy efficiency of the pumping operation while meeting system demand. The pump logic controller shall continuously monitor all zone signals to determine an active control zone. Use of a multiplexer for multiple sensor inputs is not acceptable. To prevent unnecessary changes to the operating pump speed, to become the active control zone, the candidate zone must have a greater error from set-point than the current active control zone for greater than 5 minutes. This transition delay period, 5 minutes, shall be a field adjustable parameter that can be altered by the password protected users.
 2. The pump logic controller shall sequence the pumps based on a field adjustable interval of operating hours with a "bumpless "transfer algorithm. The logic controller shall incorporate embedded logic to prevent hunting, pump flow surge, and motor overloading. The logic shall incorporate an adjustable PID control loop. PID control at the VFD is not acceptable.
Should one vfd/pump unit fail, the appropriate alarm signal shall be activated. In the place of the failed assembly, a standby vfd/pump unit shall be operated in variable speed mode.
 3. The controller shall have hand-off-automatic (H-O-A) control and should provide the option for a remote on/off signal from a single dry type relay, or BMS communication signal.
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4. The pump logic controller shall provide a data-logging feature including alarms, and events (adjustment to system parameters). The pump logic controller shall offer the option for expanded memory of 4 megabytes for a rolling record of system parameters at 10 second intervals, with a time stamp.
 5. The pump logic controller shall be self-prompting. All messages shall be displayed in plain English. The operator interface shall have; Multi-fault memory and recall, On-screen help functions, and separate user screens for:
 - Zone setups (including calibration of DP/T/Flow sensor range)
 - Pump configuration
 - Design set-point and end of curve data
 - Alarm history and event review
 - Display of zone status, pump status and system status
 - Factory default / commissioning setup data
 6. The controller shall be capable of serial communications with Modbus, LonWorks, Trend, and Metasys protocols. The controller shall offer the option of gateways for both BACnet and TCP/IP protocol connection for communication over the internet.
 7. The pump logic controller shall automatically disable any zone DP signals that are not within limits and alert the operator of a possible transmitter failure. Should system failure be detected the pump speed will default to a pre-defined percent of full speed (factory default loaded as 90% of full speed). The pump logic controller shall have a minimum speed limit entered as a field adjustable parameter, factory loaded default set to 30% of full speed.

General Description

1. Pump Controls
 - 1.1. Parallel Pump Controller.
 - 1.1.1 Mechanical and Electrical Details
 - a. For Intelligent Variable Speed pumping units, Pumps operating in parallel, the pump logic controller shall be Parallel Pump Controller. The pump logic controller shall be specifically designed for the control of multiple pumps in HVAC hot and/or chilled water systems that involve up to 4-variable speed pumps, with Control, in parallel, staged, sequenced, and standby configurations. The pump logic controller shall allow field adjustments of control parameters as described below.

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- b. The controller shall be capable of accepting, processing and displaying appropriate signals from the individual pump controls for the following values;
 - c. System Status
 - 1.1.1.c.1 Total flow
 - 1.1.1.c.2 head
 - 1.1.1.c.3 Total power
 - 1.1.1.c.4 Pumps speed
 - 1.1.1.c.5 Alarm
 - 1.1.1.c.6 Wire to water efficiency (calculated)
 - 1.1.1.c.7 Number of pumps running
 - 1.1.1.c.8 Lead pump number
 - d. Individual Pump Status
 - 1.1.1.d.1. Speed Ref (%)
 - 1.1.1.d.2. Speed (%) (rpm)
 - 1.1.1.d.3. Run time (hrs)
 - 1.1.1.d.4. Fault Nbr
 - 1.1.1.d.5. Run status (running/stopped)
 - e. Individual Pump control status
 - 1.1.1.e.1. Current (Amps)
 - 1.1.1.e.2. Volts (VAC)
 - 1.1.1.e.3. Power (kW)
 - 1.1.1.e.4. Head
 - 1.1.1.e.5. Flow
 - f. The pump logic controller shall be suitable for indoor or outdoor applications and shall be capable of being integrated with Intelligent Variable Speed pumping units for pumping packages approved to UL 778 & CSA STD C22.2 No 108 standards and also suitable for wall mounting with separate Intelligent Variable Speed pumping units and stand-alone pump controls.
 - g. The controller shall have 3-levels of password security, first level to view only (No password required); the second level is for field adjustable parameters and the third level for factory/commissioning setup parameters.
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- h. The controller shall stage the pumping units to ensure optimum pumping energy usage and shall sequence the pumps starting order, including any standby unit.
 - i. The controller shall be fed with a power supply from each pumping unit controls in the control 'daisy-chain' so that a loss of power to any pump unit controls will not affect the controller pumping operation. Should the controller go off-line, all pumps in auto-mode will operate together to provide the correct system flow needs. Staging of the units will resume as the controller is brought back online.
 - j. The integrated controller shall be capable of being easily integrated on any other pumping unit should the need occur.
Simple mounting in pre-designed location and wiring will be all that is required.

1.1.2 Performance and Operating Logic

- a. The pump logic controller shall determine the most efficient combination of operating pumps, and pump operating speed based from the individual pump controls input.
 - b. The pump logic controller shall respond to the system load flow needs by adjusting either the number of operating pumps, or the speed of the operating pumps.
 - c. The pump logic controller shall continuously monitor the system requirements and ensure that the operating point is maintained on the control curve to meet the system needs with optimized pumping energy usage.
 - d. The pump logic controller shall sequence the pumps based on a field adjustable interval of operating hours. The controls shall incorporate embedded logic to prevent hunting, pump flow surge, and motor overloading. The controller logic shall incorporate an adjustable PID control loop.
 - e. Should any pumping unit or pumping unit controller fail, the appropriate alarm signal shall be activated. In the place of the failed assembly, a standby pumping unit shall be operated in variable speed mode, or the next pump will start if there is no standby.
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- f. The controller shall have hand-off-automatic (H-O-A) control and should provide the option for a remote on/off signal by a BMS communication signal.
 - g. The pump logic controller shall be self-prompting. All messages shall be displayed in plain English. The operator interface shall have multi-fault memory and recall on-screen help functions, and separate user screens for overview, pump and setup.
 - h. The pump logic controller shall automatically disable any flow signals that are not within limits and alert the operator of a possible control failure.
 - i. The pump logic controller shall have the system design flow, system design head and minimum head limit entered as field adjustable parameters, factory loaded. The default for the minimum head is 40% of the design head.

1.1.3 Operator Screens

- a. Source of control: local or remote.
- b. Controller status: on/off.
- c. Pump information: running/off/alarm, HOA status, pump ID 1, pump ID 2, stand-by, etc.
- d. Individual pump controls information: speed, amps, power, volts AC, flow and head
- e. Set point and error of flow and head
- f. Individual cumulative pump hours of operation
- g. System set-point and error

1.1.4 Alarm Screens

- a. Alarms with time stamp
- b. Alarm help
- c. Diagnostic indicating status (ok or bad) of PLC, memory,
- d. network and communication, PLC Software version

1.1.5 Setup Screens

- a. Level 0. No password, allows view only access
 - b. Level 1. Allows modification of all parameters, except pump PID and BMS setup. Allows Restoring previously saved values
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- c. Level 2. Allows modification of all parameters. Allows saving and restoring all parameters
 - d. Levels 1 & 2 are password protected

1.1.6 BMS communication (Optional)

- a. The controller shall be capable of serial communication with a BMS [Optional] with either of the following protocols:

- 1.1.6.a.1.1 Modbus RTU
- 1.1.6.a.1.2 BACnet MS/TP
- 1.1.6.a.1.3 LonWorks

- b. The following points will be available through all protocols:

- 1.1.6.b.1.1 Total flow
- 1.1.6.b.1.2 Head
- 1.1.6.b.1.3 Total real-time power consumption
- 1.1.6.b.1.4 Pump speed
- 1.1.6.b.1.5 Individual pump run status
- 1.1.6.b.1.6 Alarm
- 1.1.6.b.1.7 Wire to water system efficiency
- 1.1.6.b.1.8 Number of pumps operating
- 1.1.6.b.1.9 ead pump ID
- 1.1.6.b.1.10 Remote start/stop
- 1.1.6.b.1.11 Controller on/off status
- 1.1.6.b.1.12 Pump controls information: running/off/alarm, HOA, duty 1, duty 2, stand-by, etc.
- 1.1.6.b.1.13 Pump controls information: speed, current, power, Volts AC, flow and head
- 1.1.6.b.1.14 Pump hours of operation
- 1.1.6.b.1.15 Head and flow Set point

VI AIR HANDLING UNITS **(FLOOR MOUNTED UNIT)**

1. AIR HANDLING UNITS

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1.1 **Scope**

The scope of this section, comprises the supply, erection, testing and commissioning of double skin construction air handling units, conforming to these Specifications and in accordance with requirements of drawings and of the Schedule of Quantities.

1.2 **Type**

The air handling units shall be double skin construction, draw-thru type comprising of various sections, filter section, coil section and fan section, mixing box, (wherever the return air and fresh air are ducted) as shown on drawings and included in schedule of quantities.

1.3 **Capacity**

The air handling capacities, maximum motor horse power and static pressure shall be as shown on Drawings and in Schedule of Quantities.

1.4 **Casing**

Double skinned panels shall be 40+/-2 mm thick. Double Skin Panels shall be made of 0.6mm Pre-coated GSS on outside and 0.6mm Galvanized sheet inside with CFC – FREE P.U. insulation of 42 (+/- 5%) kg/Cu M injected in between with an internal gasket between the skins to interrupt the thermal bridge of the panel. Outer sheet of panels shall be made of galvanized pre coated sheet of 0.6mm thickness to ensure mechanical strength, air leakage, thermal bridging and thermal transmittance. There should not be any metal to metal contact between inner and outer skins of AHU casing to ensure thermal bridging. AHU shall be with thermal break casing.

The entire framework shall be mounted on an aluminium alloy or galvanized steel or heavy duty engineering composite material channel base as per manufacturer's recommendation. Panels shall be assembled together to form an enclosure that is capable of low air leakage potential. Handles shall be made of hard nylon and all access panels should be openable with Allen key arrangement. Units supplied with various sections shall be suitable for on site assembly with continuous foam gasket. All fixing and gaskets shall be concealed.

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Units shall have hinged, quick opening access door in the fan section and also in filter section where filters are not accessible from outside. Access doors shall be double skin type.

Condensate drain pan shall be fabricated from 18 gauge stainless steel sheet with all corners welded. Drain pan externally insulated (If Drain pan is outside the unit), with 10mm thick closed cell Polyethylene foam/ equivalent suitable insulation with necessary dual slope to facilitate fast removal of condensate. Necessary supports will be provided to slide the coil in the drain pan

1.5 **Mixing Box**

AHUs requiring mixing boxes as specified in Schedule of Quantities shall be complete with fresh and return air dampers.

1.6 **Damper**

Dampers shall be opposed blade type. Blades shall be made of double skinned aerofoil aluminum sections with integral gasket and assembled within a rigid extruded aluminum alloy frame. All linkages and supporting spindles shall be made of aluminium or nylon, turning in teflon bushes. Manual dampers shall be provided with a Bakelite knob for locking the damper blades in position. Linkages shall be extended wherever specified for motorized operation. Damper frames shall be sectionalized to minimize blade warping. Air leakage through dampers when in the closed position shall not exceed 1.5% of the maximum design air volume flow rate at the maximum design air total pressure.

1.7 **Motor and Drive**

Fan motors shall be energy efficient and shall be 415±10% volts, 50 cycles, three phases, totally enclosed fan-cooled squirrel cage induction class F, with IP-55 protection. Motors shall be especially designed for quiet operation. Motor shall be suitable to operate with direct driven plug fans and frequency converter. Frequency converter (VFD) shall be supplied by the AHU manufacturer for all AHUs with direct driven plug fans for the complete control of motor. rpm. The motor shall conform to IS: 325. "Three phase induction motors" having class F insulation. The fan motor shall have the efficiency level of **IE-3 rating**.

1.8 **Fan**

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Fans shall be backward curved plug fan with aerofoil design blades so as to give maximum efficiency for given duty condition. The entire fan with casing will be certified by a reputed, internationally acclaimed certifying body which will be a 3rd party like Eurovent or ARI or AMCA and the entire Fan + Motor assembly will be balanced at supplier's works before dispatch. Fans driven by variable frequency drive shall be backward inclined irrespective of static pressure value. Fans shall be selected for minimum efficiency of 70%. Plug fan in fan array shall have individual VFDs for every motor fan set. Fan motor assembly shall be statically and dynamically balanced as per relevant ISO/AMCA/EUROVENT standard. **Certified computerized selection for AHU shall be with fan selection.**

Motors shall be mounted inside the AHU casing on slide rails for alignment and be totally enclosed, fan cooled with class 'F' insulation. The fan impeller assembly shall be statically and dynamically balanced. Both fan and motor assemblies shall be mounted on powder coated MS/galvanized steel (depending on size) base frame.

Heavy duty anti-vibration mounts shall be provided for isolating the unit casing. Flame retardant, waterproof silicone rubber impregnated flexible connection shall be provided at the fan discharge.

1.9 **Cooling / Heating Coils**

Chilled water coils shall have 12.5 to 15 mm dia (O.D) tubes minimum 0.35 mm thick with sine wave aluminium fins firmly bonded to copper tubes assembled in zinc coated steel frame. Face and surface areas shall be such as to ensure rated capacity from each unit and such that the air velocity across the coil shall not exceed 150 meters per minute. The coil shall be pitched in the unit casing for proper drainage. The coil shall have suitable size header with chilled water supply & return connections protruding out of AHU casing by minimum 150 mm. Each coil shall be factory-tested at 21 kg per sq. m air pressure under water. Tube shall be mechanically expanded for minimum thermal contact resistance with fins. Fin spacing shall be 4 - 5 fins per cm. Water pressure drop in coil shall not exceed 10 PSIG.

Coil performance shall be certified by a third party like Eurovent/AHRI.

1.10 **Air filters**

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The air used in an air conditioning systems must be filtered to maintain a clean atmosphere in the conditioned space. The concentration of contaminants in the air and the degree of cleanliness required in the conditioned space will determine the type of filter or filters that must be used .

1.10.1 **Type of filters**

1.10.1.1 **Pre – filters**

Cleanable metallic viscous type filter made out of aluminium wire mesh or of dry cleanable synthetic type minimum 50mm thick, shall be provided on the suction side of AHU as a standard equipment with the unit. These filters shall have the efficiency of 90% down to 10 micron particle size. When these filters become loaded or full of dirt, it is removed from service and replaced by another filter. The dirty filter can then be washed in a cleaning solution in a tank, dried and then given a bath of viscous oil. Face velocity across these filters shall not exceed 155 MPM.

1.10.1.2 **Dry Fabric (fine) Filters**

These filters shall have efficiency of 99% down to 5 micron particle size as per EU 7 standard. These filters are provided only where special cleanliness standard is required such as for library, lab, wards, OTs etc. These are provided on the discharge side of AHU after fan section and are always backed by pre – filters provided on the suction side of AHU. Face velocity across these filters shall not exceed 155 MPM.

1.11 **Accessories**

Each air handling unit shall be provided with manual air vent at high point in the cooling coil and drain plug in the bottom of the coil.

1.12 **Fresh Air Intakes**

Extruded aluminium construction duly anodized (20 microns and above) fresh air louvers with bird screen and dampers shall be provided in the clear openings in masonry walls of the air handling unit rooms having at least one external wall. Louvers, dampers, pre-filters, ducts and fresh air fan with speed regulator shall be provided as shown in Drawings and in

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Schedule of Quantities. Blades shall be made of extruded aluminium construction and shall be rattle-free. Dampers shall be similar to those specified in "Air Distribution". Fresh air fans and fresh air intakes shall be as per the requirements of Schedule of Quantities.

1.13 **Installation**

The air handling unit shall be so installed as to transmit minimum amount of vibration to the building structure. Adequate vibration isolation shall be provided by use of rubber/ neoprene pads and/or vibration isolation spring mountings.

1.14 **Painting**

Shop coats of paint that have become marred during shipment or erection shall be cleaned off with mineral spirits, wire brushed and spot primed over the affected areas, then coated with paint to match the finish over the adjoining shop painted surface.

1.15 **Performance Data**

Air handling unit shall be selected for the lowest operating noise level of the equipment. Fan performance rating and power consumption data with operating points clearly indicated shall be submitted and verified at the time of testing and commissioning of the installation. Computerized selection for all FMUs shall be provided through 3rd party certified software.

1.16 **Testing**

Cooling capacity of various air handling unit models will be computed from the measurements of air flow and dry and wet bulb temperatures of air entering and leaving the coil. Flow measurements shall be by an anemometer and temperature measurements by accurately calibrated mercury-in-glass thermometers. Computed results shall conform to the specified capacities and quoted ratings. Power consumption shall be computed from measurements of incoming voltage and input current.

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VII DOUBLE SKIN HORIZONTAL CEILING SUSPENDED
AIR HANDLING UNITS
(with EC Fans)

1. SCOPE

The scope comprises of supply & assembly (**CSU shall be supplied in assembled form**) of double skin construction air handling/ TFA units. The section of specification sets out the requirements for the central air handling equipment to be used in conjunction with the air distribution system.

2. GENERAL

The Supplier shall supply and assemble double-skinned central station air handling/ TFA units. Each unit shall be a factory built, modular type with field assembled (**N/A for CSU**) casing sections, complete with **High Efficiency SISW Plug Fan with EC motors**, wire guard (**N/A for CSU**), cooling/ heating coils, valves chamber, drain section, structural mountings, vibration isolators and all other related accessories as required under BOQ/ Schedule. The unit shall be horizontal Draw- thru to suit AHU room size/ available space subject to the acceptance by the consultant.

3. SIZE AND CAPACITY

The unit shall be of the type and size suitable for ensuring a performance and capacity not less than the minimum required for the design when operating under the specified conditions. The physical size of the selected unit shall be suitable for the space allocated on the drawings and in Equipment schedule.

4. MATERIAL AND CONSTRUCTION

Housing / Casing

The housing/casing of the units shall be of double skin construction. The housing shall be so made that it can be delivered at site in semi- knocked down (**N/A for CSU**) / assembled conditions depending upon the requirements. The main framework shall be of extruded aluminum structural sections. The TFA units & Units with Mixing Box having fresh

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air provision shall be provided with Thermal Break Aluminium Profile. The entire framework shall be assembled using mechanical joints to make a sturdy and strong framework for various sections. Entire framework shall be made of extruded aluminum profile.

Double Skin panels shall be 23±2/ 46±2 mm thick as required under BOQ. Outer sheet of the panel shall be made of 0.6mm pre-coated GSS sheet with PVC guard on outside and 0.6mm galvanized sheet inside with HFC/ CFC free Polyurethane foam insulation of density not less than 40±2 kg/cu. m by injection molding machine. These panels and Framework for each section shall be screwed from inside on to the framework with soft rubber gasket in between to make the joints airtight.

Suitable doors with nylon handles, aluminum die cast hinges & hatches shall be provided for access to various panels for maintenance. Units shall be required with access door(s) for maintenance purpose. The entire frame shall be mounted on rolled / formed GSS heavy gauge galvanized steel **(N/A for CSU)**

The cooling coil segment shall have a full width, multi sloped drain pan that extends Downstream of the coil to provide sufficient amount of space to contain moisture Carry-over. The unit design shall not require a drain pan in any downstream section to Contain the coil condensate. Drain pan must be accessible for inspection and cleaning.

The cooling coil Drain pan shall be made out of minimum 22G stainless steel sheet externally insulated with 13 mm thick closed cell Nitrile rubber insulation (For coastal area insulation thickness 19 mm) with multiple slope to facilitate fast removal of condensate.

5. **CODES & STANDARDS**

The design, materials, manufacture, inspection, of the units shall comply with all currently applicable statutes, regulations, codes and standards in the locality where the equipment is to be installed. In particular, the units shall confirm of the following standards:

BS EN 1886

**Mechanical & thermal
performance of casing**

IEC 60204-1 :2005 / EN 60204-1:2006 Safety of machinery -

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electrical equipment of Machines
part 1 general requirements.

6. FAN & MOTOR

The fan section shall be equipped with a Single Inlet Single Width Centrifugal Impeller with High Efficiency Backward curved blades and external rotor EC(Electronically Commutated) motor, energy optimized for operation for high efficiency and favorable acoustic behavior.

Impeller: The high efficiency Backward curved impeller made of welded aluminium sheet or high performing composite material with external rotor motor balanced together statically and dynamically according to relevant standards.

The EC fan should be capable of being fitted in horizontal position in the AHU.

Motor: The minimum efficiency class of the motor shall be equivalent to IE4. The motor shall be permanent magnet external rotor motor with integrated electronics and suitable for continuous operation. The speed of the motor shall be varied with an external 0-10V/ PWM control signal. The fan in totality shall be of most efficient type so that the power consumption and noise level is minimal.

The motor shall be minimum IP54 protection class.

Integrated Electronics: The device electronics shall be protected from overload by the “Active Temperature Management” so that if the ambient operating temperature exceeds the design limit then the fan is not switched off immediately. In such a condition the fan should be operational at lower speeds till the operating ambient temperature drops down.

7. COOLING / HEATING COIL

Chilled/ Hot Water Coils

The coil shall have 12.7mm dia (OD) & made from seamless solid drawn copper tubes. The minimum thickness of tube shall be 0.41mm for cooling/heating coils.

The depth of the coil shall be such as to suit the requirements. Viz. re-circulated air applications, or 100% fresh air applications. The coil Row

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shall be selected as per the coil selection. Computerized cooling coil selection output shall be submitted. Coils shall be **AHRI 410** certified. Each section of the coil shall be fitted with flow and return headers to feed all the passes of the coil properly. The headers shall be of copper and shall be complete with water in/out connections. Vent plug on top and drain at the bottom. The coil shall be designed to provide water velocity between 0.6 to 1.8 m/s in the tubes. spacing shall be 11-12 fins per inch (4-5fins per cm). Fins may be sine wave/corrugated typ fins. The tubes shall be mechanically expanded for minimum thermal contact between fins and tubes. The fins shall be evenly spaced and upright. The fins bent during installation shall be carefully realigned. The Coil Casing shall be of SS. For 100 % fresh air application, Fins shall be hydrophilic coated type. Each coil shall be factory tested at 21Kg/Sqcm air pressure under water. Coils shall be designed for a maximum working pressure of 10 Kg/Sqcm. Face velocity across coil shall not exceed 2.54 m/ s Stacked coils shall have an Intermediate drain pan extending to the entire finned length of the coil. Cooling coils in stacks- section shall not be acceptable unless provided with an intermediate drain pan of the similar material and thickness of primary drain pan. The intermediate drain pan shall have drop tubes to guides condensate to the main drain pan.

DX- Cooling coil specification

The coil shall have 9.52 mm dia(O.D.) & made from seamless solid drawn copper tubes. The minimum thickness of tube shall be 0.3 mm for cooling coils.

The depth of the coil shall be such as to suit the requirements. Viz. re-circulated air applications, or 100% fresh air applications. The coil Row shall be selected as per the coil selection. Computerized cooling coil selection output shall be submitted.

Each section of the coil shall be fitted with flow and return headers to feed all the passes of the coil properly. The headers shall be of copper The fins shall be of aluminum. The minimum thickness of the fins shall be 0.15 mm. Fin spacing shall be 11-12 fins per inch (4-5fins per cm). Fins may be sine wave/corrugated type. The tubes shall be mechanically expanded for maximum thermal contact between fins and tubes. The fins shall be evenly spaced and upright. The fins bent during installation shall be carefully realigned. The Coil Casing shall be of SS. For 100 % fresh air application, Fins shall be hydrophilic coated type.

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Each coil shall be factory tested at 600 PSI. Pressure & Face velocity across coil shall not exceed 2.54 m/ s.

Stacked coils shall have an Intermediate drain pan extending to the entire finned length of the coil. Cooling coils in stacks- section shall not be acceptable unless provided with an intermediate drain pan of the similar material and thickness of primary drain pan. The intermediate drain pan shall have drop tubes to guides condensate to the main drain pan.

8. **MIXING BOX**

AHU's requiring mixing boxes as specified under BOQ/ Schedule of Quantities shall be complete with fresh and return air aluminum dampers.

9. **DAMPERS**

Dampers shall be opposed blade type. Blades shall be made of aerofoil design hollow extruded aluminum sections with integral gasket and assembled within a rigid extruded aluminum alloy frame. All linkages and supporting spindles shall be made of aluminum or nylon, turning in Teflon bushes. Manual dampers shall be provided with a bakelite knob for locking the damper blades in position. Linkages shall be extended wherever specified for motorized operation. Damper frames shall be sectionalized to minimize blade warping. Air leakage through dampers when in the closed position shall not exceed 1.5% of the maximum design air volume flow rate at the maximum design air total pressure.

10. **FRESH AIR LOUVERS (Wherever specified)**

Louvers should be of aluminum construction duly anodized (more than 20 micron). Blades shall be of extruded aluminum sections fixed on a rigid aluminum frame. Supporting frames shall be provided for bigger louvers to ensure minimum warping.

11. **FILTERS**

Pre – filters (MERV-8/ G-4):

Cleanable filter made out of dry cleanable synthetic type minimum 50mm thick, shall be provided on the suction side of AHU as a standard equipment with the unit. These filters

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shall have the efficiency of 90% down to 10 micron particle size. When these filters become loaded or full of dirt, it is removed from service and replaced by another filter. Face velocity across these filters shall not exceed 155 MPM.

Dry Fabric Fine Filters (MERV-13/ F-7):

These filters shall have efficiency of 99% down to 3micron particle size as per EU 7/ MERV-13 standard. These filters are provided only where special cleanliness standard is required such as for library, lab, wards, OTs etc. These are provided on the discharge side of AHU after fan section and are always backed by pre – filters provided on the suction side of AHU. AHUs for comfort application/ Green Buildings shall be provided with these filters on the suction side along with MERV-8 filters. Face velocity across these filters shall not exceed 155 MPM.

Hepa Filters (H-13):

These filters shall have efficiency of 99.99% down to 0.3micron particle size as per EU 7/ H-13 standard. These filters are provided for clean room applications like ICU, OTs etc. These are provided on the discharge side of AHU after fan section.

For units having Hepa filters, the Fine Filters shall also be provided after the Fan section before Hepa filters. Face velocity across these filters shall not exceed 155 MPM.

Hepa filters may also be provided over terminal depending upon the shop drawings/ schedule of the tender.

12. SAFETY FEATURES

The fan access door shall be equipped with micro-switch inter locked with fan motor to enable switching off the fan motor automatically in the event of door opening (**N/A for CSU**). The access door shall be further having wire mesh screen as an added safety feature bolted on to the unit frame (**N/A for CSU**).

Fan and motor base shall be properly earthed from the factory.

All screws used for panel fixing, projecting inside the unit shall be covered with PVC caps to avoid human injury.

Units needs to be CE certified.

13. ACCESSORIES

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Each unit shall be provided with manual air vent at high point in the cooling coil and drain plug at the bottom of the coil. **(only for water type)**

14. **PERFORMANCE DATA**

The Unit shall be selected for the optimum operating point with respect to noise level & efficiency of the equipment. Fan performance rating and power consumption data with operation points clearly indicated shall be submitted and verified at the time of testing commissioning of the installation.

15. **SUBMITTALS**

After supply/ assembly of the units at site the manufacturers shall submit three complete sets of unit's drawings, test certificates of coil, test certificate of fan, test certificate of the unit and operation-maintenance manual.

VIII FAN COIL UNITS

1. **GENERAL**

The fan coil units shall be complete in all respects and shall generally comply with the specifications as given hereunder :

2. **FAN COIL UNITS (Ceiling mounted)**

- 2.1 The fan coil units shall be finished type, ceiling mounting type complete with finned coil, blower with motor, drain pan, air filters, 2 way snap acting valve along with snap acting thermostat and actuator with all control wiring etc. and encased in a decorative casing of M.S.

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powder coated with aluminium supply & return air grills. The casing shall be fabricated out of minimum 1.25mm thick G.S.S. sheet.

2.2 **Cooling Coil/Heating Coil**

The coil shall be of seamless copper tubes not less than 9 mm O.D. 0.36 mm thick (Minimum), coil shall have continuous aluminium plate fins and shall have minimum 3 rows. The fins shall be spaced by forming integral part of the fins. The tubes shall be staggered in the direction of air flow. The coil circuit should be sized for adequate water velocity but not exceeding 1.8 M/S (6 F.P.S.) the fins shall be bonded to the tubes by hydraulic expansion of the tubes. The coil shall be of seamless copper tubes with aluminum fins. The fins shall be uniformly bonded to the tubes by mechanical expansion of the tubes. The air velocity across the coil shall not exceed 155 m/min.

The coils shall be tested against leaks at a hydraulic pressure of 10 kg/sq. cm. This pressure shall be maintained for a period of 2 hours. No. drop should be observed indicating any leaks.

2.3 **Fan**

This shall consist of (2) two light weight aluminium impellers of forward curved type, both statically and dynamically balanced, alongwith properly designed G.I. sheet casing.

The two impeller shall be directly mounted on to a double shaft, single phase, multiple winding motor capable of running at (3) three speed. A G.I. plenum shall connect the fan out let to the coil.

2.4 **Drain Pan**

The drain pan shall be of 1.25 mm G.I. sheet covering the whole of coil section and extended on one side for accommodating coil connection etc. and complete with a 25 mm drain connection. The drain pan shall be insulated with 12 mm polyethylene insulation.

2.5 **Air Filter**

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The filter shall be cleanable type 15 mm thick with 90% efficiency down to 10

micron of dry cleanable synthetic type to be mounted behind the return air grill

In the Unit casing.

3. **WATER CONNECTIONS**

The water valves on inlet line shall be of gun metal ball type with integral water strainers, having BASP (FPT) inlet and flare type MPT outlet connection. The valves on return line shall be as above, but without the water strainer.

The water lines shall be finally connected to the coil of the fan coil unit, by at least 300 mm long, type L seamless solid drawn copper tubing with flare fittings connections. The same shall also be insulated with 15 mm tubular insulation.

4. **CONTROLS**

Each unit shall have corded remote for ON/OFF, temperature setting, speed control. It shall also have 24 hour programmable time, louvers & sweep mode, sleep mode and dry mode. Each unit shall have a room type thermostat and a PICB valve. The valve shall be fixed at a convenient location. The thermostat shall be mounted along with the speed control switch on a common plate. The plate shall clearly indicate the fan positions. The water valves on inlet line shall be of gun metal ball type with internal water strainers, having SSP female pipe thread inlet and flare type male pipe thread outlet connection. The valves on return line shall be as above, but without the water strainer.

A sturdy switch shall be provided with the unit complete with wiring, for ON/OFF operation and with minimum three speed control of the fan.

5. Unit shall be enclosed in M.S. powder coated with Aluminium grills for supply and return air and all controls, valves etc.

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IX HEAT RECOVERY WHEEL UNIT

1.1 Scope

The scope of this section, comprises the supply, erection, testing and commissioning of double skin construction Heat recovery unit conforming to these Specifications and in accordance with requirements of drawings and of the Schedule of Quantities.

1.2 Type

The air handling units shall be double skin construction, draw-thru type comprising of various sections, filter section, coil section and fan section, by pass section as shown on drawings and included in schedule of quantities.

1.3 Capacity

The Heat recovery unit capacities, maximum motor horse power and static pressure shall be as shown on Drawings and in Schedule of Quantities.

1.4 Casing

Double skinned panels shall be 40+/-2 mm thick. Double Skin Panels shall be made of 0.6mm Pre-coated GSS on outside and 0.6mm Galvanized sheet inside with CFC – FREE P.U. insulation of 42 (+/- 5%) kg/Cu M injected in between with an internal gasket between the skins to interrupt the thermal bridge of the panel. Outer sheet of panels shall be made of galvanized pre coated sheet of 0.6mm thickness to ensure mechanical strength, air leakage, thermal bridging and thermal transmittance. There should not be any metal to metal contact between inner and outer skins of HRV casing to ensure thermal bridging. HRV shall be with thermal break casing.

The entire framework shall be mounted on an aluminium alloy or galvanized steel or heavy duty engineering composite material channel base as per manufacturer's recommendation. Panels shall be assembled

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together to form an enclosure that is capable of low air leakage potential. Handles shall be made of hard nylon and all access panels should be openable with Allen key arrangement. Units supplied with various sections shall be suitable for on site assembly with continuous foam gasket. All fixing and gaskets shall be concealed. Units shall have hinged, quick opening access door in the fan section and also in filter section where filters are not accessible from outside. Access doors shall be double skin type.

Condensate drain pan shall be fabricated from 18 gauge stainless steel sheet with all corners welded.

1.5 **Bypass Section:**

AHUs requiring mixing boxes as specified in Schedule of Quantities shall be complete with fresh and return air dampers as required.

1.6 **Damper**

Dampers shall be opposed blade type. Blades shall be made of double skinned aerofoil aluminum sections with integral gasket and assembled within a rigid extruded aluminum alloy frame. All linkages and supporting spindles shall be made of aluminium or nylon, turning in teflon bushes. Manual dampers shall be provided with a Bakelite knob for locking the damper blades in position. Linkages shall be extended wherever specified for motorized operation. Damper frames shall be sectionalized to minimize blade warping. Air leakage through dampers when in the closed position shall not exceed 1.5% of the maximum design air volume flow rate at the maximum design air total pressure.

1.7 **Motor and Drive**

Fan motors shall be energy efficient and shall be 415±10% volts, 50 cycles, three phases, totally enclosed fan-cooled squirrel cage induction class F, with IP-55 protection. Motors shall be especially designed for quiet operation. Motor shall be suitable to operate with direct driven plug fans and frequency converter. Frequency converter (VFD) shall be supplied by the AHU manufacturer for all AHUs with direct driven plug fans for the complete control of motor. rpm. The motor shall conform to IS: 325. "Three phase induction motors" having class F insulation. The

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fan motor shall have the efficiency level of **IE-3 whichever is more efficient.**

1.8 **Fan**

Fans shall be backward curved plug fan with aerofoil design blades so as to give maximum efficiency for given duty condition. The entire fan with casing will be certified by a reputed, internationally acclaimed certifying body which will be a 3rd party like Eurovent or ARI or AMCA and the entire Fan + Motor assembly will be balanced at supplier's works before dispatch. Fans driven by variable frequency drive shall be backward inclined irrespective of static pressure value. Fans shall be selected for minimum efficiency of 70%. Plug fan in fan array shall have individual VFDs for every motor fan set. Fan motor assembly shall be statically and dynamically balanced as per relevant ISO/AMCA/EUROVENT standard. **Certified computerized selection for AHU shall be with fan selection.**

Motors shall be mounted inside the AHU casing on slide rails for alignment and be totally enclosed, fan cooled with class 'F' insulation. The fan impeller assembly shall be statically and dynamically balanced.

Both fan and motor assemblies shall be mounted on powder coated MS/galvanized steel (depending on size) base frame.

Heavy duty anti-vibration mounts shall be provided for isolating the unit casing. Flame retardant, waterproof silicone rubber impregnated flexible connection shall be provided at the fan discharge.

1.10 **Air filters**

The air used in an air conditioning systems must be filtered to maintain a clean atmosphere in the conditioned space. The concentration of contaminants in the air and the degree of cleanliness required in the conditioned space will determine the type of filter or filters that must be used .

1.10.1 **Type of filters**

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1.10.1.1 **Pre – filters**

Cleanable metallic viscous type filter made out of aluminium wire mesh or of dry cleanable synthetic type minimum 50mm thick, shall be provided on the suction side of AHU as a standard equipment with the unit. These filters shall have the efficiency of 90% down to 10 micron particle size. When these filters become loaded or full of dirt, it is removed from service and replaced by another filter. The dirty filter can then be washed in a cleaning solution in a tank, dried and then given a bath of viscous oil. Face velocity across these filters shall not exceed 155 MPM.

1.10.1.2 **Dry Fabric (fine) Filters**

These filters shall have efficiency of 99% down to 5 micron particle size as per EU 7 standard. These filters are provided only where special cleanliness standard is required such as for library, lab, wards, OTs etc. These are provided on the discharge side of AHU after fan section and are always backed by pre – filters provided on the suction side of AHU. Face velocity across these filters shall not exceed 155 MPM.

1.10.1.3 Chemical Filters

The GridBLOK filters for removal of Corrosive Gases through chemisorption process by means of adsorption & absorption, the flow shall be turbulent with 100 percent adsorbent material and the structure shall be monolithic structure. The pressure drop across the two filters shall not be greater than 146 pa. The Gridblok density shall be equal to or 27.54 lb/ per cubic feet. The manufacturer shall have at least 15 years of experience.

1.10.1.4 Photohydroionization Cell

The Photohydroionization cell with the capability to produce friendly oxidizers like Ionized Hydro Peroxides, Super Oxide Ions, Hydroxides Ions with quad metallic coating (Rohdium, silver, copper and titanium) and duly enclosed by a poly casing tube that should prevent glass or mercury leakage into the conditioned/ served space. The honeycomb matrix shall not be accepted. The units should be designed after undertaking a load factor calculation for each specific area where the equipment is to be installed. The load shall clearly state the number of units required vis-à-vis the wattage of the units. The system shall be capable of reducing

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microbial bacteria, virus and spores , VoC', odors and particulates matter. The equipment shall conform to UL 1598 CAN/CSA C222 EN60335-1, EN60335-2-65, EU standards, certifications shall be submitted along with the technical submittal.

2. **Rotary Air-To-Air Heat Exchanger:**

Heat recovery wheel shall ensuring very high level energy recovery for both sensible & latent heat.

The rotor media shall be coated with a combination of a corrosion-prohibiting and no migrating adsorbent Molecular Sieve 3Å desiccant to recover sensible heat and latent heat to a very high degree. Permanently bonded to the rotor surface and specifically developed for an expanding transfer of water vapors & capacity shall be at a constant high level, valid for year-round use.

The Rotor shall be constructed of alternate layers of corrugated and flat aluminum foil. The Rotor surface shall reinforced to achieve a polished smooth face surface to ensure that the vertical run out does not exceed ± 1 mm for every 1 metre dia, thereby ensuring negligible leakage. The radial run out also shall not exceed ± 1 mm for every 1 meter dia which provides optimal sealing surface for brush seals. Maximum operating temperature of 70 °C. Rotor should rotate at lower than 20 to 25 RPM. Thereby also ensuring long life of belts and reduced wear and tear of seals. The rotor honeycomb matrix foil should be so wound and adhered as to make a structurally very strong. Pressure drop across the heat recovery wheel shall not exceed 2.5 mm for every 0.5 m/s face velocity. The Rotor shall have smooth air channels to ensure laminar airflow.

The sectorized Rotor shall be delivered in segments. Each Rotor segment shall be stabilized with 5 interior spokes, threaded at the inner- ring and welded at the Rotor periphery for long term form stability. The spokes shall bind the layers of the rotor together and makes use of adhesives unnecessary. The segments shall be bound together with a galvanized sheet metal rim.

Standard flute size shall be 1.7mm or less with optimize pressure drop, also the pitch of the flute shall be 4 mm. The flute design, the depth of the wheel shall be 200 mm with the appropriate surface exchange area to

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get the desire efficiency for both sensible & latent energy. The Rotor shall have smooth air channels to ensure laminar airflow. The Rotor media shall be capable of being cleaned with air or hot water without degrading unit performance.

Purge Sector: The unit shall be provided with a factory-set, purge sector designed to limit cross contamination at qualified appropriate design conditions. Outdoor Air correction factor i.e OACF should be close to the value 1 & EATR should be equal to zero. Outdoor air & exhaust air should be equal or close to supply air volume to ensure the less leakages & saving the power consumption of the exhaust blower.

Unit Housing:

DS-casing for wheel diameter 2401 – 4200 mm

Frame work made of welded aluminium, face panels of galvanized sheet metal without sidewalls. Casing shall be delivered in 2 parts.

CS-casing for wheel diameter 900 -2400 mm

Made of galvanized sheet metal plates without sidewalls

The casing shall be a 'slide in'-model (un- insulated).

Certification:

Wheel should be Eurovent certified and product should be ISO certified also the product should be certified as per DIN EN ISO 846 with 0% fungal and bacterial growth at 95% RH and above.

3. **Accessories**

Each HRU shall be provided with manual air vent at high point in the cooling coil and drain plug in the bottom of the coil.

4. **Painting**

Shop coats of paint that have become marred during shipment or erection shall be cleaned off with mineral spirits, wire brushed and spot primed over the affected areas, then coated with paint to match the finish over the adjoining shop painted surface.

5. **Performance Data**

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Air handling unit shall be selected for the lowest operating noise level of the equipment. Fan performance rating and power consumption data with operating points clearly indicated shall be submitted and verified at the time of testing and commissioning of the installation. Computerized selection for all FMUs shall be provided through 3rd party certified software.

6. **Testing**

Cooling capacity of various air handling unit models will be computed from the measurements of air flow and dry and wet bulb temperatures of air entering and leaving the coil. Flow measurements shall be by an anemometer and temperature measurements by accurately calibrated mercury-in-glass thermometers. Computed results shall conform to the specified capacities and quoted ratings. Power consumption shall be computed from measurements of incoming voltage and input current.

X DIRECT EXPANSION PRECISION PACKAGED UNITS

Scope

The scope of work comprises of supply, installation, testing and commissioning of self contained DUAL FLUID (Chilled Water and direct expansion) type Precision air conditioning units suitable for operation on R410A refrigerant, using Stepless Capacity Modulation using DC Inverter technology in DX Mode and should have advanced microprocessor to the below specifications and in accordance with the Schedule of Quantities. The OEM Company should have ISO 9001: 2015 certified manufacturing unit.

General

Modular construction Precision air conditioning unit suitable for operation on Chilled Water supply (refer to BOQ for Chilled Water In & Out Conditions) and in DX mode with R410A refrigerant with Top/ bottom discharge arrangement (as per BoQ) consisting of inlet filter, Draw through direct drive Electronically commutated Motors and Backward curved Plug

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fans, fan motor assembly to deliver desired air quantity, **Inverter controlled brushless DC motor/ Digital Scroll Compressor Technology**, Direct Expansion Cooling Coil, **Electronic Expansion Valve**, Heater banks to maintain humidity inside the space, condensate drain pan of Stainless Steel construction, Microprocessor panel, programmable control complete with LCD display. The unit should be suitable for operation on 415 V, 50 Hz, AC supply.

Unit Base & Casing

Base panel shall be constructed out of sandwich panels of galvanized steel and painted with epoxy powder. All four side panels (including front door) shall be double skinned sandwiched panels. The panels shall be insulated on the inside with minimum 30 Kg/ cum glass wool, for fire insulation class A1. Unit shall be complete with space for refrigeration equipment, fans, cooling coils, liquid receiver and multistage strip heaters and modulating Humidifiers. Unit shall be provided with welded tubular steel floor stand with adjustable legs and requisite vibration isolation pads.

Fan

The units should be equipped with direct driven backward curved EC radial fans with electronically commutated brushless motors; the technology employed by these motors allows straightforward control of fan speed by means of the electronic controller in order to obtain step less adjustment of air flow rate and static pressure to ensure correct distribution of the treated air. The motor's high efficiency should make for less energy absorption, especially at partial loads and during starting (lowering of peak current), which means a reduction in power consumption of approximately 30% compared to AC motor. The motor shall have minimum IP54 Protection.

Filters

The filter chamber shall be an integral part of the system and withdraw able from the front of the unit. Filtration shall be provided by deep V form G4 performance dry disposable media to AS1324.

Evaporator Coil

Precision packaged unit shall comprise of DUAL Cooling coil, one for DX & one for Chilled Water System of copper tubes expanded into aluminum fins with

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corrugated profile and **hydrophilic** treatment. Face and surface areas shall be such as to assure rated capacity and the air velocity across the coil and Filter shall not exceed 2.75 m/s. Each type of cooling coil shall be minimum of 3 rows deep and the fin spacing shall not exceed 1.8 mm. Coil selection to be suitable for SHF > 0.95 and provided with **hydrophilic coating** to minimize / eliminate water carry over into the airflow stream. **Drain pan shall be made of stainless steel.**

For the Chilled Water Circuit, unit shall incorporate in built 2-Way/3-Way (as per BOQ) Modulating Valve for controlling the Chilled Water flow on the basis of feedback of Return Air Temperature

Scroll Compressor

The compressor shall be of the high efficiency scroll design operating with R410A refrigerant and 400V/3~/50 Hz supply.

There shall be single or two independent Refrigerant Circuits in the unit. Minimum one of the two compressors should be scroll with inverter controlled brushless DC motor or Digital Scroll (with electronic expansion valve), operating with R410A and power supply of 400-460V/3ph/50-60Hz. The compressor should have integrated thermal overload protection and acoustic hood. The compressor motor control driver is provided with integral electronic protection against over temperature, over current, over or under-voltage with absence of one or more phases. The electronic control of the inverter is provided with automatic soft-start system and continuous control of the compressor curve to prevent and correct its use beyond the maximum allowed limits.

The second compressor (if two circuit unit) shall be highly efficient scroll type operating with R410A and power supply of 400-460V/3ph/50-60Hz. The compressor shall have integrated thermal overload protection.

Crankcase Heater on Compressor should be integral part of the unit.

Compressors, the humidifier shall be isolated from the air flow in the version with downward flow, and in the air flow in versions with upward output. The compressor shall be charged with synthetic oil and designed for operation on environment friendly refrigerant R410A.

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Refrigeration Circuit

The refrigeration system shall be of the multiple circuit direct expansion type and incorporate hermetic scroll compressors, complete with crankcase heaters.

- The refrigerant circuit comprises:
- Liquid receiver
- Delivery oil separator
- Electronic expansion valve
- Solenoid valve for shutting off the refrigerant liquid
- Refrigerant liquid flow indicator
- Solid cartridge freon filter
- Safety valve
- High pressure safety pressure switch with manual reset
- Low pressure switch with automatic reset
- Shut-off valves for external connections (versions with remote condenser)
- Copper refrigerant pipes with anti-condensation insulation on the suction line
- Pipe taps on suction and delivery side and charging valve on liquid side.
- Each Compressor to have its own independent Evaporator and Condenser.

Expansion device: Electronic Expansion Valve (EEV)

- The unit should have Electronic Expansion Valve, which offers the following advantages:
- Fast, high precision adjustment of refrigerant flow;
- Fast arrival of the unit at steady-state conditions;
- Superheating value remains constant in variable thermal load conditions;
- Efficient operating conditions of the compressor, especially in the presence of low room temperatures;
- Wide working range with consequent extension of the unit's operating limits. These properties result in enhanced performance of the unit and make it possible to obtain very significant energy savings
- The Pressure transducers attached to the EEV shall be able to display real time pressure (Suction & Discharge) and Superheat on the Microprocessor panel.
- The Temperature Sensor attached to the EEV shall be able to display real time parameters of Refrigerant such as Suction & Discharge Temperature

Air Cooled Condenser

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Condenser shall be air-cooled type, suitable for outdoor installation and shall be suitable for operating at high ambient of 50 deg C DBT and at low ambient of upto 0 deg C DBT temperatures. Condenser shall be in copper tube & aluminum fins construction. Condenser coil shall be of maximum 4 rows deep and the fin spacing shall not exceed 2mm. The condenser fan/s shall be of propeller type with max 1310 RPM variable voltage electric motor complete with IP-54 protection. Motor shall be speed controlled to ensure a stable operation for varying ambient; by a factory fitted direct acting head pressure activated step-less Fan Speed Controller or using Electronically Commutated Fan. The condenser shall be complete with provisions for refrigerant piping connections, shut off valves and any other standard accessories necessary with the equipment supplied. Each Circuit to have its independent set of condenser coil and Fans is separate casing.

The condenser coil should be Epoxy-Coated from OEM factory.

Electric Strip heaters

Each packaged unit shall be provided with multistage electric heaters (multistage for more than 5TR Capacity Units) with heating elements constructed from a non- oxidable material. Electric strip heaters shall be of the low temperature totally enclosed strip type fitted with radiation fins and suitable for operating at black heat. If overheating occurs, a safety thermostat should cuts off the voltage supply to the heaters and triggers an alarm.

Humidifier

Boiling water in a polypropylene steam generator shall provide humidification. The humidifier shall be capable of providing continuous auto modulation in steam generation from 30-100% as per the steam requirement per hour. The humidifier shall be fully serviceable with replaceable electrodes. Waste water shall be flushed from the humidifier by initiation of water supply valve via U-trap. The microprocessor should be able to display the current drawn and actual steam output in the microprocessor.

De-Humidification

De-humidification cycle shall operate by reducing the speed of EC fan to reduce ADP of coil. Hence, by reduction of fan speed there shall be additional power saving.

Water Sensor:

The system shall be provided with relevant water detection kit which shall have sensors. Each of the sensor must be capable to detect individually any water below the false floor near the unit, the sensor must be connected to the unit microprocessor thus enabling the controller to give an alarm incase of wet floor.

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Air Flow Sensor

The unit should have inbuilt Air Flow Rate Feedback Sensor to display the real time Airflow rate and also to have fan modulation function based on Airflow rate.

Supply Air Sensor

The unit should have inbuilt Supply Air Flow Temperature sensor to show real time Supply Air Temperature on the display of the unit.

Microprocessor Control System

Logic Circuitry:

A microprocessor shall continuously monitor operation of each Server room air-conditioning unit continuously digitally display room temperature and room relative humidity, alarm on system malfunction and simultaneously display problem. It should also display the Suction, Discharge Temperature and Pressure of the refrigerant along with the superheat. All the required transducers should be part of the Refrigerant circuit accessories. When more than one malfunction occurs, flash fault in sequence with room temperature, remember alarm even when malfunction cleared, and continue to flash fault until reset.

Microprocessor to control the following functions:

- Ambient temperature
- Humidity (HH versions)
- Speed of the delivery fans
- Speed of the condensation fans
- Timing of compressors with automatic rotation
- Alarm signal on two levels
- Controlled automatic reset of high and low pressure alarms

XI SPLIT SYSTEM AIRCONDITIONERS

1. GENERAL

The contractor shall supply and install split system air conditioners wherever indicated. The system shall be complete in all respects and comply with the specifications as given.

2. CONDENSING UNITS

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- 2.1 Each condensing unit shall be complete unit with hermetic reciprocating/scroll compressor/s, aircooled condenser, condenser fans with motors, internal piping, switches and internal wiring and shall be enclosed in a weather proof out door type housing.
- 2.2 The compressor shall be hermetic, with enclosed gas cooled motor. The compressor's shall be suitable for R-22/R-134a/R-407c/R-410a.
- 2.3 The condenser coil shall be air cooled type with aluminium fins and copper tubes and necessary refrigerant connections. The copper tubes shall not be less than 1/2" O.D.
- 2.4 The condenser air fans shall be propeller type direct driven, each complete with motor. The air quantity and area of the condenser shall be adequate for working in the specified out door conditions.
- 2.5 The casing shall be fabricated from galvanized steel, zinc phosphated and finished with baked enamel paint. The casing shall make the whole unit fully weather proof, suitable for out door installation.
- 2.6 The unit shall include a remote control assembly with thermostat and speed switches.
- 2.7 The necessary charge of refrigerant gas and lubricated oil shall be provided to run the system.

3. **INDOOR UNITS**

General

The indoor units shall be complete in all respects and shall generally comply with the specifications as given in the following paragraphs.

3.1 **HIGH WALL MOUNTED UNITS**

The units shall be High wall mounted type. The housing of the unit shall be of powder coated galvanised steel and shall include pre filter, fan section, coil section, etc. The body shall be light in weight.

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The fan shall be Aerodynamically designed diffuser turbo fan type. The fan shall be mounted directly on motor shaft having supported from housing. The fan shaft shall be statically and dynamically balanced. The fan shall be direct driven type.

The cooling coil shall be of seamless copper tubes, and shall have continuous aluminium fins. The fins shall be spaced by collars forming integral part of the fins. The tubes shall be staggered in the direction of air flow. The fins shall be uniformly bonded to the tubes by mechanical expansion of the tubes. The coils shall be tested against leaks.

Unit shall have filter cleanable type of resin net (with mold resistant) fixed to an integrally molded plastic frame. The filter should be slid away type but neatly inserted.

Unit shall have a external attractive casing for supply and return air. Unit shall have two/four way supply air grilles on sides and return air grille in centre.

Control

Each unit shall be with corded remote controller to operate maintain inside conditions.

Testing

The indoor unit shall be tested to measure air quantity and coil performance by measuring temperature difference, and then calculating the capacity.

4. REFRIGERANT PIPING

4.1 The condensing unit and evaporator unit shall be interconnected by type 'L' seamless copper refrigerant liquid and suction lines using flared or brazed fittings. Necessary accessories shall be incorporated in the circuit.

4.2 The suction line shall be insulated with two layers of 6 mm rubber foam insulation.

5. MISCELLANEOUS

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- 5.1 The unit shall have control panel, housing the starting switches, contactor, relays etc.
 - 5.2 Isolation pads shall be provided under the units.
 - 5.3 Drain line shall be provided from fan coil unit upto drain trap. (To be priced separately).
 - 5.4 Ductable unit shall have canvass connection at its outlet. The canvass connection shall be fire retardant, nonporous double layer.
 - 5.5 Suitable M.S. angle iron supporting frame shall be provided for the condensing unit and supporting arrangement for the indoor units.
 - 5.6 Interconnecting power and control cabling shall be provided between condensing unit and evaporator unit.

XII HI WALL TYPE CHILLED WATER UNIT

1. GENERAL

The contractor shall supply and install cassette type chilled water unit wherever indicated. The system shall be complete in all respects and comply with the specifications as given.

2. HI WALL TYPE CHILLED WATER UNITS

2.1 Hi Wall Type Chilled Water Units

Unit

The units shall be wall mounted type. The housing of the unit shall be of powder coated galvanized steel and shall include pre filter, fan section, cooling coil, coil section in built motorized valve, etc. The body shall be light in weight and shall be able to cordless remote control with LCD display flush with the wall.

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The fan shall be Aerodynamically designed cross flow turbo fan type. The fan shall be mounted directly on motor shaft having supported from housing. The fan shaft shall be statically and dynamically balanced. The fan shall be direct driven type.

The cooling coil shall be of seamless copper tubes, and shall have continuous aluminium hydrophilic fins. The fins shall be spaced by collars forming integral part of the fins. The tubes shall be staggered in the direction of air flow. The fins shall be uniformly bonded to the tubes by mechanical expansion of the tubes. The coils shall be tested against leaks.

Unit shall have filter cleanable type of resin net (with mold resistant) fixed to an integrally moulded plastic frame. The filter should be slid away type but neatly inserted.

Unit shall have a external attractive panel for supply and return air. Unit shall have bottom / down supply air grilles and return air grille in top.

Each unit shall have a 2 way motorized valve.

Control

Each unit shall be with corded remote controller to operate maintain inside conditions.

Testing

The indoor unit shall be tested to measure air quantity and coil performance by measuring temperature difference, and then calculating the capacity.

XIII PRESSURIZED EXPANSION TANK & PRESSURIZATION UNIT WITH VACUUM DEGASSER

- Expansion, pressurization and Vacuum Degassing of the chilled water system to be provided by an integrated unit comprised of single make pressurized expansion tank, pressurization unit with inbuilt vacuum

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- degasser for effectively removing of dissolved gas by vacuum degassing function c/w state of the art digital controller.
- The Expansion tank & pressurization unit shall be sized appropriate to the static height above the expansion tank (meters), total system volume, maximum ambient temperature, maximum allowable system pressure and safety relief valve settings and glycol content (%) if required.
 - The expansion tank shall be fitted with a replaceable high-quality butyl rubber bladder in accordance with DIN EN 13831 norm part 3, Nitrogen gas filling for longer maintenance of pre-pressure.
 - The pressurized expansion tank shall be cylindrical, In accordance with Pressure Equipment Directive PED 2014/108/EC, EN 12828, VDI 4708.
 - Pressurization unit shall be manufactured and designed in accordance with European Pressure Equipment Directive PED 2014/68/EC and Machinery Directive 95/16/EC.
 - The tanks must be provided with a bladder rupture detector to alarm the customer immediately if the bladder fails.
 - Tank shall be Suitable for addition of glycol-based anti-freeze up to 50%.
 - Maximum continual working temperature of the bladder shall be 70 °C (158 °F), and tank shall be Suitable for systems with a flow temperature of 120 °C.
 - The Pressurization unit shall have two pump duty standby housed in the skid with vacuum degassing tube for removal of dissolved gas. The complete unit shall contain pressure sensor, solenoid valve, isolation Valve, NRV, Drain Valve, flood protection in the event of a serious leak, MODBUS Communication protocol/ BACnet communication protocol (optional). Duplicate direct-coupled pumps shall be provided comprising multistage pumps with cast iron ports, stainless steel impeller stainless steel shaft, motor, mountings, and fittings or as otherwise indicated. Use of peripheral pumps is not accepted.
 - Pumps shall be complete with drain plug, isolating valves and neoprene/rubber flexible compensators.
 - Automatic changeover of the pumps shall be provided on pump failure. The changeover shall be remotely indicated. Provision shall be incorporated for periodic variation of the duty pump. Each pump shall be fitted with an 'hours run' counter. The over frequent starting of the duty pump shall be indicated.
 - The pressure transducer shall be provided for pump control to measure High and low-level pressure.
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- A low-level alarm shall be provided on the break tank to stop the pump-set if the water level in the tank drops to a dangerous level.
 - The system shall have common control unit for pressurization as well as vacuum degassing function. The controller shall be IP54 rated, with touch screen display indicating, pump operation and alarm mode, digital pressure setpoint with adjustable differential, and security password protection, High and low pressure alarm setting shall be selectable by the user. The Vacuum degassing function and pressurization function shall be programmable according to system requirement,
 - The controller is integrated into a sturdy plastic housing that holds not only the power and communication electronics but also the operator panel with a dirt-resistant membrane keyboard. The controller is a fully automatic, freely parameterisable microprocessor controller with a real-time clock, differentiating error memory and parameter memory, two-line plain-text display to indicate system pressure and all relevant operating and alarm messages and a LED display for the operating modes and general error messages.
 - Communication electronics consist of :
 - RS-485 interface as a data interface and for connecting optional communication components
 - Floating output for forwarding common messages
 - Input for evaluating a contact water meter
 - Input for requesting functions via an external signal
 - Control unit complete with all piping and the necessary wiring for connection in accordance with VDE regulations, mains cable (l = 5 m) and shock-proof plug.
 - System pressure is monitored and displayed with an alarm message if the pressure level breaches the minimum or maximum thresholds.
 - The system is controlled by means of an integrated system-pressure evaluation function or an external 230-V signal. (e.g. a pressure-maintaining station), with automatic interruption function and alarm message if the runtime and/or the number of cycles is exceeded. Controlled make-up, an automatic interruption function, and alarm message if the runtime and/or the number of cycles is exceeded.
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- A contact water meter can be used for evaluation incl. optional capacity monitoring for ion exchangers in the make-up line.
 - The entire system is documented and monitored with regards to the parameters.
 - Voltage free contacts provided for the status of pumps, operating pressures and alarms from the unit to the building management system.
 - In case of any fault, controller shall display the fault code and generate the alarm
 - The product shall be installed according to the manufacturer's instructions using manufacturer's approved components.

XIV DIRT SEPARATORS

Supply and install In- Line type flanged steel Dirt Separator suitable for a maximum pressure of 10 bar and if necessary 16 or 25 bar shall be installed in line with operating pressure and 110°C operating temperature and sized for the full capacity /flow.

The entering velocities not to exceed 1.2 m/s at a specified flow rate. Units specifically designed for high-velocity systems may have an entering velocity of up to 3.0 meters per second and shall be used in case of pipe size or space constraint.

The separator must confirm to design as per Pressure Equipment Directive 2014/68/EU article 4 paragraph 3

The vessel shell diameter to be of a larger cross-section than the inlet/outlet pipe diameter to reduce the flow speed in the separator. Inlet and outlet to be full size.

The core element should be tube mesh construction made of copper wire and the flow to be guided through an area with a greater cross-section than the connection dimensions in order to reduce the flow. The ensuing turbulence caused by the tube mesh causes heavy materials to move in an undetermined

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direction. Depending on the volume flow, density, and volume, parts of these sludge particles are supported in their natural breakaway motion and guided to the bottom section of the casing.

The capacity at the bottom of separators to capture large amounts of sludge results in longer intervals before cleaning becomes necessary and blowdown valve is utilized to remove the sludge particles.

Detachable flange base at the bottom shall be provided for the effective cleaning.

Magnetic removal should be done by insertion of Exferro high-performance magnets. The Dirt separator shall be able to remove effectively dirt particles down to 5 microns.

XV VARIABLE FREQUENCY DRIVE (VFD)

1. General Requirement

This specification covers the requirements for furnishing complete Variable Speed Drives (VSD) and appurtenances as specified herein. All standard and optional features shall be included within the VSD.

The frequency converter shall be suitable for AHU application.

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- a) The VSD module shall be tested to UL 508C. The appropriate UL label shall be applied.
 - b) The VSD module shall be CE marked and conform to the European Union Electro Magnetic Compatibility directive.
 - c) The VSD shall be UL listed for a short circuit current rating of 50 kA .

2. **Technical Requirement:**

A) The following ratings wall or frame mountable offering shall be available:

3-phase, 380 to 480 VAC, +10%...-15% (0.75 to 250 kW)

- B) The VSD shall convert incoming fixed frequency three-phase AC power into an adjustable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for the driven load and to eliminate the need for motor derating.
- c) When properly sized, the VSD shall allow the motor to produce full rated power at rated motor voltage, current, and speed without using the motor's service factor and shall not cause the motor temperature to rise above expected class on normal mains operation. The motor shall not require an external blower even at slow speed running.
- d) VSD shall operate with supply frequencies from minimum 47Hz to up to 63Hz.
- e) The overload rating of the VSD shall be 110 % of its rated light duty current for 1 minute every 10 minutes. Overload ability shall be available at all times – not only at start. f) Efficiency at Rated Power shall be 98%
- g) A scalar and vector control modes shall be supported and there shall be independent control chains and parameters for both of the motor control modes.
- h) The drive shall support various motor types Asynchronous motor, permanent magnet motor (vector), SynRM (vector).

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- I) The VSD shall have at least two (2) programmable Analogue Inputs. Both inputs shall accept current (0 to 20 mA or 4 to 20mA) or voltage (0 to 10 VDC) signals. The signal type selection, voltage or current, shall be made via VSD user interface. DIP-switches or jumpers are not allowed for input type programming.
- j) The VSD shall have at least two (2) programmable Analogue Outputs (0 to 20 mA or 4 to 20 mA) out of which one shall be software configurable to be either voltage (0 to 10 VDC) or current output. Analog I/Os shall have an inaccuracy of ≤ 1 % of full scale in both current and voltage modes.
- k) The VSD shall have at least six (6) programmable digital inputs (24 V_{AC} and 12 to 24 V_{DC}, PNP or NPN providing flexibility in interfacing with external devices.
- l) The VSD shall have at least three (3) programmable digital Form-C relay (changeover) outputs
- m) Drives shall have distinct Color Codes for easy terminal identification.
- n) Drive Shall have Safe Torque off as a Standard feature which does the function of Emergency Stop without any additional emergency Push button. Safe Torque off Shall confine to EN61800-5-2 Standard.

3. Environmental Limits

- a. Drive shall be designed for ambient temperature of -10°C to +50°C Manufacturer's statement on output currents in different ambient temperatures (40, 45 and 50 °C) for continuous 24h/day operation shall be provided in writing for design purposes.
 - b. VSDs shall be designed to operate in ambient conditions of relative humidity minimum up to 95 % (without condensation) and up to 1000 meters above sea level. The de-rating above 1000 meter altitudes shall be less than or equal to 1 % per 100 m.
 - c. Contamination levels according to IEC 60721-3-1, IEC 60721-3-2 and IEC 60721-3-3 shall be in operation for chemical gases class 3C2 and for solid particles class 3S2
 - d. VSDs shall be suitable for safe operation up to 4000 m altitude in neutral grounded TN electrical systems. The nominal VSD ratings shall be applicable
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3. Protection Class

- a. Wall or frame mountable VSDs shall be available in **IP21 for Panel mounted requirement**
- b. Both IP21 and IP55 protection class wall and frame mountable VSDs shall have identical output current and ambient ratings.
- c. VSDs protection class (IP class) shall remain even without the control panel to ensure dust and water protection at all times.

4. Standard Features

- a. **EMC Compliance** : The EMC compliance according to EN 61800-3 Class C2 (emissions) and 2nd environment (immunity) shall be met without external filters with maximum cable lengths of 100 meters.
- b. **Harmonic Mitigation technique:**

VSDs shall provide inbuilt choke which offer current harmonic reduction complying to IEC/EN 61000-3-12. This inbuilt choke shall be with variable inductance value that provides current harmonics reduction not only at full load but also at partial loads. External chokes are not acceptable

- c. The control panel shall include **Hand-Off-Auto** selections and manual speed control. The drive shall incorporate “bumpless transfer” of speed reference when switching between “Auto” and “Hand” modes.
- d. Two independently adjustable acceleration and deceleration ramps with 1 to 1800 seconds adjustable time ramps. There shall be a possibility to use **start delay** before acceleration to ensure that all start conditions have been fulfilled.
- e. There shall be a **run permissive** circuit for damper or valve monitoring signal.
- f. The VSD shall include an **override input**. Upon receipt of a contact closure from the VSD external **fireman's control station**, the VSD shall operate at an adjustable preset speed or PID controlled speed. The mode shall override all other inputs (analogue/digital, serial communication and all keypad commands) and force the motor to run at the adjustable, preset speed or PID controlled speed. “Override” shall be displayed on the control panel. Upon removal of the override signal, the VSD shall resume normal operation. Motor rotation direction shall be selectable in override mode by using internal parameters or digital input.
- g. **Real-time clock** and calendar shall be available as standard for giving true time and date information to fault event history. Real time clock shall be

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- possible to use with timed functions, which shall allow controlling the VSD and its functions based on time of the day, day of the week, seasons of the year, holiday periods and holiday dates and special working periods and working days..VFD Should have this feature without the need of option Card and battery
- h. The VSD shall be capable of starting into a **coasting load** (forward or reverse) up to full speed and accelerate or decelerate to a setpoint (flying start) without safety tripping or component damage, with all supported motor types (induction motor, permanent magnet motor and synchronous reluctance motor).
- i. A **motor heating** function shall be supported by the VSD to prevent condensation and corrosion of the motor.
- j. There shall be built-in counters for calculating **energy savings** achieved with the VSD. VSD shall be capable of displaying energy saved value in kWh unit. It shall also display saved CO2 value. Drive shall also have Provision to monitor actual energy consumption of the equipment during Last hour / Last day / Last month as well without the need of additional energy Meter
- k. Two independently adjustable acceleration and deceleration ramps with 0.1 to 1800 secondsadjustable time ramps. There shall be a possibility to use start delay before acceleration to ensure that all start conditions have been fulfilled.
- l. The VSD shall have three (3) programmable critical frequency or critical speed lockout ranges to prevent the VSD from operating the load continuously on an undesirable speed range (skip frequencies).
- m. Drive Shall have settable load curve can be used to detect abnormal load situations that do not cause a fault or warning. For example, detecting a broken belt between the motor and load, broken fan blades or dirt accumulated in a pump.
- n. Minimum Cable distance between the Motor and Drive Shall be 100m without any need of additional output Choke.
- o. There shall be an Embedded interlock logic Safety feature available in the drive to confirm that equipment position, such as dampers, and sensor status are correct before operations begin.
- P. Drive shall have Safe Torque off feature to disconnect the Drive from Motor without the need of any additional emergency Stop Push button . Safe Torque off shall confirm to EN 61800-5-2 Standard Q. Drive Shall have Speed controlled cooling fan for Smooth and Quiet operation and conventional cooling with fixed speed is not acceptable
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5. PID Closed loop controller:

- a) Two (2) PID closed loop controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VSD, using the microprocessor in the VSD for the closed loop control
- b) There shall be two parameter sets for the first PID loop controller e.g. for night setback, summer and winter set points etc.

6. User Interfaces – Detachable Control Panel & Serial Communication

- a) The control panel shall include a backlit LCD. The display shall be in complete words, in a language selectable by the user from a list of 14 languages, for programming and fault diagnostics. Faults should be displayed in plain text format. Control panel shall be capable of showing parameters in the form of analog, Bargraph, Numeric formats
- b) The control panel shall include Hand-Off-Auto selections and manual speed control. The drive shall incorporate “bumpless transfer” of speed reference when switching between “Auto” and “Hand” modes. There shall be a possibility to reset the VSD and a dedicated “Help” button on the control panel. Help button shall provide context sensitive assistance for programming and troubleshooting.
- c) The control panel shall provide an easy to use I/O menu, where the user can see the status and function of all the analog and digital inputs and outputs.
- d) Engineering units shall be freely configurable for the user to display.
- e) The control panel shall contain a back-up information of the VSD settings. Back-up information shall be possible to be saved on the control panel both manually and automatically.
- f) The user shall be able to take a screen capture snapshot of the display with the control panel and be able to download the screen capture for user’s computer for further purposes.
- g) The user shall be able to connect a PC tool with a USB cable to the control panel to be able to set up and control the VSD. It shall be possible to connect the USB cable without using any tools.
- h) The control panel shall be standard across the VFD series and detachable in all types of VSD, IP21, IP42, IP54 and IP55 protection class VSD without tools to allow easy commissioning and programming of multiple VSDs.
- i) The VSD shall include pass code protection against unauthorized parameter changes. The pass code and the protection level shall possible to be defined by the user.
- j) The VSD shall have an EIA-485 (RS-485) port for serial communications as standard. BACnet protocol using BACnet MS/TP layer & Johnson Controls

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N2 protocol shall be embedded into the VSD memory. k) There shall be following optional protocols available as plug-in and inbuilt options: LonWorks, PROFIBUS-DP, CANopen, DeviceNet, ControlNet, EtherCAT, Ethernet POWERLINK and with a two port option Modbus/TCP, EtherNet/IP, PROFINET.
L) Displays Shall be Hot Swappable and Shall have Real time clock feature without need of additional add on Card and battery

6. HVAC Macros for ease of Parameterization

The VSD shall support below HVAC macros for ease of parametrization:

- a) Pump & Fan control
- b) Override function
- c) PID Control
- d) HVAC default configuration
- e) Timer function
- f) Motor potentiometer
- g) User load curve
- h) Reference ramping
- i) Preset speed setting

8. Protection Functions in VFD

The following protection functions shall be available

- a) Overvoltage controller
- b) Undervoltage controller
- c) Motor earth-leakage monitoring
- d) Motor short-circuit protection
- e) Motor overtemperature protection
- f) Output and input switch supervision
- g) Motor overload protection
- h) Phase-loss detection (both motor and supply)
- i) Under load supervision (belt loss detection)
- j) Overload supervision
- k) Stall protection
- l) Loss of AI signal monitoring
- m) Heat Sink over temperature Cut off

9 . Product Compliance

- a) Standards and directives Low Voltage Directive 2006/95/EC
- b) EMC Directive 2004/108/EC

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- c) Quality assurance system ISO 9001 and
 - d) Environmental system ISO 14001
 - e) CE, UL, cUL, and EAC approvals
 - f) Galvanic isolation according to PELV
 - g) RoHS2 (Restriction of Hazardous Substances)
 - h) EN 61800-5-1: 2007; IEC/EN 61000-3-12;
 - i) EN61800-3: 2017 + A1: 2012 Category C2 (1st environment restricted distribution);
 - j) Safe torque off (EN 61800-5-2)

XVI REFRIGERANT DETECTION & ALARM SYSTEM

PART 1 - GENERAL

1.1. SUMMARY:

- A. This Standard is intended to provide guidance regarding the installation of refrigerant leak detection systems to comply with standard ASHRAE 15 Design Criteria.

1.2. SUBMITTALS:

- A. Submit the following documents for reference and/or approval:
 - 1. Refrigerant leak detection Control Panel and sensors
 - 2. Audible and Visual Signaling Devices
 - 3. Interconnection Wiring Diagrams
 - 4. Installation and operating instructions for all equipment

1.3. REFRIGERANT LEAK DETECTION SYSTEM DESIGN CRITERIA:

- A. Provide a refrigerant leak detection system where required by Code and these Standards. Areas include but are not limited to the following:
 - 1. Mechanical rooms where refrigerants are used for refrigeration equipment and within piping between equipment components,
 - 2. Occupied spaces that do not have mechanical ventilation, where refrigerant piping is installed in greater than exempt quantities per ASHRAE 15.
- B. Refrigerant leak detection system shall generally:

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1. Be capable of detecting the presence of the refrigerants(s) utilized within the chiller system(s), providing various stages of alarming, and capable of continuously displaying the specific gas (refrigerant used) concentration.
 2. Shall be utilizing NDIR (Non-dispersive infrared) gas detection technology
 3. Be capable of detecting concentration levels as low as one part per million (PPM)
 4. Be capable of continuously transmitting alarm and trouble conditions, and gas concentration levels to the Building Automation System (BAS).
 5. Control the chiller room (or other protected areas) mechanical ventilation system.
- C. Refrigerant gas leak detection to be provided with the following basic features:
1. Common system trouble alarm.
 2. Each monitored alarm zone to include three levels of individual adjustable-set point alarm relays, each capable of being manually reset.
 3. 0-10 volt, or 4-20mAmp programmable refrigerant gas concentration signal output, for connection to the BAS, for each monitored alarm zone.
- D. Refrigerant monitors and alarm indicators shall be connected to building Standby Power system where available. In locations where chiller system is connected to Standby power system, chiller room ventilation system shall also be connected to Standby Power.
- E. Monitoring shall be employed to provide a minimum of two (2) points of area sampling and (1) point of relief vent monitoring for each chiller. Provide additional monitoring zones for any pit areas within the chiller mechanical room.
- F. Where multiple refrigerant types are used, it is the system supplier's responsibility to properly select the quantity and type of refrigerant detectors and monitoring systems required to safely monitor the equipment room.
- G. Operation of the chiller room Emergency ventilation system shall be initiated from the refrigerant gas leak monitor panel and from manual switches located outside the mechanical room entrance door(s).
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H. Refrigerant monitoring system(s) installed shall be completely installed and operational prior to bringing refrigerant onsite to fill new systems.

I. BAS Refrigerant alarm and alarm message nomenclature shall be coordinated - Building Automation Systems Point Names, Descriptions, Graphics and Alarming.

1.4. LEAK DETECTION ALARM LEVELS:

A. Guidance on refrigerant leak alarm actions and alarm levels for select refrigerants is noted below. If other refrigerants are proposed, contact the Project Manager for guidance.

Alarm	Action
Trouble	* BAS alarm
Level 1	Not Used
Level 2	*Activate emergency ventilation system; *BAS alarm
Level 3	*Activate emergency ventilation system; *Activate local Alert Horns / Lights; *BAS alarm

Refrigerant	“Caution” Level 1	“Caution” Level 2	“Alarm” Level 3	Referenced Maximum Exposure Limits	“Trouble”
R-11	Not Used	50PPM	700PP M	OSHA PEL: 1000 ppm	Sensor/Con troller Fault
R-22	Not Used	50PPM	700PP M	NIOSH TWA: 1000 ppm STEL: 1250 ppm	Sensor/Con troller Fault
R-123	Not Used	30PPM	50PPM	AIHA TWA: 50 ppm	Sensor/Con troller Fault
R-134a,	Not Used	50PPM	700PP M	AIHA TWA: 1000 ppm	Sensor/Con troller Fault

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R-407C, R-410A, R-507					

PART 2 – PRODUCTS

2.1. REFRIGERANT LEAK DETECTION SYSTEM:

- A. All equipment and components shall be new, and the manufacturer's current model.
- B. Acceptable Manufacturers:
 - 1. B P REFCOOL
 - 2. INGERSOL RAND

PART 3 – EXECUTION

3.1. INSTALLATION - GENERAL:

- A. Locate control panel outside the mechanical room where the chiller equipment is located, near the most frequently accessed door to the chiller room for emergency responders. If the location is not secured from public access, provide adequate tamper protection for the control panel yet allowing responders to view the display without opening.
- B. Install equipment and components in compliance with manufacturers' recommendations. Consult manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- C. The contractor shall clean all dirt and debris from the inside and the outside of the equipment and sample lines after completion of the installation.

3.2. ALARMS AND SIGNAGE:

- A. Provide audio and visual alarms both inside the mechanical space (or other protected space) and outside each entrance, positioned ~ 96 inches AFF. Visual alarms shall be colored yellow. Audio horn shall be distinct tone separate from Carbon Monoxide and fire alarm systems.

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Each device shall be labeled "REFRIGERANT LEAK ALARM" to indicate its purpose.

- B. Place warning signs inside the mechanical room and outside each door to the refrigeration equipment room; The warning sign shall read as follows:

WARNING

Authorized Personnel Only -Stay Out When Refrigerant Alarm Sounds;
Call Facilities Management Immediately at ----- and
EHS Emergency Response Team at -----
If Police, Fire or Medical is Required, Call Public Safety at -----

3.3. WIRING AND CIRCUIT IDENTIFICATION:

- A. System wiring shall conform to relevant Standards, and the requirements noted herein.
- B. System wiring, circuits, and conductors shall be color coded and identified by number and/or function, in coordination with the system wiring diagrams, at all termination points (i.e., control panels, sensors, etc.) and terminal cabinets.

3.4. REFRIGERANT MONITORING SYSTEM IDENTIFICATION/LABELING:

- A. Provide engraved nameplates for leak detection Monitor Panels. The plate shall contain the equipment identification and the control power circuit source panel name and breaker number.
- B. Provide machine-labeled directories for all equipment controls and indicators.
- C. Junction and splice boxes containing refrigerant leak detection system wiring, circuits, and conductors: provide with yellow covers and marked "refrigerant leak detection" in $\frac{3}{4}$ " (three-quarter inch) white letters.
- D. All sample tubing shall be marked "refrigerant leak detection".

3.5. STARTUP AND TRAINING:

- A. Prior to project completion, manufacturer's factory trained representative shall program, start up, thoroughly test and calibrate, set alarm threshold levels, and verify that system is in compliance with operational sequence.

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- B. Provide Training for staff in the operation, use and maintenance of the system.
- C. Provide Safety Certification documentation including: Calibration Report with before and after results of each analyzer, Alarm / Interface Report stating all threshold levels, alarm and interface action at each level of alarm with field verification report, BAS alarm Report for each alarm threshold, and Safety Training Checklist.

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XVII VENTILATION SYSTEM

1. GENERAL

The ventilation fans shall be complete in all respects and shall generally comply with the following specifications given below :

2. EXHAUST FANS (Vane/Tube Axial flow type)

Axial flow fan shall be of vane/tube axial type and shall be suitable for mounting in duct or floor/slab as required/indicated on the tender drawings. Fan performance shall be based on tests conducted in accordance to AMCA 210 for air performance and AMCA 300 for Inlet sound power levels. These fans shall be licensed to bear the AMCA seal for air and sound performance.

2.1 Impellers

Single piece cast aluminium or steel impeller shall be with blades of aerofoile design to give maximum efficiency and shall vary in twist and width from hub to tip to effect equal air distribution along the blade length. Single piece fan and hub shall be statically and dynamically balanced. Maximum clearance between blade tip and the fan housing at the specified speed shall be 5 mm. Impellers blades shall be whirl tested to a speed 25% above the design operating speed. Extended grease leads for external lubrication shall be provided. The fan blade shall be adjustable type so that actual air flow can be achieved at site as per indicated in Drawings & BOQ.

2.2 Casing

Casing shall be constructed of 14 gauge sheet steel, properly reinforced for rigidity. Fan casing, motor mount and straightening vanes shall be of welded steel construction motor mounting plate shall be minimum 20 mm thick and machined to receive motor flanges.

Casing shall be provided with two nos. wide, hinged doors which open easily. Inspection doors with handle and neoprene gasket shall be

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provided. Casing shall have flanged connection on both ends for ducted applications. Support brackets for ceiling suspensions shall be welded to casing for connection to hanger bolts. Straightening vanes shall be aerodynamically designed for maximum efficiency by converting velocity pressure to static pressure potential and minimizing turbulence. Casing shall be bondorized, primed and finish coated with enamel paint.

2.3 **Motor**

Motor shall be squirrel cage, totally enclosed, fan cooled, constant speed, suitable for $415 \pm 10\%$ volts, 50 Hz, 3 phase power supply, motor nameplate horsepower shall be more than brake horse power by a minimum of 10%. Motor speed shall not exceed be 2900, 1500, 975, or 750 rpm in 50 Hz with suitable service factor. The fan and motor combination selected for particular requirement shall be of the most efficient type so that

sound level and energy consumption is minimum. Motor conduit box shall be mounted on exterior of the casing. Wires from the motor to the conduit box shall be protected from the air stream by enclosing in a flexible metal conduit. The motor shall have 'H' class insulation wherever mentioned in BOQ. Motors must be standard IEC and corresponding Frame designs that are readily available from motor vendors. Suppliers using C-Face or Pad Mount motors must include provisions to provide replacement motors in case of a motor failure due to long motor lead times. Motors for emergency smoke/ fire ventilation shall use insulation class H and shall be UL Listed or EN Certified , as noted below: 250° C for a minimum of 2 hours of operation with class H insulation. Each fan shall be direct driven in AMCA arrangement 4 with propeller secured to the motor shaft. All fans which has to run in case of smoke exhaust, Fan manufacturer shall submit "certificate of conformity for 250 deg C for 2 hours operation as per EN12101-3: 2002 issued by internationally recognized independent fire laboratory .The make of motor used during the testing and the make of motor supplied by the fan manufacture at site should be same.

2.4 **Drive**

- **For Duct/Wall Mounted Fan:**

For duct/wall mounted fans the impeller shall be mounted directly on the motor. Drive unit and impeller shall be totally enclosed inside the duct.

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- **For Floor/Ceiling Mounted Fan:**

The fan shall be provided with belt drive and adjustable motor sheave, standard sheet steel belt guard with vented front for heat dissipation. Belt shall be of the oil resistant type.

- **Vibration Isolation:**

Base shall be provided for each fan. Base for both fan and motor shall be built as an integral part and shall be mounted on a concrete foundation through spring type of vibration isolators. The concrete foundations shall be at least 15 cm above the finished floor level and shall be further isolated from the structural floor through 5 cm. Thick layers of sand all around, topped with bitumen. In case ceiling hung fan within the ceiling shall be provided Vibration Isolation Suspension (VIS) shall be provided in each of string.

3. **INLINE FANS**

3.1 **General**

The Inline fans shall be complete in all respect and shall comply with the following specification.

3.2 **Inline Fans :**

The fan shall be complete with centrifugal impeller, casing, direct driven motor, vibration isolators.

3.2.1 **Housing**

The housing shall be constructed of hot rolled GSS sheet metal construction. Housing metal parts shall be either spot welded or screwed or mounted together with Rivets. The housing shall indicate arrow showing rotation, make, model and duty conditions.

3.2.2 **Fan Wheel**

Fan wheel shall be forward/backward curved type, fan wheel shall be statically and dynamically balanced.

3.2.3 **Ball Bearing**

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The ball bearing shall be completely maintenance free and can be used in any mounting position, at maximum indicated temperature. The bearing lubricant shall be suitable for a minimum ambient temperature of minus 15° C. For application at maximum indicated ambient temperature, life expectancy L_{10} is 40,000 hours minimum.

3.2.4 **Fan Motor**

Fan shall be supplied with built in Thermal contact (TK). At the critical high temperature point ('B' = 130 C or 'F' = 155° C) the Thermal contact will open and break the power supply to the fan. Fan motor shall have insulation class 'B' or class 'F' and protection class IP44 or IP54.

3.2.5 **Fan Drive**

The fan shall be direct driven type.

3.3 **Painting**

The complete fan assembly, casing and other steel structure shall either be GSS or epoxy painted as per IS 5 : 1994 specification for ready mixed paints and enamels.

4. **CENTRIFUGAL BLOWERS**

4.1 The centrifugal blowers shall be double/single inlet, double/single width, non overloading type, be suitable construction. The blower performance must be rated in accordance with approved test codes and procedures as per IS : 4894-1987 code of practice for centrifugal fan.

4.1.1 Housing shall be of heavy gauge sheet steel in welded construction. It shall be rigidly reinforced and supported by structural angles. Split casing shall be provided on larger sizes of fans. However neoprene/ asbestos packing shall be provided throughout split joints to make it airtight. 1.2 mm galvanized wire mesh inlet guard, of 5cms sleeves shall be provided on both inlets. Housing shall be provided with access door with quick locking tension handles and neoprene gasket. Rotation arrow shall be clearly marked on the housing

4.2 The blower housing comprising of scroll & side plates shall be accurately cut, heavy gauge all welded sectional construction and

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reinforced with angle bracing. Outlets shall be flanged to assure proper duct connections. Inlet cones shall be spun venture type or curved vane type to ensure smooth air entry. The base frame shall be of angle iron in bolted/welded construction.

4.3 Impeller shall be fabricated from sheet steel with backward curved, properly designed. Blades, heavy C.I. hub and shall be both dynamically and statically balanced, to a close tolerance for quiet and vibration free performance.

4.4 Shaft shall be hot rolled steel or forged steel, sized adequately, but in no case less than 40 mm diameter and shall be accurately ground and polished to a close tolerance.

4.5 Bearings shall be self aligning, heavy duty ball or tapered roller type with intergral dust and grease seals. Bearings shall be of the sleeve/ball bearing type mounted directly on the fan housing.

4.6 After assembly, the complete fan shall be painted with rust proof primer and two coats of synthetic enamel paint.

4.7 Fan having wheel diameter of 1220 mm or more, shall be supplied with split, bolted housing for convenience of handling and installation.

5. **BLOWER DRIVE ASSEMBLY**

5.1 Drive assembly for each blower shall consist of blower pulley, motor pulley, a set of 'V' belts, belts, guards and belt tension adjusting device.

5.2 Pulleys shall be selected to provide the required speed. They shall be multi-groove type, with section and grooves selected to transmit 33% more load than the required power and shall be statically balanced.

5.3 The belt guards shall be M.S. sheet with angle iron reinforcement and expanded metal screen.

6. **MOTORS AND STARTERS**

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- 6.1 The motor for each blower, shall be squirrel cage induction type and conform to specifications as given under section on control panel, motors and switchgear. The motor H.P. shall be at least 20% more than the limit load of fan and of minimum rating as given under 'Schedule of Equipments'.

6.2

7. **ACCESSORIES**

All necessary accessories shall be provide for proper operation and shall also include :

- 7.1 Vibration isolators for the blowers.
 7.2 Double canvas connections at the outlet of each fan.
 7.3 Nuts, bolts, shims etc. as required for the grouting of the equipment.
 7.4 Slide rails for mounting the motor and belt adjustments.

8. **DRY SCRUBBER**

8.1 **Electrostatic Section**

Electrostatic precipitation technology based dry type air cleaner to remove Oil, Smoke & fumes from the Kitchen exhaust air.

Construction: Made of 16 gauge galvanized sheet, High bake epoxy powder coated.

Pre Filter: Washable type aluminum mesh pre-filter

Post Filter: Washable type aluminum mesh.

Ionizer: Stainless steel spiked ionizers to create high voltage DC field.

Collector Plate: aluminum collector plates which should be alternatively charged positive & negative with large collecting area with 14" deep cell, to work as magnet for charged smoke & oil particles.

Average efficiency of 90-95% in single pass as per ASHRAE test method.

Electrostatic Precipitator should be able to charge particles from 0.01 micron to 10 micron through solid state power supply.

Collector cell should be of permanent type and slide out facility for easy removal for cleaning.

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- 8.2 **Power Supply:** Power supplies shall be 100% solid state UL Listed and operate on 230 VAC, 50 Hz, 1 Phase input and provide a dual high voltage output of (+) 12 to 13 KVDC for the ionizer and (+) 6.0 to 6.5 KVDC for the collector. Module of capacity above 3000 CFM shall be equipped with Pulse width modulating (PWM) to maintain the specified collection efficiency by maintaining a constant charge in the event of Low/High Voltage from source thus ensuring that the unit functionality is not affected with these voltage fluctuations. Power Consumption should not be more than 50 watts per cell.

System should be fitted with interlock switch for safety.

The system should be able connected to a double skin type fan section to achieve airflow of 500 FPM across the air cleaner and should be interlocked with the fan to prevent dry run of the units.

- 8.3 **Motor & Drive :** The fan motor shall be EFF-1 suitable for $415 \pm 10\%$ volts, 50 Hz, 3 phase, A.C supply squirrel case totally enclosed fan cooled with IP 55 protection. The motor speed shall not exceed 1450 rpm. The drive to the fan shall be provided through belt arrangement. Bottom tray of blower section shall have 1.2 mm FRP lining.

9. **DUCTLESS VENTILATION (JET FANS)**

9.1 **General**

9.1.1 **Section Includes**

A. Ductless Ventilation system package

- (i) Jet Vent Fan
- (ii) CFD analysis.

9.2 **Submittals**

A. Submittals shall include the following : -

- (i) Sequence of operation.
- (ii) Jet fan drawings indicating dimensions.

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- (iii) Power and control wiring diagrams whichever is applicable
 - (iv) Fan data sheets.

9.3 **Quality Assurance**

The supplier of ductless ventilation system shall assume “ Unit Responsibility “ for the complete ductless ventilation package. Unit responsibility shall be defined as responsibility for interface and successful operation of all system components supplied by the supplier as specified in the BOQ.

Bidders shall comply with all sections of this specification relating to packaged systems. Any deviations from this specification shall be bid as a voluntary alternate clearly defined in writing. If no exceptions are noted , the supplier or contractor shall be bound by these specifications.

9.4 **Products**

9.4.1 **Acceptable Manufacturers**

- (i) Subject to compliance with these specifications, the following manufacturers / suppliers shall be acceptable .
 - (a) System air / Flaktwood or approved equal .

9.4.2 **Manufactured Units :**

- (i) Furnish and install as shown on the plans the Jet fan as manufactured by System air or approved equal.
- (ii) The control system shall include as , a minimum the control panel , CO sensor and any other additional items wherever specified in the BOQ.
- (iii) The items as mentioned in the BOQ shall be delivered as individual components to the jobsite. However the fan should be supplied completely assembled before dispatch to the job site.
- (iv) Fans , Control panel, CO Sensors and related equipment shall be installed by the mechanical contractor as shown on the plans.

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- (v) Line voltage power wiring shall be installed by the electrical contractor as shown on the field connection drawings and wiring diagrams supplied by the ductless ventilation system supplier.
 - (vi) Low voltage (24 VDC and 115 VAC) wiring shall be installed by the controls contractor as shown on the field connection drawings and wiring diagrams supplied by the ductless ventilation system supplier.

9.5 **Components**

(i) **Jet Vent Fan**

Jet fans should be supplied as completely assembled before dispatched to the job site having characteristics as of high performance ventilation with small air volume. Each unit shall consist of fan having inlet cones , protective screen , tow silencers , terminal box & mounting arms or brackets.

Fan : Fan shall be axial flow type balanced dynamically and statically . The fans shall have adjustable aluminum impeller or shall be fully welded for high temperature applications 300 Deg. C for 2 hours operation.

Casing : The Casing of Jet Fans shall be made of Galvanized steel with flanges at both ends .

Motor : The Motor shall run on the electrical power suitable for 50 Hz. The type of motor shall be suitable for 2 speed unless otherwise specified in the BOQ. Motor shall comply with IEC 34 – a

Protective Guards : The Fans shall have protection guards at inlet side.

Silencers : The Jet Fans shall have silencers manufactured from Galvanized steel length approximately 900 mm.

Inlet Cone : Jet fans shall have inlet cone made of 18 Gauge Galvanized steel.

Terminal Box : The pre – wired Terminal box is mounted at the outer fan Casing.

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Mounting Arms / Brackets : The unit shall be with mounting brackets for ceiling suspension.

Noise Level : dB level of the jet fan should not exceed 59 db 9 (A) at 1 mtr. distance.

9.6 **Miscellaneous**

Necessary accessories shall be provided wherever necessarily required for proper operation and shall also include:

- a) Necessary GI piping for water circulation
- b) Vibration isolations pads for the blowers and pumps
- c) Canvass connections at the outlet of each fan
- d) Nuts, bolts, shims etc. as required for the grouting of the equipment
- e) Float valves in the air washer tank, along with quick fill connection

9.7 **Limitations**

The air velocity limits are as follows:

- a) Average velocity across air washer filters shall not exceed 2.6 m/sec (500 FPM)
- b) Velocity at blower outlet shall not exceed 9 m/sec (1800 FPM).

9.8 **Accessories**

All necessary accessories shall be provide for proper operation and shall also include :

9.8.1 Vibration isolators for the blowers.

9.8.2 Double canvas connections at the outlet of each fan.

9.8.3 Nuts, bolts, shims etc. as required for the grouting of the equipment.

9.8.4 Slide rails for mounting the motor and belt adjustments.

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9.8.5 Nuts, bolts, shims etc. as required for the grouting of the equipment.

9.8.6 Slide rails for mounting the motor and belt adjustments.

XVIII CONTROLS

1. SCOPE

This chapter covers the requirements of equipment safety controls, refrigerant flow controls, system controls, and variable speed drive (VSD). For chilling units all the controls shall be microprocessor based.

2. EQUIPMENT SAFETY CONTROLS

2.1 Compressor

2.1.1 Compressor shall be provided with the following safety controls:-

- High discharge pressure (HP) safety (cut out) to stop the compressor automatically, in case discharge pressure exceeds a preset safe value. This safety shall operate when discharge head pressure exceeds the set point. Only manual resetting shall be provided for this safety.
- Low suction pressure (LP) safety (cut-out) to stop the compressor automatically, in case suction pressure falls below a pre-set value. This safety shall operate when the suction pressure falls below the set point. Automatic resetting shall be provided for this safety, with adjustable cut-in and cut-out pressures. This safety shall be used for pumping down the system for shutting off the refrigeration plant.
- Oil pressure (O.P) safety (cut-outs) to stop the compressor, in case lubricating oil pressure falls below a safe set value. A time delay

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mechanism shall also be provided, so as to permit running of the compressor upto a maximum period of 90 seconds, with the oil pressure differential below the set value and allow it to continue normal operation if the pressure differential builds up to the set value within that time, or otherwise shut-down the compressor. Only manual resetting shall be provided for this safety.

- High bearing oil temperature cut-out (for centrifugal compressor only). This shall be provided with a manual reset only.
- High lubricating oil temperature cut-out (for centrifugal compressor only). This shall be provided with a manual reset only.
- Time delay mechanism on the starting gear to limit short cycling regardless of malfunctioning of controls.

The cut-outs (i) to (v) mentioned above shall operate when the respective controlled variable crosses the set point to trip the compressor. Audio visual alarm shall be provided to indicate such operations. A manual reset shall be provided for them.

2.1.2 Safeties mentioned above shall operate when the respective controlled variable crosses the set point to trip the compressor.

2.1.3 Audio visual alarm shall also be provided to indicate such operations.

2.2 **Condenser**

- The safety control for a condenser shall comprise a safety pressure relief valve on the shell. This shall operate to relieve the pressure at the set point without prior leakage. For small condensers, a fusible plug may be provided to melt at a predetermined temperature.

2.3 **Chiller**

- An antifreeze shall be provided with water chiller, set at a few degrees above the freezing point. This shall operate, when the temperature of water in the chiller falls below the set point to trip the compressor motor. The reset provided for the safety shall be manual.

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- Flooded type of chiller in addition, shall be provided with safety pressure relief valve.

2.4 **Refrigeration Plant**

2.4.1 In addition to the safety controls as above for the individual components of a refrigeration plant, the following safety controls shall also be provided for the plant.

- Compressor motor over current cut-out.
- Condenser water flow switch.
- Chilled water flow switch.
- Condenser air flow switch in the condenser fan discharge (in case of air-cooled condensers).
- Air flow switch in the evaporator fan discharge in case of direct expansion coils

2.4.2 The above controls, on operation, shall trip the compressor motor, and these shall be provided with manual reset arrangement.

2.4.3 The compressor motor shall also be interlocked electrically with,

- Condenser water pump in case of water cooled condenser, and condenser fan with air cooled condensers,
- Chilled water pumps in case of chilled water system and evaporator fan in case of direct expansion system, and
- Antifreeze thermostat in case of chillers.

2.4.4 Indicating lamps shall also be provided on the control panel for indicating operation of the safeties and interlocks.

3. **REFRIGERANT FLOW CONTROLS**

A refrigeration plant shall be provided with controls, necessary for starting, stopping and modulating the flow of refrigerant in the plant so as to satisfy the load requirements. These comprise solenoid valve, thermostatic expansion valve, float valve, compressor capacity controls etc. and other special controls if specified in a particular work.

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3.1 **Solenoid Valve**

- For screw type compressors liquid line solenoid valve shall be provided in the liquid line of the system, ahead of the expansion valve, to allow or to stop the flow of liquid refrigerant to an evaporator, or a section of sectionalized evaporator. This shall be operated by snap-acting thermostat and it shall also be provided with a test switch to enable manual energizing.
- Discharge gas valves shall be provided in the following applications as required:
- Hot gas defrosting: normally this solenoid valve shall remain closed, but it shall open up to feed the evaporator with hot gas for defrosting when required, especially in cold storage applications.
- Solenoid valves shall be direct acting in smaller sizes and pilot operated for larger sizes, as required. The size of the valves shall be determined by the desired flow rate of refrigerant through them and the pressure drop across the same (and not by the size of the refrigerant line).

3.2 **Thermostatic Expansion Valve**

Thermostatic expansion valve shall be provided in DX type refrigeration plant to modulate the flow rate of liquid refrigerant entering the evaporator in response to the extent of superheat of refrigerant gas leaving the evaporator, so that only a metered flow is ensured matching the load. The number of expansion valve shall be such that the specified accuracy of temperature control of the system can be achieved and that no valve is expected to operate below 35% of its rated capacity. The sizes shall be selected suitably so as to avoid hunting. Adjustable super heat control and external equalizer port shall be provided for each valve. Each expansion valve shall be easily removable for cleaning and adjusting.

3.3 **Float Valve**

Float valve shall be provided in refrigerant plant with flooded type chiller for maintaining the liquid level in chiller under all conditions of load at a rate commensurate with the rate of vaporization. This can be provided either on low pressure side or on high pressure side. When provided as low side float valve, this shall be located as a part of the chiller or accumulator.

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3.4 **Compressor Capacity Control**

The capacity control arrangement shall be in accordance with 2.2A.7 for centrifugal type compressors and 2.2B.8 for screw compressors.

4. **SYSTEM CONTROLS**

- The requirements for maintaining the inside design conditions as specified in the tender specifications for the work shall be met by appropriate system controls and control elements. The system shall satisfy the requirements of both full load and partial load conditions. Details of complete control elements shall be indicated by the tendered in the tender.
- Control shall be affected by 2 way diverting valve in chilled water coil. For heating using hot water coils, now control through them shall also be achieved by using 2 way valves.
- The size of 2 way diverting valves shall be selected so as to match the coil where in the flow is to be regulated. The make and size shall be indicated in the Technical particulars in the tender.
- Operation of the modulating proportional motor of 2 way diverting valve shall be controlled by proportional type thermostat.

5. **OPERATIONAL CONTROLS AND INTERLOCKS**

- The operation of refrigeration plant shall be either manual or automatic, as specified. The plant shall be started by an ON/OFF switch. Additionally, in the case of an automatic plant, an auto/manual switch shall also be provided.
- The automatic operation shall be effected through the monitoring of return chilled water temperature, or the room conditions, as the case may be. In multi-unit installations, one unit shall be arranged to be loaded fully before the next unit is switched on automatically. A similar operation system shall be followed in shutting off of the unit. Change over from one operating unit to another shall be possible through the status switch of the plant to be shut down by change to manual position and thus overriding its anti-cycle timer. It should be possible to

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- introduce the changed unit by running it to speed and changing over the status switch to "auto" position.
- Pump down shut down shall be provided through low pressure (LP) safely irrespective of the status switch position, auto/manual.
 - It should be possible to start the compressor motor only after the cooling tower fan motor, chilled water and condenser water pumps are operated.
 - The compressor motor shall be able to be started or run, only after all the safeties as per Para 12.2 are satisfied.
 - The blower motor shall be interlocked with strip heaters (where provided) such that power supply to strip heaters will become ON, only after the blower has been started and run to full (designed) speed.
 - Where only the blower motor and not heaters is connected to standby generating set in any particular application, a timer shall be provided, such that the heaters may get energized, only after a period of time, after the blower is run.
 - In the event of signal from high limit safety of heaters the power supply to the blower motor and the heater bank shall automatically and instantly be switched off.
 - The power supply to AHU shall be cut off on receipt of a signal from the Fire Alarm System.

6. REQUIREMENTS OF CONTROL ELEMENTS

The system control elements comprise controlling elements such as thermostats, three way valves etc. as required for individual applications.

6.1 **Thermostats**

Thermostats shall be electric fixed differential type as indicated below, with sensing element located in the return air stream. All thermostats shall be supplied with the standard mounting boxes as recommended by the manufacturer. The profile, mounting arrangement and exact location of the thermostat shall be such as to suit the site.

- Proportional control thermostats shall be provided for actuating the three way modulating valve at each air handling unit. Thermostat shall provide manual switching (heat-off-cool-in heating-cooling system).

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- Snap-acting fixed differential type thermostat for actuating the three-way diverting valve at each fan coil unit
 - Thermostat shall have temperature adjustments WARM-NORMAL-COOL settings and fan switch. Switching off must break fan circuit.
 - Snap-acting fixed differential heating thermostat for electric winter heating and reheat applications for putting on/off power supply to electric heating or reheat coils in air handling units.
 - Safety thermostat shall be provided for electric winter heating and reheat application for cutting off power supply to strip heaters in case air flow across strip heater is not established.
 - Air-stat shall be provided within air handling unit containing electric heating or reheat coils to prevent heaters from energizing unless the air flow is established,

6.2 **Pressure Independent/Balanced/High-Range ability Control Valves – AHU**

Control valves for air handling units shall be 2way, globe type, pressure independent/ balanced/high range ability, type of Brass/Cast Iron/S.G. Iron construction, of PN16 rating with flanged connections. The valve shall have linear stroke of minimum. The valves shall have an operating pressure rating of 150% of the pump operating head. The actuator shall be electronic, motorized, modulating type operating on 24VAC and 0-10Vdc or 4-20mA control signal. The actuator shall have provision for 0-10Vdc position feedback signal and manual operation.

6.3 **Two-Way Diverting Valves for FCUs**

This shall be provided as 2 position diverting valves in chilled/hot water lines at each fan coil unit and shall be actuated by space thermostat. Space conditions shall be maintained by allowing all of chilled/hot water to either pass through the coil or bypass the coil and mix with the chilled/hot water return. The valves shall revert to fully bypass position when fan is shut off. Pressure drop across the valve shall not exceed 0.14 kg/ sq.cm. Valve shall have the facility to replace motor actuator without removing the valve body.

7. **VARIABLE SPEED DRIVE (VSD)**

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7.1 **Air quantity flow control**

The VSD System shall function to supply variable air quantity in the air-conditioned area in response to the load variations including that due to variations in ambient conditions and filter cleanliness conditions, to maintain the inside designed temperature, RH and pressure conditions in conjunction with the humidifier and re-heaters. During the day hours, as per the time interval selected, the VSD System shall regulate the speed of the AHU to maintain the temperature within maximum designed temperature and positive air pressure inside the air-conditioned area. The positive air pressure shall be maintained by keeping a difference of minimum 15% in the –airflow between the supply and exhaust air. However, under any circumstances during the day hours, the air flow rate will not fall below the 60% of the rated CFM of the AHU or 15 air changes, whichever is higher. During the rest of the night hours, the Programmable timer shall give a signal to the VSD to run the AHU at a pre-determined reduced speed so as to provide only 25% of the normal CFM or the minimum CFM achievable closest to 25% but not below 25% of the normal CFM. Due to the clogging of the air filter if the inside temperature conditions are not achieved even at 100% AHU speed then the VSD will close an N.D. contacts to activate an alarm. The VSD shall have the provision to switch over to the manual mode as and when required. The system shall comprise of dedicated Variable Speed Drives (VSDs) designed for HVAC applications to accept 2 feedback signals (from temperature sensor installed in the AC area and programmable timer controller) and have 2 programmable set points (inside temperature conditions, and 60%

of the normal CFM condition as stated above) using HVAC terminology, to regulate the speed of the AHU motors in response to the variations in load and filter cleanliness conditions to maintain temperature and Air flow differential in supply and exhaust conditions. In case, any additional sensor (s) including wiring etc are required to meet the system requirements the cost of that shall be deemed to be included in the cost of the VSD. The VSD control shall have:

- a) RFI (Radio frequency interference) Filters for EMC (Electro magnetic compatibility) compliance.
- b) Voltage Vector Control technology to generate advanced sinusoidal output voltage, 100% true RMS value of the fundamental voltage at rated speed and nominal torque, cause no motor de-ration and keep motor temperature limits within permissible class B limits.
- c) Displays in user's friendly Alpha Numeric Characters for all operating parameters, programming parameters and faults.

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- d) Built in energy meter
 - e) Built in run time counter
 - f) Local control panel (key pad)

The system shall also comprise a suitable programmable timer & PLC with required electronic components, to allow 2 feedback signals (Temperature & Minimum CFM) to be passed on to the VSD during the day hours. In the night hours only one signal from the programmable timer shall go to the VSD to run it at pre-determined reduced speed. The room 1 space air temperature and air flow shall be sensed by a temperature and air flow transmitters, which shall generate suitable DC signal to provide feedback to the VSD, which in turn shall regulate the speed of the AHU fan to maintain the designed conditions as described above.

VSD shall be designed, with built-in PID controller, control panel (keypads & display), IP 20 enclosure for use on standard centrifugal fans. The VSDs should not cause any de-rating of the connected motors and must ensure that class B temperature levels of the connected motors are never exceeded, The display should be in alpha-numeric characters and programming facility should be in user-friendly HVAC terminology. The VSDs should be able to accept up to 2 feedback signal from temperature & air flow transmitter simultaneously and to program 2 set points in it.

The system shall also have following features incorporated

- Heat sink over temperature protection
- Under voltage protection
- Over voltage protection
- Alpha-numeric display facilities
- On indication
- Trip indication
- Selectable display of various parameters line voltage, frequency, speed, power, torque, motor temperature percentage, VSD temperature percentage, KWH.
- Raise and lower speed push button in local mode
- Frequency range variation from 0 to 50 Hz.
- Remote start and stop facility including indications thereof with necessary hardware and terminal blocks, including toggle switch etc. to over ride remote start & stop at the time of maintenance/repairs.
- Off delay facility through timer or PLC with 30 sec to 120 sec. time delay, to be connected to air flow switch.

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Safeguard facility against single phasing.

Tripping of AHU blower motors in response to the fire alarm Signal from AFAS.

Inter locking of Exhaust and AHU blowers such that power supply gets fed to exhaust blower only when the supply air flow is there.

7.2 **Chilled water flow control**

Variable Speed Drive (VSDs) for controlling the chilled water flow rate in the secondary circuit shall be provided. Requirement and Specifications of VSD system shall be as follows:

The VSD System shall function to supply variable chilled water flow in the secondary circuit of air-conditioning system in response to the load variations including that due to variations in ambient conditions to maintain the inside designed temperature conditions. However, under any circumstances, the secondary chilled water pump speed shall not fall below the 30% of the nominal speed or any other suitable minimum speed as per the system requirement. The VSD shall have the provision to switch over to the manual mode as and when required and facility for the manual speed variation from VSD itself. The system shall comprise of dedicated Variable Speed Drives (VSDs) designed for HVAC applications to accept two feedback signals (from differential pressure transmitters installed across the two farthest, most significant AHUs of the zone to select either maximum of the two or average of the two (as selected by the user) feedback signals using HVAC terminology, to regulate the speed of the secondary chilled water pump motors in response to the load variations. In case, any additional sensor (s) including wiring etc. if required to meet the system requirements the' cost of that shall be deemed to be included in the cost of the VSD. The VSD shall have:

The VSD system and controller shall be in such a way that the master controller can work with all other VFDs in case of problem even in master VFD.

- RFI (Radio frequency interference) Filters for EMC (Electromagnetic compatibility) compliance.
 - Voltage Vector Control technology to generate advanced sinusoidal output voltage, 100% true RMS value of the fundamental voltage at rated
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speed and nominal torque, cause no motor de-rating, and keep motor temperature limits within permissible class B limits.

- The VSDs shall have D.C. link reactors/ harmonic filters integrated to minimize power line Harmonics. There shall be reactors in both the positive and negative rails.
- An automatic energy optimization feature shall be provided as standard in the frequency converter. This feature shall reduce output voltage, further to quadratic V/f characteristics, when the motor is lightly loaded and minimize the motor losses.
- The VSD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 160% torque for upto 5seconds (for high inertia and high friction load).
- The VSD shall include Automatic Motor Adaptation (AMA) to optimize motor performance, improve start capabilities and compensate for motor cable variances. The AMA shall be carried out at motor stand still with no need for detaching the pump from motor.
- Unlimited output power circuit switching must be possible without the need for central circuit interlocking and without causing damage to the VSD.
- Auto-derating of maximum drive current shall be incorporated in VSD to allow continued operation at reduced speed in case of VSD over temperature phase loss or mains imbalance without damaging the VSD.
- Displays in user's friendly Alpha Numeric Characters for all operating parameters, programming parameters, faults, Built in energy meter.
- In run time counter.
- Local control panel (key pad)

The system shall also comprise a suitable PLC if required, with electronic components.

VSD shall be designed, with built-in PID controller, control panel (keypads & display), IP 20 enclosure for use on standard centrifugal pumps. The VSDs should not cause any de-rating of the connected motors and must ensure that class B temperature levels of the connected motors are never exceeded. The display should be in alpha-numeric characters and programming facility should be in user-friendly HVAC terminology. The VSDs shall be able to accept up to two feedback signals from differential Pressure transmitters simultaneously and to program set points in it. The system shall have following features incorporated:-

- Heat sink over temperature protection

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- Under voltage protection
 - Over voltage protection
 - Protections against input transients, loss of A.C. line phase, short circuit, ground fault, frequency converter over temperature.
 - Alpha-numeric display facilities
 - On indication
 - Trip indication
 - Selectable display of various parameters like output line voltage, output frequency, speed, power, motor temperature percentage, heat sink temperature, VSD temperature percentage, KWH, hours run, differential pressure.
 - Raise and lower speed push button in local mode.
 - Frequency range variation from 0 to 50 Hz.
 - Remote start and stop facility including indications thereof with necessary hardware and terminal blocks, including toggle switch etc. for over ride of remote start & stop of at the time of maintenance/repairs.
 - Safeguard facility against single phasing.

Where both building management system and air quantity flow control/ chilled water flow control through VFD are provided for same application, control panel for sequencing of VFD shall not be required.

XIX CONTROL PANEL, MOTORS AND SWITCHGEARS

1. GENERAL

- 1.1 The motor and switchgears required for various items shall generally be as per specifications given below. All electric motors shall be suitable for 3 phase, 50 Hz, 415 + 10% - 15% Volts A.C. supply.

2. L.T. ELECTRIC PANEL BOARDS

- 2.1 The main L.T. Panel board shall be extendible type on both sides, having in it all switches, starters & accessories and shall be completely factory prewired. It shall be suitable for voltage systems upto 500 volts, 3 phase, 50 Hz, 4 wire supply capable of functioning

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- satisfactorily in temperatures of 45°C and rupturing capacity not below 31 MVA at 415 Volts.
- 2.2 The boards shall be fabricated from 2.0 mm thick, cold rolled M.S. Sheets. The front opening door panels shall be from 2 mm thick, cold rolled M.S. Sheets. Suitable stiffeners shall be used in fabricating the housing. All steel members shall first be degreased, then descaled using dilute sulphuric acid and a suitable phosphating process then the boards shall be given 2 coats of red oxide primer with powder coated finish in siemens grey colour. The switch board shall be dust proof and vermin proof. The panel shall generally conform to IS 8623 (full conformity not called for). It shall be flush in front and back. The panel shall have front and rear access.
- 2.3 Cable compartment of adequate size shall be provided in the main distribution board for easy termination of all incoming and outgoing cables entering from bottom or top. Adequate support shall be provided in cable compartment to support cables. All incoming and outgoing switch terminals shall be brought out to terminal blocks in cable compartments.
- 2.4 Items such as ammeters, switches etc. shall be located close to the corresponding switchgear and otherwise all items shall be arranged in a neat symmetrical pattern.
- 2.5 The doors of the switch compartments and cable access shall be hinged type and that of busbars shall be fixed type.
- 2.6 The knobs of the hinged doors shall be provided with a locking arrangement to prevent them from falling down when they are unscrewed for opening the doors.
- 2.7 All panel doors shall have synthetic rubber gaskets with good ageing, compression and resistance characteristics.
- 2.8 All the breakers shall be interlocked with door so that the unit cannot be closed unless the unit door is closed. The interlock shall also prevent opening the unit door unless the switch/breaker is in OFF position.
- 2.9 Defeat arrangement shall be provided for deliberate inspection of switch/breaker without having to switch OFF the unit.
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- 2.10 All the units pertaining to a motor shall be incorporated in one cabin i.e switch, starter, CTS ammeter, current operated MPRD-2 single phasing preventor, indicating lamps etc.
 - 2.11 A danger notice plate of 200 mm x 150 mm of mild steel at least 2 mm thick vitreous enamelled white on both sides and with inscriptions in signal red colour on front side shall be provided on the panel board.
 - 2.12 Every starter/contactors etc. shall be controlled by an isolating device of adequate rating as listed later.
 - 2.13 A voltmeter and ammeter shall be provided to indicate incoming voltage and alongwith rotary phase selection switches.
 - 2.14 Ammeters shall be provided for incoming current to all motors of 10 HP (7.5 KW) and higher ratings.
 - 2.14.1 Ammeters for all the motors upto 50 HP (37.5 KW) shall be direct reading type.
 - 2.14.2 Ammeters for motors of 50 HP (37.5 KW) and above shall be operated with a selector switch.
 - 2.15 LED type indicating lamps in approved colours shall be provided for the 3 phases and for status of all controlled devices.
 - 2.16 All the switchgear shall be earthed to the earth bus.
 - 2.17 Earth shall be extended for each compartment to the door by means of a flexible, insulated copper conductor with crimped legs on either side.
 - 2.17.1 Each panel shall be provided with suitable size of earth bus at the rear of the panel and two earth terminals on either side.
 - 2.17.2 Suitable printed PVC ferrules shall be provided for all the conductors for easy identification.
 - 2.18 Etched plastic name plates shall be provided for all the incoming, outgoing switchgears, ammeter, voltmeter etc.
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- 2.19 All the control and auxiliary wiring shall be carried out with PVC insulated copper conductor of proper colour code.
- 2.20 The power wiring from the circuit/air breakers to the starters shall be carried out using colour coded, PVC insulated copper conductors crimped with lugs.
- 2.21 The out going wires of starters shall also be pvc insulated colour coded copper conductor crimped with lugs and terminated on a terminal block of proper rating.

Important Note

All Panel fabrication drawings shall be got approved, before the start of the fabrication work.

3. BUS BARS

- 3.1 The Bus Bar shall be mounted in a separate compartment in the Panel Board.
- 3.2 The Bus Bars and interconnections shall be of aluminium strips unless otherwise specified.
- 3.3 The Bus Bar shall have rectangular cross - section of (1) mm² per Amp. rating for full load current in the 3 phases as well as for neutral and should be extendable, if mounted horizontally.
- 3.4 The Bus Bars shall be insulated with heat shrink sleeves and colour coated. They should be supported on supports made of glass fibre reinforced thermosetting compound at regular intervals sufficient to withstand the force of any short circuit.

4. CIRCUIT BREAKERS

The panel and the bus bars plus outgoing of all devices shall be protected by different types of circuit breakers as described below and conforming to specification as given later on:

S.No	Type	Upto 40 Amp.	63 A	80 to 200 A	Above 200 to	Above 630 A
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					400 A	
1.	Incomi ng	MCB	MCCB	MCCB	MCCB	ACB
2.	Outgoi ng	MCB	MCB	MCCB	MCCB	ACB

4.1 **Air Circuit Breaker (ACB)**

- 4.1.1 The air Circuit Breakers shall be Draw out type conforming to I.S: 13947 (Part 2) 1993.
- 4.1.2 The ACB shall be complete with solid state overload, short circuit and earth fault protection with adjustable settings.
- 4.1.3 Each ACB shall have 4 'NO' and 4 'NC' potential free auxillary contacts, in addition to those required for its internal operating mechanisms.
- 4.1.4 There shall be suitable indicators for OPEN/CLOSE/SERVICE/TEST and Spring charged positions.
- 4.1.5 It shall be possible to close the door in Test position.
- 4.1.6 Castle Key and/or other interlocking devices shall be provided as required.

4.2 **Moulded Case Circuit Breakers (MCCB)**

- 4.2.1 The MCCB shall have TP + NL and be suitable for simultaneous manual opening and closing with rotary operating handle.
- 4.2.2 The ON/OFF/TRIP positions shall be clearly marked and easily visible to an operator and confirm to latest IS: 13947-1993.
- 4.2.3 There shall be fixed/adjustable tripping devices with inverse time characteristics for overload and short circuit protection.
- 4.2.4 Suitable Interlocking mechanism shall be provided, where required.

4.3 **Miniature Circuit Breakers (MCB)**

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4.3.1 The MCB shall have quick make/break contacts with a heat resistant housing, having high Impact strength and confirm to IS 8828-1996.

4.3.2 The contacts shall be of silver nickel alloy.

4.3.3 The MCB shall permit over load for short duration, as required for Inductive loads and the breaking capacity shall not be less than 10 KV at 415 Volt A.C.

4.3.4 It shall be equipped with overload and short circuit protection devices and shall be suitable for DIN mounting.

4.4 **Isolator Switches**

4.4.1 Isolator switches are to be provided for equipment located outdoors or for those located in separate enclosure, other than those Nos. having the Electric Panel.

4.4.2 The Isolator Switch should be of Rotary Load Break type with a weather proof sheet steel enclosure. Its rating shall be same as the outgoing device in the Electric Panel.

5. **CONTACTORS**

All non inductive loads shall be provided with suitable sized magnetic contactors.

5.1 The contactors shall have 3/4 poles plus a minimum 2 'NO' and 2 'NC' contacts. All contacts shall be of solid silver.

5.2 The No volt coil shall generally be suitable for 220 Volts + 10%, - 15% (wide band type) A.C. supply except when specified or required otherwise.

6. **STARTERS**

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6.1 The type of starters to be provided for the motors shall be as follows :

6.1.1 Squirrel Cage motors : upto 7.5 HP (5.6 KW) Direct on Line Type

6.1.2 Squirrel Cage motors : Above 7.5 HP (5.6 KW) Automatic Star Delta Type

6.1.3 Compressor motor : Above 300 HP (225 KW) Automatic Auto Transformers
(where specified)

6.1.4 All starters shall have auxiliary contacts for interlocking different machines, connecting indicating lights, controls, alarms, etc.

6.1.5 All starters shall be provided with separate single phasing preventors.

6.2 **Direct On-Line Starters**

6.2.1 These starters shall have heavy duty air break contactors of suitable rating.

6.2.2 These starters shall be complete with adjustable overload relays on all three phases, single phase preventing device and under voltage release. The starters should be "hand reset" type.

6.2.3 The "No Volt Coil " of these starters shall be 220 Volts + 10% - 15% (wide band type) whenever any controls on safety devices are connected in the starters circuits, otherwise standard 415 volts coils may be used. There shall be ON-OFF push button for each starter unless remote operation of the starter is required.

6.3 **Automatic Star Delta Starters**

6.3.1 These starters shall have heavy duty air break contactors of suitable ratings along with an adjustable timer to automatically switch the motor connections from star to delta connections.

6.3.2 Each starter shall be complete with adjustable overload relays on all three phases and under voltage release. The starters should be "hand reset" type.

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6.3.3 The “No Volt Coil” shall be of 220 Volts + 10% - 15% (wide band type) rating wherever any controls of safety device are connected in the starter circuit, otherwise standing 415 volts coils may be used. There shall be ON-OFF push button for each starter unless remote operation of the starter is required.

6.4 **Automatic Auto -Transformer Starter**

6.4.1 These starters will be oil immersed, each one fixed on a separate panel.

6.4.2 Necessary devices shall be provided for the automatic tap setting of the starter.

6.4.3 The starter should have “No Volt Coil” wide band type circuit of 220 volts to be connected to control circuits.

6.5 The Motor starter shall be in accordance with IS 1882. The starter shall be totally enclosed metal clad, dust and vermin proof construction. The starter shall be of continuous rating.

6.6 Contactors shall have the number of poles as required for appropriate duty. The making capacity of the starters shall be as per AC 23 of ISS.

7. **PANEL ACCESSORIES**

7.1 All Voltmeters and Ammeters as specified shall be square of 96 mm x 96 mm, flush mounting type.

7.2 The Indicating Lamps shall be of LED type with Low Watt Power. The Lamps shall have translucent covers of following colours.

7.2.1 Red/Yellow/Blue for phase light.

2. Green/Amber for ON/OFF indication.

7.2.3 Concealed door lock.

8. **SUBSIDIARY PANELS (WITH SINGLE SWITCH)**

8.1 Subsidiary panels shall be provided for equipment located away from the plant room, such as air handling units, blower etc.

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- 8.2 The construction of these panel should be similar to the main panel and shall have all related accessories, except when specified.
- 8.3 The sub panel shall be wall hung type and as compact as possible.
- 8.4 Panel fabrication drawings shall be got approved before fabrication.

9. **SQUIRREL CAGE MOTORS**

- 9.1 The squirrel cage motors shall be either screen protected or totally enclosed fan cooled, depending on the application and as stated in "schedule of equipment". All motors shall conform to IS 325/1978, IS : 1231 for foot mounted motors and IS:2223 for flange mounted motors.
- 9.2 The stator windings shall be with class 'B' insulation.
- 9.3 Motors shall be provided with ball/ roller bearings. Bearings shall have ample capacity to deal with any axial thrust. Suitable grease nipple shall be provided for regreasing the bearings.
- 9.4 Motors shall be provided with a cable box for terminating the PVC insulated, PVC sheathed armoured aluminium cables.

10. **INSTALLATION OF MOTOR**

- 10.1 Installation of the motor shall be in accordance with IS-900.
- 10.2 The motor along with its driven machine or equipment shall be provided with vibration isolation arrangement motors shall generally be provided with slide rails fixed to the base units nuts and bolts to facilitate belt installation and subsequent belt tension.
- 10.3 Motors shall be wired as per the detailed specifications and drawings all the motor frame shall be earthed with 2 Nos. of earthing conductors.
- 10.4 Motors shall be tested at works in accordance with the relevant Indian standard specifications and test certificates shall be furnished in triplicate.

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Note : Rubber mats of 1100 volts capacity shall be laid in front of panel as per site requirement and no extra shall be paid.

11. **PAINTING**

All sheet steel work shall undergo a multi tank process of degreasing, pickling in acid, cold rinsing, phosphating, passivating and then sprayed with a high corrosion resistant primer. The primer shall be baked in oven. The finishing treatment shall be by application of powder coated paint of approved shade and stoved.

XX DUCT WORK AND OUTLET

1. **SCOPE :**

The scope of this section comprises supply fabrication, installation and testing if all sheet metal / aluminum ducts.

2. **GOVERNING STANDARDS :**

Unless otherwise specifications here, the construction ,testing and performance of the ducting system shall conform to the SMACNA-1995 standards ("HVAC Duct Construction Standard – Metal and Flexible – Second Edition 1995" – SMACNA)

3. **RAW MATERIAL :**

3.1 DUCTING :

3.1.1 All ducting shall be fabricated of LFQ (Lock Forming Quality) grade prime G.I. raw material furnished with accompanying Mill Test Certification.

3.1.2 Galvanizing shall be of 120 gms/sqm (total coating on both sides)

3.1.3 In addition, if deemed necessary , samples of raw material, selected at random by owner's site representative shall be subject to approval and tested for thickness and zinc coating at contractor's expense

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3.1.4 The G.I. raw material should be used in coil-form (instead of sheets) so as to limit the longitudinal joints at the edges only irrespective of cross-section dimensions.

3.2 **DUCT CONNECTORS AND ACCESSORIES :**

3.2.1 All transverse duct connectors (flanges/cleats) and accessories/related hardware are such as support system shall be zinc-coated(galvanized)

4. **FABRICATION STANDARDS :**

All ductwork including straight sections, tapers, elbows, branches, showpieces, colors, terminal boxes and other transformation pieces must factory-fabricated or by equivalent technology. Equivalency will require fabrication by utilizing the following machines and processes to processes to provide the requisite quality of ducts and speed of supply.

4.1 Coil lines to ensure location of longitudinal seams at comers / folded edges only to obtain the required duct rigidity and low leakage characteristics. No longitudinal seams permitted along with any face side of the duct.

4.2 All ducts, transformation pieces and fittings to be made on CNC profile cutters for required accuracy of dimensions.

4.3 All edges to be machine treated using lock formers, flangers and roller for turning up edges.

4.4 Sealant dispensing equipment for applying built in sealant in Pittsburgh lock where sealing of longitudinal joints are specified.

5. **SELECTION OF G.I. GAUGE AND TRANSVERSE CONNECTOR :**

5.1 Duct construction shall be in compliance with 1" (250 ga) w.g. static norms as per SMACNA.

5.2 All transverse connectors shall be the 4-bolt slip-on flange system or 4 bolt system with TDC flange or equivalent imported makes of similar 4-bolt system with built in sealant.

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5.3 The specific class of transverse connectors and duct gauges for a given duct dimensions will be as per table 1 below for the 1" (250 pa) pressure class.

5.4 Non-toxic, AC –applications grade P.E. or P.V.C Gasketing is required between all running flange joints. Gasket sizes should confirm to flange manufacturer's specifications.

Table 1:

For selection of flange class and duct gauges at 1200 mm spacing						
Duct Dimension	<i>Duct pressure in inches</i>					
	1"(250)*5	2"(500)	3"(750)	4"(1000)	6"(1500)*4	10"(2500)
<i>In mm</i>	<u>Reinforcement Class – Duct Gauge</u>					
Upto 250	*3E-26	E-26	E-26	E-26	E-26	E-24
251 – 300	E-26	E-26	E-26	E-26	E-24	E-24
301 – 350	E-26	E-26	E-26	E-26	E-24	E-22
351 – 400	E-26	E-26	E-26	E-26	E-24	E-22
401 - 450	E-26	E-26	E-26	E-26	E-24	H-20
451 – 500	E-26	E-26	E-24	E-24	E-24	H-20
501 – 550	E-26	E-26	E-24	E-24	H-24	H-20
551 – 600	E-26	E-26	E-24	E-24	H-22	H-20
601 – 650	E-26	E-26	E-24	E-24	H-22	H-20
651 – 700*2	E-26	E-26	E-24	H-24	H-22	H-18
701 – 750	E-26	E-26	E-24	H-24	H-22	J-18
751- 900	E-26	E-24	E-24	H-22	H-20	J-18
901 – 1000	E-26	H-24	H-22	H-20	J-18	J-16
1001 – 1200	E-24	H-22	H-20	J-18	J-18	

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1201 – 1300	*3H-24	H-20	J-18	J-18	J-16	
1301 – 1500	H-24	H-18	J-18	J-16		
1501 – 1800	H-22	J-18	J-16			
1801 - 2100	*3J-20	*3J-20				
2101 – 2400	J-18	J-18				
2401 - 2700	J-18					

Notes:

- *1- SMACNA- Sheet Metal and Air Conditioning Contractor's Association Inc- "HVAC Duct Construction Standards- Metal and Flexible" – 1995 U.S.A
- *2- **Reading Guide-** for duct size between , say 651mm and 700mm, when the pressure class is 1" w.g. static we require a "E" class flange and duct gauge of 26 . For the same size range but with static pressure at 4" w.g. a 'h' Class flange with duct gauge of 24 should be used
- *3- The flange classes available are designated e, h and j .For E and H class of flange use gasket size 10 mm wide and 45 mm thick. For J Class use 15 mm wide and 6 mm thick gasket.
- *4- For pressure Class 6" w.g. static and above contact manufacture to confirm the gasket type & size.
- *5- (Not Applicable for current Specifications) For non-critical comfort cooling applications (1" w.g. pressure class) optional "C & S" or "C & SS" cleat joints can be used.

 Upto 450 mm duct size use "C & S" Cleats
 415 to 750 mm duct size use "C & SS" Cleats
 Over 750 mm duct size use flanges as specified or as per manufacturer's standard.
 All higher class flang can always be substituted for a lower class(e.g. class "J" for class "H". class "H" for Class "E")
- *6- The TDC flange classes remain same in all sizes, use gasket size 12 mm wide and 4 mm thick in all sizes.

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6. DUCT CONSTRUCTION :

- 6.1 The fabricated duct dimensions should be as per approved drawings and all connecting sections are dimensionally matched to avoid any gaps.
- 6.2 Dimensional Tolerance :All fabricated dimensions will be within ± 1.0 mm of specified dimensions . To obtain required perpendicularity. Permissible diagonal tolerance shall be ± 1.0 mm per meter.
- 6.3 Each and every duct pieces should be identified by colour coded sticker which shows specific part numbers, job name, drawing number, duct size and gauge.
- 6.4 Duct shall be straight and smooth and the inside. Longitudinal seams shall be airtight and at comers only which shall be either Pittsburgh or Snap Button Punch as per SMACNA practice , to ensure air tightness.
- 6.5 Change in dimensions and shape of ducts shall be gradual (between 1:4 and 1:7). Turning vanes or air splitter shall be installed in all bends and duct colors designed to permit the air to make the turn without appreciable turbulence.
- 6.6 Plenums shall be shop/factory fabricated panel type and assembled at sight.
- 6.7 The deflection of transverse joints should be within specified limit for rectangular duct deflection as given in SMACNA. Page No, 7.6
- 6.8 Reinforcement of duct shall be achieved by either cross breaking a straight beading depending on length of ducts.

As per SMACNA Page No.1.74, fig 1-8

“Duct Size 19” (483 mm) wide and larger which have more than 10sqft of unbraced panel shall be beaded or cross broken unless duct will have insulation covering or acoustical liner. This requirement is applicable to 20 g(1.00 mm) or less and 3” w.g(750 pa) pressure or less. Duct for 4” w.g. (1000 pa) or more do not require beads or cross-breaks”.

7. SUPPORT SYSTEM :

- 7.1 A completely galvanized system consisting of fully threaded rods, slotted angles or double L bottom brackets (made out of 3.0 mm M.S. sheet)

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nuts, washer and anchor bolts confirming to SMACNA standards should be used.

Sr. No.	Maximum Duct Size(mm)	Hanger Rod Diameter	Interval (mm)
1.	Up to 700	6mm	2400
2.	701 – 1200	8 mm	2400
3.	1201 – 2000	10 mm	2400
4.	Above 2000	12 mm	2400

7.2 As an alternative, slotted galvanized brackets attached to the top two bolts of the system may also be used as appropriate for the site condition.

7.3 To provide the required thermal brake effect, Neoprene or equivalent material of suitable thickness shall be used between duct support and duct profiles in all supply air duct does not enclosed by return air plenums.

8. **INSTALLATION :**

8.1 **TOOLS AND TACKLES FOR SITE WORK**

The duct installation shall confirm to SMACNA norms. For duct assembly and installation the use of suitable tools and tackles should be used to give the required duct quality and speed of installation including (but not restricted to)

- a) Electric Pittsburgh seamer - used for closing Pittsburgh joints
- b) Electric Slitting Shear - to make cut – outs
- c) Drilling machine and drill - for drilling holes sheet metal work
- d) bitts
- d) Hammer drill machine - for drilling holes in building structure for with drill bits anchor
- e) Hoisting system - for lifting the duct assembly up to mounting heights

8.2 **INSTALLATION PRACTICE**

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All ducts shall be installed as per tender drawings and in strict accordance with approved shop drawing to be prepared by the Contractor

- 8.2.1 The contractor shall provide any neatly erect sheet metal work as may be required to carry out the intent of these specifications and drawings. The work shall meet with the approval of owner's site representative in all its parts and details.
- 8.2.2 All necessary allowances and provisions shall be made by the contractor for beams, pipes or other obstructions in the building whether or not the same are shown on the drawings. Where there is interference /fouling with other beams, structural work, plumbing and conduits, the ducts shall be suitably modified as per actual site conditions.
- 8.2.3 Ducting over false ceiling shall be supported from the slab above , or from beam, In no case shall any duct be supported from false ceiling hangers or be permitted to rest on false ceiling . All metal work in dead or furred down spaces shall be erected in time to occasion no delay to other contractor's work in the building.
- 8.2.4 Where ducts pass through brick or masonry openings, it shall be provided with 25 mm thick appropriate insulation around the duct and totally covered with fire barrier mortar for complete sealing.
- 8.2.5 All ducts shall be totally free from vibration under all conditions of operation. Whenever duct work is connected to fans, air handling units or blowers coil unit that may cause vibration in the ducts, ducts shall be provided with a flexible connection, located at the unit discharge.

9. **DOCUMENTATION & MEASUREMENT FOR DUCTING :**

- 9.1 For each drawing, all supply of duct work must be accomplished by computer generated detailed bill of material indicating all relevant duct sizes, dimensions and quantities .In addition, summary sheets are also to be provided showing duct area by gauge and duct size range as applicable.
- 9.2 Measurement sheet covering each fabricated duct piece showing dimensions and external surface area along with summary of external surface area of duct gauge-wise.

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- 9.3 All duct pieces to have a part number, which should correspond to the serial number assigned to it in the measurement sheet. The above system will ensure speedy and proper site measurement, verification and approvals.

10. **TESTING :**

After duct installation, a part of duct section (approximately 5% of total ductwork) may be selected at random and tested for leakage. The procedure for leak testing should be followed as per SMACNA – “ HVAC Air Duct Leakage Test Manual” (First Edition)

11. **DAMPERS :**

- 11.1 At the junction of each branch duct with main duct and split of main duct, volume control dampers must be provided. Dampers shall be two gauges heavier than the gauge of the large duct and shall be rigid in construction.

- 11.2 The volume control dampers shall be of an approved type, lever operated and complete with locking devices which will permit the dampers to be adjusted and locked in any positions. Dampers shall be provided with suitable links levers and quadrants as required for their proper operation.

- 11.3 The dampers shall be of splitter, butterfly or louver type. The damper blade shall not be less than 1.25 mm (18) gauge, reinforced with 25 mm angles 3 mm thick along any unsupported side longer than 250 mm. Angles shall not interfere with the operation of dampers, nor cause any turbulence.

- 11.4 Automatic and manual volume opposed blade dampers shall be complete with frames and bronze bearings. Dampers and frames shall be constructed of 1.6 mm steel sheets and blades shall not be over 225 mm wide. The dampers for fresh air inlet shall additionally be provided with fly mesh screen, on the outside, of 0.8 mm thickness with fine mesh.

- 11.5 Wherever required for system balancing, a volume balancing opposed blade damper with quadrant and thumb screw lock shall be provided.

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11.6 After completion of the duct work, dampers are to be adjusted and set to deliver air flow as specified on the drawings.

12. FIRE & SMOKE DAMPERS:

- i) Fire dampers shall be provided in all supply air ducts and return air ducts (where provided), return air passage in the air – handling unit room and at all floor crossings. Access door will be provided in the duct before each set of fire dampers.
- ii) Fire dampers shall be multi blade louvers type. The blade should remain in the air stream in open position and shall allow maximum free area to reduce pressure drop and noise in the air passage. The blades and frame shall be constructed with minimum 1.6mm thick galvanized sheet and shall be factory fitted in a sleeve made out of 1.6mm galvanized sheet of minimum 400mm long. It shall be complete with locking device, motorized actuator and control panel.
- iii) Fire dampers shall be motorized smoke and fire dampers type. It shall be supplied with spring loaded UL stamped fusible link to close fire damper in the event of rise in duct temperature. Fire damper shall also close on receipt of fire alarm signal to cut off air supply instantaneously. An electric limit switch shall also be operated by the closing of fire damper, which in turn shall switch off power supply to AHU blower motor as well as strip heaters.
- iv) Fire dampers shall be CBRI tested and certified for 90 minutes rating against collapse and flame penetration as per UL 555 – 195. (Under writers laboratories).
- v) Fire dampers shall be compatible with the fire detection system of building and shall be capable of operating automatically through an electric motor on receiving signal from fire alarm panel.
- vi) Necessary wiring from fire alarm panel up to AHU electric panel shall be provided by the department and further from AHU electric panel to fire damper shall be provided by air conditioning contractor.

13. ACCESS PANEL :

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13.1 A hinged and gasketed access panel measuring at least 450 mm x 450 mm shall be provided on duct work before each reheat coil and at each control device that may be located inside the duct work.

14. **MISCELLANEOUS :**

14.1 All duct work joints are to be true right angle and with all sharp edges removed.

14.2 Sponge rubber gaskets also to be provided behind the flange of all grilles.

14.3 Each shoot from the duct, leading to a grille, shall be provided with an air deflector to divert the air into the grille through the shoot.

14.4 Diverting vanes must be provided at the bends exceeding 600 mm and at branches connected into the main duct without a neck.

14.5 Proper hangers and supports should be provided to hold the duct rigidly, to keep them straight and to avoid vibrations. Additional supports are to be provided where required for rigidity or as directed by owner/owner engineer consultant/architect.

14.6 The ducts should be routed directly with a minimum of directional change.

14.7 The duct work shall be provided with additional supports/hangers, wherever required or as directed by the owner/owner engineer consultant/architect, at no extra cost.

14.8 All angle iron flanges to be welded electrically and holes to be drilled.

14.9 All the angle iron flanges to be connected to the GSS ducts by rivets at 100 mm centres.

14.10 All the flanged joints, to have a sponge rubber packing stuck to the flanges with suitable adhesive.

14.11 The G.S.S. Ducts should be lapped 6 mm across the flanges.

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14.12 The ducts should be supported by approved type supports at a distance not exceeding 2.4 metres.

15. **STANDARD GRILLES :**

15.1 The supply and return air grilles shall be fabricated from extruded Aluminium sections. The supply air grilles shall have single/double louvers. The front horizontal louvers shall be of extruded section, fixed/adjustable type. The rear vertical louvers where required shall of Aluminium extruded sections and adjustable type. The return air grille shall be have single horizontal extruded section fixed louvers. The grilles may or may not be with an outer frame.

15.2 The damper blades shall also be of extruded Aluminium sections. The grill flange shall be fabricated out of Aluminium extruded section. Grilles longer than 450 mm shall have intermediate supports for the horizontal louvers.

16. **DIFFUSERS/SLOT DIFFUSERS :**

16.1 The ceiling type square diffusers shall be of Aluminium extruded sections with flush or step down face, as specified with fixed pattern and neck.

16.2 All supply diffusers shall be provided with extruded Aluminium dampers, with arrangement for adjustment from the bottom.

16.3 The slot diffusers shall be of Aluminium extruded sections with diffusion plate and sliding damper.

17. **LINEAR DIFFUSERS/GRILLES :**

17.1 The linear diffusers/grilles shall be fabricated from Aluminium extruded sections.

17.2 The diffusion blades shall be extruded, flush mounted type with single or double direction air flow.

17.3 The frame shall be of Aluminium extruded section and shall hold the louvers tightly in fixed position.

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17.4 The dampers as described under grilles shall be provided wherever specified.

18. VAV

18.1 VAV station, the air measuring control station meeting the following specifications shall be furnished and installed where shown on plans and/or as described in schedules.

18.2 The VAQ stations shall incorporate an accurate air measuring station and a motorized leak control damper in one assembly with an air quality sensor, and an application specific control as detailed in schedule.

18.3 An air measuring station shall consist of 75 mm deep honeycomb patterned alluminium airflow straightener, rapid average pressure pickups probes mounted on station, and differential pressure transducer within a heavy gauge extruded aluminium c shaped frame.

18.4 These stations shall be dynamically calibrated in a manufacturer test facility with non linear calibration routine to provide accurate airflow measurement.

18.5 A motorized low leak control damper shall be made of heavy gauge extruded alluminium airfoil blades in c shaped frame with nylon exposed gear drive linkage; EPDM blade seals; and modulating electric actuator.

18.6 VAQ Station shall be suitable for pressures to 101.6 mm H₂O, velocities to 10.2 m/sec and temperatures to 82 deg. C. Testing and ratings shall be in accordance with AMCA standard 500-D and shall accompany calibration certification chart.

18.7 An air quality sensor shall have multi-sensors which includes temperature.

18.8 An application specific controller shall includes power supply suitable for all sensors and control combined with an application specific controller described under and detailed in schedule.

18.9 Supply Air, An air quality sensor and controller shall be installed at 3-6 feet height in space for effective monitoring of indoor air quality. The

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controller shall be able to control a VAQ station installed in supply air to provide in room climate control with a remote set-point adjustment. It shall communicates on EIA-485.

19. **PAINTING :**

19.1 All grilles, and diffusers shall be powder coated, before installation, in approved colour.

19.2 All ducts immediately behind the grilles/diffusers etc. are to be given two coats of black paint in matt finish.

20. **TESTING :**

20.1 After completion, all duct system shall be tested for air leakage.

20.2 The entire air distribution system shall be balanced to supply the air quantity as required in various areas and the final tabulation of air quantity through each outlet shall be submitted to the owner/owner engineer consultant/architect for approval.

20.3 All sample required to approved by the Architect/client.

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XXI PIPE WORK

1. GENERAL

All piping work shall conform to quality standards and shall be carried out as per specifications and details given hereunder :-

Pipe sizes shown in tender documents are purely for contractor's guidance. The contractor shall be responsible for selection of sizes as per detailed engineering to be done by him. Plumbing design to be done by the Air-conditioning contractor shall conform to the following:

- i) Water velocity in pipes shall not exceed 2.5 m/sec.
- ii) Butterfly/Ball valves shall be provided at
 - a. Suction and delivery sides of pumps
 - b. Inlet and outlet of each condenser, chiller, cooling tower.
 - c. All drain connections from equipments
 - d. Inlet & outlet of every heat exchanger coil, namely for AHU's, FCU's, convector etc.
- iii) Non return valve shall be provided at the delivery of each pump. This shall be of swing type.
- iv) Balancing valve shall be provided at the outlet side of chiller, condenser, heating and cooling coils to regulate the maximum flow rate up to value preset as desired.
- v) Balancing valves shall be provided, where specified, for AHU's to regulate the maximum flow rate upto a value preset as desired. A mercury manometer shall be supplied with every 10 nos. or part thereof of balancing valves, whether or not specifically indicated in the tender specifications.
- vi) Air valves shall be provided at all high points in the piping system for venting with a size of 25 mm for pipes up to 100 mm and 40 mm for larger pipes.

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- vii) Plumbing drawings showing the sizes of valves, layout and other details shall be prepared and shall be got approved from the Engineer-in-Charge before the execution of the plumbing work.

2. **PIPES**

The pipes size 150 mm and below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS : 3589 from minimum 6.35 mm thick M.S. sheet for pipes upto 350 mm dia and for minimum 7 mm thick M.S. sheet for pipes for 400 mm dia and above.

3. **FITTINGS**

- 3.1 The dimensions of the fittings shall conform to I.S. 1239/69 Part-II unless otherwise indicated, in the specifications.
- 3.2 All bends in sizes upto and including 150 mm dia, shall be ready, made of heavy duty, wrought steel of appropriate class.
- 3.3 All bends in sizes 200 mm and larger dia, shall be fabricated from pipes of the same dia and thickness, with a minimum of 4 sections, and having a minimum centre line radius of 1.5 diameter of pipes.
- 3.4 All fittings such as branches reducers etc. In all sizes shall be fabricated from pipes of the same Dia. And thickness, and its length should be at least twice the dia of the pipe.
- 3.5 The branches may be welded straight to the main line, without making a separate fitting, where specified on drawings or required by engineer-in-charge.
- 3.6 Blank ends are to be formed with flanged joints and 6 mm thick blank between flange pair for 150 mm and over, in case where, a future extension is to be made otherwise blank end discs of 6 mm thickness are to be welded on, with additional cross stiffeners from 50 mm x 50 mm M.S. Heavy angles, for sizes upto 350 mm. All ends larger than 400 mm dia shall have dished ends.

4. **FLANGES**

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4.1 All flanges shall be of mild steel as per I.S. 6392/71 and shall be steel slip-on- type, welded to the pipes, flange thickness shall be to suit class-II pressures.

4.2 Flanges may be tack welded into position, but all final welding shall be done with joints dismantled. 3 mm thick gaskets shall be used with all flanged joints. The gaskets shall be fibre reinforced rubber as approved by the Engineer-In-Charge. Special adhesive compound shall be used between flanges of steam, air and gas lines.

4.3 Flanges shall be used as follows :-

4.3.1 Counter flanges for equipment having flanged connections.

4.3.2 Flanged pairs shall be used on all such equipment, which may require to be isolated or removed for service e.g. Pumps, refrigeration machines air handling units etc.

4.3.3 All threaded valves shall be provided with nipples and flanged pairs on both sides to permit flange connections, for removal of valves from main lines for repair/ replacement.

5. **VALVES**

5.1 **BUTTERFLY VALVES**

5.1.1 The butterfly valve shall consist of cast iron body preferably in two piece construction.

5.1.2 The disc shall consist of disc pivot and driving stem shall be in one piece centrally located.

5.1.3 The valve seat shall be synthetic material suitable for water duty. It shall be inline with the whole body.

5.1.4 The disc should move in slide bearings on both ends with 'o' ring to prevent leakage.

5.1.5 The handle should have arrangement for locking in any set position.

5.1.6 The valve should be suitable for 12 Kg/sq.cm working pressure.

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- 5.2 All gate valves and check valves upto & including 65 mm Dia shall be of gunmetal screwed type, conforming to class 2 of I.S. 778. And shall be with I.S.I. Marking/BS 5155,API 694,ISO etc, and certification.
- 5.3 All gate valves and check valves of 80 mm dia and above shall be of cast iron flanged/wafer type conforming to class 2 of I.S.780/69 (For sizes upto 350 mm). And of I.S. 2906/69 (For sizes 350 mm and above). All such valves shall be with I.S.I. Marking/BS 5155, API 694,ISO etc, and certification.
- 5.4 All guage cocks shall be of gunmetal plug type, complete with siphon (brass chrome plated).
- 5.5 All drain valves shall be of gunmetal with a hose union connection of one hand.
- 5.6 All valves on the supply of fan coil units shall be of gunmetal ball type with integral water strainers, having (BSP) fpt inlet and flare type MPT outlet connection.
- 5.7 All valves on the return line of fan coil units shall be as in 5.6 but without integral water strainer.

6. **BALANCING VALVES**

- 6.1 The balancing valves upto 80 mm dia shall be of gunmetal screwed type confirming to B.S. 5154 or equivalent specifications.
- 6.2 The valve shall be cast gunmetal ASTM B-62 and complete with non rising spindle. PTFE disc seal cast metal hand wheel.
- 6.3 The port opening shall permit precise regulation of flow rate, by accurately measuring the pressure drop across the port.
- 6.4 The valve shall be complete with two ports for connections to a mercury manometer, to measure the pressure drop, as well as a drain port.
- 6.5 The spindle shall have a shielded screw to set the flow at the desired level.
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6.6 This valve shall be used wherever specified.

7. **STRAINERS**

7.1 The strainers shall either be pot type or 'Y' type with cast iron or fabricated steel body, tested upto pressure applicable for the valves as shown on the drawings.

7.2 The strainers shall have a perforated bronze sheet screen with 3 mm perforation and with a permanent magnet, to catch iron fillings.

7.3 Pot strainers shall be provided with flanged connections and 'Y' strainers shall be provided with flanged ends.

7.4 The strainers shall be designed to facilitate easy removal of filter screen for cleaning, without disconnection of pipe line.

8. **JOINTING**

8.1 All pipe lines shall be welded type.

8.2 Square cut plain ends will be welded for pipes upto and including 100 mm dia.

8.3 All pipes 125 mm dia or larger will be bevelled by 35 Deg before welding.

9. **MISCELLANEOUS**

9.1 Provide all pipe work as required to make the apparatus connected complete and ready for regular and safe operation. Unless otherwise noted, connect all apparatus and equipment in accordance with manufacturer's standard details, as approved by Engineer-In-Charge.

9.2 Unless otherwise specified, pitch the lines of piping as follows :-

All condensation drainage, including air handling unit and fan coil unit shall be pitched in the direction of flow to ensure adequate drainage, with an adequate trap seal to prevent leakage of air due to

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static pressure developed by airconditioning units. Pitch, 20 mm per metre wherever possible, but not less than 10 mm per metre.

Drains from other equipment shall be pitched similarly without trap seal.

9.3 Provide valves and capped connections for all low points in piping system, where necessary or required for draining systems. Provide isolating valves & Drain valves in all risers to permit repairs without interfering with the rest of the system.

9.4 During construction, temporarily close, open ends of pipes with sheet metal caps, where necessary, or required to prevent debris from entering the piping system.

9.5 Support piping independently of all equipment so that the equipment is not stressed by the piping weight or expansion.

9.6 To facilitate the maintenance, repair and replacement:

9.6.1 Provide shut-off valves where indicated and for individual equipment, units at inlet and outlet, to permit unit removal for repairs, without interfering with the remainder of the system. Additional shut-off valves shall be provided as required to enable all systems to be fully sectionalized. By-pass and stop valves shall be provided for all automatic control valves as specified.

9.6.2 Arrange piping for maximum accessibility for maintenance and repair, locate valves for easy access and operation. No valves shall be installed with handles pointing down, unless unavoidable.

9.6.3 Cut the pipes accurately according to measurements, established at building site & work into place without springing or forging.

9.6.4 Pipe supports shall be adjustable for height and prime coated with rust preventive paint & finish coated with grey paint, both as approved by engineer-in-charge. The spacing of pipe supports shall not be more than that specified below :-

Nominal pipe size mm		Spacing (metres)	
15	...	...	1.25
20 & 25	...	...	2.00

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32,30,50 & 65	...	...		2.50
80,100 & 125	...	...	2.50	
150 & Above	...	...	3.00	

9.6.5 Extra supports shall be provided at the bends and at heavy fittings like valves to avoid undue stresses on the pipes. Pipe hangers shall be fixed on walls and ceiling by means of metallic approved dash fasteners.

9.6.6 Insulated piping shall be in such a manner as not to put undue pressure on the insulation, such as providing teak wood block between pipe and support.

9.6.7 Where pipes are to be buried under ground, they should be coated with one coat of bituminous paint. The top of the pipes shall not be less than 75 cms. From the ground level. Where this is not practical permission of engineer-in-charge shall be obtained for burying the pipes at lesser depth. The pipes shall be surrounded on all sides by sand cushions of not less than 15 cms. After the pipes have been laid and top sand cushions provided, the trench shall be refilled with the excavated soil, excess soil shall be removed from the site of work by the contractor.

10. **HANGERS & SUPPORTS**

10.1 Hangers and supports shall be provided and installed for all piping and tubing wherever indicated, required or otherwise specified. Wherever necessary, additional hangers and supports shall be provided to prevent vibration or excessive deflection of piping and tubing.

10.2 All hangers and supports shall be made of steel or other durable and non-combustible materials, given two coat of primer red oxide and then painted with Aluminium colour paint. Wood wire or perforated strap iron shall not be used as permanent hangers or supports.

10.3 Hangers shall be supported from structural steel, concrete inserts & pipe racks, as specifically approved.

10.4 No hangers shall be secured to underside of light weight roof decking and light weight floor glass.

10.5 Mechanical equipment shall be suspended midway between steel joists and panel points.

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10.6 Drilling or punching of holes in steel joist members will not be permitted.

11. **SLEEVES**

11.1 Where pipes pass through floors, walls, etc provide Galvanized steel pipe sleeves 50 mm larger than outside diameter of pipe. Where pipes are insulated, sleeves shall be large enough to ample clearance for insulation.

11.2 Where pipes pass through outside walls or foundations, the space between pipe and sleeve shall be caulked with lead wool and oakum.

11.3 The centre of pipes shall be in the centre of sleeves, and sleeves shall be flush with the finished surface.

12. **EXPANSION OR CONTRACTION**

12.1 The contractor shall provide for expansion and contraction of all piping installed by the use of swing connections and expansion loops.

13. **ARRANGEMENT AND ALIGNMENT OF PIPING**

13.1 All piping shall be arranged and aligned in accordance with the drawings as specified. Where special conditions are encountered in the field, the arrangement and alignment of piping shall be as directed by the engineer-in-charge.

3.2 The piping shall be installed in a uniform manner, parallel to or perpendicular to walls or ceilings, and all changes in directions shall be made with fittings. The horizontal piping shall be run at right angles and shall not run diagonally across rooms or other piping. Wherever possible all piping shall be arranged to provide maximum head room.

13.3 All piping shall be installed as directly as possible between connecting points in so far as the work of other trades permits. Where interference occurs with another trade whose work is more difficult to route, this contractor shall reroute his pipes as required to avoid interference, at the discretion of the engineer-in-charge.

13.4 All piping shall be carefully installed to provide for proper alignment, slope and expansion.

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- 13.5 The stresses in pipe lines shall be guided and pipes shall be supported in such a manner that pipe lines shall not creep, sag or buckle.
- 13.6 Anchors and supports shall be provided wherever necessary to prevent any misalignment of piping.
- 13.7 Small tubing gauges, controls or other equipment installed on any apparatus, shall not be coiled nor Excessive in length, but shall be installed neatly, carefully bent at all changes in direction, secured in place and properly fastened to equipment at intervals to prevent sagging.
- 13.8 The piping shall be grouped wherever practical and shall be installed uniformly in straight parallel lines in either vertical or horizontal positions.

14. **TESTING**

- 14.1 In general, tests shall be applied to piping before connection of equipment and appliances. In no case shall the piping, equipment or appliances be subjected to pressures exceeding their test ratings.
 - 14.2 The tests shall be completed and approved before any insulation is applied. Testing of segments of pipe work will be permitted, provided all open ends are first closed, by blank offs or flanges.
 - 14.3 After tests have been completed the system shall be drained and flushed 3 to 4 times and cleaned of all dust and foreign matter. All strainers, valves and fittings shall be cleaned of all dirt, fillings and debris.
 - 14.4 All piping shall be tested to hydraulic test pressure of at least one and half times the maximum operating pressure but not less than 10 kg/sq.cm for a period of not less than 12 hours. All leaks and defects in the joints revealed during the testing shall be rectified to the satisfaction of the engineer-in-charge, without any extra cost.
 - 14.5 All the piping systems shall be tested in the presence of the engineer-in-charge or their authorized representative. Advance notice of test dates shall be given and all equipments, labour, materials required for inspection, and repairs during the test shall be provided by the
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- contractor. A test shall be repeated till the entire systems are found to be satisfactory to the above authority. The tests shall be carried out for a part of work if required by Engineer-In-Charge in order to avoid hindrance in the work of the insulation contractor.
- 14.6 All steam and condensate pipes shall be tested and proven tight under hydrostatic pressure of 20 kg/sq.cm, unless otherwise stated, for a minimum period of 4 hours without drop in pressure.
- 14.7 Miscellaneous piping, tests with air at 10.5 kg/sq.cm for a minimum of 24 hours without drop in pressure.
- 14.8 The contractor shall make sure that proper noseless circulation is achieved through all piping systems. If due to poor bond, proper circulation is not achieved, the contractor shall bear all expenses for carrying out the rectification work including finishing of floors, walls and ceiling damaged in the process of rectifications.
- 14.9 The contractor shall provide all labours and materials to make provision for removing water and throwing it at the proper place, during the testing or/and after the testing to avoid damages to employer or other contractors' properties. Any damages caused by the contractor to the employer or other contractors' properties, shall be borne by the contractor.

15. **FLEXIBLE CONNECTIONS**

- i) The Flexible connections shall be flanged type expansion joint. Flanges shall be non-compressible and mechanically strong type and the Neoprene rubber shall be provided in between the flange ends.
- ii) The connections shall work for a temperature range of minus 10°C to 70°C.
- iii) The length and working pressure of bellows shall be as follows:

Nominal Bore (mm)	Length (mm)	Test Pressure (Bars)
Upto 200	150	16
Above 200	200	16

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- i) Connections shall be provided with control roads to control the excessive elongation or compression of piping systems.
 - ii) It shall have torsional movement upto 3° without damage.
 - iii) Bellows shall be single arch.

16. **COPPER PIPING**

16.1 Heavy gauge soft copper tubing, type M shall be used to make connections to equipment, wherever required or specified by engineer-in-charge.

16.2 Flare fittings e.g. Flare nuts, tees, elbows, reducers etc. shall all be of brass.

17. **REFRIGERANT PIPING**

17.1 The refrigerant circuit piping shall be heavy class M.S the fittings shall be heavy class. The pipes and fittings shall be connected by means of welded joints. The connections to gauges, controls etc. Shall be with soft copper tubing and flare fittings.

17.2 The refrigerant valves, required in the circuit shall be as follows.

	<u>Valve Size</u>	<u>Valve Material</u>	<u>Type of Connections</u>

17.2.1	Upto 12 mm	brass/packless type	flare fittings

17.2.2	16mm & above	brass/steel packed type	brazed/welded

Note :- All valves shall be tested against leaks upto 20 kg/sq.cm.

17.3 The strainers for the refrigerant liquid line shall be 'Y' type with gun metal body and bronze filter screen of fine mesh. The filter screen shall be easily removable type without dismantling the strainer from the circuit.

17.4 The moisture indicator in the liquid line shall have leak proof glass on opposite sides to permit easy inspection of the liquid refrigerant.

18. **DRAIN PIPING**

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18.1 The drain piping shall be medium class galvanized steel as per IS 1239/1979.

18.2 The fittings shall be of 'R'/UNIK make brand or equal forged with screwed connections.

18.3 The gate valves shall be of gun metal as described earlier.

18.4 Pipe crosses shall be provided at bends, to permit easy cleaning of drain line.

18.5 The drain line shall be provided upto the nearest drain trap and pitched towards the trap.

18.6 Drain lines shall be provided at all the lowest points in the system, as well as at equipments, where leakage of water is likely to occur, or to remove condensate and water from pump glands.

19. **INSTALLATION**

- The installation work shall be carried out in accordance with the detailed drawings prepared by the Air-conditioning Contractor and approved by the Engineer-in-charge.
- Air-conditioning contractor shall utilize the structural provisions for Air-conditioning services wherever provided by the Department in the building and make his own arrangements for additional changes.
- Expansion loops or joints shall be provided to take care of expansion or contraction of pipes due to temperature changes.
- Tee-off connections shall be through equal or reducing tees, otherwise ferrules welded to the main pipe shall be used. Drilling and tapping of the walls of the main pipe shall not be resorted to.
- Wherever reducers are to be made in horizontal runs, eccentric reducers shall be used if the piping is to drain freely, in other locations, concentric reducers may be used.
- Open ends of piping shall be blocked as soon as the pipe is installed to avoid entrance of foreign matter.

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- All pipes using screwed fittings shall be accurately cut to the required size and threaded in accordance with IS: 554 and burs removed before laying.
- Piping installation shall be supported on or suspended from structure adequately. The Air conditioning contractor shall design all brackets, saddles, clamps, hangers etc. and shall be responsible for their structure integrity.
- Pipe supports, preferably floor mounted shall be of steel, adjustable for height and prime coated with zinc chromate paint and finish-coated gray. Spacing of pipe supports shall not be more than that specified below:

Nominal Pipe size (mm)	Spacing (Meters)
12 and 15	1.25
20 and 25	2.00
32, 40, 50 and 65	2.50
80, 100 and 125	2.50
150 and above	3.00

Extra supports shall be provided at the bends and at heavy fittings like valves to avoid undue stress on the pipes. Pipe hangers shall be fixed on walls and ceiling by means of metallic or rawl plugs or approved shear fasteners.

- Insulated piping shall be supported in such a manner as not to put undue pressure on the insulation.
 - Anti vibration pads, springs or liners of resilient and non-deteriorating, material shall be provided at each support, so as to prevent transmission of vibration through the supports.
 - Pipe sleeves of diameter larger than the pipe by least 50 mm shall be provided wherever pipes pass through walls and the annular spaces shall be filled with felt and finished with retaining rings.
- i. Vertical risers shall be parallel to walls and column lines and shall be straight and plumb. Risers passing from floor to floor shall be supported at each floor by clamps or collars attached to pipe with a 12 mm thick rubber pad or any other resilient material as approved by the Engineer-in-charge.

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- ii. The space in the floor cut outs around the pipe work (after insulation work where applicable) shall be closed using cement concrete (1 :2:4 mix) or steel sheet, from the fire safety considerations, taking care to see that a small annular space is left around the pipes to prevent transmission of vibration to the structure.
 - iii. Riser shall have suitable supports at the lowest point.
 - Where pipes are to be buried under ground, the top of the pipes shall be not less than 75 cms. from the ground level. Where this is not practicable, permission of the Engineer-in-charge shall be obtained for burying the pipes at lesser depth. The pipes shall be surrounded on all sides by sand cushion of not less than 15 cms. After the pipes have been laid and top sand cushion provided, the trench shall be refilled with the excavated soil and any extra soil shall be removed from the site of work by the Air conditioning contractors.
 - All pipes and their steel supports shall be thoroughly cleaned and given one primer coat of Zinc chromate before being installed.
 - After all the water piping has been installed, pressure tested in accordance with clause 5.10, all exposed piping in the plant room shall be given two finish coats of paint, approved by the Engineer-in-Charge. Similar painting work shall be done over insulated pipe work, valves etc. The direction of flow of fluid in the pipes shall be indicated with identifying arrows.
 - 3mm gasket shall be used for flanged joints.
 - iv) Cut-outs in floor slabs shall be sealed with cement concrete or steel plate after the plumbing work is done, from the fire safety point of view.

20. **PRESSURE TESTING**

- All piping shall be tested to hydrostatic test pressure of at least one and a half times the maximum operating pressure, but not less than 10 kg/sqcm for a period not less than 24 hours. All leaks and defects in joints revealed during the testing shall be rectified to the satisfaction of the Engineer-in-charge.
- Piping repaired subsequent to the above pressure test shall be re-tested in the same manner.
- System may be tested in sections and such sections shall be securely capped.
- It shall be made sure that proper noiseless circulation is achieved through all the coils and other heat exchange equipments in the system. If proper circulation is not achieved due to air-bound connections the

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contractor shall rectify the defective connections. He shall bear all the expenses for carrying out the above rectification including the tearing up and refinishing of floors, walls etc. as required. Insulation shall be applied to piping only after the completion of the pressure testing to the satisfaction of the Engineer-in-charge.

- Pressure gauges may be capped off during pressure testing of the installation.
- The contractor shall provide all materials, tools, equipments, Instruments, services and labor required to perform the tests and to remove water resulting from cleaning after testing.

21. **BALANCING**

- After completion of the installation, all water system shall be adjusted and balanced to deliver the water quantities as specified, quoted, or as directed.
- Automatic control valves and three way diverting valves shall be set for full flow condition during balancing procedure. Water circuit shall be adjusted by balancing cocks provided for balancing. These shall be permanently marked after the balancing is completed so that they can be restored to their correct positions, if disturbed.

22. **MEASUREMENT**

Measurements of plumbing work shall be on following basis:

- Piping shall be measured along the centre line of installed pipes including all pipe fittings and accessories but excluding valves and other items for which quantities are specifically indicated in the schedule of work. No separate payment shall be made for fittings and accessories.
- The rates for piping work shall include all wastage allowances, pipe supports, hangers, nuts and check nuts, vibration isolators, suspension where specified or required and any other item as required to complete the piping installation. None of these items will be separately measured nor paid for.
- Piping measurement shall be taken before application of the insulation in the case of insulated pipe work.

23. **PAINTING**

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23.1 All pipes supports, hangers, etc., shall be given two coats of red oxide primer.

23.2 All pipes, which are not to be insulated, shall then be given one coat of finish paint, of a type and colour, as per ISI code.

Note:- All valves should be BMS compatible.

XXII INSULATION

1. SCOPE

This chapter covers the requirements of thermal insulation for chilled water / hot water piping, pumps and tanks, duct work ,and acoustic lining in duct work and weather maker rooms. This does not cover exposed roof insulation and under deck insulation work.

2. MATERIAL-TYPES

The insulation material to be used for various applications shall be any of the following, as required:

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i) For insulation of water piping, pumps and tanks: -

- a) Expanded polystyrene (T.F. Quality)
- b) Resin bonded glass wool
- c) Polyvinyl Nitrile (Closed cell rubber foam)
- d) XLPE (Closed cell cross linked polyolefin foam)

Expanded polystyrene (T.F. Quality) shall be used for pipe insulation like inside the A.C. plant room, exposed to outside or buried in ground. In the case of expanded polystyrene (TF quality), Resin bonded glass wool the pipe insulation should be in rigid sections in two halves and preformed to fit snugly on to pipes (upto pipe sizes for which the preformed sections are manufactured by the manufacturer of insulation). For higher pipe sizes insulation slabs shall be used.

Resin bonded glass wool is to be used for piping inside the building due to its fire retardant properties, for considerations of fire safety. Polyvinyl Nitrile (Closed cell rubber foam) available in tube shapes for sliding on to the small dia. pipes can be used if successfully tested for fire retardant properties.

However, all shall need to be covered with vapour barrier and cladding with aluminium sheet.

ii) For Insulation of duct work: -

- a) Resin bonded glass wool.
- (b) Polyvinyl Nitrile (Closed cell rubber foam)

iii) For acoustic lining of duct work and AHU rooms: -

- (a) Resin bonded glass wool.
- (b) Resin bonded mineral wool.

iv) For suction line, Chilled water pipe and Chiller insulation: -

- (a) Expanded Polyesterene (T.F. Quality)
- (b) Polyvinyl Nitrile (Closed cell rubber foam)

(v) For double skin AHUs:

- (a) Polyurethane foam (PUF insulation)

3. INSULATION THICKNESS

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The thickness of insulation shall be as indicated below unless specified otherwise in the tender specifications.

- i) For pipe insulation (for chilled water as well as hot water application)

Pipe Size (mm) Polystyrene (mm)	Glass fibre /Exp.
150 & below	50
Above 150	75

- ii) For Duct insulation

Application	Fibre glass (mm)
Thermal for AC area	12.5
Thermal for Non AC area	25
Acoustic	25

- iii) For room acoustic lining

Resin bonded glass wool	50 mm
Resin bonded mineral wool	50 mm

- iv) For pumps :

Expanded polystyrene TF quality	50 mm

- v) Chiller Insulation

Thickness of polyvinyl rubber insulation used for chiller insulation shall not be less than 19mm.

- vi) Expansion tank

Thickness of expanded polystyrene (TF quality) insulation used shall not be less than 50mm.

4. **APPLICATION OF INSULATION ON PIPES (including suction line insulation)**

- (i) The surface to be insulated shall be first cleaned and a coat of zinc chromate primer shall be given. The insulation shall be fixed tightly to the surface with cold setting adhesive CPRX compound. All joints shall be staggered and sealed. The second layer of
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insulation wherever required shall be similarly applied over the first layer.

- (ii) Pipes shall be preferably pre insulated at factory, meeting the requirement or the insulation shall be finished at site as under:
 - (a) For pipes laid inside the building, the insulation over the pipe work shall be finished with 0.63 mm thick aluminium sheet cladding over a vapour barrier of 120 gm/ sq.m. polythene sheet with 50 mm overlap and tied down with lacing wire and complete with type 3, grade-I roofing felt strip (as per IS 1322 as amended upto date) at the joints.
 - (b) For pipes outside the building laid above ground the finishing over the pipe insulation shall be finished with 0.63 mm G S sheet cladding over a vapour barrier of 120 gm/sq.m polythene sheet with 50mm overlap and tied down with lacing wire and complete with type 3 grade I roofing felt strip applied by means of cold setting CPRX compound..
 - (c) For pipes outside the building laid under ground the insulation shall be covered with 500 gauge polythene faced hessian, (the polythene facing outwards), with 50 mm overlap. All joints shall be sealed with bitumen. A layer of 0.50 mm x 20 mm G.I. wire mesh netting shall be provided over it butting all joints and it shall be laced down with GI wire, sand cement plaster (1:4) 20 mm. thick shall be provided in 2 layers of each 10mm and shall be water proofed by applying hot bitumen & fixing tar felt over the plaster. It shall be finally finished with a coat of hot bitumen.) In case of factory pre insulated pipes, buried underground, a water leakage sensing wire shall also be provided, to detect the location of water leakage at later date.
 - (d) In case of factory pre insulated pipes, all joints shall be properly insulated at site as per recommendation of manufacturer
 - (iii) All valves, fittings, strainers etc. shall be insulated to the same thickness and in the same manner as for the respective piping, taking care to allow operation of valves without damaging the insulation.

5. APPLICATION OF INSULATION ON PUMPS

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Expanded polystyrene (TF quality) 50mm thickness shall be sandwiched between two aluminium sheets of 0.5mm thickness and properly clamped to pump in two semicircular sections.

6. **APPLICATION OF INSULATION ON EXPANSION TANK**

Insulation of expansion tank shall be expanded polystyrene (T.F. Quality) of thickness not less than 50mm. It shall be applied as under

- i) Surface shall be thoroughly cleaned with wire brush and rendered free from all dust & grease.
- ii) The two layers of hot bitumen shall be applied.
- iii) The insulation slabs will then be fixed in one layer and joints shall be sealed with hot bitumen.
- i) The insulation slab then shall be covered with 0.63 mm x 19mm G.I. wire mesh netting which shall be fixed to insulation with brass / G.I. nails.
- v) The insulation shall then finally be finished with aluminium cladding of thickness not less than 0.5mm.

7. **MEASUREMENT OF INSULATION**

- a) Pipe insulation shall be measured in units of length along the centre line of the insulated pipe. The linear measurements shall be taken before the application of the insulation. For piping measurements, all valves, orifice plates and strainers shall be considered strictly by linear measurement along the centre line of the pipes, and no special rate shall be applicable for insulation of any accessories, fixtures or fittings whatsoever.
 - b) Duct insulation and acoustic lining shall be measured on the basis of surface area along the outer surface (ref IS14164 of 2008) of insulation thickness. Thus the surface area of externally thermal insulated or acoustically lined duct shall be based on the perimeter at the centre of thickness of insulation, multiplied by the centre-line length of ducting including tapered pieces, bends, tees,
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branches etc. as measured for bare ducting. In the case of tapering pieces, their average perimeter shall be considered.

XXIII ELECTRIC WIRING

1. GENERAL

The electric wiring of motors for compressors, pumps, air handling units etc. As well as controls, heaters etc. and earthing of all equipment shall be carried out as per specifications given hereunder.

2. WIRING FOR MOTORS, HEATERS ETC

2.1 The wiring for above equipment shall be carried out in conduits or using PVC armoured cables.

2.2 The PVC armoured power cable for use on 415 volts system shall be 3 or 3.5 core with aluminium conductors and be of 1100 volts grade, as per IS 1554 part I-1964. The cross section of the cable shall be to suit the load or rating of the equipment. The cable shall be aluminium conductor PVC insulated single wire/strip armoured with overall PVC sheathing.

2.2.1 The cables shall be laid as per IS-1255/1967, Indian Standard Code of Practice.

2.2.2 The cables shall be laid, as per drawings or along a short and convenient route between switch board and the equipment, either in trenches, on wall or on hangers, supported from the slab. Cable routing shall be checked on the site to avoid interference with structure, equipment etc. Where more than one cables are running close to each other, proper spacing should be provided between them.

2.2.3 The radius of bends of the cable should not be less than 12 times the radius of cable to prevent undue stress and damage at the bends, the cables should be supported with wooden cleats fixed on M.S. Supports, when running in trenches, wall or ceiling suspended

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hangers. When laid under ground the cables should be covered with fine soft earth and protected with cement concrete covering. Suitable G.I. Pipe shall be used wherever the cable comes out of the connected surface and clamped properly.

2.2.4 Wooden bushes shall be provided at the ends of pipes through which cables are taken in walls and floors.

2.2.4 All cables shall be terminated using suitable size cable glands and packing.

2.3 The wiring in conduits shall be 1100 volts grade.

2.3.1 The conduits used shall be of high quality, all joints shall be made with sockets. The bends and elbows shall have inspection covers fixed with grease free screws. The joints shall be water tight. Approved metal saddles shall be used to secure the exposed conduits at a space of 1 meter or less. The connection of the conduit to switches etc., shall be secured by a check nut and ebonite bushes provided at the ends of conduits.

2.3.2 Flush inspection covers shall be provided in case of concealed, recessed conduits. The staples for the conduits shall not be spaced more than 0.60 meters apart. Before filling up the chase with concrete the conduits should be given a coat of rust proof paint.

2.3.3 The wires shall be drawn only after all the conduits have been properly fixed in position.

3. **CONTROL WIRING**

3.1 Control cables shall be 1100 volts grade as per IS 1554 made from copper conductor of 1.5/2.5 sq. mm PVC insulated single multi core unarmoured with an overall PVC sheathing.

3.2 The cables and conduits wiring shall be carried out as per details given under 2.2 and 2.3 above.

4. **EARTHING**

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- 4.1 All equipment connected with electric supply shall also be provided with double earthing continuity conductors. The size of copper earthing conductors shall be :-

Size of phase wire sq.mm Aluminium	size of copper conductor tape/wire (swg)
300	25 mm x 6 mm (strip)
185	20 mm x 3 mm (strip)
150	20 mm x 3 mm (strip)
120	12 mm x 3 mm (strip)
95	4 Swg
70	4 Swg
50	6 Swg
35	8 Swg
25-6	8 Swg
4	10 Swg

Note :- GSS earthing conductors of equivalent size may be used in lieu of copper earth mentioned above.

5. MISCELLANEOUS

- 5.1 The final connections to the equipment shall be through flexible connections in case of conduit wiring and also where the equipment is likely to be moved back and forth, such as on slide rails.
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- 5.2 An isolator switch shall be provided at any motor which is separated from the main switch panel by a wall or partition or other barrier or is more than 15 metres away from the main panel.
 - 5.3 Two separate and distinct earthing conduits shall be connected from the equipment upto the main switch board panel.
 - 5.4 The branch lines from the main panel to each equipment shall be separated and should not criss cross other lines.
 - 5.5 The entire installation shall be tested as per electricity rules and I.S.S 732-1973 with amendments 1,2 & 3 prior to the commissioning of the plant and a suitable test report furnished by a competent and authorized person. The test report will be obtain by contractor himself at his own expenses.
 - 5.6 All exposed switch board panels, conduits, hangers etc. shall be given 2 coats of suitable paint of approved colour, when all work has been completed.

XXIV TESTS AT SITE/WORKS

1. GENERAL

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The contractor must perform all inspection and tests of the system as a whole and of components individually as required, under the supervision of the Architect/ Consultants/ Owner representative, site engineer-in-charge in accordance with the provisions of the applicable ASHRAE standards or approved equal and furnish necessary test certificates from manufacturers at the time of delivery of requirement at site.

2. INITIAL INSPECTION AT MANUFACTURER'S WORKS

2.1 Centrifugal Compressor

- Salient features such as model capacity control, type of lubrication etc. shall be verified against the requirements visually without opening the compressors.
- Manufacturer's internal test certificates shall be scrutinized to check compliance with the requirements as specified in the contract.
- Free running test shall be carried out at the speed for which the motor is available with manufacturer but the speed shall not be than that specified in contract. This test shall be carried out for minutes in open space. During this running test following operations are to be noted:
 - Manual operation of capacity control
 - Lubrication oil pressure
- Pneumatic test pressure test at 21 Kgf/sq.cm for casing of compressor
- Vacuum test for the compressor for 0.5mm

2.2 Condensers

- Salient features like number of tubes, inside diameter of tubes (from which the gauge of the tube can be verified), no. of passes, material of fins, length of condenser, provision of fittings like safety valve, water, gas connection shall be verified during stage inspection. The tube thickness shall be checked.
- Manufacturer's internal test certificates shall be furnished and it shall be verified against contract requirements.
- Pneumatic pressure test at twice the normal condensing pressure for gas side of condenser shall be carried out.
- Hydraulic test at 10Kgf/ sqcm for water side of the condenser shall be carried out.

2.3 Chiller

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- Salient features like type of chiller, number and inside diameter of tubes (from which gauge of the tubes can be verified), material of tubes, type, material and the number of fins, wherever applicable, diameter and length of chiller and provision of fittings be verified against requirements specified in the contract during stage inspection. Tube thickness shall be checked.
 - Manufacturer's internal test certificate shall be furnished and same shall be checked as per contract requirements.
 - Pneumatic pressure test at twice the normal condensing pressure for gas side of condenser shall be carried out.
 - Hydraulic test at 10Kgf/sqcm for the water side of chiller shall be carried out.

2.4 **Chilling Unit (Water Cooled only)**

Full load test shall be carried out to verify the capacity and IKW/ Ton.
Note: In case of imported centrifugal chilling machine, initial inspection shall be carried out at site before installation in respect of items needing physical inspection and verification. No tests shall be done at manufacturer's works. The test certificates for all the specified tests shall be produced which shall be accepted if found in order.

2.5 **Air Handling Units**

- Salient features such as model, size, physical dimensions, and other details of various sections, fan motor details, fan dia, static pressure etc. shall be verified against the contract requirements.
- Manufacturer's internal test certificates for the motor and air handling unit shall be furnished and scrutinized as per contract requirements.
- Test certificate for static and dynamic balancing of the fan/ blower should be furnished. Fan balancing may be witnessed by Engineer-in-Charge or his authorized representative.
- Salient features like type, material, no. and gauge of fins and tubes and no. of rows of cooling coil shall be furnished and verified with reference to contract requirements during stage inspection.
- Hydraulic pressure to the extent of 10 Kgf/sq.cm or pneumatic pressure of 21kgf/ sq.cm shall be applied to cooling coil and this pressure should be maintained for 1 hour and no drop should be observed indicating any leaks.

3. **INITIAL INSPECTION AT SITE**

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3.1 **Ducting**

- The sheet used for ducting shall be checked for physical test at site. The physical test should include the sheet thickness and bend test as per relevant IS specifications.
- Zinc coating of GSS sheet as mentioned in the tender documents may be got tested from a laboratory to verify that same meets the contract requirements.

3.2 **Pumps**

- Salient features such as model and make shall be checked as per contract requirements.
- The manufacturer's test certificates with Sr. No., head, discharge will be furnished and verified against contract requirements.

3.3 **Cooling Tower**

- Salient features such as make, model, dimensions, materials used, constructional details, number and size of nozzles, headers, size of tank, etc. should be verified against the requirements. Inspection of cooling tower in knocked down condition would be carried out at the site.
- Manufacturer's test certificate certifying the capacity of cooling tower and static balancing of fan should be furnished.

3.4 **Switch Gear, Control Gear and Measuring Instruments**

These should be of specified make. For air circuit breaker manufacturers test certificate shall be furnished by contractor and the same shall be verified as per contract requirements.

- 3.5 Electric motors should be of specified make, manufacturer's test certificate for electric motor shall be furnished.

3.6 **Pipes and Valves**

- It should be checked that the same is as per makes specified in contract
 - Dimensions including weight shall be checked for pipes against the requirements contract.
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3.7 **Insulation and Acoustic Lining**

- Physical verification for thickness and make should be made as per contract before application of insulation.
- Manufacturer's test certificate for density should be furnished. Note: Accuracy of testing instruments shall be as mentioned in the final inspection procedure.

4. **FINAL INSPECTION**

- 4.1 After completion of the entire installation as per specification in all respects, the AC contractor shall demonstrate trouble free running of the AC equipments and installation for a period of minimum 120 hours of running as detailed under Para 1.15.
 - 4.2 After the trial run as in Para 1.15 above, the AC contractor shall offer the plant for the seasonal test, namely test for summer or monsoon season whichever occurs earlier. The test results as per Appendix G shall be furnished.
 - 4.3 The equipment capacity computations as per Para '8' under notes of the Annexure 'G' shall be carried out.
 - 4.4 The Input KW of the unit/TR at full load shall also be checked against contract requirements, if any.
 - 4.5 Pressure drops across chiller and condenser at specified flow rates shall be checked against the contract requirements.
 - 4.6 All instruments for testing shall be provided by the AC contractor, these shall be as per Note 'A' of Appendix G, The accuracy of the instruments shall be as follows:
 - Temperature: Liquid in glass thermometer having accuracy ± 1 deg. C as per IS: 4825.
 - Wet bulb Temperature: Sling psychomotor conforming to IS:6017,
 - Scale Error: For less than 0 deg.-C. $0.3^{\circ}\text{C} \pm 0.2$ deg. C. For over 0°C $0.2^{\circ}\text{C} \pm 0.1$ deg.
 - Pressure Gauge: With the accuracy of $\pm 1\%$ for maximum scale value from 10 to 90%, and $\pm 1.9\%$ for maximum scale value for rest of the scale conforming to IS: 3695.
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- Water flow meter' Water flow shall be measured using the arrangement installed as per schedule of work,
- 4.7 In case the tendering firms do not have testing instruments of the accuracy mentioned above, they should specify the accuracy of the instrument available with them for testing before execution of this particular work.

5. TESTING REQUIREMENTS AND PROCEDURES

- 5.1 Balancing of all air and water systems and all tests as called for in the specification shall be earned out by the HVAC contractor in accordance with the specifications and relevant local codes if any. Performance tests of individual equipment and control shall be carried out as per manufacturer's recommendation. All tests and balancing shall be carried out in the presence of Engineer-in-charge or his authorized representative.

The whole system balancing shall be tested with microprocessor based hi-tech instruments with an accuracy $\pm 0.5\%$. The instrument shall be capable of storing data and then down loading into a P.C. The HVAC contractor shall provide a minimum but not limited to the following instruments:

- Microprocessor based calculation meter to measure DB and WB temperature, RH and Dew point
- Velo meter to measure air volume and air velocity
- Pitot tube -Electronic rotary vane Anemometer
- Accubalance flow measuring hood

The contractor shall be responsible to provide necessary sockets and connections for fixing of the testing instruments, probes etc.

5.2 Air Systems

Systems are to be balanced by first adjusting the total flow at the fan, then by adjusting main dampers and branch dampers. Only final minor adjustments are to be made with register and diffuser dampers. Balancing of the air system shall be accomplished without causing objectionable air noise. Baffles and orifice plates required for proper air balance shall be furnished and installed by the contractor. Basically the following tests and adjustments are required.

- Test all fan systems to provide proper cfm/ cmh.
 - Adjust fresh air return air and exhaust dampers to provide proper air quantities in all modes of control.
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- Test and record fresh air, return air and mixed air temperature at all air handling units. Test and record data at all coils after air and hydronic systems are balanced. Measure wet and dry bulb temperature on cooling coils.
 - Make point tube transverse at all main supply and return ducts to set proper air quantities. Adjust all zone and branch dampers to proper cfm/cmh.
 - Test and adjust each register, grills, diffuser or other terminals equipment to within 5% of design air quantity. Each opening shall be defined on the test report by size manufacturer's model, room location, design cfm and actual cfm. Outlets shall be adjusted to minimize objectionable drafts.
 - Test and record static pressure drop across all filters and major coils.
 - High velocity duct systems shall be tested for leakages. If excessive or audible leakage is detected, the defect shall be repaired by the contractor. Sufficient static pressure readings shall be taken from the air handling units to the terminal units to establish system static pressure.

5.3 **Water System**

Systems are to be balanced by opening all valves, closing all by-pass and setting all mixing valves to full coil flow. Water systems shall be cleared of Verify that the system has been properly cleaned, flushed and treated before testing. Basically, the following tests and adjustments are required.

- Test and adjust all pumps to deliver the proper rpm. Record rpm, motor amperage, discharge and suction pressure. Pumps shall operate without objectionable noise or cavitation. Plot actual pump and system performance points on manufacturers pump curves.
 - Check all expansion tanks for proper filling pressurization. Verify operation of automatic fill and relief valves.
 - Check the operation of all automatic valves.
 - Test and adjust correct water flow through chiller, major items of equipment and main water circuits. The balancing valves, provided on the equipment shall be used for adjustment.
 - Check capacity output of chillers and set water flow rate for proper data.
 - Check and adjust each coil to provide proper rpm. Record water and air temperature changes and water pressure drop.
 - Set pressure drops across coil by-pass to match coil full-flow pressure drop.
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5.4 Unit capacity in Tons Refrigeration shall be computed from the temperature readings, pressure readings and water/ brine flow measurements. Flow measurements shall be preferably through flow meters. Pumps shall be tested for the discharge head, flow and BHP. Where it is not possible to measure the flow, at least the discharge head and BHP (on the input side) shall be field tested.

5.5 Balancing Tolerance: Systems shall be balanced within the following tolerances

5.5.1 Duct leakage Rates (at operating pressures)

Low pressure ducts (0 to 0.5kPa)	5% of full flow
Medium Pressure Ducts (0.5 to 3kPa)	1% of full flow
High Pressure Ducts (Greater than 3kPa)	1% of full flow

5.5.2 Air flow rates

Under 70 L/S	10% of flow
Over/ at 70 L/S	5% of flow

5.5.3 Water flow rates

Chilled Water	2% of flow
Other	5% of flow

5.5.4 Heat flow rates

Heat exchangers	5% of design capacity

Procedure:-

- i) Review all pertinent plans, specifications, shop drawings and other documentation to become fully familiar with the systems and their specified and intended performance.
- ii) Furnish equipment and instruct sheet metal trade on proper use for conducting duct leakage tests. Conduct first test as a way of instructing the above trades in the presence of the Departments representative.
- iii) Test relative barometric pressures in various building area, as deemed necessary by the Department's representative and at least in an areas served by different systems.

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- iv) Test performance and continuously record on a 24 hour basis, temperature and humidity levels where control equipment is provided for that purpose in certain critical areas.
 - v) Before commissioning of the equipment, the entire electrical installation shall be tested in accordance with relevant BIS codes and test report shall be furnished by a qualified and authorized person.

5.6 **Reports**

Provide 3copies of the complete balancing and testing reports to the department. Report shall be neatly typed and bound suitable for a permanent record. Report forms shall contain complete test data and equipment data as specified and safety measures provided as per Para 1.14.3.

5.7 **Final Documentation**

- i) The contractor shall leave the system operating in complete balance with water and air quantities as shown on drawings. Set stops on all balancing valves and lock all damper quadrants in proper position. Secure all automatic damper and valve linkages in proper positions to provide correct operating ranges. Proper damper positions shall be marked on ducts with permanent indication. Notify the department of any areas marginal or unacceptable system performance.
- ii) The above tests and procedures are mentioned herein, for general guidance and information only, but not by way of lamination to the provisions of conditions of contract and design/ performance criteria.
- iii) Upon commissioning and final handover of the installation, the HVAC contractor shall submit (within 4 weeks) to the engineer-in-charge! department 6 (six) portfolios of the following indexed and bound together in hard cover ring binder (300 x 450 mm) in addition to the completion drawings as per Para 1.18.3.
 - a) Comprehensive operation and maintenance manual
 - b) Test certificates, consolidated control diagram and technical literature on all controls.
 - c) Equipment warranties from manufacturers.
 - d) Commissioning and testing reports
 - e) Rating charts for all equipment
 - f) Log books as per equipment manufacturers standard format
 - g) List of recommended spares and consumables

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- h) Any special tools required for the operation or the maintenance of the plant shall be supplied free with the plant.
 - iv) At the close of the work and before issue of final certificate of completion by the Engineer-in-charge, the contractor shall furnish a written guarantee indemnifying the department against defective materials and workmanship for the Defects liability period. The contractor shall hold himself fully responsible for reinstallation or replace free of cost to the department.
 - a) Any defective material or equipment supplied by the contractor
 - b) Any material or equipment supplied by the department which is proved to be damaged or destroyed as a result of defective workmanship by the contractor.

XXV MODE OF MEASUREMENTS

1. UNIT PRICES IN THE SCHEDULE OF QUANTITIES

- 1.1 The item description in the schedule of quantities is in the form of a condensed resume. The unit price shall be held to include every thing necessary to complete the work covered by this item in accordance with the specifications and drawings. The sum total of all the individual item prices shall represent the total price of the installation ready to be handed over.
- 1.2 The unit price of the various items shall include the following :
 - 1.2.1 All equipment, machinery, apparatus and materials required as well as the cost of any tests which the consultant may request in addition to the tests generally required to prove quality and performance of equipment.
 - 1.2.2 All the labour required to supply and install the complete installation in accordance with the specifications.

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- 1.2.3 Use of any tools, equipment, machinery, lifting tackle, scaffolding, ladders etc. Required by the contractor to carry out his work.
 - 1.2.4 All the necessary measures to prevent the transmission of vibration.
 - 1.2.5 The necessary material to isolate equipment foundations from the building structure, wherever necessary.
 - 1.2.6 Storage and insurance of all equipment apparatus and materials.
 - 1.3 The contractor's unit price shall include all equipment, apparatus, material and labour indicated in the drawings and/or specifications in conjunction with the item in question, as well as all additional equipment, apparatus, material and labour usual and necessary to make in question on its own (and within the system as a whole) complete even though not specifically shown, described or otherwise referred to.

2. MEASUREMENTS OF SHEET METAL DUCTS, GRILLES/DIFFUSERS ETC.

2.1 Sheet Metal Ducts

- 2.1.1 All duct measurements shall be taken as per actual outer duct surface area including bends, tees, reducers, collars, vanes & other fittings. Gaskets, nuts, bolts, vibration rotation pads are included in the basic duct items of the BOQ.
- 2.1.2 The unit of measurements shall be the finished sheet metal surface area in metres squares. No extra shall be allowed for lapse and wastages.
- 2.1.3 All the guide vanes, deflectors in duct elbows, Branches, grille collars quadrant dampers etc. Shall be measured for actual sheet metal surface and paid for at the same rate as duct of same thickness.
- 2.1.4 The unit duct price shall include all the duct hangers And supports, exposing of concrete reinforcement for supports and making good of the same as well as any materials and labour required to complete the duct frame.

2.2 Grilles/Diffusers

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All grilles/diffusers as per tender requirements shall be treated as a lump sum item. Where extra grilles diffusers are ordered upto award of work, they should be measured as follows :

2.2.1 All measurements of grilles/diffusers shall be the Actual outlet size excluding the outer flanges.

2.2.2 The square or rectangular grilles/diffusers shall be Measured in plain sq.m.

2.2.3 All round diffusers shall be measured by their diameters in cm.

2.2.4 All linear diffusers shall be measured as per actual Length in metres.

3. MEASUREMENTS OF PIPING, FITTINGS, VALVES, FABRICATED ITEMS

3.1 Pipe

(Including water piping, steam piping, oil piping, LP gas piping, air piping, vacuum piping) etc.

3.1.1 All pipes shall be measured in linear metre (to the Nearest cm) along the axis of the pipes and rates shall be inclusive of all fittings e.g. Tees, bends, reducers, elbows etc. Deduction shall be made for valves in the line.

3.1.2 Exposing reinforcement in wall and ceiling and floor of possible and making good the same or installing anchor fasteners and inclusive of all items as specified in specifications and schedule of quantities.

3.1.3 Rates quoted shall be inclusive of providing and fixing Vibration pads and wooden pieces, wherever specified or required by the project co-ordinator.

3.1.4 Flexible connections, wherever required or specified shall be measured as part of straight length of same diameter, with no additional allowance being made for providing the same.

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- 3.1.5 The length of the pipe for the purpose of payment will be taken through the centerline of the pipe and all fittings (e.g. Tees, bends, reducers, elbows, etc.) as through the fittings are also presumed to be pipe lengths. Nothing extra whatsoever will be paid for over and above for the fittings for valves and flanges, section 3.2 below applies.

3.2 **Valves and Flanges**

- 3.2.1 All the extra CI & cm flanged valves shall be measured according to the nominal size in mm and shall be measured by number. Such valves shall not be counted as part of pipe length hence deduction in pipe length will be made wherever valves occur.

- 3.2.2 All gun metal (gate & globe) valves shall include two Nos. of flanges and two numbers 150 mm long ms nipples, with one side threaded matching one of the valves, and other welded to the M.S. Slip-on-flange. Rate shall also include the necessary number of bolts, nuts and washers, 3 mm thick insertion gasket of required temp. grade and all items specified in the specifications.

- 3.2.3 The rates quoted shall be inclusive of making connections to the equipment, tanks, pumps etc. And the connection made with an installed pipe line shall be included in the rates as per the B.O.Q.

3.3 **Structural Supports**

Structural supports including supports fabricated from pipe lengths for pipes shall be measured as part of pipe line and hence no separate payment will be made. Rates shall be inclusive of hoisting, cutting, jointing, welding, cutting of holes and chases in walls, slabs or floors, painting supports and other items as described in specifications, drawings and schedule of quantities or as required at site by project co-ordinator.

3.4 **Copper Connections for Fan Coil Units**

- 3.4.1 Copper connection assembly for making connections to the fan coil units shall be measured, as part of the fan coil unit price and shall include brass flare nuts, brass straight connector, brass tees, brass reducing fittings, fixing of automatic 2 way valve, making connections and leak
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testing, complete assembly as per specifications and drawings. Nothing extra shall be payable on account of any variation in the length of copper pipe.

4. **INSULATION**

4.1 The measurement for vessels, piping, and ducts shall be made over the bare uninsulated surface area of the metal.

4.2 **Pipes, Ducts & Vessels**

4.2.1 **Pipes**

The measurements for installation of piping shall be made in linear metres through all valves, flanges, and fittings. Pipes/bends shall be measured along the centerline radius between tangent points. If the outer radius is R1 and the inner radius is R2. The centre line radius shall be measured as $(R1+R2)/2$. Measurement of all valves, flanges and fittings shall be measured with the running metre of pipe line as if they are also pipe lengths. Nothing extra over the above shall be payable for insulation over valves, flanges and fittings in pipe line/routings. Fittings that connect two or more different sizes of pipe shall be measured as part of the larger size.

4.2.2 **Ducts**

The measurements for insulation of ducts shall be made in actual square metres of bare uninsulated duct surface through all dampers, flanges and fittings. In case of bends the area shall be worked out by taking an average of inner and outer lengths of the bends. Measurements for the dampers, flanges, fittings shall be for the surface dimension for the connecting duct, nothing extra over the above shall be payable for insulation over dampers, flanges and fittings in duct routing.

4.2.3 **Vessels**

The area of standard dished and flat ends of vessels shall be the square of the diameter of the uninsulated body of the shell. Areas for other shapes shall be the actual calculated area. There shall be no deduction

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or additions for nozzles, handles ribs, dampers, expansion joints etc. All projections on vessels or tanks shall be measured separately as pipe/duct.

4.3 **Accessories Insulation**

- 4.3.1 The unit of measurement for accessories such as expansion tank, pumps, chiller heads etc. shall be uninsulated area in square metres.
- 4.3.2 In case of curved or irregular surfaces, measurements shall be taken along the curves.
- 4.3.3 The unit insulation price shall include all necessary adhesives, vapour proofing and finishing materials as well as additional labour and material required for fixing the insulation.

4.4 **Acoustic Duct Lining**

- 4.4.1 In case of acoustic lining of air ducts, measurements of the bare inside duct surface in square metres, shall be final for billing purposes.
- 4.4.2 The insulation/acoustic panels shall include cost of battens, supports, adhesives, vapour proofing, finished tiles/boards/sheets as well as additional labour and materials required for completing the work.

4.5 **Roof and Wall Insulation & Acoustic Treatment**

- 4.5.1 The unit of measurement for all underdeck roof insulation, wall insulation, wall/roof acoustic panel shall be the uninsulated area of walls, roofs, to be treated, in square metres.
- 4.5.2 The insulation, acoustic panels shall include cost of battens, supports, adhesives, vapour proofing, finished tiles/boards/sheets as well as additional labour and materials required for completing the work.

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XXVI LIST OF APPROVED 'MAKES'

<u>S.No.</u>	<u>Items</u>	<u>Approved</u>
	<u>Makes</u>	
1.	Water cooled screw chillers unit	Carrier/York/Trane
2.	Pumps Armstrong/Grundfoss/Xylem	
3	Cooling tower Spindle/Baltimore/Evapco	Nihon
4.	Airhandling unit	Zeco/Edgetech/Lloyd/VTS Balance air equipment
5.	PAC	Blue Box/Stulz/Uniflair
5.	FCU	Zeco/Edgetech/Balance air Equipment/Midea/Bhaturia
6.	AHU/FCU Motor ABB/Havells/Siemens/Marathon	
7.	VFD	Siemens/Danfoss/ABB/VTS

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8.	Axial flow fan /Jet Fans Greenheck/Systemair/Airflow/	Humidin	
9.	Inline fan Ostberg/Greenheck/Sphere/Caryaire/	Airflow	
10.	Split Airconditioning Samsung/Mistubishi/Toshiba/	Daikin	
11.	Packaged Type Airwasher equipment/Emerald	Zeco/Edgetech/Lloyd/ Balance air	
13.	Chilled water Hi-Wall Bhaturia/Caryaire/Edgetech/Daikin		
14.	Blower of AHU Krugar/Blowtech/Nicotra/Humidin		
15.	CO Sensors Honeywell/Greystone/Siemens/	Smart Sensor	
16.	PLC Siemens/Honeywell/Smart Sensor		
17.	Starters/switchgear Tubro/ABB	Siemens/Larsen	&

<u>S.No.</u>	<u>Items</u>	<u>Approved Makes</u>
18.	Control cables	Finolex/Skytone/Havells/Rallison/ KEI
19.	Power cables	Finolex/Skytone/Havells/Rallison/ KEI

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20.	Push button starters	Siemens/ABB/L&T/Allen Bradley
21.	Auxiliary relays/contractors	Siemens/L&T/Cutler Hammer/Jyoti
22.	Line type fuse	Siemens/English electric/L&T
23.	Timer	Siemens/L&T/Cutler Hammer/ English electric
24.	Terminal block	Elmex/Siemens
25.	Indicating lamps and Switch- Hammer	Siemens/L&T/Control gear/Cutler
26.	Selector switches	Siemens/L&T/Kaycee
27.	Electrical panel	RR Controls/Application/Advance/ EAP/Risha Control
28.	Grilles/Jet Nozzle/Diffuser/Fire Dampers/ Servex/Caryaire/Mapro/Crossair/ Drum Diffusers/ Back draft damper/ equipment Motorized Damper	Balance air
29.	Actuator assembly Belimo/Danfoss/Siemens	
30.	G.I. sheets	Tata/Sail/Jindal/Lloyd
31.	G.I. Ducting Ductofab/Zeco/Ecoduct/Rollastar/	
32.	Glasswool Ducting Gobain/	UP Twiga/Saint Owen Corning
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33. Pipe

33.1 M.S. Tata/Jindal Hissar/Apollo
tubes

33.2 G.I. Tata/Sail/Jindal Hissar

S.No. Items

Approved Makes

34. Refrigerant piping Mandev/Indigo/Mehta Tubes/
Maxflow

35. UPVC pipes Supreme/Prince/Polypack

36. Flexible pipe connection Resistoflex/Easyflex

37. Valves & strainer

37.1 Butterfly valve Advance/Honeywell/
Utam&VTM/
SKS/ALP

37.2 Motorized Butterfly Valve Advance/Honeywell/Utam&VTM/
SKS/ALP

37.3 Balancing valve Advance/Honeywell/Utam&VTM/
SKS/ALP

37.4 Non return valve Advance/Honeywell/Utam&VTM/
SKS/ALP

37.5 Y-Strainer Emerald/Rapidcool/SM/Sant/
Utam&VTM/ALP

37.6 Pot Strainer Rapidcool/Emerald/SM/Sant

37.7 Pressure gauge Emerald/Anergy/Honeywell

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- 37.8 Thermometer
Emerald/Anergy/Honeywell
- 37.9 Ball Valves
Rapidcool/Emerald/CIM/Sant/
Advance/Utam&VTM
- 37.10 PICB valve
Danfoss/Frese/Flowcon/Siemens
- 37.11 Dirt Separator
Reflex/Spirotech/Flamco
38. Airvent
Anergy/Siemens
39. Flow switch
Anergy/Siemens/Belimo/Emerald
40. Expansion Tank
Reflex/Spirotech/Flamco

<u>S.No.</u>	<u>Items</u>	<u>Approved Makes</u>
41.	<u>Insulation</u>	
41.1	Glass wool wool	U.P. Twiga/Owen Corning/K-
41.2	Nitrile rubber flex/Aerocell	Armacell/K-
41.3	Expanded polystyrene Styrene Packaging	SHI / Beardshell /
42.	PUF insulation	Lloyd/Malanpur
43.	Vibration isolator pads	Resistoflex / Kanwal

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44.	Paracoat BPC	Paramount / Pidilite
45.	Cable tray Lloyd/MEM/Profab/RICO	Feders
46.	Paint	Nerolac/Asia/Berger
47.	Groove Coupling	Vitaulic / Smithcooper
48.	Air Purification System	Pure Air/Magneto

XXVII LIST OF DRAWINGS

S.No.	Description	Floor	Sheet No.
1.	HVAC Layout	Basement	2139-LAY-A1V1P1-01B1
2.	HVAC Layout	Ground Floor	2139-LAY-A1V1P1-0100
3.	HVAC Layout	First Floor	2139-LAY-A1V1P1-0101
4.	HVAC Layout	Second Floor	2139-LAY-A1V1P1-0102

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5.	HVAC Layout	Third Floor	2139-LAY-A1V1P1-0103
6.	HVAC Layout	Fourth Floor	2139-LAY-A1V1P1-0104
7.	HVAC Layout	Fifth Floor	2139-LAY-A1V1P1-0105
8.	HVAC Layout	Terrace Floor	2139-LAY-A1V1P1-0106
9.	Schematic Layout		2139-SCH-A1-0100

APPENDIX-A **TERMINOLOGY**

- I) Air conditioning
The process of treating air so as to control simultaneously its temperature, humidity, purity, distribution and air movement and pressure to meet the requirements of the conditioned space.
- II) Dry-Bulb Temperature
The temperature of air as registered by an ordinary thermometer.
- III) Wet-Bulb temperature
The temperature registered by a thermometer whose bulb is covered by a wetted wick and exposed to a current of rapidly moving air.
- IV) Dew point Temperature

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- The temperature at which condensation of moisture begins when the air is cooled at same pressure.
- V) Humidity
It is the amount of water vapour present in a certain volume of air.
- VI) Relative Humidity
Ratio of the actual water vapor in the air as compared to the maximum amount of water that may be contained at its dry bulb temperature. When the air is saturated, dry bulb, wet bulb and dewpoint temperatures are all equal.
- VII) Enthalphy
A thermal property indicating the quantity of heat in the air above an arbitrary datum in kilo joules per kg of dry air (or in Btu per pound of dry air).
- VIII) Psychrometry
Psychrometry is the science involving thermo dynamic properties of moist air and the effect of atmospheric moisture on materials and human comfort. It also includes methods of controlling thermal properties of moist air.
- IX) Psychrometric Chart
A Psychrometric chart graphically represents the thermodynamic properties of moist air. If two properties are known, all the other properties can be determined with the help of psychrometric chart.
- X) Evaporative air cooling
The evaporative air-cooling application is the simultaneous removal of sensible heat and the addition of moisture to the air. The water temperature remains essentially constant at the wet-bulb temperature of the air. This is a process in which heat is not added or removed from the air.
- XI) Positive Ventilation
The supply of outside air by means of a mechanical device, such as a fan.
- XII) Atmospheric Pressure
The pressure of air exerted on the surface of earth by the atmospheric column is called atmospheric pressure. At sea level, the atmospheric or
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barometric pressure is 760mm column of mercury (29.92 in Hg/406.8 inch water column/101.325 Kpa).

Generally atmospheric pressure is used as a datum for indicating the system pressures in air-conditioning and accordingly, pressures are mentioned above the atmospheric pressure or below the atmospheric pressure considering the atmospheric pressure to be zero. A 'U' tube manometer will indicate zero pressure when atmospheric pressure is measured.

XIII) Indoor Air Quality (IAQ)

Indoor air quality refers to the nature of conditioned air that circulates throughout the space/ area where one works or lives, i.e. the air we breath when we are indoor. IAQ refers not only to comfort which is affected by temperature, humidity and odours but also to harmful biological contaminants and chemicals present in the conditioned space.

Bad Indoor Air Quality can be a serious health hazard. Carbon dioxide (CO₂) has been recognized by ASHRAE as the surrogate ventilation index or the only measurable variable for the indoor air contaminants.

XIIIA) Buildings Related Illnesses (BRI)

BRI are attributed directly to the specific air-borne building contaminants like the outbreak of the legionnaire's disease after a convention and sensitivity pneumonitis with prolonged exposure to the indoor environment of the building.

XIV) Sick Building Syndrome (SBS)

SBS is a term, which is used to describe the presence of acute non-specific symptoms in the majority of people caused by working in buildings with an adverse indoor environment It could be a cluster of complex irritative symptoms like irritation of the eyes, blackened nose and throat, headaches, dizziness, lethargy, fatigue irritation, wheezing, sinus, congestion, skin rash, sensory discomfort from odours, nausea, etc. These symptoms are usually short-termed and experienced immediately after exposure, and may disappear when one leaves the building.

XV) Hydronic Systems

Water systems that convey heat to or from a conditioned space or process with hot or chilled water are frequently called hydronic systems. The water flows through piping that connects a chiller or the water

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heater to suitable terminal heat transfer units located at the space or process.

XVI) Water conditioning

Water circulating in a hydronic system may require to be treated to make it suitable for air-conditioning system due to effect on the economics of air-conditioning plant. Unconditioned water used in air-conditioning system may create problems with equipments such as scale formation, corrosion and organic growth.

XVII) Water Hardness

Hardness in water is represented by the sum of calcium and magnesium in water and may also include aluminium, iron, manganese, zinc, etc. A chemical analysis of water sample should provide number of total dissolved solids (TDS) in a water sample in parts per million (ppm) as also composition of each of the salts in parts per million.

Temporary hardness is attributed to carbonates and bi-carbonates of calcium and/or magnesium expressed in parts per million (ppm) as CaCO_3 . The remainder of the hardness is known as permanent hardness, which is due to sulfates, chloride, nitrites of calcium and/or magnesium expressed in ppm as CaCO_3 .

Temporary hardness is primarily responsible for scale formation, which results in poor heat transfer resulting in increased cost of energy for refrigeration and air-conditioning. Permanent hardness (non-carbonate) is not a serious factor in water conditioning because it has a solubility which is approximately 70 times greater than the carbonate hardness. In many cases, water may contain as much as 1200 ppm of non-carbonate hardness and not deposit a calcium sulfate scale.

The treated water where hardness as ppm of CaCO_3 is reduced to 50 ppm or below, is recommended for air-conditioning applications.

XVIII) Thermal Transmittance

Thermal transmission through unit area of the given building unit divided by the temperature difference between the air or some other fluid on either side of the building unit in 'steady state' conditions.

XIX) Thermal Energy Storage

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- Storage of 'Cold Energy' sensible, latent or combination for use in central system for air-conditioning or refrigeration is called thermal energy storage. It uses a primary source of refrigeration for cooling and storing 'Cold Energy' for reuse at peak demand or for backup as planned.
- XX) Shade factor
The ratio of instantaneous heat gain through the shading device to that through a plain glass sheet of 3mm thickness.
- XXI) Sensible heat factor (SHF)
Sensible heat factor is the ratio of sensible heat to total heat, where total heat is the sum of sensible and latent heat.
- XXII) Supply Air
The air that has been passed through the conditioning apparatus and taken through the duct system and distributed in the conditioned space is termed as supply air.
- XXIII) Return Air
The air that is collected from the conditioned space and returned to the conditioning equipment is termed as return air.
- XXIV) Re-Circulated Air
The return air that has been passed through the conditioning apparatus before being re-supplied to the space is called re-circulated air.
- XXV) Duct system
A continuous passageway for the transmission of air which in addition to the ducts may include duct fittings, dampers, plenums and grilles & diffusers.
- XXVI) Plenum
An air compartment or chamber to which one or more ducts are connected and which forms part of an distribution system.
- XXVII) Supply and Return Air grilles & Diffusers
Grilles and diffusers are the devices fixed in the air-conditioned space for distribution of conditioned supply air and return of air collected from the conditioned space for recirculation.
- XXVIII) Fire damper
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A closure which consists of a normally held open damper installed in an air distribution system or in a wall or floor assembly and designed to close automatically in the event of a fire in order to maintain the integrity of the fire separation.

XXIX) Smoke damper

A smoke damper is similar to fire damper. However, it closes automatically on sensing presence of smoke in air distribution system or in conditioned space.

XXX) Fire separation wall

The wall provides complete separation of one building from another or part of a building from another part of the same building to prevent any communication of fire of any access or heat transmission to wall itself which may cause or assist in the combustion of materials of the side opposite to that portion which may be on fire.

XXXI) Refrigerant

The fluid used for heat transfer in a refrigerating system, which absorbs heat at a low temperature and low pressure of the fluid and rejects heat at a higher temperature and higher pressure of the fluid, usually involving changes of state of the fluid.

XXXII) Global Warming Potential (GWP)

Global Warming can make our planet and its climate less hospitable and more hostile to human life. It is, therefore, necessary to reduce emission of green house gases such as Co₂, Sox, Nox and refrigerants. The potential of are refrigerant to contribute to Global Warming is called its GWP. Long atmospheric life time of refrigerants results in Global Warming unless the emissions are controlled.

XXXIII) Ozone Depletion Potential (ODP)

The potential of refrigerant or gasses to deplete the Ozone in the atmosphere is called ODP. The ODP values for various refrigerants are as under:-

R-11	1.000
R-12	0.820
R-22	0.034
R-123	0.012

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R-134a

Nil

Due to high OPD of 1, R-22 & R-123 their use in the air conditioning and refrigeration is being phased-out.

APPENDIX-B

LIST OF RELEVANT INDIAN STANDARDS

I.S.3615	Glossary of Terms Used in Refrigeration & Air Conditioning.
I.S.325	Three phase Induction Motors
I.S. 1822	Motor Starters of voltage Not Exceeding 1000 volts
I.S.3624	Bourden Tube Pressure and Vacuum Gauges
I.S.2372	Timber for cooling towers
I.S.7403	Code of practice for selection of standard worm and helical gear boxes
I.S.1620	Horizontal centrifugal pumps for clear, cold, fresh water
I.S.996	Single phase small A.C. and Universal motors

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I.S.1239	Mild steel tubes, tubulars and other wrought steel fittings
I.S.3589	Electrically welded steel pipes for water, gas and sewage,
I.S.6392	Steel pipe flanges
I.S.778	Gun metal gate. globe and check valves for general purpose
I.S.2592	Recommendation for methods of measurement of fluid flow by means plates and nozzles
I.S. 277	Galvanised steel sheets
I.S.737	Wrought aluminium and aluminium alloy sheet and strip for general purposes.
I.S.655	Metal air ducts
I.S. 732	Code of practice for electrical wiring and fittings for building.
I.S.2516	A.C.circuit breakers
I.S.900	Code of practice for installation and maintenance of induction motors
I.S. 1248	Direct acting electrical indicating installments
I.S.2516	A.C. circuit breakers for voltages not exceeding 1000 volts
I.S.4047	Heavy duty air break switches and composite units of air break switches for voltage not exceeding 1000 volts.
I.S.2208	HRC cartridge fuse links upto 650 volts
I.S. 1554	PVC insulated (heavy duty) electric cables for working voltage upto and including (PART I) 1100 volts
I.S.8183	Specification for bonded glass wool/ mineral wool
I.S.4671	Specification for expanded polystyrene for thermal insulation purposes.
I.S.11561	Code of practice for testing of cooling towers.
I.S. 7896	Data for outside design conditions for air conditioning for summer months.
I.S.8148	Packages air conditioners
I.S.2370	Sectional cold rooms (walk-in type)
I.S.5111	Testing of refrigerant compressors
I.S.10594	Thermostatic Expansion Valve

APPENDIX-C

I.S. SAFETY CODES

I.S.660 Safety Code for Mechanical Refrigeration

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I.S.659 Safety Code for air conditioning

I.S.3016 Code of Practice for precautions in welding and cutting operations

I.S.818 Code of practice for safety and health requirements in electrical and gas welding and cutting operations.

I.S.5216 Code for safety procedure and practice in electrical works

I.S.3696 Safety code for scaffolds and ladders

APPENDIX-G
PROFORMA FOR RESU & NOTES ON TEST INSTRUMENTS AND CAPACITY COMPUTATIONS

S.NO.	ITEM	TEST RESULTS		
	Ambient Conditions	D.B Temp.		-deg C
		W.B Temp		-deg C
		%RH		
	Compressors	R.P.M		
		Suction Pressure		-Kg/Sq.cm
		Discharge pressure		-Kg/Sq.cm
		Oil pressure		-Kg/Sq.cm

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	Compressor Motors	R.P.M		
		Voltage		-Volts
		Current		
		(i)at 100% load		-amps
		(ii)at partial load		
		(a)		-amps
		(b)		-amps
		(c)		-amps
	Water Chiller	Water flow rate		-LPM
		Water temperature		
		(i)Entering		-deg C
		(ii)Leaving		-deg C
		Water pressure		
		(i)Entering		-Kg/Sq.cm
		(ii)Leaving		-Kg/Sq.cm
	Condensers	Water flow rate		-LPM
		Water temperature		
		(i)Entering		-deg C
		(ii)Leaving		-deg C
		Water pressure		
		(i)Entering		-Kg/Sq.cm
		(ii)Leaving		-Kg/Sq.cm
	Pumps	R.P.M		
		Motor current		-amps
		Suction Pressure		-Kg/Sq.cm
		Discharge pressure		-Kg/Sq.cm
	Cooling Towers	Water temperature		
		(i)Entering		-deg C
		(ii)Leaving		-deg C
		Wet bulb approach		-deg C
		Fan motor current		-amps
		Fan motor voltage		-Volts
		Fan motor R.P.M		
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	Air Handling Units	Total air quantity		
		Across coil		- Cu.m/min
		Coil face area		-sq.m
		Air temperature		
		(i) Entering(D.B)		-deg C
		(ii) Entering(W.B)		-deg C
		(iii) Leaving(D.B)		-deg C
		(iv) Leaving(W.B)		-deg C
		Water pressure		
		(i) Entering		-Kg/Sq.cm
		(ii) Leaving		-Kg/Sq.cm
		Water flow rate		-LPM
		Water temperature		
		(i) Entering		-deg C
		(ii) Leaving		-deg C
	Fresh Air intakes	Face area		-sq.m
		Air quantity		- Cu.m/min
	Room Conditions At The Working Plane (No. of Readings Should Be Taken And Average Out)	Temperature		
		D.B		-deg C
		W.B		-deg C
	Controls	FUNCTION OF EACH CONTROL SHALL BE TESTED AND REPORT FURNISHED		

NOTES

A. TEST INSTRUMENTS

1. All instruments for testing shall be provided by the air conditioning contractor.
2. Thermometers used for measurement of temperature of *water* / refrigerant shall have graduation of 0.1 deg C and shall be got calibrated from N.P.L. or any recognised test house before hand.

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3. Thermometers used in the psychrometers shall have graduations of 0.2 deg C and shall be calibrated as at (2) above.
 4. Pressure gauges shall also be got calibrated before hand from a recognised test house.
 5. Orifice type of flow meters shall be used for measuring flow rate through the condensers and chillers.

B. CAPACITY COMPUTATIONS

1. Condensing unit:
The capacity shall be computed from the water temperatures and water flow rate measurements of the condenser water and the compressor motor current readings. A reference may be made, if necessary to the manufacturer's motor performance characteristics for arriving at the B.H.P. consumption.
2. Water chilling unit:
The capacity shall be computed from the water temperature and water flow rate measurements of the chiller. Heat rejection from the condenser shall be computed from the water temperature and water flow rate measurements at the condenser.
3. Cooling Tower:
Water quantity measured at the condenser and the temperature of water at the cooling tower shall be recorded. Wet bulb approach shall be checked against design data recorded in the tender documents.
4. Air handling unit (chilled water type):
The capacity shall be computed from the water temperature and water flow measurement A tolerance of + 5% from the tender documents value shall be acceptable in the capacity so computed. Air quantity shall be measured in the supply duct and checked with the quantity specified in the tender documents. a tolerance of $\pm 10\%$ in the air quantity shall be acceptable. The enthalpy difference of air entering and leaving the coil shall be computed from air temperature and recorded.
5. Air handling unit (Dx type);
The capacity shall computed from the air quantity measured in the supply air duct and the enthalpy difference between the air entering leaving coil. Air quantity measured shall be checked with that recorded in the tender documents. A tolerance of $\pm 10\%$ from tender documents value shall be acceptable.

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6. For the purpose of system capacity, the refrigeration tonnage obtained from the main refrigeration plant will be accepted.
 7. If due to any reason, internal load mentioned in the tender specifications is not available psychrometric computations for actual load conditions will, be done and the plant, if found satisfactory will be accepted.

APPENDIX-H **MAINTENANCE**

The section covers the maintenance schedule during warranty period.

The maintenance provided during the warranty period shall be fully comprehensive and shall include but not limited to all equipments, labour part and emergency calls providing and site response within 24 hours. However during the maintenance period after the warranty is

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over, the materials shall be arranged by the department if any replacement is warranted.

The maintenance shall also include a minimum of 12 monthly preventive maintenance visits by qualified personnel who are thoroughly familiar with the type of equipment and system provided for this project.

CHILLER	MONTHLY INSPECTIO AND SERVICE	1) Check refrigerant level, leak test with electronic leak detector. If abnormal, trace and rectify as necessary inform department in writing on the rectification. 2) Inspect level and condition of oil. If abnormal, trace fault and rectify as necessary. Inform department in writing on the rectification. 3) Check the liquid line sight glasses for proper flow 4) Check all operating temperature and pressure. 5) Inspect and adjust, if required, all operating safety controls. 6) Check capacity control, adjust if necessary. 7) Lubricate vane/linkage/bearings. 8) Visually inspect machines and associated components, and listen for unusual sound or noise for evidence of unusual conditions. 9) Check lock bolts and chiller spring mount. 10) Review daily operating log maintained by departments' personnel. 11) Providing written report to department, outlining services carried, adjustment made, rectification carried out and if the deficiency is of major nature, arrange with department for shut-down to rectify equipment.

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CHILLER	ANNUAL INSPECTION PRIOR TO EXPIRY OF WARRANTY PERIOD	1) Perform all functions for monthly check. 2) Check all flanges for tightness. 3) Change oil in oil sump. 4) Replace filter. 5) Check oil temperature control. 6) Check motor terminals. 7) Check connections in starter.
		Please note that oil filter gasket replacement shall deem to be included in the contract. 1) Check motor earthing, megger motor and connection wiring on each leg. 2) Check motor temperature cut-out, tighten motor terminals. 3) Check starter contacts, arc shield, transformer. 4) Check dashpot oil, clean dashpot and replace oil when necessary. 5) Test and calibrate over-load settings. 6) Inspect, calibrate and adjust to original specifications all gauges, safety and operating controls including low temperature and high pressure cut-outs, oil pressure switch, load limit relay and electrical interlocks. 7) For water cooled condenser systems, inspect condenser tubes for fouling. If fouling exceeds original specifications, the contractor shall carry out the cleaning of the tubes at his own expense. 8) For air-cooled condenser coils, dust should not be slowed to accommodate on the condenser coil surfaces. Cleaning should be as often as necessary (approx. every

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		three months) to keep coils clean. Exercise care when cleaning coil, so that the coil fins are not damaged. Under no condition this unit be cleaned with acid based cleaner.

WATER PUMPS	MONTHLY INSPECTION	1) Inspect all water pumps. 2) Check all seals, glands and pipelines for leaks and rectify as necessary. 3) Re-pack and adjust pump glands as necessary. 4) Check all pump bearings and lubricate with oil or grease as necessary. 5) Check the alignment and condition of all rubber couplings between pumps and drive motors and rectify as necessary. 6) Check all bolts and nuts for tightness and rectify as necessary.
WATER PUMPS	ANNUAL INSPECTION PRIOR TO EXPIRY OF WARRANTY PERIOD	1) Perform all functions for monthly check. 2) Check motor earthing, megger motor and connection wiring on each leg. 3) Tighten motor terminals. 4) Check starter contacts. 5) Test and calibrate over-load settings.
EXPANSION TANK	ANNUAL INSPECTION PRIOR TO	1) Inspect expansion tank, drain, clean and flush out tanks as necessary.

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	EXPIRY OF WARRANTY PERIOD	
AIR HANDLING UNITS AND FAN COIL UNITS	MONTHLY INSPECTION	1) Inspect all air handling and fan coil units. 2) Check all air filters and clean or change filters as necessary. 3) Check all water coils, seals and pipelines for leaks and rectify as necessary. 4) Check and re-calibrate modulating valves and control. Adjust and rectify as necessary to ensure compliance with the original specifications. 5) Purge air from all water coils. 6) Check all fan bearings and lubricate with grease as necessary. 7) Check the tension of belt drives and adjust as necessary. 8) Check and clean all condensate pans, trays and drains. 9) Check, measure and recalibrate all sensors if necessary. 10) Check, clean and service all smoke detectors. Carry out a system test to ensure that the smoke detector will trip the AHU's. 11) Check all spring vibration isolators for abnormal vibration. Rectify as necessary. 12) Coil to be cleaned by a) Spray of high press. clean water(not exceeding 30 psi) b) With chemical spray ,if necessary.
AIR HANDLING UNITS AND FAN COIL UNITS	ANNUAL INSPECTION PRIOR TO EXPIRY OF WARRANTY PERIOD	1) Perform all functions for monthly check. 2) Tighten motor terminals. 3) Check starter contacts. 4) Test and calibrate over-load settings.

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AIR COOLED PACKAGED UNITS AND PRECISION COMPUTER AIR CONDITION EQUIPMENTS	MONTHLY CHECK	1) Check condenser fan motor load ampere. 2) Check fan and motor mounting brackets. 3) Check shafts and bearings. Lubricate with grease if necessary. 4) Check the tension of all belt drives adjust if necessary. 5) Check refrigerant leak with electronic leak detector. 6) Check electrical terminals and contactors operations and connections for tightness. 7) Check compressor motor current. 8) Check refrigerant line driers and moisture indicators.
AIR COOLED PACKAGED UNITS AND PRECISION COMPUTER AIR CONDITION EQUIPMENTS	ANNUAL INSPECTION PRIOR TO EXPIRY OF WARRANTY PERIOD	Perform all functions listed in the monthly check.

AIR DISTRIBUTIO N SYSTEM	MONTHLY AND ANNUAL INSPECTION PRIOR TO EXPIRY OF WARRANTY PERIOD	1) Check operations of all modulating and fixed dampers controlling air flow through unit. Lubricate all damper bearing and linkages as necessary. 2) Carry out space temperature checks on air conditioned areas with thermo hydrographs. Balance air flow as necessary to compliance with

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		requirement of original specifications. These checks include the calibration of sensors, thermostat, etc. 3) Check noise level of discharged air from diffusers.
VENTILATION	MONTHLY CHECK AND ANNUAL INSPECTION PRIOR TO EXPIRY OF WARRANTY PERIOD	1) Check, adjust as necessary the air flow of all fans are in compliance with the original specification. 2) Check the tension of all belt drives and adjust as necessary. 3) Check and lubricate all fan bearings. 4) Tighten motor terminals. 5) Check starter contacts. 6) Test and calibrate over-load settings. 7) A system check shall be carried out for all mechanical ventilation (MV), pressurization and exhaust system to verify the performance of the system.
SWITCH BOARD	SIX-MONTHLY AND ANNUAL INSPECTION PRIOR TO EXPIRY OF WARRANTY PERIOD	1) Clean and adjust all switch gear, contactors, relays and associated electrical equipments at intervals not exceeding six months. 2) Check and prove operation of thermal over-load and protection devices. 3) Check and ensure tightness of all equipment fastenings and cable terminations within switch boards. 4) Vacuum clean all switch board cubicles.
PIPING SYSTEM	MONTHLY AND ANNUAL INSPECTION PRIOR TO EXPIRY OF WARRANTY PERIOD	1) Check all piping system for leaks and repairs these where they have occurred. 2) Check for damages and deterioration of insulation or sheathings. Rectify as necessary.

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	CONSUMABLE MATERIALS	CONSUMABLE MATERIALS The department shall supply the following consumable materials as and when required:- 1) The oils and grease required for lubrication of compressors, fan bearings, motors bearings, pivots and other moving parts. 2) All refrigerant required for topping up. Refrigerant loss if due to manufacturing defect or due to negligence shall be made good by the contractor. 3) All consumable filter elements/rolls. 4) All chemical for the correct chemical treatment of the cooling tower and chilled water system. 5) All carbon brushes required to replace worn brushes in electric motors. 6) All electric contact points required to replace worn electric contact points in switchgears, motor starter gears, electronic control gears and electric relays. 7) All electric fuses required to replace blown fuses. Just before the expiry of the warranty of the contact, the contractor shall carry out a complete system operability test on all the system or sub systems as called for in the contract. The purpose of the test is to verify that the performance of all the systems or sub-systems in the contract is in accordance to the specifications. All test shall be carried out in the presence of the Engineer-in-charge or his representative. The warranty period is deemed to be over if the department or his representative is completely satisfied with the system performance during the test.

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END OF HVAC SPECIFICATIONS

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LIFT TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

LIFT MACHINE AND CONTROLLER

ASSOCIATED ELECTRICAL WORKS

MAINTENANCE SERVICES

TESTING OF LIFT INSTALLATION

PROVISION FOR THE DISABLED AND HANDICAPPED

TECHNICAL PARAMETERS

SCHEDULE OF QUANTITIES

1. STANDARDS

The following Indian Standard Specifications and Codes of Practice, currently applicable and updated as of date irrespective of dates given below, shall apply to the equipments and the work covered by this contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable

1.	Code of Practice for installation, operation and maintenance of electric passenger & goods lifts.	IS-14665 (Part 2) Sec-1 : 2000
2.	Code of practice for installation, operation and maintenance of electric service lift.	IS-14665 (Part 2) Sec-2 : 2000 IS-14665 (Part 3)
3.	Safety Rules Section-1 Passenger and Good lifts	Sec-1 : 2000
4.	Safety Rules Section-2 - Service Lifts	IS-14665 (Part 3) Sec-2 : 2000
5.	Outline dimension for electric lifts.	IS-14665 (Part-1) : 2000
6.	Inspection Manual for Electric Lifts	IS-14665 (Part 5) : 1999
7.	Electric Traction Lifts - Components	IS-14665 (Part 4) Sec-1 to 9 : 2001 IS 15330 :2003
8.	Installation And Maintenance of Lifts For Handicapped Persons (Code of Practice)	

9.	Specification for lifts cables.	IS-4289 (Par-1) : 1984 Reaffirmed 1991
10.	Specification for hot rolled and slit steel tee bars.	IS-1173-1978 Reaffirmed 1987
11.	Method of loading rating of worm gear.	IS-7443-1974 Reaffirmed 1991
12.	Code of practice for selection of standard worn and helical gear box.	IS-7403-1974 Reaffirmed 1991
13.	Isometrics screw threads.	IS-4218-(Part-II)1976 Reaffirmed 1996
14.	Degree of protection provided by enclosure for low voltage switchgear and control gear.	IS-2147-1962 IS-1271-1985 Reaffirmed 1990
15.	Classification of insulating materials for electrical machinery and apparatus in relation to their thermal stability in service.	
16.	Code of practice for earthing.	IS-3043-1987
17.	Electrical installation Fire Safety of Building.	IS-1646-1997
18.	PVC insulated electric cable for working voltage upto and including 1100 volts.	IS-694- 1990 IS- 732-1989
19.	Code of practice for electrical wiring and installation	IS-1554-1988 (Part-1)
20.	PVC insulated (Heavy Duty) electric cables for working voltage upto and including 1100 volts.	
21.	Flexible steel conduits	IS-3480-1966
22.	Accessories for rigid steel conduit for electrical wiring	IS-3837-1976
23.	Boxes for the enclosure of electrical accessories	IS-5133-1969 (Part 1)

24	Guide for safety procedures and practices in electrical work.	IS-5216-1982 (Part-1)
25.	Conductors for insulated electric cables and flexible cordes	IS-8130-1984
26.	Miniature Circuit Breakers	IS-8828-1996
27.	Rigid steel conduits for electrical wiring (Second revisions)	IS-9537-1981
28	Methods of test for cables	IS-10810-1998
29.	Earth Leakage Circuit Breakers.	IS-12640-1988
30.	Moulded Case Circuit Breakers	IS-13947-1993
31.	General requirement for switchgear and control gear for voltage not exceeding 1000 volts.	IS-13947-1993
32.	1100 volt grade XLPE insulated armoured cables	IS 7098
33.	Specifications for hoistway door-locks	IS 7754-1975
34.	Rules for design, installation, testing and operation of lifts, escalators and moving parts.	IS 1735-1975

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In addition the relevant clauses of the following, as amended upto date shall apply.

- The Indian Electricity Rules 1956
- The Indian Electricity Act 1910
- Bombay Lift Act 1939
- Delhi Lift Rules
- Fire safety regulations pertaining to lifts

The tenderers shall also take into account local and State regulations as in vogue for the design and installation of lifts.

Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable. BIS certified equipment shall be used as a part of the Contract.

2. ELECTRIC SUPPLY

The available system of electric supply is 415 volts +10% -20%, -3 phase 4 wire AC 50 Hz system and 240 volts between phase and neutral. Any equipment /component operating at other than the above mentioned power supply shall be provided with necessary transformers/voltage stabilizers. The amount of power required for lifts shall be indicated in the tender. Power shall be provided at one point to be indicated by the tenderer. All subsequent electrical systems shall be deemed to be included in the scope of this contract.

3. TECHNICAL PARAMETERS

Technical parameters given in Annexure -I give requirement of passenger, Service & Goods lifts. Tenderers shall fill in their item wise confirmation/comments in the column provided for the purpose in this annexure. Deviations, if any, from tender requirements shall be clearly brought out in this annexure, failing which it shall be presumed that the offer conforms to the tender requirements fully. Tenders in which Annexure- I is not duly filled in by the tenderers are liable to be summarily rejected.

4. BMS COMPATIBILITY

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All the elevators shall be hooked on to BMS. Necessary potential free contacts to be provided in the electrical system control panels. Elevator supplier shall be required to coordinate with BMS vendor for software compatibility between BMS & elevator system.

MACHINE ROOM AND MACHINE ROOM LESS LIFTS LIFT MACHINE AND CONTROLLER

1. GENERAL REQUIREMENTS

The Elevators shall include all elements confirming to specifications or as amended herein. Elevators covered by these specifications shall be provided, installed, tested, commissioned, certified and approved as per statutory requirements of Lift Inspectorate.

Each Elevator shall have its own driving machine. The method of drive shall be Electric Traction with Gear less motor having VVVF Control.

The design of the Elevators shall take into consideration fire prevention, elimination of dust and dirt traps, and easy accessibility for cleaning and routine maintenance.

2. ELECTRIC TRACTION DRIVE SYSTEM

2.1 Traction Machine

The construction of all Elevator machines shall conform with IS-14665

2.2 Motor (Machine Room Less Lifts)

- a) Driving motor shall be of the AC Permanent magnet synchronous/asynchronous axial type designed for special duty cycles required for Elevator operation with no slip rings. It should have a high starting torque, high power factor, high efficiency and low energy consumption.
- b) The motor shall be capable of not less than 180 starts per hour without excessive temperature rise.
- c) The maximum temperature rise of the winding shall not exceed 50 °C above ambient temperature when operated under normal condition.

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- d) The motor shall carry a nameplate giving full details of its ratings and characteristics.
- e) The motor used shall have Class F insulation and shall be designed for 110% of rated load.

2.3 Brake

- a) The Electro-magnetic brake with non-asbestos lining shall be spring applied and electrically released type having noiseless operation.
- b) The brake shall be capable of stopping and holding the Elevator car in its downward travel to rest with 125% of its rated load from the maximum governor tripping speed. In this condition the retardation of the Car shall not exceed that resulting from the operation of the Safety gear or stopping on the buffer.
- c) Springs used to apply the brake shoes (two nos.) shall be in compression and adequately supported.
- d) Brake linings shall be of renewable incombustible materials and shall be secured to the brake shoes such that normal wear shall not weaken their fixings. Band brakes shall not be used.
- e) No earth fault, short circuit or residual magnetism shall prevent the brake from being applied in the event of loss of power supply to the Elevator motor and control circuit.
- f) A means of adjusting the brake plunger stroke and releasing the brake in emergency shall be provided.
- g) The Elevator machine shall be fitted with a manual emergency device capable of having the brake released by hand and requiring a constant effort to keep the brake open.
- h) The fail safe break shall incorporate an approved design of brake switch i.e. pick up, hold, discharge. Brake coil shall be wired in series & their respective switches in parallel. The operation of brake shall be thyristor controlled from solid state drive in order to effect minimum pick up time and synchronized start.

2.4 Driving Mechanism

2.4.1 Lift Machine

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The lift machine shall be suitable for 415 volt 3 phase 50 Hz AC supply with a voltage variation of +10% and - 20% and shall be placed directly above the hoist way on steel beams resting on machine room floor slab.

The lift machine shall have high efficiency and low power consumption and shall be designed to withstand peak currents in lift duties.

Means for manual operation of the lift car shall be made by providing winding wheel suitably marked to indicate the direction of the movement to enable the lift car to be brought to the nearest landing. There shall be a warning display for switching off electrical supply before the manual operations.

2.5 Driving Sheaves

- a) The sheaves shall be manufactured in steel or SG iron and fitted with sealed for life lubricated bearings.
- b) The sheaves shall have machined rope grooves that can be reworked for future wear.
- c) Adequate provision shall be made to prevent any suspension ropes leaving groove due to rope slack or introduction of foreign objects.

2.6 Alignment

- a) The brake plunger, collar, sleeve, motor, sheaves and all bearings shall be mounted and assembled so that proper alignment of these parts is maintained.
- b) The assembly shall be reviewed and rectified when excessive noise is emitted during operation.

2.7 Gearless Machines

The gearless machine shall consist of a motor traction sheave and brake drum or brake disc completely aligned on a single shaft. Gearless machine shall be AC gearless with VVVF drive.

2.8 Anti-Vibration Supports

The whole traction machine shall be mounted on appropriate anti-vibration supports to minimize noise and vibration.

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3. CONTROL SYSTEMS

3.1 Description

The Lifts shall have state of art microprocessor based AC variable voltage variable frequency (ACVVVF) drive. Single lifts shall be provided with directional collective control for one car, two cars and 5 cars (also called simplex, duplex full collective control and automatic group supervisory control). The control system shall regulate dispatching of individual cars and shall provide service to all floors as different traffic conditions arise minimizing unproductive factors. The system shall respond automatically to UP and DOWN peak, balanced or light traffic etc. Some of the technical parameters required are innumerate below.

a)	Starting current	1.2 - 1.5 times full load
	running current	
b)	Power saving	50 - 55%
c)	Leveling accuracy	± 3 mm (passenger/service lifts) & ± 5 mm (Freight lift)
d)	Acceptable voltage fluctuation	+10 to - 20%
e)	Rate of acceleration/deceleration (M/S ²)	0.6 - 1.5 (Adjustable at site)
f)	Maximum jerk (M/S ³)	0.7 - 1.5 (Adjustable at site)
g)	Maximum vibration in car horizontal/ vertical	20/18 dBA
h)	Maximum noise level in car during travel	45 dBA
i)	Maximum door noise level while closing and opening at a distance of 1 mtr from car door	52dBA

The controller shall be mounted on the side of the top of lift shaft, vertical, totally enclosed cubicle type with hinged doors on the front provide easy access to all components in the controller. Cubicle shall be well ventilated such that the temperature inside never exceeds the safe limits of the components at ambient room conditions.

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The controller shall operate within the supply voltage variation of plus 10% to minus 10% of the nominal voltage.

The Controller shall be include protection against the following abnormalities and shall cut off the power supply, apply the brake and bring the car to a rest in the event of any of the abnormalities occurring.

- a) Over current
- b) Under voltage
- c) Overvoltage
- d) Single phasing
- e) Phase reversal
- f) Earth leakage

3.2 Features

Control system features are detailed as below.

Attendant Operation

All lifts shall be provided with attendant control facilities.

A key switch for change of operation mode shall be provided in a lockable recess panel on the car operation panel. After gaining control on the lift, the attendant can direct the car to stop at any storey. The attendant can also by pass the landing calls (but not cancel them) or reverse the direction of traveling.

- Automatic By-pass

Load weighing devices located either on car top or under the car cage shall be provided for all lifts. Whenever the load exceed 60-70% of the capacity load of the lifts, the lifts shall ignore all landing calls and only respond to car calls.

- Over load device

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A load weighing devices shall operate when the load in the car exceeds the rated capacity. The operation of the device shall activate buzzer sound and flashing 'overload' signals. At the same time the car doors shall be prevented from closing. When the excess load has been removed from the car, the buzzer alarm shall be muted automatically and the car shall function normally. The sensitivity shall be 30 kg for Passenger lifts and 5% of the contract load for service lifts.

- Automatic self-leveling

All lifts shall be provided with automatic self-leveling feature that shall bring the lift car level to within ± 3 mm for passenger/service elevators and ± 5 mm for freight elevators of the landing floor regardless of load or direction of travel. The automatic self leveling feature shall correct for over travel and rope stretch.

3.3 Automatic Rescue Device

The ARD shall have the following specifications.

- a) ARD should move the elevator to the nearest landing in case of power failure during normal operation of elevator.
- b) ARD should monitor the normal power supply in the main controller and shall activate rescue operation within 10 seconds of normal power supply failure. It should bring the elevator to the nearest floor at a slower speed than the normal run. While proceeding to the nearest floor the elevator will detect the zone and stop. After the elevator has stopped, it automatically opens the doors and parks with door open. After the operation is completed by the ARD the elevator is automatically switched over to normal operation as soon as normal power supply resumes.
- c) In case the normal supply resumes during ARD in operation the elevator will continue to run in ARD mode until it reaches the nearest landing and the doors are fully opened. If normal power supply resumes when the elevator is at the landing, it will automatically be switched to normal power operation.
- d) All the lift safeties shall remain active during the ARD mode of operation

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- e) The battery capacity should be adequate so as to operate the ARD at least seven times a day provided the duration between usage is at least 30 minute.

1 CAR ENCLOSURES

1.1 General Requirements

- Frame

Every lift car body shall be carried in a steel car frame assembly which shall have sufficient mechanical strength to resist the forces applied by the safety gear or impact of the car on the buffers. The deflection of the steel members carrying the platform shall not exceed 1/1000 of their span under static conditions when the rated load is evenly distributed on the platform

At least four renewable guide shoes or shoes with renewable linings or sets of guides rollers shall be provided two at the top and two at the top and two at the bottom of the car frame assembly.

- Enclosure finishes

The following are to be provided.

- Alarm System: An emergency alarm buzzer, including wiring shall be provided and connected to a plainly marked push button in the car operating panel. The alarm bell shall be located in central security room. The alarm unit shall be solid-state siren type, to give a waxing and waning siren when the alarm button in the car is pressed momentarily. Built in 3 way intercom system with telephone instrument in the car, reception and security, (as directed by Owners/Architect) including wiring telephone instrument and associated EPABX shall be provided.
- Sealed Maintenance Free Nickel Cadmium Batteries capable of maintaining the following in each lift for 2 hrs after mains failure.
 - Emergency light of adequate illumination in car
 - Car Ventilation
 - Intercommunication System
 - Alarm bell

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- One no. 16 amp switch socket outlet to IP 54 and a permanent weatherproof type luminaries to IP54 (with lighting switch) adequately protected shall be provided on the top of the lift car for maintenance
- One no.16 amp switch socket outlet to IP 54 at bottom of lift car for maintenance

1.2 Operation Panel

A full length car operating panel incorporating following control/indications shall be provided in each lift on the return panel

- LED Illuminated touch push buttons of micro pressure type corresponding to the floors served
- Door open and door close button
- Emergency stop button with Alarm
- Two position key operated switch for 'with attendant' and 'without attendant' operation.
- Ventilation fan ON/OFF switch with auto OFF when there is no call after 120 seconds (Two Speed & concealed vents).
- Built in intercom of the hands free type as well as space for providing EPABX telephone instrument and 5 pair telephone trailing cable to communicate from car to Two Locations i.e. Operator's Room (at remote location) & Security Guard Room and vice-versa.
- Dynamic car direction display
- Car position indicator (digital)
- Audio/Visual overload warning indicator
- In order to have at least one device of communication functioning at all the times, as an alternative arrangement, it is recommended that the provision of both i.e. telephone with minimum connections-one at the operator's room and other at guard room and the emergency signal with re-chargeable batteries as source of supply be made in the lift cars.
- The device used for emergency signals should incorporate a feature that gives a immediate feed back to the car passengers that the device has worked properly and the signal has been passed on to the intended agency.
- Digital voice synthesizer (Optional) for announcing special messages with background music.

1.3 Landing fixture

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The landing fixtures shall be recess mounted on a base junction box in the wall by the side or on top of landing doors as required.

Each landing fixtures shall consist of micro touch type landing call buttons with illuminated call acknowledge signal and illuminated digital type car position indicators on separate stainless steel face panels with hairline finish. Alternatives as available with bidders shall be indicated in tender for owners approval.

The following landing fixtures shall be provided for each lift.

- a) Lowest floor
 - Up call button
 - Digital car position indicators
 - Travel direction indicators
 - "In use" indicator to signify the lift door is opened for delivery at a certain landing
- b) All floors other than lowest and top most floor
 - Button up and down call buttons
 - Travel direction indicators
 - Digital car position indicators with Gong (Optional)
 - "In use" indicators to signify the lift door is opened for delivery at a certain landing
 - Manual by pass key switch for lift landings.
- c) The top most floor
 - Down call button
 - Travel direction indicators
 - Digital car position indicators with Gong (Optional)
 - "In use" indicators to signify the lift door is opened for delivery at a certain landing
 - Manual by pass key switch for lift landings.

12 V 20 W tungsten halogen spotlights shall be supplied and installed on the underside of the hall lanterns. The spot lights on a particular floor shall be lit up to signify the arrival of the corresponding lifts. These spotlights shall be switched off after the corresponding lifts have left that particular floor. For passenger cars, the spotlights on the parking floor shall be turned off after a present period adjustable from 15 to 150 sec. Should a call from the parking floor be registered, spotlight of the assigned parking car shall be switched on again

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together with the opening of the landing doors to attend the call

2. CAR AND LANDING DOORS

2.1 General requirements

All car doors shall extend to the full height and width of landing opening unless otherwise specified and shall be operated with variable frequency door operator. A similar imperforate door shall be provided for every landing opening in the lift hoistway enclosure. The top track of the landing and car doors shall not obstruct the entrance to the lift cars. All car and landing doors shall have a fire resistance of not less than 1 hour.

In addition, all the car and landing doors shall meet the following general requirements.

a) Car door locking devices

Every car door shall be provided with an electrical switch to prevent the lift car from being started or kept in motion unless the car door is closed. A mechanical locking device shall also be provided to prevent door opening from inside the car whilst the car is in motion.

b) Landing door locking devices

Every landing door shall be provided with a mechanical locking device to prevent opening of the door from the landing side in normal cases unless the lift car is in that particular landing zone.

c) Projections and recesses

Sliding car and landing doors shall be guided on door tracks and sills for the full travel of the doors. The distance between the cars and the landing sills shall not exceed 35 mm.

d) Door locking devices

All doors locking devices, door switches and associated actuating rods, levers or contracts, shall be inaccessible from the landing or the car.

e) Protective devices

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Protective devices shall be fitted to the leading edges of both car door panels. It shall automatically initiate reopening of the door in the event of a passenger being struck (or about to be struck) by the door in crossing the entrance during the closing movement. The obstruction of either leading edge when closing shall actuate the protective device to function.

f) "Door open" alarm

"Door open" alarm shall be provided in the car to initiate alarm and a continuous buzzer if a car or landing door has been mechanically kept open for a present period. The period shall be adjustable from 0-10 minute.

g) Emergency landing door unlocking devices and key

- Every landing door shall be provided with an emergency landing door unlocking device. When operated by an authorized person with the aid of a key to fit the unlocking triangle, the landing door shall be unlocked irrespective of the position of the lift car for rescue purpose. When there is no "unlocking" action, the key shall only be able to stay in the locked position.
- In the case of coupled car and landing doors, the landing doors shall be automatically closed by means of weight or springs when the car is outside the unlocking zone.

2.2 Door Hangers and Tracks

The car and the landing doors shall be provided with two point suspension sheave type hangers complete with tracks. Sheaves and rollers shall be steel with moulded nylon collar and shall include shielded ball bearings. Tracks shall be of suitable steel section with smooth surface. The landing doors shall be complete with headers, sills, frames etc. as required.

2.3 Lift Door Protection

Multiple-Infra red door protection and mechanical shoes shall be provided for all lift to control door movement which shall cover the entire door opening effectively.

2.4 Protective Hand Rail in the Car (Optional as this will depend on

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interior design)

2.5 CABIN FAN

A noiseless pressure fan (two speed and concealed vent) shall be provided in the lift cabin.

3. HOIST ROPES

Hoist way material shall be non-flammable (02 hrs fire rated) except travelling cables which shall be flame resistant.

Lift Ropes – IS 14665 (Part 4 / Sec 8)-2001

Round strand steel wires ropes made from steel wire ropes having a tensile strength not less than 12.5 tonnes/cm² and of good flexibility shall be used for lift. Lubrications between the strands shall be achieved by providing impregnated hemp core. The lift ropes shall conform to IS 14665-(Part-4- Sec. 8):2001 and the following factor of safety shall be adhered to. The minimum diameter of rope for cars and counter weight of passenger and goods lift shall be 8mm.

Rope speed of Passenger & Passenger cum Goods Lifts (Service Lift) (m/s)	Factor of safeties
0.5 or less	8
exceeding 0.5 to 1.0	8.6
exceeding 1.0 to 2.0	10
exceeding 2.0 to 3.5	11
exceeding 3.5	12

Rope fastenings

The ends of lift ropes shall be properly secured to the car and counter weight hitch plates as the case may be with adjustable rope shackles having individual tapers babbitt sockets, or any other suitable arrangement. Each lift rope shackle shall be fitted with a suitable shackle spring, seat washer, shackle nut & lock & shackle nut split pin.

Guards for Lift Ropes

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Where lift ropes run round a sheave or sheaves on the car and/ or counterweight of geared/ gearless machine suitable guards shall be provided to prevent injury to maintenance personnel.

Number & Size of Ropes

The contractor must indicate the number and size of lift ropes and governor ropes proposed to be used, their origin, type, ultimate strength and factor of safety. The contractor should furnish certificate or ropes from the rope manufacturers issued by competent authority.

4. COUNTER WEIGHT

The counter weight for lift cars shall be in accordance with clause 6 of IS 14665 (Part 4-Sec-3) : 2001 and shall be designed to balance the weight of empty lift car plus approximately 50 percent of the rated load. It shall consist of cast sections firmly secured in relative movement by at least two numbers steel tie rods having lock nuts/split pins at each end and passing through each section and Housed in a rigid steel frame work. Cracked and broken sub weights shall not be accepted. Counter weight for passenger lifts should be able to accommodate approx 350 kg weight Interior finishes. In case interior finishes material exceeds this provision, then the elevator contractor shall adjust the Counter Weight accordingly, however this will be decided and intimated much before the delivery of the elevators.

Counter Weight Guards

Guards of wire metal / mesh shall be provided in the lift pit to a suitable height above the pit floor to eliminate the possibility of injuries to the maintenance personnel.

5. GUIDES / Guide Rails

Car and counterweight guide shall be machined T section as per relevant Indian Standards IS-14665 of 2000 revised up to date. The guides shall be capable of withstanding forces resulting from the application of

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the car or counter weight safety devices The guide rails shall be minimum 16mm Tongued & Grooved type.

6. TRAILING CABLES

A single trailing cable for lighting control and signal circuit is permitted, if all the conductors of this trailing cables are insulated for maximum voltage running through any one conductor of this cable. The lengths of the cables shall be adequate to prevent any strain due to movement of the car. All cables shall be properly tagged by metallic / plastic tags for identification. Cable jacket should be suitable for immersion in water, salt water & oil etc.

Trailing cables shall run from a junction box on the top of the car to a junction box located in the shaft bear mid point of travel and from these junction boxes conductors shall be run to the various locations.

Trailing cables exceeding 30 meters in length shall run so that the strain on individual cable conductors will be reduced to a minimum and the cables are free from contact with the car counterweight, shaft walls or other equipment.

Trailing cables exceeding 30 meters in length shall have steel supporting fillers and shall be suspended directly by them without rubbing over other supports. Cables less than 30 meters in length shall have no – metallic fillers and shall be suspended by looping cables around supports of porcelain spools type or equivalent. 5 percent of the total capacity subject to a minimum of 5 wires shall be available unutilised in the trailing cable everywhere suitable distributed between various functions.

7. SAFETY DEVICES

Safety devices shall be capable of operating only in the downward direction and stopping fully loaded car, at the tripping speed of the over speed governor, even if the suspension devices break, by gripping the guides, and holding the car there. Governor sheave in elevator pit shall be enclosed in a wire cage to a height of 2.40 mtr. All safety devises statutorily required by Lift Inspector,

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including but not restricted to the following shall be provided.

- Terminal slow down switches

These shall be provided and installed to slow down the lift car when approaching the top and bottom landings. The slow down switches shall act independently from the normal car operating device.

- Over travel limit switches

These shall be provided and installed to stop the car within the top and bottom clearance, independent of the normal car operating device. The bottom over travel limit switch shall become operative when the bottom of the car touches the buffer.

When the over travel limit switches are operative, it shall be impossible to operate the car until the car has been hand would to a position within the normal travel limits.

- Pit Switch

An emergency stop switch shall be located in the pit which when operated shall stop the car regardless of the position of hoist way.

- Terminal Buffers

Suitable spring buffers mounted on RCC foundation blocks shall be provided in the pit in compliance with ANSI/ASME/CENEN-81 /JIS codes for stopping the car in case of mal-operation. Dowels for the purpose shall be left while casting the pit floor alternatively floor reinforcement could be exposed by chipping for welding additional reinforcement for Dowels. However clearance from underside of the car resting on a fully compressed buffer shall not be less than 1.20 mtr. Buffers shall be designed for a design speed + 15%. Oil buffers shall be provided for the passenger elevators for speed of more than

1.75 mps and spring buffers for lower speed.

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- Interlocking

Adequate interlocking is to be provided so that the car shall not move if the landing doors are even partially open and also the lift is overloaded.

- Over speed governor

Over speed governor shall be of centrifugal type and shall operate the safety gear at a speed at least equal to 115% of the rate speed and less than the over speed governors shall be driven by flexible wire ropes with the following requirements.

- The breaking load of ropes shall be related to the force required to operate the safety gear by the safety factor of at least 8
- The nominal rope diameter shall be at least 7 mm
- The ratio between the pitch diameter of the over speed governor pulley and the nominal rope diameter shall be at least 30

The over speed governors shall be sealed after setting the tripping speed.

The breaking or slackening of the governor rope shall cause the motor to stop by an electric safety device.

- Alarm bells

A Concealed 200 mm diameter alarm bell shall be installed in the main security area. The alarm bell shall sound when the alarm bell button in the car operating panel is pressed. The bell shall mute when the pressure on the alarm bell button is released.

- Emergency Stop Switches

An emergency stop for use by maintenance personal shall be provided in each lift car.

8 FIREMAN SWITCH

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Each Lift shall have a Fireman switch with glass front for access by the Firemen. The operation of this switch shall cancel all calls to this lift and shall stop at the next nearest landing if traveling upwards. The doors shall not open at this landing and the lift shall return to the ground floor. In case the lift is traveling downwards when the fireman's switch is operated it shall go straight to the ground floor bypassing all calls enroute. The emergency stop button inside the car shall be rendered inoperative.

The fireman's switch shall be located adjacent to the lift opening at the terminal floor and shall be at a height of approximately 2 m above the floor level. For easy identification of firemen's lift which conform to the local authorities requirements, a red and white diagonal striped backing shall be provided behind the glass of the firemen's switch.

A permanent notice of prominent size indicating the floors served shall be provided and displayed adjacent to the firemen's lift at the terminal floor. The notice shall be made of laminated plastic sheet or other approved materials with red letters on white background. Details of the notice shall be submitted to the Engineer-in-Charge for approval prior to fabrication.

9. CONTROL OF NOISE AND VIBRATION

9.1 General

The whole of the lift assembly, including the opening and closing of the car and landing doors shall be quiet in operation and shall be free of rattling or squeaking noises. Lift doors operation shall be smooth to avoid the transmission of impact noise to the surrounding structure.

Noise level resulting from the operation of the lifts, including direct sound transmission, breakout noise and re-radiation of structure borne noise, shall not exceed the specified noise criteria of the adjacent spaces. Vibration resulting from operation of lifts of escalators shall not be perceptible in any occupied areas.

9.2 Car construction

All elements of the lift car construction shall be sufficiently rigid to avoid generation of noise by panel excitation as a result of movement. The total noise level

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in a moving lift car shall not exceed 45 dBA with the ventilation system operating.

9.3 Machinery

The gearless traction machine and compact PM motor are installed within the hoist way and the slim control panel is located on the shaft side wall. Provision shall be made for the control vibration isolation measures employed to ensure that structure borne noise resulting from the operation of the lift machinery is not audible in any occupied area.

Lift machinery noise levels under normal operating conditions shall not exceed 70 dBA at 1 m from the equipment in free field.

9.4 Arrival chimes

Noise from arrival chimes shall not exceed 60 dBA.

The above levels shall be measured at 3 m from the arrival chimes using a noise meter set to 'fast' response. Chimes with adjustable loudness shall be provided.

10. FIRE SAFETY REQUIREMENTS

General requirements of lifts shall be as follows :

10.1 Landing doors in lift enclosures shall have a fire resistance of not less than one hour.

10.2 Lift car door shall have a fire resistance rating of one hour.

10.3 Grounding switch (es), at ground floor level, shall be provided on all the lifts to enable the fire services to ground the lifts

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ASSOCIATED ELECTRICAL WORKS

1.1 Scope

Based on power requirements of lifts furnished by the lift contractor, power supply for the lifts machines, terminating in a Switchboard located at a desired location, shall be provided by Engineer-in-charge. The earth bar provided on this Switchboards shall be connected to the building earthing system also by Engineer-in-charge. All cabling / wiring/loop earthing beyond this Switchboard for interconnection with the lift controllers / motors/ indicators / push buttons / safety devices etc. shall be provided by the lift contractor and its cost shall be deemed to be included in the quoted rates.

1.2 Cabling

Cabling between switchboard and the controller /lift motor shall be with XLPE insulated HR PVC sheathed 1100 volt grade aluminium conductor armoured cables conforming to IS 7098 or PVC insulated, PVC sheathed, 1100 volt grade al conductor armoured cables conforming to IS 1554. Cables shall be terminated in glands fitted with armour clamps the gland body shall be provide with an internal conical sating to receive the armour clamping cone and clamping nuts which shall secure the armour wires. A PVC shroud shall be fitted to cover the gland body and exposed armour wires

Trailing cables for the lifts shall be EPR insulated stranded copper conductor flexible cables conforming to IS 9968

Control cabling shall be with multi core stranded copper conductor PVC insulated and sheathed 1100 volt grade cables conforming to IS 8130. Minimum size of the cable shall be 2.5 sq mm.

Where cables pass through walls or floor slabs, pieces of GI sleeves shall be provided for cast into the wall / floor and cable shall be drawn therein. Annular space around the cable in the sleeve shall be sealed with fire proof sealant supplied by Engineer-in-charge.

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1.3 Wiring

All wiring shall be carried out with FRLS PVC insulated 1100 volt grade stranded copper conductor wires conforming to IS 694 drawn in MS rigid / flexible conduiting system and / or MS raceways. Minimum 2.5 sq mm size wires shall be used. Wires shall be cut only at terminations. Intermediate jointing shall not be permitted. Drawing, cutting and terminating of the wires shall comply with the relevant Indian standard specifications and shall be carried out in the most workman like manner as per standard practice. All normal care like cutting the insulation with a pencil edge, taking care not to cut the strands and proper tightening of terminal connector screws to avoid loose connection or breaking of conductors etc. shall be taken.

Heavy gauge black enameled screw type ISI embossed MS conduits with superior quality accessories approved by Engineer-in-Charge shall be used in the work. Conduits could either be recessed in floors / walls or fixed on surface with saddles and clamps. Final connections to vibrating the equipment shall be made with metal flexible conduits. Entire work shall be carried out in work man like manner as per standard practice

1.4 Earthing

Metal enclosures of all electrical equipment and devices including frames of motors, controllers, switchgear, conduits and raceways etc. shall be properly earthed so as to form an equi-potential zone. Loop earthing of vibrating equipment shall be done with flexible copper earthing braid or flexible cables. The lift motor frame shall be connected to the building earthing system termination at the switchboard by duplicate loop earthing conductors of appropriate size.

2. ASSOCIATED CIVIL & STRUCTURAL ITEMS

All civil and structural items of work associated with erection and operation of lifts shall be provided by the Contractor at his cost including (but not restricted to) the following.

- Hook for lifting lift equipments in the top of shaft.

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- Temporary scaffoldings and safety barricades during lift installation in and around lift Lift wells
 - Sill angels
 - Bearing plates
 - Buffer supports
 - Checquered plates
 - Fascia plates
 - Ladders in pits (MS)
 - Safety railing on car top
 - Separator /stretcher beams if required.
 - Dowels for terminal buffers in pit floor during casting.

The Contractor shall ensure erection and fixing of steel work in such a RCC wall or any other structural member is damaged.

MAINTENANCE SERVICES

1. SCOPE

The Contractor shall provide Free Comprehensive Maintenance service for a period on two years from the date of handing over of the lift to Engineer-in- Charge. After expiry of this free comprehensive maintenance period, Engineer-in-charge reserve right to enter into annual maintenance contract with the contractor as per rates finalized in the contract

The maintenance services rendered by the contractor (free maintenance for two years after handing over and as per AMC if entered into for subsequent years) shall include routine and preventive maintenance as also breakdown maintenance if and when required. Maintenance services shall be provided with 24 hour emergency call out service.

2. ROUTINE AND PREVENTIVE MAINTENANCE

Program of routine and preventive maintenance during the free (2 year) maintenance period as also during the tenure of annual maintenance contract shall comply with minimum requirements as below.

2.1 Fortnightly

- To check all bearing oils, oil rings, oil chains, etc. All

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machines should be carefully checked and repaired for abnormal temperature rise.

- To check and repair all relays and contacts as wells as their movements and repair as necessary
- To clean traction machines, relays panels, control panel, starter panels, selectors, governors, car top, car gates, sills and pits
- To check brake action and adjust if necessary
- To check and repair movement of door switches, gate switches and emergency stop switches
- To check and repair indicator lamps and indicator
- To check and repair annunciator lights, buzzer and car lights
- To check and adjust leveling differences, brake slippage, acceleration, deceleration and riding comfort.
- To check and repair movements of car control buttons, switches etc.
- To check and repair operation of weighting devices.

2.2 Monthly

- To turn grease cups for speed governors and compensating pulleys
- To check and oil selectors
- To top up rail lubricators
- To clean ropes oil if necessary
- To clean PM motor and inspect controller box etc.
- To oil electric brake pins
- To oil all pins of door operation and door opening mechanisms
- To clean hoist way, beams slow down cams, outside cages, rails and counterweight rails
- To clean, oil and adjust door closer and levers
- To clean main sheave, secondary sheaves and rope sheaves on car top and counterweigh top
- To clean and repair brake wheels and shoes
- To oil compensating rope tensioning pulleys.

2.3 Every Two months

- To clean and oil door hangers, door rails, interior of hanger case. If necessary adjust acentric rollers, car door hangers, door connecting ropes and chains
- To check and repair door shoe
- To clean and oil safety fears
- To clean and oil car and counterweight guide

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- shoes. Adjust if necessary
- To clean and oil interior of terminal limit switches and position switches. Check rubber rollers of terminal limit switches.
- To check oil clean and repair interior of door switches, gate switches. Replace worn parts if necessary
- To check and repair flexible cable
- To check and repair movement of limit switches
- To clean and oil interior of car control switches.
- To clean and check push buttons of care control panels
- To check, clean and repair the sleeve and plungers of the electromagnetic brakes.

2.4 Every three months

- To check and repair the operation of terminal limit switches and final limit switches.
- To check and repair the governor switches.
- To clean the brush holders and commutators of the door motors.
- To check and repair the traction ropes for broken wire, wear elongation and even tension. Adjust if necessary.
- To remove the dust inside the traction machines and controls panels using electric blower
- To clean and repair the indicator lamps
- To check the voltage of rectifiers and thyristors

2.5 Half yearly

- To check and repair the operation of safety gears
- To check oil for oil buffers
- To check and clean the hall buttons and contacts
- To check and repair the compensating chains or ropes
- To check and oil the bearing of door motors
- To grease the secondary sheaves, car top sheaves and counterweights.
- To check the wear of guide shoes of cars and counterweights

2.6 Annual

- To clean the wire connection box of every landing and car cages. Tighten all screws and check the conditions of cables at conduit inlets and outlets
- To check and tighten screws of control panels, starters panels and relay panels
- To remove the dust inside the landing indicator switches

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- by electric blower
- To test all safety devices
- To dismantle, clean and adjust the electro magnetic brake of gearless machines
- To charge motor oil
- To check and tighten screws and foundation bolts of traction machine, secondary sheaves, exterior of lift frame, guide rail, guide rail clamps and bracket etc.
- To test the overcurrent relays
- To provide all labour, materials, tools and transport to carry out annual inspection and load test according to the requirement of the employer

All the scheduled maintenance services described above shall be properly programmed and agreed with the Engineer-in-charge in order not to affect operation of the lift systems

3. BREAK DOWN MAINTENANCE

The Contractor shall also undertake to provide a comprehensive breakdown service whereby qualified technicians shall attend to each breakdown as soon as practicable after a breakdown is reported and carry out immediate remedial work at a reasonable speed according to the nature of the breakdown. Any faulty equipment or components shall be quickly replaced.

In circumstance such that the Contractor fails to attend the breakdown within four normal working hours after notification of the breakdown and where remedial work is interrupted during normal working hours for purposes other than obtaining replacement parts, the employer reserves the right to order such action as may be necessary to expedite completion of remedial work which shall be at the Contractors expense without abrogation of the Contractors responsibilities

4. GENERAL

The Contractor shall keep sufficient spare parts during the maintenance period to ensure that replacement work for defect can be carried out immediately

A competent engineer shall be provided to investigate the fundamental cause of a fault temporary quick fix solution will not be accepted.

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The employer shall at his discretion, take action to recover all losses incurred rising from the failure of the contract to perform the duties either wholly or in part as detailed in this section

TESTING OF LIFT INSTALLATION

1.0 TESTS AT SITE:

1.1 a) Leveling Test:

Accuracy of the floor levelling shall be tested with the lift empty, fully loaded.

The lift shall be run to each floor while travelling both in upward and downward directions and the actual distance of car floor above/ below landing floor shall be measured. In each case there shall not be any appreciable difference in these measurements for levelling at the floors when the car is empty and when it is fully loaded. The tolerances for levelling shall be as $\pm 5\text{mm}$ accuracy.

b) Safety Gear Test:

Instantaneous safety gear controlled by a governor, should be tested with contract load and a contract speed, governor being operated by hand. Two tests should be made, however, with wedge clamps or flexible clamp safeties, one with contract load in the car and the other with 68 kg (equivalent to one person) in the car. The stopping distance obtained should be compared with specified figures and the guides, car platform, and safety gear should be carefully examined afterwards for signs of permanent distortion.

Counterweight safety gear should be tripped by the counterweight governor and the stopping distance noted. In this case, however the governor tripping speed should exceed that of the car safety governor but by not more than 10 percent.

During the safety gear test, car speed (from the governor or the main sheave) should be determined at the instant or tripping speed with

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that stated in I.S. The governor jaws and rope should be examined for any undue wear.

c) Contract Speed:

This should be measured with contract load in the car, with half load with no load, and should not vary from the contract speed by more than 10 percent. The convenient method is by counting the number of revolutions, made by the sheave or drum in a known time. Chalk mark on the sheave or drum and a stop switch will facilitate timing but care must be exercised to ensure that no acceleration or retardation periods are included. If the roping is 2 to 1 the sheave speed is twice the car speed. Alternatively, the speed can be measured by a tachometer applied directly to shaft immediately below the sheave.

d) Lift Balance:

After the above test, some of the weight shall be removed until the remaining weights represent the figures specified by the tenderer. With this condition car at half way travel the effort required to move the lift car in either direction with the help of winding wheel shall be as nearly as can be judge by the same.

e) Car and landing doors interlocks:

The lift shall not move with any door open. The car door relay contact and the retiring release cam must be tested. The working of the door operation and the safety edges and light equipment if any provided shall also be examined.

f) Controllers:

The operation of the contactors and interlocks shall be examined and it shall be ascertained whether all requirements laid down in the specifications have been met.

g) Normal Terminal Stopping Switches:

This shall be tested by letting the car run to each terminal landing in turn, first with no load and then with

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contract load and by taking measurements, top and bottom over travels can be ascertained.

h) Final Terminal Stopping Switches:

The normal terminal stopping switches shall be disconnected for this test. It shall be ensured that these switches operate before the buffers are engaged.

i) Insulation Resistance:

This shall be measured (after removing the electronic PCB's and their connection) between power and control lines and earth and shall not be less than 5 mega-ohms when measured with D.C. voltage of 500 volts. The test shall be carried out with contactors so connected together as to ensure that all parts of every circuit are simultaneously tested.

j) Earthing:

All conduits, switches, casing and similar metal work shall have earthing continuity.

k) Ropes:

The size, number construction and fastenings of the ropes should be carefully examined and recorded.

l) Buffers:

The car should be run on to its buffers at contract speed and with contract load in the car to test whether there is any permanent distortion of the car or buffers. The counterweight buffers should be tested similarly.

1.2 Tests at Manufacturer's Works:

a) High Voltage Test:

The dielectric or electric apparatus (excluding motors, generators and instruments which are tested in accordance with the appropriate Indian Standards wherever they exist) shall be capable of withstanding a test voltage of ten times the

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working voltage with a maximum of 2000 Volts when applied.

- i) between the live parts and case of frame with all circuits completed.
- ii) between main terminals or equivalent parts with all circuits open, and
- iii) between the live parts of independent circuits.

Note : Owing to the impracticability of applying tests (ii), (iii) mentioned above on controllers and similar apparatus after controller wiring has been completed, these tests may be made at convenient stages of manufacturer.

b) i) Method of Applying High Voltage:

The test shall be made with alternating voltage of any convenient frequency, preferably between 49 to 60 cycles per second. The test voltage shall be approximately sine-wave form and during the application of voltage with peak value, as would be determined by spark gap by oscillograph or by any other approved method shall not be more than 1.45 times the rms value. The rms values of the applied voltage shall be measured by means of a volt meter used with a suitably calibrated potential transformer or by means of voltmeter used in connection with a special calibrated voltmeter winding or testing transformer by any other suitable voltmeter connected to the output side of the testing transformer.

ii) Duration of High Voltage Test:

The test shall be commenced at a voltage of about one third of the test voltage which shall be increased to the full test voltage as rapidly as is consistent with the value being indicated by the measuring instrument. The full test voltage shall be maintained for one minute. At the end of this period, the test voltage shall be rapidly diminished to one third of its full value before switching off.

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The oil buffers are examined after the above tests have been made to determine if there has been any oil leakage or distortion and to ensure that the buffers return to their normal positions.

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c) Buffer Test:

A copy of the test report shall be intimated after testing at works.

1.3 Performance Test:

This test is meant for passengers lifts and is conducted to watch the performance of lift installation in terms of passenger handling capacity and waiting interval as obtained at site vis-a-vis design, data and conducted as below :

i) Waiting interval : (T)- This can be worked out by taking the average of several round trip times as observed physically and then dividing it by the number of lifts in that bank.

ii) Handling capacity $H = \frac{300 \times Q \times 100}{T \times P}$

Where

H = Handling capacity as the percentage of the peak population handled during 5 minutes.

P = Total population to be handled during peak morning/ evening period. (It is related to the area for which particular bank of lifts serves).

Q = Average number of passenger carried in a car. T = Waiting interval.

iii) Service Temperature Test :

A continuous run of one hour should be made with number of starts and stops to reproduce as nearly as practical the anticipate duty in service. (The standard duty cycle is for 90 to 180 start per hour). It is very difficult in practice to carry out this test with alternate starts at full load and no load and it is necessary therefore to simulate these cycles. A suitable test for all motors except squirrel cage motors is to run the car up from the bottom landing with contract load and stop at each floor. From the top floor a non stop run is made to the lowest floor and the upward journey with stop is then repeated. The time intervals between stops and starts at the floors should be uniform and such as to give about 180 starts in one hour. At the end of this run the temperatures of the armatures and fields of the

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motor and generator are recorded. The temperature rise should, be with in prescribed limit.

**CHECK LIST FOR JOINT INSPECTION OF LIFTS BY OWNER &
FIRM'S REPRESENTATIVES REF. SECTION IV-TESTING OF
LIFT INSTALLATIONS**

1. Place of Inspection
2. Date of Inspection
3. Name of the Firm
4. Verify visually particulars as per agreement description and completeness of work to be executed as per contract.
5. Verify lay-out as per drawing and record discrepancies if any
6. Whether a plate with word LIFT and instruction to be displayed / provided on each landing and in lift car.

LIFT WITH EQUIPMENT

- (a) Depth of pit and whether ladder provided if required.
- (b) Arrangement for lighting in the pit.
- (c) Arrangement for lighting in the lift shaft.
- (d) Whether adequate tie rods provided for counter weights.
- (e) Whether all wiring has been in conduit pipes / troughs properly fixed and earthed.
- (f) Guard for counter weights in the pit.
- (g) Provision of check nuts and split pins in rope fastenings and terminations.
- (h) Whether rope tension equal for all ropes.
- (i) Whether buffers symmetrically positioned.
- (j) Top car clearance.
- (k) Bottom car clearance.
- (l) Top counter weight clearance
- (m) Bottom car run by.

- (n) Bottom counter weight run by.
- (o) Any other

7. Machine room check provision for:
 - (i) Arrangement for hand lamp with flexible cord,
 - (ii) A plug and socket.
 - (iii) Adequate ventilation
 - (iv) A danger plate on door
 - (v) Trap door

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- (vi) Main switch
- (vii) Circuit diagram on wall
- (viii) Any other

8. Earthing

Whether machine body controller, car frame, limit switches, and conduits properly earthed & check earthing continuity.

9. Machine and controller

- (i) Oil leakage if any
- (ii) Abnormal temp rise of oil, bearing and motor
- (iii) Abnormal noise or vibrations
- (iv) Whether UP and DOWN (direction arrows on motor or fly wheel marked)
- (v) Whether rubber pads provided under machine and its bed plates
- (vi) Whether control circuits have independent fuses
- (vii) Whether protection against breakage of rope or taps for rope selector provided
- (viii) Whether cable ferrules marked
- (ix) Gap between the car and landing sill
- (x) Any other

10. Operation

- (i) Operation of all floor buttons from with- in the car in up and down direction on both attendant and auto control.
- (ii) Operation of car by calls given from landing buttons in up and down direction on both attendant and auto control.
- (iii) Operation of door close and door open buttons
- (iv) Emergency alarm
- (v) Emergency stop
- (vi) Light and fan
- (vii) Emergency key opening
- (viii) Emergency light
- (ix) Operation on type of control stipulated in contract
- (x) Operation of car top safety switches to make the lift inoperative from within the car and speed of operation.
- (xi) Door locking as checked from each floor
- (xii) Any abnormal noise vibration jerk interval and stopping
- (xiii) Sideway play if any in the car.
- (xiv) Working of position and direction indicators in car and at each landing.
- (xv) Functioning of sensitive reopening arrangements on moving edge of doors.
- (xvi) Smooth sliding movement of car and landing doors,
- (xvii) Whether car is stopped in between the floor and whether the doors can be opened manually from inside.

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xviii) Opening of landing or car door when lift is in operation to see that the movement of lift stops,

(xix) Operation of fireman switch.

(xx) Check for brake release device and hand winding provisions,

11. Safety Devices

(i) Functioning of protection for single phasing and phase reversal.

(ii) Function of protection for automatic power cut off device before the car and counterweight load on buffers.

(iii) Function of over load relays.

(iv) Operation of safety gear and also see for undue deformation of guiderails and stopping distance.

(v) Check operation of safety switches.

(vi) Operation of upper limit switch & positions

(vii) Operation of lower limit switch and position

(viii) Operation of electrical protection against opening of emergency door.

ix) Any other.

12 Checking of rope slip after 3 complete trips by putting a reference mark on the sheave and rope 60mm/12mm, 60mm/20mm.

13 Test to see that the lift does not start in upward direction on no load and down direction on full load and on single phasing

14 Check application of brake on full load in down direction at full speed by switching off the power supply and for over-heating.

15 Load Test: Lift No.-----

No Load

Full Load

UP Down UP Down

Starting current :AC (Amp)

Running current :AC (Amp) Travel (Meters)

Speed: Meter / Sec

16. Any other test

(i) Size of the lift well

(ii) Internal depth of car platform

(iii) Size of the car door

(iv) Rope protection against breakage have been carried out and test results are found

(v) Insulation resistance test & high voltage test have also been tested. I.R. is found _____M-ohm (Requirement 0.5 M-ohm minimum) and HV test with stood/ not with stood

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PROVISION FOR THE DISABLED AND HANDICAPPED

- 1 All the Passenger Elevator shall be provided with following features:
 - a) Elevator control buttons at locations and height specified in IS 15330 - 2003
 - b) Hall call buttons at locations and height specified in IS 15330 - 2003
 - c) Hand rails shall be provided on the side walls of the Elevator at height & locations specified in IS:15330 - 2003. An international symbol of access of the disabled shall be permanently and conspicuously displayed at each and every Elevator landing next to the Elevator entrance (to be provided by signage contractor). Braille notations indicating the floor levels shall be incorporated next to each button at the handicap COP and handicap hall call buttons.
 - d) A digital voice system for announcing the car position, opening/closing of doors, direction of travel and messages shall be provided as per IS:15330 - 2003
 - e) A laminated safety glass type mirror of at least half of the size shall be installed on rear panel at appropriate position as per IS : 15330 - 2003

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Annexure-I

TENDER DOCUMENT FOR SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF LIFTS

TECHNICAL PARAMETERS

Note :-

Tenderers to give item wise confirmation/comment against each parameter. Deviations if any shall be clearly brought out in this Performa. Tenderers shall fill in the Performa and enclose it along with the tender.

Sl No	Items	Requirement as per tender	Item wise confirmation/ comment to be filled in by tenderers
A	PASSENGER LIFTS		
	All lifts are Barrier free lifts for handicapped)	Gearless	
	General		
1.1	Number of Lifts	2 nos	
1.2	Capacity	13 passenger (884kg)	
1.3	Speed	1.5 mps	
1.4	Number of Landings	7 (Basement +Gr Floor +1st Floor to 5 th Floor)	
1.5	Number of openings	7 on the same side	
1.6	Travel	24.15 M	
	Machine, Hoistway and Pit		
1.7	Machine room location	MRL	
1.8	Machine details		
-	Control	AC VVVF	
-	Operation	Duplex Collective	

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Sl No	Items	Requirement as per tender	Item wise confirmation/ comment to be filled in by tenderers
		Selective Control	
1.9	Hoistway dimensions		
-	Width (along door)	1910 mm	
-	Depth (90° to door)	2400 mm	
1.1	Head room above last landing	5550 mm approx	
1.11	Pit depth	1650 mm approx	
1.12	Sill projection	6mm MS angle	
	Car		
1.13	Car Enclosure	To be powder coated bare elevators including ceiling to receive Interior Designer work	
1.14	Car ceiling	Suitable to receive Interior Designer work	
1.15	Car floor	25 mm recessed to be provided in the floor for stone finish by the customer	
1.16	Car and landing doors	Automatic power operated Centre opening, 900 mm W x 2300 mm H SS hairline finish. (Inside car 2400 mm H)	
1.17	Car size	1100x2000x2300 As per IS	
1.18	Car Operating Panel	Stainless Steel hairline / mirror finish Car Operating Panel inside car.	

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		There shall be 1 no normal COP besides one no. handicapped COP at	
Sl No	Items	Requirement as per tender	Item wise confirmation/ comment to be filled in by tenderers
		the right hand side of the car.	
B	SERVICE LIFTS	Gearless	
	General		
1.1	Number of Lifts	1 no	
1.2	Capacity	15 passenger (1020kg)	
1.3	Speed	1.5 mps	
1.4	Number of Landings	7 (Basement +Gr Floor +1st Floor to 5 th Floor)	
1.5	Number of openings	7 on the same side	
1.6	Travel	24.15 M	
	Machine, Hoistway and Pit		
1.7	Machine room location	MRL	
1.8	Machine details		
–	Control		
–	Operation	AC VVVF	
1.9	Hoistway dimensions	Simplex Collective Selective	
–	Width (along door)		
–	Depth (90° to door)	2300 mm	
1.1	Head room above last landing	2400 mm	

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1.11	Pit depth	5550 mm approx	
1.12	Sill projection	1650 mm approx	
		6mm MS angle	
	Car		
1.13	Car Enclosure	S/S hair line Finish	
1.14	Car ceiling	S/S hair line Finish	
1.15	Car floor	5 mm thick aluminium chequered plate	
1.16	Car and landing doors	Automatic power operated Centre opening, 900 mm W x 2300 mm H SS hairline finish. (Inside car- 2400 mm H)	
1.17	Car size	1600x1500x2300 mm As per IS	
1.18	Car Operating Panel	Stainless Steel hairline / mirror finish Car Operating Panel inside car	
C	PARAMETERS COMMON TO ALL LIFTS		
1	Machine		
1.1	Power Supply	415V/240V, 50 Hz	
1.2	Acceptable voltage fluctuation	+10 to - 20%	
1.3	Rate of acceleration / deceleration (m/sec ²)	0.6 - 1.5 (adjustable at site)	
1.4	Jerk (m/sec ²)	0.7 - 1.5 (adjustable at site)	

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1.5	Vibrations in car horizontal/vertical	20/18 MG maximum	
1.6	Noise level in car	45 dBA maximum	
1.7	Noise level in machine room at 1 mtr from machine	52 dBA maximum	
1.8	Door noise level while closing and opening at a distance of 1 mtr from car door and 1.5 mtr from floor level	52dBA maximum	
2.0	Fixtures / signals inside car		
2.1	Normal lighting	LED recessed type	
2.2	Emergency light and alarm bell (to security room)	With SMF battery operated with charger rated for 30 minute	
2.3	Ventilation	Blower Fan(Two speed and concealed vents)	
2.4	Operating buttons and indications	Stainless steel operating panel with following buttons and indications.	
		Illuminated push buttons of micro pressure type corresponding to the floors served	
		Door open button	
		Emergency stop button	
		Emergency alarm button	

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		Two position key operated switch for 'with attendant' and 'without attendant' operation.	
		Ventilation fan ON / OFF switch with auto OFF when there is no call after 120 seconds.	
		Built in intercom of the	

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Sl No	Items	Requirement as per tender	Item wise confirmation/ comment to be filled in by tenderers
		hands free type.	
		Dynamic car direction display	
		Digital position indicators	
		Visual overload warning indicator	
2.5	Music(Music Speaker)	Trailing cable	
3.0	Provisions for use of lift by Handicapped persons (Barrier Free Lifts)		
3.1	Hand rail	A hand rail not less than 600 mm long at 900 mm above floor level shall be fixed adjacent to the control panel.	

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3.2	Car operating panel	Inscription in Braille also to be provided.	
		Level to be lower than the normal so as to be accessible by a person sitting on wheel chair	
3.3	Hall buttons	Inscription in Braille also to be provided.	
		Level to be lower than the normal so as to be accessible by a person sitting on wheel chair	
3.4	Car position indicator	The interior of the cage shall be provided with a device that audibly indicate the floor, the cage has reached and indicate that the door of the cage for entrance / exit is either open or close.	
3.5	Hall lantern	To be provided alongwith an audible chime.	
3.6	Any other feature	The time of an automatically closing door should be minimum 5 second and closing speed should not exceed 0.25 m/sec.	
4.0	Landing signals		

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4.1	Hall buttons	Self illuminating micro- push type in hair line stainless steel facia plates	
4.2	Car Position	Digital position indicators along with direction of travel (with audible signal in each elevator lobby)	
4.3	Hall gong	Up/down indicator with single stroke gong/chime at all landing	
5.0	Safety features		
5.1	Door safety	Temper proof infrared curtain covering the entire height of the door should be provided in the lift doors.	
5.2	Buffer	Spring Buffer to be provided	
5.3	Overload protection	Ø Overload protective device Ø Overload non starter.	
5.4	Over travel protection	Terminal and final limit switches to be provided	
5.5	Motor protection	Trip devices for : Ø Over current Ø Under voltage Ø Over voltage Ø Single phasing Ø Earth leakage Ø Phase reversal	
5.6	Interlocking of car and	To be provided as per specifications.	

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	hoistway doors		
5.7	ARD	To be provided	
6.0	Associated Civil and structural items	All civil and structural items of work associated with erection and operation of lifts shall be provided by the Contractor at his cost including (but not restricted to) the following.	
		Temporary Scaffolding and safety barricades for	
		erection in and around lift hoist ways	
		Bearing plates	
		Buffer supports	
		Facia plates	
		Ladder in pits	
		Safety railing on top of car	
		Channels, separators, stretchers etc.	
7.0	Fireman's switch	To be provided at GF/ Lobby level	
8.0	Free Comprehensive Maintenance Period	Two years after completion of work and handing over of the Lifts in satisfactory operating condition.	

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SPECIAL DATA TO BE FURNISHED BY TENDERERS

Sl No	Data to be filled in by tenderers	Passenger lifts	Service Lift
A	Equipment details		
1	Machine type (Geared/Gearless		
2	Reduction gear unit ratio		
3	Drive motor data		
i)	kW		
ii)	Starting current (Amp)		
iii)	F.L. Rated current (Amp)		
iv)	Max. no. of starts per hour.		
v)	Insulation class		
4	Hoist / Governor ropes (no. and size)		
5	Max. temperature tolerance during peak summer months		
6	Heat release data for machine room equipment		
B	Special features		
	Tenders to confirm Included /Not included in respect of the following	Included/Not Included	Included/Not Included
1	Auto fan off switch		
2	Fan inside the Car		
3	Over load warning indicator		
4	Ni-Cd batteries with charging circuit.		
5	Doors safety		

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6	Additional weight permitted inside the car for interiors.		
C	Performance parameters		
1	Leveling accuracy		
2	Governor tripping speed.		

END OF LIFT SPECIFICATIONS

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

1.0 TECHNICAL SPECIFICATIONS FOR FIRE HYDRANTS AND SPRINKLER SYSTEMS

1.1 General

Work under this subhead is time-bound and has to be completed within the time limit set in the tender. Work shall be executed in accordance with an agreed schedule which shall be submitted by the tenderers along with offer and agreed to by owners.

1.2 Scope of Work

The scope of work in this subhead shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely do all work relating to the supply, installation, testing & commissioning of Fire Fighting Systems for **COEES & PHQ Building, Guwahati** as described herein after and shown on the drawings. The scope of work in general shall include the following.

- i) External & Internal Fire Hydrant System.
- ii) Sprinkler system in entire building.

Without restricting to the generality of the foregoing, the work shall include the following: The fire fighting system covering the entire complex and consisting of the following:

- A. Other piping system ancillaries such as Suction and Delivery Headers, Air Vessel, Pressure Gauges, Pressure Switches, Pump Panel etc. as required.
- B. External Hydrant Ring Main of 150 mm dia with single headed Yard Hydrants, RRL Hoses, Branch Pipes, etc. all housed in a Hose Box.
- C. Internal Hydrant system where required with single headed landing valves on each floor accompanied by 1 number swinging type Hose Reel, 4 numbers RRL Hoses, 2 numbers of Branch Pipe etc. all housed in the niche. Bidder shall provide front frame with shutter for niche.
- D. Sprinkler system for entire building.
- E. Hand appliance as per Bill of Quantities.
- F. To obtain the approval of the relevant drawings before actual installation at site and to get the complete installation inspected and passed by the concerned authorities, as may be necessary as per local bye laws. (Any fee payable to the local bodies for such activities shall be included in the rate).

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1.3 Contractor's Experience

- 1.3.1 Contractors shall engaged specialist agency only for this work of Fire Fighting systems.
- 1.3.2 The selected specialist agency must have sufficient experience in the execution of projects as specified.

1.4 Technical Information

- 1.4.1 Contractor's attention is specially invited to the special conditions and other clauses in the agreement which required the contractor to :-
 - a. Submit detailed shop drawings.
 - b. Use material of specific makes and brands.
 - c. Obtain all approvals from Fire Fighting authorities.

1.5 Exclusions: Not applicable.

1.6 Site /Locations: PHQ, OIL Guwahati.

1.7 Approvals

The contractor shall prepare all submission drawings and obtain all approvals of fire fighting works from fire fighting authorities.

1.8 System Description

- 1.8.1 The Fire fighting System shall comprise of AC motor driven pump sets, standby diesel pump set, jockey pump sets for pressurisation with all required accessories including valves, special fittings, instrumentation, control panels and any other components required to complete the system in all respects.
- 1.8.2 The Hydrant System shall be semi automatic in action and shall be laid covering the entire area externally and all the floors internally with independent piping system. For the Sprinkler System, a separate & independent piping system shall be installed (i.e., separate & independent pipe networks & fire pumps shall be provided for sprinkler system).
- 1.8.3 The fire fighting system comprising hydrant system & sprinkler system shall be kept pressurised at all times. The proposed Jockey Pump shall take care of the leakages in the system, pipe lines and valve glands.

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- 1.8.4 The pressure in the hydrant & sprinkler & pipe work shall be kept constant at 7 Kg/cm² for hydrant & sprinkler system. In the event of fire when any of the above systems operates/open, the resultant fall in header pressure shall start the AC motor driven fire pump/sprinkler pump as the case may be through pressure switches automatically. Hydrant system operates in case of fire with the help of manual landing valves & hose reels. The sprinkler system operates by bursting of sprinklers. There shall be one Diesel Engine Driven pump as standby for all the three system. In case of failure of electricity or failure of Electric Pump to start on demand, the standby Diesel Pump shall automatically take over.
- 1.8.5 However, shutting down of the pump sets shall be manual except for the Jockey Pump which shall start and stop automatically through pressure switches. In addition to auto start arrangements, the main pump shall also have an over-riding manual starting facility by push button arrangement.
- 1.8.6 The piping for the hydrant system in the yard shall be laid in soil 1 Meter deep or in rectangular Trench. The pipe laid in soil shall be protected as specified in para 1.9.3 below. The scope of work includes necessary excavation of trench and back filling the same. The scope of work also includes necessary watering, ramming, removing the surplus earth from the site and disposing within the premises as per direction of engineer in charge. The pipe shall be laid on brick pedestals at 3 Mtrs intervals of size as indicated in the Bill of Quantities. Pipes shall be cleaned before wrapping and coating. (Cost of construction of brick pedestals shall be included in the rate).
- 1.8.7 The yard hydrants shall be placed at a regular spacing of 45m center to center. The following accessories are proposed near each yard hydrant.
- i) One no. GM single headed hydrant valves.
 - ii) Two nos. RRL Hoses of size 63mm dia x 15m long.
 - iii) One nos. GM Branch pipe.
- GM hydrant valve, RRL hose and GM branch pipe will be accommodated in a MS hose box mounted on brick pedestals.
- 1.8.8 The Internal Hydrant System (Wet Risers) shall be provided at points as indicated on the drawing on each floor.
- 1.8.9 The hydrant point shall be directly tapped from the Riser pipes, and shall be furnished with required accessories such as
- i) One no. GM single headed hydrant valves.
 - ii) Two nos. RRL Hoses of size 63mm dia x 15m long.
 - iii) One no. first aid Dunlop hose reel full swinging type 20mm dia x
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- 30m long.
- iv) One no. GM Branch pipe.

The hydrant risers shall be terminated with air release valve at the highest points to release the trapped air in the pipe work. At each tapping from the Riser a Orifice Plate shall be located in the lower floors to reduce the pressure.

- 1.8.10 Sprinkler system shall be distributed throughout the building so as to cover 10–12 sq. m area with one sprinkler.

Sprinkler risers shall be provided with instantaneous control valve with alarm gang. The entire sprinkler system shall be divided in various zones with the help of flow switches which shall be connected to central annunciation panel so that in case of fire exact location of affected area can be identified.

5 Nos. RCC overhead tanks placed on individual blocks each of capacity 10000 litres with makeup line will be connected to sprinkler riser & hydrant riser at terrace of each blocks (overhead tank is excluded from scope of work).

A suitable drainage arrangement with bye pass valves shall be provided to facilitate maintenance of sprinkler pipe work.

- 1.8.11 To compensate for slight losses of pressure in the system and to provide an air cushion for counteracting pressure surges/water hammer in the underground pipe work Air Vessels shall be furnished in the pump room near fire pumps. The air vessel shall be normally partly full of water and the remaining being filled with air which shall be under compression when the system is in normal operation.

- 1.8.12 The entire Wet Risers, external Hydrant Ring Main System & sprinkler system shall be fed from the water supply (Static Water Tank) and pump room to be provided by the others

1.9 GENERAL SPECIFICATIONS

1.9.1 Pipes and Fittings

Pipes for Wet Riser system shall be of Class-C, heavy duty black steel pipes. Pipes upto 150mm dia shall conform to IS-1239. Pipes with dia 200mm and above (6mm thick) shall confirm to IS- 3589. All pipes shall be I.S.I. marked. Fittings for black steel pipes shall be M.S. forged fittings with tapered screwed threads.

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1.9.2 Jointing

Joint for black steel pipes and fittings shall be metal-to-metal tapered thread or welded joints. A small amount of red lead may be used for lubrication and rust prevention in threaded joints.

Joints between C.I. or black steel pipes, valves and other apparatus, pumps etc. shall be made with C.I. or M.S. flanges with appropriate number of bolts. Flanged joints shall be made with 3mm thick insertion rubber gasket.

Note: Joints for pipes and fittings upto 50mm diameter shall be threaded joints using Teflon Tape or equivalent bonding tape on the threads. Joints for pipe and fittings above 50mm diameter shall be welded joints.

1.9.3 Pipe Protection

- a) All pipes in under ground masonry trenches/service tunnels, above ground and in exposed locations shall be painted with one coat of red oxide primer and two or more coats of synthetic enamel paint of approved shade.
- b) Pipes in wall chases shall be protected from corrosion by 2 coats of bituminous paints.
- c) Protection of Underground Pipes:

The underground steel pipes shall be protected by coating and wrapping. The coating and wrapping shall be done, in general, as per IS:10221-1982. The pipe coat primer shall have density of 0.92 gm/cc and drying time of 24 hours at RH 70% and temp. 30 C. Viscosity shall be 1000-2000 cps.

The pipe coat shall be a puncture resistant non-woven polyester mat 4mm thick of high mechanical strength. The mat shall be in 7 layers. The layers shall be so arranged as to give extra protection to high molecular high density polythene core which is the main permeable agent in the system.

Pipecoat Primer shall be applied on the pipe in a uniform coat leaving no drops runs. The entire surface of pipe should be primed without any patch left out. Unprimed surfaces shall reprimed immediately. Any uncleaned pipe shall be scraped down to surface of pipe and reprimed Pipecoat Primer shall essentially be thin layer for quicker drying.

The surface shall be dry at the time of applying Pipecoat Primer.

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Freshly primed pipe shall be placed on clean square cut skids and shall not be allowed to come in contact with ground or any foreign matter. It shall remain on skids until lifted or cradled after coating and wrapping operation.

All primed pipes which have excessive coat of dust accumulated over them before primer is dry or where primer has become dead, shall be reprimed. Drying time shall be minimum 24 hours. The application of Pipecoat membrane shall be taken up soon after primer coat has dried up completely and in case within three days after priming. Otherwise fresh coat of primer shall be applied.

Membrane shall be blown under tension by means of blowtorch. In this process, the inner surface of the membrane, being 10 micron thick polyethylene layer is burnt while at the same time the polymeric mix under it is softened taking care that the center core is not over heated. This molten polymeric mix is then passed over pipe surface so that no air is entrapped or voids formed underneath.

Pipecoat Primer shall be applied with brushes after cleaning the pipe thoroughly. Pipecoat Membrane shall be wrapped as mentioned above.

No wrinkling of the wrapper shall be allowed and all overlaps shall be firmly fused to secure a firm wrapping coating shall be absolutely free from pinholes and bubbles.

1.9.4 Installation of Pipes

All pipes shall be adequately supported from ceiling or walls by structural clamps fabricated from M.S. structural e.g. rods, channels, angles and flats. All clamps shall be painted with one coat of primer and two coats of black enamel paint. The contractor shall provide inserts at the time of slab casting or provide suitable anchor fasteners.

The pipe supports or hangers shall be designed to withstand combined weight of pipe, pipes fittings, fluid in pipe and insulation. Pipe supports shall be of steel and coated with rust preventing paint and finished with two coats black enamel paint. The maximum spacing for pipes supports shall be as below:

Pipe (MM)	Spacing (MTR)	Size of support
Up to 25	2.0	6mm
32 to 65	2.4	8mm
75 to 125	2.7	10mm
150 & above	3.0	12mm

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Pipes supports shall be spaced at maximum interval of 1.5 mtrs. on either side of heavy fitting and valves. Wherever piping passes through walls, pipes sleeves of diameter larger than that of piping shall be provided. Pipe sleeves shall be of steel or cast iron pipe.

The underground piping shall be supported with cement concrete blocks of suitable size and strength provided at an interval of 2.5 mtrs. The pipes shall be laid at 1 mtr depth (top of the pipe) and trench excavated for sufficient width. The rate for pipe shall include the scope of excavation/refilling the trench. 1:2:4 concrete thrust blocks are also to be provided at turning of pipe. The cost of installation includes concrete pedestals etc. as required and to be included in the item rate.

1.9.5 Orifice Flanges

Contractor shall provide orifice flanges fabricated from 6mm thick stainless steel plates on the branch lines feeding different zones/floors so as to allow required flow of water at a pressure of minimum 3.5 kg/sq.cm. and maximum up till 7.0 kg/sq.cm. for each hydrants and 2 bar at 1800 LPM at installation valve for sprinkler system. The contractor shall provide orifice flanges to ensure the required pressure. The size of orifice plate shall be as per table 32 & 33 of IS code 15105:2002.

1.9.6 Air Release Valve

Air Valves are to be provided on all high points in the system. These shall be 25 mm dia screwed inlet forged brass single acting air valves connected with ball valve on inlet side.

1.9.7 Valves & Other Accessories

1.9.7.1 General

Each valve body shall be marked with cast or stamped lettering giving the following information's:

- a) The manufacturer's name or trade mark
- b) The size of the valve
- c) The guaranteed working pressure

Isolating valves on the water supply lines shall be full bore ball valve type for pipe diameters upto 50mm. For 65mm dia and above these shall be butterfly valves.

1.9.8 Full Way Ball Valve

The valves shall be of full bore type and of quality approved by the Consultant/Owner. The body and ball shall be of copper alloy and stem seat shall be of Teflon.

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1.9.9 Butterfly Valves

The valve shall of cast iron conforming to relevant IS:13095 of PN-16 rating. The valve shall be of quality approved by the Consultant/Owner.

1.9.10 Non-Return Valves

Non-return valves are to be IS:778-1984 of PN-16 rating manufactured from gun-metal or dezincification resistant brass.

1.9.11 Drain Valve

Drain Valves are to be provided at all low points in the system for draining the water. These shall be 50mm dia full way ball valve fixed on 50mm dia black steel pipe.

1.9.12 Inspection & Testing Assembly

Inspection and testing of the sprinkler system shall be done by providing an assembly consisting of gunmetal valves, gunmetal sight glass, bye-pass valve.

1.9.13 Flow Switch

Flow switch shall be provided on sectional mains and branch lines of sprinkler systems as indicated on drawings, or necessary and required and directed by the Engineer-in-charge.

Flow switch should be suitable to actuate at a minimum of flow of single sprinkler and shall be suitable for connection to a central annunciation panel.

1.9.14 Pressure Switches

Pressure switches shall be differential type for operation of all pumps and for the various duties and settings required. Pressure switches shall be for heavy duty operation and of approved make. All pressure switches shall be factory calibrated.

1.10 External Fire Hydrants

Yard Hydrant valves shall be SS single headed as per IS : 5290. The valve shall be complete with hand wheel, quick coupling connection spring loaded type and gun metal blank cap. The Yard Hydrant shall be laid on 150mm dia Hydrant Ring Main, branched off to 80 mm dia and Stand Post of 80mm dia.

1.11 Internal Landing Valves

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The internal landing valves shall be SS double-headed and conforming to IS:5290. It shall be complete with hand -wheel, quick coupling connection spring loaded type and blank cap.

1.12 Hose pipes, Branch Pipes and Nozzles

Hose Pipe: Hose pipe shall be rubber lined woven jacketed and 63mm in diameter. They shall conform to type-A (Reinforced rubber lined) of IS:639-1979. The hose shall be sufficiently flexible and capable of being rolled.

Each run of hose pipe shall be complete with necessary coupling at the ends to match with the landing valve or with another run hose pipe or with Branch pipe. The couplings shall be of instantaneous spring lock type.

Branch Pipe: Branch pipe shall be of GM 63mm dia and be complete with male instantaneous spring lock type coupling for connection to the hose pipe. The branch pipe shall be externally threaded to receive the nozzle.

Nozzle : The nozzle shall be of copper or SS, 20mm in internal diameter. The screw threads at the inlet connection shall match with the threading on the branch pipe, the inlet end shall have a hexagonal head to facilitate screwing of the nozzle on to the branch pipe with nozzle spanner.

End couplings, branch pipes, and nozzles shall conform to IS:903-1985. two hoses of 15 mtr. Lengths with couplings shall be provided with each external (yard) hydrant. One nozzle and one branch pipe with coupling shall be provided with each yard hydrant.

1.13 External Fire Hose Cabinet

The external fire hose cabinet to accommodate the hose pipes, branch pipe nozzle and the hydrant outlets shall be fabricated from 16 gauge CRCA M.S. sheet. This shall be lockable and provided with center opening glazed doors.

The support for hose cabinet shall be of brick work up to a height of 0.5m above ground level. The depth of footing for this support shall be minimum 50cm below ground level, resting on leveling course of minimum 10cm of PCC (1:5:6). The brickwork shall be plastered in cement mortar (1:6). The hose cabinet shall be painted red and stove enameled.

1.14 Internal Fire Hose Cabinet

Each internal fire hydrant valve shall be housed in a niche of size indicated on drawings. Each internal fire hose Cabinet shall hold double headed hydrant, 4 Hoses and 2 Branch pipes and 1 no. Dunlop hose reel mounted on a drum.

- A) The cabinet shutters & frames shall be fabricated from boxed steel sections and MS plate 2mm thick.

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B) The front glass of shutters shall be 5.0 mm thick clear float glass and shall be held by means of rubber. Locking arrangement shall also be made with one number of mortice lock of approved make. A separate Key Box of 16 mm thick MS sheet with glass facing shall be provided.

C) The Shutter shall be given a powder coat finish in post office red colour.

1.15 Hose Reel

The hose reel shall be directly tapped from the riser through a 25 mm dia pipe, the drum and the reel being firmly held against the wall by use of dash fasteners. The Hose Reel shall be swinging type (180 degrees) and the entire Drum, Reel etc shall be as per IS:884. The rubber tubing shall be of approved quality and the nozzle shall be 6 mm dia shut off type.

1.16 Brigade inlet Connections

One set of 4 ways collecting head Fire Brigade connection shall be provided at the location indicated in the drawing.

The inlet to the riser shall be with 150mm dia sluice valve and non-return valve. The scope shall include providing necessary reducers, tees bends and special fittings as required. Necessary enclosure made of 2mm thick sheet metal with support shall be provided, as in the case of hose cabinets.

1.17 Sprinkler System

1.17.1 Sprinkler Heads

Sprinkler heads shall be of quartzoid bulb type with bulb, valve assembly yoke and the deflector. The sprinklers shall be approved make and type.

1.17.2 Types

1.17.2.1 Conventional Pattern

The sprinklers shall be designed to produce a spherical type of discharge with a portion of water being thrown upwards to the ceiling side of wall extras. The sprinklers shall suitable for erection in upright position or pendant position.

A. Spray Pattern

The spray type sprinkler shall produce a hemispherical discharge below the plane of the deflector.

B. Ceiling (flush) Pattern

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These shall be designed for use with concealed pipe work, these shall be installed pendant with plate or base flush to the ceiling with spray head below the ceiling.

C. Side Wall Sprinklers

These shall be designed for installation alongwith the walls of room close to the ceiling. The discharge pattern shall be similar to one quarter of sphere with a small proportion discharging on the wall behind the sprinklers.

1.17.2.2 Construction

- i) **Bulb:-** Bulb shall be made of corrosion-free material strong enough to with stand any water pressure likely to occur in the system. The bulb shall shatter when the temperature of the surrounding air reaches a predetermined level.
- ii) **Valve assembly:-** Water passage of the sprinkler shall be controlling assembly of flexible construction. The valve assembly shall be held in position by the quartzoid bulb. The assembly be stable and shall withstand pressure surges or external vibration without displacement.
- iii) **Yoke:-** The yoke shall be made of high quality gun metal. The arms of yoke shall be so designed as to avoid interference with discharge of water from the deflector. The sprinkler body shall be coated with an approved anti corrosive treatment if the same is to used in corrosive conditions.
- iv) **Deflector:-** The deflector shall be suitable for either upright or pendent erection. The deflector shall be designed to give an even distribution of water over the area protected by each sprinkler.

D) Colour Code

The following colour code shall be adopted for classification of sprinkler according to nomination temperature ratings.

Sprinkler Temperature Rating	Colour of the Bulb
79 deg. C	Yellow
68 deg. C	Red

E) Size of Sprinklers Orifices

The sprinklers shall be of 15mm nominal bore size.

1.17.2.3 Following type of sprinklers shall be provided depending upon the area.

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- i) Quick response pendent type sprinklers of 68°C temperature rating for vestibule & floor plates.
 - ii) Quick response upright type sprinklers of 68°C temperature rating for basements areas & other floors.

1.17.2.4 Pipes and Fittings

Pipes for sprinkler system shall be of black steel conforming to I.S. 1239 (Class-C, Heavy duty).

Fittings for black steel pipes shall be malleable iron suitable for welding or approved type cast iron MS forged fittings with tapered screwed threads.

1.17.2.5 Jointing

Joint for black steel pipes and fittings shall be metal to metal tapered thread or welded joints. A small amount of red lead may be used for lubrication and rust prevention in threaded joints.

Joints between G.I. or black steel pipes, valves and other apparatus, pumps etc. shall be made with G.I. or M.S. flanges with appropriate number of bolts. Flanged joint shall be made with 3mm thick insertion rubber gasket.

1.17.2.6 Pipes Protection

All pipes above ground and in exposed locations shall be painted with one coat of red oxide primer and two or more coats of synthetic enamel paint of approved shade.

The underground pipes shall be protected by coating and wrapping. The coating and wrapping shall be done, in general, as per IS:10221-1982..

1.17.2.7 Pipe Supports

All pipes shall be adequately supported from ceiling or walls from structural clamps fabricated from M.S. structural e.g. rods, channels, angles and flats. All clamps shall be painted with one coat of primer and two coats of black enamel paint. The contractor shall provide inserts at the time of slab casting or anchor fastner later.

1.17.2.8 Valves

Sluice valves of sizes 80mm and above shall be double flanged cast iron conforming to I.S. 780. Check valve shall be of cast iron double flanged conforming to I.S. 5312.

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Valves on pipes 65mm and below shall be heavy pattern gunmetal valves with cast iron wheel seat tested to 20 kg/sqcm. pressure. Valves shall conform to I.S. 778.

a. Air Valves

25mm dia screwed inlet cast iron single acting air valves on all high points in the system or as shown on drawings.

b. Drain Valves

50mm dia black steel pipe conforming to I.S. 1239 medium class with 50mm gunmetal full way valve for draining and water in the system in low pockets.

1.17.2.9 Installation Control Valve

Installation control valves shall comprise of the followings:

- a) One-man stop valve of full way pattern with gunmetal pointer to indicate where open/shut.
- b) One automatic alarm valve fitted with handle & cover.
- c) One hydraulic alarm motor and gong for sounding a continuous alarm upon out- break of fire. One combined waste and testing valve including 5mtr of tubing and fittings.
- d) Alarm stops valve.
- e) Strainer
- f) Drain plug
- g) Padlock and strap
- h) Wall box for installation of valve.

1.17.3 Pressure Gauges

Burden type pressure gauges conforming to IS/BS specifications shall be provided at the following locations:

- a. Just above alarm valve.
- b. Just below alarm valve, on the installation stop valve.
- c. One pressure gauge on delivery side of each pump.
- d. Required number of pressure gauges on pressure tank.

1.17.4 Installation of Piping

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- a. All above ground piping shall be installed on suitable to pipe hangers/supports as required. The hangers shall be made of MS angles, channels etc. and painted to the required finish with suitable synthetic enamel paint. The maximum spacing of piping supports shall be as follows:

Pipe (MM)	Spacing (MTR)	Size of support
Up to 25	2.0	6mm
32 to 65	2.4	8mm
75 to 125	2.7	10mm
150 & above	3.0	12mm

Piping shall be so installed that the system can be thoroughly drained. All the pipes shall be arranged to drain to the installation drain valve. In case of basement and other areas where the pipe work is below the installation drain valve/auxiliary valves of the following sizes shall be provided.

20mm dia valve for pipes up to

50mm dia 25mm dia valves for

65mm dia pipe

32mm dia valves for pipes larger than 65mm dia

Piping shall be of screwed type upto 50mm diameter. Welding of joints will be allowed for pipes of above 50mm dia.

The entire piping shall be pressure tested by hydrostatic method upto a pressure of 1.5 times the working pressure. The piping shall be slowly charged with water so that all the air is expelled from the piping by providing a 25mm inlet with a stop cock. The piping shall be allowed to stand full of water for a period of 2 hours and then the piping shall be put under pressure by means of manually operated test pump or by a power driven test pump. The pressure gauges used for testing shall be accurate and shall preferably be calibrated before the testing is carried out. All the leakage's and defects in joints revealed during the testing shall be rectified to the entire satisfaction of the Engineer-in-charge. The system may be tested in sections/parts as the work of erection of piping proceeds. The piping shall with stand 1.5 times the working pressure for at least 12 hours.

1.18 Testing

1.18.1 Testing on Completion of Installation

The entire system shall be tested after completion of installation as per the operating sequence specified.

Approvals It shall be the responsibility of the contractor to obtain the approval of drawings and to get the installation inspected

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and passed by any concerned authorities, as may be necessary as per local by laws, any fee payable to the local bodies for such activities shall be included in the rate.

Standards and Codes

1.	IS – 1648 – 1961	Code of Practice for fire safety of building (general) fire fighting equipment and maintenance.
2.	IS – 3844 – 1966	Code of practice for installation of internal fire hydrant in multi-stores building.
3.	IS – 2217 – 1963	Recommendation for providing first aid and fire fighting arrangement in public buildings.
4.	IS – 2190 – 971	Code of practice for selection, installation and maintenance of portable first fire appliance.
5.	IS – 3589	Electrically Welded Steel pipes (Medium class)
6.	IS – 1239	Mild steel tubes, Tubulers and other wrought steel fittings (Medium class)
7.	IS – 780	C.I. Double flanges sluice valve.
8.	IS – 778	Gun Metal Valves
9.	IS – 909 – 1965	External fire hydrant (underground)
10.	IS – 5290 – 1969	Internal Landing Valve
11.	IS – 884 – 1969	First and hose reel
12.	IS – 934 – 1976	Specification for portable chemical fire extinguisher soda acid type.
13.	IS – 2873 – 1969	Specification for fire extinguisher for carbon dioxide
14.	IS – 2189 & 2109	Automatic fire alarm system or BSS

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3116.

15.

National Building Code.

1.19 LIST OF APPROVED MAKES (FOR FIRE FIGHTING WORKS)

Engineer-in-Charge reserve the right to select the any of the brand out of the Brands listed in list of approved makes. Contractor to obtain written approval of Brand and model prior to procurement of material.

SL.NO	MATERIALS	BRAND NAME
1.	M.S. PIPES	TATA / JINDAL HISSAR / PRAKASH SURYA
2.	G.I. PIPES	TATA / JINDAL HISSAR / PRAKASH SURYA
3.	FORGED FITTINGS	DRP-M
4.	GUN METAL VALVES (GATE, GLOBE)	ZOOTO / SANT / LEADER
5.	BUTTERFLY VALVES	ZOOTO / LEADER / SANT
6.	NON-RETURN VALVES.	ZOOTO / LEADER / SANT
7.	SPRINKLER (UL LISTED)	SPRAY SAFE / HD / IMPACT
8.	FIRE HYDRANT LANDING VALVES, FIRE BRIGADE CONNECTION (ISI MARKED)	MINIMAX / NEWAGE / FLAME GUARD
9.	CONTROL VALVE	HD / VIKING (UL LISTED)
10.	FIRE HOSE PIPES, FIRST AID HOSE REEL (ISI MARKED)	MINIMAX / NEWAGE / EXFLAME
11.	BRANCH PIPE, NOZZLE AND COUPLINGS	MINIMAX / NEWAGE/ OMEX
12.	FIRE EXTINGUISHERS	MINIMAX / NEWAGE/ EXFLAME/OMEX
13.	PRESSURE GAUGE	H. GURE / FIEBIG
14.	CONTROL CABLE	CCI / GLOSTER / HAVELLS/SKYTONE
15.	1.1 KV LT CABLES (ISI MARKED)	CCI / GLOSTER / HAVELLS
16.	FIRE ALARM PANEL	APPOLO / EDWARDS / SYSTEM SENSOR
17.	PIPE COAT	IWL LIMITED / STP
18.	FLOW SWITCHES (UL LIESTED)	SYSTEM SENSOR / VIKING
19.	FASTENERS	HILTI
20.	SUSPENDERS	INTELLOTECH / CAMRY

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21.	VIBRATION ELIMINATER	RESISTOFLEX
22.	FLEXIBLE PIPE CONNETOR	EASYFLEX / ANY OTHER (UL LIESTED)

2.0 PREAMBLE TO THE PRICING OF BILL OF QUANTITES FOR FIRE HYDRANTS & SPRINKLER SYSTEMS

2.1 GENERAL

2.1.1 This section shall be applicable for item rate work and for variations. The quantities can be added or deleted with progress of work.

2.1.2 This preamble covers Fire Fighting Systems.

2.1.3 This preamble shall be read in conjunction with the specifications, condition of contract, drawings and all other documents accompanying the tender papers.

2.1.4 For all items of work the rates shall be comprehensive and all inclusive. The rates shall include for all matters and things necessary for satisfactory completion and maintenance of the work in proper working order and to the satisfaction of the Engineer-in-Charge, including testing, making samples, etc., and all that have been indicated in the specifications or other Tender Documents either directly or indirectly, and cover for all obligation of the Contractor under the Contract. No claim for additional payment shall be allowed for any error or misunderstanding by the contractor of the work involved.

2.1.5 Unless otherwise mentioned in the description of the item, this Bill of Quantities shall be applicable for work in any height, position or condition.

2.1.6 Unless otherwise stated, method of measurement as described in the latest editions of I.S. 1200 with its parts corresponding to different sections of work shall be followed. In case of any dispute in this matter, the decision of Engineer-in-Charge shall be final, binding and conclusive.

2.1.7 The following notations have been used throughout the

Bill of quantities. m - Metre

mm - Millimetre

m² - Square Metre

mm² - Square Millimetre

m³ - Cubic Metre

No. - Number/Numbers

Dia - Diameter

Kg. - Kilogramme/s

T - Metric Tonne

L.S - Lumpsum

Pt. - Point/Points

Set - Set/Sets

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C/C	-	Centre to Centre
@	-	At the rate of
V	-	Volt/Volts
A	-	Ampere/s
SWG	-	Standard Wire Gauge

- 2.1.8 The Contractor shall be deemed to have full knowledge of all his obligations under the Contract and shall be deemed to have made full allowance for complying with all such obligations in his offer.

2.2 TRADE PREAMBLE

2.2.1 External Fire fighting pipes

Pipe laying, excavation, bedding, dewatering of the trench where necessary, jointing (include for all joints, gaskets, nuts, bolts, jointing compound) backfilling in trench and disposal of surplus earth pipes shall be measured by length for an average depth as a single item but separately in accordance with type and diameter of pipe, testing necessary rectification, and sterilizing the pipe line including supplying of necessary water, chemicals and disinfectant and disposal of the water after use, should be included in this rate.

Pipe laying as per specifications shall be measured in Running Metre as actually laid measured along the centre line of the pipe line for and average depth. The bends, junctions, specials, fittings shall be included in Running Metre length of the pipe. The rates for pipe laying shall include :

- (A) Excavation of trenches in any kind of soil backfilling and disposal of surplus earth as specified.
- (B) Providing required beddings as shown in drawing and as specified.
- (C) Providing the pipes and fittings, joints, specials, etc. to the site.
- (D) Lowering the pipes, fitting, etc. into trench, jointing and fixing true to line and level.
- (E) Painting, wrapping & coating of pipes.
- (F) Providing all equipment, labour and materials, necessary to carry out the above works complete in all respects as specified and/or instructed.
- (G) Installation of valves, metres, other fittings and similar items, etc. as shown and specified.
- (H) Construction of thrust blocks as specified.

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- (I) Testing, cleaning sterilisation of pipe lines including supply of required water for such work.
- (J) Commissioning of completed pipes lines.
- (K) Backfilling to finished grade level with approved materials as shown and directed by the Engineer-in-Charge.
- (L) Removal of surplus excavated materials to an approved dumping yard.

2.2.2 **Chambers**

Valve chambers, surface boxes and similar items shall be measured by number constructed according to type.

2.2.3 **Appurtenances**

Valves and similar items shall be measured by number supplied and installed. The installation shall be included in the rate for laying etc. of the pipes measured by length.

2.2.4 **Fittings**

Pipe fittings, such as tees, bends, elbows, reducers and similar items shall be measured with pipes. Installation shall be included in the linear metre rate for laying etc. of the pipe line.

2.2.5 **Internal Fire Hydrants Pipes**

Specified pipes for fire hydrant system shall be measured in running metre along the centre line of the pipe lines and the rate shall include the cost of all necessary fittings, supports, clamps, cutting chases and holes in walls, floors and making necessary excavation, backfilling and disposal of surplus earth, where required. The rate shall be inclusive of the cost of necessary fittings, painting, testing and commissioning of the pipe lines, as specified.

2.2.6 **Masonry, RCC Chambers for Valves, Hydrants, etc.**

Chambers shall be measured in number according to type. The rates shall include-

Necessary excavation in any kind of soil backfilling and disposal of surplus earth as specified.

Protecting the excavation with all necessary shoring, strutting and keeping the excavation clear of water.

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Providing and laying foundation concrete as shown on drawing and as specified.

Providing and constructing brick masonry walls in cement mortar/RCC walls including reinforcement as shown on drawing and as specified. The openings required to be left open for pipes and subsequent reinforcement grouting shall also be included in the rates.

Providing and casting RCC top slab including reinforcement as shown on drawing and as specified.

Providing fitting and fixing C.I access cover including frame as shown on drawing and as specified and/or directed at site by the Engineer-in-Charge.

Providing external cement plaster 1:4 with water proofing compound 150mm from the bottom of the top slab for the external faces of the chamber walls. All external faces of chamber in touch with soil to be painted with two coats of bitumen coatings.

Providing concrete benching, seats, etc for pipes and valves as shown in the drawing and as directed by the Engineer-in-Charge.

The rates quoted shall be net and should any variation occur either in drawings or in specifications, the rates of individual items of work quoted in civil work shall apply.

2.2.7 Accessories for Fire Fighting Systems

All accessories for fire fighting system e.g. fire hydrants, RRL hoses, hose reels, branch pipes fire hose cabinets, air valves etc. shall be measured in numbers and shall include all items as given in the Bill of quantities.

2.2.8 Clamps, supports and fasteners:

In all types of work all supports, hangers and clamps to be fixed on RCC beam, walls, columns, slab, boundary wall and piers by means of approved galvanized expandable anchor fasteners in drilled hole of correct size and should be sufficiently strong to carry the load of pipes etc. Drilling should be done by approved power drill as recommended and approved by the manufacturers of anchor fasteners. Failure of any fastening device shall be the entire responsibilities of the contractor and he will replace such defective fasteners at his own cost. Project manager in the interest of work may use such clamps, fasteners, hangers etc for other services also.

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The project manager may modify the design and utilization of clamps, hangers, supports, fasteners contractor is not entitled to refuse such modification and no extra cost will be entitled for such modifications.

END OF FIRE FIGHTING
SPECIFICATIONS

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1.0 SPECIFICATIONS FOR PHE WORKS

1.1 General

1.1.1 Scope of work

The scope of work in this subhead comprises supply, installation, commissioning and testing of water supply, sewerage and drainage, sanitary fixtures and fittings, water pumping, water treatment system, RO plant & sewage treatment plant for **COEES & PHQ Building Guwahati**. The scope of work includes supply of all materials as per specifications and drawings, laying, fitting, fixing, installation and commissioning the same.

1.2 Specification for schedule items

- 1.2.1 All the water supply, drainage & sewerage works of schedule items shall be carried out strictly as per printed central PWD Specifications, 2009 Vol. (II) with upto date corrections.
- 1.2.2 All the water supply and sanitary works shall be carried out by the licenced plumbers approved by the Local Authorities and skilled workmen, experienced in the trade.
- 1.2.3 Only specified brand of material will be used subject to the approval of the sample.
- 1.2.4 All workmanship shall conform to Indian Standard Codes of Practice. The fixing and finishing shall be neat, true to level and plumb. Manufacturer's instructions shall be followed closely regarding installation and commissioning. All fixtures shall be protected throughout the progress of the work from damage. Special care shall be taken to prevent damage and scratching of fittings. Tool marks on exposed fixtures shall not be accepted. Protective paper on fixtures shall be removed with hot water only at the final completion of work.

1.3 LIST OF APPROVED MAKES FOR PHE AND SANITATION MATERIALS

Engineer-in-Charge reserve the right to select the any of the brand out of the Brands listed in list of approved makes. Contractor to obtain written approval of Brand and model prior to procurement of material.

SL. NO.	MATERIALS	BRAND NAME
1.	VITREOUS CHINA AND FIRECLAY SANITARYWARE	HINDWARE KOHLER GROHE

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2.	STAINLESS STEEL SINKS	KINGSTON JAYNA NIRALI
3.	C.P. FITTINGS & ACCESSORIES	JAQUAR PARKO KOHLER
4.	C.P. WASTE, SPREADERS, URINAL FLUSH PIPES	JAQUAR PARKO ORIENT
5.	SOIL, WASTE & RAIN WATER PIPES & FITTINGS	
	A) CENTRIFUGALLY CAST SPUN CAST IRON PIPES (IS:3989)	NECO
		SKF HEPCO
	B) UPVC PIPES AND FITTINGS	PRINCE SUPREME AKG
6.	RCC PIPES	PRAGATI CONCRETE UDYOG JAIN SPUN PIPE CO.
7.	STONE WARE PIPES & GULLY TRAPS	PERFECT
		BURN RK
8.	CPVC PIPES & FITTINGS	ASTRAL ASHIRVAD SUPREME
9.	G.I. PIPES	JINDAL HISSAR PRAKASH SURYA APL- APOLLO
10.	G.I. FITTINGS (MALLEABLE CAST IRON)	R -BRAND KS-BRAND
11.	BALL VALVES	ZOLOTO SANT LEADER
12.	BUTTERFLY VALVES	ZOLOTO SANT LEADER
13.	NON-RETURN VALVES	ZOLOTO SANT LEADER
14.	WATER METRES	CAPSTAN KRANTI ANAND
15.	BALL COCKS	GPA SANT L & K
16.	C.I. MANHOLES NECO COVERS AND FRAMES	RIF BC
17.	RCC MANHOLE COVERS & FRAMES	KK MANHOLE & GRATINGS CO.PVT. LTD
18.	FASTNERS	HILTI INTELLOTECH
19.	WATER HEATER	RACOLD VENUS JAQUAR
20.	HOT WATER INSULATION	ARMACELL KAIFLEX ARMAFLEX

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21.	PIPECOAT	IWL LIMITED PYPKOTE STP

NOTE:- Makes of Sanitary Fixtures and fittings are indicative. Final selection will be done by Engineer-In-Charge/OIL

SUBHEAD 2.0 SPECIFICATIONS FOR WATER SUPPLY PUMPS & WATER TREATMENT SYSTEM

2.1 Scope of Work

The Scope of work in this subhead shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely do all work relating to the supply, installation, testing & commissioning of water pumping and water treatment as described hereinafter and shown on the drawings.

The work shall include the following:-

Supply, installation, testing & commissioning of

- a) Water supply pumps & drainage pumping system.
- b) Water filtration system.
- c) Reverse Osmosis plant.
- d) Electrical works related with water supply pumps & water treatment plant.
- e) Painting of equipment and piping.
- f) Unloading of the equipment and placing in position at site.
- g) Foundation of equipments as required.

2.2 Technical Information

Contractor's attention is specially invited to the special conditions and other clauses in the agreement which required the contractor to :-

- a. To Submit detail shop drawings.
- b. Use material of specific makes and brands.
- c. Obtain approval from various authorities as necessary and required.

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2.3 General Requirements

- a) All materials shall be new and of the best quality conforming to specifications and subject to the approval of the Engineer.
- b) All equipment shall be of the best available make manufactured by reputed firms.
- c) All equipments shall be installed on suitable foundations, true to level and in a neat workmanlike manner.
- d) Equipment shall be so installed as to provide sufficient clearance between the end walls and between equipment to equipment.
- e) Piping within the pump house shall be jointed with welded flanged joints.

2.4 Pumping System

2.7.1 Water supply pumps

Water supply pumps shall be monoblock vertical in line, single or multistage stainless steel pumps suitable for clean filtered water as per BOQ item.

2.7.2 Hydro-pneumatic system

Hydro-pneumatic system shall be skid mounted factory assembled comprising vertical in line stainless steel pumps with vertical rubber membrane pressure tanks, pressure switches and electrical panel mounted on the same skid capacity as indicated in the Bill of Quantities. The pumps and pressure switches shall be arranged in a manner to operate the entire system between pre-determined pressure settings specified. Pumps shall be protected against running dry by providing low level electronic cut off switch.

Hydro-pneumatic system shall be skid mounted with all interconnecting piping and valves between pumps and pressure vessels etc.

2.7.3 Drainage Pumps

All drainage pumps shall be portable submersible monoblock non clog pumps with totally water & dust proof motor compact in design. The motor portion shall be isolated from the pump by intermediate casing with double mechanical seal in oil chamber. The shaft shall be with die cast rotor on motor side & shaft protection sleeves on pump side and shall be with grease packed bearings and greasing pump. The motor housing shall be suitable for IP 68 protection. The motor shall be

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provided with built in temperature sensor enabling tripping of motor if temp rises above 150 Deg.C and restart at 80 Deg.C giving complete dry run protect.

The pump shall be of capacities & head as given in Bill of Quantities.

2.7.4 Level Controller/Indicator

Contractor shall provide and install low voltage transistorised level controllers/indicator as specified in Bill of Quantities. Each level controller/indicator shall be provided with required number of PVC sheathed stainless steel probes with necessary wiring and conducting.

2.7.5 Neoprene flexible pipe connectors

Suction and delivery lines of the pumps shall be provided with double flanged reinforced Neoprene flexible pipe connectors. Connectors shall be suitable for a working pressure of each pump as specified in Bill of Quantities.

2.7.6 Piping

Pipes for suction and delivery line shall be galvanised steel tubes to IS:1239 (Heavy Class). Fittings shall be malleable cast iron fittings as per IS:1879.

2.7.7 Joints

All G.I. pipes and fittings shall be provided with welded flanged joints unless otherwise instructed.

2.7.8 Testing

All G.I. pipes shall be tested hydrostatically for a period of two hours to a pressure of 15.0 Kg/Cum. without drop in pressure.

2.7.9 Valves

- a) Valves 50 mm and above shall be cast iron lever operated butterfly valve as per IS: 13095 of PN-16 rating.
- b) Non-return 50 mm and above valve shall be dual plate wafer check valve of PN-16 rating.
- c) Valves 50 mm dia and below shall be lever operated valves, screwed type of gun metal body as per IS:318 with SS ball and SS stem with mild steel lever tested to 35.5 Kg/cm² of PN-16 rating.
- d) Non-return valve 50mm and below shall be gunmetal swing check

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valve confirming to IS: 778 Class-2 tested to 24.5 Kg/cm².

2.5 Water Treatment System

2.8.1 Water Filter

- a) Water filter shall be dual media pressure filter / activated carbon filter suitable for a rate of filtration given in Bill of Quantities. The design fabrication and construction shall conform to the requirement of IS:2825.
- b) Filter shall be vertical type skid mounted of required diameter. The shell shall be fabricated from M.S. plates conforming to IS:2041 suitable to withstand as design pressure given in Bill of Quantities. The minimum thickness of shell shall be 6 mm and dished ends shall be 6 mm which shall include corrosion allowance and mill allowance respectively. The scaling allowance on dished ends to be considered by the bidder as per requirement of IS:2825. The filter shall have atleast one pressure tight manhole cover. Each filter shall be provided with screwed or flanged connection for inlet, outlet, individual drain connections necessary and required. Filter shall be painted inside with minimum two coats of non-toxic corrosion resistant paint and one coat of red oxide primer outside.
- c) **Under Drain System**

Each filter shall be provided with an efficient under drain system comprising of collecting pipes, polypropylene nozzle's of manufacturer design. The entire under drain system shall be supported on M.S. plate or cement concrete supports provided by the contractor.
- d) **Face Piping**

Each filter shall be provided within interconnecting face piping comprising of inlet, outlet and back wash complete with valves. Pipes shall be galvanised steel tubes to IS:1239 (Heavy Class). Fittings shall be malleable cast iron fittings as per IS:1879.
- e) **Accessories**
 - i) Air release valve with connecting piping.
 - ii) 100 mm dia Dial Bourden type gun metal pressure gauges with gun metal isolation, cock and connecting piping on inlet and outlet, causing shall be with cast aluminium stored enamel black finish cases.

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- iii) Sampling cocks on low water inlet and filtered water outlet.
 - iv) Connection with valve for air scouring.
 - f) Each filter shall be provided with clean and washed filter media of type and depths as recommended by the manufacturer.
 - g) **Back Wash**
- Backwash flow rate shall be 400 gallons/hr./sq.ft which shall be achieved by reversal of flow from water supply pumps through the pressure filter. Backwash shall be done once in 48 hours subject to the recommendations of manufacturer.

2.8.2 Chemical Dosing Pumps (for Chlorination)

- a) Chemical dosing pumps shall be reciprocating type with PVC or Ebonite head and adjustable stroke with 0-100% adjustment.
- b) Pump shall be driven by a totally enclosed vertical spindle motor suitable for 400/440 volts, 3 phase, 50 cycles, A.C. supply.
- c) Capacity of the pump shall be as per manufacturer's recommendation.
- d) As the dose rate is likely to vary depending upon the quality of water select a pump of which operating capacity can be exceeded by further 50%.

2.8.3 Solution Tanks for Chlorination

Provide one PVC/Rubber lined M.S. tank of minimum one day storage capacity for each pump considering the extended capacity of the pump.

2.8.4 Piping & valves for Water Treatment Plant

- a) Pipes shall be M.S. galvanised steel conforming to IS: 1239 (Heavy class) with matching fittings jointed with welded flanged joints.
- b) Valves 50 mm and above shall be cast iron lever operated butterfly valve as per IS: 13095 of PN-16 rating.
- c) Non-return 50 mm and above valve shall be dual plate wafer check valve of PN-16 rating.
- d) Valves 50 mm dia and below shall be lever operated valves, screwed type of gun metal body as per IS:318 with SS ball and SS stem with mild steel lever tested to 35.5 Kg/cm² of PN-16 rating
- e) Non-return valve 50mm and below shall be gunmetal swing check valve confirming to IS: 778 Class-2 tested to 24.5 Kg/cm².

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2.8.5 Flow Measurement

The contractor shall provide one bye-pass type Rota meter reading LPH on delivery line of filter and softener.

2.8.6 The contractor shall supply one complete set of test kit for water treatment system.

2.8.7 Painting and Clean-up

- a) One completion of the installation contractor shall scrub, clean all pumps, piping, filter, softener and other equipment and apply one coat of primer.
- b) Apply minimum two coats of synthetic enamel paint. Type/make of paint shall be as per Engineer approval.
- c) Provide painted identification legend and direction arrows on all equipment and piping as directed by the Engineer.
- d) On final completion of the work, contractor shall clean up the site and pump room of all surplus materials, rubbish and leave the place in a broom clean condition.

2.6 RO PLANT

2.9.1 RO plant shall be proposed for drinking water. In general following RO will comprise the following:

- a) Pretreatment comprising filters & micron filters
- b) High pressure pumps
- c) Reverse Osmosis Membrane
- d) Anti scalant dosing in RO pretreatment
- e) PLC controls and instrumentation

2.9.2 CHARACTERISTICS OF RAW WATER AT INLET

Raw water available at site will be tested for following parameters. Based on inlet parameters RO Plant will be designed.

A) PHYSICAL TESTS

- a) Colour, Hazen units
 - b) Odour
 - c) Turbidity, NTU
 - d) pH
 - e) Total dissolved solids, mg/l
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B) CHEMICAL TESTS (MG/I)

- a) Chlorides (as Cl)
- b) Total Hardness (as CaCO₃)
- c) Iron (as Fe)
- d) Fluoride (as F)
- e) Sulphates as SO₄
- f) Nitrates as NO₃
- g) Calcium as Ca
- h) Magnesium as Mg
- i) Manganese as Mn
- j) Copper as Cu
- k) Zinc as Zn

2.9.3 TREATED WATER CHARACTERISTICS AT OUTLET OF RO

A) PHYSICAL TESTS

Sl. No.	Characteristics	Required water quality	Drinking water parameters standards as per IS:10500.1991
1.0	Colour, Hazen units	NIL	5
2.0	Odour	NIL	Unobjectionable
3.0	Turbidity, NTU	NIL	5
4.0	pH Value	6 to 6.5	6.5 to 8.5
5.0	Total dissolved solids, mg/l	<20	500

B) CHEMICAL TESTS (MG/I)

Sl. No.	Characteristics	Required water quality	Drinking water parameters standards as per IS:10500.1991
1.0	Chlorides (as Cl)	<2	250
2.0	Total Hardness (as CaCO ₃)	5	300
3.0	Iron (as Fe)	NIL	0.3
4.0	Fluoride (as F)	NIL	1.0
5.0	Sulphates as SO ₄	<1	200
6.0	Nitrates as NO ₃	<1	45

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7.0	Calcium as Ca	<5	75
8.0	Magnesium as Mg	<2	30
9.0	Manganese as Mn	NIL	0.1
10.0	Copper as Cu	NIL	0.05
11.0	Zinc as Zn	NIL	5

2.9.4 RO PLANT OPERATING CONDITION

Sr. No.	Parameter	Value.
1	Feed Flow Rate	600 LPH+
2	Product Flow Rate	300 LPH
3	Reject Flow Rate	< 300 LPH
4	Recovery	60 %

2.9.5 TREATMENT SCHEME

The treatment scheme will comprise the following components:

Sr. No.	Description
1	Raw Water Pump
2	Sand Filter
3	Carbon Filter
4	Anti Scaling Dosing System. (for more than 2000 ppm TD Sits cost extra)
5	Micron Cartridge Filter (20 Micron & 5 Micron)
6	High pressure Pump
7	RO Module
8	RO Product water storage Tank.

2.7 Electrical Works

2.10.1 Cables

- Contractor shall provide all power and control cables from motor control centre to various motors, level controllers and other control devices.
- Cables shall conform to IS:1554 and carry ISI mark.
- Wiring cables shall conform to IS:694.
- All power cables shall be aluminium conductor PVC insulated/PVC sheathed FRLS armoured cables of 1100 volts grade.
- All control and wiring cables shall be copper conductor PVC

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insulated armoured and PVC sheathed 600 volt grade.

- f) All cables shall have stranded conductors. The cables shall be in drums as far as possible and bear manufacturer's name.

2.10.2 Motor Control Centres

Cubicles switch board of floor mounted and shall be fabricated from 16 gauge M.S. sheet with dust and vermin proof construction. It shall be painted with stove enameled paint of approved make and shade. It shall be fitted with suitable etched plastic identifications plates for each motor. The cubicles shall in general comprise of the following :

- (A) Incoming and outgoing MCCB's of required capacity with rotary handle.
- (B) PVC Colour coated TPN Aluminum busbar having current density 0.8Amp/sq.mm.
- (C) Isolation switch fuse unit one for each motor.
- (D) Fully automatic DOL/Star Delta starters appropriate for motor rating with ON/OFF push buttons and on/off indicating neon lamps for individual motor.
- (E) Single phase preventor of appropriate rating for each motor.
- (F) Selector switch for pump operation.
- (G) Panel type ampere meters of appropriate rating one for each motor.
- (H) Panel type voltmeter on incoming main with rotary selector switch to read voltage between phase to neutral and phase to phase.
- (I) Rotary switch for manual or auto operation for each pump.
- (J) Space for liquid level controllers specified separately in this contract.

The panel shall be prewired with colour coded wiring. All interconnecting wiring from incoming main to switch gear, meters and accessories with in the switch board panel.

2.8 Installation, Commissioning & Guarantees

2.11.1 Installation

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- a) Contractor shall supply three copies of foundation drawings giving weight, vibration and other loads required for the proper designing of the foundations.
- b) All equipment shall be installed in a true workman like manner true to level and grade in accordance with the best current practice.
- c) Contractor shall employ sufficient and proper equipment for lifting and placing of heavy equipment and in a manner which shall not strain or cause damage to the existing structures. If any damage is done, the same shall be made good to the satisfaction of the Engineer without any additional cost.
- d) The contractor shall submit detailed shop drawings showing detailed layout of the system showing dia piping, valves etc. for approval of the Engineer. The work shall be started only after approval of shop drawings submitted by the contractor.

2.11.2 Commissioning

- a) On completion of the work in all its aspects, the contractor shall start up the plant in a manner normally done for the continuous operation for a period of not less than 48 hours and shall rectify and adjust the equipment for leakages and balancing the system.
- b) After satisfactory commissioning of the plant, the contractor shall conduct performance tests on the pumps to satisfy the Engineer that all equipments are performing to the rated outputs any or all pumps and equipment shall be rectified or replaced if the same is not performing in accordance with the specifications.

2.11.3 Guarantees

- a) On award of the work contractor shall submit a guarantee covering the quality and performance of all materials supplied and installed under the contract. This guarantee shall cover each and every material whether manufactured by the contractor or not.
- b) Contractor shall specify a suitable procedure to test the rated performance of the equipment and shall provide all necessary equipment, guages etc. for conducting such tests.
- c) The guarantee shall cover a period of one year from the date of installation and handing over and commissioning of plant.

2.11.4 Completion

On completion of the job, the contractor shall hand over to the Engineer the following:

- a) One flow chart drawn in ink on thick paper and mounted in a glass frame showing the flow diagram of the process including legend

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- showing valves to be normally open or closed and instructions for operation and maintenance of the pumping equipment.
- b) Five sets of operating and maintenance instructions with spare parts list and their manufactures and/or suppliers.
 - c) Five sets of catalogues and drawings for all equipment supplied.

On final commissioning of the plant, contractor shall provide the services of one trained supervisor for period of two calendar weeks to train the Owners' staff in the operation and maintenance of the plant

2.9 LIST OF APPROVED MAKES FOR PUMPS & WATER TREATMENT SYSTEM

Engineer-in-Charge reserve the right to select the any of the brand out of the Brands listed in list of approved makes. Contractor to obtain written approval of Brand and model prior to procurement of material.

SL. NO.	MATERIALS	BRAND NAME
1.	VERTICAL IN LINE PUMPS	- EBARA PUMPS - GRUNDFOS - WILO
2.	HYDROPNEUMATIC SYSTEM	- EBARA PUMPS - GRUNDFOS - WILO
3.	SUBMERSIBLE DRAINAGE PUMPS	- EBARA PUMPS - GRUNDFOS - WILO - KSB
4.	G.I/M.S PIPES	- JINDAL HISSAR - PRAKASH SURYA - APL-APOLLO
5.	BALL VALVE /BUTTERFLY VALVE	- ZOLOTO - SANT - LEADER
6.	NON-RETURN VALVE	- ZOLOTO - SANT - LEADER
7.	Y-STRAINERS	- ZOLOTO - SANT - LEADER
8.	PRESSURE SWITCH	- DANFOSS - SWIZER

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9.	PRESSURE GAUGE	- H GURU - FIEBIG
10.	ELECTRIC MOTORS	- KIRLOSKAR - NGFE - SIEMENS
11.	ELECTRICAL SWITCHGEAR & STARTERS	- GE POWER - L&T - CONTROL & SWITCHGEAR
12.	CABLES	- SKYTONE - POLYCAB - GRANDLAY
13.	LIQUID LEVEL CONTROLLERS AUTOLIFT LIQUID LEVEL INDICATORS TECHNICA	- - - ACTIVE CONTROL
14.	FILTER	- ION EXCHANGE - BRISANZIA - ENVIROTECH UTILITY
15.	CHLORINATOR	- MILTON ROY
16.	ELECTRICAL CONTROL PANEL	- DIAMOND ELECTRICAL - SPC ELECTROTECH PVT. LTD. - NEPTUNE SYSTEMS PVT. LTD.
17.	CI MANHOLE COVERS & FRAMES NECO FOR UNDERGROUND TANK	- - SKF
18.	SOLAR COLLECTORS	- SOLARICS - BIPSUN - SOLAHART

2.10 LIST OF APPROVED MAKES FOR RO PLANT

Engineer-in-Charge reserve the right to select the any of the brand out of the Brands listed in list of approved makes. Contractor to obtain written approval of Brand and model prior to procurement of material.

1.	FILTERS	- ION EXCHANGE - BRISANZIA - ENVIROTECH UTILITY
2.	RO FEED PUMPS	- EBARA PUMPS

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|------------------------------|------------------------|
| | - GRUNDFOS |
| | - WILO |
| 3. DOSING SYSTEM | - MILTON ROY |
| 4. R.O. MEMBRANE | - DOW |
| | - HYDRONAUTICS |
| | - PERMIONICS MEMBRANES |
| 5. MICRON CARTRIDGES | - MSK TECHNOLOGIES |
| | - MMP FILTRATION |
| | - GOPANI |
| 6. CARTRIDGE FILTER HOUSING | - MSK |
| | - PERMIONICS MEMBRANES |
| | - MMP FILTRATION |
| | - GOPANI |
| 7. DIGITAL CONDUCTIVITY | - |
| COUNTRONICS & PH INDICATORS | - |
| INSTRONICS | |
| 8. FLOW INDICATORS | - KROHNE |
| 9. HIGH PRESSURE SWITCH AND | |
| LOW PRESSURE SWITCH | - DANFOS |
| | - INDFOS |
| | - ORION INSTRUMENTS |
| 11. PRESSURE CONTROL VALVE | - SP |
| | - BREY |
| 12. PLC PANEL FOR R.O. PLANT | - SANSEL |
| | - PERMIONICS MEMBRANES |
| | - PENTAIR |
| 13. AUTO FLUSHING SWITCH | |
| WITH SOLENOID VALVE | - ACTIVE CONTROLS |
| | - FORBES MARSHALL |

SUBHEAD 3.0 SPECIFICATIONS FOR SBR BASED SEWAGE TREATMENT PLANT OF CAPACITY 50 KLD

DESCRIPTION OF PROCESS SCHEME

In order to conserve water, the sewage treatment plant will be designed to ensure that treated effluent (water) characteristics are well below the permissible limits. It is proposed to use sewage treatment plant working on principal of Sequence Bio Rector Technology (SBR).

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Technology Brief

SBRs are a variation of the activated-sludge process. They differ from activated-sludge plants because they combine all of the treatment steps and processes into a single basin, or tank, whereas conventional facilities rely on multiple basins. For continuous-flow applications, two SBR tanks shall be provided so that one tank receives flow while the other completes its treatment cycle.

System Write Up

Sewage shall be collected in the collection cum Equalization Tank for dampening of flow variation and to equalize the concentration after passing through Coarse and fine Screen and Oil and Grease Trap where it shall be screened and de-oiled. Air shall be supplied by means of diffused aeration to keep the sewage in suspension.

The air-purged sewage from collection tank shall be pumped to SBR reactors. This is a cyclic reactor having very less volume as compared to conventional treatment. The SBR tank process consist phases of anoxic and aerobic process thereby achieving the high rate of BOD and COD removal. The raw sewage is passed through following phases are carried out in the SBR Tank:

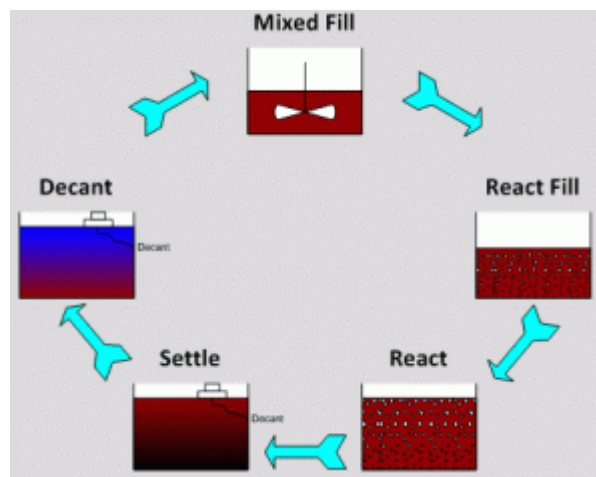


Figure 1: **Treatment step in SBR process**

Fill

During the fill phase, the basin receives influent wastewater. The influent brings food to the microbes in the activated sludge, creating an environment for biochemical reactions to take place. Mixing and aeration can be varied during the fill phase to create the following different scenarios:

Static Fill – Under a static-fill scenario, there is no mixing or aeration while the influent wastewater is entering the tank. Static fill is used during the initial start-up phase of a facility, at plants that do not need to nitrify or denitrify, and during low flow periods to save power. Because the mixers/aerators remain off, this scenario has an energy-savings component.

Aerated/React Fill – Under an aerated-fill scenario, the aerators unit are activated. The contents of the basin are aerated to convert the anoxic or anaerobic zone over to an

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aerobic zone. This initiates the feast period. Feast is when the micro-organism have been in contact with substrate and a large amount of oxygen is provided to facilitate the substrate consumption. Nitrification and de-nitrification occurs at the beginning of this stage. This stage is over when the tank is filled as per requirement or when the time limit is over.

React:

During this period the aeration is on until the complete degradation of BOD and nitrogen is achieved. During this stage the some micro-organism will die because of the lack of food and will help in reducing the settling sludge. The length of the aeration period determines the degree of BOD consumption.

Settle:

Aeration is discontinued at this stage and solids separation takes place leaving clear water above the sludge blanket. During this period no liquid is allowed to enter or leave the tank to avoid any turbulence.

Decant:

This period is characterized by the withdrawal of treated sewage from approximately 2 feet above the mixed liquor layer/sludge layer at the bottom by the floating decanter. During this stage also no turbulence is required.

The treated water is disinfected and collected in a Intermediate tank from where it shall be pumped under medium pressure through Dual Media Filter & Activated Carbon filter. The DMF will remove any suspended impurities upto 30 micron in least dimensions and ACF will adsorb remaining organic and inorganic contents.

To disinfect the water an Ultra violet unit is installed at the outlet of Filters.

The sludge settled in the SBR tank shall be withdrawn periodically with the help of Self priming non clog type pump and transferred to the filter press for sludge dewatering and supernatant shall be transferred back to EQT.

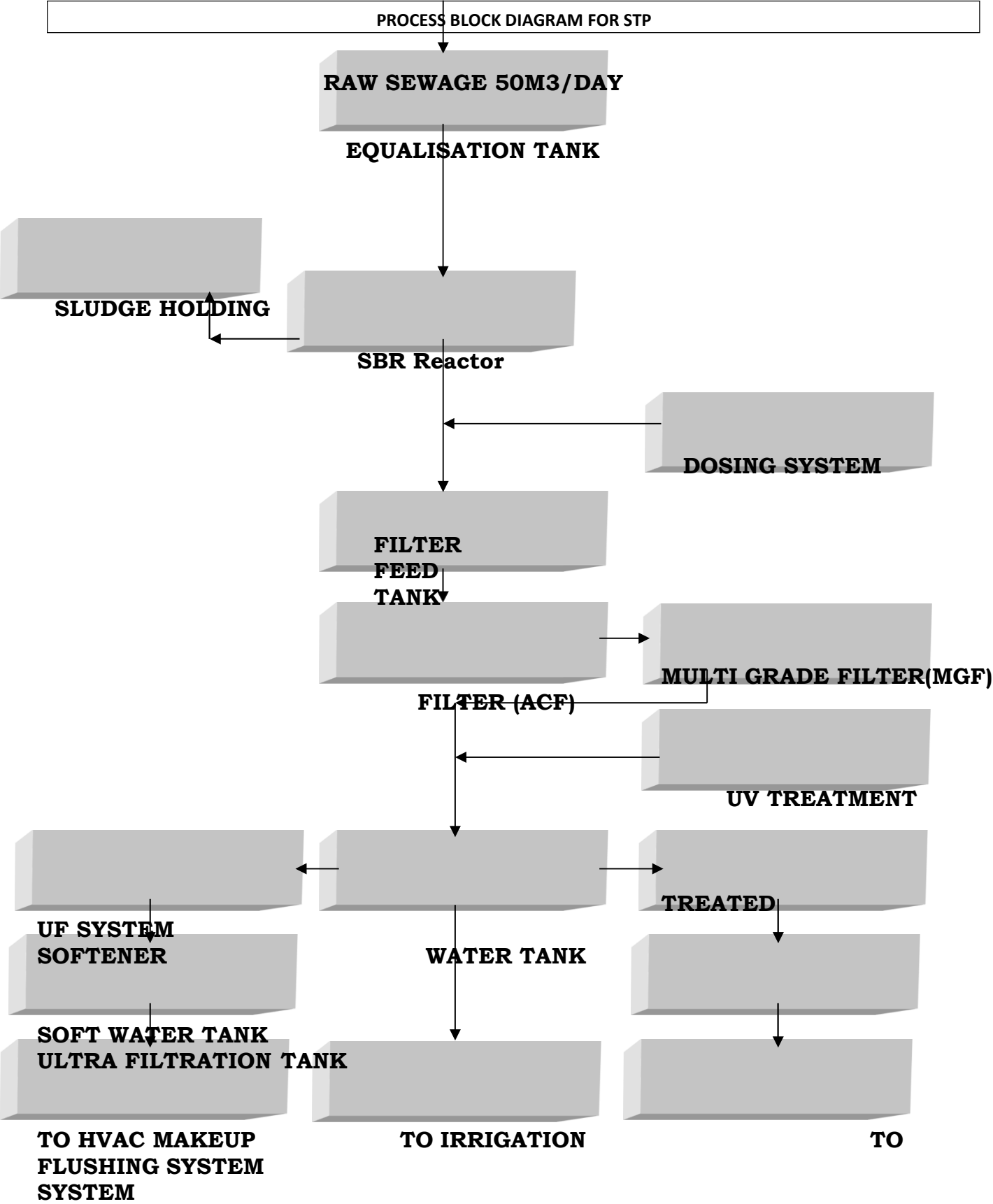
General Assumption for SBR process

S/N		
1.	Total no. of SBR tanks	1 No.
2.	No. of cycles per day per tank	4 No.
3.	Operation time for one cycle	6 Hrs.
3.	MLSS	3500-4000mg/l
4.	DO in SBR tanks	2 mg/l
5.	Temp of water	20-25 °C

After package type sewage treatment plant the treated effluent will be further treated by multi grade filter, activated carbon filter, UV system & UF system.

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The treated sewage from STP will be used for flushing, HVAC makeup & irrigation system within the complex.



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3.1 SPECIAL CONDITIONS OF CONTRACT

This section shall be read in conjunction with all other sections forming part of the tender.

3.1.1 SCOPE OF WORK

The scope of work comprises installation, commissioning and testing of sewage treatment plant of capacity **50m³/day based on SBR technology for proposed Centre of excellence for energy studies, Guwahati.** The sewage treatment plant will be constructed to cater for 50m³/day flow. The effluent as per parameters given in Para 3.2.1 shall be treated to produce effluent of quality to reach at least a standard mentioned in Para 3.2.2 of this specification or as per local regulations. The Tenderer shall handover the plant in full operational condition to the satisfaction of the Engineer.

The sewage Treatment Plant shall essentially include but not limited to the all items of work indicated in specifications Para 3.2.3.

3.1.2 SPECIFICATIONS

The work shall be executed in accordance with the specifications enclosed, the working drawings, the Bill of quantities and instructions issued from time to time. Wherever these specifications are found wanting in any way, the CPWD specifications shall apply.

3.1.3 SHOP DRAWINGS

- a) The Contractor shall prepare and submit to the Engineer-In-Charge for approval, before the work is commenced, all details and installation/ fabrication drawings in line with the drawings available for the building.

3.1.4 OPERATING INSTRUCTION, DRAWINGS ON COMPLETION

One month before the commencement of the operating period, the tenderer shall furnish the Employer with two complete sets of Maintenance, Operating Instructions and Service Manual for the working of the Plant. These shall take the form of properly bound documents, protected by strong plastic covers.

After commissioning the plant the same shall be operated for a period of two months by the contractor in order to train the client's staff.

3.1.5 SELECTION OF EQUIPMENT

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The Contractor shall be entirely responsible for the performance of the sewage treatment works in their totality with due regard to capacity, hydraulics, quality of final effluent, suitability of piping, mechanical and electrical equipment including everything complete and shall give due guarantee for the same. He shall also be responsible for type of structures, foundations and miscellaneous steel works for proper functioning of the plant.

All construction materials and workmanship shall conform to the relevant section of the specification and to the approval of the Engineer.

3.1.6 ERECTION

The Contractor shall undertake the erection of the plant under the direct supervision of the plant manufacturer or their nominated agencies, as approved by the Engineer. The Contractor shall also supply and install all the mechanical and electrical equipments required for functioning of the sewage treatment plant. The Contractor shall provide with all the facilities required by the Engineer for inspection of the installation.

3.1.7 PAINTING AND PROTECTIVE COATINGS

All surfaces exposed to the atmosphere shall be painted in accordance with relevant section of specification or as per manufacturer's instructions.

All surfaces exposed to sewage treatment plant shall have protective coatings as per approval of the Engineer. The tenderer shall submit full details of all the protective coatings he proposed for approval before any of the equipment, pipe work, etc. of the plant is ordered.

3.1.8 TESTING

The tenderer shall made all demonstrations as are required or necessary to prove that the completed works fulfil every aspect of the design requirements and specifications. The tenderer shall provide all labour, material and attendance necessary for the witnessing and checking of test results to the Engineer's satisfaction.

3.1.9 LUBRICATION

The tenderer shall ensure that all moving parts are lubricated in accordance with the equipment manufacturer's recommended procedures prior to commencement of operation of any plant and also during the operating period.

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3.2 GENERAL SPECIFICATIONS

2.2.1 CHARACTERISTICS OF SEWAGE AT INLET

The following characteristics of Sewage Treatment plant shall be considered for design purpose. The tenderer may collect additional data, if so required by him at his at his own cost.

Daily avg. sewerage/flow:

50m³/day for domestic sewage

PH : 6.5 - 8.5

BOD : 350 Mg/L

S. Solids : 250 - 300 Mg/L

COD : 500 - 800 Mg/L

Oil & grease : < 50 Mg/L

Inlet Coliform : 10⁶ - 10⁷ counts / 100 ml

3.2.2 TREATED EFFLUENT CHARACTERISTICS

The minimum quality of treated effluent after the treatment to be either equal to or better than: PH : 6.5 - 7.5

BOD5 : Less than 10

Mg/L Total suspended Solids: Less than 20

Mg/L COD : Less than

50 Mg/L

Oil & Grease : Less than 10 Mg/L

NH4-N : 5 PPM

N- total : 10 PPM

Outlet Coliform : < 100 counts / 100 ml **(at CCT outlet)**

The treated effluent shall be odourless, free from oil, grease and other obnoxious matters.

3.2.3 LIST OF ITEMS FOR SEWAGE TREATMENT PLANT

In general, STP shall comprises erecting, testing and commissioning of the following items of STP suitable for handling 50m³/day based on SBR

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technology. The sewage treatment plant in general shall comprise following items of work.

- A) 1 No. SS-304 manual bar screen suitable for 50m³/day flow rate.
- B) 2 Nos. Sewage lifting pumps (one duty + one stand by) self priming type capacity 12.0m³/hr at 10m head).
- C) 1 Lot Air Grids for SBR tank for 50m³/day sewage flow. (SS - 304 for submersible pipes and CPVC SDR 11 & SCH-40 for exposed pipes in plant room).
- C) 2 Nos. Air blowers with VFD drive (one working and one standby) twin lobe rotary air blower each of capacity 80m³/hr at 5000 mmwg.
- D) Decanter : PLC controlled moving decanter in SS-304 thickness more than 3mm thick to be install in Reactor tank & shall be driven by geared motor.
- E) 1 No. 100 litres capacity Dosing Tank with metering pump of capacity 0-6 lph for chlorine dosing.
- F) 2 Nos. Filter feed pumps (one working + one standby) each of capacity 10.0m³/hr at 25m head.
- G) 2 Nos. Softener feed pumps (one working + one standby) each of capacity 4.0m³/hr at 25m head.
- H) 2 Nos. Flushing water supply pumps (one working + one standby) each of capacity 6.0m³/hr at 45m head.
- I) 2 Nos. Irrigation water supply pumps (one working + one standby) each of capacity 6.0m³/hr at 45m head.
- J) 2 Nos. HVAC makeup water supply pumps (one working + one standby) each of capacity 6.0m³/hr at 45m head.
- K) 1 No. M.S. pressure Dual Media filter with frontal pipe work capacity. Flow Rate 10.0m³/hr and 2.5kg/cm² working Pressure.
- L) 1 No. M.S. activated carbon filter with frontal pipe work capacity. Flow Rate 10.0m³/hr and 2.5kg/cm² working Pressure.

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| M) | 1 No. M.S. Softener with frontal pipe work capacity. Flow Rate 4.0m ³ /hr and 2.5kg/cm ² working Pressure. |
| N) | 2 Nos. Sludge transfer pumps (one duty + one stand by) self priming type capacity 2m ³ /hr at 10m head. |
| O) | 2 Nos. Filter press feed screw pumps (one working + one standby) of capacity 2.0m ³ /hr at 40m head. |
| P) | 2 Nos. submersible drainage pumps (one working + one standby) each of capacity 18m ³ /hr at 15m head. |
| Q) | 1 No. UV sterlizer of capacity 10.0m ³ /hr. |
| R) | 1 No. UF system of capacity 4.0m ³ /hr. |
| S) | All interconnecting piping and valves for above equipment as per BOQ. |
| T) | 1 Lot Electrical cabling, earthing, MCC and local push buttons station (Electrical Cabling, earthing including the incoming power supply etc shall be provided by the other agency. However, connections/terminations to the equipments, testing and commissioning shall be carried out by the contractor). |
| U) | Operation & Maintenance contract of STP for a period of one year after commissioning. All spares and replacement of any defective part shall be included in the contract. |
| V) | Working/maintenance platform for STP fabrication from MS chequard plate & structure steel works. |
| W) | Any other work necessary for satisfactory performances of the system |

Following civil structures as per drawing to be executed in civil works subhead of tender documents.

A)	1 Nos. RCC Bar Screen Channel.
B)	1 No. RCC Equalisation Tank.
C)	1 No. RCC O& G Trap Chamber.
D)	1 No. RCC SBR Tank.
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- E) 1 No. RCC Filter feed tank.
- F) 1 No. RCC Treated water Tank.
- G) 1 No. RCC Ultra filtration water Tank.
- H) 1 No. RCC Soft water Tank.
- I) 1 No. RCC Sludge holding Tank.
- J) Civil Foundations for the STP mechanical equipment.
- K) All manholes, vent pipes, railings & supports as required.

3.2.4 LIST OF INSTRUMENTS

Following instruments shall be provided in STP

SR. NO.	DESCRIPTION	QTY.	LOCATION
1.	Pressure gauges	Lot	All Pumps / blowers
2.	Air rota meters	Lot	On SBR air line
3.	Digital energy meter	Lot	Electrical panel
4.	Water magnetic flow meter with totalizer	Lot	At inlet of sewage & outlet of treated water Tanks
5.	Level switches	Lot	

3.2.5 Electrical Works

3.2.6.1 Cables

- a) Contractor shall provide all power and control cables from motor control centre to various motors, level controllers and other control devices.
- b) Cables shall conform to IS:1554 and carry ISI mark.
- c) Wiring cables shall conform to IS:694.
- d) All power cables shall be aluminium conductor PVC

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insulated/PVC sheathed FRLS armoured cables of 1100 volts grade.

- e) All control and wiring cables shall be copper conductor PVC insulated armoured and PVC sheathed 600 volt grade.
- f) All cables shall have stranded conductors. The cables shall be in drums as far as possible and bear manufacturer's name.

3.2.6.2 **Motor Control Centres**

Cubicles switch board of floor mounted and shall be fabricated from 16 gauge M.S. sheet with dust and vermin proof construction. It shall be painted with stove enamelled paint of approved make and shade. It shall be fitted with suitable etched plastic indentifications plates for each motor. The cubicles shall in general comprise of the following :

- (A) Incoming and outgoing MCCB's of required capacity with rotary handle.
- (B) PVC Colour coated TPN Aluminium busbar having current density 0.8Amp/sq.mm.
- (C) Isolation switch fuse unit one for each motor.
- (D) Fully automatic DOL/Star Delta starters appropriate for motor rating with ON/OFF push buttons and on/off indicating neon lamps for individual motor.
- (E) Single phase preventor of appropriate rating for each motor.
- (F) Selector switch for pump operation.
- (G) Panel type ampere meters of appropriate rating one for each motor.
- (H) Panel type voltmeter on incoming main with rotary selector switch to read voltage between phase to neutral and phase to phase.
- (I) Rotary switch for manual or auto operation for each pump.
- (J) Space for liquid level controllers specified separately in this contract.

The panel shall be prewired with colour coded wiring. All interconnecting wiring from incoming main to switch gear, meters and accessories with in the switch board panel.

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3.3 LIST OF APPROVED MAKES FOR SEWAGE TREATMENT PLANT

Engineer-in-Charge reserve the right to select the any of the brand out of the Brands listed in list of approved makes. Contractor to obtain written approval of Brand and model prior to procurement of material.

SL. NO.	MATERIALS	BRAND NAME
1.0	STRUCTURAL STEEL	TATA / SAIL
2.0	CPVC PIPES	ASTRAL/ASHIRVAD/AKG
3.0	SS PIPES	JSL/ PRIMEGOLD/ VIEGA
4.0	G.I./M.S. PIPES	JINDAL HISSAR/SURYA PRAKASH/ TATA
5.0	ENAMEL PAINT/EPOXY PAINT	NEROLAC / BERGER / ASIAN PAINT
6.0	BUTTERFLY VALVES	ZOOTO/ SANT/ LEADER
7.0	NON-RETURN VALVES	ZOOTO/ SANT/ LEADER
8.0	BALL VALVES	ZOOTO/ SANT/ LEADER
9.0	CENTRIFUGAL TYPE, NON CLOG SELF PRIMING PUMPS	KSB /GRUNDFOS / JOHNSON /KIRLOSKAR
10.0	AIR BLOWERS	EVEREST/BETA/KAY
11.0	PRESSURE GAUGES	H.GURU/FIEBIG
12.0	AIR DIFFUSERS	REHAU/AIRFIN/MM AUQA
13.0	CHEMICAL DOSING PUMPS	ASIA LMI/PROMINENT/ WALKTON
14.0	FILTER PRESS	SACHIN/HYDROCON
15.0	MULTI GRADE FILTER/ACTIVATED CARBON FILTER/SOFTENER	FABRICATED
16.0	DOSING TANKS	SINTEX/ SHEETAL
17.0	SCREW PUMPS	ROTO/UT

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18.0	SLUDGE TRANSFER PUMPS	KIRLOSKAR / JOHNSON
19.0	PLC PANEL	ABB, SIEMENS, L&T, CUTLER- HAMMER/ALEN BRADLY/MITSHUBISHI/VE E4TECH
20.0	VFD	ABB, SIEMENS, L&T, CUTLER- HAMMER/ALEN BRADLY/MITSHUBI SHI

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21.0	DECANTER	WASTECH/C-TECH/PRIMER TECH
22.0	DO METER/EM FLOW METER/INSTRUMENTATION	FORBES MARSHALL/ABB/SIEMENS/H YDRO CON/HACH
23.0	ULTRA FILTRATION MEMBRANES	DOW/ GE/ HYDRANAUTICS
24.0	ULTRA FILTRATION INTEGRATOR	RAISA
25.0	UV SYSTEM	ALFAA/SUKRUIT
26.0	WATER METERS	AQUAMET/KAYCEE/CAPST ON
27.0	DIFFUSERS	REHAU/AIRFIN/MM AUQA
28.0	PH METERS	ION EXCHANGE/FORB S MARSHAL
29.0	ROTA METERS FOR AIR	MICROWFLOW
30.0	FLOW METERS	KROHNE/ EUREKA/ ADPEPTFLUIDYNE
30.0	CABLES	SKYTONE/ POLYCAB/ GRANDLAY
31.0	LIQUID LEVEL CONTROLLERS	ACTIVE CONTROL/MINILEC
32.0	ELECTRICAL CONTROL PANLEL	DIAMOND ELECTRICAL/ SPC ELECTROTECH PVT. LTD./ NEPTUNE SYSTEMS PVT. LTD/SYNERGY
33.0	TESTING METERS	ABB/SIEMENS
34.0	STP & UF SUPPLIERS	BRISANZIA/ KAVYA WATER TECHNOLOGIES/ ENVIROTECH UTILITY

SUBHEAD 4.0 PREAMBLE TO THE PRICING OF BILL OF QUANTITIE FOR PHE WORKS

4.1 GENERAL

4.1.1 This section shall be applicable for item rate work and for variations.

4.1.2 This preamble covers water supply, sewerage, drainage, sanitary fittings, solar heating system, pumping systems, water treatment, RO plant & sewage treatment plant.

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- 4.1.3 This preamble shall be read in conjunction with the specifications, condition of contract, drawings and all other documents accompanying the tender papers.
- 4.1.4 For all items of work the rates shall be comprehensive and all inclusive excluding GST. The rates shall include for all matters and things necessary for satisfactory completion and maintenance of the work in proper working order and to the satisfaction of the Engineer-in-Charge, including testing, making samples, etc., and all that have been indicated in the specifications or other Tender Documents either directly or indirectly, and cover for all obligation of the Contractor under the Contract. No claim for additional payment shall be allowed for any error or misunderstanding by the contractor of the work involved.
- 4.1.5 Unless otherwise mentioned in the description of the item, this Bill of Quantities shall be applicable for work in any height, position or condition.
- 4.1.6 Unless otherwise stated, method of measurement as described in the latest editions of I.S. 1200 with its parts corresponding to different sections of work shall be followed. In case of any dispute in this matter, the decision of Engineer-in-Charge shall be final, binding and conclusive.
- 4.1.7 The following notations have been used throughout the Bill of quantities.
- | | | |
|-----------------|---|---------------------|
| m | - | Metre |
| mm | - | Millimetre |
| m ² | - | Square Metre |
| mm ² | - | Square Millimetre |
| m ³ | - | Cubic Metre |
| No. | - | Number/Numbers |
| Dia | - | Diameter |
| Kg. | - | Kilogramme/s |
| T | - | Metric Tonne |
| L.S | - | Lumpsum |
| Pt. | - | Point/Points |
| Set | - | Set/Sets |
| C/C | - | Centre to Centre |
| @ | - | At the rate of |
| V | - | Volt/Volts |
| A | - | Ampere/s |
| SWG | - | Standard Wire Gauge |
- 4.1.8 The Contractor shall be deemed to have full knowledge of all his obligations under the Contract and shall be deemed to have made full allowance for complying with all such obligations in his offer.

4.2 TRADE PREAMBLE

4.2.1 External Water Supply Pipes

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Pipe laying, excavation, bedding, dewatering of the trench where necessary, jointing (include for all joints, gaskets, nuts, bolts, jointing compound) backfilling in trench and disposal of surplus earth pipes shall be measured by length for an average depth as a single item but separately in accordance with type and diameter of pipe, testing necessary rectification, and sterilizing the pipe line including supplying of necessary water, chemicals and disinfectant and disposal of the water after use, should be included in this rate.

Pipe laying as per specifications shall be measured in Running Metre as actually laid measured along the centre line of the pipe line for and average depth. The bends, junctions, specials, fittings shall be included in Running Metre length of the pipe. The rates for pipe laying shall include :

- (A) Excavation of trenches in any kind of soil backfilling and disposal of surplus earth as specified.
- (B) Providing required beddings as shown in drawing and as specified.
- (C) Providing the pipes and fittings, joints, specials, etc. to the site.
- (D) Lowering the pipes, fitting, etc. into trench, jointing and fixing true to line and level.
- (E) Providing all equipment, labour and materials, necessary to carry out the above works complete in all respects as specified and/or instructed.
- (F) Installation of valves, metres, other fittings and similar items, etc. as shown and specified.
- (G) Construction of thrust blocks as specified.
- (H) Testing, cleaning sterilisation of pipe lines including supply of required water for such work.
- (I) Filling river sand alround GI pipe.
- (J) Commissioning of completed pipes lines.
- (K) Backfilling to finished grade level with approved materials as shown and directed by the Engineer-in-Charge.
- (L) Removal of surplus excavated materials to an approved dumping yard.

Chambers

Valve chambers, surface boxes and similar items shall be measured by number constructed according to type.

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Appurtenances

Valves, metres, taps and similar items shall be measured by number supplied. The installation shall be included in the rate for laying etc. of the pipes measured by length.

Fittings

Pipe fittings, such as tees, bends, elbows, reducers and similar items shall be measured with pipes. Installation shall be included in the linear metre rate for laying etc. of the pipe line.

4.2.2 Masonry, RCC Chambers for Valves, Hydrants, etc.

Chambers shall be measured in number according to type. The rates shall include- Necessary excavation in any kind of soil backfilling and disposal of surplus earth as specified.

Protecting the excavation with all necessary shoring, strutting and keeping the excavation clear of water.

Providing and laying foundation concrete as shown on drawing and as specified.

Providing and constructing brick masonry walls in cement mortar/RCC walls including reinforcement as shown on drawing and as specified. The openings required to be left open for pipes and subsequent reinforcement grouting shall also be included in the rates.

Providing and casting RCC top slab including reinforcement as shown on drawing and as specified.

Providing fitting and fixing C.I access cover including frame as shown on drawing and as specified and/or directed at site by the Engineer-in-Charge.

Providing external cement plaster 1:4 with water proofing compound 150mm from the bottom of the top slab for the external faces of the chamber walls. All external faces of chamber in touch with soil to be painted with two coats of bitumen coatings.

Providing concrete benching, seats, etc for pipes and valves as shown in the drawing and as directed by the Engineer-in-Charge.

The rates quoted shall be net and should any variation occur either in drawings or in specifications, the rates of individual items of work quoted in civil work shall apply.

4.2.3 Valves, Meters etc.

For supply of valves, meters, taps and similar items shall be measured by number. This rate shall also include cost of installation and fitting.

4.2.4 External Drainage

Specified pipes shall be measured per Running Metre for the clear length between the chambers and appurtenances for an average depth. The rate shall be inclusive of the cost of pipes, all fittings, jointing and testing of pipes and fittings etc. as specified.

- b) Manholes and chambers shall be measured in number and shall include all works as stated in 4.3.2.
- c) Specified gully traps shall be measured by number and the rate shall include the cost of masonry chamber with cover, 150 x 150 mm C.I. grating including fixing in position with cement mortar.

4.2.5 Soil and waste Vent and Rain Water Pipes

- a) Soil, waste, vent and rain water pipes shall be measured in running metres as actually laid. The cost of all fittings, e.g. bends, junctions, off sets, terminal guards, clamps and jointing shall be included in the rate. The rate of pipes shall be inclusive of excavation, backfilling and disposal of surplus earth (where required), cutting chases, holes in walls and floors and making good and testing all complete as per specifications.
- b) Specified floor traps shall be measured by numbers and shall include the cost of CP brass cockroach trap & grating of the required size and setting the floor traps in cement concrete with suitable extension pieces where required.

4.2.6 Internal Water Supply

- a) Specified pipes for cold and hot water supply compressed air & gas supply lines shall be measured in running metre along the centre line of the pipe lines and the rate shall include the cost of all necessary fittings, clamps, cutting chases and holes in walls, floors and making necessary excavation, backfilling and disposal of surplus earth, where required. The rate shall be inclusive of the cost of necessary fittings, testing and commissioning and painting of the pipe lines, as specified.
- b) Valves and taps shall be measured by numbers.
- c) Insulation to hot water pipes shall be measured separately.

4.2.7 Sanitary Fixtures

All sanitary fixtures of specified trade mark or equivalent shall be paid by number and rate shall be included all C.P. fittings, traps, flushing cisterns, specials, connecting pipes all fixing components, brackets, screws, etc. as stated in Bill of Quantities.

4.2.8 Mechanical Equipment

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All mechanical equipment e.g Filter, Pumps & Electrical Panels etc. shall be measured in number and the rate shall include all items of work as given in specifications & Schedule of Quantities. The cost of construction of suitable foundations duly approved by the Engineer- in-Charge is also deemed to be included in the rate of the particular equipment.

END OF PHE SPECIFICATION

SOLAR PV PANEL SPECIFICATIONS

- 1. Intent Of Specification**
- 2. Scope of Work**
- 3. Design Basis**
 - 3.1 General
 - 3.2 Basic Design Data
 - 3.3 PV Modules
 - 3.4 Solar Inverters
 - 3.5 String Combiner Boxes
 - 3.6 DC Cables
 - 3.7 Module Mounting Structures (MMS) Earthing System
- 4. Shipping, Handling And Storage**
- 5. Drawing And Data Requirements**
- 6. Guarantee / Warranty**
- 7. Deviations**
- 8. List of Approved Make**

1.0 Intent Of Specification

- a. This specification is intended to cover the design, engineering, installation, and commissioning and of 50 kWp Solar Rooftop Plant.
- b. The equipment and services furnished shall meet all the requirement of this specification. In case of any conflict / contradiction among various part of the specification, the specific requirements shall govern. All the deviations / clarifications from the specifications shall be clearly brought out by the BIDDER in Deviation Schedule, for final decision by the PURCHASER.
- c. It is not the Intent to specify completely herein all aspects of design and construction of equipment. Nevertheless, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous operation in a manner acceptable to the Client/User who will interpret the meaning of the specification, drawings and shall have right to reject or accept any work or material which in his assessment is not complete to meet the requirements of this specification and / or applicable national and / or international standards mentioned

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elsewhere in the specification.

- d. Whenever material or item is specified or described by the name of a particular brand, manufacturer or trade mark, the specific item shall be understood as establishing type, function and quality desired. Other manufacturer's products may also be considered provided sufficient information is furnished so as to enable the Client/User to determine that the products are equivalent to those named.

2.0 Scope of Work

- a. The scope of this 50 kWp Capacity Project includes Solar PV Power Plant design,
engineering, supply, installation, commissioning and supervision of erection, start-up, trial and reliability runs, proving performance guarantees for Solar Power plant at the premises of Oil India, Guwahati. The work shall be performed in accordance with the enclosed specifications and shall include, but not be limited to, the items detailed herein. Primary responsibility of the contractor is to provide the plant in accordance with good engineering practices, a fully functional and reliable operating plant meeting the detailed design criteria laid down, in these specifications.
- b. The Supplies and services shall be rendered in conformity with proven engineering principles, taking into account the current state-of-art technology. The requirements of the contract must be fulfilled in its entirety.
- c. The supplies and services within the scope shall be rendered inclusive of all appliances and interconnecting arrangements with other supplies, needed for proper and reliable continuous operation and for satisfactory maintenance and repair.
- d. As far as the scope of execution of supplies is concerned, the supplies as contained in drawings, but not in specification and vice versa, shall be deemed to be contained in both. Contradictions between drawings and specifications, if any, shall be brought to the attention of the client / consultant by the contractor and the correct requirements shall be ascertained.
- e. The scope of supply and services shall include all necessary work and supply of equipment and material whether mentioned in these specifications or not, but which are necessary for the satisfactory, reliable and safe operation and maintenance of the plant and required for achieving guaranteed performance of the plant. Any equipment, device or material even if not included in the original document but found necessary for the safe and satisfactory functioning of the units under this document shall be supplied and commissioned by the contractor at no extra cost to the client.
- f. All materials supplied under this contract shall be new and unused.
- g. The broad Scope of Services of the contractor covered shall include but not be limited to:

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- i. Design, manufacture/procurement and supply of all systems / equipment.
 - ii. Plant commissioning, Installation, Supervision of erection of the PV Solar plant and the equipment.
 - iii. Commissioning mandatory and recommended spare parts.
 - iv. Training of client's personnel including O&M staff as specified or required.
 - v. Other items as required to carry out the project as defined in this work scope.
 - vi. Abiding by all statutory acts, rules and regulation.
- h. Terminal Points

DC Power	At Inverter Input
AC Power	At outgoing Terminal of 415 V Plant end in MDB in Building

- i. Scope of Supply of Equipment

Supply, Commissioning and Supervision of erection for all the items as indicated in Price Schedule.

3.0 Design Basis

3.1 General

- a. This document provides the Preliminary Design and Technical Specifications. The contractor shall be responsible for reviewing and confirming the feasibility of the Preliminary Design for the PV plant proposed by the consultant, in compliance with the required Technical Specifications, IEC / IEEE standards and applicable local and national standards. The contractor shall propose their best design for the PV Plant and Interconnection considering the lowest cost in compliance with all applicable codes and regulations and also Utility requirements.
- b. Module will be warranted for 25 years & Inverter for 5 years

3.2 Basic Design Data

- a. The contractor shall design to accommodate 80 kWp capacity Solar PV plant with module mounting fix type structure with polycrystalline solar PV modules and Grid Tied Solar Inverters.

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- b. The Contractor to propose minimum and optimized area required for installation of 80 kWp.
 - c. The details furnished in the following table are minimum requirement. The contractor shall design the system in complete.

Standards	Relevant IEC standards
Relative Humidity	95%
Design Ambient	45 Deg C
Basic Wind Speed	40 M/Sec at
Power Evacuation Voltage	At 415V

3.3 PV Modules

- a. The contractor to consider polycrystalline / mono-crystalline modules (without negative tolerance). The modules shall be protected by high transmission tempered glass covered with anodized aluminium alloy frames. Serially connected cells shall be terminated to IP65 junction boxes at bottom with 4 Sq.mm multi-strand copper cables. Positive & Negative terminals shall be terminated with MC4 connectors for making module interconnections. Module type must be qualified as per IEC 61215 latest edition for poly crystalline modules. Modules must qualify to IEC 61730 Part I and II for safety qualification testing. Certificate for module qualification from IEC or equivalent and recognized labs to be submitted alongwith design documents on receipt of Purchase Order.
- b. DC capacity of the plant shall be 50 kWp calculated based on the name plate rating and not on flash test data. Modules shall be planned accordingly to achieve average flash test result at the timing of flash test Lab.
- c. The predicted electrical degradation of power generated should not be exceeding 20% of the full rated power over the 25 year period and not more than 10% after ten years period of the full rated original output (as per MNRE Standards)
- d. **IDENTIFICATION AND TRACEABILITY**

All PV Panels must have RFID log built into the panel and containing the following information

- i. Name of the manufacturer of PV Module
- ii. Name of the manufacturer of Solar Cells
- iii. Month & Year of manufacture

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iv. Country of origin

v. I-V curve of the module

vi. Peak Wattage, Im, Vm and FF of the module

vii. Unique Serial No. and Model No. of the module

viii. Date and year of obtaining IEC PV module qualification certificate

ix. Name of the test lab issuing IEC Certificate

x. Other relevant information on traceability of solar cells and module as per ISO9000 series

The PhotoVoltaic Module Should be 72 Cell, Poly Crystalline Type with a total array capacity of for 50KWp SPV Power Plant – Power output under STC should be 80 KWp and having technical

specification mentioned below:			
S.no	Descriptions		Specifica tion
1.1.1	Output power Pmax (Watt peak)	:	Minimum 315 Wp, Tolerance 0 ~ + 3 %
1.1.2	Voltage at Pmax	:	≤ 37.5 V
1.1.3	Current at Pmax	:	≤ 8.6 Adc
1.1.4	Open circuit voltage	:	≤ 46 V
1.1.5	Short circuit current	:	≤ 10 A
1.1.6	Maximum system voltage (Volts)	:	1000 V DC
1.1.7	Type of solar PV cell	:	Poly - Crystalline silicon
1.1.8	Module output	:	MC4 electronics plug (Male and female)
1.1.9	Efficiency	:	≥15%
1.1.10	Warranty	:	(a) 10-year product warranty (b) 25-year Linear performance warranty
1.1.11	Compliance		IEC 61215 ,IEC 61701 , IEC 61730

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1.1.12	Features	Anti PID : Higher Anti-Reflective Coated Properties Higher efficiency & generation Certified to withstand increased loads of upto 5400Pa

3.4 Solar Inverters

- a. Solar Inverters are the most critical equipment in the Solar PV plant, as the reliability & performance of the inverters have great influence on the plant overall performance & availability. The contractor shall plan String Inverter suitable to feed different AC power to MDB in the manufacturing Plant. Solar Grid-Tie String Inverters with DC Safety unit should have anti-islanding feature. Inverter should have the specifications as mentioned below :

3.1.1 Control type : Voltage source, microprocessor assisted , output regulation

3.1.2 Output Voltage : 3Phase, 415V AC

3.1.3 Frequency : 50Hz

3.1.4 Continuous rating: 50kW (can use multiple string inverters as per design)

3.1.5 Standard Confirmation : IEC 61683

3.1.6 Total Harmonic Distortion : less than 3%

3.1.7 Operating Temperature Range : -20° to 60° C

3.1.8 Housing Cabinet : Inverter to be housed in suitable cabinet with minimum IP20 ingress Protection

3.1.9 Power Control : MPPT

3.2 Other Important Features / protection required in the Solar Inverter

3.2.1 Mains (Grid) over/under voltage and frequency protection

3.2.2 Anti-Islanding function

3.2.3 Included authentic tracking of the solar arrays' maximum power point operation voltage (MPPT)

3.2.4 LCD and piezoelectric keypad operator interface Menu driven

3.2.5 Automatic fault conditions reset for all parameters like voltage, frequency and/or black out.

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3.2.6 Minimum DC to AC conversion efficiency of 98%

3.2.7 Inverter should be capable of operating in parallel with grid utility service.

3.5 String Combiner Boxes

- a. The modules shall be connected with DC cables, in series & parallel combinations and hooked-up to Inverters, through string Combiner Boxes. Total number of strings and number of modules per string shall be decided by the Contractor. The String Combiner Boxes (SCBs) shall have minimum twelve (12) inputs with string current monitoring arrangement and number of inputs for SCBs to be decided by the Contractor.
- b. Auxiliary supply for SCBs and monitoring unit shall be planned by the Contractor.
- c. SCBs shall be mounted in the Module Mounting Structure below the PV panels.

3.6 DC Cables

- a. All solar field cables upto SCBs shall be UV resistant cables with multi-strand copper conductors.
- b. SCB to inverters shall be with single core / two core armoured multi-strand Copper cables with XLPE insulation.
- c. Unarmoured cables routed through buried cable trench shall be routed through conduits. Armoured cables shall be buried directly.
- d. All PV cables which are exposed to sunlight shall be routed through GI conduit/ Solid Cable Tray with Cover.
- e. The following table indicated the minimum requirements of DC cables:

Location of DC Cable		DC Cable Size and Type
From	To	
Module	Module	PV cable, UV resistant, Multi-strand Copper Conductor
Module	SCB	PV cable, UV resistant, Multi-strand Copper Conductor
SCB	Inverter	Single Core / Two Core armoured multi-strand Copper Cables

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- f. Derating factors for various conditions of installations including the following shall be considered while selecting the cable sizes.

3.7 Module Mounting Structures (MMS)

- a. Hot dip galvanized MS mounting structures may be used for mounting the modules/ panels/arrays. Each structure should have angle of inclination as per the site conditions to take maximum insolation. However to accommodate more capacity the angle inclination may be reduced until the plant meets the specified performance ratio requirements.
- b. The Mounting structure shall be so designed to withstand the speed for the wind zone of the location where a PV system is proposed to be installed (wind speed of 150 km/ hour. Necessary Reports to be provided. Suitable fastening arrangement such as grouting and calming should be provided to secure the installation against the specific wind speed.
- c. The mounting structure steel shall be as per latest IS 2062: 1992 and galvanization of the mounting structure shall be in compliance of latest IS 4759.

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- d. Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts. Aluminium structures also can be used which can withstand the wind speed of respective wind zone. Necessary protection towards rusting need to be provided either by coating or anodization.

3.8 Earthing System :

Each Array Structure of the PV yard should be grounded properly . The Module Mounting Structure shall be connected to earth pits as per IS Standards. In addition Lightning arrester/ masts should also be provided inside the array field . Provision should be provided inside the array field. Provision should be kept for shorting and grounding of the PV array at the time of maintenance work. All metal casing / shielding of the plant should be thoroughly grounded in accordance with Indian Electricity Act. / IE Rules.

2. Shipping, Handling And Storage

- a. The equipment shall be shipped permitting ease of handling for transportation and installation. Lifting instructions and special lifting tools shall be provided.
- b. Each shipping section shall be provided with supports in the form of steel sections etc. to maintain alignment of parts during shipping, handling, hoisting and installation. Location of lifting points shall be clearly marked on shipping containers and on drawings. Each shipping section shall have it's weight and center of gravity clearly marked on the container.
- c. Preparation for shipment shall protect the component parts against corrosion, dampness and breakage or vibration injury during transportation or handling.
- d. Each shipping container shall be identified with the contents, BUYER's purchase order number and item number.
- e. Where equipment has to be split for shipping, instructions shall be provided for reassembly. Materials and special tools shall be provided if necessary for reassembly at site.

3. Drawing and Data Requirements

The SELLER shall provide drawings and data in accordance with:

- a. The material requisition and it's attachments including "Vendor drawing and data requirements".
- b. Instructions to SELLERS.

Documents shall comprise but not limited to the following:

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- a. Indicates that the document to be submitted within 10 days after release of the purchase order.
- b. Indicates that the document to be submitted within 12 days after approval of drawing.

4. Guarantee / Warranty

A comprehensive warranty for maintenance of the solar system must be given for 1 year (One year) from the date of successful commissioning at site.

PV modules used must be warranted for output wattage, which should not be less than 80% at the end of 20 years.

Solar Inverters must be warranted for a period of 5 years against manufacturing defects.

5. Deviations

- a. Deviations from this specification are only acceptable where the SELLER has listed in his quotation the requirements he cannot, or does not wish to comply with and the BUYER has accepted, in writing, the deviations before the order is placed. If the SELLER is also to offer alternatives resulting in technical or price advantages he should submit a supplement to the main quotation.
- b. In the absence of a list of deviations, it will be assumed by the BUYER that the SELLER complies fully with this specification.

6. List of Approved Make

The contractor shall ensure that only those makes which can satisfy the specification fully as given in this document shall be entertained.

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ITEM DESCRIPTION	LIST OF MAKES
Solar Photo Voltaic Module= Poly crystalline	TRINA / Waare e / Jinko Solar / Vikram
String Inverter	ABB Delta Emerson Elmex / Tyco or
MC4 Connectors	Equivalent
DC Cables	Havells Polycab KEI Batra Henley
Power Cables(XLPE)	Havells Polycab Finolex
Combiner Box	Hensel / Schneider / OBO Bettermann,
Surge protection Devices	OBO Bettermann, Schneider
Molded Case Circuit Breaker (MCCB)	Electric L&T DU Sine, Siemens 3VL Legrand- DPX3

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ITEM DESCRIPTION	LIST OF MAKES
	Schneider ABB Tmax
Protection devices(MCB / RCCB / DB)	Legrand - DX3 Schneider - Acti9 Hager Siemens Beta Guard 10KA
Earthing & Lighting Protection Solution in including Earth Pit, Strips, Earth Pit Cover	Cape Electric, OBO Bettermann, Dehn Erico
Cable Tray & Support System	OBO Bettermann, Profab Naidax, Unistrut

Note:

The inclusion of a make in the list above does not imply acceptance/ approval of any particular product or material. All specific equipment or material proposed for use on the project must comply with the specifications and must be accepted in writing by the Client.

END OF SOLAR PV PANEL SPECIFICATIONS

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CIVIL WORK SPECIFICATIONS

General:

The entire works shall be done as per CPWD specifications with up to date correction. However in the event of any discrepancy in the description of any item as given in the Schedule of quantities appended with the tender and the specifications relating to the relevant item as per CPWD specifications mentioned above the former shall prevail. If the specifications for any item are not available in the CPWD specifications cited above relevant IS specifications shall be followed. In case ISI specifications are also not available the decision of the Engineer-in-charge given in written based on acceptable sound engineering practice and local usage shall be final and binding on the contractor.

1.0 The work shall be executed and measured as per metric dimensions given in the Schedule of quantities, drawings etc. (FPS units wherever indicated are for guidance only)

2.0 The following modifications, to the above specifications and some additional specifications shall however apply:-

i) All stone aggregate and stone ballast shall be of hard stone variety to be obtained from approved queries at or any other source to be got approved by the Engineer-in-charge.

ii) Sand to be used for cement concrete work mortar for masonry and plaster work shall be of standard quality. Sand shall be obtained from any source to be got approved by the Engineer-in-charge and screened as required. The same shall consist of hard silicious material. It shall be clean sand if the sand brought to site is dirty it must be washed clean in water and should conform to clause 3.1.5.1 of CPWD specifications 91-92 or latest edition for fine sand and clause 3.1.5.4 of CPWD specification 91-92 for coarse sand except for grading purposes.

3.0 Wherever any reference to any Indian standard specification occurs in the documents relating to this contract the same shall be inclusive of all amendments issued their to or revisions thereof if any upto the date of receipt of tenders.

4.0 The rates for different items of works shall be for all heights and depth of the building accept where otherwise specified in the items of work.

4.0 i) The work will be carried out in accordance with the architect drawings and structural drawings., to be issued by the Engineer-in-charge. The structural and architectural drawings shall have to be properly noticed between Architectural and structural drawings, final decision in writing of

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the Engineer- in-charge shall be obtained by the contractor. For items where so required sample shall be prepared before starting the particular items of work for prior approval of the Engineer-in-charge and nothing extra shall be payable on this account.

5.0 Articles manufactured by reputed firms and approved by the Engineer-in-charge shall only be used. Only articles classified as "First quality" by the manufactures shall be used unless otherwise specified. Preference shall be given to those articles which bear ISI certification marks. In case articles bearing ISI certification marks are not available the quality of samples brought by the contractor shall be judged by the standards laid down in the relevant CPWD specifications. For items not covered by CPWD specifications relevant ISI standards shall apply.

6.0 The contractor shall give a performance test of installations as per specification before the work is finally accepted and nothing extra whatsoever shall be payable to contractor on this account.

7.0 The work shall be carried out in a manner complying in all aspects with the requirements of relevant bye-laws of the Municipal committee/Municipal OIL INDIA Ltd./development authority. Improvement trust under the jurisdiction of which the work is to be executed or as directed by the Engineer-in-charge and nothing extra shall be paid on this account.

8.0 Other agencies doing work of electrification, external service other building work, horticulture work etc. for this project will also simultaneously execute the works and the contractor shall afford necessary facilities for the same. The contractor shall leave such necessary holes, openings etc., for laying/buying in the work pipes, cables, conduits, clamps, boxes and hooks for an clamps etc. as may be required for the electric and sanitary work etc. and nothing extra over the agreement rates shall be paid for the same.

9.0 Unless otherwise specified in the schedule of quantities the rates for all items of the work shall be considered as inclusive of pumping out or balling out water if required for which no extra payment will be made. This will include water encountered from any source such as rains, floods, subsoil water table being high due to any other cause whatsoever.

10.0 Any cement slurry added over base surface or for continuation of concerning for better bond is added to have been in built in the item (unless otherwise/explicitly stated) and nothing extra shall be payable (or) extra cement considered with consumption on its account.

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11.0 The rate for all items in which the use of cement is involved is inclusive of charges for curing.

12.0 The foundation trenches shall be kept free from water while all the works below ground level are in progress.

13.0 The fineness modulus of sand to be used in different works shall be as follows i). Course sand
Fineness modulus As specified in the item like

Between 2.5 to 3.5 plain concrete, RCC work, flooring work etc.

ii). Fine sand Fineness modulus As specified in the item like between 1.2 to 1.6 finishing coat of cement plaster skirting clade etc. The coarse sand to be used at site shall be of light golden colour.

14.0 **BRICK WORKS**

Bricks shall generally conform to specification for brick class 75. Brick shall not absorb water more than 20% of their own dry weight after 24 hours immersion in cold water. Both the faces of wall of thickness more than 23 cm shall be kept in the proper plane. Wall of half bricks thickness or less shall be measured separately and paid in sqm. Half brick thickness shall be taken as 115 mm. Brick wall beyond half brick thickness shall be measured in multiple of half brick (i.e. 115 mm) which shall be deemed to be inclusive of mortar joints. When a fraction of half brick occurs due to architectural reasons or otherwise as per the requirements of the Department the same shall be measured as half brick work provided such fraction exceeds 2 cm fraction upto 2 cm thickness shall be made up in mortar and paid for as per specified thickness under brick work. Bricks shall be obtained from the source to be approved by Engineer-in-charge and shall be of best quality, well burnt, ground moulded bricks available in the locality.

15. 0 **RCC WORK :**

In respect of projected balconies, projected slabs at roof level and projected verandah the payment for the RCC work shall be made under the item of RCC slabs. The payment for centering and shuttering of such items shall similarly be paid under the item of centering and shuttering of RCC slab. Nothing extra shall be paid for the side shuttering at the edges of these projected balconies and projected verandahs. All the exposed edge shall however be finished as per specifications and nothing extra shall be paid for this.

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In the item of RCC walls, railings and roofs etc. nothing extra shall be paid for making designs as per patterns given by Architects or for thickness of sections.

The rates for railing are inclusive of all the labour and the materials including of the item, portion of the railing which is embedded in the masonry or RCC shall not be included for measurements.

16.0 PRECAST RCC

The compaction of the concrete shall be done by vibrations, table or external vibrator as approved by Engineer-in-charge. The rate quoted for the item shall include the element both for form work and mechanical vibration.

The water will be tested with regard to its suitability for use in RCC work and nothing extra will be paid for on this account.

The rate of item of reinforcement in RCC work includes all operations including straightening, cutting, bending, binding with ancaled wire and placing in position at all the floors weight all leads and lifts complete.

17.0 FLOORING

The rate of items of flooring is inclusive of providing sunk flooring in bath rooms, kitchen etc. and nothing extra on this account is admissible.

18.0 WOOD WORK :

Timber as specified to be used for wood work shall be kiln seasoned in the relevant items in the schedule of quantities and shall conform to CPWD specifications 91-92 (Vol. I) or latest edition with correction slips upto date and will be of required variety obtained from approved sources.

Shutters of paneled doors shall be with kiln seasoned secondary species timber frames as per relevant specification of item and with panels of 12 mm thick second class teak wood 15 mm thick deodar wood both kiln seasoned or made of phenol form old dye glue processed nova teak or equivalent particle board 12 mm thick with or without commercial ply veneer faces on both sides as indicated in relevant items. The paneled shutters shall be kiln seasoned with species as specified in items (styles and rails) as per width shown in Architect drawings. Panels shall be embedded into frames to a minimum of 12mm with 1.5mm air gaps.

Permissible tolerance on wood work shall be as under:-

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- =====
- a) Door frames of 3 mm.
 - b) Door shutters.
 - i) On width and height of 3mm.
 - ii) On thickness of 1.2 mm

The samples of species to be used shall be deposited by the contractor before commencement of the work.

Transparent sheet glass conforming to IS 1761-1960 shall be used thickness being governed as under unless otherwise specified in the item.

Area of glazing	Thickness	Max. unsupported length	
For glazing area upto			
0.2 sqm.	3 mm		60 cm
For glazing area from			
0.2 sqm to 0.5 sqm	4 mm		120 cm
For glazing area more			
than 0.5 sqm	5.5 mm	120 cm	

Glazing for toilets and in fixed ventilators shall be of opaque type.

Factory made shutters as specified shall be obtained from factories to be approved by the Engineer-in-charge and shall conform to IS 2202 (Part-I) 1977. The contractor shall inform well in advance to the Engineer-in-charge the name and address of the factory where from the contractor intends to get the shutters manufactured. The contractor will place order for manufacture of shutters only after written approval of the Engineer-in-charge in this regard is given. The contractor is bound to abide by the decision of the Engineer-in-charge and recommended a name of another factory from the approval list, in case the factory from the approved list, in case the factory already proposed by the contractor is not found competent to manufacture quality shutters.

The contractor will also arrange stage-wise inspection of the shutters at factory of the Engineer- in-charge or his authorized representative, contractor will have no claim if the shutters brought at site are rejected by Engineer-in-charge in part or in full lot due to bad workmanship/quality. Such shutters will not be measured and paid and the contractor shall

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remove the same from the site of work within 7 days after the written instructions in this regard are issued by Engineer-in-charge or his authorized representative.

The rate of T/angle iron from shall include the following:-

- a) MS bill/tie of 16mm dia bar shall be belted to T-iron door frames to keep the frame vertical in correct position. The bill/tie shall be embedded in floor concrete. No tie is necessary for window frames.
- b) Each T-iron frame for doors shall have 4 nos. MS lugs 15x3 mm, 10cms long welded to each vertical member of the frame.
- c) MS plate 8x25mm, 100mm long having threaded holes (no. of flats shall correspond to the no. of butt hinges to be fixed to door/window shutter)shall be welded at appropriate places at the back of the T-iron frames for fixing the required butt hinges to the frame with machine screws. MS flats 8x25mm; 50mm long with threaded holes shall be welded to the back of the T-sections to receive the butt hinges for the cleats.

The MS flat cramps 15x6mm thick for holding arrangements are to be provided and added as per site conditions. The rate is inclusive of the cost of such cramps.

All welded steel work shall be tested for quality of weld as laid down in IS 822-970 before actual erection.

19.0 WATER SUPPLY SANITARY INSTALLATION:

Sanitary fittings, paints and other materials shall be obtained from one of the firms on the list of approved manufacturers of CPWD and shall bear ISI mark. The materials shall be tested as per provision in relevant IS codes. The contractor's rates for items involving the use of the above materials shall be deemed to cover the cost of samples.

The SCI pipe and G.I. pipe wherever necessary shall be fixed to RCC columns, beams etc. with raw plugs and nothing extra shall be paid for this.

G.I. pipes if stipulated for issue in the schedule of material can be issue in such sizes or its equivalent metric size as considered fit and the issue rate recoverable from the contractor will remain the same. The contractor will not be paid anything extra on this account and nothing will be deducted for using the size of G.I. pipes issued and the items will be paid as per agreement rate for the same item.

The contractor shall be responsible for the protection of the sanitary

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and water supply fittings and other fittings and fixtures against pilferage and breakage during the period of installation and there after until the building is handed over.

Water tanks, taps, pipes fittings and accessories should conform to bye-law and specification of the Municipal bodies/ OIL INDIA LTD. etc. The contractor should engage licenced plumbers for the work.

20.0 VARIATION CONSUMPTION OF MATERIALS:

The variation in consumption of material shall be governed as per CPWD specification and clauses of the contract to the extent applicable. The following specific clauses shall govern the variation in consumption of pie lead.

21.0 VARIATION IN CONSUMPTION OF PIG LEAD:

21.1 The pig lead for caulking of joints of SCI pipes shall be issued as per theoretical consumption for SCI pipes of sizes 400mm, 75mm, 50mm, 0.88 kg at 0.98 kg and 0.77 kg per joint respectively. Over and above the theoretical quantities of lead as marked out, variation of 5% shall be allowed for wastage etc. Any difference between the actual consumption of pig lead and theoretical consumption worked out on the above basis/c the authorized variation shall be recovered at double the issue rate. Where the pig lead is arranged by the contractor, variation of 5% will be allowed. In case variation is on higher side 5% will be allowed. In case the variation is on lower side the quantity of pig lead used less shall be recovered from the contractor at market rate to be determined by Engineer-in-charge whose decision in the matter will be final.

22.0 CONDITIONS:

The contractor will have to work according to the programme of work decided by the Engineer- in-charge. The contractor shall also construct a sample unit complete in all respects within three months from the date of award of work and this samples unit shall be got approved from the Engineer- in-charge before mass construction is taken up. No extra claim what so ever beyond the payments due at agreement rates will be entertained from the contractor on this account.

The contractor shall take instructions from the Engineer-in-charge regarding collection and stacking of materials in any place. No excavated earth or building material shall be stacked on areas where other buildings, roads, services of compound walls are to construct.

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Royalty at the prevalent rates shall have to be paid by the contractor on the boulders, metal, shingle, sand and bajri etc. or any other material where royalty is payable collected by him for the execution of work direct to the revenue authority of the State Government concerned.

The contractor shall make his own arrangements for obtaining electric/water connections, if required and make necessary payments directly to the Department concerned.

The contractor must take all precautions to avoid all accidents by exhibiting necessary day and night caution boards, speed limit, red flag, red lights and providing barriers. He shall be responsible for all damages and accidents caused due to negligence on this regard. No hindrance shall be caused to traffic during the execution of work.

The contractor shall maintain in perfect condition all works executed till the completion of the entire work allotted to him. Where phased delivery is contemplated the provisions mentioned above will apply to each phase.

No compensation shall be payable to the contractor for any damage caused by rains, lightening wind, storm, floods tornados, earthquakes or other natural calamity during execution of work. He will make good all such damages at his own cost and no claim on this account will be entertained.

The contractor shall clear the site thoroughly of all scaffolding materials and rubbish etc. left out of his work and dress the site around the building to the satisfaction of the Engineer-in- charge before the work is considered as complete.

All material obtained from Govt. stores or other work shall be get checked from the Engineer-in-charge or his representative on receipt of the same at site and before they are actually used.

If as per municipal rules the huts for labour are not to be erected at the site of work by the contractors. The contractor are required to provide such accommodation as is acceptable to local bodies and nothing extra shall be paid on this account.

The Centering and shuttering required for RCC work will be brought to site by the contractor well in advance so that the progress of the upper floors is not hampered due to non-availability of the same. Nothing extra shall be paid for this.

The contractor must see the proposed site for the work and study

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specifications and conditions carefully before tendering. No claim of any sort shall be entertained on account of any site conditions or ignorance of specifications and conditions.

The site is available and tenderer should see the approached and conditions of the same. If any approach from main road is required at site or existing approach is to be improved and maintained for cartage and materials by the contractors the same shall be provided, improved and maintained by the contractor at his own cost.

Machine made shutters shall be got approved from the Engineer-in-charge at factory site before carting the same to the site of work. The shutter damaged during the cartage shall not allow to be used in the work and shall be removed by the contractor at his own cost and no claim whatsoever shall be entertained in this regard.

23.0 CONDITIONS FOR ISSUE OF MATERIALS:

The size of the cement go-down indicated in the sketch on CPWD specification is only for guidance. The actual size of the go-down shall be as per site requirements and nothing extra will be paid for the same. The decision of the Engineer-in-charge regarding the capacity needed will be final.

The contractor shall be fully responsible for the safe custody of the material issued to him even if the materials are under double lock system.

The account daily receipts and issues of cement shall be maintained in a register in the prescribed Proforma to be decided by Engineer-in-Charge. signed daily by the contractor or his authorized agent in of its correctness.

The contractor shall construct suitable go-downs-yards at the site of work for storing all other materials so as to be safe against damage by sun, rain, dampness, fire theft etc. at his own cost and also employ necessary watch and ward establishment for the purpose at his cost. Materials to be charged directly to work and stipulated for issue free of cost shall also be issued to contractor as soon as they are received at site or at the stipulated place of issue the provisions of this clause will equally and fully be applicable to those items as well.

Issue of steel of diameter above 10mm will be regulated on sectional weight basis, weight being calculated with the help of the above table. However for bars MS/tor steel upto and including 10mm, the following

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procedure shall be adopted. The average sectional weight for each dia shall be arrived at from samples from each lot of steel to be modified to take into account the variation between the actual and the standard co-efficient given above and the contractors account will be debited by the cost of this modified quantity only. The description of the Engineer-in-charge shall be final for the procedure to be followed for determining the average sectional weight of each lot. Quantity of each diameter of steel received at site of work each day will constitute the single lot for this purpose.

For standard sectional weights of steel standard tables referred in para 5.3.3 in specifications for works 1991-92 volume1 to be considered for conversion of length of various sizes of MS or tor steel bars in to weight steel bars to be issued would be only for reinforcement works in RCC & not to cover any other items.

24.0 CLARIFICATION REGARDING PLINTH LEVEL:

The following works shall be treated as works relating to foundations:-

- a) For buildings, compound walls, plinth level (or) 1.2 meter (4 feet) above ground level whichever is lower excluding items of flooring and DPC but including base concrete below the floors.
- b) For abutment, piers, retaining walls of culverts and bridges, wall of water reservoirs. The floor level or where floor is not determinate upto 1.2 metre above bed level.
- c) For retaining walls where the floor level is not determinate upto 1.2 meters above average ground level or bed level.
- d) For roads all items of excavation and filling including treatment sub base and soiling work.
- e) For water supply lines, sewer lines, underground storm water drain and similar works, all items of work below ground level except items of pipe work and masonry work.
- f) For open storm water drains all items of work.

25.0 TESTING OF MATERIALS:

- a) The contractor shall produce all the materials in advance so that there is sufficient time for testing of the materials and clearance of the same before use in work.
- b) Samples of various materials required for testing shall be provided free of charge by the contractor. Testing charges, if any, shall be borne by the contractor. All other expenditure required to be incurred for taking the samples, conveyance, packing etc. shall be borne by the contractor himself.
- c) In case there is any discrepancy in frequency of testing as given in list

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of mandatory tests and that in individual sub-heads of work as per CPWD specifications 2009 (Vol. I & II) or latest edition the higher of the two frequencies of testing shall be followed and nothing extra shall be payable to the contractor on this account.

d) The contractor shall be responsible to arrange at his own cost all necessary tools and plants required for execution of the work.

END OF CIVIL WORK SPECIFICATIONS

PART-III, SECTION- IV

LIST OF APPROVED MAKES

Note:- The Contractor shall obtain prior approval from Engineer In-charge before placing order for any specific material or engaging any of specialized agencies the contractor shall make a detail submittal with catalogues and highlighted proposed specifications as well as full details of the works executed by specialized agency as specified.

Wherever applicable the Engineer In-charge may approve any material equivalent to specified in tender subject to proof being offered by contractor for equivalence to his satisfaction.

The Contractor shall provide samples of all material in the list of make to Engineer Incharge.

Following brands/makes will be adopted only for those items for which Brnad/Makes are not mentioned in the BOQ and the specification of work .

A. CIVIL WORKS

Sl.No.	Material	Make
1)	Cement	Lafarge/ACC/Ultratech/BIRLA/JK/S hri Ultra /Ambuja/ Dalmia/ STAR/ TopCem
2)	TMT Reinforced Steel	SAIL/RINL/TATA/Shyam Steel/SRMB
3)	Mild Steel	Mahavir / Swastik/Shyam Steel/SRMB
4)	Anti-Termite Chemical	Vam Organic/Hindustan Insecticide/Bayer/ICI

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5)	Water Proofing Chemicals	CICO/Dr.Fixit/Pidilite/STP
6)	Wall Putty	Birla/JK/Jhonson
7)	Aluminium Sections	Hindalco/Jindal/ OASIS
8)	Vitrified Tiles	Marbita/Kajaria/Somany/Orient Bell/OASIS/ NITCO/ Johnson
9)	Ceramic Tiles	Marbita/Kajaria/Somany/Orient Bell/ OASIS/ NITCO/ Johnson
10)	Enamel paint	Dulux/ICI/Asian/ Nerolac
11)	Plastic Emulsion Paint	Asian/ Berger/ Nerolac/ ICI
12)	Water proof Cement Paint	Asian/ Berger/ Nerolac/ ICI
13)	Sanitary ware	Hindware/Parryware/Cera/ Kohler
14)	CP Fittings	Cera/Jaquar/Marc/Hindware
15)	UPVC SWR pipes & Fittings	Supreme/Finolex/Prince/Kissan/AK G
16)	SCI Pipes & Fittings	NECO/SRIF/RIF
17)	GI & MS Pipes	Jindal Hissar/Prakash Surya/Swastik
18)	CPVC Pipes	Astral/Ajay/Ashirwad/Prince/Supreme
19)	GI Fittings	UNIK/DRIP-M/ZOLOTO/"R"/ Jindal
20)	Ball Valves	Zoloto/DRP/Sant
21)	CI Valves(>65mm dia)	Kirloskar/Leader/Sant
22)	50mm dia and above	Audco/Veeson/KSB/Zoloto/Sant
23)	Ferrules/Ballcocks/Water level Fittings	DRP/Zoloto/Leader/Sant
24)	Pressure Regulating valves	DRP/Zoloto/Kartar/CIIm
25)	Garden Irrigation Sprinklers	Rainbird/Harvel/Premier/Jain
26)	Stoneware Pipes & Gully Traps	Perfect/Ananad
27)	RCC Pipes	Pragati/JSP
28)	SFRC Manholes Covers & Gratings	KK/RPMF
29)	CI-LA/DI Fittings	Kartar/Neer
30)	False Ceiling	USG Boral/Anutone/Armstrong
31)	Wall Paneling (wooden/Acoustical)	Anutone/ Armstrong
31)	Tensile Fabric	Royal Tensile Structure
32)	Metal Roofing System	Colortop/ Dura roof/ Dyna Roof
33)	Running Track/Badminton/Volleyball Court	Sports Surfacing Pro/ Quality Sports Surface
34)	Manhole C.I. cover and frame	NECO.BIC/RPMF
35)	CI pipes and fittings	NECO.BIC/RPMF

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36)	Plywood/Block Board/Vineer	Legend/Archid ply/Green ply/Kanchan ply/ Century Ply
37)	Flush Doors	Legend /Archid ply/Green ply/Kanchan ply/ Century Ply
FIRE FIGHTING WORKS		
1)	MS Pipes	TATA/Jindal/Swastik
2)	Gunmetal Ball Valves	Leader/DRP/Sant/Zoloto/TBS
3)	CI Double Flanged Sluice valves & Check Valves	Kirloskar/Sant/Leader
4)	Slim Seal Butterfly Valve	Audco/Veeson/C&R/KSB/Advance/Sant
5)	Dual Disk type Non Return Valve	Audco/Veeson/C&R/KSB/Advance/Sant
6)	Fire Hydrant Valves/Branch Pipes & Fire Main Axe.	Minimax/Firex/Newage/SAFEX
7)	Fire Aid Fire Hose reels	Minimax/Firex/Newage/SAFEX
8)	CP Hose Pipes	Minimax/Firex/Newage
9)	Sprinkler Head	Tyco/Grinel/Viking
10)	Fire Pumps	Kirloskar/ Mather & Platt
11)	Motors	Kirloskar/Seimens/Crompton
12)	Electric Switch Gear	L&T/Seimens
13)	Cables	RR Cable /Polycab/Paramount/Finolex/Havells
14)	Suction Stainer	Vaishno/Jaypee/Grandpit
15)	Vibration Eliminator Connector	Resistoflex/Kanwal
16)	Single Phasing Preventer	Siemens/Minilec/L&T
17)	Pipe Coat Material	PYPKOTE/Coaltek/STP
18)	Flow switch	Potter/System Sensor/Jhonson Control
19)	Diesel Engine	Ashok Leyland/Kirloskar/Cummins
20)	Main Control Panel	Tricolite/Vidyut Control
21)	Fire Brigade Inlet	Minimax/Newage/SAFEX
22)	Rubber Hose Pipe	Jyoti/Tiger/Padmini
23)	Hose Coupling Branch	Minimax/Newage/SAFEX
24)	Pressure Switch	Indfoss/Switzer
25)	Pressure Gauge	H/Guru/Fiebig
26)	Battery	Exide/Prestolite/HBL/Ameron
27)	Fire Extinguisher	Minmax/Newage/SAFEX/ CEASE FIRE
28)	Enamel Paint	Asian/Nerolac/Berger
29)	Annunciation panel	Safeway/Agni/Mather & Platt
30)	Contactor	L&T/Siemens
31)	Thimbles/Ferrules	Dowel
32)	Cable Gland	Commex/Power/Gripwell
33)	Power capacitor	L&T/Crompton/Asian/Ducati

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34)	Measuring meter	L&T/Siemens/AE
35)	MS Conduit	BEC/AKG/steel craft

ELECTRICAL WORKS		
1)	MCCB &MPCB	L&T/ABB/GE/SEIMENS VL
2)	MCB& ELMCB	M&G/HEGGAR/LEGRAND/HAVELLS
3)	Lugs, Thimbles	Dowells
4)	Capacitor	EPCOS/DUCATI/MEHER
5)	APCR relay	EPCOS/DUCATI/CONZERV
6)	Reactor	EPCOS/DUCATI/ELSPEC/SAIGON
7)	Indication Lights	Schnieder/L&T/Seimens
8)	Selector Switch	Sulzer/Kaycee
9)	Push Button	Schnieder/L&T/Seimens
10)	Terminal Strip	Connectwell/Elmex/Phoenix
11)	Digital Meter	Conzerv/Trinity/Siemens
12)	Analogue Meter	Rishabh/AE/IMP
13)	Current transformer cast Resin	G&M/KAPPA/AE
14)	Compression Glands	HMI/Comet
15)	HRC Fuses	Siemens/L&T
16)	Lighting Fixtures	Philips/Wipro/ Bajaj/Artemide/LT
17)	Power(PVC/XLPE 1.1KV gradecables)	POLYCAB/FINOLEX/PARAMOUNT
18)	Cable Tray	Slotco/SECO/Steel Ways/Indiana
19)	Ms Conduit & Accessories	BEC/AKG/Steel Craft/Bereli
20)	PVC insulated copper conductor	Finolex/RR Kabel/KEI/Polycab/Anchor/Havells
21)	Switches&socket	Legrand/Havells/anchor/Schneider/A BB/CFS
22)	DB	Legrand/Havells/Indo Asian
23)	HT Cable	Unistar/Polycab/RPG/KEI/Rallison
24)	Telephone wire	Finolex/Polycab/RR Kabel/Havells/Anchor
25)	Fans & exhaust fans	Orient/Crompton/Bajaj/Havells
26)	Data Points	Awaya/Amp
27)	Pre-Fabricated MS Junction Box	Legrand/MK
28)	LED Display unit	Delite Or Equ.
29)	Lightning Protection	Alltec/LPI
30)	Conventional fire alarm system	Notifier/Edwards/Siemens/Simplex
31)	Transformer	

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		Crompton/voltamps/pete/ABB/Siemens
32)	DG set	Cummins/Catterpillar/Sterling/Kirloskar
33)	LT Panel& PDB's	AARVEE/Electro/IPC/vidyut/Milestone/Precision System Control Equivalent
34)	Lifts	KONE/OTIS/Shindler/Olympus/Jhonson
35)	Air-conditioning	Carrier/Hitachi/Daikin/Voltas/Bluestar
36)	Furniture	Godrej/Bpergo/Featherlite/Geeken

BMS/ Audio& Video system		
1)	Water level switches	Veskler/Flippro/ABB/Dwyer/E&H
2)	Flame proof level transmitter	Veskler/Flippro/ABB/Dwyer/E&H
3)	PH analyser/TDS Analyser/Water hardness	Hach/Forbes Marshal/ABB/Omicron/E&H
4)	Video Conferenceing	AVAYA/PLYCOM/CISCO
5)	PA system	AHUJA/BOSE

Note:-

- The contractor will use one of the approved makes with prior approval of the engineer in charge. For technical reason the engineer in charge can specify a particular make.**
- Order will be placed with the prior approval of engineer in charge relating to makes and quantities.**

When certain makes of the items are missing in the above list/description of item, the make will be decided as per the approval of Engineer- in- charge.

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APPLICATION FOR EXTENSION OF TIME

(To be completed by the
Contractor) P A R T –I

1.Name of Contractor

2.Name of the work as given in the Agreement

3.Agreement No.

4.Estimated amount put to tender

5.Date of commencement work as per agreement

6.Period allowed for completion of work as per agreement

7.Date of completion stipulated as per agreement

8.Period for which extension of time has
been given previously Extension granted

a) First extension vide Engineer-in- charge..... letter No... date Months Days

b) 2nd extension vide Engineer-in- charge..... letter No... date Months Days

c) 3rd extension vide Engineer-in- charge.....letter No... date Months Days

d) 4th extension vide engineer-in- charge letter No... date Months Days

Total extension previously given

9.Reasons for which extension have been previously given (copies of the
previous application should be attached)

10. Period for which extension is applied for :

11. Hindrances on account of which extension is applied for with dates on
which hindrances occurred, and the period for which these are likely to
last.

a) Serial No.

b) Nature of hindrance

c) Date of Occurrence

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- d) Period for which it is likely to last
 - e) Period for which extension required for this particular hindrance.
 - f) Over lapping period, if any, with reference to item
 - g) Net extension applied for
 - h) Remarks, if any

Total period for which extension is now applied for
on account of hindrances mentioned above
..... Month/ days.

12. Extension of time required for extra work.

13. Details of extra work and on the amount involved:

- a) Total value of extra work
- b) Proportionate period of extension of
time based on estimated amount put to
tender on account of extra work.

14. Total extension of time required for 11 & 12

Submitted to the Engineer-in-Charges office.

SIGNATURE OF CONTRACTOR DATE

PART-IX**ANNEXURE-LABOUR SAFETY PROVISION**

The contractor shall be fully responsible to observe the labour safety provisions as per prevailing act and amended from time to time.

- 1.0 Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than 1/4 to 1 (1/4 horizontal and 1 vertical).
- 2.0 Scaffolding or staging more than 3.6m (12 feet) above the ground or floor, swung or suspended from an overhead support or erected with stationery support shall have a guard rail properly attached or bolted, braced and otherwise secured at least 90 cm. (3 feet) high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.
- 3.0 Working platforms, gangways, and stairways should be so constructed that they should not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.6m (12 feet) above ground level or floor level, they should be closely boarded, should have adequate width & should be suitable fastened as described in (2.0) above.
- 4.0 Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 90 cm (3 feet).
- 5.0 Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9m. (30 feet) in length while the width between side rails in rung ladder shall in no case be less than 29 cm. for ladder up to and including 3m (10 feet) in length. For longer ladders this width should be increased at least 1/4" for each additional 30 cm (1 ft.) of length. Uniform step spacing shall not exceed 30 cm (12"). Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites of the work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The

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contractor shall provide all necessary fencing and lights to protect the public from accident, and shall be bound to bear the expenses of defence of every suit, action or other proceeding at law that may be brought by an person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit, action or proceedings to any such person or which may, with the consent of the Contractor, be paid to compensate any claim by any such person.

6.0 EXCAVATION AND TRENCHING

All trenches, 1.2mts.(four feet) or more in depth, shall at all times be supplied with at least one ladder for each 30m. (100 feet) in length or fraction thereof, Ladder shall be extended from bottom of the trench to at least 90 cm (3feet) above the surface of the ground. The side of the trenches, which are 1.5m (5 feet) or more in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger or sides to collapsing. The excavated materials shall not be placed within 1.5m (5 feet) of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.

7.0 DEMOLITION –

Before any demolition work is commenced and also during the progress of the work:

- a) All roads and open areas adjacent to the work site shall either be closed or suitably protected.
- b) No electric cable or apparatus that is likely to be a source of danger or a cable or apparatus used by the operator shall remain electrically charged.
- c) All practical steps shall be taken to prevent danger to persons employed from risk or fire or explosion or flooding. No floor, roof or other part of the building shall be overloaded with debris or materials as to render it unsafe.

8.0 All necessary personal safety equipments as considered adequate by the Engineer-in- charge should be kept available for the use of persons employed on the site and maintained in a condition suitable for immediate use, and the contractor should take adequate step to ensure proper use of equipment by those concerned- The following safety equipment shall be invariably provided.

8.1 Workers employed on mixing asphaltic materials, cement and lime

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mortars shall be provided with protective footwear and protective goggles.

8.2 Those engaged in white washing and mixing or stacking of cement bags or any materials that are injurious to the eye shall be provided with protective goggles.

8.3 Those engaged in welding works shall be provided with welders protective eye shields.

8.4 Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe interval.

8.5 When workers are employed in sewers and manholes, which are in active use, the Contractors shall ensure that the manhole covers are opened and ventilated at-least for an hour before the workers are allowed to get into the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident the public. In addition, the contractor shall ensure that the following safety measures are adhered to:

- a. Entry for workers into the line shall not be allowed except under supervision of JE or any other higher officer
- b. At least 5 to 6 manholes upstream and downstream should be kept open for at least 2 to 3 hours before any man is allowed to enter into the manholes for working inside.
- c. Before entry, presence of Toxic gases should be tested by inserting wet lead acetate paper, which changes colour in the presence of such gases and gives indication of their presence.
- d. Presence of Oxygen should be verified by lowering a detector lamp into the manhole. In case, no Oxygen is found inside the sewer line, workers should be sent only with Oxygen kit.
- e. Safety belt with rope should be provided to the workers. While working inside the manholes such rope should be handled by two men standing outside to enable him to be pulled out during emergency.
- f. The area should be barricaded or cordoned off by suitable means to avoid mishaps of any kind. Proper warning signs should be displayed for the safety of the public whenever cleaning works are undertaken during night or day.
- g. No smoking or open flames shall be allowed near the blocked manhole being cleaned.
- h. The malba obtained on account of cleaning of blocked manholes and sewer lines should be immediately removed to avoid accidents on account of slippery nature of the malba.
- i. Workers should not be allowed to work inside the manhole continuously. He should be given rest intermittently. The Engineer In-charge may

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- decide the time up to which a worker may be allowed to work continuously inside the manhole.
- j. Gas masks with Oxygen Cylinder should be kept at site for use in emergency.
 - k. Air-blowers should be used for flow of fresh air through the manholes. Whenever called for, portable air-blowers are recommended for ventilating the manholes. The Motors for these shall be vapour proof and of totally enclosed type. Non sparking gas engines also could be used but they should be placed at-least 2 meters away from the opening and on the leeward side protected from wind so that they will not be a source of friction on any inflammable gas that might be present.
 - l. The workers engaged for cleaning the manholes/ sewers should be properly trained before allowing working in the manhole.
 - m. The workers shall be provided with Gumboots or non sparking shoes, bump helmets and gloves non sparking tools, safety lights and gas masks and portable air blowers (when necessary). They must be supplied with barrier cream for anointing the limbs before working inside the sewer lines.
 - n. Workmen descending a manhole shall try each ladder step or rung carefully before putting his full weight on it to guard against insecure fastening due to corrosion of the rung fixed to manhole well.
 - o. If a man has received a physical injury, he should be brought out of the sewer immediately and adequate medical aid should be provided to him.
 - p. The extent to which these precautions are to be taken depend on individual situation but the decision of the Engineer In charge regarding the steps to be taken in this regard in an individual case will be final.

8.6 The Contractor shall not employ men and women below the age of 18 years on the work of painting with products containing lead in any form wherever men above the age of 18 are employed on the work of lead painting the following precautions should be taken.

8.6.1 No paint containing lead or lead products shall be used except in the form of paste or readymade paint.

8.6.2 Suitable facemasks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint is dry rubbed and scrapped.

8.6.3 Overalls shall be supplied by the Contractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.

8.6.4.1

- a. White lead, sulphate or lead work products containing those pigments shall not be used in painting operation except in the form of paste or of
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paints ready for use.

- b. Measures shall be taken whenever required in order to prevent danger arising from the application of paint in the form of spray.
- c. Measures shall be taken, whenever practicable to prevent danger arising out of dust caused by dry rubbing down and scrapping.

8.6.4.2

- a. Adequate facilities shall be provided to enable working painter to wash during and on cessation of work.
- b. Suitable arrangements shall be made to prevent clothing put off during working hours being spoiled by painting materials.

8.6.4.3

- a. Cases of lead poisoning and of suspected lead poisoning shall be notified and shall be subsequently verified by a medical man appointed by the competent authorities of the Consultant.
- b. The OIL INDIA LTD may require when necessary a medical examination of workers.
- c. Instructions with regard to the special hygienic precautions to be taken in the painting trade shall be distributed to working painters.

9.0 When the work is done near any place where there is risk of drowning, all necessary equipments should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provisions should be made for prompt first aid treatment of all injuries likely to be obtained during the course of the work.

10.0 Use of hoisting machines and tackle including their attachment encourage and supports shall conform to the following standard of conditions.

10.1

- a. These shall be of good mechanical construction, sound material and adequate strength and free from patent, defects and shall be kept required in good working order.
- b. Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from patent defects.

10.2 Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years should be in-charge of any hoisting machine including any Scaffolding, winch or giving signals to operator.

10.3 In case of every hoisting machine and of every chain ring hook,

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shackle swivel and pulley block used in hoisting or as means of suspension the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. In case of a hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.

- 10.4 In case of OIL INDIA LTD machines, the safe working load shall be notified by the Engineer-in- Charge. As regards Contractor's machines the Contractor shall notify the safe working load of the machine to the Engineer-in-charge whenever he brings any machinery to site of work and get verified by the Engineer-in-Charge.
- 11.0 Motors gearing, transmission electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguard, hosting appliances should be provided with such means as will reduce to the minimum the risk of accidental descent of the load. Adequate precautions should be taken to reduce the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations, which are already energized, insulating mats, wearing apparel, such as gloves sleeves and boots as may be necessary be provided. The worker should not wear any rings, watches and carry keys or other materials, which are good conductors of electricity.
- 12.0 All scaffolding, ladders, and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of work.
- 13.0 These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place of work spot. The person responsible for compliance of the safety codes shall be named therein by the contractor.
- 14.0 To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the Contractor shall be open to inspection by the or their representatives.
- 15.0 Notwithstanding the above Clauses from (1) to (14) there is nothing in these to exempt the contractor from the operations of any other Act or Rule in force in the Republic of India.

MODEL RULES FOR THE PROTECTION OF HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS

1.0 APPLICATION

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These rules shall apply to all building and construction works in which 20 (twenty) or more workers are ordinarily employed or are proposed to be employed in any day during the period during which the contractor work is in progress.

2.0 **DEFINITION**

Work place means a place where twenty or more workers are ordinarily employed or are proposed to be employed in connection with construction work on any day during the period during which the contractor work is in progress.

3.0 *FIRST-AID FACILITIES*

3.1 At every work place first aid facilities shall be provided and maintained, so as to be easily accessible during working hours, First-Aid boxes at the rate of not less than one box per 150 contract labour or part thereof ordinarily employed.

3.2 The First-Aid boxes shall be distinctly marked with a red cross on white ground and shall contain the following equipments: -

3.2.1

- a) For work places in which number of contract labour employed does not exceed 50, each First-Aid box shall contain the following equipments:
- i) 6 small sterilized dressings.
 - ii) 3 medium size sterilized dressings.
 - iii) Large size sterilized dressings.
 - iv) 3 large sterilized burn dressings.
 - v) 1 (30 ml) bottle containing a two percent alcoholic solution of iodine.
 - vi) 1(30 ml) bottle containing Sal volatile having the dose and mode of administration indicated on the label.
 - vii) 1 snakebite lancet.
 - viii) (30 gms) bottle of potassium permanganate crystals.
 - ix) 1 pair of scissors.
 - ix) 1 copy of the First-Aid leaf-let issued by the Director General, Factory Advise Service & Labour Institutes, Government of India.
 - x) 1 bottle containing 100 tablets (each of 5 grams) of aspirin.
 - xi) Ointment for burns.
 - xii) A bottle of suitable surgical antiseptic solution.

3.2.2 For work places in which the number of contract labour exceed 50. Each First-Aid box shall contain the following equipments:

- i) 12 small sterilized dressings.
- ii) 6 medium size sterilized dressings.
- iii) 6 large size sterilized dressings.

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- iv) 6 large size sterilized burn dressings.
 - v) 6 (15 gms) packet sterilized cotton wool.
 - vi) 1 (60 ml.) bottle containing a two percent iodine alcoholic solution.
 - viii) 1 (60 ml.) bottle containing salvolatile having the dose and mode of administration indicated on the label.
 - viii) 1 rolls of adhesive plaster.
 - ix) 1 snake – bite lancet.
 - x) 1 (30 gms.) bottle of potassium permanganate crystals.
 - xi) 1 pair of scissors.
 - xiii) 1 copy of the First-Aid leaf-let issued by the Director General, Factory Advice Service and Labour Institutes, Government of India.
 - xii) A bottle containing 100 tablets (each of 5 grams) of aspirin.
 - xiii) Ointment for burns.
 - xiv) A bottle of suitable surgical antiseptic solution.

3.3 Adequate arrangements shall be made for immediate recoupment of the equipment when necessary.

3.4 Nothing except the prescribed contents shall be kept in the First Aid box.

3.5 The First Aid box shall be kept in charge of a responsible person who shall always be readily available during the working hours of the work place.

3.6 A person in charge of the First-Aid box shall be a person trained in First-Aid treatment, in work places where the number of labour employed is 150 or more.

3.7 In work places where the number of labour employed is 500 or more and hospital facilities are not available within easy distance of the works, first-Aid Posts shall be established and run by a trained Compounder. The Compounder shall be on duty and shall be available at all hours when the workers are at work.

3.8 Where work places are situated in places, which are not towns or cities, a suitable motor transport shall be kept readily available to carry injured person or persons suddenly taken ill to the nearest hospital.

4.0 DRINKING WATER

4.1 In every work place, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of cold water fit for drinking.

4.2 Where drinking water is obtained from an intermittent public water supply, each work place shall be provided with storage where such drinking water shall be stored.

4.3 Every water supply of storage shall be at a distance of not less than 50 feet from any latrines drain or other source of pollution, Where water has to be drawn from an existing well which is within such proximity of

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latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with a trap-door which shall be dust and water-proof.

4.4 A reliable pump shall be fitted to each covered well, trap-door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.

5.0 WASHING FACILITIES

5.1 In every work place adequate and suitable facilities for washing shall be provided and maintained for the use of labour employed herein.

5.2 Separate and adequate screening facilities shall be provided for the use of male and female workers.

5.3 Such facilities shall be conveniently accessible & shall be kept clean and hygienic condition.

6.1 LATRINES AND URINALS

6.1 Latrines shall be provided in every work place on the following scale, namely:

a) Where females are employed there shall be at least one latrine for every 25 females.

b) Where males are employed, there shall be at least one latrine for every 25 males.

6.2 Provided that where the number of males or females exceeds 100, it shall be sufficient if there is one latrine for 25 males or females, as the case may be, up to the first 100, and one for every 50 thereafter.

6.3 Every latrine shall be under cover and so partitioned off as to secure privacy, and shall have a proper door and fastenings.

Construction of Latrines: The inside walls shall be constructed of masonry or some suitable heat resisting non-absorbent materials and shall be cement washed inside and outside at least once a year. Latrine shall not be a standard lower than borehole system.

6.4

(a) Where workers of both sexes are employed, there shall be displayed outside each block of latrine and urinal, a notice in the language understood by the majority of the workers "For Men only" or "For Women only" as the case may be.

(b) The notice shall also bear the figure of man or of women, as the case may be.

6.5 There shall be at least one urinal for male workers up to 50 and one

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for female workers up to 50 employed at a time. Provided that where the number of male or female workmen, as the case may be, exceeds 500, it shall be sufficient if there is one urinal for every 50 males or females up to the first 500 and one for every 100 or part thereof, thereafter.

6.6

a) The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.

b) Latrines and urinals other than those connected with a flush sewerage system shall comply with the requirements of the Public Health Authorities.

6.7 Water shall be provided by means of a tap or otherwise so as to be conveniently accessible in or near the latrines and urinals.

6.8 *Disposal of Excreta*

Unless otherwise arranged for by the local sanitary authority arrangements for proper disposal of excreta by incineration at the work place shall be made by means of a suitable incinerator. Alternatively excreta may be disposed off by putting a layer of night soil at the bottom of a pucca tank prepared for the purpose and covering it with a 15 cm layer of waste or for refuse and then covering it with a layer of earth for fortnight (when it will turn into manure).

The Contractor shall, at his own expense, carry out all instruction issued to him by the Engineer-in-Charge to effect proper disposal of night soil and other conservancy work in respect of the Contractor's workmen or employees on the site. The Contractor shall be responsible for payment of any charges, which may be levied by Municipal or Cantonment Authority for execution of such work on his behalf.

7.0 *PROVISION OF SHELTER DURING REST*

At every place there shall be provided, free of cost four suitable sheds, two for males and the other two for rest separately for the use of man and women labour. The height of each shelter shall not be less than 3 meters from the floor level to the lowest part of the roof. These shall be kept clean and the space provided shall be on the basis of 0.6 sqm. Per head, provided that the Engineer-in-Charges may permit, subject to his satisfaction, a portion of the building under construction or other alternative accommodation to be used for the purpose.

8.0 *CRECHES*

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8.1 At every work place, at which 20 or more women workers are ordinarily employed, there shall be provided two rooms of reasonable dimensions for the use of their children under the age of six years. One room shall be used as a playroom for the children and the other as their bedrooms.

The rooms shall be constructed on standard not lower than the following:

- i) Thatched roof
- ii) Mud floor and walls.
- iii) Planks spread over the mud floor and covered with matting

8.2 The rooms shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the places clean.

- 8.3 The Contractor shall supply adequate number of toys and games in the playroom and sufficient number of cots and beddings in the bedroom.

The Contractor shall provide one Ayah to look after the children in the crèche when the number of women workers does not exceed 50 and two when the number of women workers exceeds 50.

The use of the rooms/earmarked as crèche shall be restricted to children, their attendant and mother of the children.

9.0 CANTEENS

9.1 In every work place where the work regarding the employment of contract labour is likely to continue for six months and wherein contract labour numbering one hundred or more are ordinarily employed, an adequate canteen shall be provided by the Contractor for the use of such labour.

9.2 The canteen shall be maintained by the Contractor in an efficient manner.

9.3 The canteen shall consist of at least a dining hall, kitchen, storeroom, pantry and washing places separately for workers and utensils.

9.4 The canteen shall be sufficiently lighted at all times when any person has access to it.

9.5 The floor shall be made of smooth and impervious material and inside walls shall be lime washed or colour washed at least once in each year provided that the inside walls of the kitchen shall be lime-washed every four months.

9.6 The premises of the canteen shall be maintained in a clean and sanitary condition.

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9.7 Waste Water shall be carried away in suitable covered drains and shall not be allowed to accumulate so as to cause a nuisance.

9.8 Suitable arrangements shall be made for the collection and disposal of garbage.

9.9 The dining hall shall accommodate at a time 30 persons of the labour working at time.

9.10 The floor area of the dining hall, excluding the area occupied by the service counter and any furniture except tables and chair shall not be less than one square meter per dinner to be accommodated.

9.11

- a) A portion of the dining hall and service counter shall be partitioned off and reserved for women workers in proportion to their number.
- b) Washing places for women shall be separate and screened to secure privacy.

9.12 Sufficient tables, stool, chairs or benches shall be available for the number of dinners to be accommodated.

9.13.1

- a) There shall be provided and maintained sufficient utensils, crockery, furniture and any other equipment necessary for the efficient running of the canteen.
- b) The furniture, utensils and other equipment shall be maintained in a clean and hygienic condition.

9.13.2

- a) Suitable clean clothes for the employees serving in the canteen shall be provided and maintained.
- b) A service counter, if provided, shall have top of smooth and impervious material.
- c) Suitable facilities including an adequate supply of hot water shall be provided for the cleaning of utensils and equipment.

9.14 The foodstuffs and other items to be served in the canteen shall be in conformity with the normal habits of the labour.

9.15 The charge for foodstuffs, beverages and any other items served in the canteen shall be based on 'No profit No loss' and shall be conspicuously displayed in the canteen.

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9.16 In arriving at price of foodstuffs, and other articles served in the canteen, the following items shall not be taken into consideration as expenditure, namely:

- a) The rent of land building.
- b) The depreciation and maintenance charges for the building and equipment provided for the canteen.
- c) The cost of purchase, repair and replacement of equipment including furniture, crockery, cutlery and utensils:
- d) The water charges and other charges incurred for lighting and ventilation:
- e) The interest and amounts spent on the provision and maintenance and equipment provided for in the canteen.

9.17 The accounts pertaining to the canteen shall be audited once in every 12 months by registered accountants and auditors.

10.0 ANTI MALARIAL PRECAUTIONS

The Contractor shall at his own expense, conform to all anti-malarial instructions given to him by the Engineer-in-Charge including the filling up of any borrow pits which may have been dug by him.

11.0 **AMENDMENTS**

OIL INDIA LTD may from time to time, add to or amend these rules and issue such directions as it may consider necessary for the purpose of removing any difficulty which may arise in the administration hereof.

CONTRACTOR'S LABOUR REGULATIONS**1.0 SHORT TITLE**

These regulations may be called the Contractor "Labour Regulations".

2.0 Definitions

2.1 "Workman" means any person employed by the OIL INDIA LTD or its Contractor directly or indirectly through a sub-contractor, with or without the knowledge, of the OIL INDIA LTD to do any skilled, semi-skilled, un-skilled, manual, supervisory, technical or clerical work for hire or reward, whether, the terms of employment are expressed or implied but does not include any person-

- a) Who is employed mainly in a managerial or administrative capacity; or
- b) Who being employed in a supervisory capacity draws wages exceeding Rupees Two thousand Five hundred per person or exercises either by the nature of the duties attached to the office or by reason of powers vested to him, functions mainly of managerial nature.
- c) Who is an outworker, that is to say, a person to whom any articles or materials are given out by or on behalf of the principal employer to be made up cleaned, washed, altered, ornamental finished, repaired, adopted or otherwise processed for sale for the purpose of the trade or business of the principal employer and the process is to be carried out either in the home of the out worker or in some other premises, not being premises under the control and management of the principal employer.

2.2 "**Fair Wages**" means wages whether for time or piecework fixed and notified under the provisions of the minimum Wages Act from time to time.

2.3 "Contractor" shall include every person who undertake to produce a given result other than a mere supply of goods or articles of manufacture through labour or who supplies labour for any work and includes a sub-contractor.

2.4 "Wages" shall have the same meaning as defined in the Payment of Wages Act

2.4.1 Normally working hours of an adult employee should not exceed 9 hours a day. The working day shall be so arranged that inclusive of interval for rest, if any, it shall not spread over more than 12 hours on any day.

2.4.2 When an adult worker is made to work for more than 9 hours on any day or for more than 48 hours in any week he shall be paid overtime for the extra hours put in by him at double the ordinary rate of wages.

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2.4.3.1 Every worker shall be given a weekly holiday on a Sunday, in accordance with the provisions of the Minimum Wages (Central) Rules 1960 as amended from time to time, irrespective of whether such worker is governed by the Minimum Wages Act or not.

2.4..3.2 Whether the Minimum Wages prescribed by the Government under the Minimum Wage Act are not inclusive of the wages for the weekly day of rest, the worker shall be entitled to rest day wages at the rate applicable to the next preceding day, provided he has worked under the same contractor for a continuous period of not less than 6 days.

2.4..3.3 here a contractor is permitted by the Engineer-in-Charge to allow a worker to work on a normal weekly holiday, he shall grant a substitute holiday to him for the whole day on one of the five days immediately before or after the normal weekly holidays and pay wages to such worker for the work performed on the normal weekly holiday at overtime rate.

3.0 DISPLAY OF NOTICE REGARDING-WAGES, ETC.

The contractor shall before he commences his work on contract, display and correctly maintain and continue to display and correctly maintain in a clean and legible condition in conspicuous places on the work, notices in English and in the local Indian languages spoken by the majority of the workers, giving the minimum rates of wages fixed under the Minimum Wages Act, the actual wages being paid, the hours of work for which such wages are earned, wage period, dates of payment of wages and other relevant information as per Appendix 'A'.

4.0 PAYMENT OF WAGES

4.1 The contractor shall fix wage periods in respect of which wages shall be payable.

4.2 No wage period shall exceed one month.

4.3 The wages of every person employed as labour in an establishment or by a contractor where less than one thousand, such persons are employed shall be paid before the expiry of the seventh day and in other cases before the expiry of tenth day

after the last day of the wage period in respect of which the wages are payable.

4.4 Where the employment of any worker is terminated by or on behalf of the contractor the wages earned by him shall be paid before the expiry of the second working day from the date on which his employment is terminated.

4.5 All payments of wages shall be made on a working day at the work premises and during the working time and on a date notified in advance and

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in case the work is completed before the expiry of the wage period, final payment shall be made within 48 hours of the last working day.

4.6 Wages due to every worker shall be paid to him direct or to other person authorized by him in this behalf.

4.7 All wages shall be paid in current coin or currency or in both.

4.8 Wages shall be paid without any deductions of any kind except those specified by the Central Government by general or special order in this behalf or permissible under the Payment of Wages Act 1956.

4.9 A notice showing the wage period and the place and time of disbursement of wages shall be displayed at the place of work and a copy sent by the contractor to the Engineer-in-Charge under acknowledgment.

4.10 It shall be the duty of the contractor to ensure the disbursement of wages in the presence of the Engineer or any other authorized representatives of the Engineer-in- Charge who will be required to be present at the place and time of disbursement of wages by the contractor to workmen.

4.11 The contractor shall obtain from the Engineer or any other authorized representative of the Engineer-in-Charge as the case may be, a certificate under his signature at the end of the entries in the “Register of Wages” or the “Wage-cum-Muster Roll” as the case may be in the following form:

“Certified that the amount shown in column No..... has been paid to the workmen concerned in my presence on..... at

5.0 FINES AND DEDUCTIONS, WHICH MAY BE MADE FROM WAGES

5.1 The wages of a worker shall be paid to him without any deduction of any kind except the following–

a) Fines

b) Deductions for absence from duty i.e. from the place or the places where by the terms of his employment he is required to work. The amount of deduction shall be in proportion to the period for which he was absent.

c) Deduction for damage to or loss of goods expressly entrusted to the employed persons for custody, or from loss of money or any other deduction which he is required to account where such damage or loss is directly attributable to his neglect or default.

d) Deduction for recovery of advances or for adjustment of over payment of wages, advances granted shall be entered in a register.

e) Any other deduction, which the Central Government may from time to

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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time allow.

5.2 No fines should be imposed on any workers in respect of such acts and omissions on his part as have been approved by the Chief Labour Commissioner.

5.3 No fine shall be imposed on a worker and no deduction for damage or loss shall be made from his wages until the worker has been given an opportunity of showing cause against such fines or deductions.

5.4 The total amount of fine, which may be imposed in any one-wage period on a worker, shall not exceed an amount equal to three paise in Rupees of the total wages, payable to him in respect of that wage period.

5.5 No fine imposed on any worker shall be recovered from him in installment, or after the expiry of sixty days from the date on which it was imposed.

5.6 Every fine shall be deemed to have been imposed on the day of the act or omission in respect of which it was imposed.

6.0 LABOUR RECORDS

6.1 The contractor shall maintain a "Register of persons employed" on work on contract in form XIII of the CL (R&A) Central Rules 1971 (Appendix-B).

6.2 The contractor shall maintain a "Muster Roll" register in respect of all workmen employed by him on the work under contract in from XVI of the CL (R&A) Rules 1971 (Appendix-C).

6.3 The contractor shall maintain a "Wage Register" in respect of all workmen employed by him on the work in form (Appendix-D).

6.4 Register of accidents – The contractor shall maintain a register of accidents in such

form as may be convenient at the work place but the same shall include the following particulars:

- a) Full particulars of the labourers who met with accident.
 - b) Rate of wages
 - c) Sex
 - d) Age
 - e) Nature of accident and cause of accident.
 - f) Time and date of accident.
 - g) Date and time when he/she admitted in Hospital
 - h) Date of discharge from the Hospital
 - i) Period of treatment and result of treatment
 - j) Percentage of loss of earning capacity and disability as assessed by Medical Officer.
 - k) Claim required to be paid under Workmen's Compensation Act.
 - l) Date of payment of compensation.
 - m) Amount paid with details of the person to whom the same was paid.
 - n) Authority by whom the compensation was assessed.
 - o) Remarks.
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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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7.0 ATTENDANCE CARD-CUM WAGE SLIP:

7.1 The contractor shall issue an attendance card-cum-wage slip to each workman employed by him in the specimen form at (Appendix-E).

7.2 The card shall be valid for each wage period.

7.3 The contractor shall mark the attendance of each workman on the card twice each day, once at the commencement of the day and again after the rest interval, before he actually starts work.

7.4 The card shall remain in possession of the worker during the wage period under reference.

7.5 The contractor shall complete the wage slip portion on the reverse of the card at least a day prior to the disbursement of wages in respect of the wage period under reference.

7.6 The contractor shall obtain the signature or thumb impression of the worker on the wage slip at the time of disbursement of wages and retain the card with himself.

8.0 EMPLOYMENT CARD

The contractor shall issue an Employment Card in form to each worker within three days of the employment of the worker (Appendix-F).

9.0 SERVICE CERTIFICATE

On termination of employment for any reason whatsoever the contractor shall issue to the workman whose services have been terminated, a service certificate in from Appendix-G.

10.0 PRESERVATION OF LABOUR RECORDS

All records required to be maintained under Regulations Nos. 6 and 7 shall be preserved in original for a period of three years from the date of last entries made in them and shall be made available for inspection by the Engineer-in-Charge, Labour Officer.

11.0 POWER OF LABOUR OFFICERS TO MAKE INVESTIGATIONS INQUIRY

The Labour Officer or any other person authorized by OIL INDIA LTD on its behalf shall have power to make inquiries with a view to ascertaining and enforcing due and proper observance of the Fair Wage Clauses and the Provisions of Regulations. He shall investigate into any complaint regarding the default made by the contractor or sub- contractor in regard to such provision.

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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12.0 Inspection of Book and slips

The contractor shall allow inspection of all the prescribed labour records to any of his workers or to his agent at a convenient time and place after due notice is received or to the Labour officer or any other person, authorized by the Central Government on his behalf.

13.0 Submission of Returns

The contractor shall submit periodical returns as may be specified from time to time.

14.0 Amendments

The OIL INDIA LTD may from to time, add or amend the regulations and on any question as to the application, interpretation or effect of these regulations the decision of the OIL INDIA LIMITED concerned shall be final.

15.0 Contractor has to follow all the rules & regulations as per Labour Act and maintain all the records in the proper formats by obtaining from concerned labour department/office which are to be produced before the OIL INDIA LTD / labour officers for inspection as & when asked.

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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Appendix – ‘A’

LABOUR BOARD

S. No	Description	
1.	Name of work	
2.	Name of Contractor	
3.	Address of Contractor	
4.	Name and Address of UNIT	
5.	Name of Labour Enforcement Officer	
6.	Address of Labour Enforcement Officer	
7.	Date:	

S. No	Category	Minimum Wages fixed	Actual Wages fixed	Numbers present	Remarks

Weekly Holiday	

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Wage Period	
Date of Payment of wages	
Working hours	
Rest interval	

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See rule 75

Appendix – ‘B’

REGISTER OF WORKMEN EMPLOYED BY CONTRACTOR

Sl.No.	Description	
	Name and Address of Contractor	
	Name and Address of Establishment in/ under which contract is carried on	
	Nature and location of work	
	Name & Address of Principal Employer	
1	Sl. No.	
2.	Name and surname of workman	
3.	Age & sex	
4.	Father's/ Husbands Name	
5.	Nature of employment / designation	
6.	Permanent home address of the workman (village and Taluka and District)	
7.	Local address	
8.	Date of commencement of employment	
9.	Signature or thumb impressions of the workman	
10.	Date of termination of employment	
11.	Reasons for termination	
12.	Remarks	

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Appendix – ‘C’

**(See Rule 78(2)
(193)**

MUSTER ROLL

SL.No.	Description	
	Name and address of contractor	
	Name and address of establishment in/under	
	which contract is carried on	
	Nature and location of work	
	Name and Address of Principal Employer	
	For the month / fortnight	
1.	S. No.	
2.	Name of the workman	
3.	Sex	
4.	Father's/Husband's Name	
5.	Dates (1, 2, 3, 4, 5, -----12, 13, 14, 15)	
6.	Remarks	

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Appendix – ‘D’**[See Rule 78(2) (03)]****REGISTER OF WAGES**

	Name and address of contractor	
	Name and address of establishment in/under which contract is carried on	
	Nature and location of work	
	Name and Address of Principal Employer	
	Wage period: per month/ fortnightly	
1	Sl. No.	
2	Name of Workman	
3	Serial No. in the register of workman	
4	Designation /nature of work done	
5	Nos. of days worked	
6	UNITs of work done	
7	Daily rate of wages/ piece rate	
8	Basic rate of Wages	
9	Dearness allowance	
10	Overtime	
11	Other cash payments (Nature of payments to be indicated)	

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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12	Total	
13	Deduction if any (indicate nature)	
14	Net amount paid	
15	Signature thumb impression of the workman	
16	Initials of contractor or his representatives	

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[SEE RULE 78 (2) (B)]

Appendix – ‘E’

W A G E S L I P

	Name and address of contractor	
	Name and Father's/Husband's Name of workman	
	Nature and location of work	
	For the Week/Fortnight/Month ending	
1	No. of days worked	
2	No. of UNITs worked in case of piece rate works	
3	Rate of daily wages/piece rate	
4	Amount of overtime wages	
5	Gross wages payable	
6	Deductions if any	
7	Net amount of wages paid	
	Sign of the Contractor	
	Received the sum of Rs.----- -----	
	towards my wages for the above period.	

Sign.of workman: -----

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

WAGE CARD

Appendix – ‘E’

Wage Card No. &	Date of Issue
	Month/Fortnight
Name and address of Contractor	
Nature of work with location	Designation
Name of workman	

Rate of Wages

Dates	Morning	Evening	Rate	Amount	Initials
1	2	3	4	5	6

Received from the sum of Rs. on account of my wages.

Signature

The wage card is valid for one month from the date of issue.

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Appendix – ‘F’**(See Rule 76)****EMPLOYMENT CARD**

Sl.No	Description	
.		
	Name and address of contractor	
	Name and address of establishment under which	
	the contract is carried out	
	Nature and location of work	
	Name and address of Principal Employer	
1	Name of the workman	
2	Sl. No in the register of workman employed	
3	Nature of Employment/Designation	
4	Wage rate (with particulars of unit in case of piece work)	
5	Wage Period	
6	Tenure of employment	
7	Remarks	

Signature of Contractor

Appendix – ‘G’**(See Rule 77)****SERVICE CERTIFICATE**

Name and address of contractor	
Nature and location of work	
Name and address of workman	
Age or date of birth	
Identification Marks	
Father's/Husband's Name	
Name and address of establishment in/under which	
contract is carried on	
Name and address of Principal Employer	
Total period of which employed	

S. No.	From	To	Nature of work	Rate of wages	Remarks

With particulars of unit in case of
piece work)

Signature

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

PART II – PRICE BID
PROFORMA-B

OIL INDIA LIMITED
(A Govt. of India Enterprise)

Description of Service: Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

TENDER NO. CGI 6122P21

SCHEDULE OF QUANTITIES (SOQ), SERVICE/WORK AND RATES

GROUP A-CIVIL WORKS								
SL.N O.	DESCRIPTION OF WORK	QTY (A)	UNIT	RATE PER UNIT (IN WORDS & FIGURES) (B)		TOTAL AMOUNT C=(AXB)	SERVICE ACCOUNTI NG CODE (SAC)	SPECI FY % OF GST ON (C)
				FIGURES	WORDS			
1	<u>Earth work in surface excavation</u> Earth work in surface excavation not exceeding 30 cm in depth but exceeding 1.5 m in width as well as 10 sqm on plan including getting out and disposal of excavated earth upto 50 m and lift upto 1.5 m, as directed by Engineer-in-Charge: All kinds of	500	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	soil							
2	<u>Banking excavated earth in layers</u> Banking excavated earth in layers not exceeding 20 cm in depth, breaking clods, watering, rolling each layer with ½ tonne roller, or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up, in embankments for roads, flood banks, marginal banks, and guide banks etc., lead upto 50 m and lift upto 1.5 m : All kinds of soil	30,369.710	M3					
3	<u>Deduct for not rolling with power roller</u> Deduct for not rolling with power roller of minimum 8 tonnes for banking excavated earth in layers not exceeding 20 cm in depth.	5000	M3					
4	<u>Deduct for not watering:</u> Deduct for not watering the	5500	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	excavated earth for banking							
5	<u>Earth work in excavation:</u> Earth work in excavation by mechanical means (Hydraulic excavator) / manual means over areas (exceeding 30 cm in depth, 1.5m in width as well as 10 sqm on plan) including disposal of excavated earth, lead upto 50 m and lift upto 1.5 m, disposed earth to be levelled and neatly dressed. : All kinds of soil.	29,369.710	M3					
6	<u>Earth work in excavation: "</u> Earth work in excavation by mechanical means (Hydraulic excavator) / manual means over areas (exceeding 30 cm in depth, 1.5m in width as well as 10 sqm on plan) including disposal of excavated earth, lead upto 50 m and lift upto 1.5	2500.00	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	m, disposed earth to be levelled and neatly dressed. :Ordinary rock							
7	<u>Earth work in excavation:</u> Earth work in excavation by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. : All Kinds of soil	1,000.00	M3					
8	<u>Extra rates for quantities of works,:</u> Extra rates for quantities of works, executed : In or under water and/or liquid mud, including pumping out water as required. (unit Per M Depth)	8,500	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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9	<u>Extra rates for quantities of works,:</u> Extra rates for quantities of works, executed : In or under water and/or liquid mud, including pumping out water as required. Same as above but for - In or under foul position, including pumping out water as required The extra percentage rate is applicable in respect of each item but limited to quantities of work executed in these difficult conditions. The unit, namely, metre depth, to be considered for payment, shall be the depth measured from the sub soil water level upto the centre of gravity of the quantity executed in difficult conditions. The depth shall be reckoned correct to 0.1 metre. 0.05 metre or more shall be taken as 0.1 metre and less than 0.05 metre ignored.	8500	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Unit: Per M depth							
10	<u>Filling available excavated earth:</u> Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.	10000.00	M3					
11	<u>Extra for every additional lift:</u> Extra for every additional lift of 1.5 m or part thereof in. All kinds of soil.	20000.00	M3					
12	<u>Supplying and filling in plinth:</u> Supplying and filling in plinth with River sand under floors including, watering, ramming	1,964.33	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	consolidating and dressing complete.							
13	<u>Clearing jungle including uprooting:</u> Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared.	10,000	M2					
14	<u>Supplying chemical emulsion:</u> Supplying chemical emulsion in sealed containers including delivery as specified. Chlorpyriphos/ Lindane emulsifiable concentrate of 20%	20	L					
15	<u>Diluting and injecting chemical:</u> Diluting and injecting chemical emulsion POST-CONSTRUCTIONAL anti-termite treatment (excluding the cost of chemical	600	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	emulsion) : Along external wall where the apron is not provided using chemical emulsion @ 7.5 litres / sqm of the vertical surface of the substructure to a depth of 300 mm including excavation channel along the wall & rodding etc. complete: The plinth Protection 450mm wide along the periphery of the Building shall be measured for payment. The work must be executed by approved specialised agency who is a member of IPCA and shall give a 10 (ten) years guarantee.							
16	<u>Providing and laying in position CC:</u> Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level : 1:2:4 (1 cement : 2 coarse sand	917.760	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	(zone-III) : 4 graded stone aggregate 20 mm nominal size).							
17	<u>Providing and laying in position CC:</u> Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level : for - 1:4:8 (1 Cement : 4 coarse sand : 8 graded stone aggregate 40 mm nominal size).	1,208.37	M3					
18	<u>Providing and laying in position:</u> Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level :1:5:10 (1 Cement : 5 coarse sand : 10 graded brick aggregate 40 mm nominal size).	50.000	M3					
19	<u>Providing and laying RCC:</u> Providing and laying cement concrete in retaining walls, return walls,	10.000	M3					

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	walls (any thickness) including attached pilasters, columns, piers, abutments, pillars, posts, struts, buttresses, string or lacing courses, parapets, coping, bed blocks, anchor blocks, plain window sills, fillets etc. up to floor five level, excluding the cost of centering, shuttering and finishing : 1:1½:3 (1 cement:1½ coarse sand:3 graded stone aggregate 20 mm nominal size).							
20	<u>Providing and laying CC:</u> Providing and laying cement concrete in kerbs, steps and the like at or near ground level excluding the cost of centering, shuttering and finishing. 1:1½:3 (1 Cement: 1½ coarse sand(zone-III) : 3 graded stone aggregate 20 mm nominal size).	35.000	M3					
21	<u>Providing and fixing Precast CC:</u>	10.000	M3					

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	Providing and fixing up to floor five level precast cement concrete string or lacing courses, copings, bed plates, anchor blocks, plain window sills, shelves, louvers, steps, stair cases, etc. including hoisting and setting in position with cement mortar 1:3 (1 Cement : 3 coarse sand), cost of required centering, shuttering and finishing smooth with 6mm thick cement plaster 1:3 (1 Cement : 3 fine sand) on exposed surfaces complete. : 1:1.5:3 (1 cement : 1.5 coarse sand (Zone-III) : 3 graded stone aggregate 20mm nominal size).							
22	<u>Providing and laying damp-proof:</u> Providing and laying damp-proof course 40mm thick with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone	50	M2					

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	aggregate 12.5mm nominal size).							
23	<u>Extra for providing and mixing:</u> Extra for providing and mixing water proofing material in cement concrete work @ 1 kg per 50kg of cement. Rate: Per 50 KG cement	10.000	K G					
24	<u>Providing & applying a coat:</u> Providing & applying a coat of residual petroleum bitumen of grade of VG-10 of approved quality using 1.7kg per square metre on damp proof course after cleaning the surface with brushes and finally with a piece of cloth lightly soaked in kerosene oil.	50	M2					
25	<u>Making plinth protection:</u> Making plinth protection 50mm thick of cement concrete 1:3:6 (1cement :3 coarse sand :	234	M2					

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	6graded stone aggregate 20mm nominal size) over 75mm bed by dry brick ballast 40mm nominal size well rammed and consolidated and grouted with fine sand including finishing the top smooth							
26	Reinforced cement concrete work: Reinforced cement concrete work in walls(any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. up to floor five level excluding cost of centering, shuttering, finishing and reinforcement :1:1.5:3 (1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)	10.000	M3					
27	Reinforced cement concrete work: Reinforced cement concrete work in vertical and horizontal fins individually or forming box louvers, facias and eaves boards	125.140	M3					

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	above plinth level up to floor five level, excluding the cost of centering, shuttering, finishing and reinforcement with 1:1½:3 (1 cement : 1½ coarse sand (zone-III) : 3 graded stone aggregate 20mm nominal size).							
28	<u>Centering and shuttering:</u> Centering and shuttering including strutting, propping etc. and removal of form for : Foundations, footings, bases of columns, etc. for mass concrete.	2,807.45	M2					
29	<u>Centering and shuttering:</u> Centering and shuttering including strutting, propping etc. and removal of form for : .Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	8,659.59	M2					
30	<u>Centering and shuttering:</u> Centering and shuttering including strutting, propping	19,433.40	M2					

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	etc. and removal of form for : Suspended floors, roofs,landings, balconies and access platform.							
31	<u>Centering and shuttering:</u> Centering and shuttering including strutting, propping etc. and removal of form for : .Shelves (Cast in situ)	25	M2					
32	<u>Centering and shuttering:</u> Centering and shuttering including strutting, propping etc. and removal of form for : Lintels, beams, plinth beams,girders, bressumers and cantilevers.	14,815.770	M2					
33	<u>Centering and shuttering column:</u> Centering and shuttering including strutting, propping etc. and removal of form for : Columns, Pillars, Piers, Abutments, Posts and Struts.	7,621	M2					
34	<u>Centering and shuttering stairs:</u> Centering and shuttering	747.300	M2					

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	including strutting, propping etc. and removal of form for : Stairs, (excluding landings) except spiral-staircases.							
35	<u>Centering and shuttering fins:</u> Centering and shuttering including strutting, propping etc. and removal of form for : Vertical and horizontal fins individually or forming box louvers band, facias and eaves boards.	1,462.730	M2					
36	<u>Extra for shuttering in circular work:</u> Extra for shuttering in circular work (20% of respective centering and shuttering items)	150	M2					
37	<u>Centering and shuttering small lintel</u> Centering and shuttering including strutting, propping etc. and removal of form for : Small lintels not exceeding 1.5 m clear span, moulding as in	150	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	cornices, window sills, string courses, bands, copings, bed plates, anchor blocks and the like							
38	<u>Centering and shuttering small edges:</u> Centering and shuttering including strutting, propping etc. and removal of form for : .Edges of slabs and breaks in floors and walls :- Under 20 cm wide	450	M					
39	<u>Centering and shuttering small edges:</u> Centering and shuttering including strutting, propping etc. and removal of form for : Edges of slabs and breaks in floors and walls :- Above 20 cm wide .	110	M2					
40	<u>Providing and fixing tie bolt:</u> Providing and fixing tie bolt, spring coil and plastic cone in wall shuttering	100	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	complete as per the direction of Engineer-in-charge.: 12 mm dia. & 150 mm length.							
41	<u>Providing and fixing tie bolt:</u> Providing and fixing tie bolt, spring coil and plastic cone in wall shuttering complete as per the direction of Engineer-in-charge.: 20 mm dia.& 225 mm length	150	EA					
42	<u>Extra for additional height in centering</u> Extra for additional height in centering, shuttering where ever required with adequate bracing, propping etc. including cost of deshuttering and decentering at all levels, over a height of 3.5 m, for every additional height of 1 metre or part thereof (Plan area to be measured). : Suspended floors, roofs, landing, beams and balconies (Plan area to be measured).	19,433.400	M2					
43	<u>Providing, hoisting and fixing:</u>	5.000	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Providing, hoisting and fixing above plinth level up to floor five level precast reinforced cement concrete work in string courses, bands, copings, bed plates, anchor blocks, plain window sills and the like, including the cost of required centering, shuttering but, excluding cost of reinforcement, with 1:1.5:3 (1 cement : 1.5 coarse sand (zone-III) : 3 graded stone aggregate 20 mm nominal size).							
44	<u>Providing, hoisting and fixing:</u> Providing, hoisting and fixing up to floor five level precast reinforced cement concrete in small lintels not exceeding 1.5m clear span up to floor five level, including the cost of required centering, shuttering but , excluding the cost of reinforcement, with 1:1.5:3 (1 cement : 1.5 coarse sand (zone-III) : 3 graded stone	6.210	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	aggregate 20 mm nominal size).							
45	<u>Extra for laying reinforced cement concrete:</u> Extra for laying reinforced cement concrete in or under water and/ or liquid mud, including cost of pumping or bailing out water and removing slush etc.,complete. The quantity will be calculated by multiplying the depth measured from the subsoil water level up to the centre of gravity of the R.C.C. under subsoil water with the quantity of R.C.C. in cubic metre executed under subsoil water. The depth of centre of gravity shall be reckoned correct to 0.1 m. 0.05 m or more shall be taken as 0.1 m and less than 0.05 m ignored. No extra payment shall be made for placing reinforcement or centering & shuttering under sub - soil water conditions.	3,695.840	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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46	<u>Extra for laying reinforced cement concrete:</u> Extra for laying reinforced cement concrete in or under foul positions.	3,695.840	M3					
47	<u>Reinforcement for R.C.C. work:</u> Reinforcement for R.C.C. work including straightening, cutting,bending, placing in position and binding all complete. : Thermo-Mechanically Treated bars.	1,735,530.770	KG					
48	<u>Providing and fixing in position:</u> Providing and fixing in position pre-moulded joint filler in expansion joints. Unit: per cm depth per cm Width per m length	153,410.400	CM					
49	<u>Providing and laying in</u>	5,998.000	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	<u>position:</u> Providing and laying in position machine batched, machine mixed and machine vibrated design mix cement concrete of specified grade for reinforced cement concrete work including pumping of concrete to site of laying but excluding the cost of centering,shuttering, finishing and reinforcement. including Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. M-25 grade reinforced cement concrete by using 330 kg. of cement per cum of concrete. : All work upto plinth level.							
50	<u>Providing and laying in position:</u> Providing and laying in position machine batched, machine mixed and	5,228.990	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	machine vibrated design mix cement concrete of specified grade for reinforced cement concrete work including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement. including Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. M-25 grade reinforced cement concrete by using 330 kg. of cement per cum of concrete. : All work above plinth level upto floor V level.							
51	Add or deduct for: Add or deduct for providing richer or leaner mixes respectively at all floor levels. : Providing M-30 grade concrete instead of M-25 grade BMC / RMC. (Note:- Cement content considered in M-30 is @ 340	9,131.050	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	kg/ kg/cum)							
52	<u>Add or deduct for:</u> Add or deduct for providing richer or leaner mixes respectively at all floor levels. : Providing M-40 grade concrete instead of M-25 grade BMC/RMC.(Note : Cement content considered in M-40 is @ 360 kg/ cum)	2,102.150	M3					
53	<u>Add for using extra cement:</u> Add for using extra cement in the items of design mix over and above the specified cement content therein.	100	QTL					
54	<u>Providing and placing in position:</u> Providing and placing in position precast reinforced cement concrete waffle units square or rectangular as per design and shape for floors and roofs in 1:1½:3 (1 Cement : 1 ½ coarse sand : 3 graded	15.000	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	stone aggregate 10mm nominal size) including flush or deep ruled pointing at joints in Cement mortar 1:2 (1 Cement : 2 Fine sand), making necessary holes of required sizes for carrying through service lines etc., providing steel hooks for lifting etc, form work in precasting, handling, hoisting, centering and erection complete for all floor levels but excluding the cost of reinforcement.							
55	<u>Extra for R.C.C./ B.M.C/ R.M.C. work:</u> Extra for R.C.C./ B.M.C/ R.M.C. work above floor V level for each four floors or part thereof.	966.060	M3					
56	<u>Supplying and applying</u> Supplying and applying pre tested and approved water based concrete curing compound to concrete/	7,621	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	masonry surface, all as per manufacturer's specification and direction of Engineer-in-charge. : Non pigmented wet curing compound							
57	<u>Providing and fixing parallel threaded:</u> Providing and fixing parallel threaded couplers conforming to IS code on “ Reinforcement Couplers for Mechanical Splices of Bars for Concrete Reinforcement - Specification”, to reinforcement bars including threading, enlargement at connection by forging, protecting the prepared reinforcement bars and related operations as required to complete the works per direction of Engineer-in-Charge. : Coupler for 16 mm diameter reinforcement bar	1,000	EA					
58	<u>Coupler for 20 mm diameter:</u> Providing and fixing parallel threaded couplers conforming to IS code on	1,000	EA					

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	“ Reinforcement Couplers for Mechanical Splices of Bars for Concrete Reinforcement - Specification”, to reinforcement bars including threading,enlargement at connection by forging, protecting the prepared reinforcement bars and related operations as required to complete the works per direction of Engineer-in-Charge. : Coupler for 20 mm diameter reinforcement bar							
59	<u>Coupler for 25 mm diameter:</u> Providing and fixing parallel threaded couplers conforming to IS code on “ Reinforcement Couplers for Mechanical Splices of Bars for Concrete Reinforcement- specification”, to reinforcement bars including threading, enlargement at connection by forging, protecting the prepared reinforcement bars and related	1,000	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	operations as required to complete the works per direction of Engineer-in-Charge. : Coupler for 25 mm diameter reinforcement bar							
60	<u>Coupler for 28 mm diameter:</u> Providing and fixing parallel threaded couplers conforming to IS code on “ Reinforcement Couplers for Mechanical Splices of Bars for Concrete Reinforcement - Specification”, to reinforcement bars including threading, enlargement at connection by forging, protecting the prepared reinforcement bars and related operations as required to complete the works per direction of Engineer-in-Charge. : Coupler for 28 mm diameter reinforcement bar	1,000	EA					
61	<u>Coupler for 32 mm diameter</u> Providing and fixing parallel threaded couplers conforming	1,000	EA					

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	to IS code on “ Reinforcement Couplers for Mechanical Splices of Bars for Concrete Reinforcement - Specification”, to reinforcement bars including threading,enlargement at connection by forging, protecting the prepared reinforcement bars and related operations as required to complete the works per direction of Engineer- in-Charge. : Coupler for 32 mm diameter reinforcement bar							
62	<u>Expansion Joint Treatment</u> <u>:For out side:</u> Expansion Joint Treatment : For out side of the wall :Providing & fixing of the specialized temperature resistant seal, for 25 mm Expansion Joints comprising of Flexible High Quality EPDM Seal. The seal should be resistant to oils, petrochemicals and must have Hard wearing, temperature resistant (-30°C to +120°C) The system should be	164.740	M					

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	installed using the manufacturers recommended adhesive at exterior wall. The System The system is designed for 25 mm Joint size, having a total Movement of 50% of Joint width (total 14mm movement).The side of the seal should have special grooves to house the adhesive, allowing for secure fixing and flexible anchoring. The seal should be in gray color from visible surface and black in inner layer.							
63	<u>Expansion Joint Treatment : Inside</u> Expansion Joint Treatment : Inside Floor Joint : Providing & Fixing of the Floor to Floor & Floor to wall corner, Flat Model, for 25 mm Expansion Joints Aluminium Covers Profiles, having a Hard Wearing, Maintenance Free, long Lasting design having Smooth Surface.	293.780	M					

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	The Exp. Joint Covers should have large movement capacity +/- 10mm The design of the Exp. Joint Cover System should be such that it should avoid any accumulation of dirt. The Exp. Joint Cover should have an Semitic and non-bump with minimum expose surface. The surface of the system should be in the Mill finish. The Total Visible width of the profile should not be more than 37 mm (+/- 5 mm). The system should be capable of heavy load capacity. The Side Profile should have a MULTI HOLE mounting bracket allowing for secure fixing and Flexible anchoring and excellent bonding with given slab surface/masonry/epoxy bedding. For Precise Transitions the factory supplied slid-in connection pins should be used during the installation of the cover system.							
64	Expansion Joint Treatment : For Basement:	105.350	M					

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	Expansion Joint Treatment : For Basement Wall & Slab Top :Providing & fixing of the specialized sealing strip at mother slab. The Sealing strip should be used for the application areas for the non- Pressurized water areas as per DIN 18195 Specification. The sealing strip must have 150mm Connection flanges with striations on both sides for safe adhesion with existing water proofing membrane for optimum safety The strip must have 3 sealing layers bulb shape design in movement area to produce required movement and as protection against possible mechanical damage. The total movement must be 20mm.							
65	Expansion Joint Treatment: Internal wall: Expansion Joint Treatment : For Internal Walls : Supply and installation of wall model for	463.370	M					

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interior use, Cover strip for 25mm in accordance with the requirements of the specifications below. The joint covers are designs utilizing extruded aluminium base members of 70mm wide along with the Snap in Tension Clip System. The material shall be such that it provides an Expansion Joints System suitable for Vertical Wall to Wall Flat & Horizontal Ceiling to Ceiling Flat application. The Joint System shall utilize lightweight aluminium profiles exhibiting minimal exposed aluminium surfaces of 70mm mechanically locking with a specifically designed clip made up of stainless steel to facilitate movement. Throughout the normal movement cycle, the system shall demonstrate the ability to remain flat at all times and provide a flush transition between opposing and adjacent finish							

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	construction.							
66	<u>Brick work with FPS bricks:</u> Brick work with FPS bricks of class designation 75 in foundation and plinth in: (i) Cement mortar 1:6 (1 cement : 6 coarse sand)	389.630	M3					
67	<u>Brick work with FPS bricks:</u> Brick work with FPS bricks of class designation 75 in superstructure above plinth level up to floor V level in all shapes and sizes in : Cement mortar 1:6 (1 cement : 6 coarse sand)	2,820.370	M3					
68	<u>Extra for brick work /AAC block masonry:</u> Extra for brick work / AAC block masonry / Tile brick masonry in superstructure above floor V level, for each four floors or part thereof by mechanical means.	598.270	M3					
69	<u>Half brick masonry:</u> Half brick masonry with common burnt clay F.P.S. (non	15.180	M2					

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	modular) bricks of class designation 7.5 in foundations and plinth in : Cement mortar 1:4 (1 cement :4 coarse sand)							
70	<u>Half brick masonry:</u> Half brick masonry with FPSbricks of class designation 75 in superstructure above plinth level up to floor V level.: Cement mortar 1:4 (1 cement :4 coarse sand)	1,913.490	M2					
71	<u>Extra for half brick masonry:</u> Extra for half brick masonry in superstructure, above floor V level for every four floors or part thereof by mechanical means.	259.330	M2					
72	<u>Extra for providing and placing:</u> Extra for providing and placing in position 2 Nos. 6mm dia. M.S. bars at every third course of half brick masonry (with FPS bricks).	1,913.490	M2					
73	<u>Extra on brickwork:</u> Brick work with FPS bricks of	29.810	M3					

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	class designation 75 in superstructure above plinth level up to floor V level in all shapes and sizes in : Cement mortar 1:6 (1 cement : 6 coarse sand)Extra on above for Tapered Brick work for Steps or Similar work and Square Pillars							
74	<u>Providing and fixing marble:</u> Providing and fixing 18mm thick gang saw cut mirror polished (pre-moulded and pre-polished) machine cut for kitchen platforms, vanity counters, window sills , facias and similar locations of required size of approved shade, colour and texture laid over 20mm thick base cement mortar 1:4 (1 cement : 4 coarse sand) with joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edge to give high gloss finish etc. complete at all levels.: Granite (Jet black). - Area of slab over	15	M2					

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	0.50 sqm.							
75	<u>Extra for providing edge moulding:</u> Extra for providing edge moulding to 18mm thick marble stone counters, Vanities etc. including machine polishing to edge to give high gloss finish etc. complete as per design approved by Engineer-in-Charge.: Marble work	100	M					
76	<u>Extra for providing edge moulding:</u> Extra for providing edge moulding to 18mm thick marble stone counters, Vanities etc. including machine polishing to edge to give high gloss finish etc. complete as per design approved by Engineer-in-Charge.: Granite work.	1,119.64	M					
77	<u>Extra for fixing marble /granite stone:</u> Extra for fixing marble /granite stone over and above corresponding basic item, in facia and drops of width upto	10	M					

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	150 mm with epoxy resin based adhesive including cleaning etc. complete.							
78	Extra for providing opening: Extra for providing opening of required size & shape for wash basins/kitchen sink in kitchen platform, vanity counters and similar location in marble/Granite/stone work including necessary holes for pillar taps etc. including rubbing and polishing of cut edges etc. complete.	5	EA					
79	Mirror polishing: Mirror polishing on marble work/Granite work/stone work where ever required to give high gloss finish complete.	400	M2					
80	Providing and fixing cramps: Providing and fixing cramps of required size & shape in RCC/ CC / Brick masonry backing with cement mortar 1:2 (1 cement : 2 coarse sand),including drilling necessary hole in stones and embedding the cramp in the hole (fastener to be paid	1,000.00	KG					

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	separately).: Stainless steel cramps							
81	<u>Providing and fixing:</u> Providing and fixing expansion hold fasteners on C.C. /R.C.C./Brick masonry surface backing including drilling necessary holes and the cost of bolt etc Complete. Wedge expansion type : Fastener with threaded dia 10 mm	2,000	EA					
82	<u>18mm thick Granite Stone work:</u> 18mm thick Granite Stone work for wall lining / Riser of Steps / Skirting over 20mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand)Sand cement slurry @ 3.3 kg/sqm including pointing in white cement complete.	448	M2					
83	<u>Providing and fixing 18 mm thick stone</u> Providing and fixing 18 mm thick stone slab table rubbed, edges rounded and polished of size 75x50 cm deep and 1.8 cm thick fixed in urinal partitions by cutting a chase of	23.030	M2					

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	appropriate width with chase cutter and embedding the stone in the chase with epoxy grout or with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm nominal size) as per direction of Engineer-in-charge and finished smooth. : Granite Stone of approved shade.							
84	Providing and fixing: Providing and fixing machine cut, mirror/ eggshell polished , marble stone work for wall lining (veneer work) including dado, skirting, risers of steps etc., in required design and pattern wherever required, stones of different finished surface texture, on 12 mm (average) thick cement mortar 1:3 (1 cement : 3 coarse sand) laid and jointed with white cement slurry @ 3.3 kg/sqm including pointing with white cement slurry admixed with pigment of matching shade, including rubbing, curing, polishing etc.	12.460	M2					

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	all complete as per Architectural drawings, and as directed by the Engineer-in-Charge. : 18 mm thick Italian Marble stone slab, Perlato,Rosso verona, Fire Red or Dark Emperadore etc.							
85	<u>Providing and laying Polished Granite:</u> Providing and laying Polished Granite stone flooring in required design and patterns, in linear as well as curvilinear portions of the building, all complete as per the architectural drawings, with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand), laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade, including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge. Polished Granite stone slab jet Black, Cherry Red, Elite	3,631.52	M2					

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	Brown, Cat Eye or equivalent.							
86	<u>Extra for Granite stone flooring:</u> Extra for Granite stone flooring in treads of steps and risers using single length up to 2.00 metre.	302.240	M2					
87	<u>Providing wood work:</u> Providing wood work in frames of doors, windows, clerestory windows and other frames, wrought framed and fixed in position : Second class teak wood	7.000	M3					
88	<u>Extra for providing frosted glass:</u> Extra for providing frosted glass panes 4 mm thick instead of ordinary float glass panes 4 mm thick in doors, windows and clerestory window shutters. (Area of opening for glass panes excluding portion inside rebate shall be measured).	25	M2					
89	<u>Providing and fixing ISI marked:</u> Providing and fixing ISI marked flush door shutters conforming to IS:2202 (Part I) non-	26.210	M2					

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	decorative type, core of block board construction with frame of 1st class hard wood and well matched commercial 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters : 35 mm thick including ISI marked Stainless Steel butt hinges with necessary screws.							
90	<u>Providing and fixing ISI marked:</u> Providing and fixing ISI marked flush door shutters conforming to IS:2202 (Part I) non-decorative type, core of block board construction with frame of 1st class hard wood and well matched commercial 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters : 35 mm thick including ISI marked Stainless Steel butt hinges with necessary screws. 30 mm thick including ISI marked Stainless Steel butt hinges with necessary screws	137.590	M2					
91	<u>Providing and fixing plywood:</u>	137.590	M2					

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	Providing and fixing plywood 4 mm thick, both side non-decorative veneer , for plain lining with necessary screws, nails and adhesives.							
92	<u>Providing and fixing decorative:</u> Providing and fixing decorative high pressure laminated sheet of plain / wood grain in gloss /matt/suede finish with high density protective surface layer and reverse side of adhesive bonding quality conforming to IS:2046 Type S including cost of adhesive of approved quality. : 1.0mm thick	327.600	M2					
93	<u>Extra for providing lipping:</u> Extra for providing lipping with 2nd class teak wood battens 25 mm minimum depth on all edges of shutters (over all area of door shutter to be measured) Over Flush door shutter item.	146.330	M2					
94	<u>Extra for providing vision panel:</u>	150.700	M2					

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	Extra for providing vision panel not exceeding 0.1 sqm in all type of flush doors (cost of glass excluded) (overall area of door shutter to be measured) : Rectangular or square.							
95	Extra for louvers: Extra if louvers (not exceeding 0.2 sqm) are provided in flush door shutters (overall area of door shutters to be measured).: Decorative Type.	13.100	M2					
96	Extra for cutting rebate: Extra for cutting rebate in flush door shutters (Total area of the shutter to be measured).	72.070	M2					
97	Providing and fixing wooden: Providing and fixing wooden moulded beading to door and window frames with iron screws, plugs and priming coat on unexposed surface etc. complete : 2nd class teak wood - 50 x 20 mm	405.600	M					
98	Providing 40x5 mm flat iron hold fast: Providing 40x5 mm flat iron hold fast 40 cm long including fixing to frame with 10 mm	310	EA					

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	diameter bolts, nuts and wooden plugs and embedding in cement concrete block 30x10x15cm 1:3:6 mix (1 cement : 3 coarse sand: 6 graded stone aggregate 20mm nominal size).							
99	<u>Providing and fixing:</u> Providing and fixing chromium plated brass 100 mm mortice latch and lock with 6 levers and a pair of lever handles of approved quality with necessary screws etc. complete.	62	EA					
100	<u>Providing and fixing:</u> Providing and fixing chromium plated brass night latch of approved quality including necessary screws etc. complete.	13	EA					
101	<u>Providing and fixing:</u> Providing and fixing bright finished brass hanging type floor door stopper with necessary screws, etc. complete.	90	EA					
102	<u>Providing and fixing:</u>	90	EA					

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	Providing and fixing bright finished brass tower bolts (barrel type) with necessary screws etc. complete : 250x10 mm							
103	<u>Providing and fixing</u> Providing and fixing bright finished brass tower bolts (barrel type) with necessary screws etc. complete :150x10 mm	90	EA					
104	<u>Providing and fixing:</u> Providing and fixing bright finished brass door latch with necessary screws etc. complete : 300x16x5 mm	15	EA					
105	<u>Providing and fixing aluminium:</u> Providing and fixing aluminium extruded section body tubular type universal hydraulic door closer (having brand logo with ISI, IS : 3564,embossed on the body, door weight upto 36 kg to 80 kg and door width from 701 mm to 1000 mm), with double Speed adjustment with necessary accessories and screws etc. complete.	61	EA					

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106	<u>Providing and fixing factory made UPVC:</u> Providing and fixing factory made uPVC door frame made of Upvc extruded sections having an overall dimension as below (tolerance ±1mm), with wall thickness 2.0 mm (± 0.2 mm), corners of the door frame to be Jointed with galvanized brackets and stainless steel screws, joints mitred and Plastic welded. The hinge side vertical of the frames reinforced by galvanized M.S. tube of size 19 X 19 mm and 1mm (± 0.1mm) wall thickness and 3 nos. stainless steel hinges fixed to the frame complete as per manufacturer's specification and direction of Engineer –in-charge : Extruded section profile size 48x40 mm	20.590	M					
107	<u>Providing and fixing:</u> Providing and fixing to existing door frames :- 24 mm thick factory made PVC door shutters made of styles and rails of a uPVC hollow section of	6.550	M2					

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size 59x24 mm and wall thickness 2 mm (±0.2 mm) with inbuilt edging on both sides. The styles and rails mitred and joint at the corners by means of M.S. galvanised/ plastic brackets of size 75x220 mm having wall thickness 1.0 mm and stainless steel screws. The styles of the shutter reinforced by inserting galvanised M.S. tube of size 20x20 mm and 1 mm (± 0.1 mm) wall thickness. The lock rail made up of 'H' section, a uPVC hollow section of size 100x24 mm and 2 mm (± 0.2 mm) wall thickness, fixed to the shutter styles by means of plastic/galvanised M.S. 'U' cleats. The shutter frame filled with a uPVC multi-chambered single panel of size not less than 620 mm, having over all thickness of 20 mm and 1 mm (±								

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	0.1 mm) wall thickness. The panels filled vertically and tie bar at two places by inserting horizontally 6 mm galvanised M.S. rod and fastened with nuts and washers, complete as per manufacturer's specification and direction of Engineer-in-charge. (For W.C. and bathroom door shutter).							
108	<u>TOILET CUBICAL:</u> Supply and installation of Besco by Merino TITAN 18MM BOX UP series cubicles or equivalant of width and depth as per specifications/ site drawings. Cubicle height to be 2100 mm. Made from solid grade compact high pressure laminate as per IS:2046 manufactured under high specific pressure > 5 MPa and temperature >120°C with bunch of kraft papers impregnated with thermosetting phenolic resin and decorative	35	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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papers made of Alpha cellulose fiber impregnated with thermosetting melamine resin which provide superior scratch, abrasion, heat, chemical, impact, graffiti & moisture resistance along with anti-bacterial properties. Panels have a black core that when machined, presents a distinctive black edge. Panel thickness 18 mm. Design no. as specified by Arch. / Engr. in suede finish. Size of panels to be as per drawing. HARDWARE & ACCESSORIES :- • No head frame structure ,All panels to be aliengned to the top • Corner joinery section made from Stainless steel grade 304. Surface finish to be matt type. A thin plastic film pasted for surface protection. Size to be 35mmx15mmx0.8							

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mmT. Wall joinery section with hamming profile made from Stainless steel grade 304. Surface finish to be matt type. A thin plastic film pasted for surface protection. Size to be 21mmx16mmx0.8 mmT. • Fixed front panel to be anchored to floor with L Bracket of SS and covered with SS 316 Grade Box Type plate from all directions with 100mm clear Height from ground. Surface finish to be matt type. • Spring loaded Butt Hinges made from Stainless steel grade 304. Surface finish to be matt type. Covers to be lacor coated. • Conical shape Coat hook with rubber stopper made from Stainless steel grade 304. Surface finish to be matt type. • Round Door knob diameter 30 mm with grooves for better							

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	hand grip made from Stainless steel grade 304. Surface finish to be matt type. • Rotating Thumb-turn locking system with privacy indicator made from Stainless steel grade 304. Surface finish to be matt type. • Anti-noise rubber padding of thickness 2 mm and width 10 mm • Stainless steel grade 304 screws. • Anti-rotation Nylon polyamide grade-6 expandable wall plugs. Titan Box up 18 mm Series Cubicles: Standard Sizes (W x D x H)- 900 mm x 1550 mm x 2100 mm, (Height is including 100 mm gap from bottom) Door Size- 600 mm X 1995mm; Divider Size- 1550mm X 1995mm							
109	Structural steel work: Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including	24,647.530	KG					

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	cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
110	<u>Providing and fixing:</u> Providing and fixing 1mm thick M.S. sheet door with frame of 40x40x6mm angle iron and 3mm M.S. gusset plates at the junctions and corners, all necessary fittings complete, including applying a priming coat of approved steel primer. : Using flats 30x6mm for diagonal braces and central cross piece.	22.280	M2					
111	<u>Supplying and fixing:</u> Supplying and fixing rolling shutters of approved make, made of required size M.S. laths interlocked together through their entire length and jointed together at the end by end locks mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with	33.470	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	push and pull operation complete including the cost of providing and fixing necessary 27.5cm long wire springs grade No.2 and M.S. top cover of required thickness for rolling shutters. : 80x1.25mm M.S. laths with 1.25 mm thick top cover.							
112	<u>Providing and fixing ball bearing:</u> Providing and fixing ball bearing for rolling shutters.	16	EA					
113	<u>Extra for providing mechanical device:</u> Extra for providing mechanical device chain and crank operation for operating rolling shutters. : Exceeding 10.00 sqm and upto 16.80 sqm in the area.	33.470	M2					
114	<u>Extra for:</u> Extra for providing grilled rolling shutters manufactured out of 8 mm dia M.S. bar instead of laths as per design approved by Engineer-in-charge,(area of grill to be	13.390	M2					

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	measured).							
115	<u>Steel work in built up tubular trusses:</u> Steel work in built up tubular trusses including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, welded and bolted including special shaped washers etc. complete. : Hot finished seamless type tubes.	5,424.59	KG					
116	<u>Steel work welded in built up sections:</u> Steel work welded in built up sections/ framed work including cutting,hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required. : In gratings, frames,guard bar, ladder, railings, brackets, gates and similar works.	45,293.040	KG					
117	<u>Cement concrete flooring:</u> Cement concrete flooring 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate) finished with a floating coat of neat	62.990	M2					

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	cement including cement slurry, but excluding the cost of nosing of steps etc. complete. : 40mm thick with 20mm nominal size stone aggregate.							
118	52 mm thick cement concrete flooring: 52 mm thick cement concrete flooring with concrete hardener topping, under layer 40 mm thick cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) and top layer 12mm thick cement hardener consisting of mix 1:2 (1 cement hardener mix: 2 graded stone aggregate 6 mm nominal size) by volume, hardening compound mixed @ 2 litre per 50 kg of cement or as per manufacturer's specifications. This includes cost of cement slurry, but excluding the cost of nosing of steps etc. complete.	150.800	M2					
119	62 mm thick cement concrete flooring: 62 mm thick cement concrete flooring with concrete hardener topping,	4,161.310	M2					

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	under layer 50 mm thick cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) and top layer 12mm thick cement hardener consisting of mix 1:2 (1 cement hardener mix : 2 graded stone aggregate, 6mm nominal size) by volume, hardening compound mixed @ 2 litre per 50 kg of cement or as per manufacture 's specifications. This includes cost of cement slurry, but excluding the cost of nosing of steps etc. complete.							
120	Cement plaster skirting: Cement plaster skirting (up to 30 cm height) with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement. : 18mm thick.	92.540	M2					
121	Marble stone flooring: Marble stone flooring with 18mm thick marble stone (sample of marble	250	M2					

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	shall be approved by Engineer-in-charge) over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with grey cement slurry including rubbing and polishing complete with: Raj Nagar plain.							
122	Extra for pre finished nosing: Extra for pre finished nosing to treads of steps of marble stone.	50	M					
123	Kota stone slab flooring: Kota stone slab flooring over 20 mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab including rubbing and polishing complete with base of cement mortar 1 : 4 (1 cement : 4 coarse sand) : 25 mm thick.	3,303.38	M2					
124	Kota stone slabs 25 mm thick: Kota stone slabs 25 mm thick in risers of steps, skirting, dado and pillars laid on 12 mm (average) thick cement mortar	325.010	M2					

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	1:3 (1 cement 3 coarse sand) and jointed with grey cement slurry mixed with pigment to match the shade of the slabs, including rubbing and polishing complete.							
125	Extra for pre finished nosing: Extra for pre finished nosing in treads of steps of Kota stone/ sand stone slab.	951.600	M					
126	Extra for Kota stone: Extra for Kota stone/ sand stone in treads of steps and risers using single length	562.130	M2					
127	Providing and fixing : Providing and fixing Ist quality ceramic glazed wall tiles conforming to IS : 15622 (thickness to be specified by the Manufacturer) of approved make in all colours, shades except burgundy, bottle green, black of any size as approved by Engineer-in-Charge in skirting, risers of steps and dados over 12 mm thick bed of cement Mortar 1:3 (1 cement : 3 coarse sand) and jointing with grey	2,673.25	M2					

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	cement slurry @ 3.3kg per sqm including pointing in white cement mixed with pigment of matching shade complete. (Size of Tile is 300x450 mm)							
128	<u>Providing and laying Ceramic</u> : Providing and laying Ceramic glazed floor tiles 300x300 mm (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 15622 of approved make in colours such as White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick Cement Mortar 1:4 (1 Cement : 4 Coarse sand) including pointing the joints with white cement and matching pigment etc., complete.	242.410	M2					
129	<u>Providing and laying rectified Glazed:</u> Providing and laying rectified Glazed Ceramic floor tiles of size 300x300 mm or more (thickness to be specified by the manufacturer), of 1st	250	M2					

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	quality conforming to IS : 15622, of approved make, in colours White,Ivory, Grey, Fume Red Brown, laid on 20 mm thick cement mortar 1:4 (1 Cement: 4 Coarse sand), jointing with grey cement slurry @ 3.3kg/sqm including grouting the joints with white cement and matching pigments etc., complete.							
130	<u>Providing and laying vitrified tiles:</u> Providing and laying vitrified tiles in floors in different sizes (thickness to be specified by the manufacturer) with water absorption's less than 0.08% and conforming to IS : 15622 of approved make in all colours and shades, laid on 20mm thick cement mortar 1:4 (1 cement :4 coarse sand) including grouting the joints with white cement and matching pigments etc., complete. : Size of Tile 600x600 mm	7,933.50	M2					

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131	<u>Providing and laying:</u> Providing and laying Vitrified tiles in different sizes (thickness to be Specified by the manufacturer), with water absorption less than 0.08% and conforming to IS: 15622, of approved brand & manufacturer, in all colours and shade, in skirting, riser of steps, laid with cement based high polymer modified quick set tile adhesive (water based) conforming to IS:15477, in average 6 mm thickness, including grouting of joints (Payment for grouting of joints to be made separately).: Size of Tile 600x600 mm	292.440	M2					
132	<u>Providing and laying Vitrified :</u> Providing and laying Vitrified tiles in different sizes (thickness to be specified by the manufacturer), with water absorption less than 0.08% and conforming to IS: 15622, of approved brand &	100	M2					

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	manufacturer, in all colours and shade, in skirting, riser of steps, laid with modified Polyurethane Adhesive (LATICRETE® DWA 215 Modified PU Adhesive or equivalent) designed for the installation of ceramic tile, vitrified tile, Glass Mosaic Tiles and natural stone on most drywall boards and clean dry cement based surfaces. Modified PU Adhesive is a factory made pail consisting of pre-blended single component adhesive which is ready to use in appropriate thickness, including grouting of joints							
133	<u>Providing and laying machine cut:</u> Providing and laying machine cut, mirror polished, Italian Marble stone flooring laid in required pattern in linear portion of the building all complete as per architectural drawings, with 18 mm thick stone slab laid over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse	50	M2					

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	sand) laid and jointed with white cement slurry @ 4.4 kg/sqm, including pointing with white cement slurry admixed with pigment to match the marble shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge. : 18 mm thick Italian Marble stone slab, Perlato, Rosso verona, Fire Red or Dark Emperadore etc.							
134	Providing and laying: Providing and laying machine cut, mirror polished Marble stone flooring, in required design (Simple geometrical, abstract etc.) and in patterns in combination with Italian marble stones of different colours, shades and finished surface texture etc., in linear portions of the building, all complete as per the architectural drawings, with 18 mm thick stone slab laid over 20 mm (average) thick base of cement	370.760	M2					

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	mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with white cement slurry @ 4.4 kg/sqm including pointing with white cement slurry admixed with pigment to match the marble shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge. : 18 mm thick Italian Marble stone slab, Perlato, Rosso verona, Fire Red or Dark Emperadore etc.							
135	<u>Providing and fixing Glass mosaic tile:</u> Providing and fixing Glass mosaic tiles on finished plain wall surface of size 20 mm x 20 mm x 4 mm in all colour, design , fixing in approved design. The glass mosaic tiles shall be fixed on the wall surface with the help of approved adhesive applied at the rate of 2.5 kg per	20	M2					

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	sqm and grouting of the same. All completed as per direction of Engineer-in-charge.							
136	Providing and fixing: Providing and fixing removable raised/false access flooring with system and its components of approved make for different plenum height with possible height adjustment upto 50 mm, comprising of modular load bearing floor panels supported on G.I. rectangular stinger frame work and G.I. Pedestal etc. all omplete, as per the architectural drawings, as specified and as directed by Engineer-in-charge consisting of a) Providing at required spacing to form modular framework, pedestals made out of GI tube of thickness minimum 2 mm and 25 mm outer diameter, fully welded on to the G.I. Base plate of size 100mm x 100mm x 3mm at the bottom of the	50	M2					

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pedestal tube, G.I. pedestal head of size 75mmx75mmx3.5 mm welded with GI fully threaded stud 16mm outer diameter with two GI Check nuts screwed on the stud for level adjustment upto 50mm, locking and stabilizing the pedestal head in position at the required level. The pedestals shall be fixed to the subfloor (base) through base plate using epoxy based adhesive of approved make or the machine screw with rawl plug. b) Stringers system in all steel construction hot dipped galvanized of rectangular size 570x20x30x0.80mm thick having holes at both ends for securing the stringers on to the pedestal head using fully threaded screws ensuring maximum lateral stability in all directions, the grid formed by the pedestal and stringer assembly shall receive the floor panel, this system shall provide adequate solid, rigid support for access floor panel, the system							

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shall provide a minimum clear uninterrupted clearance between the bottom of the floor for electrical conduits and wiring etc. all complete as per the architectural drawings, as specified and as directed by the Engineer-in-charge. c) Providing and fixing Access Floor panel of 600x600x32 mm medium grade Filled Steel anti static high pressure Lamination of 800H grade (FS800H). Access Floor panel shall be steel welded construction with an enclosed bottom pan with uniform pattern of 64 hemispherical cones. The top and bottom plates of Steel Gauges: top 0.6 mm and bottom 0.7 mm fused spot welded together (minimum 64 welds in each dome and 20welds along each flange). The panel should be corrosion resistant epoxy coated for lifetime rust protection and cavity formed by the top and bottom plate is filled with								

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	Pyrogrip non-combustible Portland cementitious core mixed with lightweight foaming compound. The access floor shall be factory finished with Anti-static High Pressure laminate with Non Warp technology upto 1mm thickness for superior adhesion and Surface flatness within 0.75mm.The panel is to withstand a Concentrated Load of 363 kgs applied on area 25mm x 25mm without collapse in the centre of the panel which is placed on four steel blocks. The panel will withstand and Uniformly Distributed Load (UDL) minimum 1250 kg/sqm and, an impact load of 50kg all complete as per the approved manufacturers specification and as per the direction of Engineer-in-charge. All specification must be printed on the side of the panel to ensure the quality of the product. : 450 mm Finished Floor Height (FFH).							
137	(G.R.C) flooring Tiles:	2,747.38	M2					

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Providing and fixing of ‘ Unistone ’ or equivalent Glass Reinforced Concrete (G.R.C) Flooring Tiles in approved design, size, texture,thickness, pattern and color. The thickness of the tiles should range between 22 to 25 mm, allowing variance of ±5 mm in accordance with IS: 1237:1980. The tiles should be made with M 40 Grade Concrete mix design having ‘43’ Grade White Portland cement, reinforced with Alkali Resistant Glass Fiber and the pigmentation should be done with exterior grade synthetic inorganic iron oxide pigments manufactured by ‘ BAYFERROX (Germany) ’ or equivalent. The pigmentation should be homogeneous and in accordance with British Standards BS EN 12878:1999. The other additives should be fine washed graded quartz, super plasticizers and								

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	integrated water proofers and others. The tiles should be produced with high vibration technology and should have compressive strength equivalent to M 40 Grade@28 days. The top surface of the tiles should be sealed with acrylic lacquer resulting in surface water absorption of tiles, less than 1% and water absorption by 24 hrs immersion method, less than 8%. The beds where the tiles are to be laid shall be clean, wet and mopped. The bedding for the tiles shall be 20mm thick and with cement mortar 1:3 (1 cement: 3 coarse sand) and it shall be spread properly and the usage shall begin only after 48 hours.							
138	(G.R.C) Skirting Tiles: Providing and fixing of ‘ Unistone ’ or equivalent Glass Reinforced Concrete (G.R.C) Flooring Tiles in approved design, size, texture, thickness, pattern and color. The	108.770	M2					

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thickness of the tiles should range between 22 to 25 mm, allowing variance of ±5 mm in accordance with IS: 1237:1980. The tiles should be made with M 40 Grade Concrete mix design having ‘43’ Grade White Portland cement, reinforced with Alkali Resistant Glass Fiber and the pigmentation should be done with exterior grade synthetic inorganic iron oxide pigments manufactured by ‘ BAYFERROX (Germany) ’ or equivalent. The pigmentation should be homogeneous and in accordance with British Standards BS EN 12878:1999. The other additives should be fine washed graded quartz,super plasticizers and integrated water proofers and others. The tiles should be produced with high vibration technology and should have compressive strength equivalent to M 40 Grade@28 days. The top surface of the tiles should be sealed with acrylic lacquer							

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	resulting in surface water absorption of tiles, less than 1% and water absorption by 24 hrs immersion method, less than 8%. The beds where the tiles are to be laid shall be clean, wet and mopped. The bedding for the tiles shall be 20mm thick and with cement mortar 1:3 (1 cement: 3 coarse sand) and it shall be spread properly and the usage shall begin only after 48 hours. FOR SKIRTING							
139	PUF Panel Roofing: The Puf Panels will be manufactured in discontinuous plant using high pressure dispensing machine of required capacity to inject specified amount Iso-Cyanide and polyol liquid chemicals into the cavity of full panel in 2/3 shot. All panels will be moulded in place using the above insitu process after placing them in a hydraulic press with heated	727.270	M2					

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aluminium platen so as to attain the desire finish, bonding and structural properties. All material required for the manufacture of shelter will be new and shall comply with relevant Bureau of Indian Standard specification. The PUF insulation material in the panel will have fire retarding and self extinguishing properties. Supply & Fixing of STL PUF Roof Panels shall be made up of 40mm (40+25) thick composite PUF sandwich between PPGI Sheet. The panels shall be made of 0.4mm thick trapezoidal profiled PPGI sheet on top and 0.3mm thick micro ribbing PPGI Sheet on bottom with 40mm thick layer of rigid CFC free polyurethane foam of density of 40 ± 2 kg/m3 as insulation. PPGI Sheet shall have minimum coating of 4-5 micron epoxy primer and 25 micron polyester top coat on the finish surface and 7-8 micron primer alkyl base on reverse. The interior and							

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	exterior. The prefabricated panels shall be fixed directly to the girth using self drilling fasteners colour of panels shall be RAL 9003.The polyurethane insulation shall confirm to IS: 12436 work shall be carried out as per direction of Engineer-in-charge. . Make- Svarn Group/Archana Insulation/Shilpkar/VNS Infra/ STL.							
140	Supply & Fixing of ridge: Supply & Fixing of ridge- size- 300x300 shall be made out of 0.5mm thick PPGI Sheet. The PPGI Sheet Shall be of minimum 240 MPA Steel grade confirming to14246:1995 and having zinc coating of minimum 120 gsm as per IS 277:1992, 5-7 micron proxy primer on both side of the sheet and polyster top coat 15- 18 micron to avoid scratches during transportation. The Ridges shall be fixed by POP rivet or self- drilling /Self Stitching fasteners @maximum	53.870	M					

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	450mm c/c along length of capping/flushing etc. complete							
141	Supply and installation of polycarbonate Supply and installation of polycarbonate multilayered system, a complete assembly of extruded multilayer UV protected polycarbonate panels incorporated into a complete system. Co-extruded UV protected polycarbonate panel system of min 12- 14 mm thick panel of 600 mm (min.) width with angular daylighting concept in a complete system.Panels shall have six layers with opaque and translucent clear combination as per required lux level all fixing accessories to ensure best performance for wind uplift, vibration, oil canning and visual appearance. Panels shall be manufactured with vertical standing seam at both sides of the panel. Panels shall be fixed on Purlin with snap on	318.550	M2					

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connectors with grip lock locking mechanism and will be secured on MS structure (will be paid Seperately) with 3 numbers self drilling screws & trapezoid SS fasteners to ensure a pull-out load of min. 7000N (7KN) tested as per ISO 6892:1998 and IS 1608: 2005. Panels must satisfy Dart drop impact test as per IS 14443-97 shall show no sign of breakage on Polycarbonate sheets which have been exposed to UV for a min. of 500 Hours as per ASTM G 155. Panels must satisfy Dart drop impact test as per IS 14443- 97 shall show no sign of breakage on Polycarbonate sheets which have been exposed to UV for a min of 500 Hours as per ASTM G 155. Panels shall not have Yellowness Index as per ASTM D 1925 of 15 units when tested on a sample exposed to UV for 500 Hours as per ASTM G 155. U value shall not be more than 2.1 W/m2K as per EN ISO							

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	1077-2:2018 Panel shall be with additional End cap/Aluminium U/F profile/ Glazing Bar for ends as required. Panel shall be fixed over MS structural steel/MS purlin (paid separately) conforming to the detail technical specifications as per approved architectural drawings. Trained and factory authorized labor with supervision to complete the entire panel installation as per drawing & direction of the engineering in charge. Color: As per Approval. Approved Make: DPI Daylighting / Everlite							
142	12 mm cement plaster: 12 mm cement plaster of mix : 1:6 (1 cement: 6 fine sand)	18,708.61	M2					
143	15 mm cement plaster: 15 mm cement plaster on the rough side of single or half brick wall of mix : 1:6 (1 cement: 6 coarse sand)	8,017.97	M2					
144	20 mm cement plaster: 20 mm cement plaster of mix : 1:4 (1 cement: 4 coarse sand)	3,425.03	M2					

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145	<u>Cement plaster 1:3</u> Cement plaster 1:3 (1 cement: 3 coarse sand) finished with a floating coat of neat cement. 12 mm cement plaster	1,967.06	M2					
146	<u>Neat cement punning:</u> Neat cement punning.	1,482	M2					
147	<u>18mm cement plaster:</u> 18mm cement plaster in two coats under layer 12mm thick cement plaster 1:5 (1 Cement : 5 Coarse sand) and a top layer 6mm thick cement plaster 1:3 (1 Cement : 3 Coarse sand)	3,253.03	M2					
148	<u>6mm cement plaster:</u> 6 mm cement plaster of mix : 1:3 (1 cement: 3 fine sand)	27,753.170	M2					
149	<u>Extra for plastering exterior:</u> Extra for plastering exterior walls of height more than 10 m from ground level for every additional height of 3 m or part thereof.	880.690	M2					
150	<u>Extra for wire mesh:</u> Extra for Supplying and Fixing wire mesh at joint of Concrete and Brick wall before Plastering.	9,173.67	M2					

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151	<u>White washing with lime:</u> White washing with lime to give an even shade: New work (three or more coats)	500	M2					
152	<u>Oil bound washable distemper:</u> Distempering with oil bound washable distemper of approved brand and manufacture to give an even shade : New work (two or more coats)over and including priming coat with cement primer.	1,500	M2					
153	<u>Acrylic emulsion paint:</u> Wall painting with acrylic emulsion paint of approved brand and manufacture to give an even shade : Two or more coats on new work	32,712.68	M2					
154	<u>Water thinnable cement primer:</u> Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface : Water thinnable cement primer	32,712.68	M2					

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155	Water proofing cement paint: Finishing walls with water proofing cement paint of required shade: New work (Two or more coats applied @ 3.84 kg/10 sqm).	1,500	M2					
156	Textured exterior paint: Finishing walls with textured exterior paint of required shade : New work (Two or more coats applied @ 3.28 ltr/10 sqm) over and including base coat of water proofing cement paint applied @ 2.20kg/10 sqm.	500	M2					
157	Premium Acrylic Smooth exterior paint: Finishing walls with Premium Acrylic Smooth exterior paint with Silicone additives of required shade : New work (Two or more coats applied @ 1.43 ltr/ 10 sqm. over and including base coat of water proofing cement paint applied @ 2.20 kg/ 10 sqm).	3,253.030	M2					
158	Deluxe Multi surface paint: Finishing with Deluxe Multi surface paint system for interiors and exteriors using Primer as per manufacturers	3,500	M2					

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	specifications : Two or more coats applied on walls @ 1.25 ltr/10 sqm over and including one coat of Special primer applied @ 0.75 ltr /10 sqm							
159	<u>Applying priming coat with red oxide:</u> Applying priming coat : With ready mixed pink or Grey primer of approved brand and manufacture on wood work (hard and soft wood)	175.500	M2					
160	<u>Applying priming coat with red oxide:</u> Applying priming coat : With ready mixed red oxide zinc chromate primer of approved brand and manufacture on steel galvanised iron/steel works	2,584.560	M2					
161	<u>Epoxy paint:</u> Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. : On concrete work	1,901.540	M2					

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162	<u>Synthetic enamel paint:</u> Painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade : Two or more coats on new work over an under coat of suitable shade with ordinary paint of approved brand and manufacture	2,584.560	M2					
163	<u>Providing and applying POP Putty:</u> Providing and applying plaster of paris putty of 2 mm thickness over plastered surface to prepare the surface even and smooth complete.	32,712.68	M2					
164	<u>6 mm plaster on cement concrete:</u> 6 mm plaster on cement concrete or reinforced cement concrete work with white cement based polymer modified self curing mortar of approved make as per the direction of Engineer-In-Charge.	1,400	M2					
165	<u>Providing and fixing wall cladding tiles:</u>	3,676.490	M2					

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Providing and fixing 9" X 3" or 9" X 15" , 'CERA BRICK' , 6mm thick ± 1mm Exterior satin glazed ceramic body wall cladding tiles in approved shade with specially designed deep grooves on back side of the tile for superior adhesion. The tiles should have excellent water absorption i.e.between 8 – 15 % from back surface to assist superior adhesive bonding with substrate. The tiles should weigh 1 - 1.2 Kg / Sq ft, have zero water absorption from top surface and should be efflorescence proof. The tiles should be fixed on surface having rough plaster of cement mortar in 1:3ratio (1 Cement: 3Coarse sand) with 6x6mm groove and the fixing agent used should be Unistone , Unistone Tile Adhesive or equivalent and the tiles should be fixed as per manufacturer's laying instructions. The rates for this item including filling groove by epoxy grout. (Make : Unistone or							

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	equivalent)							
166	<u>Providing and fixing GRC screens:</u> Providing and fixing Glass Reinforced Concrete (G.R.C) Screens in approved size, pattern, design, shade and thickness of 50mm on frame and design element in 30mm thick casted with power spray method have weight approximately between 3.5 – 4 Kg per Sq. Ft. of M/s UniStone make or equivalent. The above weight and thickness is considering dimensions of screens up to 2133mm in height and 1219mm in width and having at least 50% void space. The screens should be made from ‘53 grade ’ White Portland Cement manufactured by ‘ JK Cement ’ or equivalent, Quartz, Fine Silica Sand, having Alkali Resistant Glass Fiber percentage 3.5-4% with minimum zirconia content	100.250	M2					

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16%,manufactured by 'N.E.G JAPAN' or equivalent, Super Plasticizers manufactured by 'BASF' or equivalent, Polymers manufactured by 'BASF' or equivalent and U.V resistant non fading Synthetic inorganic exterior grade pigments should be used for homogeneous concrete pigmentation manufactured by ' BAYFERROX (Germany) ' or equivalent. The material casting should take place in FRP Molds. The GRC screens flexural strength average L.O.P should be above or equivalent to 6N/mm2 & M.O.R should be above or equivalent to 15 N/mm2 The fixing of Screens should be 'Dry fixing' i.e. to be done with M.S Galvanized Clamps, or S.S. -304 clamps, fixtures and fasteners of Hilti / Fischer or self - tapping screws or as per approved shop drawings							

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	approved by site engineer in charge. (Make : Unistone or equivalent)							
167	Providing and fixing GRC : Providing and fixing of ‘ Unistone ’ or equivalent Glass Reinforced Concrete (G.R.C) Wall Cladding Tiles in approved design, size, texture,thickness, pattern and color. The thickness of the tiles should range between 12 to 18 mm (depending on the texture of the tile), allowing variance of ±2 mm in accordance with IS: 1237ý1980. The composition of tiles should be ‘43’ Grade White Portland cement, reinforced with Alkali Resistant Glass Fiber and the pigmentation should be done with exterior grade synthetic inorganic iron oxide pigments manufactured by ‘ BAYFERROX (Germany) ’ or equivalent. The pigmentation should be homogeneous and in accordance with British Standards BS EN 12878:1999.	903.950	M2					

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	The other additives should be fine washed graded quartz, super plasticizers and integrated water proofing agents and others. The tiles should be produced with high vibration technology and should have compressive strength equivalent to M ý 40 Grade@28 days. The top surface of the tiles should be sealed with acrylic lacquer resulting in surface water absorption of tiles, less than 1% and water absorption by 24 hrs immersion method, less than 8%. The tiles should be applied on a rough plaster of cement mortar 1:3 (1 cement: 3 coarse sand) and the fixing of tiles should be done by 'Unistone' tile adhesive or equivalent as per manufacturer's laying instruction. (Make : Unistone or equivalent)							
168	Cast-in-situ RCC Piles: Boring, providing and installation bored cast-in-situ reinforced cement	19,600	M					

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concrete piles of grade M-25 of specified diameter and length below the pile cap, to carry a safe working load not less than specified,excluding the cost of steel reinforcement but including the cost of boring with bentonite solution and temporary casing of appropriate length for setting out and removal of same and the length of the pile to be embedded in the pile cap etc. by percussion drilling using Direct mud circulation (DMC) or Bailer and chisel technique by tripod and mechanical Winch Machine all complete, including removal of excavated earth with all its lifts and leads (length of pile for payment shall be measured up to bottom of pile cap). Note: Truck Mounted rotary/TMR/Tubewell boring machine shall not be used. : Specifications: - Vertical							

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	Load Carrying Capacity - 42T, Lateral Load Carrying capacity - 2T, Tension Carrying Capacity -10T , 12.00 Mtr Pile length from cut-off level- 500 mm dia piles							
169	<u>Vertical load testing of piles:</u> Vertical load testing of piles in accordance with IS 2911 (Part IV)including installation of loading platform by Kentledge/Anchor piles method and preparation of pile head or construction of test cap and dismantling of test cap after test etc. complete as per specification & the direction of Engineer in-charge. Note: 1. Initial and Routine Load Test shall not be carried out by Dynamic method of testing. Note: 2. Testing agency shall submitt the design of loading platform for the approval of Engineer-in-charge. :- Single pile upto 50 tonne Safe	8	PTS					

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	capacity - Routine test (Test Load 1.5 times the Safe capacity)							
170	<u>Cyclic vertical load testing of pile:</u> Initial load test : Cyclic vertical load testing of pile in accordance with IS Code of practice IS: 2911 (part IV) by Kentledge method including preparation of pile head etc for. : Single pile : upto 50tonne safe capacity pile (Test Load 2.5 times the Safe capacity)	3	PTS					
171	<u>Lateral load testing of pile:</u> Lateral load testing of single pile in accordance with IS Code of practice IS : 2911 (Part IV) for determining safe allowable lateral load on pile : (total load 1.5 times the safe capacity) : Upto 50 tonne capacity pile	6	PTS					
172	<u>Pullout test of pile:</u> Pullout test in accordance with IS Code of practice IS : 2911	5	PTS					

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	(Part IV) for single pile including cost of kentledge etc. determining safe allowable Tension carrying cacity test for pile : Upto 50 tonne capacity pile							
173	<u>Providing and fixing aluminium works:</u> Providing and fixing aluminium work for doors, windows, ventilators, Fins and partitions with extruded built up standard tubular sections/appropriate Z sections and other sections of approved make conforming to IS: 733 and IS : 1285, fixed with rawl plugs and screws or with fixing clips, or with expansion hold fasteners including necessary filling up of gaps at junctions, at top, bottom and sides with required PVC/neoprene felt etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing / paneling,	10,334.12	KG					

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	C.P. brass / stainless steel screws, nut-bolt clam if required, all complete as per architectural drawings and the directions of Engineer-in- charge. (Glazing and paneling to be paid for separately) : For fixed portion :Powder coated aluminium (minimum thickness of powder coating 50 micron)							
174	Aluminium work for shutters: Providing and fixing aluminium work for doors, windows, ventilators, Fins and partitions with extruded built up standard tubular sections/appropriate Z sections and other sections of approved make conforming to IS: 733 and IS : 1285, fixed with rawl plugs and screws or with fixing clips, or with expansion hold fasteners including necessary filling up of gaps at junctions, at top, bottom and sides with required PVC/neoprene felt etc. Aluminium sections shall be smooth, rust free, straight,	1,646.320	KG					

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	mitred and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing / paneling, C.P. brass / stainless steel screws, nut-bolt clam if required, all complete as per architectural drawings and the directions of Engineer-in-charge. (Glazing and paneling to be paid for separately) :For shutters of doors, windows & ventilators including providing and fixing hinges/ pivots and making provision for fixing of fittings wherever required including the cost of PVC / neoprene gasket required (Fittings shall be paid for eparately). : Powder coated aluminium (minimum thickness of powder coating 50 micron)							
175	<u>12mm thick pre-laminated particle board:</u> Providing and fixing 12mm thick prelaminated particle board flat pressed three layer or	48.860	M2					

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	graded wood particle board conforming to IS: 12823 Grade 1 Type II, in panelling fixed in aluminum doors, windows shutters and partition frames with C.P. brass / stainless steel screws etc. complete as per architectural drawings and directions of engineer-incharge.: Pre-laminated particle board with decorative lamination on both sides.							
176	Providing and fixing glazing: Providing and fixing glazing in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of engineer-in-charge .(Cost of aluminium snap beading shall be paid in basic item): With float glass panes of 4.0 mm thickness	50	M2					
177	Float glass panes 5.5mm:	682.440	M2					

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	Providing and fixing glazing in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of engineer-in-charge .(Cost of aluminium snap beading shall be paid in basic item):With float glass panes of 5.50 mm thickness							
178	<u>Float glass panes 8mm:</u> Providing and fixing glazing in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of engineer-in-charge .(Cost of aluminium snap beading shall be paid in basic item):With float glass panes of 8 mm thickness	174.160	M2					
179	<u>Extra for Using Toughen Glass:</u>	856.600	M2					

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	Extra for Using Toughen Glass as per manufacturers specifications and Instruction by Engg-In-Charge.							
180	Hydraulic floor spring: Providing and fixing double action hydraulic floor spring of approved brand and manufacture conforming to IS : 6315, having brand logo embossed on the body / plate with double spring mechanism and door weight upto 125 kg, for doors, including cost of cutting floors, embedding in floors as required and making good the same matching to the existing floor finishing and cover plates with brass pivot and single piece M.S. sheet outer box with slide plate etc. complete asper the direction of Engineer-in-charge. With stainless steel cover plate minimum 1.25 mm thickness	80	EA					
181	Providing and fixing aluminium cover: Providing and fixing machine moulded aluminium covering of	500.000	KG					

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	approved pattern & design, made out of machine cut aluminium sheet and machine holed for receiving dash fastener, over expansion joints on vertical surfaces/ceiling floors, the fixing on plate in one row on one side of joint only shall be done with stainless steel dash fasteners of 8 mm dia and 75 mm long bolt including providing aluminium washers 2 mm thick & 15 mm dia , at a staggered pitch of 200mm centre to centre including drilling holes in the receiving surface and providing expandable plastic sleeves in holes etc. complete as per direction of Engineer-in-charge. : Powder coated aluminium sheet 2.5mm thick (minimum thickness of powder coating 50 micron)							
182	<u>Weather silicon sealant:</u> Filling the gap in between aluminium frame & adjacent RCC/ Brick/ Stone work by providing weather silicon	2,513.950	M					

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	sealant over backer rod of approved quality as per architectural drawings and direction of Engineer-in-charge complete.: Upto 5mm depth and 5 mm width							
183	<u>Providing and fixing double glazed:</u> Providing and fixing double glazed hermetically sealed glazing in aluminium windows, ventilators and partition etc. with 6 mm thick clear float glass both side, having 12 mm air gap, including providing EPDM gasket, perforated aluminium spacers, desiccants, sealant (Both primary and secondary sealant) etc. as per specifications, drawings and direction of Engineer-in-charge complete.	150	M2					
184	<u>Providing and fixing :</u> Providing and fixing stainless steel (SS 304 grade) adjustable friction windows stays of approved quality with necessary stainless	395	EA					

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	steel screws etc. to the side hung windows as per direction of Engineer-in-charge complete. 255 X 19 mm							
185	<u>Providing and fixing window :</u> Providing and fixing stainless steel (SS 304 grade) adjustable friction windows stays of approved quality with necessary stainless steel screws etc. to the side hung windows as per direction of Engineer-in-charge complete. 355 X 19 mm	40	EA					
186	<u>Providing and fixing 100mm brass locks:</u> Providing and fixing 100mm brass locks (best make of approved quality) for aluminium doors including necessary cutting and making good etc.complete.	83	EA					
187	<u>Aluminium casement windows fastener:</u> Providing and fixing aluminium casement windows fastener of required length for aluminium windows with necessary screws etc.	625	EA					

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	complete. :Powder coated minimum thickness 50 micron aluminium							
188	<u>Aluminium round shape handle:</u> Providing and fixing aluminium round shape handle of outer dia 100mm with SS screws etc. complete as per direction of Engineer-incharge : Powder coated minimum thickness 50 micron aluminium	1	EA					
189	<u>Toughened glass door shutter:</u> Providing and fixing 12 mm thick frameless toughened glass door shutter of approved brand and manufacture, including providing and fixing top & bottom pivot & spring type fixing arrangement and making necessary holes etc. for fixing required door fittings, all complete as per direction of Engineer-in-charge (including cost of Door handle, lock and stopper etc.complete).	1	M2					

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190	<u>Providing & fixing single point locking:</u> Providing and fixing single point locking handle (code 607T of Alualpha make or equivalent) die-casted in zamak and complete with steel screws. Handle base width to be 28mm with overall height being 61mm.Keep width to be 16.5mm Alualpha / Giesse / Lavaal / Kinlong or equivalent make with stainless steel screws etc. complete as per the direction of Engineer-in-charge.	395	EA					
191	<u>Providing and fixing one Mortice Lock:</u> Providing and fixing one Mortice Lock : Mortise Handle (code 615 of Alualpha make or equivalent) die-casted in zamak and complete with zinc steel screws. Handle base width to be 33mm with overall height being 64.4mm. Handle to be tested to 2,00,000 open close cycles. Mortise lock	83	EA					

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	body (code 4210305NM of Tesa make or equivalent) with latch, dead bolt, faceplate & Strike Plate made of SS304 grade stainless steel supplied complete with compatible cylinder (code 503030 of Tesa make or equivalent). Make - Alualpha / Giesse / Lavaal / Kinlong or equivalent make with stainless steel screws etc. complete as per the direction of Engineer-in-charge.							
192	<u>Providing and fixing Euro Butt Hinges:</u> Providing and fixing Euro Butt Hinges (code CE2F of Alualpha make or equivalent) to be supplied manufactured from aluminum profile, zamak and steel. Length of the butt hinge to be 103mm. Powder coating to be done as per RAL international standards. Make - Alualpha / Giesse /Lavaal / Kinlong or equivalent make with stainless steel screws etc.complete as per the direction of Engineer-in-charge.	249	EA					

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193	<u>Providing & fixing aluminium tower Bolt:</u> Providing and fixing aluminium tower bolts, ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour or shade, with necessary screws etc. complete :300x10 mm	86	EA					
194	<u>Providing & fixing:</u> Providing and fixing aluminium tower bolts, ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour or shade, with necessary screws etc. complete :250x10 mm	30	EA					
195	<u>Water proofing treatment:</u> Providing and laying water proofing treatment to vertical and horizontal surfaces of depressed portions	546.520	M2					

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	of W.C., kitchen and the like consisting of: (i) Ist course of applying cement slurry @ 4.4 kg/sqm mixed with water proofing compound conforming to IS 2645 in recommended proportions including rounding off junction of vertical and horizontal surface. (ii) IInd course of 20 mm cement plaster 1:3 (1 cement : 3 coarse sand)mixed with water proofing compound in recommended proportion including rounding off junction of vertical and horizontal surface. (iii) IIIrd course of applying blown or residual bitumen applied hot at 1.7 kg. per sqm of area. (iv) IVth course of 400 micron thick PVC sheet. (Overlaps at joints of PVC sheet should be 100 mm wide and pasted to each other with bitumen @1.7 kg/ sqm).							
196	Providing and Placing in	2,074.360	M					

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	<u>position:</u> Providing and Placing in position suitable PVC water stops conforming to IS:12200 for construction/ expansion joints between two RCC members and fixed to the reinforcement with binding wire before pouring concrete etc. complete : Serrated with central bulb (225 mm wide, 8-11 mm thick)							
197	<u>Cement based water proofing treatment:</u> Providing and laying integral cement based water proofing treatment including preparation of surface as required for treatment of roofs,balconies, terraces etc consisting of following operations: a) Applying a slurry coat of neat cement using 2.75 kg/sqm. of cement admixed withwater proofing compound conforming to IS. 2645 and approved by Engineer-in-charge over the RCC slab including adjoining	2,747.380	M2					

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walls upto 300mm height including cleaning the surface before treatment. b) Laying brick bats with mortar using broken bricks/brick bats 25 mm to 115mm size with 50% of cement mortar 1:5 (1 cement : 5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge over 20 mm thick layer of cement mortar of mix 1:5 (1 cement :5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineerin-charge to required slope and treating similarly the adjoining walls upto 300 mm height including rounding of junctions of walls and slabs. c) After two days of proper curing applying a second coat of cement slurry using using 2.75kg/ sqm of cement admixed with water proofing compound conforming to IS : 2645 and approved by Engineerin-							

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	charge.d) Finishing the surface with 20 mm thick jointless cement mortar of mix 1:4 (1 cement :4 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge including laying glass fibre cloth of approved quality in top layer of plaster . The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Engineer-in-charge: With average thickness of 120mm and minimum thickness at khurra as 65 mm.							
198	<u>Providing and laying:</u> Providing and laying in situ seven course water proofing treatment with APP (Atactic Polypropylene) modified Polymeric memberane over roof consisting of first coat of bitumen primer @ 0.40 Kg per	6,646.640	M2					

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sqm, 2nd, 4th & 6th courses of bonding material @ 1.20 kg/sqm, which shall consist of blown type bitumen of grade 85/25 conforming to IS : 702, 3rd and 5th layers of roofing membrane APP modified Polymeric membrane 2.0 mm thick of 3.00 Kg/sqm weight consisting of five layers prefabricated with centre core as 100 micron HMHDPE film sandwiched on both sides with polymeric mix and the polymeric mix is protected on both side with 20 micron HMHDPE film. 7th, the top most layer shall be finished with brick tiles of class designation 10 grouted with cement mortar 1:3 (1 cement : 3 fine sand) mixed with 2% integral water proofing compound by weight of cement over a 12 mm layer of cement mortar 1:3 (1 cement : 3 fine sand) and finished neat (item of laying brick tiles shall be paid for separately).							

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199	<u>Providing and laying APP:</u> Providing and laying APP (Atactic Polypropylene Polymer) modified prefabricated five layer 3 mm thick water proofing membrane, black finished reinforced with non-woven polyester matt consisting of a coat of bitumen primer for bitumen membrane @ 0.40 litre/sqm by the same membrane manufacture of density at 25 °C, 0.87-0.89 kg/litre and viscosity 70-160 cps. Over the primer coat the layer of membrane shall be laid using Butane Torch and sealing all joints etc, and preparing the surface complete. The vital physical and chemical parameters of the membrane shall be as under : Joint strength in longitudinal and transverse direction at 23 ° C as 650/450N/5cm. Tear strength in longitudinal and transverse direction as 300/250N.	1,803.620	M2					

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	Softening point of membrane not less than 150°C. Cold flexibility shall be upto - 2°C when tested in accordance with ASTM, D - 5147. The laying of membrane shall be got done through the authorised applicator of the manufacturer of membrane : 3 mm thick							
200	<u>Extra for covering top of membrane:</u> Extra for covering top of membrane with Geotextile, 120 gsm non woven, 100% polyester of thickness 1 to 1.25 mm bonded to the membrane with intermittent touch by heating the membrane by Butane Torch as per manufactures recommendation.	1,803.620	M2					
201	<u>Supplying, filling, spreading & levelling</u> Supplying, filling, spreading & leveling stone boulders of size range 5 cm to 20 cm, in recharge pit, in the required	18.370	M3					

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	thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.							
202	<u>Supplying, filling, spreading Gravels:</u> Supplying, filling, spreading & leveling gravels of size range 5 mm to 10 mm, in the recharge pit, over the existing layer of boulders, in required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.	18.370	M3					
203	<u>Supplying, filling, spreading Sand:</u> Supplying, filling, spreading & levelling coarse sand of size range 1.5 mm to 2 mm in recharge pit, in required thickness over gravel layer, for all leads & lifts, all complete as per direction of Engineer -in-charge.	18.370	M3					
204	<u>Gravel packing in tubewell construction:</u> Gravel packing in tubewell construction in accordance with IS: 4097,including providing	3.900	M3					

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	gravel fine/ medium/ coarse, in required grading & sizes as per actual requirement, all complete as per direction of Engineer-in-charge.							
205	<u>Providing orange colour safety foot rest:</u> Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS : 10910 on 12mm dia steel bar conforming to IS : 1786 having minimum cross section as 23 mmx25mm and over all minimum length 263 mm and width as 165mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having	260	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	manufacture's permanent identification mark to be visible even after fixing, including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) complete as per design.							
206	<u>Constructing brick masonry manhole:</u> Constructing brick masonry manhole in cement mortar 1:4 (1 cement : 4 coarse sand) with R.C.C. top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size),foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone	5	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	aggregate 20 mm nominal size) finished with a floating coat of neat cement complete as per standard design : Inside size 90x80 cm and 45 cm deep including C.I. cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover and frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg) : With common burnt clay F.P.S. (non modular) bricks of class designation 7.5							
207	<u>C.I. cover with frame for manholes:</u> Supplying and fixing C.I. cover with frame for manholes : 560 mm diameter C.I. cover (heavy duty) the weight of the cover to be not less than 108 kg	31	EA					
208	<u>Providing and supplying aluminium:</u> Providing and supplying aluminium extruded tubular and other aluminium sections as per the architectural	12,644.16	KG					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	drawings and approved shop drawings ,the aluminium quality as per grade 6063 T5 or T6 as per BS 474,including super durable powder coating of 60-80 microns conforming to AAMA 2604 of required colour and shade as approved by the Engineer-in-Charge. (The item includes cost of material such as cleats, sleeves, screws etc. necessary for fabrication of extruded aluminium frame work. Nothing extra shall be paid on this account).							
209	Structural glazing: Designing, fabricating, testing, protection, installing and fixing in position semi (grid) unitized system of structural glazing (with open joints) for linear as well as curvilinear portions of the building for all heights and all levels, including: Structural analysis & design and preparation of shop drawings for the specified design loads conforming to IS 875 part III (the system must	2,107.360	M2					

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passed the proof test at 1.5 times design wind pressure without any failure), including functional design of the aluminum sections for fixing glazing panels of various thicknesses, aluminium cleats, sleeves and splice plates etc. gaskets, screws, toggles, nuts, bolts, clamps etc.,structural and weather silicone sealants, flashings, fire stop (barrier)- cumsmoke seals, microwave cured EPDM gaskets for water tightness, pressure equalisation & drainage and protection against fire hazard including: Fabricating and supplying serrated M.S. hot dip galvanised / Aluminium alloy of 6005 T5 brackets of required sizes, sections and profiles etc. to accommodate 3 Dimentional movement for achieving perfect verticality and fixing structural glazing system rigidly to the RCC/ masonry/structural steel							

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framework of building structure using stainless steel anchor fasteners/ bolts, nylon seperator to prevent bimetallic contacts with nuts and washers etc. of stainless steel grade 316, of the required capacity and in required numbers. Providing and filling, two part pump filled, structural silicone sealant and one part weather silicone sealant compatible with the structural silicone sealant of required bite size in a clean and controlled factory / work shop environment , including double sided spacer tape, setting blocks and backer rod, all of approved grade, brand and manufacture, as per the approved sealant design, within and all around the perimeter for holding glass. Providing and fixing in position flashings of solid aluminium sheet 1 mm thick and of sizes, shapes and profiles, as required as per the								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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site conditions, to seal the gap between the building structure and all its interfaces with curtain glazing to make it watertight. Making provision for drainage of moisture/ water that enters the curtain glazing system to make it watertight, by incorporating principles of pressure equalization, providing suitable gutter profiles at bottom (if required), making necessary holes of required sizes and of required numbers etc. complete. This item includes cost of all inputs of designing, labour for fabricating and installation of aluminium grid, installation of glazed units, T&P, scaffolding and other incidental charges including wastages etc., enabling temporary structures and services, cranes or cradles etc. as described above and as specified. The item includes the cost of getting all							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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the structural and functional design including shop drawings checked by a structural designer, dully approved by Engineer-in-charge. The item also includes the cost of all mock ups at site, cost of all samples of the individual components for testing in an approved laboratory, field tests on the assembled working structural glazing as specified, cleaning and protection till the handing over of the building for occupation. In the end, the Contractor shall provide a water tight structural glazing having all the performance characteristics etc. all complete as required, as per the Architectural drawings, as per item description, as specified, as per the approved shop drawings and as directed by the Engineer- in-Charge. Note:- 1. The cost of providing extruded aluminium frames, shadow boxes,							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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extruded aluminium section capping for fixing in the grooves of the curtain glazing and vermin proof stainless steel wire mesh shall be paid for separately under relevant items under this sub- head. However, for the purpose of payment, only the actual area of structural glazing (including width of grooves) on the external face shall be measured in sqm. up to two decimal places. Note:- 2. The following performance test are to be conducted on structural glazing system if area of structural glazing exceeds 2500 Sqm from the certified laboratories accredited by NABL(National Accreditation Board for Testing and Calibration Laboratories), Department of Science & Technologies, India. Cost of testing is payable separately. The NIT approving authority will decide the necessity of testing on the basis of								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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cost of the work, cost of the test and importance of the work. Performance Testing of Structural glazing system Tests to be conducted in the NBL Certified laboratories 1. Performance Laboratory Test for Air Leakage Test (-50pa to -300pa) & (+50pa to +300pa) as per ASTM E-283-04 testing method for a range of testing limit 1 to 200 mVhr” Static Water Penetration Test. (50pa to 1500pa) as per ASTM E- 331-09 testing method for a range up to 2000 ml.” Dynamic Water Penetration (50pa to 1500pa) as per AAMA 501.01- 05 testing method for a range upto 2000 ml” Structural Performance Deflection and deformation by static air pressure test (1.5 times design wind pressure without any failure) as per ASTM E- 330-10 testing method for a range upto 50 mm” 5. Seismic Movement Test (upto 30 mm) as per AAMA 501.4-09							

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	testing method for Qualitative test” Tests to be conducted on site 6. Onsite Test for Water Leakage for a pressure range 50 kpa to 240 kpa (35psi) upto 2000ml”							
210	<u>Vision glass panels</u> Providing, assembling and supplying vision glass panels (IGUs)comprising of hermetically-sealed 6-12- 6 mm insulated glass (double glazed) vision panel units of size and shape as required and specified,comprising of an outer heat strengthened float glass 6mm thick, of approved colour and shade with reflective soft coating on surface # 2 of approved colour and shade, an inner Heat strengthened clear float glass 6mm thick, spacer tube 12mm wide, dessicants, including primary seal and secondary seal (structural silicone sealant) etc. all complete for the	2,107.360	M2					

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required performances, as per the Architectural drawings, as per the approved shop drawings, as specified and as directed by the Engineer-in-Charge. The IGUs shall be assembled in the factory/ workshop of the glass processor. (Payment for fixing of IGU Panels in the curtain glazing is included in cost of item No.26.2) For payment, only the actual area of glass on face # 1 of the glass panels (excluding the areas of the grooves and weather silicone sealant) provided and fixed in position, shall be measured in sqm. (i) Coloured tinted float glass 6mm thick substrate with reflective soft coating on face # 2, + 12mm Airgap + 6mm Heat Strengthened clear Glass of approved make having properties as visible Light transmittance (VLT) of 25 to 35 %, Light reflection internal 10 to 15%, light								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	reflection external 10 to 20 %, shading coefficient (0.25- 0.28) and U value of 3.0 to 3.3 W/m2 degree K etc. The properties of performance glass shall be decided by technical sanctioning authority as per the site requirement.							
211	<u>Extra for solid white Ceramic Fitting:</u> Extra for solid white Ceramic Fritting on glass as approved specification and colour (as laid area of ceramic fritting measured for billing)	477.830	M2					
212	<u>Extra for openable side / top hung :</u> Extra for openable side / top hung vision glass panels (IGUs) including providing and supplying at site all accessories and hardwares for the openable panels as specified and of the approved make such as heavy duty stainless steel friction hinges, min 4 -point cremone locking sets with stainless steel	500	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	plates, handles, buffers etc. including necessary stainless steel screws/ fasteners, nuts, bolts, washers etc. all complete as per the Architectural drawings, as per the approved shop drawings, as specified and as directed by the Engineer- in-Charge.							
213	<u>Providing and fixing of Hollow metal:</u> 120Mins. fire rated doors with 30Mins. Insulation as per IS 3614 / BS 476-Painted Providing and fixing of Hollow metal Insulated fire rated doors as per IS 3614 part-1, for stability, integrity & insulation. Pressed galvanized steel confirming to IS 277 with the following specification. Recommended fire door shall be tested to IS 3614 part 2 / ISO 834-1 Part 1 / BS476 Part 20 & 22, CBRI / Cerifire or third	18	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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party certified or equivalent lab, for maximum rating of 120mins with 30minutes of insulation, in latched /unlatched condition (if used with deadbolts and pull handles). Labeled doors with certification shall be with vision glass as a part of complete assembly. Manufacturer test certificate shall cover doors both single and double leaf and all doors supplied shall be within the tested specimen, deviation in specification and sheet thickness other than what is mentioned in the test certificates are not allowed. Proper label confirming the type of door and the hourly rating is mandatory. Approved manufacturer Shakti Hormann or approved equivalent. Door frame shall be single rebate grooved profile of size 125 x 60mm								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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made out of 1.60mm (16gauge) minimum thick galvanized steel sheet. Frames shall be mitered and field assembled with self tabs. Frames to have inbuild grooved sealing system and shall be site fitted with fire rated EPDM gasket as standard. All provision should be mortised, drilled and tapped for receiving appropriate hardware. Frames should be provided with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. Frames shall be filled with fire rated puff. Door leaf shall be 46mm thick fully flush double skin door, insulated with or without vision lite. Door leaf shall be manufactured from 1.2mm (18guage) minimum thick galvanised steel sheet. The internal							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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construction of the door should be rigid reinforcement pads for receiving appropriate hardware. The infill material shall be high density insulation material. Intumescent seals 15x2mm to be provided all around the door in addition to the grooved smoke seal. All doors shall be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. The edges should be interlocked with a bending radius of 1.4mm. For pair of doors integrated astragals has to be provided on the meeting stile for both active and inactive leaf. Vision lite wherever applicable should be provided as per manufacturers recommendation with a clipon arrangement. The glass								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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should be 6mm clear borosilicate fire rated glass of relavant rating of the door. All doors and frames shall be finished Powder coated and shall have passed minimum 500 hours of salt spreya test. Rate shall include supply and installation of door and hardware as a complete assembly as mentioned in the door and hardware schedule. Once frame installed should be filled with PUF as recomended by the manufacturer or engineer. 120Mins Fire Rated Door Single leaf of size : FD1 1000 x 2100 with vision panel with below hardware set-3no.5 Kn1, Ball bearing hinges size 4"x3"x3mm, SSS 1no Single point surface panic push bar, 1211, Silver finish 1no External lever handle, 1185, with half cylinder, Silver Finish							

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	1no Door closer HDC 03 EN 3 with Std. arm in silver finish 1no Clear fire rated glass, 6mm, for 120min (200 x 300) 2RM Gasket, Fire rated 4mm thick x 13mm, Black 6RM Intumescent seal 15 x 2mm for insulated door 6RM Fire rated seal for grooved frame profile C421 EPDM Black -Hormann							
214	<u>120Mins. fire rated doors with 30Mins.</u> 120Mins. fire rated doors with 30Mins.Insulation as per IS 3614 / BS 476-Painted Providing and fixing of Hollow metal Insulated fire rated doors as per IS 3614 part-1, for stability, integrity & insulation. Pressed galvanized steel confirming to IS 277 with the following specification. Recommended fire door shall be tested to IS 3614 part 2 / ISO 834-1 Part 1 / BS476 Part 20	4	NO					

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& 22, CBRI / Cerifire or third party certified or equivavelent lab, for maximum rating of 120mins with 30minutes of insulation, in latched /unlatched condition (if used with deadbolts and pull handles). Labeled doors with certification shall be with vision glass as a part of complete assembly. Manufacturer test certificate shall cover doors both single and double leaf and all doors supplied shall be within the tested specimen, deviation in specification and sheet thickness other than what is mentioned in the test certificates are not allowed. Proper label confirming the type of door and the hourly rating is mandatory. Approved manufacturer Shakti Hormann or approved equivalent. Door frame shall be single rebate grooved profile of size								

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125 x 60mm made out of 1.60mm (16gauge) minimum thick galvanized steel sheet. Frames shall be mitered and field assembled with self tabs. Frames to have inbuild grooved sealing system and shall be site fitted with fire rated EPDM gasket as standard. All provision should be mortised, drilled and tapped for receiving appropriate hardware. Frames should be provided with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. Frames shall be filled with fire rated puff. Door leaf shall be 46mm thick fully flush double skin door, insulated with or without vision lite. Door leaf shall be manufactured from 1.2mm (18guage) minimum thick galvanised steel sheet. The								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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internal construction of the door should be rigid reinforcement pads for receiving appropriate hardware. The infill material shall be high density insulation material. Intumescent seals 15x2mm to be provided all around the door in addition to the grooved smoke seal. All doors shall be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. The edges should be interlocked with a bending radius of 1.4mm. For pair of doors integrated astragals has to be provided on the meeting stile for both active and inactive leaf. Vision lite wherever applicable should be provided as per manufacturers recommendation with a clipon arrangement. The								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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glass should be 6mm clear borosilicate fire rated glass of relavant rating of the door. All doors and frames shall be finished Powder coated and shall have passed minimum 500 hours of salt spreya test. Rate shall include supply and installation of door and hardware as a complete assembly as mentioned in the door and hardware schedule. Once frame installed should be filled with PUF as recomended by the manufacturer or engineer. 120Mins Fire Rated Door Single leaf of size : FD3 1100 x 2100 with vision panel with below hardware set- 3no.5 Knl, Ball bearing hinges size 4"x3"x3mm, SSS 1no Single point surface panic push bar, 1211, Silver finish 1no External lever handle, 1185, with half cylinder, Silver							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Finish 1no Door closer HDC 03 EN 3 with Std. arm in silver finish 1no Clear fire rated glass, 6mm, for 120min (200 x 300) 2RM Gasket, Fire rated 4mm thick x 13mm, Black 6RM Intumescent seal 15 x 2mm for insulated door 6RM Fire rated seal for grooved frame profile C421 EPDM Black - Hormann							
215	120Mins. fire rated doors with 30Mins 120Mins. fire rated doors with 30Mins. Insulation as per IS 3614 / BS 476-Painted Providing and fixing of Hollow metal Insulated fire rated doors as per IS 3614 part-1, for stability, integrity & insulation. Pressed galvanized steel confirming to IS 277 with the following specification. Recommended fire door shall be tested to IS 3614 part 2 / ISO 834-1 Part 1 /	2	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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BS476 Part 20 & 22, CBRI / Cerifire or third party certified or equivavelent lab, for maximum rating of 120mins with 30minutes of insulation, in latched /unlatched condition (if used with deadbolts and pull handles). Labled doors with certification shall be with vision glass as a part of complete assembly. Manufacturer test certificate shall cover doors both single and double leaf and all doors supplied shall be within the tested specimen, deviation in specification and sheet thickness other than what is mentioned in the test certificates are not allowed. Proper label confirming the type of door and the hourly rating is mandatory. Approved manufacturer Shakti Hormann or approved equivalent. Door frame shall be single rebate grooved profile of size							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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125 x 60mm made out of 1.60mm (16gauge) minimum thick galvanized steel sheet. Frames shall be mitered and field assembled with self tabs. Frames to have inbuild grooved sealing system and shall be site fitted with fire rated EPDM gasket as standard. All provision should be mortised, drilled and tapped for receiving appropriate hardware. Frames should be provided with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. Frames shall be filled with fire rated puff. Door leaf shall be 46mm thick fully flush double skin door, insulated with or without vision lite. Door leaf shall be manufactured from 1.2mm (18guage) minimum thick galvanised steel sheet. The								

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internal construction of the door should be rigid reinforcement pads for receiving appropriate hardware. The infill material shall be high density insulation material. Intumescent seals 15x2mm to be provided all around the door in addition to the grooved smoke seal. All doors shall be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. The edges should be interlocked with a bending radius of 1.4mm. For pair of doors integrated astragals has to be provided on the meeting stile for both active and inactive leaf. Vision lite wherever applicable should be provided as per manufacturers recommendation with a clipon arrangement. The								

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glass should be 6mm clear borosilicate fire rated glass of relavant rating of the door. 120Mins Fire Rated Door Double leaf of size : FD6 2000 x 2100 & FD7 1780x2100 with vision panel with below hardware set- 6no 5 Knl, Ball bearing hinges size 4"x3"x3mm, SSS 2no Single point surface panic push bar, 1211, Silver finish 1no Rod & cover modular for pullman latch, 1181, Silver finish 1no Vertical pullman latch set 1180V, Silver finish 1no External lever handle, 1185, with half cylinder, Silver Finish 2no Door closer HDC 03 EN 3 with Std. arm in silver finish 2no Clear fire rated glass, 6mm, for 120min (200 x 300) 4 RM Gasket, Fire rated 4mm thick x 13mm, Black 11RM Intumescent seal 15 x							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	2mm for insulated door 7RM Fire rated seal for grooved frame profile C421 EPDM Black - Hormann							
216	<u>Providing and fixing of Hollow metal Ins</u> 120Mins. fire rated doors with 30Mins. Insulation as per IS 3614 / BS 476-Painted Providing and fixing of Hollow metal Insulated fire rated doors as per IS 3614 part-1, for stability, integrity & insulation. Pressed galvanized steel confirming to IS 277 with the following specification. Recommended fire door shall be tested to IS 3614 part 2 / ISO 834-1 Part 1 / BS476 Part 20 & 22, CBRI / Cerifire or third party certified or equivavelent lab, for maximum rating of 120mins with 30minutes of insulation, in latched	6	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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/unlatched condition (if used with deadbolts and pull handles). Labeled doors with certification shall be with vision glass as a part of complete assembly. Manufacturer test certificate shall cover doors both single and double leaf and all doors supplied shall be within the tested specimen, deviation in specification and sheet thickness other than what is mentioned in the test certificates are not allowed. Proper label confirming the type of door and the hourly rating is mandatory. Approved manufacturer Shakti Hormann or approved equivalent. Door frame shall be single rebate grooved profile of size 125 x 60mm made out of 1.60mm (16gauge) minimum thick galvanized steel sheet. Frames shall be mitered and field assembled with self tabs.								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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Frames to have inbuild grooved sealing system and shall be site fitted with fire rated EPDM gasket as standard. All provision should be mortised, drilled and tapped for receiving appropriate hardware. Frames should be provided with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. Frames shall be filled with fire rated puff. Door leaf shall be 46mm thick fully flush double skin door, insulated with or without vision lite. Door leaf shall be manufactured from 1.2mm (18guage) minimum thick galvanised steel sheet. The internal construction of the door should be rigid reinforcement pads for receiving appropriate hardware. The infill material shall be high density								

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insulation material. Intumescent seals 15x2mm to be provided all around the door in addition to the grooved smoke seal. All doors shall be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. The edges should be interlocked with a bending radius of 1.4mm. For pair of doors integrated astragals has to be provided on the meeting stile for both active and inactive leaf. Vision lite wherever applicable should be provided as per manufacturers recommendation with a clipon arrangement. The glass should be 6mm clear borosilicate fire rated glass of relavant rating of the door. All doors and frames shall be							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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finished Powder coated and shall have passed minimum 500 hours of salt spre test. Rate shall include supply and installation of door and hardware as a complete assembly as mentioned in the door and hardware schedule. Once frame installed should be filled with PUF as recomended by the manufacturer or engineer. 120Mins Fire Rated Door Double leaf of size : FD4 1500 x 2100 with vision panel with below hardware set- 6no 5 Knl, Ball bearing hinges size 4"x3"x3mm, SSS 2no Single point surface panic push bar, 1211, Silver finish 1no Rod & cover modular for pullman latch, 1181, Silver finish 1no Vertical pullman latch set 1180V, Silver finish 1no External lever handle, 1185, with half cylinder, Silver							

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	Finish 2no Door closer HDC 03 EN 3 with Std. arm in silver finish 2no Clear fire rated glass, 6mm, for 120min (200 x 300) 4RM Gasket, Fire rated 4mm thick x 13mm, Black 10RM Intumescent seal 15 x 2mm for insulated door 6RM Fire rated seal for grooved frame profile C421 EPDM Black - Hormann							
217	<u>Providing and fixing of Hollow metal Un-:</u> 120Mins.Un-Insulated fire rated doors as per IS 3614 / BS 476 - Painted Providing and fixing of Hollow metal Un-Insulated fire rated doors as per IS 3614 part-1, for stability and integrity. Pressed galvanized steel confirming to IS 277 with the following specification. Recommended fire door shall be tested to IS 3614 part 2 / ISO 834-1 Part 1 /	12	NO					

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BS476 Part 20 & 22, CBRI / Cerifire or third party certified or equivavelent lab, for maximum rating of 120mins, in latched /unlatched condition (if used with deadbolts and pull handles). Labled doors with certification shall be with vision glass as a part of complete assembly. Manufacturer test certificate shall cover doors both single and double leaf and all doors supplied shall be within the tested specimen, deviation in specification and sheet thickness other than what is mentioned in the test certificates are not allowed. Proper label confirming the type of door and the hourly rating is mandatory. Approved manufacturer Shakti Hormann or approved equivalent. Door frame shall be single							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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rebate grooved profile of size 125 x 60mm made out of 1.60mm (16gauge) minimum thick galvanized steel sheet. Frames shall be mitered and field assembled with self tabs. Frames to have inbuild grooved sealing system and shall be site fitted with fire rated EPDM gasket as standard. All provision should be mortised, drilled and tapped for receiving appropriate hardware. Frames should be provided with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. Door leaf shall be 46mm thick fully flush double skin door, Un-insulated with or without vision lite. Door leaf shall be manufactured from 1.2mm (18guage) minimum thick galvanised steel sheet. The internal							

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construction of the door should be rigid reinforcement pads for receiving appropriate hardware. The infill material shall be resin bonded honeycomb core. All doors shall be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. The edges should be interlocked with a bending radius of 1.4mm. For pair of doors integrated astragals has to be provided on the meeting stile for both active and inactive leaf. Vision lite wherever applicable should be provided as per manufacturers recommendation with a clipon arrangement. The glass should be 6mm clear borosilicate fire rated glass of relavant rating of the door. All doors and frames shall be finished Powder coated and shall have passed minimum 500 hours of								

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salt spray test. Rate shall include supply and installation of door and hardware as a complete assembly as mentioned in the door and hardware schedule. Once frame installed should be filled with PUF as recommended by the manufacturer or engineer. 120Mins Fire Rated Door FD2 Single leaf of size 1000 x 2100 : with vision panel with below hardware set- 4no 5 Knl, Ball bearing hinges size 4"x3"x3mm, SSS 1no Mortise Dead lock, H4, 55 BS/8mm, SSS finish 1no Euro profile 5 pin cylinder 5701, 70mm Key x TT, NP finish 1pair Pull handle D type PD12, 25 dia, CTC 300mm, back to back, with extended spindle, SS 304, SSS Finish 1no Door closer HDC 03 EN 3 with Std. arm in silver finish 1no Clear fire rated glass, 6mm,							

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	for 120min (200 x 300) 2 RM Gasket, Fire rated 4mm thick x 13mm, Black 6RM Fire rated seal for grooved frame profile C421 EPDM Black - Hormann							
218	<u>Providing and fixing of Hollow metal Un-:</u> 120Mins.Un-Insulated fire rated doors as per IS 3614 / BS 476 - Painted Providing and fixing of Hollow metal Un-Insulated fire rated doors as per IS 3614 part-1, for stability and integrity. Pressed galvanized steel confirming to IS 277 with the following specification. Recommended fire door shall be tested to IS 3614 part 2 / ISO 834-1 Part 1 / BS476 Part 20 & 22, CBRI / Cerifire or third party certified or equivavelent lab, for maximum rating of 120mins, in latched /unlatched condition (if used with	23	NO					

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deadbolts and pull handles). Labled doors with certification shall be with vision glass as a part of complete assembly. Manufacturer test certificate shall cover doors both single and double leaf and all doors supplied shall be within the tested specimen, deviation in specification and sheet thickness other than what is mentioned in the test certificates are not allowed. Proper label confirming the type of door and the hourly rating is mandatory. Approved manufacturer Shakti Hormann or approved equivalent. Door frame shall be single rebate grooved profile of size 125 x 60mm made out of 1.60mm (16gauge) minimum thick galvanized steel sheet. Frames shall be mitered and field assembled with self tabs.								

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Frames to have inbuild grooved sealing system and shall be site fitted with fire rated EPDM gasket as standard. All provision should be mortised, drilled and tapped for receiving appropriate hardware. Frames should be provided with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. Door leaf shall be 46mm thick fully flush double skin door, Un-insulated with or without vision lite. Door leaf shall be manufactured from 1.2mm (18guage) minimum thick galvanised steel sheet. The internal construction of the door should be rigid reinforcement pads for receiving appropriate hardware. The infill material shall be resin bonded honeycomb core. All doors shall be factory prepped for receiving								

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appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. The edges should be interlocked with a bending radius of 1.4mm. For pair of doors integrated astragals has to be provided on the meeting stile for both active and inactive leaf. Vision lite wherever applicable should be provided as per manufacturers recommendation with a clipon arrangement. The glass should be 6mm clear borosilicate fire rated glass of relavant rating of the door. All doors and frames shall be finished Powder coated and shall have passed minimum 500 hours of salt spreya test. Rate shall include supply and installation of door and hardware as a complete assembly as mentioned in the door and hardware schedule.								

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Once frame installed should be filled with PUF as recommended by the manufacturer or engineer. 120Mins Fire Rated Door FD5 Double leaf of size 1500 x 2100 : with vision panel with below hardware set- 6no 5 Knl, Ball bearing hinges size 4"x3"x3mm, SSS 1no Mortise Dead lock, H4, 55 BS/8mm, SSS finish 1no Euro profile 5 pin cylinder 5701, 70mm Key x TT, NP finish 2pair Pull handle D type PD12, 25 dia, CTC 300mm, back to back, with extended spindle, SS 304, SSS Finish 2no Door closer HDC 03 EN 3 with Std. arm in silver finish 2no RB10 Flush Bolt L=300mm 1no Dust Excluding Socket 2no Clear fire rated glass, 6mm, for 120min (200 x 300) 4RM Gasket, Fire rated 4mm thick x 13mm, Black 6RM Fire rated seal for grooved frame profile C421 EPDM Black -							

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	Hormann							
219	<u>Providing and fixing of Hollow metal door:</u> Multi purpose doors - Painted Providing and fixing of Hollow metal doors made of pressed galvanized steel confirming to IS 277 with the following specification. Doors shall be with vision glass and louver as a part of complete assembly. Approved manufacturer Shakti Hormann or approved equivalent. Door frame shall be single rebate of size 125 x 60mm made out of minimum 1.20mm (18gauge) thick galvanized steel sheet with grooved profile to receive the seal. Frames shall be mitered and field assembled with self tabs. All provision should be mortised, drilled and tapped for receiving appropriate hardware.	24	NO					

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Frames should be provided with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. Frames shall be filled with non-fire rated puff. Door leaf shall be 46mm thick fully flush double skin door, with or without vision lite. Door leaf shall be manufactured from minimum 0.8mm (22guage) thick galvanised steel sheet. The internal construction of the door should be rigid reinforcement pads for receiving appropriate hardware. The infill material shall be resin bonded honeycomb core. All doors shall be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. The edges should be							

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interlocked with a bending radius of 1.4mm. For pair of doors integrated astragals has to be provided on the meeting stile for both active and inactive leaf. Vision lite wherever applicable should be provided as per manufacturers recommendation with a clipon arrangement. The glass should be 6mm clear borosilicate fire rated glass of relavant rating of the door. All doors and frames shall be finished Powder coated and shall have passed minimum 500 hours of salt spreya test. Rate should include supply and installation of frame, door leaf and hardware as a complete assembly as given in the schedule. Once frame installed should be filled with non-fire rated PUF as recommended by the								

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	manufacturer or the engineer in charge HMPS doors of size 1000x1800 FHC with full glass as per elevation with below hardware set- 3no 5 Knl, Ball bearing hinges size 4"x3"x3mm, SSS 1no Mortise shaft lock, H10, 57 BS, SSS finish 1no Flush pull handle CH 120S, 120mmx40mm, sss 1no Clear glass, 5mm thick as per drwg, 8RM Gasket, Fire rated 4mm thick x 13mm, Black							
220	<u>Supplying at site :- Welded steel wire:</u> Supplying at site :- Welded steel wire fabric of required width having rectangular mesh painted with two or more coats of enamel paint of approved shade over a coat of primer (Priming & Painting to be paid for separately).	1,051.130	KG					
221	<u>Supplying at site Angle iron post & strut:</u>	451.190	KG					

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	Supplying at site Angle iron post & strut of required size including bottom to be split and bent at right angle in opposite direction for 10 cm length and drilling holes upto 10 mm dia. etc. complete							
222	Welded steel wire fabric fencing: Welded steel wire fabric fencing with posts of specified material and of standard design placed and embedded in cement concrete blocks 45x45x 60 cm of mix 1:5:10 (1 cement:5 fine sand : 10 graded stone aggregate 40 mm nominal size), every 15th post, last but one end post and corner post shall be strutted on both sides and end post on one side only and struts embedded in cement concrete blocks 70x45x50 cm of the same mix, provided with welded	105.110	M2					

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	steel wire fabric fixed between the posts fitted and fixed with G.I. staples on wooden plugs or tied to 6 mm bar nibs with G.I. binding wire (cost of posts, welded steel wire fabric, painting, earth work in excavation and concrete to be paid for separately).							
	TOTAL AMOUNT(GROUP A) WITHOUT GST=							
	TOTAL AMOUNT(GROUP A) WITH GST=							
GROUP-B, PHE WORK								
SL. NO.	DESCRIPTION OF WORK	QTY (A)	UNIT	RATE PER UNIT (IN WORDS& FIGURES) (B)		TOTAL AMOUNT C=(AxB)	SERVICE ACCOUNTING CODE (SAC)	SPECIFY % OF GST ON (C)
				FIGURES	WORDS			
1	<u>Providing And fixing soil:</u> Providing and fixings soil waste and vent pipes:100mm Centrifugally cast(spun)iron socket & spigot(S&S) pipe as	1,000	M					

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	per IS:3989.							
2	<u>Providing And fixing soil:</u> Providing and fixings soil waste and vent pipes:100mm Centrifugally cast(spun)iron socket & spigot(S&S) pipe as per IS:3989. 75mm Centrifugally cast(spun)iron socket & spigot(S&S)pipe as per IS:3989.	115	M					
3	<u>M.S.holder-bat clamps:</u> Providing and fixing M.S. holder-bat clamps of approved design to sand cast iron centrifugally cast (spun) iron S&S pipes embedded in and including cement concrete blocks 10x 10 x 10 cm of 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) including cost of cutting holes and making good the walls, etc. : For 100 mm dia pipe	236	EA					
4	<u>Providing and fixing soil waste:</u>	50	EA					

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	Providing and fixing soil waste and vent pipes : 100mm Centrifugally cast (spun) iron socket & spigot (S&S) pipe as per IS:3989.For 75 mm dia pipe							
5	<u>Providing and fixing bend of:</u> Providing and fixing bend of required degree with access door, insertion rubber washer 3 mm thick,bolts and nuts complete. : 100mm Sand cast iron S&S as per IS - 3989	32	EA					
6	<u>Providing and fixing plain bend:</u> Providing and fixing plain bend of required degree: 100mm centrifugally cast (spun) iron S&S as per IS:3989.	175	EA					
7	<u>Providing and fixing heel rest bend.</u> Providing and fixing heel rest bend. : 100mm centrifugally cast (spun) iron S&S as per IS:3989.	16	EA					
8	<u>Providing and fixing heel rest bend.:</u>	7	EA					

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	Providing and fixing heel rest bend. 75mm centrifugally cast (spun) iron S&S as per IS:3989.							
9	<u>Providing and fixing single equal:</u> Providing and fixing single equal plain junction of required degree : 100x100x100 mm Sand cast iron S&S as per IS - 3989	81	EA					
10	<u>Providing and fixing single equal plain:</u> Providing and fixing single equal plain junction of required degree 75x75x75 mm Sand cast iron S&S as per IS - 3989	18	EA					
11	<u>Providing and fixing single equal plain:</u> Providing and fixing single equal plain junction of required degree with access door, insertion rubber washer 3 mm thick, bolts and nuts complete. :100x100x100 mm Sand cast iron S&S as per IS -3989	72	EA					

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12	<u>Providing and fixing single unequal plain:</u> Providing and fixing single unequal plain junction of required degree : 100x100x75 mm Sand cast iron S&S as per IS - 3989	18	EA					
13	<u>Providing and fixing terminal guard:</u> Providing and fixing terminal guard : 100mm centrifugally cast (spun) iron S&S as per IS: 3989	16	EA					
14	<u>Providing and fixing terminal guard:</u> Providing and fixing terminal guard 75mm centrifugally cast (spun) iron S&S as per IS: 3989.	5	EA					
15	<u>Providing drip seal (Density 1.95 gm/cc):</u> Providing drip seal (Density 1.95 gm/cc) joints to .C.I. pipes and specials including cost of drip seal, yarn and tools etc of approved make (as per approval of engineer-in-charge). The drip seal shall be in two pack system	1,782	EA					

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	which hardness on mixing. Drip shall have setting time of 4 to 6 hours and shall able to stand pressure of 20 kg/cm2 after hardening. Drip seal shall be provided in quantity as indicated against each dia meter of pipe below. : 100 mm (200 to 250 gm/joint)							
16	<u>Providing drip seal (Density 1.95 gm/cc):</u> Providing drip seal (Density 1.95 gm/cc) joints to .C.I. pipes and specials including cost of drip seal, yarn and tools etc of approved make (as per approval of engineer-in-charge). The drip seal shall be in two pack system which hardnes on mixing. Drip shall have setting time of 4 to 6 hours and shall able to stand pressure of 20 kg/cm2 afrer hardeing. Drip seal shall be provided in quantity as indicated against each dia meter of pipe below. :	187	EA					

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	75 mm (200 to 250 gm/joint)							
17	<u>Providing and fixing M.S. stays and clamps:</u> Providing and fixing M.S. stays and clamps for sand cast iron/centrifugally cast (spun) iron pipe of diameter: 100mm	16	EA					
18	<u>Providing and fixing M.S. stays and clamps:</u> Providing and fixing M.S. stays and clamps for sand cast iron/centrifugally cast (spun) iron pipe of diameter:75mm	5	EA					
19	<u>Providing and fixing cast iron trap:</u> Providing and fixing cast iron trap of self cleansing design with sand cast iron screwed down or hinged grating with or without vent, arm complete, including cost of cutting and making good the walls and floors : 100mm inlet and 100mm outlet	116	EA					

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	centrifugally cast (spun) iron S&S as per IS: 3989.							
20	<u>Painting sand cast iron/centrifugally cast:</u> Painting sand cast iron/centrifugally cast (spun) iron soil, waste vent pipes and fittings with paint of any colour such as chocolate, grey or buff, etc., over a coat of primer (of approved quality) for new work. : 100mm diameter pipe	875	M					
21	<u>Painting sand cast iron/centrifugally cast:</u> Painting sand cast iron/centrifugally cast (spun) iron soil, waste vent pipes and fittings with paint of any colour such as chocolate, grey or buff, etc., over a coat of primer (of approved quality) for new work. : 75mm diametre pipe	105	M					
22	<u>Providing and fixing G.I. pipes complete:</u> Providing and fixing G.I. pipes complete with G.I.	110	M					

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	fittings and clamps including cutting and making good the walls etc., (Internal work) : 32mm nominal bore							
23	<u>Providing and fixing G.I. pipes complete:</u> Providing and fixing G.I. pipes complete with G.I. fittings and clamps including cutting and making good the walls etc., (Internal work) : 50mm nominal bore	90	M					
24	<u>Painting G.I. pipes and fittings:</u> Painting G.I. pipes and fittings with two coats of anticorrosive bitumastic paint of approved quality. : 32mm diameter pipe	110	M					
25	<u>Painting G.I. pipes and fittings:</u> Painting G.I. pipes and fittings with two coats of anticorrosive bitumastic paint of approved quality. 50mm diameter pipe	90	M					
26	<u>Providing and laying in position cement:</u>	6.000	M3					

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	Providing and laying in position cement concrete of specified grade excluding the cost of centring and shuttering - All work up to plinth level. : 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
27	<u>Providing, fixing and testing cast iron:</u> Providing, fixing and testing cast iron soil waste and vent pipes (IS:3989) including all fittings such as bends, junctions, inspection doors, offsets, cowls, access pieces/plugs, brass floor cleanouts plugs etc.clamps/ structural steel supports as required/directed at site, jointing with dripseal joints including cutting holes in RCC/ Masonry walls and floors wherever required and making good the same. (The cost of cutting holes of all sizes in RCC walls, slabs & beams wherever required including making good the same with sealents as	70	M					

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	required by the engineer-in-charge shall be included in the rate). : 150mm dia							
28	<u>Providing and fixing CP Brass floor clean:</u> Providing and fixing CP Brass floor cleanout plug as per drawing complete with G.I. Socket jointed to drainage pipe outlet with drip seal joint. : 100mm dia	40	EA					
29	<u>Providing and fixing Chlorinated Polyvinyl:</u> Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. (Concealed	20	M					

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	work, including cutting chases and making good the walls etc.) : 15 mm nominal outer dia Pipes							
30	<u>Providing and fixing Chlorinated Polyvinyl:</u> Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. (Concealed work, including cutting chases and making good the walls etc.) : 20 mm nominal outer dia Pipes	320	M					
31	<u>Providing and fixing Chlorinated Polyvinyl:</u> Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes,	25	M					

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	having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. (Concealed work, including cutting chases and making good the walls etc.) 25 mm nominal outer dia Pipes							
32	<u>Providing and fixing Chlorinated Polyvinyl:</u> Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of	85	M					

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	joints complete as per direction of Engineer-in- Charge. : Internal work - Exposed on Wall - 15 mm nominal outer dia Pipes							
33	<u>Providing and fixing Chlorinated Polyvinyl:</u> Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in Charge. : Internal work - Exposed on Wall 20 mm nominal outer dia Pipes	455	M					
34	<u>Providing and fixing Chlorinated Polyvin:</u> Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes,	180	M					

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	having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in Charge. : Internal work - Exposed on Wall - 15 mm nominal outer dia Pipes 25 mm nominal outer dia Pipes							
35	<u>Providing and fixing Chlorinated Polyvin:</u> Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per	30	M					

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	direction of Engineer in Charge. : Internal work - Exposed on Wall -32 mm nominal outer dia Pipes							
36	<u>Providing and fixing G.I. pipes complete:</u> Providing and fixing G.I. pipes complete with G.I. fittings and clamps, i/c cutting and making good the walls etc. : Internal work - Exposed on wall - 15 mm dia nominal bore	5	M					
37	<u>Providing and fixing G.I. pipes complete:</u> Providing and fixing G.I. pipes complete with G.I. fittings and clamps, i/c cutting and making good the walls etc. : Internal work - Exposed on wall -20 mm dia nominal bore	315	M					
38	<u>Providing and fixing G.I. pipes complete:</u> Providing and fixing G.I. pipes complete with G.I. fittings and clamps, i/c cutting	325	M					

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	and making good the walls etc. : Internal work - Exposed on wall -25 mm dia nominal bore							
39	<u>Providing and fixing G.I. pipes complete:</u> Providing and fixing G.I. pipes complete with G.I. fittings and clamps, i/c cutting and making good the walls etc. : Internal work - Exposed on wall -32 mm dia nominal bore	200	M					
40	<u>Providing and fixing G.I. pipes complete:</u> Providing and fixing G.I. pipes complete with G.I. fittings and clamps, i/c cutting and making good the walls etc. : Internal work - Exposed on wall -40 mm dia nominal bore	175	M					
41	<u>Providing and fixing G.I. pipes complete:</u> Providing and fixing G.I. pipes complete with G.I. fittings and clamps, i/c cutting and making good the	405	M					

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	walls etc. : Internal work - Exposed on wall -50 mm dia nominal bore							
42	<u>Providing and fixing G.I. pipes complete:</u> Providing and fixing G.I. pipes complete with G.I. fittings and clamps, i/c cutting and making good the walls etc. : Internal work - Exposed on wall -65 nominal bore	20	M					
43	<u>Providing and fixing G.I. pipes complete:</u> Providing and fixing G.I. pipes complete with G.I. fittings and clamps, i/c cutting and making good the walls etc. : Internal work - Exposed on wall -80 mm dia nominal bore	100	M					
44	<u>Providing and fixing G.I. pipes complete:</u> Providing and fixing G.I. pipes complete with G.I. fittings and clamps, i/c cutting and making good the walls etc. : Internal work -	15	M					

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	Exposed on wall - 100mm dia nominal bore							
45	<u>Providing and fixing G.I. pipes:</u> Providing and fixing G.I. pipes complete with G.I. fittings including trenching and refilling etc. : External Work - 25 mm dia nominal bore	170	M					
46	<u>Providing and fixing G.I. pipes:</u> Providing and fixing G.I. pipes complete with G.I. fittings including trenching and refilling etc. : External Work 50 mm dia nominal bore	230	M					
47	<u>Painting G.I. pipes and fittings:</u> Painting G.I. pipes and fittings with synthetic enamelwhite paint with two coats over a ready mixed priming coat, both of approved quality for new work : 15mm nominal bore	5	M					
48	<u>Painting G.I. pipes and fittings:</u> Painting G.I. pipes and fittings with synthetic enamelwhite	315	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	paint with two coats over a ready mixed priming coat, both of approved quality for new work : 20mm nominal bore							
49	<u>Painting G.I. pipes and fittings:</u> Painting G.I. pipes and fittings with synthetic enamel white paint with two coats over a ready mixed priming coat, both of approved quality for new work : 25mm nominal bore	325	M					
50	<u>Painting G.I. pipes and fittings:</u> Painting G.I. pipes and fittings with synthetic enamel white paint with two coats over a ready mixed priming coat, both of approved quality for new work : 32mm nominal bore	200	M					
51	<u>Painting G.I. pipes and fittings:</u> Painting G.I. pipes and fittings with synthetic enamel white paint with two coats over a ready mixed priming coat, both of approved quality for new work : 40mm nominal bore	175	M					
52	<u>Painting G.I. pipes and fittings:</u>	405	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	<u>fittings:</u> Painting G.I. pipes and fittings with synthetic enamel white paint with two coats over a ready mixed priming coat, both of approved quality for new work : 50mm nominal bore							
53	<u>Painting G.I. pipes and fittings:</u> Painting G.I. pipes and fittings with synthetic enamel white paint with two coats over a ready mixed priming coat, both of approved quality for new work : 65mm nominal bore	20	M					
54	<u>Painting G.I. pipes and fittings:</u> Painting G.I. pipes and fittings with synthetic enamel white paint with two coats over a ready mixed priming coat, both of approved quality for new work : 80mm nominal bore	100	M					
55	<u>Painting G.I. pipes and fittings:</u> Painting G.I. pipes and fittings with synthetic enamel white paint with two coats over a ready mixed priming coat, both of approved quality for new	15	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	work : 100mm nominal bore							
56	<u>Painting G.I. pipes and fittings:</u> Painting G.I. pipes and fittings with two coats of anticorrosive bitumastic paint of approved quality : 25 mm diameter pipe	170	M					
57	<u>Painting G.I. pipes and fittings:</u> Painting G.I. pipes and fittings with two coats of anticorrosive bitumastic paint of approved quality : 50 mm diameter pipe	230	M					
58	<u>Providing and filling sand:</u> Providing and filling sand of grading zone V or coarser grade, allround the G.I. pipes in external work : 25 mm diameter pipe	170	M					
59	<u>Providing and filling sand:</u> Providing and filling sand of grading zone V or coarser grade, allround the G.I. pipes in external work : 50 mm diameter pipe	230	M					
60	<u>Providing and fixing ball (brass) valve:</u> Providing and fixing ball (brass) valve of approved	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	quality. High or low pressure, with plastic floats complete: 40 mm nominal bore.							
61	<u>Providing and fixing ball (brass) valve:</u> Providing and fixing ball (brass) valve of approved quality. High or low pressure, with plastic floats complete: 50 mm nominal bore.	2	EA					
62	<u>Constructing masonry Chamber:</u> Constructing masonry Chamber 30x30x50 cm inside, in brick work in cement mortar 1:4 (1 cement :4 coarse sand) for stop cock, with C. I. surface box 100x100 x75 mm (inside) with hinged cover fixed in cement concrete slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone	15	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	aggregate 40mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand)12mm thick, finished with a floating coat of neat cement complete as per standard design : With common burnt clay F.P.S (nonmodular) bricks of class designation 7.5							
63	<u>Providing and fixing in position:</u> Providing and fixing in position pre-cast R.C.C. manhole cover and frame of required shape and approved quality : H D - 20 : Circular shape 560 mm internal diameter (For over head tanks)	8	EA					
64	<u>Providing and fixing in position pre-cast:</u> Providing and fixing in position pre-cast R.C.C. manhole cover and frame of required shape and approved quality : EHD - 35 : Circular shape 560 mm internal dia (For under ground tank)	12	EA					
65	<u>Providing orange colour</u>	156	EA					

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safety foot rest: Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS : 10910 on 12mm dia steel bar conforming to IS : 1786 having minimum cross section as 23 mmx25mm and over all minimum length 263 mm and width as 165mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufacture's permanent identification mark to be visible even after fixing, including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size) complete							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	as per design.							
66	Class-O Careflex ST insulation: Providing and fixing class-O Careflex ST insulation 6mm thick to hot water pipe and fittings and valves as per manufacturer's recommendations complete to satisfaction of Engineer in charge. : 16mm nominal bore (6 mm thick insulation)	15	M					
67	Class-O Careflex ST insulation: Providing and fixing class-O Careflex ST insulation 6mm thick to hot water pipe and fittings and valves as per manufacturer's recommendations complete to satisfaction of Engineer in charge. : 22mm nominal bore (6 mm thick insulation)	45	M					
68	Class-O Careflex ST insulation: Providing and fixing class-O Careflex ST insulation 6mm thick to hot water pipe and fittings and valves as per	95	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	manufacturer's recommendations complete to satisfaction of Engineer in charge. : 22mm nominal bore (32 mm thick insulation)							
69	Class-O Careflex ST insulation: Providing and fixing class-O Careflex ST insulation 6mm thick to hot water pipe and fittings and valves as per manufacturer's recommendations complete to satisfaction of Engineer in charge. : 28mm nominal bore (32 mm thick insulation)	35	M					
70	Providing and fixing lever: Providing and fixing lever operated gun metal ball valve with SS ball. : 20mm nominal bore	56	EA					
71	Providing and fixing lever: Providing and fixing lever operated gun metal ball valve with SS ball. : 25mm nominal bore	50	EA					
72	Providing and fixing lever: Providing and fixing lever operated gun metal ball	9	EA					

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	valve with SS ball. : 32mm nominal bore							
73	<u>Providing and fixing lever:</u> Providing and fixing lever operated gun metal ball valve with SS ball. : 40mm nominal bore	4	EA					
74	<u>Providing and fixing lever:</u> Providing and fixing lever operated gun metal ball valve with SS ball. : 50 mm nominal bore	20	EA					
75	<u>Providing and fixing lever:</u> Providing and fixing lever operated gun metal ball valve with SS ball. : 65 mm nominal bore	4	EA					
76	<u>Supplying, fixing, testing and commission:</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications. : BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile	2	EA					

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	Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot eater circulation as specified : -80 mm dia							
77	<u>Supplying, fixing, testing and commission:</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications. : BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot eater circulation as specified : -100 mm dia	1	EA					
78	<u>Complete Item Rate for Providing and fix:</u> Complete Item Rate for	8	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Providing and fixing 600mm long Puddle Flanges fabricated out of 6mm thick M.S. plates along with flanges of suitable size properly fixed in walls and top slabs of underground 25mm dia							
79	<u>Complete Item Rate for Providing and fix:</u> Complete Item Rate for Providing and fixing 600mm long Puddle Flanges fabricated out of 6mm thick M.S. plates along with flanges of suitable size properly fixed in walls and top slabs of underground 32mm dia	2	EA					
80	<u>Complete Item Rate for Providing and fix:</u> Complete Item Rate for Providing and fixing 600mm long Puddle Flanges fabricated out of 6mm thick M.S. plates along with flanges of suitable size properly fixed in walls and top slabs of underground 40 mm dia	2	EA					
81	<u>Complete Item Rate for</u>	13	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	<u>Providing and fix:</u> Complete Item Rate for Providing and fixing 600mm long Puddle Flanges fabricated out of 6mm thick M.S. plates along with flanges of suitable size properly fixed in walls and top slabs of underground 50 mm dia							
82	<u>Complete Item Rate for</u> <u>Providing and fix:</u> Complete Item Rate for Providing and fixing 600mm long Puddle Flanges fabricated out of 6mm thick M.S. plates along with flanges of suitable size properly fixed in walls and top slabs of underground 65 mm dia	16	EA					
83	<u>Complete Item Rate for</u> <u>Providing and fix:</u> Complete Item Rate for Providing and fixing 600mm long Puddle Flanges fabricated out of 6mm thick M.S. plates along with flanges of suitable size properly fixed in walls and top	10	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	slabs of underground 80 mm dia							
84	<u>Complete Item Rate for Providing and fix:</u> Complete Item Rate for Providing and fixing 600mm long Puddle Flanges fabricated out of 6mm thick M.S. plates along with flanges of suitable size properly fixed in walls and top slabs of underground 100 mm dia	20	EA					
85	<u>Complete Item Rate for Providing and fix:</u> Complete Item Rate for Providing and fixing 600mm long Puddle Flanges fabricated out of 6mm thick M.S. plates along with flanges of suitable size properly fixed in walls and top slabs of underground 150 mm dia	11	EA					
86	<u>Complete Item Rate for Providing and fix:</u> Complete Item Rate for Providing and fixing 600mm long Puddle Flanges fabricated out of 6mm thick	2	EA					

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	M.S. plates along with flanges of suitable size properly fixed in walls and top slabs of underground 200 mm dia							
87	<u>Complete Item Rate for Providing and fix:</u> Complete Item Rate for Providing and fixing 600mm long Puddle Flanges fabricated out of 6mm thick M.S. plates along with flanges of suitable size properly fixed in walls and top slabs of underground 250 mm dia	6	EA					
88	<u>Providing and fixing 100mm dia G.I. vent:</u> Providing and fixing 100mm dia G.I. vent pipe on Under ground and over head tank inlcuding cost of 2 Nos. 900 bend and painting with enamel paint complete with in all respect.	20	EA					
89	<u>Providing and fixing mosquito proof/vent:</u> Providing and fixing mosquito proof/vent/ overflow brass coupling of an approved design.	20	EA					

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	: 100mm dia							
90	<u>Supply, fixing, testing and commissioning:</u> Supply, fixing, testing and commissioning of Air Release Valves screwed ends with ball valve of approved brand of manufacture, with accessories etc., complete. : 15mm dia	6	EA					
91	<u>Providing, laying & jointing in position:</u> Providing, laying & jointing in position of uPVC pipes (I.S.:4985-1981) of 6 kg/cm2 rating with all fittings and accessories e.g. couplings, tees, bends, reducers, screwed adapters, flanged tail pieces etc. jointing as per manufacturers' instruction, including earth work in excavation and refilling (Earth work includes 450mm of soil cover over the pipe and width of 300mm). (For Irrigation lines). : 50mm OD- 6 kg/cm²	510	M					
92	<u>Providing, laying & jointing in position:</u>	5	M					

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	Providing, laying & jointing in position of uPVC pipes (I.S.:4985-1981) of 6 kg/cm2 rating with all fittings and accessories e.g. couplings, tees, bends, reducers, screwed adapters, flanged tail pieces etc. jointing as per manufacturers' instruction, including earth work in excavation and refilling (Earth work includes 450mm of soil cover over the pipe and width of 300mm). (For Irrigation lines). : 40mm OD- 6 kg/cm²							
93	<u>Providing, laying & jointing in position:</u> Providing, laying & jointing in position of uPVC pipes (I.S.:4985-1981) of 6 kg/cm2 rating with all fittings and accessories e.g. couplings, tees, bends, reducers, screwed adapters, flanged tail pieces etc. jointing as per manufacturers' instruction, including earth work in excavation and refilling (Earth work includes 450mm of soil cover over the pipe and	5	M					

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	width of 300mm). (For Irrigation lines). : 32mm OD- 6 kg/cm ²							
94	<u>Providing, laying & jointing in position:</u> Providing, laying & jointing in position of uPVC pipes (I.S.:4985-1981) of 6 kg/cm ² rating with all fittings and accessories e.g. couplings, tees, bends, reducers, screwed adapters, flanged tail pieces etc. jointing as per manufacturers' instruction, including earth work in excavation and refilling (Earth work includes 450mm of soil cover over the pipe and width of 300mm). (For Irrigation lines). : 25mm OD- 6 kg/cm ²	20	M					
95	<u>Providing and fixing Solar water heating:</u> Providing and fixing Solar water heating system complete with Solar Panels, insulated SS 304 storage vessel with cemamic lining inside & interconnecting pipes and valves complete in all respect as per manufacturer specifications. Tank shall be	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	supplied without electrical boosters. :Capacity 300 LPD (comprising 2 nos. collector panel and 300 ltres SS 304 storage vessel) - (The Vendor shall include in this rate cost of all interconnecting pipes and valves & insulations connecting the panels).							
96	<u>Providing and fixing white vitreous chin:</u> Providing and fixing white vitreous china extended wall mounting water closet of size 780x370x690 mm of approved shape including providing & fixing white vitreous china cistern with dual flush fitting, of flushing capacity 3 litre/ 6 litre (adjustable to 4 litre/ 8 litres), including seat cover, and cistern fittings, nuts, bolts and gasket etc complete.	43	EA					
97	<u>Providing and fixing white vitreous chin:</u> Providing and fixing white vitreous china battery	42	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	based infrared sensor operated urinal of approx. size 610 x 390 x 370 mm having pre & post flushing with water (250 ml & 500 ml consumption), having water inlet from back side, including fixing to wall with suitable brackets all as per manufacturers specification and direction of Engineer-in-charge.							
98	<u>Providing and fixing vitreous China :</u> Providing and fixing vitreous China Sanitary fixturs and CP fitting and other accessories for Handicapped toilet Hindware Cat no. 70002 (Matrix Set-1) or equivalent make CERA Cat. no. CRANE. Each Matrix Set shall comprised (Wash Basin 65 x 35 with one pair mounting brackets, EWC & Cistern complete with fittings & seat cover, one no hinged rail 76 cm and five nos of grab rails 60 cm). complete all respect.	6	EA					

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99	<u>Providing and fixing white glazed vitreo:</u> Providing and fixing white glazed vitreous china wash basins with C.P. pillar tap/mixer, C.P. brass waste 32mm C.P. bottle trap and unions and sealing of joints between wash basins and counter slabs around the wash basins with Silicone rubber cement of approved make of matching colour all complete including cutting and making good the walls and floors where required. : H.S.I. Rhapsody Wash basin No. 10045 (over counter) (630 x 500mm) or equivalent make with C.P. Pillar Cock Auto Closing System (Jaquar Cat No. PRS-031) or approved equivalent GROHE Cat. No.-20159000 & KOHLER Cat. No.-K-11545IN-4-CP, C.P. brass waste Jaquar Cat No. ALD-709 or approved equivalent GROHE	42	EA					

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	Cat. No.- 28910000& KOHLER Cat. No.-K-45432INCP & C.P. bottle trap Jaquar Cat. No. ALD-769B, GROHE Cat. No. -28920000 & KOHLER Cat. No. -K-16407IN-CP or equivalent make.							
100	<u>Providing and fixing Stainless Steel:</u> Providing and fixing Stainless Steel A ISI 304 (18/8)Kitchen Sink as per IS: 13983 with C.I. brackets and stainless steel plug 40 mm, including painting of fittings and brackets, cutting and making good the walls wherever required : Kitchen sink with drain board : 510x1040 mm bowl depth 250 mm	8	EA					
101	<u>Providing and fixing C.P. brass bib cock:</u> Providing and fixing C.P. brass bib cock of approved quality conforming to IS:8931 :(with WC) : 15 mm nominal bore	43	EA					
102	<u>Providing and fixing C.P.</u>	36	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	<u>brass long bod:</u> Providing and fixing C.P. brass long body bib cock of approved quality conforming to IS standards and weighing not less than 690 gms.(with Drinking water, Shower & Janitor Sink) : 15 mm nominal bore							
103	<u>Providing and fixing C.P. Brass extension:</u> Providing and fixing C.P. Brass extension nipple (size 15mmx50mm) of approved make and quality as per direction of Engineer-in-charge.	20	EA					
104	<u>Providing and fixing 600x450 mm bevelled:</u> Providing and fixing 600x450 mm bevelled edge mirror of superior glass (of approved quality) complete with 6 mm thick hard board ground fixed to wooden cleats with C.P. brass screws and washers complete.	48	EA					
105	<u>Providing and fixing CP brass Sink Mixer:</u>	8	EA					

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	Providing and fixing CP brass Sink Mixer, mixing fittings (JAQUAR Cat. No. CON-CHR-309KN/ /KOHLER-K-37315IN-4-CP /GROHE Cat. No. - 31233000 or approved equivalent.							
106	<u>Providing and Fixing Health Faucet JAQUAR:</u> Providing and Fixing Health Faucet JAQUAR Cat. No. 573 (ALLIED SERIES) or equivalent make GROHE Cat. No.- 27513000 & KOHLER Cat. No.- K-12927IN-CP with flexible pipe and wall hook with each European W.C. Pan.	49	EA					
107	<u>Providing and fixing C.P. brass towel ring:</u> Providing and fixing C.P. brass towel ring JAQUAR Cat No. ACN-1121N (CONTINENTAL SERIES) or approved equivalent GROHE Cat. No. -40460000 & KOHLER Cat. No. -K-5631IN-CP complete with C.P.	34	EA					

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	brass brackets fixed to rawl plug of approved design with C.P. brass screws.							
108	<u>Providing and fixing S.S. hinged grating:</u> Providing and fixing S.S. hinged grating, 1.5mm thick with frame (Neer Cat. No. - NRG 7006 or equivalent make CHILLY-CRG-R-127 (Square	116	EA					
109	<u>Providing and fixing C.P. brass twin robe:</u> Providing and fixing C.P. brass twin robe hooks, JAQUAR Cat. No. 1161 or equivalent make GROHE Cat. No. 40461000 & KOHLER Cat. No. - K-16256-CP.	49	EA					
110	<u>Providing and fixing, Soap Dispenser:</u> Providing and fixing, Soap Dispenser with Metallic Bottle with push lever assembly complete with soap refill - (JAQUAR Cat No. ACN-1137N) Make or	34	EA					

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	approved equivalent GROHE Cat. No.- 40389KS0 & KOHLER Cat. No. -K-10712D-CP							
111	<u>Providing and fixing 15mm C.P. brass Connection:</u> Providing and fixing 15mm C.P. brass Connection Pipe Jaquar Cat No. ALD-805B (450mm Long Braided Hose with Two 15mm Nuts & Rubber Washers Without Nipple (Suitable for WC, Geysers & Basin Mixers) or equivalent make union nuts complete with C.P. brass flange including cutting and making good the walls wherever required. (with angle valve)	162	EA					
112	<u>Providing and fixing C.P. brass angle valve:</u> Providing and fixing C.P. brass angle valve for basin mixer and geyser points of approved quality conforming to IS:8931 : 15mm nominal bore	162	EA					
113	<u>Providing and fixing stainless steel :</u> Providing and fixing stainless steel Toilet Paper	49	EA					

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	Holder JAQUAR Cat. No. ACN-1151N or equivalent make KOHLER Cat. No. -K-10554-CP & GROHE Cat. No. -40457000 fixed in position by means of C.P. screws and rawl plugs embedded in the walls complete including cutting and making good the walls wherever required.							
114	<u>Providing and fixing white glazed:</u> Providing and fixing white glazed vitreous china Division Plates for urinals (H.S.I. Cat no. 61001	41	EA					
115	<u>Providing and fixing automatic high pressure:</u> Providing and fixing automatic high pressure electric water heaters HAVELLS-Monza or equivalent make VENUS-Magma-Vertical 25GV/ RACOLD-Etrno ER2 with glass lining thermostats with each element and high temperature cut off, necessary insulation,safety valve, etc. all complete. : 15 litres	8	EA					

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116	<u>Providing and fixing white vitreous china:</u> Providing and fixing white vitreous china Janitor Sink HSI Cat. NO. 50001 of 53x43x18 with CI brackets, 40mm CP brass waste with CP brass union, complete including cutting and making good the walls wherever required	6	EA					
117	<u>pvc rain water pipes:</u> Providing and fixing on wall face unplasticised rigid pvc rain water pipes conforming to IS 13592 type a including jointing with seal ring conforming to IS 5382 leaving 10mm gap for thermal expansion (i) single socketed pipes : 75mm diameter	15	M					
118	<u>Coupler : 75mm</u> Providing and fixing on wall face unplasticised PVC moulded fittings/ accessories for unplasticised rigid PVC rain water pipes conforming to IS 13592 type A including jointing with seal ring conforming to IS 5382 leaving	2	EA					

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	10mm gap for thermal expansion Coupler : 75mm							
119	<u>Bend 87.5° : 75mm bend:</u> Bend 87.5° : 75mm bend	2	EA					
120	<u>Shoe (plain) : 75mm shoe:</u> Shoe (plain) : 75mm shoe	2	EA					
121	<u>PVC pipe clips:</u> Providing and fixing unplasticised PVC pipe clips of approved design to unplasticised PVC rain water pipes by means of 50x50x50mm hard wood plugs screws with MS screws of required length including cutting brick work and fixing in cement mortar 1:4(1 cement 4 coarse sand) and making good the wall etc. complete : 75mm	3	EA					
122	<u>cast iron grating:</u> Providing and fixing to the inlet mouth of rain water pipe cast iron grating 15cm dia meter and weighing not less than 440 grams	16	EA					
123	<u>Providing and laying:</u> Providing and laying in position	2.000	M3					

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	cement concrete of specified grade excluding the cost of centring and shuttering - All work up to plinth level. : 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
124	SWR UPVC pipes: Providing and fixing SWR uPVC pipes (Type-B)confirming to IS 13592 : 1992 complete with allfittings e.g. plain or door bends, junctions, cowls, offsets, access pieces etc. jointing with rubber rings and solvent cement including fixing the pipes on wall face with MS galvanized holder bat clamps or suspended below ceiling with MS galvanized hangers/ supports and fasteners all as approved by the engineer in charge including Cutting holes in walls, floors excavation, refilling and disposal of surplus earth wherever required and making good . The rates shall be inclusive of painting of all	330	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	supports and clamps with a coat of red oxide primer and two or more coats of synthetic enamel paint of approved colour and Quality to give an even shade including surface preparation.(Sample of holder bat clamps,hangers/ supports to be approved by the Engineer-in-Charge.) : 160 mm dia							
125	UPVC pipes: Providing and fixing uPVC pipes confirming to IS 4985: 2000) pressure rating 6 kg/cm2 including all fittings of equivalent rating e.g. plain or door bends, junctions, cowls, offsets, access pieces etc. jointing with rubber rings and solvent cement including all MS structural steel supports fabricated from ms rods,flats, bars etc including suspending the pipes with ceiling/walls with thimble bolts (The sample of clamp/supports shall be approved by enginner incharge) complete with cutting holes in RCC/	70	M					

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	Masonry walls and floors wherever required and making good the same complete as per specifications. (The cost of cutting holes of all sizes in RCC walls, slabs & beams wherever required including making good the same with sealents as required by the engineer-in-charge shall be included in the rate). : 110 mm dia							
126	<u>Providing, laying and jointing glazed :</u> Providing, laying and jointing glazed stoneware pipes class SP-1 with stiff mixture of cement mortar in the proportion of 1:1 (1 cement : 1 fine sand) including testing of joints etc. complete: 100 mm diameter	15	M					
127	<u>Providing, laying and jointing 150mm:</u> Providing, laying and jointing glazed stoneware pipes class SP-1 with stiff mixture of cement mortar in the proportion of 1:1 (1	205	M					

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	cement : 1 fine sand) including testing of joints etc. complete: 150 mm diameter							
128	<u>Providing, laying and jointing 250mm:</u> Providing, laying and jointing glazed stoneware pipes class SP-1 with stiff mixture of cement mortar in the proportion of 1:1 (1 cement : 1 fine sand) including testing of joints etc. complete: 250 mm diameter	100	M					
129	<u>Providing and laying:</u> Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) all-round S.W. pipes including bed concrete as per standard design : 100mm diameter S.W. pipe	15	M					
130	<u>Providing and laying:</u> Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size)	205	M					

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	all-round S.W. pipes including bed concrete as per standard design : 150mm diameter S.W. pipe							
131	<u>Providing and laying:</u> Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) all-round S.W. pipes including bed concrete as per standard design : 250mm diameter S.W. pipe	100	M					
132	<u>S.W. gully trap:</u> Providing and fixing square-mouth S.W. gully trap class SP-1 complete with C.I. grating brick masonry chamber with water tight C.I. cover with frame of 300 x300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg as per standard design : 150 x 100mm size P-type - With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	8	EA					
133	<u>brick masonry manhole:</u> Constructing brick masonry manhole in cement mortar 1:4 (	18	EA					

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1 cement : 4 coarse sand) with R.C.C.top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40mm nominal size), inside plastering 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement complete as per standard design : Inside size 90x80 cm and 45 cm deep including C.I. cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover and frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg): With common burnt clay F.P.S. (non modular) bricks of							

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	class designation 7.5							
134	Extra for depth for manholes: Extra for depth for manholes: Size 90 x 80 cm : With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	8	M					
135	Excavating trenches: Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth upto 1.5 m including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : All kind of soils : Pipes, cables etc. exceeding 80 mm dia. but not exceeding 300 mm dia.	320	M					
136	Providing orange colour	34	EA					

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safety: Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS : 10910 on 12mm dia steel bar conforming to IS : 1786 having minimum cross section as 23 mmx25mm and over all minimum length 263 mm and width as 165mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufacture's permanent identification mark to be visible even after fixing, including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate							

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	20 mm nominal size) complete as per design.							
137	<u>Earth work in excavation:</u> Earth work in excavation by mechanical means (hydraulic excavator) / manual means over areas (exceeding 30cm in depth. 1.5m in width as well as 10 sqm on plan) including disposal of excavated earth lead upto 50m and lift upto 1.5m, disposal earth to be levelled and neatly dressed. : All kinds of soil	45.00	M3					
138	<u>Filling available excavated earth:</u> Filling available excavated earth (excluding rock) in treanches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50m and lift upto 1.5m.	8.000	M3					
139	<u>Providing and laying non-pressure:</u> Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars	360	M					

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	jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete : 150mm dia RCC pipe							
140	<u>Providing and laying non- pressure250mm:</u> Providing and laying non- pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete : 250mm dia RCC pipe	270	M					
141	<u>Providing and laying non- pressure300mm:</u> Providing and laying non- pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete : 300mm dia RCC pipe	160	M					
142	<u>Providing and laying cement concrete:</u>	360	M					

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	Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) up to haunches of S.W. pipes including bed concrete as per standard design :150mm diameter RCC pipe							
143	<u>Providing and laying cement concrete:</u> Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) up to haunches of S.W. pipes including bed concrete as per standard design : 250mm diameter RCC pipe	270	M					
144	<u>Providing and laying cement concrete:</u> Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) up to haunches of S.W. pipes including bed concrete as per standard design : 300mm diameter RCC pipe	160	M					

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145	<u>Constructing brick masonry circular type:</u> Constructing brick masonry circular type manhole 0.91 m internal dia at bottom and 0.56m dia at top in cement mortar 1:4 (1 cement :4 coarse sand), in side cement plaster 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement, foundation concrete 1:3:6 mix (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size), and making necessary channel in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) finished with a floating coat of neat cement, all complete as per standard design : 0.91 m deep with S.F.R.C. cover and frame (heavy duty, HD-20 grade designation) 560 mm internal diameter conforming to	13	EA					

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	I.S. 12592, total weight of cover and frame to be not less than 182 kg., fixed in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) including centering, shuttering all complete. (Excavation, foot rests and 12mm thick cement plaster at the external surface shall be paid for separately): With common burnt clay F.P.S. (non modular) bricks of class designation 7.5							
146	Extra depth for circular: Extra depth for circular type manhole 0.91m internal dia (at bottom) beyond 0.91 m to 1.67 m With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	5	M					
147	Constructing brick masonry circular manh Constructing brick masonry circular manhole 1.22m internal dia at bottom and 0.56m dia at top in cement mortar 1:4 (1 cement :4 coarse	7	EA					

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sand) inside cement plaster 12mm thick with cement mortar 1:3 (1 cement :3 coarse sand) finished with a floating coat of neat cement foundation concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40mm nominal size) and making necessary channel in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement, all complete as per standard design : 1.68 m deep with SFRC Cover and frame (heavy duty HD-20 grade designation) 560mm internal diameter conforming to I.S. 12592, total weight of cover and frame to be not less than 182kg. fixed in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) including							

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	centering, shuttering all complete. (Excavation, foot rests and 12 mm thick cement plaster at the external surface shall be paid for separately) : Withaid for separately): With common burnt clay F.P.S. (non modular) bricks							
148	Extra depth: Extra depth for circular type manhole 1.22m internal dia (at bottom) beyond 1.68 m to 2.29 m : With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	7	M					
149	Constructing brick masonry road: Constructing brick masonry road gully chamber 50x45x60cm with bricks in cement mortar 1:4 (1 cement : 4 coarse sand) including 500x450mm precast RCC horizontal grating with frame complete as per standard design. : With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	42	EA					

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150	<u>Extra for depth beyond 45 cm:</u> Extra for depth beyond 45 cm of brick masonry chamber : For 455x610 mm size : With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	3	M					
151	<u>Excavating trenches:</u> Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth upto 1.5 m including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : All kind of soils : Pipes, cables etc. exceeding 80 mm dia. but not exceeding 300 mm dia.	790	M					

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152	<u>Providing orange colour safety:</u> Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS : 10910 on 12mm dia steel bar conforming to IS : 1786 having minimum cross section as 23 mmx25mm and over all minimum length 263 mm and width as 165mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufacture's permanent identification mark to be visible even after fixing, including fixing in manholes	86	EA					

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	with 30x20x15 cm cement concrete block 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) complete as per design.							
153	<u>Earth work in excavation:</u> Earth work in excavation by mechanical means (hydraulic excavator) / manual means over areas (exceeding 30cm in depth. 1.5m in width as well as 10 sqm on plan) including disposal of excavated earth lead upto 50m and lift upto 1.5m, disposal earth to be levelled and neatly dressed. : All kinds of soil	107.00	M3					
154	<u>Filling available excavated earth:</u> Filling available excavated earth (excluding rock) in treanches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50m and lift upt 1.5m.	14.000	M3					

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155	<u>BOREHOLE FOR RAIN WATER HARVESTING:</u> Boring/drilling bore well of required dia for casing/ strainer pipe, by suitable method prescribed in IS:2800 (part I), including collecting samples from different strata, preparing and submitting strata chart/bore log, including hire & running charges of all equipments, tools, plants & machineries required for the job, all complete as per direction of Engineer-incharge, upto 90 metre depth below ground level. : All types of soil : 300 mm dia	200	M					
156	<u>BOREHOLE FOR RAIN WATER HARVESTING:</u> Supplying, assembling, lowering and fixing in vertical position in bore well, unplasticized PVC medium well casing (CM) pipe of required dia, conforming to IS:12818, including required hire and labour charges, fittings & accessories etc. all complete, for all depths,	150	M					

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	as per direction of Engineer -in-charge. : 150 mm nominal size dia							
157	<u>BOREHOLE FOR RAIN WATER HARVESTING:</u> Supplying, assembling, lowering and fixing in vertical position in bore well unplasticized PVC medium well screen (RMS) pipes with ribs, conforming to IS: 12818, including hire & labour charges, fittings & accessories etc. all complete, for all depths, as per direction of Engineer-in-charge. : 150 mm nominal size dia	50	M					
158	<u>BOREHOLE FOR RAIN WATER HARVESTING:</u> Providing and fixing bail plug/Bottom plug of required dia to the bottom of pipe assembly of tubewell as per IS:2800 (Part-I). : 150 mm dia	5	EA					
159	<u>PUMPING SYSTEM:</u> Providing, fixing, testing and commissioning of Vertical in line type pump set with SS casing, SS impeller and SS shaft suitable	2	EA					

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	for operation on 400/440 volts, 3 phase 2900 RPM, TEFC electric motor mounted on a common channel base plate with coupling guard, 150mm dia pressure gauge, GM isolation cock and cement concrete foundation with plaster complete as required. : Filter Feed pumps Pump capacity - 100 lpm Head - 20 m RPM - 2900							
160	<u>PUMPING SYSTEM:</u> Providing, fixing, testing and commissioning of Vertical in line type pump set with SS casing, SS impeller and SS shaft suitable for operation on 400/440 volts, 3 phase 2900 RPM, TEFC electric motor mounted on a common channel base plate with coupling guard, 150mm dia pressure gauge, GM isolation cock and cement concrete foundation with plaster complete as required. Treated water supply pumps Pump capacity - 150 lpm	2	EA					

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	Head - 45 m RPM - 2900							
161	<u>PUMPING SYSTEM:</u> Provding, installation, testing, and commissioning of Factory assembled skid mounted Variable Freqency Drive Hydropneumatic system comprising of following items. (RO water supply). 2 Nos. Vertical in line pumps complete in SS coupled with TEFC motor Pump capacity - 100 lpm Head - 45 m RPM - 2900 1 No. 200 litres vessels with inter changeable butyl rubber membrane. 1 No. Variable speed drive Electric control panel with controller relays, sequence timer for alternate operation of pumps, electrical wiring, cabling from panel to pumps, level controller complete with all accessories as per manufacturer specifications. Accessories like butterfly valves,	1	SET					

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	NRV's on suction and discharge, pressure gauge suction, discharge header, PRV and base frame etc., complete as required.50mm dia Flow meter at outlet of hydropneumatic system.Hydropneumatic system as described above.							
162	PUMPING SYSTEM: Providing, fixing and commissioning non clog type stainless Steel mono block submersible drainage pumps suitable for handling solids of 32 mm size with totally water and dust proof motor : Capacity 100 lpm	2	EA					
163	PUMPING SYSTEM: Providing, fixing and commissioning non clog type stainless Steel mono block submersible drainage pumps suitable for handling solids of 32 mm size with totally water and dust proof motor : Capacity 300 lpm & Head 10m (in basement drainage)	4	EA					

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164	<u>PUMPING SYSTEM:</u> Providing, fixing and commissioning non clog type stainless Steel mono block submersible drainage pumps suitable for handling solids of 32 mm size with totally water and dust proof motor : Capacity 500 lpm & Head 10m (in basement ramp area)	2	EA					
165	<u>PUMPING SYSTEM:</u> Providing and fixing Transistorised liquid level controllers with low voltage Relays and Seamless Steel probes and PVC shroud, including necessary wiring and conduiting from probes to display panel/motor control panels and to provide Audible Alarm for low level for each underground tank. (The cost of all required cabling from probes to Motor control panels to be including in the rate).	1	SET					

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	For Domestic Filter feed pumps To start domestic filter feed pumps at low water level in domestic treated under ground tank and stop at high water level in domestic treated tank and stop at low water level in domestic raw water tank.							
166	<u>PUMPING SYSTEM:</u> Providing and fixing Transistorised liquid level controllers with low voltage Relays and Seamless Steel probes and PVC shroud, including necessary wiring and conduiting from probes to display panel/motor control panels and to provide Audible Alarm for low level for each underground tank. (The cost of all required cabling from probes to Motor control panels to be including in the rate). For Domestic Treated water supply pumps	1	SET					

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	To start pump at low water level in overhead tank and stop at high water level in overhead tank and low water level in under ground tank.							
167	<u>PUMPING SYSTEM:</u> Supply, installation, testing and commissioning of dust, damp and vermin proof, free floor standing factory built sheet steel enclosed nondrawout modular panel for water supply pumps, fabricated out of suitable sized square tubular section and covered with 2.0mm thick CRCA sheet, hinged doors of 2mm thick CRCA sheet, duly painted complete with earth bus, necessary metering protections & indications and mounted with the following including all inter connection etc. (Including earthing). a) One No. 100 amps TP incoming MCCB complete with the following:	1	EA					

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i)1 No. 0-500 volts 96x96 sq. mm ammeter with selector switch and fuses. (1 set). ii)1 No. 0-150 amps 96x96sq.mm ammeter with 60/5 amps ratio CT's and selector switch. iii)Over voltage and under voltage tripping machanism for persistent voltage fluctuations of more than ±10% of the rated voltage for more than 5 minutes. (1set) iv)Phase indicating lamps with toggle switches. v)Indication lamps for ON/OFF/TRIP status of motors. b)Aluminium bus bar of 150 amps for three phase and neutral. C)Outgoing Feeders/Starters. i)16 amps TPN MCB with DOL starter each suitable 1 HP filter feed pumps (2 Nos). ii)16 amps TPN MCB with DOL starter each suitable for 4 HP for domestic water supply (2 Nos).							

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iii)16 amps TPN MCB each suitable for 3 HP hydropneumatic pumps panel for RO water supply pumps (1 Set) iv)16 amps TPN MCB each suitable for 3 HP RO Plant (1 Set) v)16 amps TPN MCB each suitable for 5 HP drainage pumps panel in pumproom (1 Set). vi)16 amps TPN MCB each suitable for 2 HP drainage pumps panel in barement (2 Sets). vii)16 amps TPN MCB each suitable for 5 HP drainage pumps panel in basement ramp area (1 Set). viii)10 amps TPN MCB with selector swiitch for 60 Watt metering pump ix)Rotary manual/auto/off switch. (4 Nos.) X) Spares a)16 amps TPN MCB - 2 Nos. b)32 amps TPN MCB - 2 Nos. xi) Notes: a)All switch gear/panels shall							

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be suitable for 10 KA rating. b)All outgoing will have 96 sq. mm size ammeter and CT. c)All starter will have spare 10 amps 230 V coil auxiliary contractor for building Automation system. d)All starter units for pumps to be provided with 3 level liquid level contractor. e)Lamps. f)All pumps to be provided with duty selector switch. g)All pumps to be provided with sequence timer 220/440 V AC/DC and alternate working of pumps between 6 to 8 hours or alternate use of pumps after one service in sequence. h)All pumps to be provided with over load relay. i)All starter to be provided with single phase preventor. j)Necessary cable alleys for space switches, level controller internal wiring and copper earthing of all							

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	equipment shall also be included. All switch gears/control gears shall be motor duty rating.							
168	<u>PUMPING SYSTEM:</u> Providing and fixing wall mounted dust and vermin proof motor control panels outdoor type fabricated from 2.0mm thick CRCA sheet with stove enamelled paint and comprising of the following: (For drainage pumps in pump room & basement). a) 16 amps incoming MCB (1 No.) b) Fully tapped Copper bus bar of suitable capacity. (1set) c) Panel type volt meter 96mm square with Rotary selection switch for reading voltage between phase and neutral or incoming feeder. (1 set) d) Phase indicating lights with toggle switches and shall be protected by 2 amps MCB's. (2 sets) e) Ampere meter 96mm square	4	SET					

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	panel type of appropriate range. (1 set) f) 16 amps outgoing MCB (2 Nos.) g) Fully automatic DOL starters with push buttons indicating lights and overload relay each for drainage pump. (2 Nos.) h) Single phasing preventors. (2 Nos.) i) Rotary manual/auto/off switch. (2 Nos.) j) Space of one liquid level controller							
169	<u>PUMPING SYSTEM:</u> Supplying and laying the PVC insulated & sheathed FRLS Armoured cables of 1.1 K.V. Aluminium Conductor including supplying and making and termination with brass compression glands: 3 x 4 sq.mm	280	M					
170	<u>PUMPING SYSTEM:</u> Supplying and laying the PVC insulated & sheathed FRLS Armoured cables of 1.1 K.V. Aluminium Conductor including supplying and making and	35	M					

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	termination with brass compression glands:3 x 6 sq.mm							
171	PUMPING SYSTEM: Supplying and installation following size of perforated pre painted M.S. cable trays with perforation not more than 17.5%, in convenient sections, joint with horizontal and vertical bends, reducers, tees, cross members and other accessories as required and duly suspended from the ceiling with M.S. suspenders etc. as required. : 150mm width x 50mm depth x 1.6 mm thickness.	30	M					
172	WATER TREATMENT SYSTEM: Providing and fixing skid mounted vertical MSRL Dual Media pressure filter fabricated from IS 226/2062 plate 5mm thick for shell and 6mm thick M.S. plate for dished ends complete with initial charge of filter media, face	1	EA					

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	piping and valves accessories, painting, testing and commissioning complete. For Domestic water supply Capacity 6000 lph. Working pressure 2.5 kg./cm2 Flow velocity: 15m3/hr/m2 Design pressure 4 kg./cm2							
173	<u>Providing and fixing skid mounted:</u> Providing and fixing skid mounted vertical MSRL Activated carbon filter fabricated from IS 226/2062 plate 5mm thick for shell and 6mm thick M.S. plate for dished ends complete with initial charge of filter media, face piping and valves accessories, painting, testing and commissioning complete. For Domestic water supply Capacity 6000 lph. Working pressure 2.5 kg./cm2 Flow velocity: 15m3/hr/m2 Design pressure 4 kg./cm2	1	EA					
174	<u>Providing and fixing bulk water meter:</u>	2	EA					

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	Providing and fixing bulk water meter with direct reading dial in KL, all internal parts and strainer in gun metal/brass. : 50mm dia							
175	<u>Providing and fixing direct reading:</u> Providing and fixing direct reading rate of flow Rota Meter : For 50mm dia for 6000 lph rate of flow for filter & softner	2	EA					
176	<u>Supply, assembly, erection, testing:</u> Supply, assembly, erection, testing and commissioning of chlorinator with metering pump suitable for operation on 220 ± 5% single phase, 50 Hz AC supply, compete in all respects. : Suitable for flow rate 0 -6 lph	1	EA					
177	<u>Providing and fixing in position:</u> Providing and fixing in position the industrial type pressure gauges with gun metal / brass valves complete as required	2	EA					

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178	<u>SUCTION AND DELIVERY PIPES AND VALVES:</u> Providing and fixing G.I. suction & delivery headers/pipes for water supply pumps (IS:1239 heavy class) with G.I. Fittings (bends, tees, reducers, plugs, union, flange & blank flanges etc) and clamps and jointing with teflon tape or hold tite including chase cutting and making good the walls, floors etc. wherever required. : 50 mm nominal bore	80	M					
179	<u>Providing and fixing G.I. suction & delivery:</u> Providing and fixing G.I. suction & delivery headers/pipes for water supply pumps (IS:1239 heavy class) with G.I. Fittings (bends, tees, reducers,plugs, union, flange & blank flanges etc) and clamps and jointing with teflon tape or hold tite including chase cutting and making good the walls, floors etc. wherever required. : 65 mm nominal bore	15	M					

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180	<u>Providing and fixing G.I. suction & delivery:</u> Providing and fixing G.I. suction & delivery headers/pipes for water supply pumps (IS:1239 heavy class) with G.I. Fittings (bends, tees, reducers, plugs, union, flange & blank flanges etc) and clamps and jointing with teflon tape or hold tite including chase cutting and making good the walls, floors etc. wherever required. :80 mm nominal bore	60	M					
181	<u>Providing and fixing G.I. suction & delivery:</u> Providing and fixing G.I. suction & delivery headers/pipes for water supply pumps (IS:1239 heavy class) with G.I. Fittings (bends, tees, reducers,plugs, union, flange & blank flanges etc) and clamps and jointing with teflon tape or hold tite including chase cutting and making good the walls, floors etc. wherever required. :	25	M					

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	100 mm nominal bore							
182	Painting for G.I. Pipes: Painting for G.I. Pipes with two or more coats of synthetic enamel paint of approved quality and shade over a coat of approved primer coat as directed including surface preparation (Shade as per pipe colour code) : 50 mm nominal bore	80	M					
183	Painting for G.I. Pipes: Painting for G.I. Pipes with two or more coats of synthetic enamel paint of approved quality and shade over a coat of approved primer coat as directed including surface preparation (Shade as per pipe colour code) :65 mm nominal bore	15	M					
184	Painting for G.I. Pipes: Painting for G.I. Pipes with two or more coats of synthetic enamel paint of approved quality and shade over a coat of approved primer coat as directed including surface preparation (Shade as per pipe colour code)	60	M					

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	:80 mm nominal bore							
185	<u>Painting for G.I. Pipes:</u> Painting for G.I. Pipes with two or more coats of synthetic enamel paint of approved quality and shade over a coat of approved primer coat as directed including surface preparation (Shade as per pipe colour code) :100 mm nominal bore	25	M					
186	<u>Providing and fixing gunmetal horizontal:</u> Providing and fixing gunmetal horizontal Non-Return Valve with flanged ends tested to 20 kg/cm2. : 50mm dia	6	M					
187	<u>Supplying, fixing, testing and:</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications. : BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O-	2	EA					

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	Ring PN 16 pressure rating for chilled water/ hot eater circulation as specified : 100mm dia							
188	<u>Supplying, fixing, testing and</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications. : BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O-Ring PN 16 pressure rating for chilled water/ hot eater circulation as specified : 80 mm dia	6	EA					
189	<u>Supplying, fixing, testing and</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and	4	EA					

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	adequately supported as per specifications. : BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/ hot eater circulation as specified : 65 mm dia							
190	<u>Supplying, fixing, testing and</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications. : BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/ hot eater circulation as specified : 50 mm dia	9	EA					
191	<u>NON - RETURN VALVE with</u> <u>duel plate</u> NON - RETURN VALVE with	2	EA					

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	duel plate of C I body SS plates vulcanized NBR seal flanged end & PN 16 pressure rating for chilled / hot water circulation including insulation as specified. : 100mm dia							
192	<u>NON - RETURN VALVE with duel plate:</u> NON - RETURN VALVE with duel plate of C I body SS plates vulcanized NBR seal flanged end & PN 16 pressure rating for chilled / hot water circulation including insulation as specified. : 80mm dia	4	EA					
193	<u>Y - STRAINER of Ductile CI Body flanged</u> Y - STRAINER of Ductile CI Body flanged ends with stainless steel strainer for chilled / hot water circulation including insulation as specified. : 65mm dia	4	EA					
194	<u>REVERSE OSMOSIS PLANT:</u> Providing, fixing, testing, and commissioning of 300 lph capacity Reverse Osmosis Plant comprising of all equipments & accessories as	1	SET					

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per specifications and all necessary inter connecting pipe work and The RO plant in general shall comprises the following equipment and accessories. a) Multigrade Filter - 1 No. b) Activated carbon filter - 1 No. c) Antiscalent dosing system-1 No. d) High pressure pump - 2 Nos. (1W + 1S) e) RO skids for 600 lph plant with accessories f) PH correction System – 1 No. g) Instrument panel – 1 No. h) Conductivity indicator - 1 No. i) PH indicator - 1 No. j) Flow indicator - 2 Nos. k) Pressure Indicator - 7 Nos. l) Pressure switches - 2 Nos. m) Electric Power Panel – 1 Set. n) All inter connecting pipe work and valves – 1 Lot. o) Memberane cleaning system – 1 No. p) S.S vertical RO water storage tank (Capacity 1000 Ltrs.) suitable for 2.5 Kg/Scm operating pressure and							

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test pressure of 5 Kg/Scm. The tank shall have thickness of 4 mm and Dished end thickness of 6 mm. Tank shall be fabricated with all necessary mountings and accessories with valves and Provision for inlet/outlet, drain, overflow, manhole, air vent system. q) Drainage arrangement for disposal of rejected water from RO system Including making connection with the nearest drain r) All foundations for electrical & mechanical equipment. s) Any other item required for satisfactory completion of work. t) Recommended spares for 2000 hours of normal operation - 1 lot. All piping works and associated valves including supports, valve chambers and manholes etc. All mechanical and electrical							

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	works including motor control panels, cables etc. connected with the plant. All RCC and Masonry works related with Reserve Osmosis plant and related foundation works for electrical mechanical equipment. Any other work necessary for satisfactory performance of the system.							
195	<u>SEWAGE TREATMENT PLANT OF CAP. = 50 KLD</u> Supply, erection, testing and commissioning of sewage treatment plant based on SBR technology for the following: Daily Avg. Sewage : 50m3/day PH : 6.5 - 8.5 BOD : 350 mg/l S. Solids : 250- 300 mg/l COD : 500- 800 mg/l Oil & grease : < 50 mg/l Coliform : 106 - 107 counts / 100 ml Effluent discharge standard after treatment: Conforming to requirement	1	EA					

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	approved standards PH : 6.5 - 7.5 BOD 5 : <10 PPM S. Solids : < 20 mg/l COD : < 50 PPM Oil & grease : < 10 mg/l NH4-N : 5 PPM N-Total : 10 PPM Coliform : < 100 counts / 100 ml Sewage treatment plant shall include supply erection, testing & commissioning of the following items: Manual Bar screen (SS-304) for 50m3/day at the inlet of receiving sump. Suitable for 50 m3/day.							
196	Sewage lifting pum: Sewage lifting pumps: Centrifugal type, non clog self priming pumps complete with suction and delivery valves and non return valves, suction and delivery headers of an approved make of capable of handling minimum 7 to 9 mm solids size for untreated effluent with fan cooled	2	EA					

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	induction motor with class 'B' insulation, mounted on a common structural base plate, suitable vibration eliminated pads of approved design for pump foundation, motor to be suitable for 400/440 volts, 3 phase, 50 cycles AC supply with rpm, to suit the corresponding pumps. Capacity 12m3/hr at 10m head (For sewage lifting from equalization tank).							
197	Sludge transfer pumps: Sludge transfer pumps: Centrifugal type, non clog self priming pumps complete with suction and delivery valves and non return valves,suction and delivery headers of an approved make of capable of handling minimum 7 to 9 mm solids size for untreated effluent with fan cooled induction motor with class 'B' insulation, mounted on a common structural base plate, suitable vibration	2	EA					

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	eliminated pads of approved design for pump foundation, motor to be suitable for 400/440 volts, 3 phase, 50 cycles AC supply with rpm, to suit the corresponding pumps. Capacity 2.0m3/hr at 10m head (For transfer of sludge)							
198	Submersible drinage pumps: Submersible drinage pumps: Providing, fixing and commissioning non clog type stainless Steel mono block submersible drainage pumps suitable for handling solids of 12 mm size with totally water and dust proof motor. : Capacity 18m3/hr at 15m head (For drainage lifting from drainage sump)	2	EA					
199	Air Blowers: Air Blowers: Twin lobe positive displacement type, rotary air blowers of suitable type with V-belt drive,belt guard, base plate, inlet filter-silencer, flexible connectors, check valve, relief valve, pressure gauge	2	EA					

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	and piping. : Capacity-80m3/hr @ 5000 MMWG							
200	Air Grid: Air Grid in SS for equilisation tank, SBR tank & sludge holding tank.	1	LOT					
201	Supply, installation, testing & commission: Supply, installation, testing & commissioning of Floating type SBR Decanter with SS304 baloons to suit SBR tank with MOC SS-304 with guide rail, food grade breaded water pipes and connected through ultrasonic level transmitter & ultrasonic level element for automatic control, 1 No. DO Metre, 1 No. Ultrasonic Level transmitter, etc. complete as required.	1	SET					
202	Supply, installation, testing & commissioning Supply, installation, testing & commissioning of Hydraulic operated Filter press of plate size 18"x18" with 24 number of plates, including sludge collection	1	EA					

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	tray.							
203	Filter press feed screw pumps: Filter press feed screw pumps of an approved makes complete with suction and delivery valves and non return valves,suction pipes and delivery pipes headers capable of handling sludge complete with motor & mounted on structrural base plate with pressure guage with isolation cable. : Capacity 2.0m3/hr at 40m head.	2	EA					
204	Filter Feed pumps: Filter Feed pumps: Centrifugal type, monoblock pumps complete with valves, suction and delivery header of an approved make of suitable capacity for treated effluent mounted on a base plate, suitable vibration eliminated pads of approved design for pump foundation, motor to be suitable for 400/440 volts, 3 phase, 50 cycles AC supply with rpm, to suit the corresponding	2	EA					

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	pumps. 2 nos (1w+1s). Capacity 10m3/hr at 25m head.							
205	<u>Softener Feed pumps:</u> Softener Feed pumps: Centrifugal type, monoblock pumps complete with valves, suction and delivery header of an approved make of suitable capacity for treated effluent mounted on a base plate, suitable vibration eliminated pads of approved design for pump foundation, motor to be suitable for 400/440 volts, 3 phase, 50 cycles AC supply with rpm, to suit the corresponding pumps. 2 nos (1w+1s). : Capacity 4m3/hr at 25m head.	2	EA					
206	<u>Vertical, MSRL, filter:</u> Vertical, MSRL, filter: Supply, installation, testing & commissioning of vertical MSRL filter Fabricated from IS:226/2062 plate 5mm thick for shell and 6mm thick M.S. plate for dished ends complete with initial	1	SET					

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	charge of filter media, face piping and valves accessories, painting, testing and commissioning complete. Capacity : 10m3/hr Flow velocity: 15m3/hr/m2 Working pressure : 2.5kg/cm2 Design pressure: 4 kg./cm2							
207	<u>Vertical, MSRL, activated carbon filter:</u> Vertical, MSRL, activated carbon filter: Supply, installation, testing & commissioning of vertical MSRL activated carbon filter Fabricated from IS:226/2062 plate 5mm thick for shell and 8mm thick M.S. plate for dished ends complete with initial charge of filter media, face piping and valves accessories, painting, testing and commissioning complete. Iodide value of carbon = 1000 Capacity : 10m3/hr Flow velocity: 15m3/hr/m2 Working pressure : 2.5kg/cm2	1	SET					

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	Design pressure: 4 kg./cm2							
208	<u>Providing and fixing skid mounted MSRL,:</u> Providing and fixing skid mounted MSRL, “Cation” ION Exchange water softener fabricated from IS 226/2062 plate 6mm thick for shell and 5mm thick for dished ends complete with MSRL tanks for salt mixing, brine & brine saturation, initial charge of ION Exchange resins face piping and valves, hydraulic brine injection assembly with hose pipes,accessories, painting, testing and commissioning complete. Capacity : 4m3/hr Total hardness = (as per tubewell water at site) OBR = 40000 ltrs, working pressure = 2.5 g./cm2 Working pressure 2.5 kg./cm2 Design pressure 4 kg./cm2	1	SET					
209	<u>UV system complete in:</u> UV system complete in SS 316 internals with monitoring system suitable for flow rate of	1	EA					

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	10.0m3/hr.							
210	<u>Chlorinator Supply, assembly, erection,:</u> Chlorinator Supply, assembly, erection, testing and commissioning of chlorinator with metering pump suitable for operation on 220 ± 5% single phase, 50 Hz AC supply, compete in all respects complete with 100 litres HDPE tank.	1	SET					
211	<u>Supply, installation, testing & commissioning:</u> Supply, installation, testing & commissioning of Centrifugal type, monoblock, self priming pumps with bronze in impeller of an approved make and complete with with suction and delivery valves and non return valves,suction and delivery headers capable of handling clear water complete with fan cooled induction motor with class B insulation, mounted on a common structural base plate with	2	EA					

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	100mm dia pressure gauge with gunmetal isolation cock and suitable vibration elimination pads of approved design for pump foundation. Motor to be suitable for 400/440 volts, 3 phase, 50 cycle AC supply with rpm, to suit the corresponding pumps. Irrigation water supply pumps Capacity 6m3/hr Head 45m RPM 2900							
212	<u>Supply, installation, testing & commissioning:</u> Supply, installation, testing & commissioning of Centrifugal type, monoblock, self priming pumps with bronze in impeller of an approved make and complete with with suction and delivery valves and non return valves,suction and delivery headers capable of handling clear water complete with fan cooled induction motor with class B insulation,mounted on	2	EA					

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	a common structural base plate with 100mm dia pressure gauge with gunmetal isolation cock and suitable vibration elimination pads of approved design for pump foundation. Motor to be suitable for 400/440 volts, 3 phase, 50 cycle AC supply with rpm, to suit the corresponding pumps. - Flushing water supply pumps Capacity 6m3/hr Head 45m RPM 2900							
213	<u>Supply, installation, testing & commissioning:</u> Supply, installation, testing & commissioning of Centrifugal type, monoblock, self priming pumps with bronze in impeller of an approved make and complete with with suction and delivery valves and non return valves,suction and delivery headers capable of handling clear water complete with fan	2	EA					

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	cooled induction motor with class B insulation, mounted on a common structural base plate with 100mm dia pressure gauge with gunmetal isolation cock and suitable vibration elimination pads of approved design for pump foundation. Motor to be suitable for 400/440 volts, 3 phase, 50 cycle AC supply with rpm, to suit the corresponding pumps. HVAC makeup soft water supply pumps Capacity 6m3/hr Head 45m RPM 2900							
214	<u>Supplying, installing, testing and commissioning:</u> Supplying, installing, testing and commissioning of UF System piping and valves with all the required accessories & chemical cleaning system, complete in all respects & comprising the following: a) UF Module (Hollow Fibre-	1	SET					

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outside in type porocity 0.1 to 0.01 micron) including micron cartridge filter in PP housing, Pneumatic Valve, PLC Electrical Panel, flow meter, compressor and all other accessories making the system complete. Flow rate : 4cum/hr Output Inlet TSS :- 10-30 mg/lt Filtration Flux :- 40 lt/m2/hr Membrane Area - 55-75 M2 as per approved makes Membrane MOC - PVDF Membrane Type :- Pressure Feed Mambrane 25 micron cartridge type, Out to in process No. of UF Membrane - 1 Number b) UF Feed Pumps 2 Nos. (1W+S) 4m3/hr each 20-25m head. c) UF pre fine filtration d) UF Backwash pumps with Complete SS-304 with motor, pressure gauge with isolation cock, Isolation valve, NRV on delivery line. Isolation valve, strainer							

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	C 3e) Chlorine dosing system/ (S) f) CEB / CIP dosing station including dosing tank & pumps etc. g) PLC control panel with all automation required like Pneumatic valves, piping in UPVC PLC and other required accessories. PLC will have provision of automation of SBR function along with required timer interlock							
215	Electrical panel: Electrical panel: Dust, damp and vermin proof, free floor standing factory built sheet steel enclosed nondrawout modular panel for sewage treatment plant, fabricated out of suitable sized square tubular section and covered with 2.0mm thick CRCA sheet, hinged doors of 2mm thick CRCA sheet, duly painted complete with earth bus, necessary metering protections & indications and	1	EA					

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	mounted with the following including all inter connection etc. (Including earthing). (Indoor type) Switch gear for pumps & equipments indicated above and required for STP shall be included in the panel. The agency shall provide 2 Nos. spares outgoing with 16 Amps & 32 Amps outgoing. The agency shall submit shop drawing of SLD, fabrication details indicating all switch gears, bill of materials & makes of switch gears of panel before placing order of panel for approval.							
216	<u>Pipe lines and valves:</u> Pipe lines and valves: CPVC / SS pipes complete with all valves & fittings e.g. tees, crosses, plugs, sockets, elbows, reducers, supports and clamps, etc., cutting chases complete as per Note:	1	LOT					

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	All exposed pipes shall be CPVC pipes (SDR 11 grade ASTM D-2846) for pipes upto 50 mm NB & for 65 NB & above (SCH-40 ASTM F-441) All submerged pipes in tanks shall be SS-304 grade.							
217	<u>Instrumentation comprising of the followi:</u> Instrumentation comprising of the following items. a) Digital energy meter in the electrical panel - 1no. b) At Inlet of sewage & Outlet of treated water magnetic flow meter - 4 each c) pH meter - 1 no. d) Level switches for auto operation of the system- 1 lot	1	LOT					
218	<u>Approval: Contractor to provide:</u> Approval: Contractor to provide adequacy report consisting of inlet and outlet test reports, report/drawings as per pollution board requirement. Contractor shall include the cost of all chemicals	1	JOB					

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	consumed during testing and commissioning and the cost of such items of works, which are not explicitly mentioned above. All required statutory approvals shall be included in the rates.							
219	Opertaion & Maintenance contract of STP Opertaion & Maintenance contract of STP for a period of one year after completion of one year defect liability period after commissioning. All spares and replacement of any defective part shall be included in the contract. SEWAGETREATMENTPLANTOFCAP. = 50 KLD	1	JOB					
TOTAL (GROUP B) WITHOUT GST =								
TOTAL (GROUP B) WITH GST =								
<u>GROUP C- FIRE FIGHTING WORKS</u>								
SL.N O.	DESCRIPTION OF WORK	QTY (A)	UNIT	RATE PER UNIT (IN WORDS & FIGURES)		TOTAL AMOUNT	SERVICE ACCOUNTI	SPECI FY %

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				(B)		C=(AXB)	NG CODE (SAC)	OF GST ON (C)
				FIGURES	WORDS			
1	<u>INTERNAL & EXTERNAL FIRE HYDRANT:</u> Above ground Piping: Supplying, installing and testing & commissioning above ground Mild Steel Pipe of Heavy class ERW of following sizes conforming to IS 1239 & IS 3589 with one coat of zinc Chromite primer & two coats of fire red enamel paint as per IS-5 Shade 536, etc. as per specifications. along with necessary fittings (elbows, tees, reducers,bends, u clamps, beam clamps and adoptor, anchor fastner, GI/MS rods, flats,nuts washers, threaded rod etc to complete the requirement) painted with enamel paint, pipes to be duly tested to 1.5 times of working pressure, in an approved manner as per given drawings, specifications and instruction of	260	M					

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	the engineer in charge. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. :- 150 mm dia							
2	Above ground Piping: Above ground Piping: Supplying, installing and testing & commissioning above ground Mild Steel Pipe of Heavy class ERW of following sizes conforming to IS 1239 & IS 3589 with one coat of zinc Chromite primer & two coats of fire red enamel paint as per IS-5 Shade 536, etc. as per specifications. along with necessary Fittings (elbows, tees, reducers,bends, u clamps, beam clamps and adaptor,anchor fastner, GI/MS rods, flats,nuts washers, threaded rod etc to complete the requirement) painted with enamel paint, pipes to be duly tested to 1.5 times of working pressure, in an approved manner as per given drawings, specifications and	170	M					

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	instruction of the engineer in charge. Fittings shall be SOCKET WELDTYPE upto 50 mm and butt weld type for 65 mm & above. :-100 mm dia							
3	Above ground Piping: Above ground Piping: Supplying, installing and testing & commissioning above ground Mild Steel Pipe of Heavy class ERW of following sizes conforming to IS 1239 & IS 3589 with one coat of zinc Chromite primer & two coats of fire red enamel paint as per IS-5 Shade 536, etc. as per specifications. along with necessary fittings (elbows, tees, reducers,bends, u clamps, beam clamps and adaptor,anchor fastner, GI/MS rods, flats,nuts washers, threaded rod etc to complete the requirement) painted with enamel paint, pipes to be duly tested to 1.5 times of working pressure, in an approved manner as per given drawings, specifications and	50	M					

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	instruction of the engineer in charge. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. :-80 mm dia							
4	Above ground Piping: Above ground Piping: Supplying, installing and testing & commissioning above ground Mild Steel Pipe of Heavy class ERW of following sizes conforming to IS 1239 & IS 3589 with one coat of zinc Chromite primer & two coats of fire red enamel paint as per IS-5 Shade 536, etc. as per specifications. along with necessary fittings (elbows, tees, reducers,bends, u clamps, beam clamps and adoptor,anchor fastner, GI/MS rods, flats,nuts washers, threaded rod etc to complete the requirement) painted with enamel paint, pipes to be duly tested to 1.5 times of working pressure, in an approved manner as per	40	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	given drawings, specifications and instruction of the engineer in charge. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. :-25mm dia							
5	Under Ground Piping : Under Ground Piping : Supplying, installing and testing & commissioning MS Pipe of Heavy class ERW of following sizes conforming to IS 3589 with all accessories like fittings including tees,elbows,reducers,union,flanges, nuts bolts etc including excavation in all kinds of soil and refilling including bed preparation the trench all complete. Pipes to be laid underground in 1 mtr below from ground including concrete anchor blocks (thrust block) at all change in direction of pipeline and also near each joints complete as required as per	540	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	approved layouts or as instructed by engineer in-charge. Pipes to be duly tested to 1.5 times of working pressure, in an approved manner as per given drawings ,specifications and instruction of the engineer in charge including protection of pipes by wrapping and coating with 4 mm thick tape as per IS:10221 complete as required as per approved layouts or as instructed by engineer incharge in line with the specifications. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. : 150 mm dia							
6	Under Ground Piping : Under Ground Piping : Supplying, installing and testing & commissioning MS Pipe of Heavy class ERW of following sizes conforming to IS 3589 with all accessories like fittings including tees,elbows, reducers,union,flanges, nuts	100	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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bolts etc including excavation in all kinds of soil and refilling including bed preparation the trench all complete. Pipes to be laid underground in 1 mtr below from ground including concrete anchor blocks (thrust block) at all change in direction of pipeline and also near each joints complete as required as per approved layouts or as instructed by engineer in-charge. Pipes to be duly tested to 1.5 times of working pressure, in an approved manner as per given drawings ,specifications and instruction of the engineer in charge including protection of pipes by wrapping and coating with 4 mm thick tape as per IS:10221 complete as required as per approved layouts or as instructed by engineer incharge in line with the specifications. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. :100 mm dia								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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7	Under Ground Piping : Under Ground Piping : Supplying, installing and testing & commissioning MS Pipe of Heavy class ERW of following sizes conforming to IS 3589 with all accessories like fittings including tees,elbows,reducers,union,flan ges, nuts bolts etc including excavation in all kinds of soil and refilling including bed preparation the trench all complete. Pipes to be laid underground in 1 mtr below from ground including concrete anchor blocks (thrust block) at all change in direction of pipeline and also near each joints complete as required as per approved layouts or as instructed by engineer in-charge. Pipes to be duly tested to 1.5 times of working pressure, in an approved manner as per given drawings	35	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	,specifications and instruction of the engineer in charge including protection of pipes by wrapping and coating with 4 mm thick tape as per IS:10221 complete as required as per approved layouts or as instructed by engineer incharge in line with the specifications. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. :80 mm dia							
8	<u>Providing and fixing GM Single Headed Hy:</u> Providing and fixing GM Single Headed Hydrant Valves with flanged inlet 63 mm female instantaneous outlet of ss complete with blank cap and chain IS:5290 marked.	44	EA					
9	<u>Providing and fixing 63 mm dia 15m:</u> Providing and fixing 63 mm dia 15m long EPDM lined fabric lined Hose including GM male and female instantaneous type coupling approved by fire authority, machine wound with copper	80	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	wire complete in all respects. Hose shall conform to IS 636 TypeII and coupling.							
10	<u>Providing and fixing standard short size:</u> Providing and fixing standard short size GM Branch Pipe with GM nozzle 20 mm dia outlet with standard instantaneoustype 63 mm dia coupling. (ISI marked).	40	EA					
11	<u>Providing and fixing first aid fire Hose:</u> Providing and fixing first aid fire Hose Reel drum wall mounting, swinging type fitted with 20 mm dia 30 m long high pressure hose to I.S. 5132 with 5 mm outlet GM nozzle with shut off valve (I.S. 884-1969). Name of Manufacturer should be embossed on the drum including 25mm dia MS 'C' class pipe tapping from main riser pipe. (Cost of 25mm dia MS 'C' class pipe shall be included in the rate).	32	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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12	<u>Providing and making Drainage Provision:</u> Providing and making Drainage Provision for the risers with necessary 40 mm dia pipe, ball valve etc as required. Maximum length of pipe shall be 6 M. (For fire down comer)	7	EA					
13	<u>Providing and fixing 6 mm thick stainless:</u> Providing and fixing 6 mm thick stainless steel Orifice Flange 100 mm dia mm of orifice size as per table 32 & 33 of IS code 15105:2002 to restrict the pressure to 3.5 kg per sq cm at the point of branching off from Riser on lower floors.	16	EA					
14	<u>Providing and fixing 25 mm dia:</u> Providing and fixing 25 mm dia screwed inlet forged brass Single Acting Air Valves connected with ball valve on inlet side at top of the Risers.	4	EA					
15	<u>Providing and fixing door with</u>	64	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	frame : Providing and fixing door with frame for all internal fire hydrants fabricated from 16 gauge CRCA M.S. sheet double door including 2 nos allen key lock for locking along with padlock arrangement & fully glazed with 5 mm thick float glass approved by local Fire Authority, stove enameled fire red finish with " fire hose' written on front with radium strip suitable to house 15 mm long four length of canvas hose with couplings, one no of branch pipe, one fire mans axe and two numbers of portable extinguishers, first aid fire hose and supports for hoses, branch pipes, Axe and hose reel. as per approved design including necessary fixing arrangement for hoses & axe and branch pipe.).							
16	<u>Providing and fixing fire hose cabinet :</u> Providing and fixing fire hose cabinet fabricated from 16 gauge M.S.sheet with locking	8	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	arrangement and hanging arrangement for accessories painted "Fire Red" with Stove enameled paint "Fire Hose" written on front including suitable supports to place 900 mm above ground level properly anchored, approximately size 750x600x250 mm deep (to house two lengths of canvas hose with couplings, branch pipe with nozzle for external hydrants)							
17	<u>Supplying, fixing, testing and commission:</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications. BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot eater	3	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	circulation as specified : 150 mm dia							
18	<u>Supplying, fixing, testing and commission:</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications. BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot water circulation as specified : 100 mm dia	2	EA					
19	<u>Supplying, fixing, testing and commission:</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per	40	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	specifications. BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot eater circulation as specified : 80 mm dia							
20	<u>Supplying, fixing, testing and commission:</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications. NON - RETURN VALVE with dual plate of C I body SS plates vulcanized NBR seal flanged end & PN 16 pressure rating for chilled / hot water circulation including insulation as specified. : 150 mm dia	4	EA					
21	<u>Supplying, fixing, testing and commission:</u> Supplying, fixing, testing and	2	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications. NON - RETURN VALVE with dual plate of C I body SS plates vulcanized NBR seal flanged end & PN 16 pressure rating for chilled / hot water circulation including insulation as specified. : 100 mm dia							

22	<u>Providing and fixing in position the ind:</u> Providing and fixing in position the industrial type Pressure Gauges with gun metal / brass valves complete as required	36	EA					
23	<u>Providing and fixing standard Fireman's:</u> Providing and fixing standard Fireman's Axe with heavy .insulated rubber handle.	32	EA					
24	<u>Providing and fixing Four Way:</u>	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Providing and fixing Four Way Fire Brigade Inlet to Hydrant outside the Building with Butterfly valve and non return valve complete in all respects. (Butterfly valve & Non return valve shall paid seperately). : 150 mm dia							
25	<u>Constructing masonry Chamber 90x90x100:</u> Constructing masonry Chamber 90x90x100 cm inside, in brick work in cement mortar 1:4 (1 cement : 4 coarse sand) for sluice valve, with C.I. surface box 100 mm top diameter, 160 mm bottom diameter and 180 mm deep (inside) with chained lid and RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse	2	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	sand) 12 mm thick, finished with a floating coat of neat cement complete as per standard design : With common burnt clay F.P.S (non modular) bricks of class designation 7.5							
26	<u>SPRINKLER SYSTEM/Above ground Piping::</u> Above ground Piping: Supplying, installing and testing & commissioning above ground Mild Steel Pipe of Heavy class ERW of following sizes conforming to IS 1239 & IS 3589 with one coat of zinc Chromite primer & two coats of fire red enamel paint as per IS-5 Shade 536, etc. as per specifications. along with necessary fittings (elbows,tees, reducers, bends, u clamps, beam clamps and adoptor,anchor fastner, GI/MS rods, flats,nuts washers,threaded rod etc to complete the requirement) painted with enamel paint, pipes to be duly tested to 1.5 times of working pressure, in an	6,550	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	approved manner as per given drawings, specifications and instruction of the engineer in charge. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. :- 25 mm dia							
27	<u>SPRINKLER SYSTEM/Above ground Piping:</u> Above ground Piping: Supplying, installing and testing & commissioning above ground Mild Steel Pipe of Heavy class ERW of following sizes conforming to IS 1239 & IS 3589 with one coat of zinc Chromite primer & two coats of fire red enamel paint as per IS-5 Shade 536, etc. as per specifications. along with necessary fittings (elbows,tees, reducers,bends, u clamps, beam clamps and adoptor,anchor fastner, GI/MS rods, flats,nuts washers,threaded rod etc to complete the requirement) painted with enamel paint, pipes to be duly tested to 1.5 times of	1,080	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	working pressure, in an approved manner as per given drawings, specifications and instruction of the engineer in charge. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. :- 32 mm dia							
28	<u>SPRINKLER SYSTEM/Above ground Piping:</u> Above ground Piping: Supplying, installing and testing & commissioning above ground Mild Steel Pipe of Heavy class ERW of following sizes conforming to IS 1239 & IS 3589 with one coat of zinc Chromite primer & two coats of fire red enamel paint as per IS-5 Shade 536, etc. as per specifications. along with necessary fittings (elbows, tees, reducers,bends, u clamps, beam clamps and adoptor,anchor fastner, GI/MS rods, flats,nuts washers, threaded rod etc to complete the requirement) painted with enamel paint, pipes to be	1,000	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	duly tested to 1.5 times of working pressure, in an approved manner as per given drawings, specifications and instruction of the engineer in charge. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. :- 40 mm dia							
29	<u>SPRINKLER SYSTEM/Above ground Piping:</u> Above ground Piping: Supplying, installing and testing & commissioning above ground Mild Steel Pipe of Heavy class ERW of following sizes conforming to IS 1239 & IS 3589 with one coat of zinc Chromite primer & two coats of fire red enamel paint as per IS-5 Shade 536, etc. as per specifications. along with necessary fittings (elbows,tees, reducers, bends, u clamps, beam clamps and adoptor,anchor fastner, GI/MS rods, flats,nuts washers,threaded rod etc to complete the requirement)	265	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	painted with enamel paint, pipes to be duly tested to 1.5 times of working pressure, in an approved manner as per given drawings, specifications and instruction of the engineer in charge. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. :- 50mm dia							
30	<u>SPRINKLER SYSTEM/Above ground Piping:</u> Above ground Piping: Supplying, installing and testing & commissioning above ground Mild Steel Pipe of Heavy class ERW of following sizes conforming to IS 1239 & IS 3589 with one coat of zinc Chromite primer & two coats of fire red enamel paint as per IS-5 Shade 536, etc. as per specifications. along with necessary fittings (elbows,tees, reducers, bends, u clamps, beam clamps and adoptor,anchor fastner, GI/MS rods, flats,nuts washers, threaded rod etc to complete the	330	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	requirement) painted with enamel paint, pipes to be duly tested to 1.5 times of working pressure, in an approved manner as per given drawings, specifications and instruction of the engineer in charge. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. :- 65 mm dia							
31	<u>SPRINKLER SYSTEM/Above ground Piping:</u> Above ground Piping: Supplying, installing and testing & commissioning above ground Mild Steel Pipe of Heavy class ERW of following sizes conforming to IS 1239 & IS 3589 with one coat of zinc Chromite primer & two coats of fire red enamel paint as per IS-5 Shade 536, etc. as per specifications. along with necessary fittings (elbows, tees, reducers,bends, u clamps, beam clamps and adaptor,anchor fastner, GI/MS rods, flats,nuts washers, threaded rod etc to complete the	880	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	requirement) painted with enamel paint, pipes to be duly tested to 1.5 times of working pressure, in an approved manner as per given drawings, specifications and instruction of the engineer in charge. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. :- 80 mm dia							
32	<u>SPRINKLER SYSTEM/Above ground Piping::</u> Above ground Piping: Supplying, installing and testing & commissioning above ground Mild Steel Pipe of Heavy class ERW of following sizes conforming to IS 1239 & IS 3589 with one coat of zinc Chromite primer & two coats of fire red enamel paint as per IS-5 Shade 536, etc. as per specifications. along with necessary fittings (elbows,tees, reducers, bends, u clamps, beam clamps and adoptor,anchor fastner, GI/MS rods, flats,nuts	550	M					

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	washers,threaded rod etc to complete the requirement) painted with enamel paint, pipes to be duly tested to 1.5 times of working pressure, in an approved manner as per given drawings, specifications and instruction of the engineer in charge. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. :- 100 mm dia							
33	<u>SPRINKLER SYSTEM/Above ground Piping::</u> Above ground Piping: Supplying, installing and testing & commissioning above ground Mild Steel Pipe of Heavy class ERW of following sizes conforming to IS 1239 & IS 3589 with one coat of zinc Chromite primer & two coats of fire red enamel paint as per IS-5 Shade 536, etc. as per specifications. along with necessary fittings (elbows,tees, reducers, bends, u clamps, beam clamps and adoptor,anchor fastner, GI/MS	950	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	rods, flats,nuts washers, threaded rod etc to complete the requirement) painted with enamel paint, pipes to be duly tested to 1.5 times of working pressure, in an approved manner as per given drawings, specifications and instruction of the engineer in charge. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. :- 150 mm dia							
34	<u>Under Ground Piping :</u> <u>Supplying:</u> Under Ground Piping : Supplying, installing and testing & commissioning MS Pipe of Heavy class ERW of following sizes conforming to IS 3589 with all accessories like fittings including tees,elbows, reducers,union,flanges, nuts bolts etc including excavation in all kinds of soil and refilling including bed preparation the trench all complete. Pipes to be laid underground in 1 mtr below	120	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	from ground including concrete anchor blocks (thrust block) at all change in direction of pipeline and also near each joints complete as required as per approved layouts or as instructed by engineer in-charge. Pipes to be duly tested to 1.5 times of working pressure, in an approved manner as per given drawings ,specifications and instruction of the engineer in charge including protection of pipes by wrapping and coating with 4 mm thick tape as per IS:10221 complete as required as per approved layouts or as instructed by engineer incharge in line with the specifications. Fittings shall be SOCKET WELD TYPE upto 50 mm and butt weld type for 65 mm & above. : 150 mm dia							
35	<u>Providing testing and commissioning:</u> Providing testing and	3	SET					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	commissioning of nstallation Control Valve inclusive of : 150 mm dia Butterfly valve , Alarm Valve with Water Motor Gong, Pressure gauge and other miscellaneous , Valves and fittings as required.							
36	<u>Providing and fixing full bore type flow:</u> Providing and fixing full bore type flow switch suitable for minimum 60 lpm flow rate. : 150mm dia	7	EA					
37	<u>Providing and fixing in position:</u> Providing and fixing in position the industrial type Pressure Gauges with gun metal / brass valves complete as required	8	EA					
38	<u>Providing, fixing, testing & commissioni:</u> Providing, fixing, testing & commissioning of Sprinkler heads (K-80) of the following type : Quick response Pendent Type normal throw sprinklers of 68° C temperature.	1,200	EA					

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39	<u>Providing, fixing, testing & commissioni:</u> Providing, fixing, testing & commissioning of Sprinkler heads (K-80) of the following type : Quick response Upright Type normal throw sprinklers of 68° C temperature.	2,070	EA					
40	<u>Providing and fixing SS Flexible Connect:</u> Providing and fixing SS Flexible Connection of 200 psi rating for sprinkler heads from branch lines complete with nipple and nut, SS flexible pipe, gasket & wing clamp etc. Flexible pipe shall be UL listed. : 1.0m length	400	EA					
41	<u>Providing and fixing SS Flexible Connect:</u> Providing and fixing SS Flexible Connection of 200 psi rating for sprinkler heads from branch lines complete with nipple and nut, SS flexible pipe, gasket & wing clamp etc. Flexible pipe shall be UL listed. :1.2m length	400	EA					
42	<u>Providing and fixing SS Flexible Connect:</u> Providing and fixing SS Flexible	400	EA					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Connection of 200 psi rating for sprinkler heads from branch lines complete with nipple and nut, SS flexible pipe, gasket & wing clamp etc. Flexible pipe shall be UL listed. : 1.5m length							
43	<u>Providing and fixing 25 mm dia:</u> Providing and fixing 25 mm dia screwed inlet forged brass Single Acting Air Valves connected with ball valve on inlet side at top of the Risers.	1	EA					
44	<u>Supplying, fixing, testing and commission:</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications. : BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot eater circulation as	17	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	specified : 150 mm dia							
45	<u>Supplying, fixing, testing and commission:</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications. : BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot eater circulation as specified : 100 mm dia	1	EA					
46	<u>Supplying, fixing, testing and commission:</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications. : BUTTERFLY	1	EA					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot eater circulation as specified : 80 mm dia							
47	<u>Supplying, fixing, testing and commission:</u> Supplying, fixing, testing and commissioning of following valves, strainers, gauges in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported as per specifications. : BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot eater circulation as specified : 50 mm dia	9	EA					
48	<u>NON - RETURN VALVE:</u> NON - RETURN VALVE with duel plate of C I body SS plates vulcanized NBR seal flanged end & PN 16 pressure rating for chilled / hot water circulation including	2	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	insulation as specified. : 150 mm dia							
49	<u>Providing, fixing, testing and:</u> Providing, fixing, testing and commissioning of main control fire alarm panel complete with individual indication for each zone with LED, Piezo Sounder and Acknowledge facility. : For 6 zones panel	1	EA					
50	<u>Supplying and drawing following sizes of:</u> Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing surface/ recessed steel/ PVC conduit as required. : 2 x 2.5 sq. mm	300	M					
51	<u>Providing & fixing 25 mm dia:</u> Providing & fixing 25 mm dia gunmetal inspecting & Testing Assembly with ball valve (3 nos.), gunmetal sight glass, bye pass valve & connected to drain line. (Cost of all valves & fittings shall be included in the rate).	7	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

52	<u>Providing and fixing Four Way Fire:</u> Providing and fixing Four Way Fire Brigade Inlet to Hydrant outside the Building with Butterfly valve and non return valve complete in all respects. (Butterfly valve & Non return valve shall paid seperately). : 150 mm dia	1	EA					
53	<u>HAND APPLIANCES:</u> Providing and fixing ABC powder stored pressure type Fire Extinguishers consisting of welded MS cylindrical body, squeeze lever discharge valve fitted with pressure indicating gauge internal discharge tube, 30 cms long high pressure discharge hose, discharge nozzle, suspension bracket, conforming to ISI finished externally with red enamel paint and fixed to wall with brackets complete with internal charge. : Capacity 6 kg. IS 13849	120	EA					
54	<u>Providing and fixing Carbon-di-oxide:</u> Providing and fixing Carbon-di-	33	EA					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	oxide Fire Extinguishers consisting of welded M.S cylindrical body,squeeze lever discharge valve fitted with internal dischargetube, 30cms long high pressure discharge hose, discharge nozzle, suspension bracket, confirming to IS : 934 finished externally with red enamel paint and fixed to wall with brackets with rawl plug/dash fasteners complete with internal charge. : Capacity 4.5 kg. I.S.I. Marked.							
55	<u>Providing and fixing Mechanical Foam:</u> Providing and fixing Mechanical Foam type (ISI marked) fire extinguishers consisting of welded M.S. cylindrical body squeeze lever discharge valve 30 cm long high pressure discharge hose, discharge nozzle suspension bracket ISI marked as per IS 933 finished externally with red enamel paint and fixed to wall with brackets complete with internal charger. : 9 litres capacity (trolley mounted)	46	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

56	<u>CEILING MOUNTED MODULAR TYPE FIRE::</u> CEILING MOUNTED MODULAR TYPE FIRE EXTINGUISHER : Providing and fixing of Modular Type Clean Agent (HFC 236) type fire extinguishers consisting of welded MS cylindrical body automatic actuated through a sprinkler head mounted on the extinguisher body finished externally with red enamel paint and fixed to ceiling with brackets complete with internal charge. : 5 Kg. Capacity (Make Minimax/LifeGuard)	11	EA					
57	<u>WALL MOUNTED/FLOOR MOUNTED FIRE:</u> WALL MOUNTED/FLOOR MOUNTED FIRE EXTINGUISHER : Providing and fixing Clean Agent (HFC 236) type fire extinguishers consisting of welded MS cylindrical body, squeeze lever discharge valve fitted with pressure indicating gauge internal discharge tube, 30 cms long high pressure discharge	4	EA					

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	hose, discharge nozzle, suspension bracket, conforming to ISI finished externally with red enamel paint and fixed to wall with brackets complete with internal charge. : 6 Kg. Capacity (Make Minimax/LifeGuard)							
TOTAL (GROUP C) WITHOUT GST =								
TOTAL (GROUP C) WITH GST =								
<u>GROUP D-ELECTRICAL WORKS</u>								
SL.N O.	DESCRIPTION OF WORK	QTY (A)	UNIT	RATE PER UNIT (IN WORDS & FIGURES) (B)		TOTAL AMOUN T C=(AXB)	SERVI CE ACCOU NTING CODE (SAC)	SPECIFY % OF GST ON (C)
				FIGURES WORDS				
1	<u>Wiring for light point/ fan point:</u> Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed	777	EA					

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	steel conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required. - Group C							
2	<u>Wiring for group controlled</u> Wiring for group controlled (looped) light point/fan point/exhaust fan point/ call bell point (without independent switch etc.) with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable in surface/recessed steel conduit, and earthing the point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable etc. as required. -Group C	1,824	EA					
3	<u>Wiring for light/ power plug:</u> Wiring for light/ power plug with 2X4 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed steel conduit alongwith 1 No. 4 sq. mm FRLS	5,000	M					

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	PVC insulated copper conductor single core cable for loop earthing as required.							
4	<u>Wiring for light/ power:</u> Wiring for light/ power plug with 4X4 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed steel conduit alongwith 2 Nos. 4 sq. mm FRLS PVC insulated copper conductor single core cable for loop earthing as required.	7,200	M					
5	<u>Wiring for circuit/ submain wiring:</u> Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed steel conduit as required. - 2 X 1 .5 sq. mm + 1 X 1 .5 sq. mm earth wire	4,500	M					
6	<u>Wiring for circuit/ submain wiring:</u> Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS	200	M					

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	PVC insulated copper conductor, single core cable in surface/ recessed steel conduit as required 2 X 4 sq. mm + 1 X 4 sq. mm earth wire							
7	<u>Wiring for circuit/ submain wiring:</u> Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed steel conduit as required 4 X 1 .5 sq. mm + 2 X 1 .5 sq.mm earth wire	3,000	M					
8	<u>Wiring for circuit/ submain wiring:</u> Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed steel conduit as required 6 X 1 .5 sq. mm + 3 X 1 .5 sq.mm earth wire	200	M					
9	<u>Wiring for circuit/ submain</u>	200	M					

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	wiring: Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed steel conduit as required 4 X 4 sq. mm + 2 X 4 sq. mm earth wire							
10	<u>Wiring for circuit/ submain wiring:</u> Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed steel conduit as required 2 X 6 sq. mm + 1 X 6 sq. mm earth wire	50	M					
11	<u>Wiring for circuit/ submain wiring:</u> Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed steel conduit as required	50	M					

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	4 X 6 sq. mm + 2 X 6 sq. mm earth wire							
12	<u>Wiring for circuit/ submain wiring:</u> Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed steel conduit as required. - 2 X 10 sq. mm + 1 X 6 sq. mm earth wire	250	M					
13	<u>Wiring for circuit/ submain wiring:</u> Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed steel conduit as required 4 X 10 sq. mm + 2 X 6 sq. mm earth wire	200	M					
14	<u>Wiring for circuit/ submain wiring:</u> Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper	200	M					

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	conductor, single core cable in surface/ recessed steel conduit as required. 4 X 16 sq. mm + 2 X 6 sq. mm earth wire							
15	<u>Supplying and drawing following:</u> Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing raceway/ furniture/ surface/ recessed steel/ PVC conduit as required - 3 x 1.5 sq. mm	50	M					
16	<u>Supplying and drawing following:</u> Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing raceway/ furniture/ surface/ recessed steel/ PVC conduit as required 6 x 1.5 sq. mm	50	M					
17	<u>Supplying and drawing following:</u> Supplying and drawing following sizes of FRLS PVC insulated copper conductor,	50	M					

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	single core cable in the existing raceway/ furniture/ surface/ recessed steel/ PVC conduit as required 9 x 1.5 sq. mm							
18	<u>Supplying and drawing following:</u> Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing raceway/ furniture/ surface/ recessed steel/ PVC conduit as required 3 x 4 sq. mm	1,500	M					
19	<u>Supplying and drawing following:</u> Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing raceway/ furniture/ surface/ recessed steel/ PVC conduit as required 6 x 4 sq. mm	6,000	M					
20	<u>Supplying and drawing following:</u> Supplying and drawing following sizes of FRLS PVC insulated copper conductor,	50	M					

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	single core cable in the existing raceway/ furniture/ surface/ recessed steel/ PVC conduit as required 9 x 4 sq. mm							
21	<u>Supplying and drawing following pair:</u> Supplying and drawing following pair 0. 5 sq mm FR PVC insulated annealed copper conductor, unarmored telephone cable in the existing surface/ recessed steel/ PVC conduit/ Race way as required.- 2 Pair	50	M					
22	<u>Supplying and fixing of following sizes:</u> Supplying and fixing of following sizes of steel conduit along with accessories in surface/recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required. - 25mm	4,000	M					
23	<u>Supplying and fixing of following sizes:</u>	500	M					

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	Supplying and fixing of following sizes of steel conduit along with accessories in surface/ recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required. - 32mm							
24	<u>Supplying and fixing of following sizes:</u> Supplying and fixing of following sizes of steel conduit along with accessories in surface/ recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required. - 40mm	500	M					
25	<u>Supplying and fixing of following sizes:</u> Supplying and fixing of following sizes of steel conduit along with accessories in surface/recess including painting in case of surface conduit, or cutting the wall and	200	M					

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	making good the same in case of recessed conduit as required. - 50mm							
26	<u>Supplying and fixing of following sizes:</u> Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required. – 20 mm	50	M					
27	<u>Supplying and fixing of following sizes:</u> Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required. – 25 mm	50	M					
28	<u>Supplying and fixing of following sizes:</u> Supplying and fixing of	50	M					

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	following sizes of medium class PVC conduit along with accessories in urface/recess including cutting the wall and making good the same in case of recessed conduit as required. – 32 mm							
29	<u>Supplying and fixing of following sizes:</u> Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/ recess including cutting the wall and making good the same in case of recessed conduit as required. – 40 mm	50	M					
30	<u>Supplying and fixing of following sizes:</u> Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required. – 50 mm	50	M					
31	<u>Supplying and fixing metal box:</u>	2	EA					

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	Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required - 75 mm X 75 mm X 60 mm deep							
32	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 100 mm X 100 mm X 60 mm deep	2	EA					
33	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 150	2	EA					

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	mm X 75 mm X 60 mm deep.							
34	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 150 mm X 150 mm X 60 mm deep	2	EA					
35	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 180 mm X 100 mm X 60 mm deep.	2	EA					
36	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size)	2	EA					

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	on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 200 mm X 125 mm X 60 mm deep.							
37	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 200 mm X 150 mm X 60 mm deep.	2	EA					
38	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 200 mm X 150 mm X 75 mm	2	EA					

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	deep.							
39	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 200 mm X 250 mm X 60 mm deep.	2	EA					
40	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 200 mm X 250 mm X 75 mm deep.	2	EA					
41	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on	2	EA					

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	surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 200 mm X 150 mm X 100 mm deep.							
42	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 200 mm X 250 mm X 100 mm deep.	2	EA					
43	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 200 mm X 300 mm X 60 mm	2	EA					

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	deep.							
44	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 200 mm X 300 mm X 100 mm deep.	2	EA					
45	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 250 mm X 300 mm X 60 mm deep.	2	EA					
46	<u>Supplying and fixing metal box:</u> Supplying and fixing metal box of following sizes (nominal size) on	2	EA					

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	surface or in recess with suitable size of phenolic laminated sheet cover in front including painting etc. as required 250 mm X 300 mm X 100 mm deep.							
47	<u>Supplying and fixing two module stepped:</u> Supplying and fixing two module stepped type electronic fan regulator on the existing modular plate switch box including connections but excluding modular plate etc. as required.	24	EA					
48	<u>Supplying and fixing modular blanking:</u> Supplying and fixing modular blanking plate on the existing modular plate & switch box excluding modular plate as required	20	EA					
49	<u>Supplying and fixing following size:</u> Supplying and fixing following size/ modules, G1 box along with modular base & cover plate for modular switches in	15	EA					

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	recess etc as required- 1 or 2 Module (75mmX75mm)							
50	<u>Supplying and fixing suitable size:</u> Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 5/6 amps modular socket outlet and 5/6 amps modular switch,connection etc. as required. (For light plugs to be used in non residential buildings).	421	EA					
51	<u>Supplying and fixing suitable size GI:</u> Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 6 pin 15/16 & 5/6 amps modular socket outlet and 15/16 amps modular switch, connection, painting etc. as required	651	EA					
52	<u>Supplying and fixing suitable size:</u>	637	EA					

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	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providng and fixing 2 Nos. 3 pin 5/6 A modular socket outlet and 2 Nos. 5/ 6 A modular witch, connections etc. as equired. (For light plugs to be used in nonresidential Buildings).							
53	<u>Supplying & fixing suitable size:</u> Supplying & fixing suitable size GI box wih modular plate and cover in front on surface or in recess including providing and fixing 25 A modular socket outlet and 25 A modular SP MCB,“C” curve including connections, painting etc. as required.	2	EA					
54	<u>Providing, laying and fixing:</u> Providing, laying and fixing following dia RCC pipe NP2 class (light duty) in ground complete with RCC collars, jointing with cement mortar 1:2 (1 cement : 2 fine sand) including trenching (75 cm	50	M					

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	deep)and refilling etc as required.- 100 mm dia							
55	<u>Providing, laying and fixing:</u> Providing, laying and fixing following dia RCC pipe NP2 class (light duty) in ground complete with RCC collars, jointing with cement mortar 1:2 (1 cement : 2 fine sand) including trenching (75 cm deep)and refilling etc as required.- 250 mm dia	50	M					
56	<u>Providing, laying and fixing:</u> Providing, laying and fixing following dia RCC pipe NP2 class (light duty) in ground complete with RCC collars, jointing with cement mortar 1:2 (1 cement : 2 fine sand) including trenching (75 cm deep)and refilling etc as required.- 300 mm dia	50	M					
57	<u>Supplying and fixing DP sheet steel:</u> Supplying and fixing DP sheet steel enclosure on surface/recess along with 25/32 A, 240 V “ C ” curve DP MCB completewith	2	EA					

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	connections, testing and commissioning etc. as required							
58	<u>Supplying and fixing TP sheet steel:</u> Supplying and fixing TP sheet steel enclosure on surface/ recess along with 16/25/32 A, 415 V “ C ” curve TP MCB complete with connections, testing and commissioning etc. as required	2	EA					
59	<u>Supplying and fixing 20 amps, 240 volts,:</u> Supplying and fixing 20 amps, 240 volts, SPN industrial type, socket outlet, with 2 pole and earth, metal enc losed plug top along with 20 amps "C" curve, SP, MCB, in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket outlet and complete with connections, testing and commissioning etc. as required.	6	EA					
60	<u>Supplying and fixing 20 A, 415 V,:</u> Supplying and fixing 20 A, 415 V, TPN Industrial type socket	6	EA					

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	outlet,with 4 pole and earth, metal enclosed plug top alongwith 20 A, "C" curve, TPMCB, in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket out let and complete with connections, testing and commissioning etc. as required.							
61	<u>Supplying and fixing 30 amps, 415 volts,</u> Supplying and fixing 30 amps, 415 volts, TPN industrial type, socket outlet, with 4 pole and earth, metal enclosed plug top alongwith 30 amps "C" curve, TPMCB, in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket out let and complete with connections, testing and commissioning etc. as required.	1	EA					
62	<u>Supplying, installation, testing:</u> Supplying, installation, testing and commissioning of Microwave technology based	1	EA					

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	occupancy sensor having high preformance, non regulating programmable type, suitable for connected load upto 10 A,for mounting height up to 2.6 meter and for 5m X 20m coverage area along with necessary fixing arrangements i/c programming at site etc. complete as required.							
63	<u>Supplying and fixing GI raceway system:</u> Supplying and fixing GI raceway system fabricated from 2 mm thick with neoprene gasketted removable cover fabricated from 2 mm thick fixed to the raceway by countersunk cadmium plated screws at 300 mm intervals alongwith all fittings like bends, T-joints, couplers, earth links between adjacent sections to ensure earth continuity, recessed in floors including the cost of chasing and making good the damages complete as per specifications as required of	50	M					

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	following sizes- 50 mm wide x 40 mm deep							
64	<u>Supplying and fixing GI raceway system:</u> Supplying and fixing GI raceway system fabricated from 2 mm thick with neoprene gasketted removable cover fabricated from 2 mm thick fixed to the raceway by countersunk cadmium plated screws at 300 mm intervals alongwith all fittings like bends, T-joints, couplers, earth links between adjacent sections to ensure earth continuity, recessed in floors including the cost of chasing and making good the damages complete as per specifications as required of following sizes -100 mm wide x 40 mm deep	50	M					
65	<u>Supplying and fixing GI raceway system:</u> Supplying and fixing GI raceway system fabricated from 2 mm thick with neoprene gasketted	1,000	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	removable cover fabricated from 2 mm thick fixed to the raceway by countersunk cadmium plated screws at 300 mm intervals alongwith all fittings like bends, T-joints, couplers, earth links between adjacent sections to ensure earth continuity, recessed in floors including the cost of chasing and making good the damages complete as per specifications as required of following sizes -150 mm wide x 40 mm deep							
66	<u>Supplying and fixing GI raceway system:</u> Supplying and fixing GI raceway system fabricated from 2 mm thick with neoprene gasketted removable cover fabricated from 2 mm thick fixed to the raceway by countersunk cadmium plated screws at 300 mm intervals alongwith all fittings like bends, T-joints, couplers, earth	50	M					

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	links between adjacent sections to ensure earth continuity, recessed in floors including the cost of chasing and making good the damages complete as per specifications as required of following sizes- 200 mm wide x 40 mm deep							
67	<u>Supplying and fixing GI raceway system:</u> Supplying and fixing GI raceway system fabricated from 2 mm thick with neoprene gasketted removable cover fabricated from 2 mm thick fixed to the raceway by countersunk cadmium plated screws at 300 mm intervals alongwith all fittings like bends, T-joints, couplers, earth links between adjacent sections to ensure earth continuity, recessed in floors including the cost of chasing and making good the damages complete as per specifications	600	M					

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	as required of following sizes -300 mm wide x 40 mm deep							
68	<u>Supplying and fixing floor recessed:</u> Supplying and fixing floor recessed junction boxes for GI raceway systems fabricated from 3 mm GI sheets finished with powder coating paint finish of approved colour of teh top cover only with 1, 2 or 3 nos "+" , "I" , "L' shaped support in the centre in case required with 3 mm thick neoprene gasketted removable cover fixed by counter sunk cadmium plated screws including the cost of earth links at all joints to ensure earth continuity and including the cost of chasing and making good recess in floor etc complete as required and as below. - 100mm x 100mm x 50 mm deep	5	NO					
69	<u>Supplying and fixing floor</u>	5	NO					

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	<u>recessed:</u> Supplying and fixing floor recessed junction boxes for GI raceway systems fabricated from 3 mm GI sheets finished with powder coating paint finish of approved colour of teh top cover only with 1, 2 or 3 nos "+" , "I" , "L" shaped support in the centre in case required with 3 mm thick neoprene gasketted removable cover fixed by counter sunk cadmium plated screws including the cost of earth links at all joints to ensure earth continuity and including the cost of chasing and making good recess in floor etc complete as required and as below. - 150mm x 150mm x 50 mm deep							
70	<u>Supplying and fixing floor recessed:</u> Supplying and fixing floor recessed junction boxes for GI	20	NO					

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	raceway systems fabricated from 3 mm GI sheets finished with powder coating paint finish of approved colour of teh top cover only with 1, 2 or 3 nos "+", "I", "L' shaped support in the centre in case required with 3 mm thick neoprene gasketted removable cover fixed by counter sunk cadmium plated screws including the cost of earth links at all joints to ensure earth continuity and including the cost of chasing and making good recess in floor etc complete as required and as below. - 200mm x 200mm x 50 mm deep							
71	<u>Supplying and fixing floor recessed:</u> Supplying and fixing floor recessed junction boxes for GI raceway systems fabricated from 3 mm GI sheets finished with powder coating paint finish of approved colour of teh top cover only with 1, 2	20	NO					

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	or 3 nos "+", "I", "L" shaped support in the centre in case required with 3 mm thick neoprene gasketted removable cover fixed by counter sunk cadmium plated screws including the cost of earth links at all joints to ensure earth continuity and including the cost of chasing and making good recess in floor etc complete as required and as below. - 350mm x 350mm x 50 mm deep							
72	<u>Supplying and fixing following way.:</u> Supplying and fixing following way, single pole and neutral, sheet steel, MCB distribution board, 240 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without	13	EA					

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	MCB/RCCB/Isolator)- 8 way, Double door							
73	<u>Supplying and fixing following way,:</u> Supplying and fixing following way, single pole and neutral, sheet steel, MCB distribution board, 240 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator)- 12 way, Double door	2	EA					
74	<u>Supplying and fixing following way, hori:</u> Supplying and fixing following way, horizontal type three pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth	1	EA					

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	bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator)- 6 way (4 + 18), Double door							
75	<u>Supplying and fixing following way, hori:</u> Supplying and fixing following way, horizontal type three pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/ RCCB/ Isolator)- 8 way (4 + 24), Double door	31	EA					
76	<u>Supplying and fixing of following ways:</u> Supplying and fixing of following ways surface/ recess mounting, vertical type, 415 V, TPN MCB distribution board of sheet steel, dust	2	EA					

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	protected, duly powder painted, inclusive of 200 A, tinned copper bus bar, common neutral link, earth bar, din bar for mounting MCBs (but without CBs and incomer) as required. (Note : Vertical type MCB TPDB is normally used where 3 phase outlets are required.) -4 way (4 + 12), Double door							
77	<u>Supplying and fixing of following:</u> Supplying and fixing of following ways surface/ recess mounting, vertical type, 415 V, TPN MCB distribution board of sheet steel, dust protected, duly powder painted, inclusive of 200 A, tinned copper bus bar, common neutral link, earth bar, din bar for mounting MCBs (but without CBs and incomer) as required. (Note : Vertical type MCB TPDB is normally used where 3 phase	22	EA					

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	outlets are required.) -8 way (4 + 24), Double door							
78	<u>Supplying and fixing of following:</u> Supplying and fixing of following ways surface/ recess mounting, vertical type, 415 V, TPN MCB distribution board of sheet steel, dust protected, duly powder painted, inclusive of 200 A, tinned copper bus bar, common neutral link, earth bar, din bar for mounting MCBs (but without CBs and incomer) as required. (Note : Vertical type MCB TPDB is normally used where 3 phase outlets are required.) -12 way (4 + 36), Double door	58	EA					
79	<u>Supplying and fixing 5 amps to 32 amps:</u> Supplying and fixing 5 amps to 32 amps rating, 240/415 volts, "C" curve, miniature circuit breaker suitable for inductive load of following	2,894	EA					

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	poles in the existing MCB DB complete with connections, testing and commissioning etc. as required.- Single pole							
80	<u>Supplying and fixing 5 amps to 32 amps:</u> Supplying and fixing 5 amps to 32 amps rating, 240/415 volts, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required.- Double Pole	120	EA					
81	<u>Supplying and fixing 5 amps to 32 amps:</u> Supplying and fixing 5 amps to 32 amps rating, 240/415 volts, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required.- Triple pole.	217	EA					

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82	<u>Supplying and fixing 5 amps to 32 amps:</u> Supplying and fixing 5 amps to 32 amps rating, 240/415 volts, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required.- Triple pole (63 amp)	35	EA					
83	<u>Supplying and fixing single pole:</u> Supplying and fixing single pole blanking plate in the existing MCB DB complete etc. as required	2	EA					
84	<u>Supplying and fixing following rating:</u> Supplying and fixing following rating, double pole, 240 volts, isolator in the existing MCB DB complete with connections, testing and commissioning etc. as required. -40 amps	2	EA					
85	<u>Supplying and fixing following rating:</u>	15	EA					

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	Supplying and fixing following rating, double pole, 240 volts, isolator in the existing MCB DB complete with connections, testing and commissioning etc. as required. -63 amps							
86	<u>Supplying and fixing following rating:</u> Supplying and fixing following rating, double pole, (single phase and neutral), 240 volts, residual current circuit breaker (RCCB), having a sensitivity current upto 30 milliamperes in the existing MCB DB complete with connections, testing and commissioning etc. as required. - 63 amps	141	EA					
87	<u>Supplying and fixing following rating:</u> Supplying and fixing following rating, four pole, 415 volts, isolator in the existing MCB DB complete with connections, testing and commissioning etc. as	66	EA					

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	required.- 63 amps							
88	<u>Supplying and fixing following rating,:</u> Supplying and fixing following rating, four pole, 415 volts, isolator in the existing MCB DB complete with connections, testing and commissioning etc. as required.- 100amps	6	EA					
89	<u>Supplying and fixing Cable End Box:</u> Supplying and fixing Cable End Box (Loose wire box)(IP 43) suitable for following single pole and neutral, sheet steel, MCB istribution board, 240 V, on surface/ recess, complete with testing and commissioning etc. as required. -8 way, Double door SPN MCBDB	13	EA					
90	<u>Supplying and fixing Cable End Box:</u> Supplying and fixing Cable End Box (Loose wire box)(IP 43) suitable for following single pole and neutral, sheet steel, MCB distribution	2	EA					

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	board, 240 V, on surface/ recess, complete with testing and commissioning etc. as required. -14 way, Double door SPN MCBDB							
91	<u>Supplying and fixing Cable End Box:</u> Supplying and fixing Cable End Box (Loose wire box)(IP 43) suitable for following triple pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with testing and commissioning etc. as required.- For 6 way, Double door TPN MCBDB	1	EA					
92	<u>Supplying and fixing Cable End Box:</u> Supplying and fixing Cable End Box (Loose wire box)(IP 43) suitable for following triple pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with testing and commissioning etc. as	31	EA					

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	required.- 8 way, Double door TPN MCBDB							
93	<u>Supplying and fixing Cable End:</u> Supplying and fixing Cable End Box (Loose wire box) suitable for triple pole and neutral, sheet steel, Vertical MCB distribution board, 415 V, on surface/ recess, complete with testing and commissioning etc. as required.	82	EA					
94	<u>Providing and fixing of lightning:</u> Providing and fixing of lightning conductor finial, made of 25 mm dia 300mm long, G.I. tube, having single prong at top, with 85mm dia 6mm thick G.I. base plate including holes etc. complete as required.	8	EA					
95	<u>Providing and fixing G.I. tape:</u> Providing and fixing G.I. tape 20 mm X 3 mm thick on parapet or surface of wall for lightning conductor complete	400	M					

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	as required.(For horizontal run)							
96	<u>Providing and fixing G.I. tape:</u> Providing and fixing G.I. tape 20 mm X 3 mm thick on parapet or surface of wall for lightning conductor complete as required.(For vertical run)	300	M					
97	<u>Providing and fixing testing joint,:</u> Providing and fixing testing joint, made of 20 mm X 3 mm thick G.I. strip, 125 mm long, with 4 nos. of G.I. bolts, nuts, chuck nuts and spring washers etc. complete as required.	20	EA					
98	<u>Jointing copper /G.I. tape:</u> Jointing copper /G.I. tape (with another copper/ GI tape, base of the finial or any other metallie object) by riveting /nut bolting /sweating and soldering etc as required.	50	EA					
99	<u>Providing and laying G.I. tape:</u>	50	M					

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	Providing and laying G.I. tape 32 mm X 6 mm from earth electrode directly in ground as required.							
100	Supply, installation, testing: Supply, installation, testing , commissioning and numbering of light fixtures suitable for fluorescent / CFL lamps/LED with all components and accessories including but not restricted to reflectors, housings, lamp holders and including cost of ballasts and cost of lamps complete as required and as below. (as per drawings) Colour temperature shall be finalized by the architect. Recessed mount IP20 2x2ft LED fixture with Powder coated CRCA housing,PMMA Diffuser,system wattage 36W and system efficacy 100lm/W.The LED system has a L70 life of 50000Hrs with CRI>80,and CCT 5700K.The driver is CC type,Class I	160	EA					

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	insulationwith APFC constructiion with efficiency ≥85%,THD<10%, p.f ≥0.95,and operating range of 150-270V eqv to WIPRO ELATE LED Cat No. CRCO20R038HP57GL1 (A1)							
101	Supply, installation, testing: Supply, installation, testing , commissioning and numbering of light fixtures suitable for fluorescent / CFL lamps/LED with all components and accessories including but not restricted to reflectors, housings, lamp holders and including cost of ballasts and cost of lamps complete as required and as below. (as per drawings) Colour temperature shall be finalized by the architect- Recess mount IP20 Linear LED fixture with Powder coated CRCA housing,system wattage 32W and system efficacy ≥90lm/W. The LED system has a L70 life of	262	EA					

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	50000Hrs with CRI>80,and CCT 5700K.The driver is class I insulation,APFC construction with efficiency ≥85%,THD<10%,p.f ≥0.95,and operating range of 150-270V eqv to WIPRO LINEOS LED Cat No. LM30-401- XXX-57-XX (A2.1)							
102	Supply, installation, testing: Supply, installation, testing , commissioning and numbering of light fixtures suitable for fluorescent / CFL lamps/LED with all components and accessories including but not restricted to reflectors, housings, lamp holders and including cost of ballasts and cost of lamps complete as required and as below. (as per drawings) Colour temperature shall be finalized by the architect- for Surface mount IP20 LED batten	166	EA					

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	with Polycarbonate diffuser,extruded Al housing,system wattage 40W and system efficacy≥100lm/W.The LED system has a L70 life of 50000Hrs with CRI>80,and CCT 6500K.The driver is of multistage,APFC construction with THD<20%,p.f ≥0.9,and operating range of 150-270V with Class-I insulation eqv to WIPRO LED Linear Lamp CAT No. LL21-541-XXX-65-XX (A3)							
103	Supply, installation, testing: Supply, installation, testing , commissioning and numbering of light fixtures suitable for fluorescent / CFL lamps/LED with all components and accessories including but not restricted to reflectors, housings, lamp holders and including cost of ballasts and cost of lamps complete as required and as below. (as per drawings)	1,018	EA					

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	Colour temperature shall be finalized by the architect- Recess mount with provision for Continuous Arrangement IP20 Linear LED fixture with Powder coated CRCA housing,system wattage 32W and system efficacy ≥ 90lm/W.The LED system has a L70 life of 50000Hrs with CRI>80,and CCT 5700K.The driver is class I insulation,APFC construction with efficiency ≥85%,THD<10%, p.f ≥0.95,and operating range of 150- 270V eqv to WIPRO LINEOS LED CAT No. LM30-401-XXX-57-XX/CT (A4)							
104	Supply, installation, testing: Supply, installation, testing , commissioning and numbering of light fixtures suitable for fluorescent / CFL lamps/LED with all components and accessories including but not restricted to reflectors,	31	EA					

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	housings, lamp holders and including cost of ballasts and cost of lamps complete as required and as below. (as per drawings) Colour temperature shall be finalized by the architect- for Recess mount IP65 LED downlighter with PDC housing and with PC diffuser,system wattage 10W and system efficacy $\geq 72\text{lm/W}$.The LED system has a L70 life of 50000Hrs with CRI>80,and CCT 5700K.The driver is of Class I Insulation with APFC construction,CC type,THD<10%,p.f ≥ 0.95 ,and operating range of 140- 280V,eqv to WIPRO LED Bulkhead CAT No. LW07-141-XXX-57-XX (A5)							
105	Supply, installation, testing: Supply, installation, testing , commissioning and numbering of light fixtures suitable for fluorescent	278	EA					

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	/ CFL lamps/LED with all components and accessories including but not restricted to reflectors, housings, lamp holders and including cost of ballasts and cost of lamps complete as required and as below. (as per drawings) Colour temperature shall be finalized by the architect- for Recess mount IP20 LED downlighter with Al.Die cast housing and HET diffuser,system wattage 18W and system efficacy ≥100lm/W with cutout dia Ø 172mm.The LED system has a L70 life of 50000Hrs with CRI>80,and CCT 5700K.The driver is of Class I Insulation with APFC constructiion,CC-CV,THD<10%,p.f≥0.95,and operating range of 150-270V,eqv to WIPRO Halo Recess CAT No. CRDL11R023HP57 (A6)							

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106	Supply, installation, testing: Supply, installation, testing , commissioning and numbering of light fixtures suitable for fluorescent / CFL lamps/LED with all components and accessories including but not restricted to reflectors, housings, lamp holders and including cost of ballasts and cost of lamps complete as required and as below. (as per drawings) Colour temperature shall be finalized by the architect- for Recess mount IP20 LED downlighter with Al.Die cast housing and HET diffuser,system wattage 18W and system efficacy ≥100lm/W with cutout dia Ø 172mm.The LED system has a L70 life of 50000Hrs with CRI>80,and CCT 5700K.The driver is of Class I Insulation with APFC constructiion,CC-	508	EA					

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	CV,THD<10%,p.f≥0.95,and operating range of 150- 270V,eqv to WIPRO Halo Recess Cat No. CRDL11R023HP57 (A7.1)							
107	Supply, installation, testing: Supply, installation, testing , commissioning and numbering of light fixtures suitable for fluorescent / CFL lamps/LED with all components and accessories including but not restricted to reflectors, housings, lamp holders and including cost of ballasts and cost of lamps complete as required and as below. (as per drawings) Colour temperature shall be finalized by the architect- for Recess mount IP20 LED downlighter with Al.Die cast housing and HET diffuser,system wattage 12W and system efficacy ≥100lm/W with cutout dia	81	EA					

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	Ø 172mm.The LED system has a L70 life of 50000Hrs with CRI>80,and CCT 5700K.The driver is of Class I Insulation with APFC construction,CC-CV,THD<10%,p.f≥0.95,and operating range of 150-270V,eqv to WIPRO Halo Recess CAT No.CRDL11R023HP57 (A7.2)							
108	<u>Supply, installation, testing:</u> Supply, installation, testing , commissioning and numbering of light fixtures suitable for fluorescent / CFL lamps/LED with all components and accessories including but not restricted to reflectors, housings, lamp holders and including cost of ballasts and cost of lamps complete as required and as below. (as per drawings) Colour temperature shall be finalized by the architect- for Surface mount IP20 LED	66	EA					

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	downlighter with Al.Die cast housing and PMMA-LGP diffuser,system wattage 18W and system efficacy ≥84 lm/W with cutout dia Ø 172mm.The LED system has a L70 life of 50000Hrs with CRI>70,and CCT 6000K.The driver is of Class I Insulation with APFC constructiion,CC-CV,THD<20%,p.f≥0.95,and operating range of 150-270V,eqv to WIPRO Iris Slim RO CAT No. CRDL11R023HP57 (A7.3)							
109	Supply, installation, testing: Supply, installation, testing , commissioning and numbering of light fixtures suitable for fluorescent / CFL lamps/LED with all components and accessories including but not restricted to reflectors, housings, lamp holders and including cost of ballasts and cost of lamps	34	EA					

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	complete as required and as below. (as per drawings) Colour temperature shall be finalized by the architect- for Recess mount IP20 LED downlighter with Al.Die cast housing and HET diffuser,system wattage 18W and system efficacy ≥100lm/W with cutout dia Ø 172mm.The LED system has a L70 life of 50000Hrs with CRI>80,and CCT 5700K.The driver is of Class I Insulation with APFC constructiion,CC-CV,THD<10%,p.f≥0.95,and operating range of 150-270V,eqv to WIPRO Halo Recess CRDL11RO23HP57 (A8)							
110	Supply, installation, testing: Supply, installation, testing , commissioning and numbering of light fixtures suitable for fluorescent / CFL lamps/LED with all components and accessories including but not restricted to reflectors,	181	EA					

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	housings, lamp holders and including cost of ballasts and cost of lamps complete as required and as below. (as per drawings) Colour temperature shall be finalized by the architect- for Wall mount IP20 LED batten with Polycarbonate diffuser,extruded PC housing,system wattage 20W and system efficacy ≥100lm/W.The LED system has a L70 life of 50000Hrs with CRI>80,and CCT 6500K.The driver is of multistage,APFC construction with THD<20%,p.f≥0.95,and operating range of 150-270V with Class-I insulation eqv to WIPRO Trim Led NE WIPRO Trim Led NEO CA No. LL20-221-XXX-65NE1 (A9)							
111	Supply, installation, testing: Supply, installation, testing , commissioning and numbering of light	17	EA					

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	fixtures suitable for fluorescent / CFL lamps/LED with all components and accessories including but not restricted to reflectors, housings, lamp holders and including cost of ballasts and cost of lamps complete as required and as below. (as per drawings) Colour temperature shall be finalized by the architect- for IP20 LED batten with HET diffuser,system wattage 10W and system efficacy ≥90lm/W.The LED system has a L70 life of 50000Hrs with CRI>80,and CCT 6500K.The driver is of CC type,APFC constructiion with THD<20%,p.f≥0.95,and operating range of 150-270V with Class-I insulation eqv to WIPRO Trim Led NEO Cat No. LL20-111-XXX-65-NE (A10)							
112	Supply, installation, testing:	32	EA					

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	Supply, installation, testing , commissioning and numbering of light fixtures suitable for fluorescent / CFL lamps/LED with all components and accessories including but not restricted to reflectors, housings, lamp holders and including cost of ballasts and cost of lamps complete as required and as below. (as per drawings) Colour temperature shall be finalized by the architect- for IP65 IK08 Recessed Step Light ,with extruded Al powder coating,system wattage 2.5W,CCT 3000K eqv to WIPRO Arcus Step Light CAT No. LT50-050-XXX-30-XX (A11)							
113	<u>Installation testing and commissioning:</u> Installation testing and commissioning of ceiling fan,including wiring the down rods of standard	24	EA					

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	length(upto 30cm) with 1.5 sq.mm FRLS PVC insulated, copper conductor,single core cable etc. as required.							
114	<u>Installation of exhaust fan:</u> Installation of exhaust fan in the existing opening, including making good the damage connection testing and commissioning etc. as required.up to 450mm sweep	60	EA					
115	<u>Installation, testing and:</u> Installation, testing and commissioning of pre-wired, LED fitting / compact fluorescent fitting of all types, complete with all accessories and tube etc. directly on ceiling/ wall, including connection with 1.5 sq. mm FR PVC insulated, copper conductor, single core cable and earthing etc. as required.	2,834	EA					
116	<u>Numbering of ceiling fan:</u> Numbering of ceiling fan/ exhaust fan/ fluorescent fittings as required.	2,918	EA					

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117	<u>Supply of following single:</u> Supply of following single phase ceiling fans without regulator, standard accessories and standard length of down rod complete as required. -1200 mm sweep	24	NO					
118	<u>Supply of 240 volt single phase:</u> Supply of 240 volt single phase propeller type AC ventilator (exhaust fans) conforming to IS : 2312/67 with Amdt. no. 1 to 7 complete with mounting ring frame with four fixing holes but without regulator and with louver shutters of the following sweep and poles complete as required - 300 mm 6 pole	60	NO					
119	<u>Supply,installing,testing,com missioning:</u> Supply,installing,testing,commi ssioning of 360 Degree PIR sensor with photocell complete as required	110	NO					

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120	<u>Supply,installing,testing,com missioning:</u> Supply,installing,testing,commi ssioning of MLS Digital Bus Power Supply complete as required	3	NO					
121	<u>Supply,installing,testing,com missioning:</u> Supply,installing,testing,commi ssioning of Interface Controller- Medium to large applications complete as required	1	NO					
122	<u>Supply, installation, testing</u> Supply, installation, testing & commissioning of Programming & Commissioning Remote complete in all respect as required.	1	NO					
123	<u>Supplying and drawing co- axial TV</u> Supplying and drawing co-axial TV cable RG-6 grade, 0.7 mm solid copper conductor PE insulated, shielded with fine tinned copper braid and protected with PVC sheath in the existing surface/ recessed steel/ PVC conduit as required.	100	EA					
124	<u>Supplying and fixing TV</u>	2	EA					

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	antenna Supplying and fixing TV antenna socket outlet modular type on the existing modular plate & switch box including connections but excluding modular plate etc. as required.							
125	<u>Supply, Installation of 3/4 way splitter</u> Supply, Installation of 3/4 way splitter inclusive of accessories for Fitting in wall/ceiling	2	EA					
126	<u>Supply, Installation of 6 way splitter:</u> Supply, Installation of 6 way splitter inclusive of accessories for Fitting in wall/ceiling	2	EA					
127	<u>Supply,installing,commissioning of IP66:</u> Supply,installing,commissioning of IP66 LED Street Light fixture with PDC Al.housing,Toughened Glass Cover,system wattage 30W and system efficacy ≥100lm/W.The LED system has a L70 life of	22	EA					

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	50000Hrs with CRI>70,and CCT 5700K.The driver is CC,CV type,Class I insulationwith APFC constructiion with efficiency _ 85%,THD<10%,p.f≥0.95,interna l Surge protection 4kV,and operating range of 150-270V eqv to WIPRO Skyline CAT No. LR02-331-XXX-57-XX							
128	<u>Supply,installing,commissioning of 20W:</u> Supply,installing,commissionin g of 20W Led Post top,IP 65,Pipe Suitable Upto dia 50mm,eqv to WIPRO Post Top LP07 CAT No. LP07-251-XXX-57-CL	29	EA					
129	<u>Supply,installing,commissioning of IP66:</u> Supply,installing,commissionin g of IP66 LED Flood Light fixture with Al.die cast housing,Toughened Glass Cover,system wattage 100W and system efficacy≥ 100lm/W.The LED system has	4	EA					

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	a L70 life of 50000Hrs with CRI>70,and CCT 5700K.The driver is integral CC type,Class I insulationwith APFC constructiion with efficiency ≥ 87%,THD<10%,p.f ≥0.95,internal Surge protection 4kV,and operating range of 120-300V eqv to WIPRO Alpha LED CAT No. LF20-122-060-57-G2							
130	<u>Supply,installing,commissioning:</u> Supply,installing,commissioning of Surface mount IP20 LED downlighter with Al.Die cast housing and PMMA-LGP diffuser,system wattage 12W and system efficacy ≥ 84lm/W with cutout dia Ø 170mm.The LED system has a L70 life of 50000Hrs with CRI>70,and CCT 6000K.The driver is of Class I Insulation with APFC constructiion,CC-	2	EA					

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	CV,THD<20%,p.f≥0.95,and operating range of 150- 270V,eqv to WIPRO Iris Slim RO Surface CAT No. LD80-101- XXX- 60-SM							
131	<u>Supply,installing,commission ing of IP67:</u> Supply,installing,commissionin g of IP67,Integral LED Bush light eqv to Wipro Gardenia CAT No. LF05-450-XXX-27-XX	5	EA					
132	<u>Supply,installing,commission ing:</u> Supply,installing,commissionin g of IP68 Led Fixture eqv to Wipro Arcus Under Water Light CAT No. LU03-950-030-30-XX	16	EA					
133	<u>Supplying and Laying of PVC:</u> Supplying and Laying of PVC insulated and PVC sheathed / XLPE insulated armoured aluminium power cable of 1.1 kV grade confirming to IS 7098(Part 1) ammended upto date of following sizes	2,000	M					

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	in the existing DWC/RCC/ HUME/ METAL pipe as required. - 2 core 6 sq mm							
134	<u>Supplying and laying of following sizes:</u> Supplying and laying of following sizes earthed XLPE insulated amoured aluminium conductor power cable of 1.1 KV grade confirming to IS 7098(Part II) amended upto date, direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc. as required. as required. - 2 core 6 sq mm	1,100	M					
135	<u>Earthing with G.I. earth pipe:</u> Earthing with G.I. earth pipe 4.5 metre long, 40 mm dia including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe etc. with charcoal/ coke and salt as required.	29	EA					

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136	<u>Providing and laying earth connection:</u> Providing and laying earth connection from earth electrode with 6 SWG dia G.I. Wire in 15 mm dia G.I. pipe from earth electrode including connection with G.I. thimble excavation and re-filling as required.	240	M					
137	<u>Providing and fixing 6 SWG dia G.I. wire:</u> Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing along with existing surface/ recessed conduit/ submain wiring/ cable as required.	6,000	M					
138	<u>Supplying and laying of following:</u> Supplying and laying of following size DWC HDPE pipe ISI marked along with all accessories like socket, bend, couplers etc. conforming to IS 14930, Part II complete with fitting and cutting, jointing etc. in the	100	M					

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	existing trench, complete as required. - 63 mm dia (OD-63 mm & ID-51 mm nominal)							
139	<u>Fabricating, supplying, installation,:</u> Fabricating, supplying, installation, testing & commissioning of floor mounted type dooble door, out door feeder piller, fabricated from CRCA sheet of 2mm thickness of appropriate size to accomodate following switchgears, dust, damp & vermin proof having hinged type double leaf door in front with additional tapered top with 50 mm x 50 mm x 5 mm angle iron base & minimum 30 cm long legs for grouting in cement concrete foundation blocks and complete with 100 amp. capacity 4 strip copper bus bar, bakelite sheet for mounting the accessories and providing and	2	NO					

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fixing the following mountings, connections, interconnections with suitable size copper busbar upto cable alley, locking arrangement i/c painting making suitable cement concrete foundation etc. complete as reqd.(The size of the feeder pillar is measured from the lowest portion of the tapered hight.) INCOMING 1 No. 100 Amps 25 kA Four Pole MCCB with adjustable thermal over load and adjustable magnetic short circuit releaes 3 Nos. LED Phase Indication Lamp 2 Nos. LED Indication Lamp (Red for ON and GreenOFF) BUS BAR Electrolytic high conductivity aluminium three phase and neutral busbars rated at 100 amps having a maximum current density of 1							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	amp per sq mm suitable to with stand symmetrical fault level of 10 KA at 415 volts. The neutral busbar is to be of 100% capacity. OUTGOINGS 2 Nos. 63 Amps 25 kA Four Pole MCCB with adjustable thermal and adjustable magneic protective releases as spares. 2 Nos. 32 Amps 660 volt 10 kA TPN MCB with thermal magnetic protective releases as spares. 3 Nos 32 amp 10 kA DP MCB with thermal magnetic protective releases 3 Nos. 32 A DP Contactor 3 Nos. Dual setting 24 hour calibrated digital time switch 18 Nos. 10/16 amp SP 10 kA MCB Feeder Pillar complete with interconnection earthing as as per above							
140	Supply and erection of	22	NO					

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galvanized steel: Supply and erection of galvanized steel octagonal pole of suitable length conforming to IS 2629/IS 2633/ IS4759. The pole shall be in single piece (single hot dip galvanized) and shall tapered towards the top.The bottom section shall have open able slot with exterior surface door & shall have suitable locking arrangement for housing single phase 3 wire cable connection, bakelite sheet, MCB, loop in and out arrangement for incoming/ outgoing cables. There shall also be suitable arrangement for the purpose of earthing. Rigid Base plate of suitable size and thickness shall be welded inside and outside at the bottom of pole with provision for fixing 4							

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	foundation bolts.The octagonal pole shall be bolted on a pre- cast foundation with a set of four foundation bolts for greater rigidity. The foundation shall be erected over cement concrete M20 of given size to fixed up to a required planting depth below ground level as required:- Galvanized octagonal pole overall length 6 metre (sheet thickness 3mm), top dia.(A/F) 70mm and bottom dia. (A/F) 130mm, foundation size below ground level 550mm x 550mm x 1200mm, 4Nos. foundation bolts size 20mm dia., length >=600mm with base plate dimensions 220mm x 220mm x 12mm thick.							
141	Supplying, installation, testing: Supplying, installation, testing & commissioning of indoor type	1	SET					

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floor mounted metal clad, 6.6KV VCB panel with air insulated but encapsulated copper bus bars of 630 Amps current carrying capacity and fault level of 350 MVA, suitable power pack of 24 volts D.C., with 5 Nos. VCBs totally enclosed & fully interlocked, horizontal drawout, horizontal/ vertical isolation type breaker as per IS 13118, as amended up to date and additional specifications, each having 630 Amp current carrying capacity, single break, trip free mechanism, motorised charged and auto/manually closing breaker suitable for use on 6.6 KV, 3 Phase, 50 Hz A.C. supply with short circuit fault level breaking capacity of 350 MVa, complete with self contained,							

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fully interlocked, rack in and rack out mechanism, featured with mechanical ON/OFF indicator with hand trip device, spring release coil, shunt trip coil and auxiliary switch of 4 NO+4NC, type tested for internal arc test of 25 KA or more for 1 second and equipped with following switchgears and accessories i/c connections suitable for 3c 240sq. mm. XLPE 6.6 KV cable (cable entry from *bottom/ top/side) end termination with heat shrinkable jointing material etc. as required. (Note- Cost of end termination not included in this item) Incomer : Incoming – 1 Nos 630 Amp. VCB 1 Nos. – 6.6 KV / 110 Volts PT Class 0.5 accuracy and 100 VA burde and protection MCB on both							

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side 1 Sets of 3 Nos. dual core dual ratio 3 CTs 300/150/5/5 A of 15VA burden and accuracy Class-0.5 for metering and class 5P10 for protection . 1 Sets of Digital multi functional meter of class 0.5 or better accuracy to record demand (KVA), energy (KWH), total power factor, current, voltage with communication port (RS-485) port, Modbus RTU for integration with energy management systems. 1 Nos. – Microprocessor based numerical relay with O/L, E/F and S/C protection, LCD display and push button for parameter setting . Following indicating lamps and push buttons for each VCB 3 Nos. Phase indicating Lamps. 4 Nos. Indicating Lamps for the following; Red for VCB ON.							

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Green for VCB OFF Amber for Trip Circuit Healthy Orange for Auto Trip. Push buttons for the followings, Green for Breaker ON Red for Breacker OFF. Yellow for trip alarm cancellation. 1 Set of electrical and mechanical interlocking arrangement with castle key suitable to keep only one incomer in ON position at a time. Outgoing 2 Nos. 630 A VCB 2 Sets of 3 Nos. dual core dual ratio 3 CTs 150/5/5 A of 15VA burden and accuracy Class-0.5 for metering and class 5P10 for protection . 2 Sets of Digital multi functional meter of class 0.5 or better accuracy to record demand (KVA), energy (KWH), total power factor, current, voltage with communication port (RS-485) port, Modbus							

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	RTU for integration with energy management systems 2 Nos. – Microprocessor based numerical relay with O/L, E/F and S/C protection, LCD display and push button for parameter setting . Following indicating lamps and push buttons for each VCB 3 Nos. Phase indicating Lamps. 4 Nos. Indicating Lamps for the following; Red for VCB ON. Green for VCB OFF Amber for Trip Circuit Healthy Orange for Auto Trip. Push buttons for the followings, Green for Breaker ON Red for Breacker OFF. Yellow for trip alarm cancellation <u>HT Panel Board as above.</u>							
142	Supplying, installation, testing and commissioning of Cast Rasin Dry Type 1500KVA 6.6/0.433 KV, 3 Phase, 50 Hz, Dyn 11 vector group,	2	EA					

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copper wound, outdoor type Transformer with class F insulation, complete with winding temperature indicator, alarm and trip controller actuated by means of resistance temperature detector embedded in LV windings, with Approximately 5% impedance, tapping for off load operation on HV side in steps of +/-2.5%, +/-5% - 7.5%, having cable end boxes suitable for terminaton of 3c240 Sq.mm XLPE cable on of 6.6 KV grade HV side, an arrangment for termination of 8x 3.5c 300 XLPE cables LV side with neutral brought out separately including supplying and laying of copper conductor multicore control cable from transformer to HT breaker for safety tripping, suitably mounted on								

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	M.S. Channel i/c supplying and grouting of suitable M.S. Channel with all accessories and confirming to IS 11171:1985& as per specification attached complete in all respects as required at site.							
143	<u>Supplying, installation, testing & commissioning of Floor mounted:</u> Supplying, installation, testing & commissioning of Floor mounted type switchboard suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated from CRCA sheet steel of 2 mm thick for frame work and covers i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having termination box with terminals suitable to terminate 8 nos 3.5c 300sq,mm cables on incoming and outgoing side,	2	EA					

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	i/c providing & fixing following switch gears and accesories with their interconnection :- 1 No. 2500 Amps 50 kA 4-P EDO ACB 2 Nos. ON/OFF indicating lamps (RED for ON, Green for OFF) 3 Nos. Phase indicating lamps with MCB Isolator Box as above							
144	MAIN LT Panel: Supplying, installation, testing & commissioning of cubical type LT panel suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade,having 2000 amp capacity extensible type	1	EA					

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TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley, switchgears to BBT/Cable Connection box with required size of Al. bus bars and control wiring with 2.5 .sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable							

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gland plates in two half, i/c providing following switch gears :- All the incoming, outgoing and bus coupler ACB shall be equipped with suitable port for control,monitoring and operation of ACB with IBMS. Incoming : 2 Nos. - 2500 Amps each four pole horizontal drawout type (EDO) air circuit breaker of fault breaking capacity 50 kA (Ics = Icu = Icw upto 433V) electrically operated, fitted with interlocked door, automatic safety shutters, mechanical ON/OFF and service/test/isolated position indicators and frame earthing contact, conforming to IS- 13947-2 1993 as amended up-to-date complete with following accessories for each ACB.							

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Motor Wound spring closing mechanism- 1 No. Microprocessor based numerical relay (EMI & EMC certified) for over current, earth fault & short circuit protection with LCD display & button for ajustment/setting/viewing of parameters - 1 set. Digital Multifunctional Meter to record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as a percentage of total current, comprising of suitable communication port for connection to IBMS. and 1 set of 3 Nos. CT of 2500 A/5 A Class 1 accuracy and 30 VA burden. -- 1 Set 3 Nos. Phase indication LED lamps with 2 Amp back up MCB							

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3 Nos. Indication lamps (Red for ACB ON, Green for ACB OFF, Orange for Auto Trip.) Shunt trip coil 220 V A.C. Breaker control switch for Breaker ON, Breaker OFF and Trip Alarm Cancellation Test terminal block set, fuses, circuits as per standard practice, auxiliary contacts for positive interlocking of the breakers as required. Bus Couplers : 1 No. - 2500 Amps four pole horizontal drawout type (EDO) air circuit breakers of fault breaking capacity 50 kA (Ics=Icu upto 433V) electrically operated, with interlocked door, automatic safety shutters, mechanical ON/OFF and service/test/isolated position indicators and frame earthing contact, conforming to IS-13947-2-1993							

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as amended upto date complete with following accessories for each ACB - Motor Wound spring closing mechanism- 1 No. 2 Nos. Indication lamps (Red for ACB ON, Green for ACB OFF) Breaker control switch for Breaker ON, Breaker OFF Test terminal block set, fuses, circuits as per standard practice, auxiliary contacts for positive interlocking of the breakers as required. Bus Bars : TPN aluminium bus bars of minimum of 3000 Amps capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bar cross section, size supports & their spacing etc. for withstanding fault level of 31 MVA for 1 Sec. Interlocking : Electrical through advance							

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contacts in ACB ' s (incomers & bus couplers) and mechanical (castel key) interlocking should be provided to ensure that only one supply is available at a time on each section of bus and to eliminate any possiblility of accidentally approaching two supplies at one bus section as per control sequence indicated on drawing. Outgoing : SECTION-I 2 Nos 1250 Amp TPN horizontal drawout type (MDO) air circuit breaker of fault breaking capacity 35 kA (Ics = Icu = Icw upto 433V) Manually operated, fitted with interlocked door, automatic safety shutters, mechanical ON/OFF and service/test/isolated position indicators and frame earthing contact, conforming to IS-							

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13947-2 1993 as amended up-to-date complete --Each ACB as mentioned above shall be comprised with followings Independent manual spring closing mechanism - 1 No. Microprocessor based numerical relay (EMI & EMC certified) for over current, earth fault & short circuit protection with LCD display & button for ajustment/setting/viewing of parameters - 1 set. Digital Multifunctional Meter to record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as a percentage of total current, comprising of suitable communication port for connection to IBMS. and 1 set of 3 Nos. CT of 1250							

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	A/5 A Class 1 accuracy and 30 VA burden. -- 1 Set 3 Nos. Phase indication LED lamps with 2 Amp back up MCB 3 Nos. Indication lamps (Red for ACB ON, Green for ACB OFF, Orange for Auto Trip.) Shunt trip coil 220 V A.C. Breaker control switch for Breaker ON, Breaker OFF and Trip Alarm Cancellation Test terminal block set, fuses, circuits as per standard practice, auxiliary contacts for positive interlocking of the breakers as required. 1 Nos 1000 Amp TPN horizontal drawout type (MDO) air circuit breaker of fault breaking capacity 35 kA (Ics = Icu = Icw upto 433V) Manually operated, fitted with interlocked door, automatic safety						

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shutters, mechanical ON/OFF and service/test/isolated position indicators and frame earthing contact, conforming to IS-13947-2 1993 as amended up-to-date complete --Each ACB as mentioned above shall be comprised with followings Independent manual spring closing mechanism - 1 No. Microprocessor based numerical relay (EMI & EMC certified) for over current, earth fault & short circuit protection with LCD display & button for ajustment/setting/viewing of parameters - 1 set. Digital Multifunctional Meter to record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as							

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a percentage of total current, comprising of suitable communication port for connection to IBMS. and 1 set of 3 Nos. CT of 1000 A/5 A Class 1 accuracy and 30 VA burden. -- 1 Set 3 Nos. Phase indication LED lamps with 2 Amp back up MCB 3 Nos. Indication lamps (Red for ACB ON, Green for ACB OFF, Orange for Auto Trip.) Shunt trip coil 220 V A.C. Breaker control switch for Breaker ON, Breaker OFF and Trip Alarm Cancellation Test terminal block set, fuses, circuits as per standard practice, auxiliary contacts for positive interlocking of the breakers as required. 2 Nos 400 Amp TPN MCCB (Ics = 36 kA upto 433 V) with adjustable thermal & adjustable magnetic							

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release CT's of ratio 400/5 Amps 3 Nos Digital type ammeter (0-400Amp) with selector switch set. Digital Type Energy Meter (kWH) 1 Nos 150 Amp TPN MCCB (Ics = 36 kA upto 433 V) with adjustable thermal & adjustable magnetic release CT's of ratio 150/5 Amps 3 Nos Digital type ammeter (0-150Amp) with selector switch set. Digital Type Energy Meter (kWH) 1 Nos 100 Amp TPN MCCB (Ics = 36 kA upto 433 V) with adjustable thermal & adjustable magnetic release CT's of ratio 100/5 Amps 3 Nos Digital type ammeter (0-100Amp) with selector switch set. Digital Type Energy Meter (kWH) 2 Nos 63 Amp TPN MCCB (Ics =							

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36 kA upto 433 V) with adjustable thermal & adjustable magnetic release CT's of ratio 63/5 Amps 3 Nos Digital type ammeter (0-63Amp) with selector switch set. Digital Type Energy Meter (kWH) SECTION-II 2 Nos 1250 Amp TPN horizontal drawout type (MDO) air circuit breaker of fault breaking capacity 35 kA (Ics = Icu = Icw upto 433V) Manually operated, fitted with interlocked door, automatic safety shutters, mechanical ON/OFF and service/test/isolated position indicators and frame earthing contact, conforming to IS-13947-2 1993 as amended up-to-date complete --Each ACB as mentioned above shall be comprised with							

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followings Independent manual spring closing mechanism - 1 No. Microprocessor based numerical relay (EMI & EMC certified) for over current, earth fault & short circuit protection with LCD display & button for ajustment/setting/viewing of parameters - 1 set. Digital Multifunctional Meter to record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as a percentage of total current, comprising of suitable communication port for connection to IBMS. and 1 set of 3 Nos. CT of 1250 A/5 A Class 1 accuracy and 30 VA burden. -- 1 Set 3 Nos. Phase indication LED lamps with 2 Amp back up							

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MCB 3 Nos. Indication lamps (Red for ACB ON, Green for ACB OFF, Orange for Auto Trip.) Shunt trip coil 220 V A.C. Breaker control switch for Breaker ON, Breaker OFF and Trip Alarm Cancellation Test terminal block set, fuses, circuits as per standard practice, auxiliary contacts for positive interlocking of the breakers as required. 1 Nos 630 Amp 4 Pole MCCB (Ics = 36 kA upto 433 V) with adjustable thermal & adjustable magnetic release- Each MCCB comprises of CT's of ratio 630/5 Amps 3 Nos Digital type ammeter (0-630Amp) with selector switch set. Digital Type Energy Meter (kWH) 1 Nos 400 Amp 4 Pole MCCB (Ics = 36 kA upto 433 V) with							

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	adjustable thermal & adjustable magnetic release- Each MCCB comprises of CT's of ratio 400/5 Amps 3 Nos Digital type ammeter (0-400Amp) with selector switch set. Digital Type Energy Meter (kWH) 1 Nos 63 Amp 4 Pole MCCB (Ics = 36 kA upto 433 V) with adjustable thermal & adjustable magnetic release- Each MCCB comprises of CT's of ratio 63/5 Amps 3 Nos Digital type ammeter (0-63Amp) with selector switch set. Digital Type Energy Meter (kWH) <u>Main LT Panel as above</u>							
145	<u>Automatic Power Factor Correction Pane:</u> Supplying, installation, testing & commissioning of cubical type floor/wall mounted auto/manual power factor	2	EA					

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correction system of 450 KVAR capacity in Nine steps (5+10+10+25+50+50+50+50+50+50+50) having 3 phase MPP super heavy duty resin bonded, low loss, terminal less capacitors without oil, housed in aluminium cans power capacitors, each capacitor provided with suitable rating Thyristor switch, copper inductor coils (7% detuned reactors), semiconductor fuse and suitable for 433V, 3 Phase, 4Wire, 50 Hz AC supply system, fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3mm thick for gland plates i/c cleaning & finishing complete with 7 tank process and powder coating in approved shade, having 800 Amp capacity extensible type								

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TP&N Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 50 KA for 1 Sec., bottom base channel of MS section not less than 100mm x 50mm x 5mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25mm x 5mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 2.5sq.mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two halves, i/c providing following switch gears/accessories and details:- INCOMING							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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1 No. 1250 Amp TPN horizontal drawout type (MDO) air circuit breaker of fault breaking capacity 35 kA (Ics = Icu = Icw upto 433V) Manually operated, fitted with interlocked door, automatic safety shutters, mechanical ON/OFF and service/test/isolated position indicators and frame earthing contact, conforming to IS-13947-2 1993 as amended up-to-date complete --Each ACB as mentioned above shall be comprised with followings Independent manual spring closing mechanism - 1 No. Microprocessor based numerical relay (EMI & EMC certified) for over current, earth fault & short circuit protection with LCD display & button for ajustment/setting/viewing of parameters - 1 set. Digital Multifunctional Meter to							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as a percentage of total current, comprising of suitable communication port for connection to IBMS. and 1 set of 3 Nos. CT of 1250 A/5 A Class 1 accuracy and 30 VA burden. -- 1 Set 3 Nos. Phase indication LED lamps with 2 Amp back up MCB 3 Nos. Indication lamps (Red for ACB ON, Green for ACB OFF, Orange for Auto Trip.) Shunt trip coil 220 V A.C. Breaker control switch for Breaker ON, Breaker OFF and Trip Alarm Cancellation Test terminal block set, fuses, circuits as per standard							

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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practice, auxiliary contacts for positive interlocking of the breakers as required. 12 step automatic power factor intelligent monitoring relay (microprocessor) to sense and monitor the system power factor and provide impulses for operation of 8 sequential capacitor circuits. The system shall have9 step display mode real time power factor control with 7% anti harmonic block reactors, microprocessor based power factor controller, for target PF setting and having 16 x 2 LED display, with first mode showing V, I, PF, shortfall KVAR, KW on the screen continuously without scrolling & in second mode the controller should show actual KVAR activated, KVA in every second & actual PF (in								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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30-40 miliseconds). Dedicated fan should be provided for forceful cooling of the Thyristor. BUSBARS Electrolytic high conductivity aluminium three phase busbars rated at 1250 amps having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 36 kA at 415 volts. OUTGOINGS Indicating lamp with holder: 8 Nos. 32 Amp TP MCCB: 3 Nos. 63 Amp TP MCCB: 1 Nos. 100 Amp TP MCCB: 8 Nos. 1-0-2 single pole switch: 12 Nos. MPP Super Heavy duty 3 phase capacitors suitable for operation on 433V, 50 Hz as per following configuration. Each capacitor shall be provided with thyristor switching module and 7%							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	harmonic block reactors. The rating of the switching module and harmonic block reactors shall be cofirming to rating of respective capacitors. Each bank of capacitor shall be provided with semiconductor fuse and fuse assembly. 5 kVAR-1No. 10 kVAR - 2 No., 25 kVAR - 1 No., 50 kVAR - 8 Nos. APFC Panel as above							
146	<u>Emergency Panel:</u> Emergency Panel Supplying, installation, testing & commissioning of floor mounted cubical type Emergency panel suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm thick for gland, plates i/c	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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cleaning & finishing complete with 7 tank process for powder coating in approved shade,having following capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with required size of Al. bus bars and control							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	wiring with 2.5 .sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears :- INCOMING 1 No. 1000 Amp TPN horizontal drawout type (MDO) air circuit breaker of fault breaking capacity 35 kA (Ics = Icu = Icw upto 433V) Manually operated, fitted with interlocked door, automatic safety shutters, mechanical ON/OFF and service/test/isolated position indicators and frame earthing contact, conforming to IS-13947-2 1993 as amended up-to-date complete --Each ACB as mentioned above shall be comprised with followings Independent manual spring closing mechanism - 1 No. Microprocessor based						

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	numerical relay (EMI & EMC certified) for over current, earth fault & short circuit protection with LCD display & button for ajustment/setting/viewing of parameters - 1 set. Digital Multifunctional Meter to record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as a percentage of total current, comprising of suitable communication port for connection to IBMS. and 1 set of 3 Nos. CT of 1000 A/5 A Class 1 accuracy and 30 VA burden. -- 1 Set 3 Nos. Phase indication LED lamps with 2 Amp back up MCB 3 Nos. Indication lamps (Red for ACB ON, Green for ACB OFF,							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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Orange for Auto Trip.) Shunt trip coil 220 V A.C. Breaker control switch for Breaker ON, Breaker OFF and Trip Alarm Cancellation Test terminal block set, fuses, circuits as per standard practice, auxiliary contacts for positive interlocking of the breakers as required. BUSBAR Electrolytic high conductivity aluminium three phase and neutral busbars rated at 1200 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 35 kA at 415 volts. The neutral busbar is to be of 50% capacity. The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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50° C. The temperature rise should not be more than 40° C over ambient of 50° C. <u>OUTGOING UNITS</u> 2 No. 630 amp 35 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF indicating lamps complete with 1 no. 3 phase 4 wire unbalanced panel mounted, Digital dual type kWh CT operated meter alongwith CT's class 1.0 accuracy 10 VA Burden & CT shorting link.B578 1 No. 250 amp 35 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF indicating lamps complete with 1 no. 3 phase							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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4 wire unbalanced panel mounted, Digital dual type kWh CT operated meter alongwith CT's class 1.0 accuracy 10 VA Burden & CT shorting link. 1 No. 400 amp 35 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF indicating lamps complete with 1 no. 3 phase 4 wire unbalanced panel mounted, Digital dual type kWh CT operated meter alongwith CT's class 1.0 accuracy 10 VA Burden & CT shorting link. 1 No. 200 amp 35 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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indicating lamps complete with 1 no. 3 phase 4 wire unbalanced panel mounted, Digital dual type kWH CT operated meter alongwith CT's class 1.0 accuracy 10 VA Burden & CT shorting link. 4 No. 100 amp 35 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit protection with ON/OFF indicating lamps complete with 1 no. 3 phase 4 wire unbalanced panel mounted, Digital dual type kWH CT operated meter alongwith CT's class 1.0 accuracy 10 VA Burden & CT shorting link. 1 No. 63 amp 35 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short circuit							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	protection with ON/OFF indicating lamps complete with 1 no. 3 phase 4 wire unbalanced panel mounted, Digital dual type kWH CT operated meter alongwith CT's class 1.0 accuracy 10 VA Burden & CT shorting link. The Switchboard Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above							
147	UPS Panel: Supplying, installation, testing & commissioning of floor mounted cubical type panel suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm thick for gland, plates i/c cleaning & finishing complete with 7 tank	1	EA					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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process for powder coating in approved shade,having following capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with required size of Al. bus bars and control wiring with 2.5 .sq. mm. PVC insulated copper							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears :- INCOMING 2 No. 630 Amps, 25 kA 4P MCCB with adjustable thermal and adjustable magnetic and extended rotary handle . Digital Multifunctional Meter to record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as a percentage of total current, comprising of suitable communication port for connection to IBMS. and 1 set of 3 Nos. CT of 630 A/5 A Class 1 accuracy and 30 VA burden. -- 1 Set 3 Nos. LED Phase Indication Lamp							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

2 Nos. LED Indication Lamp (Red for ON and GreenOFF) BUSBAR Electrolytic high conductivity aluminium three phase and neutral busbars rated at 800 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity. The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at 500 C. The temperature rise should not be more than 40° C over ambient of 50° C. OUTGOING UNITS 1 No. 400 amp 25 kA TPN MCCB with adjustable thermal and adjustable magnetic release having overcurrent and short							

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	circuit protection with ON/OFF indicating lamps complete with 1 no. 3 phase 4 wire unbalanced panel mounted, Digital dual type kWh CT operated meter alongwith CT's class 1.0 accuracy 10 VA Burden & CT shorting link. 1 Nos. 200 amp 25 kA TPN MCCB with adjustable thermal & adjustable magnetic release, ON/OFF indicating lamps complete with 6Nos. 3 phase 4 wire unbalanced panel mounted, Digital dual type kWh CT operated meter alongwith CT ' s class 1.0 accuracy 10 VA Burden & CT shorting link. 1 Nos. 100 amp 25 kA TPN MCCB with adjustable thermal & adjustable magnetic release, ON/OFF indicating lamps complete with							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	6Nos. 3 phase 4 wire unbalanced panel mounted, Digital dual type kWh CT operated meter alongwith CT ' s class 1.0 accuracy 10 VA Burden & CT shorting link. 2 Nos. 63 amp 25 kA TPN MCCB with adjustable thermal & adjustable magnetic release, ON/OFF indicating lamps The Emergency Switchboard Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above							
148	<u>Supplying, installation, testing & commi:</u> Supplying, installation, testing & commissioning of floor mounted cubical type Lift panel suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for	1	EA					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

frame work and covers, 3 mm thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade,having following capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with required size of							

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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Al. bus bars and control wiring with 2.5 .sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears :- INCOMING 1 No. 100 Amps, 25 kA 4P Automatic Changeover switch with 1 nos 100A 4P MCCB adjustable thermal and adjustable magnetic and extended rotary handle . Digital Multifunctional Meter to record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as a percentage of total current, comprising of suitable communication port for connection to IBMS.							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

and 1 set of 3 Nos. CT of 100 A/5 A Class 1 accuracy and 30 VA burden. -- 1 Set 3 Nos. LED Phase Indication Lamp 2 Nos. LED Indication Lamp (Red for ON and GreenOFF) BUSBAR Electrolytic high conductivity aluminium three phase and neutral busbars rated at 200 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity.b The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at 50° C. The temperature rise should not be more than 40° C over ambient of 50° C.							

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	OUTGOING UNITS 3 Nos. 63 amp 25 kA TPN MCCB with adjustable thermal & adjustable magnetic release, ON/OFF indicating lamps 4 Nos. 32 amp 25 kA TPN MCCB with adjustable thermal & adjustable magnetic release, ON/OFF indicating lamps The Lift Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above.							
149	<u>Supplying, installation, testing & commissioning of floor mounted:</u> Supplying, installation, testing & commissioning of floor mounted cubical type Common Services Panel suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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covers, 3 mm thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade,having following capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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required size of Al. bus bars and control wiring with 2.5 .sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears :- INCOMING 1 No. 150 Amps, TPN Switch Isolator with thermal and adjustable magnetic and extended rotary handle . Digital Multifunctional Meter to record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as a percentage of total current, comprising of suitable communication port for connection to IBMS. and 1 set of 3 Nos. CT of 150 A/5 A Class 1 accuracy and 30							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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VA burden. -- 1 Set 3 Nos. LED Phase Indication Lamp 2 Nos. LED Indication Lamp (Red for ON and GreenOFF) BUSBAR Electrolytic high conductivity aluminium three phase and neutral busbars rated at 200 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity. The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at 50° C. The temperature rise should not be more than 40° C over ambient of 50° C. OUTGOING UNITS 7 Nos. 63 amp 25 kA TPN							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	MCCB with adjustable thermal & adjustable magnetic release, ON/OFF indicating lamps 2 Nos. 32 amp 25 kA TPN MCCB with adjustable thermal & adjustable magnetic release, ON/OFF indicating lamps The Common Services Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above							
150	<u>Supplying, installation, testing & commi:</u> Supplying, installation, testing & commissioning of floor mounted cubical type Basement Ventilation Panel suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm thick for gland, plates i/c cleaning & finishing	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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complete with 7 tank process for powder coating in approved shade,having following capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with required size of Al. bus bars and control wiring with 2.5 .sq.							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears :- INCOMING 1 No. 400 Amps, TPN Switch Isolator with thermal and adjustable magnetic and extended rotary handle . Digital Multifunctional Meter to record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as a percentage of total current, comprising of suitable communication port for connection to IBMS. and 1 set of 3 Nos. CT of 150 A/5 A Class 1 accuracy and 30 VA burden. -- 1 Set 3 Nos. LED Phase Indication							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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Lamp 2 Nos. LED Indication Lamp (Red for ON and GreenOFF) BUSBAR Electrolytic high conductivity aluminium three phase and neutral busbars rated at 500 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity. The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at 50° C. The temperature rise should not be more than 40° C over ambient of 50° C. OUTGOING UNITS 1 Nos. 100 amp 25 kA TPN MCCB with adjustable thermal & adjustable magnetic release,							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	ON/OFF indicating lamps 6 Nos. 63 amp 25 kA TPN MCCB with adjustable thermal & adjustable magnetic release, ON/OFF indicating lamps 2 Nos. 32 amp 25 kA TPN MCCB with adjustable thermal & adjustable magnetic release, ON/OFF indicating lamps The Basement Ventilation Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above							
151	<u>Supplying, installation, testing & commi:</u> Supplying, installation, testing & commissioning of floor mounted cubical type Ground panel (UPS) suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm	1	EA					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade,having following capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with required size							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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of Al. bus bars and control wiring with 2.5 .sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears :- INCOMING 1 No. 63 Amps, TPN switch Isolator with adjustable thermal and adjustable magnetic and extended rotary handle . Digital Multifunctional Meter to record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as a percentage of total current, comprising of suitable communication port for connection to IBMS. and 1 set of 3 Nos. CT of 63 A/5 A Class 1 accuracy and 30 VA							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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burden. -- 1 Set 3 Nos. LED Phase Indication Lamp 2 Nos. LED Indication Lamp (Red for ON and GreenOFF) BUSBAR Electrolytic high conductivity aluminium three phase and neutral busbars rated at 100 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity. The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at 50° C. The temperature rise should not be more than 40° C over ambient of 50° C. OUTGOING UNITS 5 Nos. 32 amp 15 kA TPN MCCB with adjustable thermal							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	& adjustable magnetic release, ON/OFF indicating lamps The Ground Floor UPS Switch Board Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above							
152	<u>Supplying, installation, testing & commi:</u> Supplying, installation, testing & commissioning of floor mounted cubical type typical panel (First-Fifth) suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade,having following	5	EA					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with required size of Al. bus bars and control wiring with 2.5 .sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	half, i/c providing following switch gears :- INCOMING 1 No. 200 Amps, TPN switch Isolator with adjustable thermal and adjustable magnetic and extended rotary handle . Digital Multifunctional Meter to record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as a percentage of total current, comprising of suitable communication port for connection to IBMS. and 1 set of 3 Nos. CT of 200 A/5 A Class 1 accuracy and 30 VA burden. -- 1 Set 3 Nos. LED Phase Indication Lamp 2 Nos. LED Indication Lamp (Red for ON and GreenOFF) BUSBAR						

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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Electrolytic high conductivity aluminium three phase and neutral busbars rated at 200 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity. The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at 50° C. The temperature rise should not be more than 40° C over ambient of 50° C. OUTGOING UNITS 2 Nos. 100 amp 15 kA TPN MCCB with adjustable thermal & adjustable magnetic release, ON/OFF indicating lamps 2 Nos. 63 amp 15 kA TPN MCCB with adjustable thermal &							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	adjustable magnetic release, ON/OFF indicating lamps 2 Nos. 32 amp 15 kA TPN MCCB with adjustable thermal & adjustable magnetic release, ON/OFF indicating lamps The Typical Switch Board Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above (For First Floor, First Floor and Second Floor,Third Floor,Fourth Floor)							
153	<u>Supplying, installation, testing & commi:</u> Supplying, installation, testing & commissioning of floor mounted cubical type typical panel (Ground Floor) suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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covers, 3 mm thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having following capacity extensible type TPN aluminium alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears, switch gears to cable alley with							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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required size of Al. bus bars and control wiring with 2.5 .sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears : INCOMING 1 No. 200 Amps, TPN switch Isolator with adjustable thermal and adjustable magnetic and extended rotary handle . Digital Multifunctional Meter to record demand (KVA), energy (KWH & KVAH), power factor, current (in each phase and the neutral), voltage (between phases and between each phase and neutral), Total haramonic distoration (THD) as a percentage of total current, comprising of suitable communication port for connection to IBMS. and 1 set of 3 Nos. CT of 200 A/5 A Class 1 accuracy and 30 VA							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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burden. -- 1 Set 3 Nos. LED Phase Indication Lamp 2 Nos. LED Indication Lamp (Red for ON and GreenOFF) BUSBAR Electrolytic high conductivity aluminium three phase and neutral busbars rated at 200 amps having interleaving design throughout having a maximum current density as per IEC 60439 suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity. The fault level & temperature rise calculations to withstand 25kA to be submitted with no derating at 500 C. The temperature rise should not be more than 400 C over ambient of 500 C. OUTGOING UNITS 1 Nos. 100 amp 15 kA TPN MCCB with adjustable thermal							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	& adjustable magnetic release, ON/OFF indicating lamps 6 Nos. 63 amp 15 kA TPN MCCB with adjustable thermal & adjustable magnetic release, ON/OFF indicating lamps 2 Nos. 32 amp 15 kA TPN MCCB with adjustable thermal & adjustable magnetic release, ON/OFF indicating lamps The Typical Switch Board Panel complete with all interconnections, risers, internal wiring, labels etc. as required as per above							
154	<u>Supplying and laying of following sizes:</u> Supplying and laying of following sizes earthed XLPE insulated amoured aluminium conductor power cable of 6.6 KV grade confirming to IS 7098(Part II) amended upto date, direct in ground including excavation, sand	200	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	cushioning, protective covering and refilling the trench etc. as required. as required.- 3 Core 240 Sq. mm							
155	<u>Supplying and laying of following sizes:</u> Supplying and laying of following sizes earthed XLPE insulated amoured aluminium conductor power cable of 6.6 KV grade confirming to IS 7098(Part II) amended upto date in the existing masonry open duct as required. - 3 Core 240 Sq. mm	50	M					
156	<u>Supplying and making indoor cable end te:</u> Supplying and making indoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for following size of 3 core, XLPE aluminium conductor cable of 6.6 kV grade as required. - 240 sq. mm	4	EA					
157	<u>Supplying and making straight through ca:</u> Supplying and making straight	2	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	through cable jointing with heat shrinkable jointing kit complete with all accessories including ferrules suitable for following size of 3 core, XLPE aluminium conductor cable of 6.6 kV grade as required. - 240 sq. mm							
158	<u>Supplying and fixing of nominal 2.5 mm:</u> Supplying and fixing of nominal 2.5 mm +/-10% thick insulated synthetic Mat conforming to IS 15652 : 2006 and meeting the requirements of IS 5216 (part 1,2 &3), IS 8437, IEC-479 Pub-1, alongwith suitable adhesive/chemibound, Pu resin, waterproofing compound and sealing material as per in service recommendation of Annexure 'A' ' Clause C' of IS :15652 and suitable for class-B upto 11kV	30	M2					
159	<u>Providing & Fixing of ISI</u>	4	EA					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Marked 9 Kg. ': Providing & Fixing of ISI Marked Portable fire Extinguisher, Carbandioxide type capacity 4.5 Kg flat base including valve, discharge horn of not less than 10 mm dia. 1m long & complete in all respects including initial filling with CO2 gas filled to a filling ratio of not more than 0.667 and wall suspension bracket etc. as required.							
160	Providing & Fixing of ISI Marked 9 Kg. ': Providing & Fixing of ISI Marked 9 Kg. 'ABC' stored pressure type fire extinguisher conforming to IS: 15683:2006, with IS 14609, ISI marked ABC powder complete with squeeze grip release valve, discharge pipe locking arrangement, pressure gauge, Operating Temperature: - 10°C to + 55°C. with fixing	4	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	hanger, brackets, screws etc. as required							
161	<u>Supply and fixing safety instruction cha:</u> Supply and fixing safety instruction chart in word duly framed with 5 mm thick glass as required, (approx. Front area 1.20 sq.m)	6	EA					
162	<u>Providing of set of 4 Nos. 9.5 Litre cap:</u> Providing of set of 4 Nos. 9.5 Litre capacity GI bucket painted in post office red colour with prior coat of red-oxide paint and written with white paint 'FIRE' and mounted on MS angle iron frame with bracket of appropriate size & capacity including filling sand etc.	4	EA					
163	<u>Providing First Aid Box as approved by S:</u> Providing First Aid Box as approved by St. John Ambulance Brigade/Indian Red Cross conforming to IS 2217-1963.	2	EA					
164	<u>Supply & fixing shock</u>	2	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	<u>treatment chart du:</u> Supply & fixing shock treatment chart duly-mounted on a wooden frame with 5mm thick glass as required. (approximate front area 1.20sq.metre).							
165	<u>Supplying rubber gloves and tool kit as:</u> Supplying rubber gloves and tool kit as required	2	EA					
166	<u>Supplying and fixing wooden board for Ke:</u> Supplying and fixing wooden board for Keys as required	2	EA					
167	<u>Supplying, laying and fixing of the foll:</u> Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on wall surface as required. - 3.5 core 300 sq	50	M					
168	<u>Supplying, laying and fixing of the foll:</u>	50	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on wall surface as required. 4 core 4 sq mm							
169	<u>Supplying and Laying of XLPE insulated:</u> Supplying and Laying of XLPE insulated and PVC sheathed armoured aluminium power cable of 1.1 kV grade confirming to IS 7098(Part 1) ammended upto date of following sizes direct in ground including excavation and refilling the trench etc as required, but excluding sand cushioning and protective covering as complete as required - 3.5 core 50 sq mm	50	M					
170	<u>Supplying and Laying of XLPE insulated:</u> Supplying and Laying of XLPE	240	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	insulated and PVC sheathed armoured aluminium power cable of 1.1 kV grade confirming to IS 7098(Part 1) ammended upto date of following sizes direct in ground including excavation and refilling the trench etc as required, but excluding sand cushioning and protective covering as complete as required - complete as required - for 3.5 core 95 sq mm							
171	<u>Supplying and Laying of XLPE insulated:</u> Supplying and Laying of XLPE insulated and PVC sheathed armoured aluminium power cable of 1.1 kV grade confirming to IS 7098(Part 1) ammended upto date of following sizes direct in ground including excavation and refilling the trench etc as required, but	1,150	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	excluding sand cushioning and protective covering as complete as required 3.5 core 300 sq mm							
172	<u>Supplying and Laying of XLPE insulated:</u> Supplying and Laying of XLPE insulated and PVC sheathed armoured aluminium power cable of 1.1 kV grade confirming to IS 7098(Part 1) ammended upto date of following sizes direct in ground including excavation and refilling the trench etc as required, but excluding sand cushioning and protective covering as complete as required 4 core 16 sq mm	50	M					
173	<u>Supplying, laying and fixing of the foll:</u> Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on	300	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	existing cable tray as required. - 3.5 core 50 sq mm							
174	<u>Supplying, laying and fixing of the:</u> Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. - for 3.5 core 70 sq mm	50	M					
175	<u>Supplying, laying and fixing of the:</u> Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. - for 3.5 core 95 sq mm	100	M					
176	<u>Supplying, laying and fixing of the:</u> Supplying, laying and fixing of	150	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. - for 3.5 core 120 sq mm							
177	<u>Supplying, laying and fixing of the:</u> Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. - for 3.5 core 150 sq mm .	200	M					
178	<u>Supplying, laying and fixing of the:</u> Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming	300	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. - for 3.5 core 185 sq mm							
179	<u>Supplying, laying and fixing of the:</u> Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. - for 3.5 core 240 sq mm	650	M					
180	<u>Supplying, laying and fixing of the:</u> Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. -	100	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	3.5 core 300 sq mm							
181	<u>Supplying, laying and fixing of the:</u> Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. - for 4 core 4 sq mm	50	M					
182	<u>Supplying, laying and fixing of the:</u> Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. - for 4 core 6 sq mm	1,800	M					
183	<u>Supplying, laying and fixing</u>	2,500	M					

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	of the: Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. - for 4 core 10 sq mm							
184	Supplying, laying and fixing of the: Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. - for 4 core 16 sq mm	1,050	M					
185	Supplying, laying and fixing of the: Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE	1,150	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. - for 4 core 25 sq mm							
186	<u>Supplying, laying and fixing of the:</u> Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. - 4 core 35 sq mm	700	M					
187	<u>Supplying, laying and fixing of the:</u> Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on	100	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	existing cable tray as required. - 2 core 16 sq mm							
188	<u>Supplying, laying and fixing of the:</u> Supplying, laying and fixing of the following sizes armoured aluminium conductor XLPE power cable of 1.1 KV grade confirming to IS 7098(Part I) amended upto date of following sizes on existing cable tray as required. -for 2 core 10 sq mm	600	M					
189	<u>Supplying and Laying of PVC insulated:</u> Supplying and Laying of PVC insulated and PVC sheathed / XLPE insulated armoured aluminium power cable of 1.1 kV grade confirming to IS 7098(Part 1) ammended upto date of following sizes in the existing RCC/ HUME/ METAL pipe as required. - 3.5	20	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	core 95 sq mm XLPE aluminium conductor armoured cable							
190	<u>Supplying and Laying of PVC insulated:</u> Supplying and Laying of PVC insulated and PVC sheathed / XLPE insulated armoured aluminium power cable of 1.1 kV grade confirming to IS 7098(Part 1) ammended upto date of following sizes in the existing RCC/ HUME/ METAL pipe as required for 3.5 core 300 sq mm XLPE aluminium conductor armoured cable	20	M					
191	<u>Supplying and Laying of PVC insulated an:</u> Supplying and Laying of PVC insulated and PVC sheathed / XLPE insulated armoured aluminium power cable of 1.1 kV grade confirming to IS 7098(Part 1) ammended upto date of the followng sizes in the existing masonry open duct as complete as	50	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	required - 3.5 core 300 sq mm XLPE aluminium conductor armoured cable							
192	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.- - 3.5 core 50 sq mm	12	NO					
193	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.- for 3.5 core 70 sq mm	2	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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194	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required. for 3.5 core 95 sq mm-	2	NO					
195	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required. 3.5 core 120 sq mm	4	NO					
196	<u>Supplying and making end termination:</u> Supplying and making end termination with brass	10	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.- for 3.5 core 150 sq mm							
197	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.- for 3.5 core 185 sq mm	16	NO					
198	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium	6	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	conductor cable of 1.1 KV grade as required.- for 3.5 core 240 sq mm							
199	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.- for 3.5 core 300 sq mm	48	NO					
200	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.- for 4 core 4 sq mm	4	NO					
201	<u>Supplying and making end termination:</u>	88	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.- for 4 core 6 sq mm							
202	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.- for 4 core 10 sq mm	130	NO					
203	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for	56	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.- for 4 core 16 sq mm							
204	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.- for 4 core 25 sq mm	40	NO					
205	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC	36	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.- for 4 core 35 sq mm							
206	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.- for 2 core 16 sq mm	4	NO					
207	<u>Supplying and making end termination:</u> Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.-	26	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	for 2 core 10 sq mm							
208	<u>Supplying, installing by suspension on c:</u> Supplying, installing by suspension on ceiling/along the wall, testing and commissioning of following capacity Sandwich Type Rising Mains for use on 3 phase 4 wire 415 V, 50Hz A.C. supply with metal clad enclosure having IP-54 rating after fixing the tap off boxes and all accessories, made of 1.6mm thick steel sheet duly powder coated in convenient sections complete with 4 Nos. aluminium bus bars having current density of 130 A/sq. cm at nominal current rating, necessary joints, elbow joints & expansion joints and bends, fire barrier at each floor, provision of tapping at every meter, adopter box and copper	24	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	flexible for joints, continuous earthing with 2 Nos. aluminium strip of suitable size (one on each side) including, G.I. clamping brackets, suspenders, angle iron bracket, steel fasteners, connecting to earthing system etc. as required- 400 A, Isc = 25 kA for 1 second							
209	<u>Supplying, installing by suspension on c:</u> Supplying, installing by suspension on ceiling/along the wall, testing and commissioning of following capacity Sandwich Type Rising Mains for use on 3 phase 4 wire 415 V, 50Hz A.C. supply with metal clad enclosure having IP-54 rating after fixing the tap off boxes and all accessories, made of 1.6mm thick steel sheet duly powder coated in convenient sections complete with 4 Nos. aluminium bus	24	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	bars having current density of 130 A/sq. cm at nominal current rating, necessary joints, elbow joints & expansion joints and bends, fire barrier at each floor, provision of tapping at every meter, adopter box and copper flexible for joints, continuous earthing with 2 Nos. aluminium strip of suitable size (one on each side) including, G.I. clamping brackets, suspenders, angle iron bracket, steel fasteners, connecting to earthing system etc. as required- 630 A, Isc = 50 kA for 1 second							
210	<u>Supplying, installing, connecting to exi:</u> Supplying, installing, connecting to existing Sandwich Type Rising Mains, testing and commissioning of following capacity End Feed Unit	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	for use on 3 phase 4 wire 415 volts, 50Hz A.C. supply made with 1.6mm thick steel sheet enclosure duly powder coated with provision of MCCB/ACB (but without MCCB/ACB) complete with necessary joints including clamping brackets, angle iron bracket, steel fasteners, connecting to earthing system etc. as required (as per drawing)- 400 amps 30KA SC for 1 sec							
211	<u>Supplying, installing, connecting to exi:</u> Supplying, installing, connecting to existing Sandwich Type Rising Mains, testing and commissioning of following capacity End Feed Unit for use on 3 phase 4 wire 415 volts, 50Hz A.C. supply made with 1.6mm thick steel sheet enclosure duly powder coated with provision	1	EA					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	of MCCB/ACB (but without MCCB/ACB) complete with necessary joints including clamping brackets, angle iron bracket, steel fasteners, connecting to earthing system etc. as required (as per drawing)- for 630 amps 50KA SC for 1 sec							
212	<u>Supplying, installing, connecting to exi:</u> Supplying, installing, connecting to existing Sandwich Type Rising Mains, testing and commissioning of following capacity Plug In/ Tap Off Box for use on 3 phase 4 wire 415 volts, 50Hz A.C. supply with 1.6mm thick steel sheet enclosure duly powder coated with provision of MCCB (but without MCCB) complete etc. as required - 63 amps 25KA SC for 1 sec	11	EA					
213	<u>Supplying, installing, connecting to exi:</u> Supplying, installing,	6	EA					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	connecting to existing Sandwich Type Rising Mains, testing and commissioning of following capacity Plug In/ Tap Off Box for use on 3 phase 4 wire 415 volts, 50Hz A.C. supply with 1.6mm thick steel sheet enclosure duly powder coated with provision of MCCB (but without MCCB) complete etc. as required for 200amps 25KA SC for 1 sec							
214	<u>Providing and fixing following ratings a:</u> Providing and fixing following ratings and breaking capacity MCCB with thermal and magnetic release in the existing plug in /Tap Off Box including drilling holes in plug in /Tap Off Box, making connection etc. as required. - 63 amps 25KA SC for 1 sec	11	EA					
215	<u>Providing and fixing following ratings a:</u> Providing and fixing following	6	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	ratings and breaking capacity MCCB with thermal and magnetic release in the existing plug in /Tap Off Box including drilling holes in plug in /Tap Off Box, making connection etc. as required. for 200amps 25KA SC for 1 sec							
216	<u>Providing and fixing following ratings a:</u> Providing and fixing following ratings and breaking capacity MCCB with thermal and magnetic release in the existing plug in /Tap Off Box including drilling holes in plug in /Tap Off Box, making connection etc. as required. for 400amps TPN isolator	1	EA					
217	<u>Providing and fixing following ratings a:</u> Providing and fixing following ratings and breaking capacity MCCB with thermal and magnetic release in the existing plug in	1	EA					

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	/Tap Off Box including drilling holes in plug in /Tap Off Box, making connection etc. as required. for 630amps TPN isolator							
218	<u>Supplying and installing following size:</u> Supplying and installing following size of perforated painted with powder coating M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required. - 100 mm width X 50 mm depth X 1.6 mm thickness	50	M					
219	<u>Supplying and installing following size:</u> Supplying and installing following size of perforated painted with powder coating M.S. cable trays with perforation not more than	150	M					

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	17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required. for 225 mm width X 50 mm depth X 1.5 mm thickness							
220	<u>Supplying and installing following size:</u> Supplying and installing following size of perforated painted with powder coating M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required. for 300 mm width X 50 mm depth X 1.6 mm thickness	50	M					
221	<u>Supplying and installing</u>	1,300	M					

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	following size: Supplying and installing following size of perforated painted with powder coating M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required. for 450 mm width X 50 mm depth X 2.0 mm thickness							
222	Supplying and installing following size: Supplying and installing following size of perforated painted with powder coating M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required.	200	M					

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	for 600 mm width X 62.5 mm depth X 2.0 mm thickness							
223	<u>Supplying and installing following size:</u> Supplying and installing following size of perforated painted with powder coating M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required. for 900 mm width X 62.5 mm depth X 2.0 mm thickness	150	M					
224	<u>Supplying and installing following size:</u> Supplying and installing following size of perforated painted with powder coating M.S. cable trays Tee with perforation not more than 17.5%, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts &	50	EA					

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	nuts, painting suspenders etc as required. - 100 mm width X 50 mm depth X 1 .6 mm thickness							
225	<u>Supplying and installing following size:</u> Supplying and installing following size of perforated painted with powder coating M.S. cable trays Tee with perforation not more than 17.5%, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required. for 225 mm width X 50 mm depth X 1 .6 mm thickness	50	EA					
226	<u>Supplying and installing following size:</u> Supplying and installing following size of perforated painted with powder coating M.S. cable trays Tee with perforation not more than 17.5%, joined with connectors, suspended from the ceiling	10	EA					

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	with M.S. suspenders including bolts & nuts, painting suspenders etc as required.for 300 mm width X 50 mm depth X 1 .6 mm thickness							
227	<u>Supplying and installing following size:</u> Supplying and installing following size of perforated painted with powder coating M.S. cable trays Tee with perforation not more than 17.5%, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required. for 450 mm width X 50 mm depth X 2.0 mm thickness	20	EA					
228	<u>Supplying and installing following size:</u> Supplying and installing following size of perforated	10	EA					

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	painted with powder coating M.S. cable trays Tee with perforation not more than 17.5%, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required. for 600 mm width X 62.5 mm depth X 2.0 mm thickness							
229	<u>Supplying and installing following size:</u> Supplying and installing following size of perforated painted with powder coating M.S. cable trays Tee with perforation not more than 17.5%, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required. for 750 mm width X 62.5 mm depth	5	EA					

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	X 2.0 mm thickness							
230	<u>Supplying and installing following size:</u> Supplying and installing following size of perforated painted with powder coating M.S. cable trays Tee with perforation not more than 17.5%, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required. for 900 mm width X 62.5 mm depth X 2.0 mm thickness	2	EA					
231	<u>Earthing with G.I. earth plate 600 mm X:</u> Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure	10	SET					

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	with cover plate having locking arrangement and watering pipe of 2.7 metre long etc. (but without charcoal/ coke and salt) as required							
232	<u>Earthing with copper earth plate 600 mm:</u> Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. (but without charcoal/ coke and salt) as required.	6	SET					
233	<u>Supplying and laying 25 mm X 5 mm copper:</u> Supplying and laying 25 mm X 5 mm copper strip at 0.50 meter below ground as strip earth electrode, including connection/ terminating with nut, bolt, spring, washer etc. as required. (Jointing shall be done by	200	M					

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	overlapping and with 2 sets of brass nut bolt & spring washer spaced at 50 mm)							
234	<u>Supplying and laying 25 mm X 5 mm G.I st:</u> Supplying and laying 25 mm X 5 mm G.I strip at 0.50 meter below ground as strip earth electrode, including connection/terminating with G.I. nut, bolt, spring, washer etc. as required. (Jointing shall be done by overlapping and with 2 sets of G.I. nut bolt & spring washer spaced at 50 mm) meter 85	350	SET					
235	<u>Providing and fixing 25 mm X 5 mm copper:</u> Providing and fixing 25 mm X 5 mm copper strip in 40 mm dia G.I. pipe from earth electrode including connection with brass nut, bolt, spring, washer excavation and re-filling etc. as required.	35	M					
236	<u>Providing and fixing 25 mm X</u>	50	M					

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	5 mm G.I. s: Providing and fixing 25 mm X 5 mm G.I. strip in 40 mm dia G.I. pipe from earth electrode including connection with G.I. nut, bolt, spring, washer excavation and re-filling etc. as required.							
237	<u>Providing and fixing 25 mm X 5 mm copper:</u> Providing and fixing 25 mm X 5 mm copper strip on surface or in recess for connections etc. as required.	10	M					
238	<u>Providing and fixing 25 mm X 5 mm G.I. s:</u> Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.	1,500	M					
239	<u>Earthing with G.I earth Pipe 4.5 metre l:</u> Earthing with G.I earth Pipe 4.5 metre long, 40mm dia including accessories and providing masonry enclosure with cover	12	NO					

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	Plate having locking arrangement and watering pipe etc with charcoal /coke and salt as required.							
240	<u>DATA / NETWORKING CABLING:</u> Supplying and drawing of UTP 4 pair CAT 6 LAN Cable in the existing raceway/furniture/ surface/ recessed Steel/ PVC conduit as required. - 1 run of cable	6,000	M					
241	<u>DATA / NETWORKING CABLING:</u> Supplying and drawing of UTP 4 pair CAT 6 LAN Cable in the existing raceway/furniture/ surface/ recessed Steel/ PVC conduit as required. for 2 run of cable	6,000	M					
242	<u>DATA / NETWORKING CABLING:</u> Supplying and drawing of UTP 4 pair CAT 6 LAN Cable in the existing raceway/furniture/ surface/ recessed Steel/ PVC conduit as	8,000	M					

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	required.for 3 run of cable							
243	<u>Supplying and fixing following modular s:</u> Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required. - Telephone socket outlet	313	EA					
244	<u>Supplying and fixing following modular s:</u> Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required. for RJ-45 Computer Socket Outlet	671	EA					
245	<u>Supply, Installation, Testing and Commis:</u> Supply, Installation, Testing and Commissioning of UTP CAT6 24	36	EA					

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	Ports capacity gigaspeed angular patch panel, all ports loaded with individual RJ-45 IOs. Any unused / unloaded ports should be masked with blank modules or blank IO inserts as per tender specifications							
246	<u>Supply, Installation, Testing and Commis:</u> Supply, Installation, Testing and Commissioning of Single UTP CAT6 RJ-45 I/O of specified make including faceplate and MS back box assembly, inclusive of termination of CAT6 cable at each IO at workstation area / device / desktop / or at a patch panel inside a rack as per tender specifications	671	EA					
247	<u>Supply, Installation, Testing and Commis:</u> Supply, Installation, Testing and Commissioning of UTP CAT6 RJ45 Ethernet Patch Cord - 7ft as	671	EA					

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	per tender specifications							
248	<u>Supply, Installation, Testing and Commis:</u> Supply, Installation, Testing and Commissioning of UTP CAT6 RJ45 Ethernet Patch Cord - 3ft as per tender specifications	671	EA					
249	<u>Supply, Installation, Testing and Commis:</u> Supply, Installation, Testing and Commissioning of outdoor 12 core armoured single mode fiber optic cable for outdoor connectivity where ever required in prelaidd conduits / RCC hume pipes/HDPE/DWC, whichever maybe available etc. as required.	100	M					
250	<u>Supply, Installation, Testing and Commis:</u> Supply, Installation, Testing and Commissioning of 19" rack mounting type fiber shelf for assembly/termination of minimum 12 cores of singlemode ofc cable for LC style components, for	2	EA					

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	optical splicing and provision for storage of pigtails and splices, equipped with adaptors, adaptor plates and any other such all necessary hardware for proper dressing and management of fiber optic cable etc. as required. Any blank adaptor positions must be suitably masked for restricting dust entry etc. as required.							
251	<u>Supply, Installation, Testing:</u> Supply, Installation, Testing and Commissioning of LC type single mode pre-terminated pigtail 1mtr as per tender specification etc. as required.	20	EA					
252	<u>Supply, Installation, Testing and:</u> Supply, Installation, Testing and Commissioning of LC-LC single mode duplex fiber optic patch cord 1mtr as per tender	20	EA					

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	specification etc. as required.							
253	<u>Supplying and making cable route:</u> Supplying and making cable route marker with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) of size 60 cm X 60 cm at the bottom and 50 cm X 50 cm at the top with a thickness of 10cm including inscription duly engraved as required. for OFC Marker	5	EA					
254	<u>Supply, Installation, Testing:</u> Supply, Installation, Testing and Commissioning of Networking Enclosure - wall mounted, 19" mounting frame, usable height 15U, 600mmW x 600mmD etc. as required.	1	EA					
255	<u>Supply, Installation, Testing:</u> Supply, Installation, Testing and Commissioning of Networking	1	EA					

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	Enclosure - wall mounted, 19" mounting frame, usable height 22U, 800mmW x 800mmD etc. as required.							
256	SITC 42U Floor Standing: SITC 42U Floor Standing 19" Networking Enclosure as per specification and complete with all accessories. (upto size - 1000mmW x 1000mmD) as required.	6	EA					
257	Supply, Installation, Testing and: Supply, Installation, Testing and Commissioning of Layer 3 fiber aggregation networking switch, 24 nos. SFP+ fiber optics ports, 1 AC power supply built in and inclusive of redundant power supply and redundant fans as per technical specification etc. as required.	1	EA					
258	Supply, Installation, Testing: Supply, Installation, Testing	1	EA					

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	and Commissioning of Layer 3 fiber aggregation networking switch, 24 nos. SFP+ fiber optics ports, 1 AC power supply built in and inclusive of redundant power supply and redundant fans as per technical specification etc. as required.							
259	Supply, Installation, Testing: Supply, Installation, Testing and Commissioning of Layer 2 manageable networking switch, 24 # 10/100/1000Tx ports, all 24 ports shall be capable of providing PoE+ as per 802.3at, minimum 2 SFP+ ports + Uplink Port	1	EA					
260	Supply, Installation, Testing: Supply, Installation, Testing and Commissioning of Layer 2 manageable networking switch, 24 # 10/100/1000Tx ports, minimum 2 SFP+ ports + Uplink Port as per technical specification etc. as	35	EA					

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	required.							
261	<u>Supply, Installation, Testing & Commissi:</u> Supply, Installation, Testing & Commissioning of 16 port gigabit Industrial grade Layer 2 network switch with 8 x RJ45 10/100/1000 with 8 x 1G PoE, 4 x 1G Combo with rack mount kit as per tender specification.	1	EA					
262	<u>Supply, Installation, Testing and Commis:</u> Supply, Installation, Testing and Commissioning of 1000 Base LX singlemode Transceiver for L2/L3 switch, LC termination supporting distance upto 2000 mtrs as per technical specification etc.	1	EA					
263	<u>Supply, Installation, Testing:</u> Supply, Installation, Testing and Commissioning of 10G SFP+ Single Mode Transceiver, 1310nm, 2Km, LC connector, inclusive of any	1	EA					

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	hardware such as modules for populating SM-LC transceivers as per technical specification etc. as required.							
264	<u>Supply, Installation, Testing:</u> Supply, Installation, Testing and Commissioning of Wireless Access Point supporting Dual band with 802.11a/n/ac (5 GHz) and 802.11g/n (2.4GHz) concurrent operation with MIMO support 4x4, 3 spatial streams, PHY data rates upto 1.3Gbps per radio, One 10/100/1000 BASE-TX auto-sensing (RJ45) PoE port as per technical specification etc. as required.	24	EA					
265	<u>Supplying and laying of following:</u> Supplying and laying of following size DWC HDPE pipe ISI marked along with all accessories like socket, bend, couplers etc. conforming	30	M					

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	to IS 14930, Part II complete with fitting and cutting, jointing etc..direct in ground (75 cm below ground level) including excavation and refilling the trench but excludings and cushioning and protective covering etc., complete as required. - 63 mm dia (OD-63 mm & ID-51 mm nominal)							
266	<u>Providing and making of manhole chamber:</u> Providing and making of manhole chamber with masonry bricks (115mm thick wall) and plastering inside with 1:3:6 and fixing of Heavy duty frame and pre cast RCC cover as required. - 450x450x500 deep	2	EA					
267	<u>Supply, Installation, Testing:</u> Supply, Installation, Testing and Commissioning of Full HD Video Conferencing system with 1 + 3 Sites Connectivity with HD Communication Camera,	1	EA					

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	Boundary Mic, Two Monitor Output, Video Input : HDMI X 2 for Camera, RGB X 1 and HDMI X 1 for PC Input, Video Output: HDMI X 2, RJ 45 X 1 for Control Purpose							
268	<u>Supply, Installation, Testing and:</u> Supply, Installation, Testing and Commissioning of 55" Full HD (1920 x 1080) LED display, Brightness 450 cd/m sq, Panel backlit : Edge LED, RCA Input, HDMI input, PC input, Built in 20 W Speaker	2	EA					
269	<u>Supply, Installation, Testing and:</u> Supply, Installation, Testing and Commissioning of High-Definition multimedia system switcher & Scaler with 3 HDMI connectors (HDMI, HDCP), 2 VGA on 15-pin HD connectors, 2 composite video on RCA connectors, 3 unbalanced	1	EA					

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	analog audio on 3.5mm mini jacks for HDMI, 2 unbalanced analog audio on 3.5mm mini jacks for PC, and minimum 2 HDMI connectors (HDMI, HDCP), 1 HDBT on RJ – 45 connector Outputs, 1 line out balanced stereo output.							
270	<u>Supply, Installation, Testing:</u> Supply, Installation, Testing and Commissioning of Hydraulic Pop-up Box which include 2 X Universal Power, 2 X RJ45 Network, 1X VGA,1 X 3.5mm Audio,1 X HDMI	2	EA					
271	<u>Supply, Installation, Testing:</u> Supply, Installation, Testing and Commissioning of 40W Wall Mount Speaker, 6” Coaxial Transducer, 80Hz - 20kHz Frequency Response, 105dB (average) , 90 degrees conical Dispersion, 6 Ohms Nominal Impedance, with bracket accessories	2	EA					

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272	<u>Supply, Installation, Testing and:</u> Supply, Installation, Testing and Commissioning of 2 channels Mixer Amplifier delivers 60 watts/channel into 4 ohms, balanced line-level inputs on plug-in barrier strips, amplifier outputs on screw-terminal connectors	1	EA					
273	<u>Supply, Installation, Testing and:</u> Supply, Installation, Testing and Commissioning of Male to Male VGA with audio Cables - Molded Connectors.VGA Cable: 15-pin HD Male to Male Molded - 15 mtr- Cable cubby to rack to Rack	2	EA					
274	<u>Supply, Installation, Testing and:</u> Supply, Installation, Testing and Commissioning of Ultra Flexible High Speed HDMI Cables. 1.5 Mtr High Speed version 4	2	EA					
275	<u>Supply, Installation, Test:</u>	4	EA					

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	Supply, Installation, Testing and Commissioning of Ultra Flexible High Speed HDMI Cables. 15 Mtr High Speed version 4							
276	<u>Supply, Installation, Testing:</u> Supply, Installation, Testing and Commissioning of Ultra Flexible High Speed HDMI Cables. 5 Mtr High Speed version 4	2	EA					
277	<u>Supply, Installation, Testing:</u> Supply, Installation, Testing and Commissioning of Dual 20 AWG shielded twisted pairs with individual drain wires for Mic and Controlling Purpose,	150	M					
278	<u>Supply, Installation, Testing:</u> Supply, Installation, Testing and Commissioning of Two 14 AWG conductors non- plenum Speaker Cable, for High performance cable for audio signals.	150	M					
279	<u>Supply, Installation, Testing:</u> Supply, Installation, Testing and Commissioning of	1	EA					

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	Networking Enclosure - wall mounted, 19" mounting frame, usable height 15U, 800mmW x 800mmD etc. as required.							
280	<u>Supply, installation, testing and:</u> Supply, installation, testing and commissioning of Finger print, smart card and password based reader cum controller with UL listed power supply, patented fake finger detection technology, 500 DPI optical sensor, 2.8" color LCD display, 20,000 user capacity, 61,000 transaction storage , wiegand in/out RS 485, RS 232, TCP-IP for template management & PC connectivity, capacitive touch leypad, anti pass back, blacklist employee management, email/alarm	39	EA					

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	notification on various events like terminal disconnected, terminal tampered , door not closed, door forced open, tail gate, IP 65 complaint for water and weather resistance conditions etc.complete as per specifications.							
281	<u>Supply, installation, testing and commis:</u> Supply, installation, testing and commissioning of finger print & card based slave reader to be connected with Master biometric reader on RS 485 communication for exit, supports anti pass back feature complete as required& approved.	39	EA					
282	<u>Supply, installation, testing and commis:</u> Supply, installation, testing and commissioning of Single leaf EM loack with holding force of 600lbs, with LED, with L and U bracket and with	31	EA					

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	feedback complete as per specifications.							
283	<u>Supply, installation, testing and commis:</u> Supply, installation, testing and commissioning of Double leaf EM loack with holding force of 600x2lbs, with LED, with L and U bracket and with feedback complete as per specifications.	11	EA					
284	<u>Supply, installation, testing and commis:</u> Supply, installation, testing and commissioning of glass break unit as per approved etc. complete as per specifications.	39	EA					
285	<u>Supply, installation, testing and commis:</u> Supply, installation, testing and commissioning of Flap barrier for gated access control to control pedestrian entry/exit complete as per specifications.	1	EA					
286	<u>Supply, installation, testing and commis:</u>	4	EA					

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	Supply, installation, testing and commissioning of Tripod Turnstiles for gated access control to control pedestrian entry/exit complete as per specifications.							
287	<u>Supply, installation, testing and commis:</u> Supply, installation, testing and commissioning of P type swing gate for gated access control to control pedestrian entry/exit complete as per specifications.	2	SET					
288	<u>Supply, installation, testing and commis:</u> Supply, installation, testing and commissioning of Contactless capacitive touch based exit button with beep sound & LED statud indicatorfor gated access control to control pedestrian entry/exit complete as per specifications.	1	EA					
289	<u>Supply, installation, testing and commis:</u>	300	M					

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	Supply, Installation , Testing & Commissioning and laying of 4 Core X 0.5Sqmm Multistrand copper Cable from card reader to EM lock, push button etc..as per technical specification etc. as required.							
290	<u>Supplying and fixing of following sizes:</u> Supplying and fixing of following sizes of steel conduit along with accessories in surface/recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required.- 25 mm	25	M					
291	<u>Supplying and drawing of UTP 4 pair CAT:</u> Supplying and drawing of UTP 4 pair CAT 6 LAN Cable in the existing raceway/furniture/ surface/ recessed Steel/ PVC conduit as required.- 1 run of cable	500	M					

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292	<u>Supply, Installation , Testing & Commiss:</u> Supply, Installation , Testing & Commissioning face recognition, fingerprint, EM & smart Dual card & password (PIN) based reader cum controller with UL listed power supply, patented fake finger detection technology, 1.3MP cp;pr & IR dual camera with an tilt feature, 5" touch screen LCD display, Android OS, 1GHz quad core processor 2GM RAM 10,000 Face storage capacity, 2,50,000 fingerprint capacity, wiegand out to integrate with any controller,TCP-IP for template management, tail gate, anti pass back, blacklist employee management, email/alarm notification on various events like terminal disconnected, terminal tampered , door not closed, door forced open, tail gate etc.complete as per specifications.	1	EA					

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293	<u>Supply, installation, testing and commi:</u> Supply, installation, testing and commissioning of USB based finger print & Smart card based enrollment cum authentication device for visitors finger print enrollment as per approved etc. complete as per specifications.	1	EA					
294	<u>Supply, installation, testing and commi:</u> Supply, installation, testing and commissioning of Webcam compatible with VMS to capture the visitors images complete as per specifications.	1	EA					
295	<u>Supply, installation, testing and commi:</u> Supply, installation, testing and commissioning of flatbed document scanner compatible with VMS to scan the ID proof documents of visitors complete as per specifications.	1	EA					
296	<u>Supply, installation, testing and commi:</u>	1	EA					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Supply, installation, testing and commissioning of printer to generate the visitor passes complete as per specifications.							
297	<u>Supply, installation, testing and commi:</u> Supply, installation, testing and commissioning of Boom Barriers with 6 meter boom length, fitted with loop sensors to detect the movement of vehicle, reversal of boom movement option etc, (with all accessories)complete as per specifications.	1	EA					
298	<u>Supply, installation, testing and commi:</u> Supply, installation, testing and commissioning of following integrated access control and vistor management software complete as required. - EINS- Ultimate edition with Access Control module supporting upto 40 Viridi reader, supporting upto 5000	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	users							
299	<u>Supply, installation, testing and commi:</u> Supply, installation, testing and commissioning of following integrated access control and vistor management software complete as required. - EINS- Ultimate edition visitor management software supporting single company, single PC, single location and webcam & barcode scanner	1	EA					
300	<u>Supply, installation, testing and commi:</u> Supply, installation, testing and commissioning of following integrated access control and vistor management software complete as required. - EINS- Ultimate edition with Access Control module supporting upto 40 Viridi reader, supporting upto 5000 users Additional client licence	1	EA					
301	<u>Supply , Installation , Testing</u>	36	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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and comm: Supply , Installation , Testing and commissioning of 2.0 MP IP Vandal Dome Camera, True Day Night camera with IR Illuminator, 1/2.8" CMOS or better, 2 MP @ 25fps, Min. Illumination required 0.01 lux @F1.4 (color)) Lux IR On, AGC - Auto/Manual, 120dB True WDR, Min. Pixels 1920 x 1080 , triple stream, Wide Angle Fixed lens 2.8 mm IR corrected lens with angle of view of 120° or better, BLC, HLC, 3DNR, Audio with inbuilt Mic - G.711, Auto White Balance, Privacy Mask, high power LEDs IR with upto 15m IR distance, Min 128GB SD Card Slot, PoE, H.264 High Profile and MJPEG, PoE and 12V DC, IP 66 & IK10 Having Operating temp range : -30°C to 60° C. Certifications: ONVIF Profile S compliant, UL, CSA 60950-1, CE (EN 50130-4) & FCC Part 15 including cable termination and fixing accessories complete in all respect as per instruction of							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	engineer in-charge.							
302	<u>Supply , Installation , Testing and comm:</u> Supply, Installation, Testing & Commissioning of IP Network TDN Low-Light IR Bullet Camera, 1/2.7" CMOS, 2 MP @ 25fps or better, triple stream, Min. Illumination required 0.01 lux @ F2 (color), 120dB True WDR, Min. Pixels 1920 × 1080, triple stream, 3.6mm lens, BLC, HLC, 3DNR, Privacy Mask, 4 IR LEDs Smart IR with upto 40m IR distance, PoE, H.264 High Profile and MJPEG, PoE Class 3 and 12V DC, IP 66, , Having Operating temp range : -30°C to 60° C. Certifications: ONVIF Profile S compliant, North America UL Listed to UL/CSA 60950-1, CE (EN 60950-1) North America UL Listed to UL/CSA 60950-22, CE (EN 60950-22)	20	NO					
303	<u>Supply , Installation , Testing and comm:</u> Supply, Installation, Testing &	1	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

Commissioning of IP Network TDN Low-Light PTZ Camera with auto tracking, 1/1.9" CMOS, 2 MP @ 25fps, triple stream, Min. Illumination required 0.005 lux @ F1.6 (color) & 0.0005 lux @ F 1.6(B/W) or better, 120dB True WDR or better, Min. Pixels 1920 × 1080, triple stream, 6mm –180 mm or 4.5 to 135mm 30x motorized focus & zoom lens, BLC, HLC, 3DNR, Defog, Electronic Image Stabilization, Privacy Mask, Internal / External Illuminatrion range with upto 200m IR distance, Dual channel Audio G.711a/G.711u/AAC, 128GB SD card support, Alarm: 7 In/ 2 out, PoE, H.264 High Profile and MJPEG, PoE Class 5 and 12V DC/24VAC, IP 67, IK 10 vandal proof, Having Operating temp range : –10°C to 65° C. Certifications: ONVIF Profile S compliant, UL, CSA 60950-22, CE (EN 50130-4 & EN 55022) , FCC Part 15 & RoHS							

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	compliant.							
304	<u>Supply , Installation , Testing and comm:</u> Supply , Installation , Testing and commissioning of 32 Channel NVR (Network Video Recorder), for recording upto 32CH @ 1080P with 04 nos. SATA HDDs minimum 32TB storage or more (recording requirement all cameras recording at 2MP, 25fps for 30 days), Front Control Pannel with LEDs Indication, 3 nos. USB, Video Export feature on USB, Search Mode: Time/Date; Alarm; Motion Detection (MD); Exact Search (accurate to a second); Smart Search, HDMI and VGA Output, Alarm Input (16 nos.), Alarm Output (6 nos.), 16 POE Ports, eSATA Device, 320Mbps each Incoiming & Outgping throughput, Mobile app based client for Android & iOS based devices, Certification : CE, FCC & UL including fixing accessories and cable	2	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	termination with required connectors/Jack, complete in all respect as per instruction of engineer in-charge.							
305	<u>Supply , Installation , Testing and comm:</u> Supply , Installation , Testing and commissioning of 24 Port Switch (D Link 24 Port Switch with SFP DGS 1210-28P) Complete as required as per specifications	4	NO					
306	<u>Supply , Installation , Testing and comm:</u> Supply , Installation , Testing and commissioning of 08 Port Switch (8 Port POE Switch for CCTV & Access control System (Cisco / Linksys or equal) cisco SG350-10P) Complete as required as per specifications	4	NO					
307	<u>Supply , Installation , Testing and comm:</u> Supply , Installation , Testing and commissioning of LCD SCREEN 32 INCH complete as	2	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	required as per specifications							
308	<u>Supply , Installation , Testing and comm:</u> Supply , Installation , Testing and commissioning of PTZ Pole 3 MTR complete as required as per specifications	1	NO					
309	<u>Supply , Installation , Testing and comm:</u> Supply , Installation , Testing and commissioning of PTZ 5AMP Power Supply complete as required as per specifications	1	NO					
310	<u>Supply , Installation , Testing and comm:</u> Supply , Installation , Testing and commissioning of PTZ Power Cable (2X1.5 SQMM) complete as required as per specifications	40	M					
311	<u>Supply , Installation , Testing and comm:</u> Supply , Installation , Testing	1	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	and commissioning of CCTV Server Rack (12U) Floor Mounted Rack complete as required as per specifications							
312	<u>Supply , Installation , Testing and comm:</u> Supply , Installation , Testing and commissioning of CCTV Server Rack (12U) Floor Mounted Rack complete as required as per specifications	6	NO					
313	<u>Supply , Installation , Testing and comm:</u> Supply , Installation , Testing and commissioning of Client Worstation Intel i7 Quadcore Desktop 8GB RAM, 1TB Hardisk, Dual Monitor loaded with genuine windows latest Operating system & PC should have dedicated minimum 2 GB graphics card with complete set as required as per specifications	1	NO					
314	<u>Supplying and fixing of following sizes:</u> Supplying and fixing of	2,000	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	following sizes of steel conduit along with accessories in surface/recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required. - 25 mm							
315	<u>Supplying and drawing of UTP 4 pair CAT:</u> Supplying and drawing of UTP 4 pair CAT 6 LAN Cable in the existing raceway/furniture/ surface/ recessed Steel/ PVC conduit as required. - 1 run of cable	3,750	M					
316	<u>Supplying, Installation, Testing and Comm:</u> Supplying, Installation, Testing and Commissioning of intelligent analog addressable photothermal detector complete with mounting base complete as required.	552	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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317	<u>Supplying,</u> <u>Installation,Testing and</u> <u>Comm:</u> Supplying, Installation, Testing and Commissioning of intelligent addressable thermal detector complete with rate of rise cum fixed temperature thermistor complete with base as required. complete as required.	358	EA					
318	<u>Supplying,</u> <u>Installation,Testing and</u> <u>Comm:</u> Supplying, Installation, Testing and Commissioning of intelligent addressable thermal detector complete with rate of rise cum fixed temperature thermistor complete with base as required. complete as required.	6	EA					
319	<u>Supplying,</u> <u>Installation,Testing and</u> <u>Comm:</u> Supply, Installation, Testing & Commissioning of Micro processor based intelligent	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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addressable main fire alarm panel,central processing unit with the following loop modules and capable of supporting not less than 240 devices (including detectors and minimum 120 dtectors per loop and loop length up to 2km, network communication card minimum 320 character graphics/LCD display with touch screen or other keypad and minimum 4000 events history log in the non volatile memory (EPROM), power supply unit(230+ 5%V, 50Hz), 48 hours back-upwith 24 volt sealed maintenance free batteries with automatic charger. The panel shall have the facility to connect printer to print out log and facility to have seamless integration with analog/digital voice exacuation system (which is part of the schedule of work under SH:PA system) and shall be complete with all accessories. The panel shall be compatible for IBMS system with open protocol								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	BACnet/Modbus over IP complete as per specifications. - 10 loop panel							
320	<u>Supplying, Installation, Testing and Comm:</u> Supply, Installation, Testing & Commissioning of addressable Manual Call Point complete as required.	24	EA					
321	<u>Supply, Installation, Testing & Commisi:</u> Supply, Installation, Testing & Commissioning of addressable Fire Monitor Module complete as required.	24	EA					
322	<u>Supply, Installation, Testing & Commisi:</u> Supply, Installation, Testing & Commissioning of addressable Fire control Module complete as required.	45	EA					
323	<u>Supply, Installation, Testing & Commisi:</u> Supply, installation, testing and commissioning of fire	10	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	fighter phone jack complete as required.							
324	<u>Supply, Installation, Testing & Commisi:</u> Supply, installation, testing and commissioning of fire fighter telephone handset complete as required.	2	EA					
325	<u>Supply, Installation, Testing & Commisi:</u> Supply, installation, testing and commissioning of 1.5/3/6W metal box wall speakers complete as required.	9	EA					
326	<u>Supply, installation, testing and commis:</u> Supply, installation, testing and commissioning of 1.5/3/6W metal box ceiling speakers complete as required.	199	EA					
327	<u>Supplying and laying of 2 x 1.5 sq.mm fi:</u> Supplying and laying of 2 x 1.5 sq.mm fire survival armoured cable, 600/1000V rated with annealed copper conductor	15,000	M					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	having glass mica fire barrier tape covered by an extruded layer of cross Linkable Ethylene Propylene Rubber (EPR) insulation and LSZH inner bedding, steel wire armouring & LSZH outer sheath complete as required.							
328	<u>Supply, Installation, Testing & Commissi:</u> Supply, Installation, Testing & Commissioning of addressable horn cum strobe complete as required.	24	EA					
329	<u>Supply, Installation, Testing & Commissi:</u> Supply, Installation, Testing & Commissioning of Fault isolator complete with base as required.	50	EA					
330	<u>Supply, Installation, Testing & Commissi:</u> Supply, Installation, Testing & Commissioning of addressable phone control Module complete as required.	24	EA					
331	<u>Supply, Installation, Testing</u>	2	EA					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	& Commisi: Supply, Installation, Testing & Commissioning of addressable beam detector with short circuit isolator(inbuilt or separate) complete with emitter and receiver including connections with remote test features etc complete as required.							
332	<u>Supply, Installation, Testing & Commisi:</u> Supply, Installation, Testing & Commissioning of intelligent interface unit BACnet/ Modbus Protocol i.e supplying communication link between building management system and fire alarm control panel complete as required.	1	EA					
333	<u>Supply, Installation, Testing & Commisi:</u> Supplying, installation testing and commissioning of 6 zone voice alarm controller with USB, MP3 player (including 6zone button paging station) with seamless integration	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	facility with main fire alarm panel for voice evacuation complete as required.							
334	<u>Supply, Installation, Testing & Commisi:</u> Supply, Installation, Testing & Commissioning of digital audio amplifier 75 Watt, 25V rms operating at 240Volt AC Supply complete as required.addressable phone control Module complete as required.	5	EA					
335	<u>Supply, Installation, Testing & Commisi:</u> Supply, Installation, Testing & Commissioning of Voice command Keypad 6zone, with microphone assembly complete as required.	1	EA					
336	<u>Supply, installation, testing and commis:</u> Supply, installation, testing and commissioning of UPS system comprising of 200 kVA unit in static by-pass configuration with a battery	2	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	backup of 30 minutes duration for full load and with all standards fittings, accessories, protection, instruments, indications and controls including but not restricted to transformer, rectifier, inverter, SMF battery with float cum boost battery charger, static bypass switch, maintenance bypass, output isolation transformer, interconnections etc. including warranty and free all inclusive comprehensive maintenance services for one year after the date of handing over complete as per specifications and as required.							
337	<u>Supply, transportation at site, Installa:</u> "Supply, transportation at site, Installation, testing and commissioning of 3 phase 415 volts 50 cycle per second 1500 RPM Radiator cooled Diesel Generator Sets of rating as below, but complete with indoor mounting acoustical enclosure complying to CPCB	1	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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norms. The engine shall include flywheel to suit flexible coupling with guard, air cleaner, blower fan, fuel pump, variable speed electronic governor, fuel filter, lub oil filter & pump, Radiator, battery charger, 24 volt batteries of compatible capacity with battery stand and instrument panel comprising of switch with key etc. as required. The alternator shall be self excited (PMG), self regulated and continuously rated as below suitable for 3 phase 415 volts 50 cycles, 4 wire system and shall be provided with static excitation unit, Alternator insulation shall be class 'H' suitable to withstand tropical conditions and shall generally comply with BS 5000 and IS 4722. The overload capacity shall be not be less than 110% of rated capacity for 1 hour in every 12 hours The DG set shall be mounted on a fabricated rigid common base frame with GERB make							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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resilient anti-vibration mountings to provide 98% vibration isolation. The DG set shall include all accessories, fittings, instruments & standard tool kit complete as per specifications and as required including control cabling. The cost shall include providing adopter box for Cable termination as required. External 990 Litre Day Fuel tank with all visual indication, exhaust pipe, residential silenser and clading " The Acoustic Enclosure, fabricated from high quality sheet steel of minimum 2 mm thickness finished with powder coating shall be of weather proof construction, designed to reduce noise by 75 dB at 1 m distance (As per latest CPCB regulations). The enclosure shall be provided with a forced ventilation system to restrict the temperature rise within the enclosure to permissible limits. The DG Set shall be complete							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	with PCC (Power Command Control) module suitable for AMF (auto-mains failure), Auto Load Sharing, Auto Synchronization & Interface with PC & PLC mounted in the LT panel for ACB switching and Autoload sensing & load management. The prices should include communication card and networking gateway and software as required. - 500 KVA DG Sets							
338	<u>Supply, installation, testing and commis:</u> Supply, installation, testing and commissioning of totally enclosed, dust and vermin proof (IP-56 ingress protection) OUTDOOR MOUNTING, front operated, sheet steel clad cubical type AMF Panel suitable for operation of 500 kVA DG sets with hinged and lockable gasketed doors fabricated from minimum 2 mm thick CRCA sheet including cost of providing powder coating finish after 7	1	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

tanks surface treatment and including the cost of interconnections, earthing, provisions for cable terminations etc. complete as required with AMF relay and as below. 1 no. 690 volt 800 amp 4-pole motorized MCCB for MAINS 1 no. 690 volt 800 amp 4-pole motoried MCCB for ALTERNATOR 1 no. AC voltmeter 96 mm sq 0-500 V 1 no. Voltmeter selector switch OFF/RY/YB/BR with MCB 1 no. Voltmeter selector switch OFF/ALT/ MAINS/LOAD 1 no. AC Ammeter 96 mm sq. 0-800 amp for LOAD 1 no. Ammeter selector switch OFF/R/Y/B for LOAD 1 no. Frequency meter for LOAD. 1 no. kWh meter 3 phase 4 wire unbalanced load with 800/5 Cl 1.0 CT's for ALTERNATOR supply 3 no. 200/5 Cl 1.0 CT's for LOAD							

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	One set of Battery charger consisting of Transformer/Rectifier DC Ammeter DC Voltmeter Charging rate selector switch OFF/Trickle/Boost. One Mains supply voltage monitor One set of DC Control relays incorporating engine Start/Stop, three attempt starting facility and failure to start lock out. One set of relays for automatic closing and opening of the Mains and alternator power contactors as required. One selector switch Auto/Manual/ Test One set of the following One Selector switch for engine control OFF/ON							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Four Push buttons, Start, Stop, Reset, Test.							
	Three Indicating lamp "Load on set" "Load on Mains" "Set fails to start".							
	Five Indicating lamps for shutdown for "Low oil pressure" "High water Temp." "overspeed" "low fuel" "lub oil temperature"							
	One counter to indicate number of times set has operated.							
	One Tachometer to record speed							
	One Hour meter to indicate the number of hours set has operated							
	12 window annunciation.							
	The AMF panel shall include necessary internal wiring, control circuit fuses, dial plates etc. complete as required							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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TOTAL (GROUP- D) WITHOUT GST =								
TOTAL (GROUP- D) WITH GST =								

GROUP- E-LIFT

SL. NO.	DESCRIPTION OF WORK	QTY (A)	UNIT	RATE PER UNIT (IN WORDS & FIGURES) (B)		TOTAL AMOUNT C=(AXB)	SERVICE ACCOUNTING CODE (SAC)	SPECIFY % OF GST ON (C)
				FIGURES WORDS				
1	<u>Design, manufacture, supply, installatio:</u> Design, manufacture, supply, installation, testing, commissioning and handing over in satisfactory working condition of lifts including the cost of providing free comprehensive maintenance for two years after handing over complete as per specifications and as required and as below. Note : All the lifts are provided	2	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	with ARD Passenger Lifts (Machine roomless) with 13 passenger /884 kg capacity, 1.5 mps speed, ACVVVF control, Duplex collective selective control Operation 7 stops (Basement+ 1st Floor to 5th Floor) all on same side, travel 24.15 M approx. (The lift shall have provisions for Barrier free lift for handicapped persons alongwith provisions for a normal passenger lifts as per technical specifications)							
2	<u>Design, manufacture, supply, installatio:</u> Design, manufacture, supply, installation, testing, commissioning and handing over in satisfactory working condition of lifts including the cost of providing free comprehensive maintenance for two years after handing over complete as per specifications and as required and as below. Note : All the lifts are provided with ARD	1	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	For Service Lifts (M/c Room less) with 15 passenger 1020 kg capacity, 1.5 mps speed, ACVVVF control, Simplex Collective Operation 7 stops (Basement+ 1st Floor to 5th Floor) all on same side, travel 24.15 M approx.							
<u>TOTAL (GROUP E) WITH GST</u>								
<u>TOTAL (GROUP E) WITHOUT GST</u>								
<u>GROUP -F- SOLAR POWER PLANT</u>								
SL. NO.	DESCRIPTION OF WORK	QTY (A)	UNIT	RATE PER UNIT (IN WORDS & FIGURES) (B)		TOTAL AMOUNT C=(AxB)	SERVICE ACCOUNTING CODE (SAC)	SPECIFY % OF GST ON (C)
				FIGURES WORDS				
1	<u>Design, engineering, manufacture, supply:</u>		JOB					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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Design, engineering, manufacture, supply, installation, testing and commissioning of Grid interactive roof top 50 KWp Solar Power Generating System complete with following as required i/c complete set of spares and consumables for the system required for one year and training charges for 3 engineers at vendors work Solar PV Polycrystalline Module, 325W or above -154 nos 50kW / 3P / 415V Solar Inverter (Grid Connected) - 1 no Complete Set of Structure, Hot Dip GI - 1 set 1C / 4 sqmm Cu UV Protected wire (Module to inverter) -400 mtr 3.5C / 25 sqmm Al Flexible wire (Inv to ACDB) - 50 mtr 3.5C / 75 sqmm Al Cable (ACDB to LT Panel) -150 mtr AC DB (Complete with MCCB / CT & MFM) -1 Nos DC Fuse Box - 4 Nos GI Strip 25 x 3mm -500 Nos	1						

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	Conduit and Flexible Pipe - 800 Mtrs Lightning Arrester - 1 nos Earthing System - 3 set Civil Material for foundation of structure and earthing - 1 job MC4 Compatible connectors - 60 pairs Lugs, Glands & Misc (as per site) Job as above							
TOTAL (GROUP F) WITH GST								
TOTAL (GROUP F) WITHOUT GST								

GROUP-G- HVAC WORK								
SL. NO.	DESCRIPTION OF WORK	QTY (A)	UNIT	RATE PER UNIT (IN WORDS & FIGURES) (B)		TOTAL AMOUNT C=(AXB)	SERVICE ACCOUNTIN G CODE (SAC)	SPECIFY % OF GST ON (C)
				FIGURES	WORDS			
1	<u>Water Chilling Unit Screw Chiller with VFD:</u> Supply, installation, testing and commissioning of AHRI Certified screw type chilled water	3	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	pacakged refrigerant machine of 200 TR (R-134a) (Actual Capacity) complete with compressor- single / multiple stage, open / hermetic type (squirrel cage induction motor with class-F insulation) operated on 415 ±10% volts, 3 phase, 50 Hz. AC supply; water cooled condenser with marine water box, factory insulated chiller, vibration, isolators, integral refrigerant piping and wiring, all required accessories, automatic & safety controls, advanced microprocessor based control panel along with required hardware & software for integration with a 3rd party BMS (Open protocol), first charge of refrigerant and oil, incommer switchgear with terminations box suitable for terminations of XLPE AL cables, earth terminations etc. all mounted on a steel frame, foundation bolts nuts and accessores complete as required & as per specifications with the following characteristics:						

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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The machine must unload till 25% even at constant condenser water entering temperature of 90 Deg.F. The chilling machine shall be ECBC/ ASHRAE 90.1.2013 Compliant for performance. The scope of work shall also include Lifting, shifting & positioning of chiller at location shown on drawing. 1 No. or more NEMA 1 VFD and Twin Screw type compressor open/semi hermetic complete with automatic capacity control, safety switches, speed increasing gears, forced feed lubrication system etc. as per specifications. Necessary drive arrangement 1 Set- lubrication device consisting of automatic electric oil pump, oil cooler, head tank, oil strainer, automatic pressure regulating mechanism, oil heater, thermal switch etc. as per specifications. 1 No - matching shell and tube water cooled condenser of M.S. shell and integrally fined copper tubes. Condenser shell should							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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be ASME certified(U-stamped) or GB Complied. 1 No. -matching shell and tube flooded type chiller for centrifugal type units of M.S. shell and integrally finned copper tubes. Chiller shell should be ASME certified(U-stamped) or GB Complied. 1 Lot- Refrigerant piping fittings, valves and accessories to inter connect compressor, condenser, chillers and expansion valve. 1 Set - Microprocessor based control panel with coloured graphical display complete with accessories as per specifications. Controls shall be suitable for hookup to BMS, compatible with BacNet / Modbus as per specifications. Lot - Refrigerant line accessories comprising of safety valves, angle valves, liquid line indications, liquid level control etc. Lot- Suction line and chiller insulation with minimum 19mm thick polyvinyl nitrile rubber insulation finished with 0.63							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	mm thick G.S.S. cladding complete as required Lot - Frame work for mounting the above condenser, chiller compressor and motor with base plate complete with antivibration pads/springs. Lot-Initial/first charge of refrigerant gas and compressor oil duly charged at factory. C.O.P of selected chiller at AHRI conditions shall not be less than ECBC + requirement Chiller Chiller Water IN - 55 °F Chilled Water OUT - 45 °F Chilled water Flow - 475 USGPM Fouling Factor - 0.0005 FPS Condenser Condenser Water IN - 85°F Condenser Water OUT - 92.5°F Condenser Water Flow - 741 USGPM Fouling Factor - 0.001						

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	FPS IPLV not less than ECBC + requirement Pressure drop Evaparator side - Max. 6 mtr. Pressure drop Condenser side - Max. 8 mtr. NOTE a) The price quoted shall include pre shipping inspection / testing at the works of the manufacturer Freight, Insurance, Port clearance, loading / unloading, Installation, testing and commissioning as per specifications. b) RCC foundation will be in the scope of bidder only and nothing extra shall be paid on this account. c) Performance Testing 1 No. chiller at 5 points, 4 points at 100%. 75%, 50%, 30% at above conditions and constant condenser (90OF) 5th point is at 100% load and AHRI condition to verify COP of ECBC + requirement Performance test is not witnessed but the						

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	manufacturer would be required to submit the performance test certificates and get the same approved before dispatch of machines.							
2	Pump Set Supply, installation, testing and commissioning of vertical inline long coupled type water circulation pump in cast iron body & Bronze impeller, mechanical seals,complete driven with TEFC squirrel cage induction motor with class-F insulation & efficiency class IE-3 suitable for operation on 415 + 10% volts, 3 phase, 50 Hz., AC supply, all required fittings & accessories including coupling, coupling guard, complete as required & as per specification with following capacities. 1 No. vertically inline type pump. 1 No- Suitable HP, TEFC squirrel cage induction motor with class 'F' insulations & efficiency class IE3 whichever is more efficient,	3	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	1450 rpm synchronous speed , operating on 415 +10% volts ,3 phase , 50 Hz A.C.supply. Lot-Expanded polystrene (T.F.Quality) insulations of not less than 75mm thick duly cladded between aluminium sheets of 0.5mm thickness and properly clamped to pump in two semicircular section as per specifications. (For Chilled Water Pumps Only) Min. pump efficiency at duty conditions shall be 75% Lot- Mounting frame work with anti vibration pads. The scope of work shall include Lifting, shifting & positioning of pump at location shown on drawing. For Condensor Capacity : 800 US GPM Head : 25 Mtrs Note: 1. Total Static pressure given below minimum required for the system. Actual static pressure shall be calculated & confirmed by the bidder at time of						

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Execution.							
3	Primary Chilled Water Pumps with VFD Supply, installation, testing and commissioning of variable speed pumping system consisting of 3 numbers vertically inline long coupled type water circulation pump and 3 Nos.VFD with single stage impeller controlled by dedicated microprocessor based pump logic controller with modbus communication mounted separately in a control panel. The pump shall be driven by TEFC induction motor of class `F' insulation & efficiency class IE-3, suitable for operation on 415 volts ±10%, 3 phase, 50 Hz A.C. supply and insulated with Expanded polystrene (T.F.Quality) insulation complete. Panel mounted microprocessor based multi pump controller with VFD should also have provision for automatic alternate (cyclic) operation of pumps, multiple differential pressure sensor/ transmitters as necessary, ON/OFF push buttons, selection	1	SET					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	of pumps mode on panel, adequate provision to terminate alumunium armounred power cable as incommer to controller incommer, earth terminations complete as required and as per specification. The system shall be BMS compatible and complete in all respect and suitable for following rating. VFDs shall be with IP-55 protection and mounted over motor for control. 3 Nos. Vertically inline type pump. 3 Nos.- Suitable HP, TEFC squirrel cage induction motor with class 'F' insulations & efficiency class IE-3 , 1450 rpm synchronous speed , operating on 415 +10% volts ,3 phase , 50 Hz A.C.supply. 3 Nos. DP sensor across chillers and 3 Nos. DP sensors in risers. Variable Primary Panel should have a dedicated programmable logic controller with individual drive (mounted over motor) for each pump and with required no. of sensors and the entire							

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	unit has to be procured from the Pump manufacturer to ensure the smooth operation of the system. The Programmable logic controller shall be able to control minimum 1 Pump and maximum of 6 Pumps, panel shall be able to control by pass motorized valve. Automatic cascade control of pumps, automatic sequence change, Friction loss compensation, pump status shall be there. Display shall be graphical type with minimum 320 pixels X 240 Pixels VGA display with backlight.Drive should have rated input frequency 50 Hz and output frequency range of 0.5 to 132 Hz. An IP41/IP55 Nema Standard powder coated steel enclosure for Basement/Roof top, with sufficient capacity of cooling fan shall house all the electrical control components. Microprocessor based control panel shall have suitable hardware & software so that it can be integrated directly to						

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	IBMS with standard communication open protocol using backnet / Modbus as well as open IP. Any card required to do so shall be consider in scope. (All the Pump set will have their control panel with respect to the motor rating). All pumps to be provided with separate IP 55 rated variable frequency drives with integrated input disconnect switch. Control panel should also consist of cooling fan. Lot-Expanded polystrene (T.F.Quality) insulations of not less than 75mm thick duly cladded between aluminium sheets of 0.5mm thickness and properly clamped to pump in two semicircular section as per specifications. Min. pump efficiency at duty conditions shall be 75% Lot- Mounting frame work with anti vibration pads. Capacity : 480 USGPM (Each pump) Head : 27 Mtrs						

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	1 set consist of 3 Nos. pumps and control panel. "Note:- 1) The entire system alongwith primary pumps must be sourced from single manufacturer only for unit responsibility. 2) Total Static pressure given below minimum required for the system. Actual static pressure shall be calculated & confirmed by the bider at time of execution."							
4	<u>Cooling Tower (CTI CERTIFIED):</u> Supply, installation, testing and commissioning of FRP CTI Certified induced draft cross flow type cooling tower with FRP water basin, PVC fills with integral louvers and drift eliminators complete with hot water basin either fitted with spray nozzles or gravity fed nozzle free design, statically & dynamically balanced axial flow V-belt pulley driven or direct driven fans with	3	NO					

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TEAO induction motor (IP-55) of class F insulation, efficiency class IE-3 suitable for operation on 415 ± 10% volts, 50 Hz. AC supply with IP-54 VFD; suction screen, make up-quick fill arrangement, overflow and drain connections with all necessary valves & foot valves, suitable inspection ladder, access arrangement for cooling tower interior, steel /masonry supporting structure with proper design, anti-vibration mountings, foundation nuts, bolts, painting etc. complete as required and as per specification with the following. The scope of work shall include Lifting, shifting & positioning of cooling tower at location shown on drawing.							
Capacity : 250 Tons Water entering temperature : 92.5° F Water leaving temperature : 84.5° F Wet Bulb Temperature : 78° F							

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	Flow Rate : 800 GPM Note:- CC Foundation will be in the scope of bidder only and nothing extra shall be paid on this account.							
5	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of factory built Air handling ceiling suspended chilled water units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick metal viscous/ washable synthetic type MERV-8 air pre filters, MERV-13 fine filter, IE-3,	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	TEFC motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - 5,000 cfm, 15 mmwg ESP, 6 row deep, 12.5 TR							
6	Providing, fixing, testing and commissioning: Providing, fixing, testing and commissioning of factory built Air handling ceiling suspended chilled water units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick metal viscous/ washable synthetic type MERV-8 air pre filters, MERV-13 fine filter, IE-3, TEFC motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. 4000 cfm, 15 mmwg ESP, 6 row deep, 10 TR							
7	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of factory built Air handling ceiling suspended chilled water units Double skin	5	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick metal viscous/ washable synthetic type MERV-8 air pre filters, MERV-13 fine filter, IE-3, TEFC motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - for - 2000 cfm, 15 mmwg ESP,						

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	6 row deep, 5 TR							
8	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of factory built Air handling ceiling suspended chilled water units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick metal viscous/ washable synthetic type MERV-8 air pre filters, MERV-13 fine filter, IE-3, TEFC motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire	2	NO					

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	retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - for - 1600 cfm, 15 mmwg ESP, 6 row deep, 4 TR							
9	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of floor mounted chilled water factory built Air handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick	1	NO					

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	MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - 19,500 cfm, 30 mmwg ESP, 6 row deep, 48.75 TR							
10	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of floor mounted chilled water factory built Air handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - 17,000 cfm, 30 mmwg ESP, 6 row deep, 42.5 TR							
11	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of floor mounted chilled water factory built Air	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - 16,000 cfm, 30 mmwg ESP, 6							

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	row deep, 40 TR (with mixing box)							
12	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of floor mounted chilled water factory built Air handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas	1	NO					

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	connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - 16,000 cfm, 30 mmwg ESP, 6 row deep, 40 TR							
13	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of floor mounted chilled water factory built Air handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter	3	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	section having 50 mm thick MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - 15,500 cfm, 30 mmwg ESP, 6 row deep, 38.75 TR							
14	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of floor mounted chilled water factory built Air handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having	4	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - 13,000 cfm, 30 mmwg ESP, 6 row deep,32.5 TR							
15	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of floor mounted chilled water factory built Air	2	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - 12,500 cfm, 30 mmwg ESP, 6							

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	row deep, 31.25 TR							
16	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of floor mounted chilled water factory built Air handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas	2	NO					

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	connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - 11,000 cfm, 30 mmwg ESP, 6 row deep, 27.5 TR							
17	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of floor mounted chilled water factory built Air handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium	1	NO					

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	finned copper tubes. Filter section having 50 mm thick MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - 10,000 cfm, 30 mmwg ESP, 6 row deep, 25 TR							
18	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of floor mounted chilled water factory built Air handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - 8,500 cfm, 30 mmwg ESP, 6 row deep, 21.25 TR							
19	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of floor mounted	2	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	chilled water factory built Air handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. 7,500						

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	cfm, 30 mmwg ESP, 6 row deep, 18.75 TR							
20	Supply, installation, testing: Supply, installation, testing and commissioning of Heat recovery unit of 0.6mm thick Pre-Coated GI sheet Outer skin & 0.6 mm thk GI sheet metal cabinet type plain Inner skin Double skin unit with with 40 mm thick with Thermal break profile, 40 kg/cum polyurethane foam sandwiched between panels complete with pre filter of MERV-8 efficiency at fresh air inlet along with Gridblok IAQ chemical filter with turbulent flow and monolithic structure with 100 mm thick designed for 500 fpm with pressure drop not exceeding 146 pa having density 27.54 lb/ft of along with MERV-13 fine filter at fresh air outlet (Blow thru type), MERV-8 filter at return air outlet. Fan section with direct driven plug fan & IE-3 Motor with, IP-20 variable frequency drive shall be suitable for 415 + 10% volts, 50 cycles, 3 phase AC supply. Heat reovery	1	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	unti shall be wheel type of aluminium with 3 angstorn molecular sieve which is for recovery of both latest and sensible load. The unit shall have two separate passages one for supply of fresh air and the other for exhaust of cool air from the rooms after the recovery of energy, with all accessories as required. The fan outlet velocity shall be limited to 9.5 MPS maximum and face velocity across filter shall be limited to 500 FPM maximum. The unit wheel shall be min. 200 mm thick and shall be capable of recovering atleast 75% latent as well as sensible energy. The unit shall be complete as per drawings and specifications. The Photohydroionization cell with the capability to produce friendly oxidizers like Ionized Hydro Peroxides, Super Oxide Ions, Hydroxides Ions with quad metallic coating (Rohdium, silver, copper and titanium) and duly enclosed by a poly casing tube that should prevent glass or						

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	mercury leakage into the conditioned/ served space. The honeycomb matrix shall not be accepted. The units should be designed after undertaking a load factor calculation for each specific area where the equipment is to be installed. The load shall clearly state the number of units required vis-à-vis the wattage of the units. The system shall be capable of reducing microbial bacteria, virus and spores , VoC', odors and particulates matter. The equipment shall conform to UL 1598 CAN/CSA C222 EN60335-1, EN60335-2-65, EU standards, certifications shall be submitted along with the technical submittal. - Supply air fan-14500 cfm, external static 20 mmwg, Exhaust air fan - 11500 cfm, external static 20 mmwg							
21	Supply, installation, testing: Supply, installation, testing and commissioning of Heat recovery unit of 0.6mm thick Pre-Coated GI sheet Outer skin & 0.6 mm	1	NO					

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	thk GI sheet metal cabinet type plain Inner skin Double skin unit with with 40 mm thick with Thermal break profile, 40 kg/cum polyurethane foam sandwiched between panels complete with pre filter of MERV-8 efficiency at fresh air inlet along with Gridblok IAQ chemical filter with turbulent flow and monolithic structure with 100 mm thick designed for 500 fpm with pressure drop not exceeding 146 pa having density 27.54 lb/ft of along with MERV-13 fine filter at fresh air outlet (Blow thru type), MERV-8 filter at return air outlet. Fan section with direct driven plug fan & IE-3 Motor with, IP-20 variable frequency drive shall be suitable for 415 + 10% volts, 50 cycles, 3 phase AC supply. Heat reovery unti shall be wheel type of aluminium with 3 angstorn molecular sieve which is for recovery of both latest and sensible load. The unit shall have two separate passages one for supply of fresh air and the							

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	other for exhaust of cool air from the rooms after the recovery of energy, with all accessories as required. The fan outlet velocity shall be limited to 9.5 MPS maximum and face velocity across filter shall be limited to 500 FPM maximum. The unit wheel shall be min. 200 mm thick and shall be capable of recovering atleast 75% latent as well as sensible energy. The unit shall be complete as per drawings and specifications. The Photohydroionization cell with the capability to produce friendly oxidizers like Ionized Hydro Peroxides, Super Oxide Ions, Hydroxides Ions with quad metallic coating (Rohdium, silver, copper and titanium) and duly enclosed by a poly casing tube that should prevent glass or mercury leakage into the conditioned/ served space. The honeycomb matrix shall not be accepted. The units should be designed after undertaking a load factor calculation for each specific area where the						

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	equipment is to be installed. The load shall clearly state the number of units required vis-à-vis the wattage of the units. The system shall be capable of reducing microbial bacteria, virus and spores , VoC', odors and particulates matter. The equipment shall conform to UL 1598 CAN/CSA C222 EN60335-1, EN60335-2-65, EU standards, certifications shall be submitted along with the technical submittal. Supply air fan-13500 cfm, external static 20 mmwg, Exhaust air fan - 10000 cfm, external static 20 mmwg							
22	Supply, installation, testing: Supply, installation, testing and commissioning of Heat recovery unit of 0.6mm thick Pre-Coated GI sheet Outer skin & 0.6 mm thk GI sheet metal cabinet type plain Inner skin Double skin unit with with 40 mm thick with Thermal break profile, 40 kg/cum polyurethane foam sandwiched between panels complete with pre filter of MERV	1	NO					

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	-8 efficiency at fresh air inlet along with Gridblok IAQ chemical filter with turbulent flow and monolithic structure with 100 mm thick designed for 500 fpm with pressure drop not exceeding 146 pa having density 27.54 lb/ft of along with MERV-13 fine filter at fresh air outlet (Blow thru type), MERV-8 filter at return air outlet. Fan section with direct driven plug fan & IE-3 Motor with, IP-20 variable frequency drive shall be suitable for 415 + 10% volts, 50 cycles, 3 phase AC supply. Heat recovery unit shall be wheel type of aluminium with 3 angstrom molecular sieve which is for recovery of both latent and sensible load. The unit shall have two separate passages one for supply of fresh air and the other for exhaust of cool air from the rooms after the recovery of energy, with all accessories as required. The fan outlet velocity shall be limited to 9.5 MPS maximum and face velocity across filter shall be limited to							

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500 FPM maximum. The unit wheel shall be min. 200 mm thick and shall be capable of recovering atleast 75% latent as well as sensible energy. The unit shall be complete as per drawings and specifications. The Photohydroionization cell with the capability to produce friendly oxidizers like Ionized Hydro Peroxides, Super Oxide Ions, Hydroxides Ions with quad metallic coating (Rohdium, silver, copper and titanium) and duly enclosed by a poly casing tube that should prevent glass or mercury leakage into the conditioned/ served space. The honeycomb matrix shall not be accepted. The units should be designed after undertaking a load factor calculation for each specific area where the equipment is to be installed. The load shall clearly state the number of units required vis-à-vis the wattage of the units. The system shall be capable of reducing microbial bacteria, virus and spores , VoC', odors							

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	and particulates matter. The equipment shall conform to UL 1598 CAN/CSA C222 EN60335-1, EN60335-2-65, EU standards, certifications shall be submitted along with the technical submittal. - Supply air fan-6000 cfm, external static 20 mmwg , Exhaust air fan - 5000 cfm, external static 20 mmwg							
23	<u>Supply, installation, testing:</u> Supply, installation, testing and commissioning of chilled water Hi-Wall units complete with casing, filter box with synthetic fibre filter, 3 row deep copper cooling/heating coil with Aluminium fins, fan with slow speed (three speed) TEFC motor of class 'F' insulation, operated on 230 volts, single phase, 50Hz, AC supply, drain pan, space for valve, drain pump, electrical & control copper cabling from nearest power point complete as required and as per specification with the following capacities - 1.0 Tons (with drain pump)	4	NO					

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24	<u>Supply, installation, testing:</u> Supply, Installation, Testing and commissioning of horizontal hide away type fan coil units complete with fan, fan motor, cooling coil, fire retardant canvas connections, filters, including control panel complete as per specifications and drawings. - 2.0 Tons	2	NO					
25	<u>Providing ,fixing, testing:</u> Providing ,fixing, testing and commissioning of Refrigerant leak detection system as per given specs.	1	SET					
26	<u>Providing ,fixing, testing</u> Providing and fixing of Groove Coupling in chilled water risers from pumps and chillers upto headers in plant room with insulation. - 250 NB x 150 NB Grooved Reducing Tee	12	NO					
27	<u>Providing ,fixing, testing</u> Providing and fixing of Groove Coupling in chilled water risers from pumps and chillers upto headers in plant room with insulation. - 150 NB Grooved	12	NO					

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	Elbow 90 Degree							
28	Providing and fixing, Providing and fixing of Groove Coupling in chilled water risers from pumps and chillers upto headers in plant room with insulation. - - 150 NB Grooved Flange Adapter	36	NO					
29	Providing and fixing: Providing and fixing of Groove Coupling in chilled water risers from pumps and chillers upto headers in plant room with insulation. - 150 NB Reducer	6	NO					
30	Providing and fixing: Providing and fixing of Groove Coupling in chilled water risers from pumps and chillers upto headers in plant room with insulation. - 150 NB Installation Ready Flexible Coupling	18	NO					
31	Providing and fixing: Providing and fixing of Groove Coupling in chilled water risers from pumps and chillers upto headers in plant room with insulation. -150 NB Installation	16	NO					

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	Ready Rigid Coupling							
32	Providing and fixing: Providing and fixing of Groove Coupling in condenser water risers from pumps and chillers upto headers in plant room without insulation. - 300 NB x 250 NB Grooved Reducing Tee	12	NO					
33	Providing and fixing: Providing and fixing of Groove Coupling in condenser water risers from pumps and chillers upto headers in plant room without insulation. - 250 NB Grooved Elbow 90 Degree	12	NO					
34	Providing and fixing: Providing and fixing of Groove Coupling in condenser water risers from pumps and chillers upto headers in plant room without insulation. - 300 NB x 250 NB Grooved Reducing Tee Same as above but for - 250 NB Grooved Flange Adapter	48	NO					
35	Providing and fixing: Providing and fixing of Groove	6	NO					

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	Coupling in condenser water risers from pumps and chillers upto headers in plant room without insulation. - 300 NB x 250 NB Grooved Reducing Tee Same as above but for - 250 NB Reducer							
36	Providing and fixing: Providing and fixing of Groove Coupling in condenser water risers from pumps and chillers upto headers in plant room without insulation. - 300 NB x 250 NB Grooved Reducing Tee Same as above but for - 300 NB Rigid Coupling	24	NO					
37	Providing and fixing: Providing and fixing of Groove Coupling in condenser water risers from pumps and chillers upto headers in plant room without insulation. - 300 NB x 250 NB Grooved Reducing Tee Same as above but for - 250 NB Flexible Coupling	18	NO					
38	Providing and fixing:	34	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	Providing and fixing of Groove Coupling in condenser water risers from pumps and chillers upto headers in plant room without insulation. - 300 NB x 250 NB Grooved Reducing Tee Same as above but for - 250 NB Installation Ready Rigid Coupling							
39	<u>Supplying, laying/ fixing,:</u> Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water piping inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with 80 kg/cum density resin bonded fiber glass or 144 Kg/ m3 density mineral wool (non combustible) pipe section insulation covered with a layer of 120 gm/sq.m polythene sheet (vapour barrier) and finally applying 0.63mm aluminium sheet cladding complete with type3, grade 1 roofing felt strip (as per IS:1322 as amended up	150	M					

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	to date) at joints and repairing of damage to building etc. as per specifications and as required. - 250 mm dia. (75 mm thick insulation) Note: The Pipes of sizes 150 mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above.							
40	Supplying, laying/ fixing,: Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water piping inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with 80 kg/cum density resin bonded fiber glass or 144 Kg/ m3 density mineral wool (non combustible) pipe section insulation covered with a layer of	100	M					

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	120 gm/sq.m polythene sheet (vapour barrier) and finally applying 0.63mm aluminium sheet cladding complete with type3, grade 1 roofing felt strip (as per IS:1322 as amended up to date) at joints and repairing of damage to building etc. as per specifications and as required. - 250 mm dia. (75 mm thick insulation) Note: The Pipes of sizes 150 mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above. Same as above but for - 200 mm dia. (75 mm thick insulation)							
41	Supplying, laying/ fixing,: Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water	120	M					

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	piping inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with 80 kg/cum density resin bonded fiber glass or 144 Kg/ m3 density mineral wool (non combustible) pipe section insulation covered with a layer of 120 gm/sq.m polythene sheet (vapour barrier) and finally applying 0.63mm aluminium sheet cladding complete with type3, grade 1 roofing felt strip (as per IS:1322 as amended up to date) at joints and repairing of damage to building etc. as per specifications and as required. - 250 mm dia. (75 mm thick insulation) Note: The Pipes of sizes 150 mm & below shall be M.S. ‘C’ class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	sheet for pipes of 400 mm dia and above. Same as above but for - 150 mm dia. (50 mm thick insulation)							
42	Supplying, laying/ fixing Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water piping inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with 80 kg/cum density resin bonded fiber glass or 144 Kg/ m3 density mineral wool (non combustible) pipe section insulation covered with a layer of 120 gm/sq.m polythene sheet (vapour barrier) and finally applying 0.63mm aluminium sheet cladding complete with type3, grade 1 roofing felt strip (as per IS:1322 as amended up to date) at joints and repairing of damage to building etc. as per specifications and as required. - 250 mm dia. (75 mm thick	80	M					

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	insulation) Note: The Pipes of sizes 150 mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above. Same as above but for - 125 mm dia. (50 mm thick insulation)							
43	Supplying, laying/ fixing, testing: Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water piping inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with 80 kg/cum density resin bonded fiber glass or 144 Kg/ m3 density mineral wool (non combustible) pipe section insulation covered with a layer of	30	M					

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	120 gm/sq.m polythene sheet (vapour barrier) and finally applying 0.63mm aluminium sheet cladding complete with type3, grade 1 roofing felt strip (as per IS:1322 as amended up to date) at joints and repairing of damage to building etc. as per specifications and as required. - 250 mm dia. (75 mm thick insulation) Note: The Pipes of sizes 150 mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above. Same as above but for - 100 mm dia. (50 mm thick insulation)							
44	Supplying, laying/ fixing, testing: Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water	275	M					

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	piping inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with 80 kg/cum density resin bonded fiber glass or 144 Kg/ m3 density mineral wool (non combustible) pipe section insulation covered with a layer of 120 gm/sq.m polythene sheet (vapour barrier) and finally applying 0.63mm aluminium sheet cladding complete with type3, grade 1 roofing felt strip (as per IS:1322 as amended up to date) at joints and repairing of damage to building etc. as per specifications and as required. - 250 mm dia. (75 mm thick insulation) Note: The Pipes of sizes 150 mm & below shall be M.S. ‘C’ class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	sheet for pipes of 400 mm dia and above.							
	Same as above but for - 80 mm dia. (50 mm thick insulation)							
45	Supplying, laying/ fixing, testing: Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water piping inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with 80 kg/cum density resin bonded fiber glass or 144 Kg/ m3 density mineral wool (non combustible) pipe section insulation covered with a layer of 120 gm/sq.m polythene sheet (vapour barrier) and finally applying 0.63mm aluminium sheet cladding complete with type3, grade 1 roofing felt strip (as per IS:1322 as amended up to date) at joints and repairing of damage to building etc. as per specifications and as required. - 250 mm dia. (75 mm thick	50	M					

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	insulation) Note: The Pipes of sizes 150 mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above. Same as above but for - 65 mm dia. (50 mm thick insulation)							
46	Supplying, laying/ fixing, testing: Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water piping inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with 80 kg/cum density resin bonded fiber glass or 144 Kg/ m3 density mineral wool (non combustible) pipe section	230	M					

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	insulation covered with a layer of 120 gm/sq.m polythene sheet (vapour barrier) and finally applying 0.63mm aluminium sheet cladding complete with type3, grade 1 roofing felt strip (as per IS:1322 as amended up to date) at joints and repairing of damage to building etc. as per specifications and as required. - 250 mm dia. (75 mm thick insulation) Note: The Pipes of sizes 150 mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above. Same as above but for - 50 mm dia. (50 mm thick insulation)							
47	Supplying, laying/ fixing, testing: Supplying, laying/ fixing, testing and commissioning of following	100	M					

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	nominal sizes of chilled water piping inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with 80 kg/cum density resin bonded fiber glass or 144 Kg/ m3 density mineral wool (non combustible) pipe section insulation covered with a layer of 120 gm/sq.m polythene sheet (vapour barrier) and finally applying 0.63mm aluminium sheet cladding complete with type3, grade 1 roofing felt strip (as per IS:1322 as amended up to date) at joints and repairing of damage to building etc. as per specifications and as required. - 250 mm dia. (75 mm thick insulation) Note: The Pipes of sizes 150 mm & below shall be M.S. ‘C’ class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and							

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	from minimum 7mm thick MS sheet for pipes of 400 mm dia and above.							
	Same as above but for - 40 mm dia. (50 mm thick insulation)							
48	Supplying, laying/ fixing, testing: Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water piping inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with 80 kg/cum density resin bonded fiber glass or 144 Kg/ m3 density mineral wool (non combustible) pipe section insulation covered with a layer of 120 gm/sq.m polythene sheet (vapour barrier) and finally applying 0.63mm aluminium sheet cladding complete with type3, grade 1 roofing felt strip (as per IS:1322 as amended up to date) at joints and repairing of damage to building etc. as per	190	M					

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	specifications and as required. - 250 mm dia. (75 mm thick insulation) Note: The Pipes of sizes 150 mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above. Same as above but for - 32 mm dia. (50 mm thick insulation)							
49	Supplying, laying/ fixing, testing: Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water piping inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with 80 kg/cum density resin bonded fiber glass or 144 Kg/ m3 density mineral wool (non	200	M					

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	combustible) pipe section insulation covered with a layer of 120 gm/sq.m polythene sheet (vapour barrier) and finally applying 0.63mm aluminium sheet cladding complete with type3, grade 1 roofing felt strip (as per IS:1322 as amended up to date) at joints and repairing of damage to building etc. as per specifications and as required. - 250 mm dia. (75 mm thick insulation) Note: The Pipes of sizes 150 mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above. Same as above but for - 25 mm dia. (50 mm thick insulation)							
50	Supplying, laying/ fixing, testing:	4	NO					

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	Supply, installation, testing and commissioning of following valves, strainers, gauges, flexible connection, airvent, flow switch, etc. in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported complete as per specifications, requirement, standard and drawings. Supplying, fixing, testing and commissioning of following sizes Motorized Butterfly Valve with CI Body, SS Disc, O - ring and minimum PN-16 pressure rating, conforming to BS 5155, IS 13095, with IP-55 actuator, capable of accepting upto 10V DC , and upto 20 mA electric signal and providing similar transduced feedback output to control system as required. - 150 mm							
51	Supplying, laying/ fixing, testing: Supply, installation, testing and commissioning of following valves, strainers, gauges, flexible connection, airvent, flow switch,	3	NO					

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	etc. in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported complete as per specifications, requirement, standard and drawings. Supplying, fixing, testing and commissioning of following sizes Motorized Butterfly Valve with CI Body, SS Disc, O - ring and minimum PN-16 pressure rating, conforming to BS 5155, IS 13095, with IP-55 actuator, capable of accepting upto 10V DC , and upto 20 mA electric signal and providing similar transduced feedback output to control system as required. - 150 mm BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot water circulation as specified. - 250 mm							
52	Supplying, laying/ fixing, testing: Supply, installation, testing and	16	NO					

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	commissioning of following valves, strainers, gauges, flexible connection, airvent, flow switch, etc. in the chilled water plumbing duly insulated to the same specifications as the connected piping andadequately supported complete as per specifications, requirement, standard and drawings. Supplying, fixing, testing and commissioning of following sizes Motorized Butterfly Valve with CI Body, SS Disc, O - ring and minimum PN-16 pressure rating, conforming to BS 5155, IS 13095, with IP-55 actuator, capable of accepting upto 10V DC , and upto 20 mA electric signal and providing similar transduced feedback output to control system as required. - 150 mm						
	BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot eater circulation as specified.						

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	150 mm							
53	Supplying, laying/ fixing, testing: Supply, installation, testing and commissioning of following valves, strainers, gauges, flexible connection, airvent, flow switch, etc. in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported complete as per specifications, requirement, standard and drawings. Supplying, fixing, testing and commissioning of following sizes Motorized Butterfly Valve with CI Body, SS Disc, O - ring and minimum PN-16 pressure rating, conforming to BS 5155, IS 13095, with IP-55 actuator, capable of accepting upto 10V DC , and upto 20 mA electric signal and providing similar transduced feedback output to control system as required. - 150 mm BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile	2	NO					

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	Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot eater circulation as specified. - 125 mm							
54	Supply, installation, testing and commissioning: Supply, installation, testing and commissioning of following valves, strainers, gauges, flexible connection, airvent, flow switch, etc. in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported complete as per specifications, requirement, standard and drawings. Supplying, fixing, testing and commissioning of following sizes Motorized Butterfly Valve with CI Body, SS Disc, O - ring and minimum PN-16 pressure rating, conforming to BS 5155, IS 13095, with IP-55 actuator, capable of accepting upto 10V DC , and upto 20 mA electric signal and providing similar transduced feedback output to	30	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	control system as required. - 150 mm BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot eater circulation as specified. - 80 mm							
55	Supply, installation, testing and commissioning: Supply, installation, testing and commissioning of following valves, strainers, gauges, flexible connection, airvent, flow switch, etc. in the chilled water plumbing duly insulated tothe same specifications as the connected piping andadequately supported complete as per specifications, requirement, standardard and drawings. Supplying, fixing, testing and commissioning of following sizes Motorized Butterfly Valve with CI Body, SS Disc, O - ring and minimum PN-16 pressure rating, conforming to BS 5155, IS 13095, with IP-55 actuator,	9	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	capable of accepting upto 10V DC , and upto 20 mA electric signal and providing similar transduced feedback output to control system as required. - 150 mm							
	BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot eater circulation as specified. - 65 mm							
56	Supply, installation, testing and commissioning: Supply, installation, testing and commissioning of following valves, strainers, gauges, flexible connection, airvent, flow switch, etc. in the chilled water plumbing duly insulated to the same specifications as the connected piping and adequately supported complete as per specifications, requirement, standard and drawings. Supplying, fixing, testing and commissioning of following sizes Motorized Butterfly Valve with CI	8	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	Body, SS Disc, O - ring and minimum PN-16 pressure rating, conforming to BS 5155, IS 13095, with IP-55 actuator, capable of accepting upto 10V DC , and upto 20 mA electric signal and providing similar transduced feedback output to control system as required. - 150 mm BUTTERFLY VALVE (MANUAL) with C I body SS Disc, Nitrile Rubber Seal & O- Ring PN 16 pressure rating for chilled water/hot eater circulation as specified. - 50 mm							
57	BALANCING VALVE WITH BUILT IN MEASURING FACILITY BALANCING VALVE WITH BUILT IN MEASURING FACILITY with C I body flanged construction with EPDM coated disc with long pitch with protected out pipe insulation & PN 16 pressure rating for chilled / hot water circulation as specified. -150 mm	3	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

58	Non return valve: Non return valve with dual plate of CI body and SS plates vulcanized NBR seal flanged and PN 16 pressure rating for chilled/hot water circulation including insulation as specified. - 150 mm	3	NO					
59	Y - Strainer of Ductile CI Body: Y - Strainer of Ductile CI Body flanged ends with stainless steel strainer for chilled/hot water circulation includinginsulation as specified. - 150 mm	3	NO					
60	Y - Strainer of Ductile CI Body: Y - Strainer of Ductile CI Body flanged ends with stainless steel strainer for chilled/hot water circulation including insulation as specified. - for - 80 mm	13	NO					
61	Y - Strainer of Ductile CI Body: Y - Strainer of Ductile CI Body flanged ends with stainless steel strainer for chilled/hot water circulation includinginsulation as specified. - for - 65 mm	4	NO					
62	Y - Strainer of Ductile CI Body: Y - Strainer of Ductile CI Body flanged ends with stainless steel	4	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	strainer for chilled/hot water circulation including insulation as specified. - for - 50 mm							
63	Ball Valves: Ball Valves - 32 mm with strainer	13	NO					
64	Ball Valves: Ball valves 32 mm without strainer	13	NO					
65	Ball Valves: Ball valves 25 mm with strainer	6	NO					
66	Ball Valves: Ball valves 25 mm without strainer	6	NO					
67	Water flow switch: Water flow switch	3	NO					
68	Providing and fixing: Providing and fixing of in position the industrial type pressure gauges with gun metal / brass valves complete as required.	12	NO					
69	Providing and fixing: Providing and fixing of in position the mercury in glass industrial type thermometers.	6	NO					
70	Auto Airvent: Auto Airvent 25 mm dia	6	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

71	Test point: Test point 1 /4" BSP (6mm)	10	NO					
72	Supply, Installation, Testing: Supply, Installation, Testing and Commissioning of following sizes electronic, self-balancing, pressure independent type dynamic balancing valve with integrated 2 way modulating control valve in a single body. The actuator shall be capable of accepting upto 10V DC and upto 20 mA electric signal and shall provide similar transduced feedback output to control system. Maximum close off pressure shall not be less than 6 Bar for upto 50 mm valves and 7 Bar for 65 mm & above. Valves should have pressure rating of 25 Bar minimum. - 80 mm dia	13	NO					
73	Supply, Installation, Testing: Supply, Installation, Testing and Commissioning of following sizes electronic, self-balancing, pressure independent type dynamic balancing valve with integrated 2 way modulating control valve in a single body. The actuator shall be capable of	4	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	accepting upto 10V DC and upto 20 mA electric signal and shall provide similar transduced feedback output to control system. Maximum close off pressure shall not be less than 6 Bar for upto 50 mm valves and 7 Bar for 65 mm & above. Valves should have pressure rating of 25 Bar minimum. - 65 mm dia							
74	Supply, Installation, Testing: Supply, Installation, Testing and Commissioning of following sizes electronic, self-balancing, pressure independent type dynamic balancing valve with integrated 2 way modulating control valve in a single body. The actuator shall be capable of accepting upto 10V DC and upto 20 mA electric signal and shall provide similar transduced feedback output to control system. Maximum close off pressure shall not be less than 6 Bar for upto 50 mm valves and 7 Bar for 65 mm & above. Valves should have pressure rating of 25 Bar minimum. -50 mm dia	4	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

75	Supply, Installation, Testing: Supply, Installation, Testing and Commissioning of following sizes electronic, self-balancing, pressure independent type dynamic balancing valve with integrated 2 way modulating control valve in a single body. The actuator shall be capable of accepting upto 10V DC and upto 20 mA electric signal and shall provide similar transduced feedback output to control system. Maximum close off pressure shall not be less than 6 Bar for upto 50 mm valves and 7 Bar for 65 mm & above. Valves should have pressure rating of 25 Bar minimum. -32 mm dia	13	NO					
76	Supply, Installation, Testing: Supply, Installation, Testing and Commissioning of following sizes electronic, self-balancing, pressure independent type dynamic balancing valve with integrated 2 way modulating control valve in a single body. The actuator shall be capable of accepting upto 10V DC and upto 20 mA electric signal and shall	6	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	provide similar transduced feedback output to control system. Maximum close off pressure shall not be less than 6 Bar for upto 50 mm valves and 7 Bar for 65 mm & above. Valves should have pressure rating of 25 Bar minimum. - 25 mm dia							
77	Supplying, laying, fixing/testing: Supplying, laying, fixing/testing and commissioning of MS condenser water pipes of following nominal sizes along with necessary, clamps, vibration, isolators and fittings such as bends, tees etc. but excluding valves, strainers, gauges etc. adequately supported on rigid supports duly painted/buried in ground excavation and refilling etc. as per specifications and as required complete in all respect. (Note:- The pipes size 150 mm & below shall be M.S. `C' class as per IS:1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS:3589, from minimum 6.35	470	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	mm thick M.S. sheet for pipes upto 350 mm dia. and from minimum 7 mm thick MS sheet for pipes of 400 mm dia and above.)-300 mm							
78	Supplying, laying, fixing/testing: Supplying, laying, fixing/testing and commissioning of MS condenser water pipes of following nominal sizes along with necessary, clamps, vibration, isolators and fittings such as bends, tees etc. but excluding valves, strainers, gauges etc. adequately supported on rigid supports duly painted/buried in ground excavation and refilling etc. as per specifications and as required complete in all respect. (Note:- The pipes size 150 mm & below shall be M.S. `C' class as per IS:1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS:3589, from minimum 6.35 mm thick M.S. sheet for pipes upto 350 mm dia. and from minimum 7 mm thick MS sheet	70	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	for pipes of 400 mm dia and above.)-200 mm							
79	Supplying, laying, fixing/testing: Supplying, laying, fixing/testing and commissioning of MS condenser water pipes of following nominal sizes along with necessary, clamps, vibration, isolators and fittings such as bends, tees etc. but excluding valves, strainers, gauges etc. adequately supported on rigid supports duly painted/buried in ground excavation and refilling etc. as per specifications and as required complete in all respect. (Note:- The pipes size 150 mm & below shall be M.S. `C' class as per IS:1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS:3589, from minimum 6.35 mm thick M.S. sheet for pipes upto 350 mm dia. and from minimum 7 mm thick MS sheet for pipes of 400 mm dia and above.)-65 mm	30	M					
80	Supplying, laying,	50	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	fixing/testing: Supplying, laying, fixing/testing and commissioning of MS condenser water pipes of following nominal sizes along with necessary, clamps, vibration, isolators and fittings such as bends, tees etc. but excluding valves, strainers, gauges etc. adequately supported on rigid supports duly painted/buried in ground excavation and refilling etc. as per specifications and as required complete in all respect. (Note:- The pipes size 150 mm & below shall be M.S. `C' class as per IS:1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS:3589, from minimum 6.35 mm thick M.S. sheet for pipes upto 350 mm dia. and from minimum 7 mm thick MS sheet for pipes of 400 mm dia and above.)-50 mm							
81	Supplying, laying, fixing/testing: Supplying, laying, fixing/testing and commissioning of MS	20	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	condenser water pipes of following nominal sizes along with necessary, clamps, vibration, isolators and fittings such as bends, tees etc. but excluding valves, strainers, gauges etc. adequately supported on rigid supports duly painted/buried in ground excavation and refilling etc. as per specifications and as required complete in all respect. (Note:- The pipes size 150 mm & below shall be M.S. `C' class as per IS:1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS:3589, from minimum 6.35 mm thick M.S. sheet for pipes upto 350 mm dia. and from minimum 7 mm thick MS sheet for pipes of 400 mm dia and above.)-40 mm							
82	Supplying, laying, fixing/testing: Supplying, fixing, testing and commissioning of following valves, gauges and strainers for condenser water circulation as per specifications.	6	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Supplying, fixing, testing and commissioning of following sizes Motorized Butterfly Valve with CI Body, SS Disc, O - ring and minimum PN-16 pressure rating, conforming to BS 5155, IS 13095, with IP-55 actuator, capable of accepting upto 10V DC and upto 20 mA electric signal and providing similar transduced feedback output to control system as required. - 200 mm							
83	BUTTERFLY VALVE: BUTTERFLY VALVE (MANUAL) with CI body SS disc nitrile sheet & O - ring & PN 16 pressure rating as specified. - 300 mm	3	NO					
84	BUTTERFLY VALVE: BUTTERFLY VALVE (MANUAL) with CI body SS disc nitrile sheet & O - ring & PN 16 pressure rating as specified. - 200mm	15	NO					
85	BUTTERFLY VALVE: BUTTERFLY VALVE (MANUAL) with CI body SS disc nitrile sheet & O - ring & PN 16	3	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	pressure rating as specified. - 50 mm							
86	BUTTERFLY VALVE: BUTTERFLY VALVE (MANUAL) with CI body SS disc nitrile sheet & O - ring & PN 16 pressure rating as specified. - 40 mm	3	NO					
87	Balancing Valve: Balancing Valve with Built in Measuring Facility with C I body flanged construction with EPDM coated disc with longpitch with protected out pipe insulation & PN 16 pressure ratingfor chilled / hot water circulation as specified. - 200 mm	6	NO					
88	NON - RETURN VALVE: NON - RETURN VALVE with dual plate of C I body SS plates vulcanized NBR seal flanged end & PN 16 pressure rating as specified. - 200 mm	3	NO					
89	Y - Strainer of Ductile CI Body: Y - Strainer of Ductile CI Body flanged ends with stainless steel strainer for chilled / hot water circulation PN16 includinginsulation as specified.	3	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	- 200 mm							
90	Pot Strainer: Pot Strainer - Supplying, fixing, testing and commissioning of M.S. Pot- Strainer with stainless steel bucket as per specification (PN-10 rating). 300 mm dia	1	NO					
91	Water flow: Water flow switch	3	NO					
92	Providing and fixing: Providing and fixing of in position the industrial type pressure gauges with gun metal / brass valves complete as required.	12	NO					
93	Providing and fixing: Providing & fixing of in position the mercury in glass industrialtype thermometers.	6	NO					
94	Test point: Test point 1 /4" BSP (6mm)	10	NO					
95	Supply, installation, testing & commissioning : Supply, installation, testing & commissioning of Pressurized Expansion Tank, Pressurization Unit inbuilt vacuum cylinder c/w break tank as detailed in	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	specification. High and low pressure alarm setting shall be selectable by the user. Expansion and pressurization of the chilled water system to be provided by an integrated pump with pressurized expansion tank(s) for Approximate system volume = 34172 ltr at Max ambient temp 35 ° C and total Static height above the expansion tank.30 M. The total Volume checked by vendor. The system shall consist of following : 1) Twin pump(1W+1S) Pressurization Unit with vacuum degasser - ,vacuum cylinder, Break tank, float valve, over flow connection, pressure sensor for system and for vacuum cylinder, solenoid valve, isolation Valve, NRV, Drain Valve, flood protection in the event of a serious leak, Pipe fittings c/w Controller & display, full unit tested, housed in a mild steel cabinet. 2) Pressurized Expansion Tank 500 liter made from top quality							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	steel and finished with powder coating c/w high quality butyl rubber removable bladder, Nitrogen filling for longer maintenance of pre pressurization. 3) Controller : Individual controllers for pressurization as well as vacuum degassing with IP 54 rating. LED display showing srolling messages and status of the main operating components, top up function, flood limiter/shut down function in event of serious leak. in case of any fault, controller shall display fault code and generate alarm The complete unit should be made by a single manufacture. - 500 litres "							
96	Supply, installation, testing & commissioning : Supply, Installation, Testing & Commissioning of Dirt Separators with removable flange base, with dirt removal as well as magnetic particles using a ferro magnet upto 5 microns	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	as per the specifications on the return water line located at the pump suction or a suitable location as suggested and suitable for water flow mentioned below. The separator should be complete with service valve, non return valve, butterfly valve connection for makeup water inlet, flanges, drain valve etc. 250 mm							
97	Supply, installation, testing & commissioning : Supply, installation, testing and commissioning of MICROPROCESSOR BASED Dual Fluid (Refrigerant R410 A & Chilled water) PRECISION A/C UNITS as per the specifications complete with all four side doubled skin sandwich panels with A class insulation, air cooled condenser with stepless variable drive for all fans for all for winter operation, Single/Multiple Circuit DC Inverter Variable Speed Scroll Compressor each with Independent Condensers with	6	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Stepless Fan Speed controller, Minimum 4 row deep DX evaporator coil with hydrophilic coating Chilled Water Coil with inbuilt two way modulating valve, Electronically commutated brushless motor Backward curved Plug fan, MERV-8 filter Electronic Expansion Valve, suitable for environment friendly R410A refrigerant, Multistage electric heater, variable capacity auto-modulating humidifier, drain pump of suitable capacity, Stainless Steel Drain Pan, Water Leak Detector and vibration isolator. The unit refrigerant circuit shall have factory installed Oil Separator, Solenoid Valve, Liquid receiver and service valves. Motor shall be suitable for 415 + 10% volts, 50 cycles, 3 phase AC supply and external static pressure shall be 25 Pa. Outdoor unit motor protection should be with IP-54 protection and should be weather proof. PAC shall have bottom throw. Auto sequencing							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	of the unit for equal run time should be integral part of the micro-processor. The unit shall BMS compatible. Change over from DX to chilled water and vises versa should be automatic without any intervention. The unit shall have water leak detector which should be able to generate alarm in case of water leakage. The unit shall be side bottom discharged. The unit shall have a provision for auto restart in the event of power disruption. The coil shall be designed considering CHW temp as 8.0 Deg C and 13.6 Deg C. Each unit shall be complete with powder coated electrical panel and double earthing. The cables should be Cross linked polythene insulated, armoured Copper cabling and all termination between main panel and PAC. Timers shall be provided in Electrical panel for delayed start of units. For each unit installation price shall be inclusive of First Charge of Refrigerant, Lifting shifting to							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	the designated floor, Isolator & Power cabling from isolator to indoor unit upto 5 RMT per unit, Powder coated Adjustable Height Indoor Stand and outdoor stand for Outdoor condenser, Commissioning of the unit . The Indoor Fan Should be cable on modulating by taking feedback from Supply Air Temperature OR Supply Air Airflow Rate, both option should be available. Each unit shall have inbuilt sequential controller for operating unit in N+1 configuration. Microprocessor should have inbuilt features of Team Mode and cascade mode incase required. Capacity should be designed for Unit should be designed to deliver actual capacity at design conditions (43° C) S/I/T/C of 5.5 TR Actual Sensible Capacity DX Precision AC Unit for both Chilled Water and DX Operation							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

98	Pair of hard drawn copper refrigerant piping: Pair of hard drawn copper refrigerant piping not less than 18 gauge thick for Precision Packaged Units. 5.5 TR	90	M					
99	Pair of hard drawn copper refrigerant piping: Pair of hard drawn copper refrigerant piping not less than 18 gauge thick for Precision Packaged Units. Copper Armoured Cable 3c x 2.5 SQMM for condensers from Indoor unit to Outdoor Unit	90	M					
100	Supply, Installation, Testing and commissioning: Supply, Installation, Testing and commissioning of extended piping kit complete with check valves, solenoid valves, "U" trap, additional oil charge cabling etc. as required.	6	SET					
101	Supply, Installation, Testing and commissioning: Supply, Installation, Testing and commissioning of GI Piping for Humidifier Inlet and condensate drain of following sizes.	90	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	25 mm							
102	Supply, Installation,Testing and commissioning: Supply, Installation, testing and Balancing of double louvered supply air grilles in accordance with the approved shop drawings along with VCD. Supply Air Powder coated extruded aluminium grilles with dampers of approved colour & shade. Size 600 x 600 mm.	6	NO					
103	Supply, Installation,Testing and commissioning: Supply, Installation, testing and Balancing of double louvered supply air grilles in accordance with the approved shop drawings along with VCD. Return Air Powder coated extruded aluminium grilles without dampers of approved colour & shade.	6	NO					
104	<u>Supplying and fixing of following 16mm thick duly laminated :</u> Supplying and fixing of following 16mm thick duly laminated aluminium foil of mat finish	45	M2					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	closed cell Nitrile rubber (Class “O”) insulation on floor. The joints shall be sealed with 50 mm wide and 3 mm thick self adhesive nitrile rubber tape insulation complete as per specifications and as required.							
105	Supply, installation, testing and commisining : Supply, installation, testing and commisining of high wall mounted split unit airconditioners with evaporator with fan with motor, cooling coil, filter, all enclosed in decorative plastic casing, condenser with hermatically sealed inverter rotary compressor, condenser coil, propeller fan with motor, inter connecting refrigerant piping, wiring, earthing, cordless remote control, M.S. frame for mounting condensing unit. - 2.0 Tons	2	NO					
106	Supply, installation, testing and commisining : Supply, installation, testing and commisining of high wall mounted split unit	3	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	airconditioners with evaporator with fan with motor, cooling coil, filter, all enclosed in decorative plastic casing, condenser with hermatically sealed inverter rotary compressor, condenser coil, propeller fan with motor, inter connecting refrigerant piping, wiring, earthing, cordless remote control, M.S. frame for mounting condensing unit. - 1.5 Tons							
107	Supply, installation, testing and commissioning : Supply, installation, testing and commissioning of copper refrigerant piping (Circuit length) with 9 mm thick nitrile rubber insulation along with control cabling etc. as required and as per standards & specifications. - 2.0 Tons Hi wall	15	M					
108	Supply, installation, testing and commissioning Supply, installation, testing and commissioning of copper refrigerant piping (Circuit length) with 9 mm thick nitrile rubber insulation along with control	15	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	cabling etc. as required and as per standards & specifications. - 1.5Tons Hi wall							
109	Providing, fixing, testing and commissioning: Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I. construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class 'H' insulation. Motor shall be of high temperature resistance "Class H Smoke Spill" 250° C for 2 hrs.Fan shall be CE or UL	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	certified for high temprature. Fan Total Efficiency should not be less than 70 %, noise level should not be more than 80 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. (Motor make shall be same as mentioned on the fire certificate.) - 16,000 cfm, 15 mmwg S.P.							
110	Providing, fixing, testing and commissioning : Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I. contruction. Entire fan model & AMCA Seal shall apear in techncial submittal of fan. All the fans are synthetic enamelled panited/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at	2	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class `H' insulation. Motor shall be of high temperature resistance "Class H Smoke Spill" 250° C for 2 hrs.Fan shall be CE or UL certified for high temprature. Fan Total Efficiency should not be less than 70 %, noise level should not be more than 80 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. (Motor make shall be same as mentioned on the fire certificate.) - - 15,500 cfm, 15 mmwg S.P.							
111	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	standard M.S./G.I. construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class 'H' insulation. Motor shall be of high temperature resistance "Class H Smoke Spill" 250° C for 2 hrs.Fan shall be CE or UL certified for high temperature. Fan Total Efficiency should not be less than 70 %, noise level should not be more than 80 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. (Motor make shall be same as mentioned on the fire certificate.)							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	- 12,000 cfm, 15 mmwg S.P.							
112	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I. construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class 'H' insulation. Motor shall be of high temperature resistance "Class H Smoke Spill" 250° C for 2 hrs.Fan shall be CE or UL	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	certified for high temprature. Fan Total Efficiency should not be less than 70 %, noise level should not be more than 80 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. (Motor make shall be same as mentioned on the fire certificate.) - 10,000 cfm, 15 mmwg S.P.							
113	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I.construction. Entire fan model & AMCA Seal shall appear in techncial submittal of fan. All the fans are synthetic enamelled panited/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class `F' insulation. Fan Total efficiency should not be less than 70 %, noise level should not be more than 80 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. - 20,000 cfm, 25 mmwg S.P.							
114	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I.construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class `F' insulation. Fan Total efficiency should not be less than 70 %, noise level should not be more than 80 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. - - 16,000 cfm, 15 mmwg S.P.							
115	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I.construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	synthetic enamelled panited/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class `F' insulation. Fan Total efficiency should not be less than 70 %, noise level should not be more than 80 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. - - 12,000 cfm, 15 mmwg S.P.							
116	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I.construction. Entire fan model & AMCA Seal	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class `F' insulation. Fan Total efficiency should not be less than 70 %, noise level should not be more than 80 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. - 10,000 cfm, 25 mmwg S.P.							
117	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in	2	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	standard M.S./G.I.construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class 'F' insulation. Fan Total efficiency should not be less than 70 %, noise level should not be more than 80 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. - - 9,000 cfm, 25 mmwg S.P.							
118	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I.construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class `F' insulation. Fan Total efficiency should not be less than 70 %, noise level should not be more than 80 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. - - 3,500 cfm, 25 mmwg S.P.							
119	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and	2	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I. construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class 'H' insulation. Motor shall be of high temperature resistance "Class H Smoke Spill" 250° C for 2 hrs.Fan shall be CE or UL certified for high temperature. Fan Total Efficiency should not be less than 70 %, noise level should not be more than 75 dba when measured in hemispherical reverberant room conditions at a							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	distance of 3 mtrs from the fan. Fans should be as per specification and drawings. (Motor make shall be same as mentioned on the fire certificate.) -12,000 cfm, 15 mmwg S.P.							
120	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I. construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class 'H' insulation.	2	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	Motor shall be of high temperature resistance "Class H Smoke Spill" 250° C for 2 hrs.Fan shall be CE or UL certified for high temprature. Fan Total Efficiency should not be less than 70 %, noise level should not be more than 75 dba when measured in hemisperical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. (Motor make shall be same as mentioned on the fire certificate.) 10,000 cfm, 15 mmwg S.P.							
121	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I. contruction. Entire fan model & AMCA Seal shall apear in techncial submittal of fan. All the fans are synthetic enamelled panited/hot dip galvanized with minimum	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class `H' insulation. Motor shall be of high temperature resistance "Class H Smoke Spill" 250° C for 2 hrs.Fan shall be CE or UL certified for high temprature. Fan Total Efficiency should not be less than 70 %, noise level should not be more than 75 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. (Motor make shall be same as mentioned on the fire certificate.) - 7,500 cfm, 20 mmwg S.P.							
122	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I. construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class `H' insulation. Motor shall be of high temperature resistance "Class H Smoke Spill" 250° C for 2 hrs.Fan shall be CE or UL certified for high temperature. Fan Total Efficiency should not be less than 70 %, noise level should not be more than 75 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per							

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	specification and drawings. (Motor make shall be same as mentioned on the fire certificate.) - 4,000 cfm, 20 mmwg S.P.							
123	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I.construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class `F' insulation. Fan Total efficiency should not be less than 70 %, noise level should not be more than 75 dba	2	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. - 12,000 cfm, 15 mmwg S.P.							
124	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I.construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class `F' insulation. Fan	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	Total efficiency should not be less than 70 %, noise level should not be more than 75 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. 5,500 cfm, 20 mmwg S.P.							
125	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I.construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	type) confirming to IS - 325-IP - 55 with class `F' insulation. Fan Total efficiency should not be less than 70 %, noise level should not be more than 75 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. - 7,000 cfm, 20 mmwg S.P.							
126	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and commissioning of AMCA Certified (For Air and Sound Performance) vane axial flow fan of different capacity as mentioned in schedule in standard M.S./G.I.construction. Entire fan model & AMCA Seal shall appear in technical submittal of fan. All the fans are synthetic enamelled painted/hot dip galvanized with minimum 220 GSM Zinc Coating and complete with bird screen at inlet, along with backdraft damper & canvas connection at	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	outlet. The electric motor coupler shall be squirrel cage induction motor (IE-3/EFF-1 type) confirming to IS - 325-IP - 55 with class `F' insulation. Fan Total efficiency should not be less than 70 %, noise level should not be more than 75 dba when measured in hemispherical reverberant room conditions at a distance of 3 mtrs from the fan. Fans should be as per specification and drawings. - 3,000 cfm, 20 mmwg S.P.							
127	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and commissioning of weather proof exhaust blower fan section of 18 Ga G.I., blower housing with centrifugal backward curved DIDW blower with motor, drive set (both fan motor shall be mounted on a common frame using cushy food mounting) including vibration isolator M.S. frame for supports, including fire proof canvass connection with pre filter as per specifications and drawings. 9,000 cfm, 30	1	NO					

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	mmwg ESP.							
128	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and commissioning of Ductless Ventilation / high thrust Jet fans with silencer for Normal ventilation and Smoke Extraction application (maximum 2HP motor) for car parking. The complete fan assembly with its Casing, impeller & motor (not only the motor or one of the item) shall be sourced from one manufacturer and certified as tested for 2500C for 2 hours operation, jet fan motor shall be suitable for 400/380 volts plus minus 10% volts, 50Hz, three phase power supply. Adequate number of CO sensors, electrical starter panels, MS conduiting with power / control cabling for 3 phase fans and logic controller with necessary control cabling will form a part of the same. Each fan shall be complete with Dual speed motor. Casing shall be made Galvanized Aluminum.	9	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	The Motor shall run on the electrical power suitable for 50Hz. CFD analysis will be carried out for all the areas leading to the selection of the fans. Cost of CFD analysis for each of the are shall be included in the quoted rates. High thrust jet fans size 355 mm.							
129	<u>CO Sensors - Supply and installation</u> :CO Sensors - Supply and installation of CO sensors with online, continuous monitoring of CO & CO radicals concentration in ambient air, measuring range: 0-300 ppm CO with electro-chemical (Gel electrolyte) technology, sensor should be UL2075 certified, response time t90 < 30 sec, capable of providing multiple threshold to identify normal mode, invisible smoke mode and fire mode. It should provide both analog output and digital communication via RS485 serial interface with Modbus RTU protocol. It should be uniquely	12	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	addressable and suitable for connection in digital communication BUS. Enclosure should have minimum fire retardant UL94: V0 rated with IP65 protection. Sensor cell should be plug-in, field replaceable, sensor life expectancy > 7 years, replaceable sensor cell, CE certified. It Should confirm to EMC- Directive 2014/30/EU							
130	Combined MCC + PLC Panel :Combined MCC + PLC Panel for Fan operation - Supply, installation, testing and commissioning of combined single panel for control logic and fan starter modules, with self diagnostic feature of overload, cable heating, over temperature, inbuilt smoke detection and alarm. Control system should based on programmable logic controller (PLC) with RS485 serial interface over ModBus RTU open protocol digital communication, with Master-Slave architecture connected in	2	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Bus topology. Sensors should be connected in Bus and addressed, with bi-directional communication, capable of configuring multiple threshold for each sensor to identify and trigger normal ventilation, fire mode etc. It should work in closed loop, feedback mode with sensors, with auxilliary power supply to the sensor transmitters. It should be easily integrated with BMS (from Master PLC Module) providing all parameter values including fan status, sensor values, threshold status, fire command etc. It should accept and offer command to & from fire alarm system.Master Panel should have colored touch-screen based HMI LCD display for – sensor values, fan status, alarm status, error & fault log, alarm location etc. System should be configurable via touch-screen with easy English driven menu. It should have password protection against unauthorized access. Programmable to run						

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	and control fan (Jet Fans, Axial Fans) operation in normal, early fire, ventilation and fire mode based on sensor values or fire alarm signal or BMS signal or Manual operation. Configurable to control fan operation of any zone based on trigger of sensor of any same or other zone.It should have automated logic controlled fan Starter for Jet fans, Axial fans start / stop. It should have closed feedback signals for fan status, fan error etc. It should have overvoltage, over current, phase protection features. Manual / Auto fan mode should be accessed by LCD Display.							
131	2 x 2-core 1.00 sq mm, twisted, shielded cable 2 x 2-core 1.00 sq mm, twisted, shielded cable (PLC to Sensor).	125	M					
132	2-core 1.00 sq mm, twisted, shielded cable 2-core 1.00 sq mm, twisted, shielded cable (PLC to PLC) Important note for Tenderer Tenderer will be required to	330	M					

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	workout the quantities of jet fans based on CFD analysis and shall guarantee the results accordingly. Tenders without CFD analysis will be summarily rejected. Notes for Jet Fan Panels The Jet fan panels shall include all logic control with necessary logic for CO Sensor and Control of Jet Fans based on CO sensing. 24V DC Supply for CO sensors shall be part of Jet fan Panels. Actual qty. of Starter for Jet Fans shall be as per CFD Analysis submitted by Vendor.							
133	Providing, fixing, testing and commissioning Providing, fixing, testing and commissioning of propeller type fan for exhaust/fresh air complete with gravity louvers and cabling upto power point complete as per specifications and drawings. 20" dia.	3	NO					

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134	Providing, fixing, testing and commissioning : Providing, fixing, testing and commissioning of propeller type fan for exhaust/fresh air complete with gravity louvers and cabling upto power point complete as per specifications and drawings. 8" dia.	6	NO					
135	Providing, fixing, testing and commissioning Providing, fixing, testing and commissioning inline fans of G.I. construction complete with centrifugal fan with motor, canvass connection at inlet and outlet complete with electric panel with MCB and relays, with 5 Rm cabling and earthing with louvers bird screen at outlet, complete as per standards, requirement and drawings. - 1,000 cfm	1	NO					
136	Providing, fixing, testing and commissioning Providing, fixing, testing and commissioning inline fans of G.I. construction complete with centrifugal fan with motor, canvass connection at inlet and	6	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	outlet complete with electric panel with MCB and relays, with 5 Rm cabling and earthing with louvers bird screen at outlet, complete as per standards, requirement and drawings. - 850cfm							
137	Providing, fixing, testing and commissioning Providing, fixing, testing and commissioning inline fans of G.I. construction complete with centrifugal fan with motor, canvass connection at inlet and outlet complete with electric panel with MCB and relays, with 5 Rm cabling and earthing with louvers bird screen at outlet, complete as per standards, requirement and drawings. - 450 cfm	1	NO					
138	Providing, fixing, testing and commissioning Providing, fixing, testing and commissioning inline fans of G.I. construction complete with centrifugal fan with motor, canvass connection at inlet and outlet complete with electric panel with MCB and relays, with	3	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	5 Rm cabling and earthing with louvers bird screen at outlet, complete as per standards, requirement and drawings. - 300cfm							
139	<u>Providing, fixing, testing and commissioning:</u> Providing, fixing, testing and commissioning inline fans of G.I. construction complete with centrifugal fan with motor, canvass connection at inlet and outlet complete with electric panel with MCB and relays, with 5 Rm cabling and earthing with louvers bird screen at outlet, complete as per standards, requirement and drawings. - 250 cfm	1	NO					
140	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and commissioning inline fans of G.I. construction complete with centrifugal fan with motor, canvass connection at inlet and outlet complete with electric panel with MCB and relays, with 5 Rm cabling and earthing with louvers bird screen at outlet,	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	complete as per standards, requirement and drawings. - 150 cfm							
141	<u>Providing, fixing, testing and commissioning</u> Providing, fixing, testing and commissioning inline fans of G.I. construction complete with centrifugal fan with motor, canvass connection at inlet and outlet complete with electric panel with MCB and relays, with 5 Rm cabling and earthing with louvers bird screen at outlet, complete as per standards, requirement and drawings. - 1,00 cfm	1	NO					
142	<u>Supply & fixing of UPVC drain piping</u> Supply & fixing of UPVC drain piping with all fitting such as bends, tees etc. necessary clamps, adequate support duly insulate with 9 mm nitrile rubber insulation complete as per specifications, requirement, standard and drawings. 50 mm dia	70	M					
143	<u>Supply & fixing of UPVC drain</u>	40	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	piping Supply & fixing of UPVC drain piping with all fitting such as bends, tees etc. necessary clamps, adequate support duly insulate with 9 mm nitrile rubber insulation complete as per specifications, requirement, standard and drawings. 40 mm dia							
144	<u>Supply & fixing of UPVC drain piping</u> Supply & fixing of UPVC drain piping with all fitting such as bends, tees etc. necessary clamps, adequate support duly insulate with 9 mm nitrile rubber insulation complete as per specifications, requirement, standard and drawings. 32 mm dia	180	M					
145	<u>Supply & fixing of UPVC drain piping</u> Supply & fixing of UPVC drain piping with all fitting such as bends, tees etc. necessary clamps, adequate support duly insulate with 9 mm nitrile rubber insulation complete as per specifications, requirement,	130	M					

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	standard and drawings. 25 mm dia							
146	G.I. Sheet Metal Ducting (Rectangular) - SuG.I. Sheet Metal Ducting (Rectangular) - Supply, installation, balancing and commissioning of factory fabricated GSS sheet metal rectangular/ round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports etc. as per approved drawings and specifications of following sheet thickness complete as per specifications, requirement, standard and drawings. - Thickness 0.63 mm sheet (24 Gauge)	300	M2					
147	G.I. Sheet Metal Ducting (Rectangular) G.I. Sheet Metal Ducting (Rectangular) - Supply, installation, balancing and commissioning of factory fabricated GSS sheet metal rectangular/ round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers,	400	M2					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	supports etc. as per approved drawings and specifications of following sheet thickness complete as per specifications, requirement, standard and drawings. - Thickness 0.80 mm sheet (22 Gauge)							
148	<u>Thermal Duct (for Air-conditioning)</u> Thermal Duct (for Air-conditioning) - Providing & fixing of fiberglass wool Duct Board for duct thermal insulation is having 25mm thickness with both side factory laminated aluminum foil, outer facing foil is having - Reinforced aluminum + Kraft+ glass veil and inner facing foil - Aluminum + Kraft + glass veil. Duct Board Size: 1.19mtr (W) X 2.9mtr (L) - 25 mm thick	8300	M2					
149	<u>Thermal Duct Accoustic Lining</u> Thermal Duct Accoustic Lining - Providing & fixing of fiberglass wool Duct Board-Neto for duct acoustic insulation is having 25mm thickness with one side factory laminated aluminum foil, outer facing foil is having -	1350	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Reinforced aluminum + Kraft+ glass veil and inner facing - Black glass textile. Duct Board Size: 1.19mtr (W) X 2.9mtr (L) - 25 mm thick							
150	Exposed Duct Insulation Exposed Duct Insulation - Supplying and fixing of aluminium cladding on exposed duct as per specifications and as required. 26 gauge aluminium cladding.	100	M2					
152	Supplying & fixing : Supplying & fixing of powder coated extruded aluminium Supply/Exhaust Air Grills with aluminium volume control dampers as per specifications.	80	M2					
153	Supplying & fixing : Supplying & fixing of powder coated extruded aluminium Return Air Grills with louvers but without volume control dampers complete as required.	150	M2					
154	Supplying, fixing testing :Supplying, fixing testing commissioning of Return air diffusers of powder coated	50	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	aluminium without volume control dampers with anti smudge ring & removable core.							
155	Supply and installation : Supply and installation of Fresh air grille of aluminium powder coated with louvers, bird Screen and damper as per specifications and drawings.	25	M2					
156	Supply and installation : Supply, installation, testing and commissioning of GI volume control duct damper complete with neoprene rubber gaskets, nuts, bolts, screws linkages, flanges etc., as per specifications.	80	M2					
157	Supplying, of acoustic lining :Supplying, of acoustic lining on wall and ceiling of AHU rooms with 25mm thick Rigid Board of Glasswool one side aluminum faced and other side black glass cloth lamination, density 70 to 80 kg/cu.m has to be fitted directly on the wall of the room with the help of screw (2 inch) and GI washers (3 inch x 3 inch)/PVC Gitti (1 inch). If the	2200	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	acoustic board is placed with the help of GI washer, it has to be painted in black color to match the cloth color. The accoustic board should be placed in such a way that black glass cloth is visible from inside the AHU room. Complete as required and as per specifications.							
158	Supply, installation, testing: Supply, installation, testing and commissioning of Motorized modulating type duct mounted GI volume control damper with CO2 sensor and controller and necessary control wire (minimum 1.5 sq.mm) for integration within AHU complete in all respect. - Damper	1	M2					
159	Supply, installation, testing: Supply, installation, testing and commissioning of Motorized modulating type duct mounted GI volume control damper with CO2 sensor and controller and necessary control wire (minimum 1.5 sq.mm) for integration within AHU complete in all respect. - - Actuator with CO2 sensor and wiring.	1	EA					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

160	Providing,fixing,testing: Providing,fixing,testing and commisioning of Bypass type VAV Boxes for climate control, made out of 20 gauge thick galvanised steel sheet acoustically lined from inside; low leak multi blade extruded aluminium motorised face & bypass volume control damper with thumb-wheel adjustable thermostat. Dynamic factory calibrated and adjustable flow of below mentioned range complete in all respect. - 100-500 cfm	9	NO					
161	Providing,fixing,testing Providing,fixing,testing and commisioning of Bypass type VAV Boxes for climate control, made out of 20 gauge thick galvanised steel sheet acoustically lined from inside; low leak multi blade extruded aluminium motorised face & bypass volume control damper with thumb-wheel adjustable thermostat. Dynamic factory calibrated and adjustable flow of below mentioned range complete in all respect. - 120-600 cfm	1	NO					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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162	Providing,fixing,testing Providing,fixing,testing and commissioning of Bypass type VAV Boxes for climate control, made out of 20 gauge thick galvanised steel sheet acoustically lined from inside; low leak multi blade extruded aluminium motorised face & bypass volume control damper with thumb-wheel adjustable thermostat. Dynamic factory calibrated and adjustable flow of below mentioned range complete in all respect. 200-1000 cfm	4	NO					
163	Supplying, Fixing, testing : Supplying, Fixing, testing and commissioning of fire dampers in supply air duct/main branch and return air path as and where required of required sizes i/c control wiring, the damper shall be motorized and spring return so as to close the damper in the event of power failure automatically and open the same in case of power being restored. The spring return action shall be inbuilt mechanism and not externally	60	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	mounted. The damper shall also be closed in the event of fire signal complete as required and as per specifications. - Fire dampers							
164	Supplying, Fixing, testing : Supplying, Fixing, testing and commissioning of fire dampers in supply air duct/main branch and return air path as and where required of required sizes i/c control wiring, the damper shall be motorized and spring return so as to close the damper in the event of power failure automatically and open the same in case of power being restored. The spring return action shall be inbuilt mechanism and not externally mounted. The damper shall also be closed in the event of fire signal complete as required and as per specifications. - Actuator assembly (10 NM)	173	NO					
165	Providing, fixing, testing: Providing, fixing, testing and commissioning of weather proof main panel board cubical compartmentalised, floor	1	SET					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	mounted made of 2.0 mm thick steel sheet duly painted complete with voltmeter, ammeter, indicating lights for selector switch, incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-1) 1 No. 1200 Amps TPN incoming MCCB. 1 set 1400 Amps TPN Aluminium conductor bus bar duly sleeved. 2 Nos. 16 Amps TPN MCB outgoing along with 2 Nos. DOL starter for Axial Fan Motor (1.5 kW). 3 Nos. 400 Amps TPN MCCB outgoing for Chiller (140 kW). 3 Nos. 63 Amps TPN MCCB outgoing with space for VFD for 3 Nos. primary variable pumps(15 kW).						

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	3 Nos.63 Amps TPN MCCB outgoing along with 3 Nos. star delta starters for 3 Nos. condensor water pumps(18.5 kW). 3 Nos. 25 Amps TPN MCB outgoing with space for VFD for 3 Nos. cooling towers (5.5 kW).							
166	<u>Providing, fixing, testing:</u> Providing, fixing, testing and commissioning of weather proof main panel board cubical compartmentalised, floor mounted made of 2.0 mm thick steel sheet duly painted complete with voltmeter, ammeter, indicating lights for selector switch, incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-2) 1 No. 63 Amps TPN incoming MCB. 1 set 100 Amps TPN Aluminium conductor bus bar duly sleeved.	1	SET					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	3 Nos. 25 Amps TPN MCB outgoing along with 3 Nos. DOL starter for Axial Fan Motor (5.5 kW).							
	4 Nos. 16 Amps TPN MCB outgoing along with 4 Nos. DOL starter for Jet Fan Motor (0.75 kW).							
167	<u>Providing, fixing, testing:</u> Providing, fixing, testing and commissioning of weather proof main panel board cubical compartmentalised, floor mounted made of 2.0 mm thick steel sheet duly painted complete with voltmeter, ammeter, indicating lights for selector switch, incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-3) 1 No. 40 Amps TPN incoming MCB. 1 set 63 Amps TPN Aluminium conductor bus bar duly sleeved.	1	SET					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	3 Nos. 25 Amps TPN MCB outgoing along with 3 Nos. DOL starter for Axial Fan Motor (5.5 kW).							
168	<u>Providing, fixing, testing:</u> Providing, fixing, testing and commissioning of weather proof main panel board cubical compartmentalised, floor mounted made of 2.0 mm thick steel sheet duly painted complete with voltmeter, ammeter, indicating lights for selector switch, incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-4) 1 No. 63 Amps TPN incoming MCB. 1 set 100 Amps TPN Aluminium conductor bus bar duly sleeved. 3 Nos. 25 Amps TPN MCB outgoing along with 3 Nos. DOL starter for Axial Fan Motor (5.5 kW).	1	SET					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	5 Nos. 16 Amps TPN MCB outgoing along with 5 Nos. DOL starter for Jet Fan Motor (0.75 kW).							
169	<u>Providing, fixing, testing:</u> Providing, fixing, testing and commissioning of weather proof main panel board cubical compartmentalised, floor mounted made of 2.0 mm thick steel sheet duly painted complete with voltmeter, ammeter, indicating lights for selector switch, incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-5) 1 No. 16 Amps TPN incoming MCB. 1 set 25 Amps TPN Aluminium conductor bus bar duly sleeved. 2 Nos. 16 Amps TPN MCB outgoing along with 2 Nos. DOL starter for Axial Fan Motor (2.2 kW , 3.0 kW, 1.5 kW).	2	SET					
170	<u>Providing, fixing, testing:</u> Providing, fixing, testing and	4	SET					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	commissioning of weather proof main panel board cubical compartmentalised, floor mounted made of 2.0 mm thick steel sheet duly painted complete with voltmeter, ammeter, indicating lights for selector switch, incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-6) 1 Nos. 16 Amps TPN MCB outgoing along with 1 Nos. DOL starter for Axial Fan Motor (1.5 kW, 3.0 kW).							
171	Providing, fixing, testing: Providing, fixing, testing and commissioning of weather proof main panel board cubical compartmentalised, floor mounted made of 2.0 mm thick steel sheet duly painted complete with voltmeter, ammeter, indicating lights for selector switch, incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-7)	4	SET					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	1 Nos. 25 Amps TPN MCB outgoing along with 1 Nos. DOL starter for Axial Fan Motor (4.0 / 5.5 kW).							
172	<u>Providing, fixing, testing:</u> Providing, fixing, testing and commissioning of weather proof main panel board cubical compartmentalised, floor mounted made of 2.0 mm thick steel sheet duly painted complete with voltmeter, ammeter, indicating lights for selector switch, incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-8) 1 Nos. 25 Amps TPN MCB outgoing along with 1 Nos. star delta starter for Axial Fan Motor (7.5 kW).	1	SET					
173	<u>Providing, fixing, testing:</u> Providing, fixing, testing and commissioning of weather proof main panel board cubical compartmentalised, floor mounted made of 2.0 mm thick steel sheet duly painted complete with voltmeter,	1	SET					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	ammeter, indicating lights for selector switch, incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-9) 1 No. 25 Amps TPN incoming MCB. 1 set 32 Amps TPN Aluminium conductor bus bar duly sleeved. 2 Nos. 25 Amps TPN MCB outgoing along with 2 Nos. DOL starter for HRW Fan Motor (5.5 kW). 1 Nos. 6 Amps SPN MCB outgoing for HRW wheel Motor (0.55 kW).							
174	<u>Providing, fixing, testing:</u> Providing, fixing, testing and commissioning of weather proof main panel board cubical compartmentalised, floor mounted made of 2.0 mm thick steel sheet duly painted complete with voltmeter, ammeter, indicating lights for selector switch,	1	SET					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-10) 1 No. 25 Amps TPN incoming MCB. 1 set 32 Amps TPN Aluminium conductor bus bar duly sleeved. 1 Nos. 16 Amps TPN MCB outgoing along with 1 Nos. DOL starter for HRW Fan Motor (3.0 kW). 1 Nos. 25 Amps TPN MCB outgoing along with 1 Nos. DOL starter for HRW Fan Motor (5.5 kW). 1 Nos. 6 Amps SPN MCB outgoing for HRW wheel Motor (0.55 kW).							
175	Providing, fixing, testing: Providing, fixing, testing and commissioning of weather proof main panel board cubical compartmentalised, floor mounted made of 2.0 mm thick steel sheet duly painted	1	SET					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	complete with voltmeter, ammeter, indicating lights for selector switch, incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-11) 1 No. 16 Amps TPN incoming MCB. 1 set 25 Amps TPN Aluminium conductor bus bar duly sleeved. 2 Nos. 16 Amps TPN MCB outgoing along with 2 Nos. DOL starter for HRW Fan Motor (2.2 kW). 1 Nos. 6 Amps SPN MCB outgoing for HRW wheel Motor (0.55 kW).							
176	<u>Providing, fixing, testing:</u> Providing, fixing, testing and commissioning of weather proof main panel board cubical compartmentalised, floor mounted made of 2.0 mm thick steel sheet duly painted complete with voltmeter, ammeter, indicating lights for	10	SET					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	selector switch, incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-12) 1 Nos. 16 Amps TPN MCB outgoing along with space for VFD for 1 Nos. AHU (1.1 kW,2.2 kW, 3.0 kW , 4.0 kW).							
177	<u>Providing, fixing, testing:</u> Providing, fixing, testing and commissioning of weather proof main panel board cubical compartmentalised, floor mounted made of 2.0 mm thick steel sheet duly painted complete with voltmeter, ammeter, indicating lights for selector switch, incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-13) 1 Nos. 25 Amps TPN MCB outgoing along with space for VFD for 1 Nos. AHU (5.5 kW,7.5 kW).	11	SET					
178	<u>Providing, fixing, testing:</u> Providing, fixing, testing and commissioning of weather proof	7	SET					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	main panel board cubical compartmentalised, floor mounted made of 2.0 mm thick steel sheet duly painted complete with voltmeter, ammeter, indicating lights for selector switch, incoming/outgoing feeders CTS contactors, NO/NC contacts complete as per specifications and required. (EP-14) 1 Nos. 63 Amps TPN MCB outgoing along with space for VFD for 1 Nos. AHU (11 kW).							
179	<u>Supplying and installing :</u> Supplying and installing following size of perforated painted with powder coating M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc. as required. - 300 mm width X 62.5 mm depth X 2.0 mm thickness	10	M					
180	<u>Supplying and installing :</u> Supplying and installing following size of perforated	210	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	painted with powder coating M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc. as required. - 150 mm width X 50 mm depth X 1.6 mm thickness							
181	<u>Providing & fixing of XLPE:</u> Providing & fixing of XLPE insulated armoured Aluminium / Copper cables for various equipments through walls/ceiling with appropriate clamps & fixing arrangement as per specifications and drawings. - 31/2 C - 400 sqmm	45	M					
182	<u>Providing & fixing of XLPE:</u> Providing & fixing of XLPE insulated armoured Aluminium / Copper cables for various equipments through walls/ceiling with appropriate clamps & fixing arrangement as per specifications and drawings. - 3C - 4 sqmm (Aluminium)	720	M					
183	<u>Providing & fixing of XLPE:</u> Providing & fixing of XLPE	150	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	insulated armoured Aluminium / Copper cables for various equipments through walls/ceiling with appropriate clamps & fixing arrangement as per specifications and drawings. - 3C - 6 sqmm (Aluminium)							
184	Providing & fixing of XLPE: Providing & fixing of XLPE insulated armoured Aluminium / Copper cables for various equipments through walls/ceiling with appropriate clamps & fixing arrangement as per specifications and drawings. - 3C - 10 sqmm (Aluminium)	50	M					
185	Providing & fixing of XLPE: Providing & fixing of XLPE insulated armoured Aluminium / Copper cables for various equipments through walls/ceiling with appropriate clamps & fixing arrangement as per specifications and drawings. - 6C - 2.5 sqmm (Copper)	400	M					
186	Providing & fixing of XLPE: Providing & fixing of XLPE insulated armoured Aluminium / Copper cables for various equipments through	50	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	walls/ceiling with appropriate clamps & fixing arrangement as per specifications and drawings. - 2 C - 2.5 sqmm (Copper)							
187	Providing & fixing of weather: Providing & fixing of weather proof isolator with suitable rating near each outdoor unit the prices should be inclusive of copper cabling from isolators to outdoor units. - 5.5 kw	3	NO					
188	Supply and laying of double :Supply and laying of double earthing continuity conductors of G.I. /G.S.S between panel boards and equipments as drawings. - Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.	50	M					
189	Providing & fixing of XLPE: Providing & fixing of XLPE insulated armoured Aluminium / Copper cables for various equipments through walls/ceiling with appropriate clamps & fixing arrangement as per specifications and drawings. - 3C - 4 sqmm (Aluminium) - Providing and fixing 6 SWG	880	M					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

	dia G.I. wire on surface or in recess for loop earthing as required.							
TOTAL (GROUP G) WITHOUT GST								
TOTAL (GROUP G) WITH GST								

GROUP-H- BMS WORK								
SL. NO.	DESCRIPTION OF WORK	QTY (A)	UNIT	RATE PER UNIT (IN WORDS & FIGURES) (B)		TOTAL AMOUNT C=(AXB)	SERVICE ACCOUNTING CODE (SAC)	SPECIFY % OF GST ON (C)
				FIGURE S	WORDS			
1	<u>Supply, installation, testing and commissioning PC:</u> Supply, installation, testing and commissioning of I7 Processor or Equivalet PC with 4 GB RAM, & 1 TB HDD, 10/100 Mbps Ethernet card, USB connection & internal modem, Microsoft(R) Windows(R) 7 OS Professional or higher. Accessories included Optical	1	NO.					

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Mouse, Key Pad with the above BMS System configuration.							
2	<u>32 Inch HD Color LED Monitor.</u> 32 Inch HD Color LED Monitor.	1	NO					
3	<u>Laser jet Printer (A4 size, B&W)</u> Laser jet Printer (A4 size, B&W)	1	NO					
4	<u>Supply, Installation, Testing & Commissioning of UPS</u> Supply, Installation, Testing & Commissioning of 2kVA online UPS with 30min backup.	1	NO					
5	<u>Supply, installation, testing and commis</u> Supply, installation, testing and commissioning of Layer 2/3 managed switch with 16 or 24 ports (RJ-45) port. The switch shall have 2 RSTP enabled ports to communicate with other switches to built a ring topology network on CAT6 A cable. The switch shall have 1 GB port to communicate with other switches including Passive components inbuilt 2 SFP ports including SFP modules, rack mountable, SMPS power supply & other termination accessories (Like Pigtails/LIUs/ Convertors/Splicing equipment ,Patch panel, Patch	1	LOT					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Cord, Etc) complete as per specifications and as required for BMS DDC Panel Networking. The switch to switch distance shall not exceed beyond 80 meters. Vendor to decide the quantity of network switches based on their network design.							
6	Supply, Installation, Testing & Commissioning software: "Supply, Installation, Testing & Commissioning of software for Building Management Software with features like 3D vector dynamic graphics with Autocad import of plan with Zoom In & Zoom Out facility, Graphic Builder, Plant Viewer, Trend Viewer, Object Viewer, Report Viewer, Alarm router, Log Viewer. The Web-Based Server software shall permit use of Standard Web-Browsers such as Microsoft Internet Explorer, Netscape Navigator, etc. The software shall be capable of integartion third-party systems and should supports latest IP technology (IP V4/V6). The Management Stations shall match the BACnet Profile B-AWS	1	LOT					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	(Advanced workstation) as per the BTL Listing. The Web based software shall include 1 Client License for remote viewing. Number of IO points shall be considered as per the IO summary considering 15% spares.							
7	Supply, Installation, Testing & Commissioning PANELS: Supply, Installation, Testing & Commissioning of High-quality CAPACTIVE touch 7.0" panels for technical on-site operation of plants as well as room operation. The Touch Panel shall have integrated web server and a BACnet/ IP web interface to connect a HTML5 browser to a device on the network. Generic operation and monitoring of plant functions (alarms, schedulers, calendars, set point changes, display of actual values, etc.) .	1	NO					
8	Supply, Installation, Testing & Commissioning DDC: Supply, Installation, Testing & Commissioning of True IP Based Standalone 32 Bit Intelligent, BTL Listed & UL certified interoperable	1	LOT					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	DDC as per the specification. Each DDC Controller shall have inbuilt IP port & shall directly connect to the Network switches. No Supervisory Controller/Router shall be acceptable for IP conversion. The DDC shall be Programmable and Application specific. The Controller shall have minimum 18 onboard points and can be expandable upto max of 52 points. The DDC must support trending & scheduling at Controller level. All trend data must be created and saved to the automation station to achieve gap-free trend documentation during communication failure. The above shall be housed in IP 55 vandal proof, lockable & secure MS Cabinets to be supplied along with all necessary switchgear protections as required. Number of controllers shall have spare capacity of 15% for future expansion. - DDC for Chiller Plant.							
9	Providing, fixing, testing and commission water factory: Providing, fixing, testing and commissioning of floor mounted	1	LOT					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	chilled water factory built Air handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - DDC for AHU's /HRW/ Ventilation Fans.							
10	Providing, fixing, testing and commission AHU:	1	LOT					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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Providing, fixing, testing and commissioning of floor mounted chilled water factory built Air handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m3,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be AHRI/Eurovent certified. - DDC for Electrical System.							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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11	Providing, fixing, testing and commission AHU: Providing, fixing, testing and commissioning of floor mounted chilled water factory built Air handling units Double skin type with 40 mm thick panels consisting of G.I casing of thickness 0.6 mm outside layer and 0.6 mm inside layer with zinc coating and polyurethane foam (PUF) insulation having density of 42 kg/m³,complete with backward curved Plug type direct driven fan with IP - 21 VFD suitable for static pressure as detailed below, chilled water cooling coil with aluminium finned copper tubes. Filter section having 50 mm thick MERV-8 pre filters, MERV-13 fine filter, TEFC, IE-3 motor suitable for 415 +10% volts,50 Hz, 3 phase AC supply,drain connections with stainless steel drain pan (18 Ga) with PUF insulation, fire retardent canvas connection and necessary vibration isolation arrangement to avoid any vibration alongwith etc. complete as per specifications and drawings. AHU coils shall be	1	LOT					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	AHRI/Eurovent certified. - DDC for Plumbing System.							
12	Supply, Installation, Testing & Commissioning Integration UNIT: Supply, Installation, Testing & Commissioning of True IP Based System Integration unit consisting of microprocessor based controller units BTL & UL Listed for third party integration. The same should support operations/ monitoring via portable operator terminal. .The controller shall be Native BACnet type with communication via BACnet/LonTalk, Integration platforms and system controllers for third-party devices and systems via KNX, Modbus, M-Bus and other protocols into the automation level via BACnet. The same shall Support operation via local or network-compatible operator units. It should store trend logs and event buffer for a typical duration of up to 30 Days. All the Integrators shall be seperate. (Note: No 3rd party make integartor shall be accepted.) - Chillers Integartion on Modbus Protocol .	1	LOT					
13	Supply, Installation, Testing &	1	LOT					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Commissing : Supply, Installation, Testing & Commissioning of True IP Based System Integration unit consisting of microprocessor based controller units BTL & UL Listed for third party integration. The same should support operations/ monitoring via portable operator terminal. .The controller shall be Native BACnet type with communication via BACnet/LonTalk, Integration platforms and system controllers for third-party devices and systems via KNX, Modbus, M-Bus and other protocols into the automation level via BACnet. The same shall Support operation via local or network-compatible operator units. It should store trend logs and event buffer for a typical duration of up to 30 Days. All the Integrators shall be seperate. (Note: No 3rd party make integartor shall be accepted.) - VFD Integration on Modbus Protocol.							
14	Supply, Installation, Testing & Commissing : Supply, Installation, Testing & Commissioning of True IP Based	1	LOT					

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	System Integration unit consisting of microprocessor based controller units BTL & UL Listed for third party integration. The same should support operations/ monitoring via portable operator terminal. .The controller shall be Native BACnet type with communication via BACnet/LonTalk, Integration platforms and system controllers for third-party devices and systems via KNX, Modbus, M-Bus and other protocols into the automation level via BACnet. The same shall Support operation via local or network-compatible operator units. It should store trend logs and event buffer for a typical duration of up to 30 Days. All the Integrators shall be seperate. (Note: No 3rd party make integartor shall be accepted.) - UPS Integartion on Modbus RS 485 Protocol.							
15	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of True IP Based System Integration unit consisting of microprocessor based controller	1	LOT					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	units BTL & UL Listed for third party integration. The same should support operations/ monitoring via portable operator terminal. .The controller shall be Native BACnet type with communication via BACnet/LonTalk, Integration platforms and system controllers for third-party devices and systems via KNX, Modbus, M-Bus and other protocols into the automation level via BACnet. The same shall Support operation via local or network-compatible operator units. It should store trend logs and event buffer for a typical duration of up to 30 Days. All the Integrators shall be seperate. (Note: No 3rd party make integartor shall be accepted.) - DG Integartion on Modbus RS 485 Protocol.							
16	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of True IP Based System Integration unit consisting of microprocessor based controller units BTL & UL Listed for third party integration. The same should support operations/ monitoring via	1	LOT					

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	portable operator terminal. .The controller shall be Native BACnet type with communication via BACnet/LonTalk, Integration platforms and system controllers for third-party devices and systems via KNX, Modbus, M-Bus and other protocols into the automation level via BACnet. The same shall Support operation via local or network-compatible operator units. It should store trend logs and event buffer for a typical duration of up to 30 Days. All the Integrators shall be seperate. (Note: No 3rd party make integartor shall be accepted.) - Energy Meters to be on Modbus RTU with RS 485 Communication.							
17	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of True IP Based System Integration unit consisting of microprocessor based controller units BTL & UL Listed for third party integration. The same should support operations/ monitoring via portable operator terminal. .The controller shall be Native BACnet	1	LOT					

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	type with communication via BACnet/LonTalk, Integration platforms and system controllers for third-party devices and systems via KNX, Modbus, M-Bus and other protocols into the automation level via BACnet. The same shall Support operation via local or network-compatible operator units. It should store trend logs and event buffer for a typical duration of up to 30 Days. All the Integrators shall be seperate. (Note: No 3rd party make integartor shall be accepted.)- FAS integration on BACnet.							
18	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of True IP Based System Integration unit consisting of microprocessor based controller units BTL & UL Listed for third party integration. The same should support operations/ monitoring via portable operator terminal. .The controller shall be Native BACnet type with communication via BACnet/LonTalk, Integration platforms and system controllers	1	LOT					

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	for third-party devices and systems via KNX, Modbus, M-Bus and other protocols into the automation level via BACnet. The same shall Support operation via local or network-compatible operator units. It should store trend logs and event buffer for a typical duration of up to 30 Days. All the Integrators shall be seperate. (Note: No 3rd party make integartor shall be accepted.) - Plumbing PLC to be on Modbus RTU with RS 485 Communication Port.							
19	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of True IP Based System Integration unit consisting of microprocessor based controller units BTL & UL Listed for third party integration. The same should support operations/ monitoring via portable operator terminal. .The controller shall be Native BACnet type with communication via BACnet/LonTalk, Integration platforms and system controllers for third-party devices and systems via KNX, Modbus, M-Bus and	1	LOT					

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	other protocols into the automation level via BACnet. The same shall Support operation via local or network-compatible operator units. It should store trend logs and event buffer for a typical duration of up to 30 Days. All the Integrators shall be seperate. (Note: No 3rd party make integartor shall be accepted.) - VAV to be on Bacnet/IP or Modbus RTU with RS 485 Communication Port.							
20	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of True IP Based System Integration unit consisting of microprocessor based controller units BTL & UL Listed for third party integration. The same should support operations/ monitoring via portable operator terminal. .The controller shall be Native BACnet type with communication via BACnet/LonTalk, Integration platforms and system controllers for third-party devices and systems via KNX, Modbus, M-Bus and other protocols into the automation level via BACnet. The same shall	1	LOT					

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	Support operation via local or network-compatible operator units. It should store trend logs and event buffer for a typical duration of up to 30 Days. All the Integrators shall be seperate. (Note: No 3rd party make integartor shall be accepted.) - PAC Integartion on Modbus RS 485 Protocol.							
21	Supply, Installation, Testing & Commissing : Supply, Installation, Testing & Commissioning of True IP Based System Integration unit consisting of microprocessor based controller units BTL & UL Listed for third party integration. The same should support operations/ monitoring via portable operator terminal. .The controller shall be Native BACnet type with communication via BACnet/LonTalk, Integration platforms and system controllers for third-party devices and systems via KNX, Modbus, M-Bus and other protocols into the automation level via BACnet. The same shall Support operation via local or network-compatible operator units. It should store trend logs and event	1	LOT					

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	buffer for a typical duration of up to 30 Days. All the Integrators shall be seperate. (Note: No 3rd party make integartor shall be accepted.) - Motion Sensor & Access Ontrol System integration on Modbus/ BACnet.							
22	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of Immersion temperature sensor 100 mm Pt1000 with Brass Thermowell.	10	NO					
23	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of Outside air temperature + humidity sensors for measuring outside air temperature. It should be provided with sun sheild and rain protection.	1	NO					
24	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of Clamp-on Ultrasonic flow meter.	1	NO					
25	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of Differential	6	NO					

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	pressure switch for Pumps.							
26	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of PH Analyser.	1	NO					
27	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of TDS Analyser.	1	NO					
28	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of Level Switch.	3	NO					
29	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of Bi Level Switch.	23	NO					
30	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of Differential pressure switch Air.	89	NO					
31	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of Duct Temp. Sensor.	40	NO					
32	Supply, Installation, Testing & Comissing : Supply, Installation, Testing &	40	NO					

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	Commissioning of Duct Temp. Cum RH Sensor.							
33	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of Flame Proof Level Transmitter.	3	NO					
34	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of Voltage Transducer.	1	NO					
35	Supply, Installation, Testing & Comissing : Supplying, laying, termination, testing and commissioning of signal cables. (2 core x 1.5 Sq.mm), PVC insulated, Shielded tinned copper conductor cable.	10000	M					
36	Supply, Installation, Testing & Comissing : Supplying, laying, termination, testing & commissioning of CAT 6A unarmoured Cables with required accessories like RJ45 connector etc.	3000	M					
37	Supply, Installation, Testing & Comissing :	12000	M					

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	Supply, Installation, Testing & Commissioning of MS Conduit 25 mm for Signal & Communication Cable.							
38	Supply, Installation, Testing & Comissing : Supply, Installation, Testing & Commissioning of GI Flexible.	600	M					
TOTAL (GROUP H) WITHOUT GST								
TOTAL (GROUP H) WITH GST								

GROUP-I - INTERIOR WORK

SL. NO.	DESCRIPTION OF WORK	QTY (A)	UNIT	RATE PER UNIT (IN WORDS & FIGURES) (B)		TOTAL AMOUNT C=(AXB)	SERVICE ACCOUNTING CODE (SAC)	SPECIFY % OF GST ON (C)
				FIGURE S	WORDS			
1	Providing and fixing false ceiling : Providing and fixing false ceiling at all height including providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm	9145.45	M2					

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(both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450							

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	mm centre, with 25mm long dry wall screws @ 230 mm interval, including fixing of gypsum board to ceiling section and perimeter channel with the help of dry wall screws of size 3.5 x 25 mm at 230 mm c/c, all as per manufacturer's specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge but excluding the cost of painting with : 12.5 mm thick tapered edge gypsum plain board conforming to IS: 2095- Part I							
2	Fully Perforated Gypsum Plaster Board : Fully Perforated Gypsum Plaster Board of size 1200x2400x12.5 mm having approx. 15 % perforated area with perforation size and pattern as approved by the Engineerin-charge and as per manufacturer's specification, with all 4 side tapered and backed by acoustical tissue with NRC value	560.02	M2					

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	not less than 0.60							
3	Providing and Fixing 15 mm false ceiling tiles: Providing and Fixing 15 mm thick densified regular edged eco friendly light weight calcium silicate false ceiling tiles of approved texture of size 595 x 595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galvanised steel sections (galvanising @ 120 grams per sqm including both side) consisting of main ‘T’ runner suitably spaced at joints to get required length and of size 24x38 mm made from 0.33 mm thick (minimum) sheet, spaced 1200 mm centre to centre, and cross ‘T’ of size 24x28 mm made out of 0.33 mm (Minimum) sheet, 1200 mm long spaced between main‘T’ at 600 mm centre to centre to form a grid of 1200x600 mm and secondary cross ‘T’ of length 600 mm and size 24 x28 mm made of 0.33 mm thick (Minimum) sheet to be inter locked at middle of the 1200x 600 mm panel to from grid of size 600x600 mm, resting on periphery walls /partitions on a	2965.68	M2					

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Perimeter wall angle pre-coated steel of size(24x24X3000 mm made of 0.40 mm thick (minimum) sheet with the help of rawl plugs at 450 mm centre to centre with 25 mm long dry wall screws @ 230 mm interval and laying 15 mm thick densified edges calicum silicate ceiling tiles of approved texture in the grid, including, cutting/ making opening“for services like diffusers, grills, light fittings, fixtures, smoke detectors etc., wherever required. Main ‘T’ runners to be suspended from ceiling using G.I. slotted cleats of size 25x35x1.6 mm fixed to ceiling with 12.5 mm dia and 50 mm long dash fasteners, 4 mm G.I. adjustable rods with galvanised steel level clips of size 85 x 30 x 0.8 mm, spaced at 1200 mm centre to centre along main ‘T’, bottom exposed with 24 mm of all Tsections shall be pre-painted with polyster baked paint, for all heights, as per specifications, drawings and as directed by Engineer-in-Charge. "Note :- Only calcium silicate false							

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	ceiling area will be measured from wall to wall. No deduction shall be made for exposed frames/ opening (cut outs) having area less than 0.30 sqm.The calcium silicate ceiling tile shall have NRC value of 0.50 (Minimum), light reflection > 85%, non- combustible as per B.S. 476 part IV, 100% humidity resistance and also having thermal conductivity <0.043 w/mK."							
4	Providing and fixing of frame work for Ceiling: providing and fixing of frame work for Ceiling made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size	543.60	M2					

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	and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450 mm centre, with 25mm long dry wall screws @ 230 mm interval							
5	Providing wood work in frames : Providing wood work in frames of doors, windows, clerestory windows and other frames, wrought framed and fixed in position with hold fast lugs or with dash fasteners of required dia & length (hold fast lugs or dash fastener shall be paid for	7.5	M3					

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	separately). :- Second class teak wood							
6	Providing wood work in frames : Providing wood work in frames of false ceiling, partitions etc. sawn and fixed in position : Kiln seasoned and chemically treated hollock wood	85	M3					
7	Providing and fixing glazed shutters: Providing and fixing glazed shutters for doors, windows and clerestory windows using 4 mm thick float glass panes, including ISI marked M.S. pressed butt hinges bright finished of required size with necessary screws. : Second class teak wood - 35 mm thick shutters	416.75	M2					
8	Extra for providing heavy sheet float glass panes: Extra for providing heavy sheet float glass panes instead of ordinary float glass in glazed doors, windows and clerestory window shutters. (Area of opening for glass panes excluding portion inside rebate shall be measured):- 5.5 mm thick instead of 4 mm thick.	416.75	M2					
9	Extra for providing ISI marked	416.7	M2					

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	Stainless Steel: Extra for providing ISI marked Stainless Steel butt hinges instead of M.S. pressed butt hinges bright finished of required size with necessary screws. (Shutter area to be measured).							
10	Extra for providing lipping with 2nd class teak wood: Extra for providing lipping with 2nd class teak wood battens 25 mm minimum depth on all edges of flush door shutters (over all area of door shutter to be measured).	150	M2					
11	Extra for cutting rebate in flush door s shutters: Extra for cutting rebate in flush door shutters (Total area of the shutter to be measured).	104.19	M2					
12	Providing and fixing expandable fastener Providing and fixing expandable fasteners of specified size with necessary plastic sleeves and galvanised M.S. screws including drilling holes in masonry work /CC/ R.C.C. and making good etc. complete : 50 mm long	1411.20	EA					
13	Providing and fixing 2nd class	25	M2					

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	teak wood Providing and fixing 2nd class teak wood plain lining tongued and grooved, including wooden plugs complete with necessary screws and priming coat on unexposed surface. :- 20 mm thick							
14	Providing and fixing 2nd class teak wood : Providing and fixing 2nd class teak wood plain lining tongued and grooved, including wooden plugs complete with necessary screws and priming coat on unexposed surface. :-12 mm thick	118.88	M2					
15	Providing and fixing specified wood frame work: Providing and fixing specified wood frame work consisting of battens 50x25 mm fixed with rawl plug and drilling necessary holes for rawl plug etc. including priming coat complete. :- Kiln seasoned and chemically treated hollock wood	3	M3					
16	Providing and fixing plywood 4 mm thick, Providing and fixing plywood 4 mm thick, one side decorative veneer conforming to IS: 1328 (type-1), for	992.24	M2					

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	plain lining / cladding / ceiling with necessary screws, including priming coat on unexposed surface with : Decorative veneer facings of approved manufacture							
17	Providing and fixing 4mm thick ply board: Providing and fixing 4mm thick ply board, plain lining with necessary screws, Adhessives, etc., complete.	6878.09	M2					
18	Providing and fixing 9mm thick ply board: Providing and fixing 9mm thick ply board, plain lining with necessary screws, adhessives, etc., complete.	10215.16	M2					
19	Providing and fixing 12mm thick ply board: Providing and fixing 12mm thick ply board, plain lining with necessary screws, adhessives, etc., complete.	543.6	M2					
20	Providing and fixing 25mm thick ply board: Providing and fixing 25mm thick ply board, plain lining with necessary screws, adhessives, etc.,	67.17	M2					

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	complete.							
21	Providing & fixing 6mm thick mirror : Providing & fixing 6mm thick mirror on existing paneling / wall with the help of 20X50 metallic studs . Complete as per Drawing.	27.22	M2					
22	Providing and fixing wooden moulded beading: Providing and fixing wooden moulded beading to door and window frames with iron screws, plugs and priming coat on unexposed surface etc. complete : 2nd class teak wood - 50x12 mm	75	M					
23	<u>Providing and fixing wooden moulded beading</u> Providing and fixing wooden moulded beading to door and window frames with iron screws, plugs and priming coat on unexposed surface etc. complete : 2nd class teak wood for - 40 x 15 mm	14534.67	M					
24	<u>Providing and fixing wooden moulded beading</u> Providing and fixing wooden moulded beading to door and window frames with iron screws,	508.24	M					

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	plugs and priming coat on unexposed surface etc. complete : 2nd class teak wood 85 x 30 mm							
25	<u>Providing and fixing teak wood lipping o</u> Providing and fixing teak wood lipping of size 25x3 mm in pelmet.	150	M					
26	<u>Providing and fixing chromium plated brass:</u> Providing and fixing chromium plated brass 100 mm mortice latch and lock with 6 levers and a pair of lever handles of approved quality with necessary screws etc. complete.	176.4	EA					
27	<u>Providing and fixing 2nd class teak wood:</u> Providing and fixing 2nd class teak wood lipping/ moulded beading or taj beading of size 18X5 mm fixed with wooden adhesive of approved quality and screws/ nails on the edges of the Pre-laminated particle board as per direction of Engineer-in-charge.	250	M					
28	<u>Providing & Fixing decorative high press. Laminated sheet:</u> Providing & Fixing decorative high	6809.84	M2					

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	pressure laminated sheet of plain /wood grain in gloss / matt/ suede finish with high density protective surface layer and reverse side of adhesive bonding quality conforming to IS : 2046 Type S, including cost of adhesive of approved quality. 1.0 mm thick							
29	<u>Providing and fixing cup board shutters</u> Providing and fixing cup board shutters 25 mm thick, with Pre-laminated flat pressed three layer particle board or graded wood particle board IS: 12823 marked, exterior grade (Grade 1 Type II), having one side decorative lamination and other side balancing lamination, including IInd class teak wood lipping of 25 mm wide x12 mm thick with necessary screws and bright finished stainless steel piano hinges, complete as per direction of the Engineer-in-Charge	50	M2					
30	<u>Providing and fixing 60 mm door shutter</u> Providing and fixing 60 mm (overall) thick both side Acoustic door shutters, made out 32 mm	25	M2					

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	hard wood framing with two layers of 9 mm + 4mm thick ply fixed both sides and filling with glass wool of appropriate density. and finished with 1mm thick laminate on both sides. 12mm thick wood lipping on all edges of shutters including 4 nos. brushed steel heavy duty butt hinges 125 mm with matching screws , PVC buffers, polishing where required etc. all complete as per design and drawing. (Cost of providing door seal & Rubber gaskets to be included in the quoted rate).							
31	<u>Providing and fixing of following hardware:</u> Providing and fixing of following hardware for Acoustic Doors: Lock: Dorset doorware (Product Code ML100. Profile cylinder) including cylinder or equivalent as per approved make	5	NO.					
32	<u>Providing and fixing of following hardware</u> Providing and fixing of following hardware for Acoustic Doors: : for - Pair of door Handle: dorest doorware (Product Code SU OR SS, stainless steel finish) or equivalent	10	NO.					

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	as per approved make							
33	<u>Providing and fixing of following hardware:</u> Providing and fixing of following hardware for Acoustic Doors: : for - Door Closer: D-Line DPL (Product Code: 15.5283.AA.002 Surface Mounted Door Closer) or equivalent as per approved make	10	NO					
34	<u>Providing and fixing of following hardware:</u> Providing and fixing of following hardware for Acoustic Doors: for - Door Stopper: D-Line DPL(Product Code: 80.0118.0005 Solid SS Door Stopper Door mounted) or equivalent as per approved make	10	NO					
35	<u>Structural steel work :</u> Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	1175.49	KG					
36	<u>Steel work in built up tubular :</u>	1175.49	KG					

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	Steel work in built up tubular (round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete. : Hot finished seamless type tubes							
37	Supplying & Fixing Skin with Vinyle Black wall paper: Supplying & Fixing Skin with Vinyle Back wall paper of approved colour/shade/design over a existing Wall , Paneling / Partitions. as per the drawing. (Basic Rate of Wall Paper including fixing is Rs 150/- Per Sqft)	84.42	M2					
38	Acoustic Wall Paneling : Acoustic Wall Paneling :- Providing and fixing Slated Wooden Acoustic panel with lineal perforations to be fixed on walls.The panels shall be high density fiber board with melamine laminate finish of size 2440mm x 128mm x17mm with 4mm grooves at 28 mm pitch tounge and groove edges for	302.61	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	seamless mounting having density of 825-850 kg/m3 and system NRC of 0.83 as per IS 8225 / ISO 354 / ASTM 423C . The back of the panels are perforated with 10mm diameter circular holes with a nonwoven fabric covering of 0.2mm for providing Sound absorption via the acoustic impedance method. Panel is to be fixed on 50mm GI framework consisting of 48x36x34x0.5mm thick GI Studs wall channels & 50x35x35x0.5mm floor channels @ 600mm c/c back support with 100x12mm ply strip as recommended by the manufacturer with screw fixed horizontal / vertical to wall in tongue & groove system. The cavity of GI framework should be inserted with 50mm thick 1000GSM, thermally bonded polyester fibre for better insulation. The shade of panel will be approved by architect or engineer in charge.							
39	Finishing walls with textured exterior paint: Finishing walls with textured exterior paint of required shade : New work (Two or more coats	785.37	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	applied @ 3.28 ltr/10 sqm) over and including priming coat of exterior primer applied @ 2.20kg/10 sqm							
40	French spirit polishing : French spirit polishing : Two or more coats on new works including a coat of wood filler	3495.78	M2					
41	Providing and fixing glazing With float glass panes: Providing and fixing glazing With float glass panes of 5.50 mm thickness in wooden partitions etc. with necessary screws, nails, silicon etc. complete as per the drawings and the directions of Engineer-in-charge .	1303.23	M2					
42	Providing & Fixing of Flocked textile floor covering: "Providing & Fixing of Flocked textile floor covering of Nylon 6.6 face fiber or equivalent of approved make with 100% Nylon and completely water proof resilient backing. The flooring should be Anti static with thickness of 4.3 mm and approximate weight of 1.8 k.g./sqm of roll form. The carpet should be completely stain	117.10	M2					

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resistant and of a density approx. 80 million fibers/sq.mtr (70 million fiber/sq.yd) in the width of 2 mtr .The floor covering should have Fire Test EN-13501, Appearance Retention Hexapod ISO 140-8, Friction Slip Resistance Test EN 14041 Class DS, SANITISED anti-microbial treatment, with resilient waterproof backing, anti allergic which is certified by British allergy foundation, with ten year replacement guarantee. The carpet should have permanent static control & should be fixed with powder coated aluminum angles as per detail. Aluminum angles to be paid separately. The work should be carried out by the authorized installer of the Company in Providing & Fixing of Flocked textile floor covering of Nylon 6.6 face fiber or equivalent of approved make with 100% Nylon and completely water proof resilient backing. The flooring should be Anti static with thickness of 4.3 mm and approximate weight of 1.8 k.g./sqm of roll form. The carpet should be completely stain							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	resistant and of a density approx. 80 million fibers/sq.mtr (70 million fiber/sq.yd) in the width of 2 mtr . " The floor covering should have Fire Test EN-13501, Appearance Retention Hexapod ISO 140-8, Friction Slip Resistance Test EN 14041 Class DS, SANITISED anti-microbial treatment, with resilient waterproof backing, anti allergic which is certified by British allergy foundation, with ten year replacement guarantee. The carpet should have permanent static control & should be fixed with powder coated aluminum angles as per detail. Aluminum angles to be paid separately. The work should be carried out by the authorized installer of the Company .							
43	Providing & fixing of roll carpet : "Providing & fixing of roll carpet of "Saxony" construction, tufted, 1/10 gauge, 100% type 6 Crealon® nylon with inbuilt Scotchguard® for better stain resistance, roll type carpet, style name "Commodore-800", brand "Carus" or equivalent and manufactured in Belgium	1318.57	M2					

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Europe (no Asian manufacturing acceptable) to ensure high quality standard, which is suitable & recommended to be used in an Auditorium application. The selected carpet should have primary backing of ""Woven Polypropylene"" and secondary backing of “Weave back®” type for better performance. It should have a standard length & width of 25m and 4m respectively. The carpet should have a minimum pile height of 6mm (as per ISO 1766), with a total height of 8mm (as per ISO 1765), should also have a minimum pile weight of 800g/m² and a minimum total weight of 1945g/m² (as per ISO 8543) to ensure adequate quality for the said usage. The carpet should have minimum 185040/m² number of tufts (as per ISO 1763), to ensure good density to perform under heavy traffic usage. The carpet should also have color fastness standard of minimum 4 (as per ISO105x12 for dry & wet, as per ISO105 E01 for water and as per ISO 105 B2 for light) or more for							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	rubbing (wet or dry), water or light. It should also have thermal resistance of 0.072m²K/W (as per ISO 8302) and impact sound insulation of minimum 25dB (as per ISO 140 - 8) or more. material should be Carus carpet or its equivalent, manufactured by Beaulieu International Group in Europe and certified for all the standards as mentioned above." Design & shade to be as per architect's choice, to be installed by authorised and trained staff like of CCIL in India or equivalent, complete as per architects and EIC instructions.							
44	Providing and Fixing polyester fibre : Providing and Fixing polyester fibre of 50 mm thick having density of 1000gsm as backing material of ceiling and wall framework for better insulation.	900	M2					
45	Extra for Using Toughen Glass : Extra for Using Toughen Glass as per manufacturers specifications and instruction by Engg-In-Charge.	1719.98	M2					
46	Providing and fixing of frosted	1719.98	M2					

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	film : "Providing and fixing of frosted film of approved make on glasses as per approved pattern / design complete in all respect as per direction of Engineer in-charge and as per site conditions. The colour and design will be approved by the competent authority (total glass panel area shall be measured for billing) Make-3M or any approved equivalent make.							
47	Providing and fixing Wooden Laminate Flooring: Providing and fixing Wooden Laminate Flooring of approved shade, manufactured as per manufacturer's specifications (Ac4 base HDF, matt syrface & square edge) 8mm thick on 4mm thick high density foam base and 100 micron thick polythelene sheet, complete as per design and drawing. (Base rate Rs 245/- per sqft F.O.R. at site)	516.6	M2					

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48	Screen Roller Blinds Supply & Installation: Screen Roller Blinds :- Supply & Installation of manually operated Vista or equivalent 5% Classic Screen Series Roller Blinds with Head rail as the head rail is an aluminum extruded rail Powder Coated in white. CONTROL UNIT and Idler are mounted on the Head rail with powder Coated M.S. brackets control Unit and idler are fixed to the either ends of the tube. The Roller Tube is made of extruded aluminum with 38 mm Dia. weight 0.38 Kg/mtr fabric fitted on the tube with double side tape; tube is an anodized extruded tube of high strength; Bottom rail are aluminum extruded rail with a groove for fixing the fabric and power coated in white fixed to the bottom of the fabric and the purpose of it is, to keep the fabric in tension and straight. The Fabric is fitted to the tube using plastic insert. The end caps of the tube are ABS. CLUTCH MECHANISM: Made of High Strength reinforced plastic which is operated directionally by	1633.75	M2					

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	the use of endless beaded chain and clutch never needs adjustment. PERATING CHAIN: PLASTIC 4.5mm Plastic Beads molded on 2.2mm tick polyester chord The pitch of Beads is 6mm for smooth operation of blinds. Bottom Bar : aluminum extruded circular 21 mm OD section with powder coated white finish, having a Min. weight to be 0.28 Kg/Mtr for a perfect Fall of fabric to avoid war page / floating. Ends are covered with end caps to give a perfect Finish. Fixing brackets & clamps: These are used to fix the blind to the wall or ceiling. 'L' bracket is made of mild steel and zinc plated. The clamp is made up of spring steel of thickness 0.7mm and zinc plated. FABRIC: - 75% PVC , 25% Polyester Composition Weight 465gsm, thickness 0.65 mm, Openness factor Approx. 5%, Fire classification NFPA NO.701.BS 5867, Part-2Type A							
49	Blackout Fiber Glass Roller Blind: - Blackout Fiber Glass Roller Blind: -	408.44	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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Supply & Installation of manually operated Vista DS Opaque Fiber Glass Series Roller Blinds with Head rail as the head rail is an aluminum extruded rail Powder Coated in white. CONTROL UNIT and Idler are mounted on the Head rail with powder Coated M.S. brackets control Unit and idler are fixed to the either ends of the tube. The Roller Tube is made of extruded aluminum with 38 mm Dia. weight 0.38 Kg/mtr fabric fitted on the tube with double side tape; tube is an anodized extruded tube of high strength; Bottom rail are Aluminum extruded rail with a groove for fixing the fabric and power coated in white fixed to the bottom of the fabric and the purpose of it is, to keep the fabric in tension and straight. The Fabric is fitted to the tube using plastic insert. The end caps of the tube are ABS. CLUTCH MECHANISM: Made of High trength reinforced plastic which is operated directionally by the use of endless beaded chain and clutch never needs adjustment. OPERATING CHAIN:							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	PLASTIC 4.5mm Plastic Beads molded on 2.2mm tick polyester chord The pitch of Beads is 6mm for smooth operation of blinds. Bottom Bar : aluminum extruded circular 21 mm OD section with powder coated white finish, having a Min. weight to be 0.28 Kg/Mtr for a perfect fall of fabric to avoid war page / floating. Ends are covered with end caps to give a perfect finish. Fixing brackets & clamps: These are used to fix the blind to the wall or ceiling. 'L' bracket is made of mild steel and zinc plated. The clamp is made up of spring steel of thickness 0.7mm and zinc plated. FABRIC Composition is of 3 ply PVC + 1Ply + ply Fiberglass Blackout Roller Green Guard Fabric having 520 GSM , Thickness 0.36 mm, Openness 0% Factor Fire Resistance classification NFPA NO.701.AATCC 16-2003 4.5 Anti Fungal and Anti Bacterial Fabric							
50	Providing & Fixing Fabrick Panels : Providing & Fixing Fabrick Panels	70	M2					

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	to existing partition or Wall , Fabric panels should be of 12mm thick Soft & covered with fabric on exposed side, turned back (min. 40mm) & stapled with pins on the back side. The Fabric shall contain any of the following materials or combinations & shall be of various colours / shades as approved by the Engineer-incharges. Basic cost of fabric shall not be less than Rs. 150/- per meter.							
51	Supplying and Fixing matt finish magnetic board: Supplying and Fixing matt finish magnetic board should be of 9mm overall thickness consisting of : The surface material shall be made of 0.40mm thickness chemically treated zinc coated steel sheet with minimum zinc coating of 550 grams/sqm and shall be as per IS 1367(PtXIII) with top surface finished with stove enamel paint in matt finish of thickness not less than 45 micron. Core material shall be of 8mm thickness exterior grade MDF board confirming to IS12406 , The backing material shall be of 0.40mm thickness	70	M2					

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	chemically treated Zinc coated steel sheet. Both surface & backing material should be properly bonded with core material using Rubber based sprayable adhesive. Edges of the board should be covered and sealed with polyurethane primer. The board should pass the tests like Surface Hardness. Gloss, Scratch Resistance, Abrasion Resistance, atmospheric Corrosion Resistance, Water Resistance, Humidity Resistance, Impact Resistance, and Erasability.							
52	Providing and placing in position Storage: Providing and placing in position Storage 500 mm deep , consisting of 19mm thick waterproof board on top, bottom, sides, partition, shutter and 6mm thick water proof ply on back of cabinate and fixing 1.0mm thick approved shade & colour Laminate on shutter , exposed sides and top of cabinate and fixing of approved colour & shade 0.8mm laminate on inner faces , Providing teak wood lipping on exposed edges of shutters,	50	M2					

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	shelves inside the cabinate , melamine polishing on lippings , hinges , ball catchers , tower bolts , handles , knobs for drawers , multi purpose locks , sliding chanel, etc complete as per design and drawing.(All hard ware fitting is brushed steel finish of 304 grade).							

TOTAL (GROUP I) WITHOUT GST								
TOTAL (GROUP I) WITH GST								

GROUP-J -FURNITURE

SL. NO.	DESCRIPTION OF WORK	QTY (A)	UNIT	RATE PER UNIT (IN WORDS & FIGURES) (B)		TOTAL AMOUNT C=(AXB)	SERVICE ACCON TING CODE (SAC)	SPECIFY % OF GST ON (C)
				FIGURE S	WORDS			
1	Main Table (T-1): 2100(W) x 750(D) x 750 "MODEL: VEENER SERIES FOR CMD,PLS,ED AND DED Main Table (T-1): 2100(W) x 750(D) x 750(H) Veneer tops MDF panels total	4	NO					

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thickness: 30 mm, density 740kg/m ³ , covered in real wood veneer 0.6 mm.Beveled edge: side measures 16 mm. Standard finish: veneer Made with an engineered composite panel and 80% pre-consumer wood fiber-bonded with resin. Laminate components are 3rd party certified compliant with GREENGUARD and ANSI/BIFMA Standards for Low-Emitting Products. whose top and legs are made of 25mm. thick Particle Board (E-1 Grade), finishes with matched 2 mm PVC edge-banding.E1 grade (<or= 8mg/100 g oven dry board-perforated method) for better in-house quality. This should comply with (EN 120-1992).It has Netbox axial comfort 4 gang (UNIVERSAL Version).The Modesty is Particle board wood in 4mm Laminate E-1 (Environmental Friendly) thicness 25 mm. ,cover with Edge-Banding(PVC) 2 mm..The return desk and extension unit top is made of 25mm. thick Particle Board (E-1 Grade), 2mm PVC finishes with matched 2 mm edge-							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	banding.Also legs are made of Particle board wood Grade E-1 (Environmental Friendly) thickness 25 mm. ,cover with 2MM edge band.Table sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth"							
2	Back Storage (BST-1): 1800 (W) x 450 (D) Back Storage (BST-1): 1800 (W) x 450 (D) x 750 (H) X 2NOS	4	NO					
3	Side Storage (SST-1): 1550 (W) x 450 (D) Side Storage (SST-1): 1550 (W) x 450 (D) x 750 (H)	4	NO					
4	TABLE FOR GM AND CGM CABINS (T-2) "TABLE FOR GM AND CGM CABINS (T-2) Main Table of size 1950x750mmx750mmwhose top and legs are made of 25mm. thick Particle Board (E-1 Grade), 4mm veneer finishes with matched 2 mm PVC edge-banding.E1 grade 4mm veneer with zero urea formaldehyde emissions (<or=	49	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	8mg/100 g oven dry board-perforated method) for better in-house quality. This should comply with (EN 120-1992).It has Netbox axial comfort 4 gang (UNIVERSAL Version).The Modesty is Particle board wood in 4mm veneer Grade E-1 (Environmental Friendly) thicness 25 mm. ,cover with Melamine Edge-Banding(PVC) 2 mm..The return desk and extension unit top is made of 25mm. thick Particle Board (E-1 Grade), 4mm veneer finishes with matched 2 mm. 4mm veneer edge-banding.Also legs are made of Particle board wood Grade E-1 (Environmental Friendly) thicness 25 mm. ,cover with 4mm veneer.Table sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth"							
5	Side Storage (SST-2): 1550 (W) x 450 (D) Side Storage (SST-2): 1550 (W) x 450 (D) x 750 (H)	116	NO					
6	Back Storage (BST-2): 1500 (W) x 450 (D)	96	NO					

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	Back Storage (BST-2): 1500 (W) x 450 (D) x 750 (H)							
7	Side Storage (SST-3): 1350 (W) x 450 (D) Side Storage (SST-3): 1350 (W) x 450 (D) x 750 (H)	4	NO					
8	Side Storage (SST-4): 1110 (W) x 450 (D) Side Storage (SST-4): 1110 (W) x 450 (D) x 750 (H)	9	NO					
9	Side Storage (BST-3): 1200 (W) x 450 (D) Side Storage (BST-3): 1200 (W) x 450 (D) x 750 (H)	42	NO					
10	Main Table: 1650(W)x600(D)x750(H) "T-3 Main Table: 1650(W)x600(D)x750(H) whose top and legs are made of 25mm. thick Particle Board (E-1 Grade), Melamine finishes with matched 2 mm PVC edge-banding.E1 grade 4mm veneer with zero urea formaldehyde emissions (<or= 8mg/100 g oven dry board-perforated method) for better in-house quality. This should comply with (EN 120-	48	NO					

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	1992).It has Netbox axial comfort 4 gang (UNIVERSAL Version).The Modesty is Particle board wood in (Environmental Friendly) thicness 25 mm. ,cover with Melamine Edge-Banding(PVC) 2 mm..The return desk and extension unit top is made of 25mm. thick Particle Board (E-1 Grade), Melammine finishes with matched 2 mm. Laminate edge-banding.Also legs are made of Particle board wood Grade E-1 (Environmental Friendly) thicness 25 mm. ,cover with Melamine.Table sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth"							
11	Side Storage (SST-5): 900 (W) x 450 (D) Side Storage (SST-5): 900 (W) x 450 (D) x 750 (H)	5	NO					
12	Table of Size 1350X600X750ht "T-4 Table of Size 1350X600X750ht whose top and legs are made of 25mm. thick Particle Board (E-1 Grade), Melamine finishes with matched 2 mm PVC edge-	20	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	banding.E1 grade 4mm veneer with zero urea formaldehyde emissions (<or= 8mg/100 g oven dry board-perforated method) for better in-house quality. This should comply with (EN 120-1992).It has Netbox axial comfort 4 gang (UNIVERSAL Version).The Modesty is Particle board wood in (Environmental Friendly) thickness 25 mm. ,cover with Melamine Edge-Banding(PVC) 2 mm..The return desk and extension unit top is made of 25mm. thick Particle Board (E-1 Grade), Melammine finishes with matched 2 mm. Laminate edge-banding.Also legs are made of Particle board wood Grade E-1 (Environmental Friendly) thickness 25 mm. ,cover with Melamine.Table sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth"							
13	Linear workstation for Cubicals "Linear workstation for Cubicals MAIN TABLE (WS-2 / WS-3) :- 2000W / 1800X 600D X 750HT SIDE TABLE :-1750W X 450D X	220	NO					

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750HT MAIN TABLE AND SIDE TABLE Table Top- 25mm thick Pre Lam particle board with 2mm edge lipping on all exposed sides Support - Supported on 25mm thick Pre- Laminated Partical Board Gable ends & 18mm Thick Pre-Laminated Partical Board Modesty Panel with suitable spacers & Levellers. SIDE STORAGE AND STORAGE:- The structure is made out of 18mm Thick Pre-Laminated Particle Board. The Shelves are adjustable in height. The shutters are fitted with auto closing hinges. Recessed Aluminum handles, central locking system , levellers & other necessary hardware are priovided. MOBILE PEDESTAL:-Made of 18mm Thick Pre-Laminated Particle Board with 2 Equal Drawer + 1 filing Drawer arrangement. Castors are provided for easy mobility of the pedestal.Recessed Aluminium handles, central locking system & other necessary hardware are provided.Table sould be BIFMA certified.							

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	Approved Make:- Featherlite/Godrej/Wipro"							
14	SIDE STORAGE:- 1100W X 450D X 650HT SIDE STORAGE:- 1100W X 450D X 650HT	92	NO					
15	STORAGE:- 1000W X 450D X 1350HT STORAGE:- 1000W X 450D X 1350HT	92	NO					
16	MOBILE PEDESTAL:- 400WX450DX640HT MOBILE PEDESTAL:- 400WX450DX640HT	92	NO					
17	L-SHAPE WORKSTATION WITH PEDESTAL (NEO) "L-SHAPE WORKSTATION WITH PEDESTAL (NEO) - WS-1 PEDESTAL SIZE:- 400W X 450D X 640HT SIZE:-1900mmW/1900W X 600mm D x 750mm HT and 1200mm HT Partition Table Top - 25mm thick Pre laminate particle board with 2mm PVC edge lipping. Support - 18mm thick Pre lam gable ends. Wiremanagement -One metal	36	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	raceway tile to mount switches below table top level for power and skirting tile for data by default.Grommet hole is considered for each workstation. PARTITION:-Partition is made of 50mm thick NEO based system with fabric magnetic above and lamiante below the table top. Fabric magnetic and glass markers are provided for each table. Outside tiles would be laminate tiles. Grouting Post are provided for additional support. Approved Make:- Featherlite/Godrej/Wipro"							
18	MINI CONFERENCE ROOM TABLE/VIDEO CONFERENCE "MINI CONFERENCE ROOM TABLE/VEDIO CONFERENCING ROOM TABLE AND CONFERENCE ROOM TABLE (CON-T3) Main Table – 7900mmX 1800X 750HT with worktop to be 25mm thick prelaminated particle board with the edge banding of 1.5mm thickness Metal Understructure A trough runs between the two Y legs in the base of the tables for lay in cable management. This trough	2	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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has grommet , approx 21/2"" in diameter, in one side of the trough to allow acess to an outside power source . Wires can be routed Vertically Using the leg. Knee Clearenceunder trough is 251/2""(650mm).imagine legs should made of 2.5 mm thick sheet metal, cut and folded into the form.Cable Tray should made of 1.2mm SPCC sheet metal.Beam connector should made of glass fibre filled polyamide 66. It is specified with beams to be used with 600mm deep.ase made of plastic injection with Nylon, 30% fiber glass, and in middle of base applies with M8 metal inserter. Glide made of plastic injection with Nylon 30% fiber glass. Accent plate made of 1.6mm SPCC steel with epoxy finished. End bracket made of 5mm SPCC steel with epoxy finished. Base, glide, accent plate and end bracket deliver together with Steel A-leg.Table sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman							

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Miller/Steelcase/Haworth"							
19	CONFERENCE ROOM TABLE (CON-T2) " CONFERENCE ROOM TABLE (CON-T2) Main Table – 5200mmX 3500X 750HT with worktop to be 25mm thick prelaminated particle board with the edge banding of 1.5mm thickness Metal Understructure A trough runs between the two Y legs in the base of the tables for lay in cable management. This trough has grommet , approx 21/2" in diameter, in one side of the trough to allow access to an outside power source . Wires can be routed Vertically Using the leg. Knee Clearanceunder trough is 251/2" (650mm).imagine legs should made of 2.5 mm thick sheet metal, cut and folded into the form.Cable Tray should made of 1.2mm SPCC sheet metal.Beam connector should made of glass fibre filled polyamide 66. It is specified with beams to be used with 600mm deep.ase made of plastic injection with Nylon, 30%	1	NO					

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	fiber glass, and in middle of base applies with M8 metal inserter. Glide made of plastic injection with Nylon 30% fiber glass. Accent plate made of 1.6mm SPCC steel with epoxy finished. End bracket made of 5mm SPCC steel with epoxy finished. Base, glide, accent plate and end bracket deliver together with Steel A-leg.Table sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth							
20	CONFERENCE ROOM TABLE (CON-T5) "CONFERENCE ROOM TABLE (CON-T5) Main Table – 9200mmX 2500X 750HT with worktop to be 25mm thick prelaminated particle board with the edge banding of 1.5mm thickness Metal Understructure A trough runs between the two Y legs in the base of the tables for lay in cable management. This trough has grommet , approx 21/2"" in diameter, in one side of the trough to allow acess to an outside power source . Wires	1	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	can be routed Vertically Using the leg. Knee Clearanceunder trough is 251/2""(650mm).imagine legs should made of 2.5 mm thick sheet metal, cut and folded into the form.Cable Tray should made of 1.2mm SPCC sheet metal.Beam connector should made of glass fibre filled polyamide 66. It is specified with beams to be used with 600mm deep.ase made of plastic injection with Nylon, 30% fiber glass, and in middle of base applies with M8 metal inserter. Glide made of plastic injection with Nylon 30% fiber glass. Accent plate made of 1.6mm SPCC steel with epoxy finished. End bracket made of 5mm SPCC steel with epoxy finished. Base, glide, accent plate and end bracket deliver together with Steel A-leg.Table sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth"							
21	TABLE FOR TENDER ROOM (CON-1)	1	NO					

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	"TABLE FOR TENDER ROOM (CON-1) SIZE:-7500WX1800DX750HT Table Top - 25mm Thick Pre-Laminated Particle Board finished with 2mm PVC Edge Banding. Supports - Supported on 25 mm thick Gable Ends. Modesty Panel : 18 mm thick PLT Modesty Panel of 450 mm ht is considered. Wire Management - 450mm Flip up with provision to mount switches and sockets is considered along with cable tray is provided below work surface. Wire Entry through intermediate leg. Approved Make:- Featherlite/Godrej/Wipro"							
22	TABLE FOR LUNCH ROOM & LIBRARY (CON-6) "TABLE FOR LUNCH ROOM & LIBRARY (CON-6) SIZE:-4000WX1500DX750HT Table Top - 25mm Thick Pre-Laminated Particle Board finished with 2mm PVC Edge Banding. Supports - Supported on 25 mm thick Gable Ends. Modesty Panel : 18 mm thick PLT	3	NO					

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	Modesty Panel of 450 mm ht is considered. Wire Management - 450mm Flip up with provision to mount switches and sockets is considered along with cable tray is provided below work surface. Wire Entry through intermediate leg. Approved Make:- Featherlite/Godrej/Wipro"							
23	<u>TABLE FOR MEETING ROOM (CON-T1A)</u> "TABLE FOR MEETING ROOM (CON-T1A) SIZE:-6000WX1500DX750HT Table Top - 25mm Thick Pre-Laminated Particle Board finished with 2mm PVC Edge Banding. Supports - Supported on 25 mm thick Gable Ends. Modesty Panel : 18 mm thick PLT Modesty Panel of 450 mm ht is considered. Wire Management - 450mm Flip up with provision to mount switches and sockets is considered along with cable tray is provided below work surface. Wire Entry through intermediate leg. Approved Make:-	1	NO					

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	Featherlite/Godrej/Wipro"							
24	MEETING TABLE (CONT-4) "MEETING TABLE (CONT-4) FOR CONFERENCE ROOM 2250 DIA The worktop to be 25mm thick prelaminated particle board with the ABS edge banding of 1.5mm thickness Metal Understructure Understructure - Steel leg with leveling composes of leg, base, glide, accent plate and end bracket. Steel leg with leveling applies epoxy finished. Leg composes of vertical tubes and cross tube beam. Vertical tube made of roll forming with average thickness 2mm, and cross beam made of steel tube with thickness 3mm. Base made of plastic injection with Nylon, 30% fiber glass, and in middle of base applies with M8 metal inserter. Glide made of plastic injection with Nylon 30% fiber glass. Accent plate made of 1.6mm SPCC steel with epoxy finished. End bracket made of 5mm SPCC steel with epoxy finished. Base, glide, accent plate	1	NO					

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	and end bracket deliver together with Steel A-leg.Table sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth"							
25	MEETING TABLE (CAT-1) "MEETING TABLE (CAT-1) FOR CMD,PLS,ED AND DED CABIN 1200 DIA The worktop to be 25mm thick prelaminated particle board with the ABS edge banding of 1.5mm thickness Metal Understructure Understructure - Steel leg with leveling composes of leg, base, glide, accent plate and end bracket. Steel leg with leveling applies epoxy finished. Leg composes of vertical tubes and cross tube beam. Vertical tube made of roll forming with average thickness 2mm, and cross beam made of steel tube with thickness 3mm. Base made of plastic injection with Nylon, 30% fiber glass, and in middle of base applies with M8 metal inserter. Glide made	4	NO					

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	of plastic injection with Nylon 30% fiber glass. Accent plate made of 1.6mm SPCC steel with epoxy finished. End bracket made of 5mm SPCC steel with epoxy finished. Base, glide, accent plate and end bracket deliver together with Steel A-leg.Table sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth"							
26	MODEL:- CX LEATHER HIGH BACK-CX1ENCLP1L1 "MODEL:- CX LEATHER HIGH BACK-CX1ENCLP1L1C5YFULBE FOR CMD,PLS,ED AND DED (CH-5) Medium back with headrest.Base should be 5 dtar base diacast with nylon castor and stem range should be upto 100mm.Exposed metal surfaced are painted for seat mechanism.Frame would be PP for back incase of flex fabric backs with Steel syncro tilt having PU density of 40kg/m3.Plastic/ nylon component composition non-toxic (no Phthalates or Halogenatic substances).Plastic/ nylon	4	NO					

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	component composition non-toxic (no Phthalates or Halogenatic substances).The upholstered contoured seat shall be molded polypropylene insert with molded polyurethane foam. The foam shall have a nominal 50mm thickness and have waterfall edges. Leather is applied non-bonded. When chairs are refurbished, the complete seat assembly can be replaced. The foam firmness is 55+/-5 degree (LX-F sclerometer), and its density is 55-60kg/m3.The Chair should be Green Guard and BIFMA Certified. Approved Make:- Herman Miller/Steelcase/Haworth"							
27	MODEL:- CX LEATHER MID BACK-CX1MNCLP1L1C "MODEL:- CX LEATHER MID BACK-CX1MNCLP1L1C5YFULBK (CH-6) FOR CMD,PLS,ED AND DED Base should be 5 dtar base diacast with nylon castor and stem range should be upto 100mm.Exposed metal surfaced are painted for seat mechanism.Frame would be PP for back incase of flex fabric backs	24	NO					

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	with Steel syncro tilt having PU density of 40kg/m3.Plastic/ nylon component composition non-toxic (no Phthalates or Halogenatic substances).Plastic/ nylon component composition non-toxic (no Phthalates or Halogenatic substances).The upholstered contoured seat shall be molded polypropylene insert with molded polyurethane foam. The foam shall have a nominal 50mm thickness and have waterfall edges. Leather is applied non-bonded. When chairs are refurbished, the complete seat assembly can be replaced. The foam firmness is 55+/-5 degree (LX-F sclerometer), and its density is 55-60kg/m3.The Chair should be Green Guard and BIFMA Certified. Approved Make:- Herman Miller/Steelcase/Haworth"							
28	MODEL:- 6040HB (CH-4) "MODEL:- 6040HB (CH-4) High back chair with cushioned and padded Leatherette upholsted back with metal structure base,aluminum buffed metal fixed	218	NO					

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	armrest,multilock synchro tilt mechanism with metal base and castors.The knee-tilt multilock mechanism makes you feel like you are sitting on a cushion of air as it creates a smooth and balanced feel as you move from one position to the next Push the left-side lever up/down to unlock/lock reclining at multiple positions.The Chair should be BIFMA Certified. Approved Make:- Featherlite/Godrej/Wipro"							
29	<u>MODEL:- 6040MB (CH-7)</u> "MODEL:- 6040MB (CH-7) High back chair with cushioned and padded Leatherette upholsted back with metal structure base,aluminum buffed metal fixed armrest,multilock synchro tilt mechanism with metal base and castors.The knee-tilt multilock mechanism makes you feel like you are sitting on a cushion of air as it creates a smooth and balanced feel as you move from one position to the next Push the left-side lever up/down to unlock/lock reclining at multiple positions.The Chair	130	NO					

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	should be BIFMA Certified. Approved Make:- Featherlite/Godrej/Wipro"							
30	MODEL:-ICON (CH-8) "MODEL:-ICON (CH-8) Mid back chair with CUSHION back fabric upholsted cushioned seat and adjustable lumbar support. The 640mm dia (26 inches) five pronged base is made out of GF nylon – Reinforced with bottom ribbing for additional buttress and strength. Tested prudently and rigorously as per ANSI/BIFMA X5.1-2011 General Purpose Office Chair Standards. Upholstery: Seat Cushion with pre moulded foam of 50 - 60 density Density -- 52 kg/m3,Hardness -- 12.6kgf at 25%.The Chair should be BIFMA Certified. Approved Make:- Featherlite/Godrej/Wipro"	557	NO					
31	MODEL:- EXPRESS MB (CH-3) "MODEL:- EXPRESS MB (CH-3) FOR MEETING AND CONFERENCE ROOM BIFMA X5.1-2017 American National Standards Institute/Business and	104	NO					

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Institutional Furniture Manufacturer's Association (ANSI/BIFMA) Office chair QB/T 2280-2016 The light industry standard of PRC.The upholstered contoured seat shall be molded polypropylene insert with molded polyurethane foam. The foam shall have a nominal 50mm thickness and have waterfall edges. Fabric is applied non-bonded. When chairs are refurbished, the complete seat assembly can be replaced. The foam firmness is 45+/-5 degree (LX-F sclerometer), and its density is 55-60kg/m3.The back sub- assembly shall consist two layers: backframe, mesh(or upholstery). The backframe shall be polyamide 6 + 30% glass fiber. Glass- reinforced nylon results in materials possessing better tensile and flexural strengths than the base resin. It was regarded to be almost a replacement for some die casting alloys.The Express 2.0™ Chairs shall be available with no arms or adjustable arms. The adjustable arms can be adjusted in width and in height. The inside							

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	width is adjusted through the quick release button on the horizontal lever. The arm pad can be rotated by 30 degree. The arms shall have an arm support stem of glass-filled polyamide 6 with over moulded polyurethane arm pads. Approved Make:- Herman Miller/Steelcase/Haworth"							
32	AUDITORIUM CHAIR (CH-1) "AUDITORIUM CHAIR (CH-1) MODEL:-VENUS Made up of Moulded PU foam, with density 45 + / - 5 density. Tubular steel structure for Stand 80 x 40 x 1.6 mm. Metal frame for back frame (25 x 3 mm m.s. flat) Metal frame for back frame (20 x 3 mm m.s. flat)PPCP plastic tray for seat & back cover.Wooden polish arm rest without cup holder.PPCP plastic side panel with upholstered fabric Laminated fabric.Foldable metal mechanism.Available in fix type only and auto tip.Available size is 23 inch C/C.Fitting with expandable anchor fasteners of size M 8 x 75 mm.Central pedestal is moulded aluminium epoxy	262	NO					

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	finish. Fixed to floor with a steel plate. Seats could be numbered with writting desk (optional).The Chair should be BIFMA Certified. Approved Make:- Featherlite/Godrej/Wipro"							
33	CHAIR FOR HALL (CH-2) "CHAIR FOR HALL (CH-2) MOVE CHAIR WITHOUT ARMREST Mid Back Chair with mesh back and fabric upholsted cushioned seat,steel moulded backrest and chrome plated 4 metal legs.The Chair should be BIFMA Certified. Approved Make:- Featherlite/Godrej/Wipro"	128	NO					
34	MODEL:- GOEZTE SOFA 2 SEATER (SF-1a) "MODEL:- GOEZTE SOFA 2 SEATER (SF-1a) FOR CMD,PLS,ED AND DED SIZE:- 1450W X 750D X 820HT The sofa offers a wide array of options for combining veneers, upholstery, and accent materials to allow the versatile design to precisely fit a range of environmentsTo achieve the right look for the wood veneer shell, an intricate miter is incorporated at	4	NO					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	every corner, allowing the molded veneer to wrap completely around the sides and back. There is only one seam on the entire shell.The Seat is made of PU Foam with Density 32+/- 2 kg/cu .mtr having an additional top layer of PU Foam with Density 28+/- 2 kg/cu.mtr, Seat is upholstered wuth Leather.Back Foam: The Back is made of PU Foam with Density 28 +/- 2 kg/cu .mtr having an additional top layer of PU Foam with Density 23+/- 2 kg/cu.mtr, Backis upholstered with Leather. understructure: understructure is made up of 1.2+/- 0.1cm thick hote pressed plywood , 4mm Dia zigzag Spring is mounted in the understructure for support and additional cushioning purpose. Leg Assembly: is welded assembly made in SS 202 Grade tube and plate.Sofa sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth"							
35	<u>MODEL:- GOEZTE SOFA 1 SEATER (SF-1)</u> "MODEL:- GOEZTE SOFA 1	4	NO					

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SEATER (SF-1) FOR CMD,PLS,ED AND DED SIZE:- 820W X 750D X 820HT The sofa offers a wide array of options for combining veneers, upholstery, and accent materials to allow the versatile design to precisely fit a range of environmentsTo achieve the right look for the wood veneer shell, an intricate miter is incorporated at every corner, allowing the molded veneer to wrap completely around the sides and back. There is only one seam on the entire shell.The Seat is made of PU Foam with Density 32+/- 2 kg/cu .mtr having an additional top layer of PU Foam with Density 28+/- 2 kg/cu.mtr, Seat is upholstered wuth Leather.Back Foam: The Back is made of PU Foam with Density 28 +/- 2 kg/cu .mtr having an additional top layer of PU Foam with Density 23+/- 2 kg/cu.mtr, Backis upholstered with Leather. understructure: unterstructure is made up of 1.2+/- 0.1cm thick hote pressed plywood , 4mm Dia zigzag Spring is mounted in the							

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	understructure for support and additional cushioning purpose. Leg Assembly: is welded assembly made in SS 202 Grade tube and plate.Sofa sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth"							
36	FOR CMD,PLS,ED AND DED (CT) "FOR CMD,PLS,ED AND DED (CT) MODEL:-AMBASSADOR Center Table of size 400 (H) X 1002 (W) X 501 (D) with wooden structure and base having glass top and melamine polished finish.Table should be BIFMA certified. Approved Make:- Featherlite/Godrej/Wipro"	13	NO					
37	SIDE TABLE FOR FOR CMD AND PLS (SDT) "SIDE TABLE FOR FOR CMD AND PLS (SDT) MODEL:-AMBASSADOR Center Table of size 400 (H) X 1002 (W) X 501 (D) with wooden structure and base having glass top and melamine polished finish.Table should be BIFMA certified.	9	NO					

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	Approved Make:- Featherlite/Godrej/Wipro"							
38	SOFA FOR CABINS (SF-2a) "SOFA FOR CABINS (SF-2a) MODEL:-FLORANCE FOR CGM CABINS,VIGILANCE AND CABINS 2 seater Sofa - The seat is made up of PU foam in density 28+/- 2KG/cu meter with an additional top layer of super soft PU foam of density 32+/-2 kg/cu meter, upholstered with leaterette. The back is made up of PU foam in density 28+/-2KG/cu meter with two additional top layer of super soft PU foam of density 32+/-2 kg/cu meter, upholstered leatherette. Understructure is made up of 1.2+/-cm thick hot presses plywood moisture resistant and termite proof as per IS:303 and pinewood of cross sections devoid of major knots and surfacte defects. 6Nos per seat and 3.8mm dia zig zag spring assembly is mounted over understructure for cushioning purpose. Leg assembly is a welded assembly made is stainless steel grade SS302 tube	11	NO					

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	and plate with plastic end cap. Size :- 1420mmW X780mmDX725mm HT.Sofa sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth"							
39	FOR CGM CABINS,VIGILANCE AND CABINS (SF-2) "FOR CGM CABINS,VIGILANCE AND CABINS (SF-2) MODEL:-FLORANCE 1 seater Sofa - The seat is made up of PU foam in density 28+/- 2KG/cu meter with an additional top layer of super soft PU foam of density 32+/-2 kg/cu meter, upholstered with Leaterette. The back is made up of PU foam in density 28+/-2KG/cu meter with two additional top layer of super soft PU foam of density 32+/-2 kg/cu meter, upholstered leatherette. Understructure is made up of 1.2+/-cm thick hot presses plywood moisture resistant and termite proof as per IS:303 and pinewood of cross sections devoid of major knots and surfacte defects. 6Nos per seat and 3.8mm dia zig zag spring assembly is	11	NO					

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	mounted over understructure for cushioning purpose. Leg assembly is a welded assembly made is stainless steel grade SS302 tube and plate with plastic end cap. Size :- 820mmW X780mmDX725mm.Sofa sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth "							
40	INDULGE 2 SEATER (SF-3a): "INDULGE 2 SEATER (SF-3a) sofa-Width: 1445 mm Depth:800 mm Height: 735mm cm Seat Foam: The Seat is made of PU Foam with Density 32+/- 2 kg/cu .mtr having an additional top layer of PU Foam with Density 28+/- 2 kg/cu.mtr, Seat is upholstered wuth Leatherite.Back Foam: The Back is made of PU Foam with Density 28 +/- 2 kg/cu .mtr having an additional top layer of PU Foam with Density 23+/- 2 kg/cu.mtr, Backis upholstered with Leatherite. understructure: unterstructure is made up of 1.2+/- 0.1cm thick hote pressed plywood , 4mm Dia	56	NO					

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	zigzag Spring is mounted in the understructure for support and additional cushioning purpose. Leg Assembly: is welded assembly made in SS 202 Grade tube and plate. Approved Make:- Featherlite/Godrej/Wipro "							
41	INDULGE 1 SEATER (SF-3) "INDULGE 1 SEATER (SF-3) sofa-Width: 910 mm Depth:800 mm Height: 735mm cm Seat Foam: The Seat is made of PU Foam with Density 32+/- 2 kg/cu .mtr having an additional top layer of PU Foam with Density 28+/- 2 kg/cu.mtr, Seat is upholstered with Leatherite.Back Foam: The Back is made of PU Foam with Density 28 +/- 2 kg/cu .mtr having an additional top layer of PU Foam with Density 23+/- 2 kg/cu.mtr, Backis upholstered wuth Fabric or Leatherite. understructure: unterstructure is made up of 1.2+/- 0.1cm thick hote pressed plywood , 4mm Dia zigzag Spring is mounted in the understructure for	15	NO					

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	support and additional cushioning purpose. Leg Assembly: is welded assembly made in SS 202 Grade tube and plate. Approved Make:- Featherlite/Godrej/Wipro"							
42	CENTER TABLE (CT-1) "CENTER TABLE (CT-1) MODEL: CRYSTAL VERVE CENTER TABLE Size: 1200(W) x 600(D) x 425(H) Center Table made with 22mm steel frame duly chromeplated with 8 mm glass top.Table should be BIFMA certified. Approved Make:- Featherlite/Godrej/Wipro"	26	NO					
43	CENTER TABLE (SDT-1) "CENTER TABLE (SDT-1) MODEL: SL8 FOR RECEPTION AND WAITING Size: 600(W) x 600(D) x 505(H) Corner Table made with 22mm steel frame duly chromeplated with 8 mm glass top.Table should be BIFMA certified. Approved Make:- Featherlite/Godrej/Wipro"	30	NO					

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44	TABLE FOR DINING AREA (CAT-5) "TABLE FOR DINING AREA (CAT-5 1800W X 750D X 750HT Table for whose top is made of Particle board wood Grade E-1(Environmental Friendly), thickness 25mm cover with Melamine, Edge banding (PVC) 2mm.E1 grade 1mm laminate (<or= 8mg/100 g oven dry board-perforated method) for better in-house quality. This should comply with (EN 120-1992).The understructure is made of Steel round pipes. Thickness 2.5mm. Epoxy powder coated spray paint, baked at temperature 200 C° coated of 70-80 micron thickness. Approved Make:- Featherlite/Godrej/Wipro"	9	NO					
45	TABLE FOR CAFETERIA (CAT-3) "TABLE FOR CAFETERIA (CAT-3) 900 DIA Table for whose top is made of Particle board wood Grade E-1(Environmental Friendly), thickness 25mm cover with Melamine, Edge banding (PVC) 2mm.E1 grade 1mm laminate with	9	NO					

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	zero urea formaldehyde emissions (<or= 8mg/100 g oven dry board-perforated method) for better in-house quality. This should comply with (EN 120-1992).The understructure is made of Steel square pipe dimension 38 X 38mm. Thickness 2.5mm. Epoxy powder coated spray paint, baked at temperature 200 C° coated of 70-80 micron thickness.Table sould have Green Guard certificate and BIFMA certified. Approved Make:- Featherlite/Godrej/Wipro"							
46	TABLE FOR CAFETERIA (CAT-2) "TABLE FOR CAFETERIA (CAT-2) 1200 DIA Table for whose top is made of Particle board wood Grade E-1(Environmental Friendly), thickness 25mm cover with Melamine, Edge banding (PVC) 2mm.E1 grade 1mm laminate with zero urea formaldehyde emissions (<or= 8mg/100 g oven dry board-perforated method) for better in-house quality. This should comply with (EN 120-1992).The understructure is made of Steel	6	NO					

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	square pipe dimension 38 X 38mm. Thickness 2.5mm. Epoxy powder coated spray paint, baked at temperature 200 C° coated of 70-80 micron thickness.Table sould have Green Guard certificate and BIFMA certified. Approved Make:- Featherlite/Godrej/Wipro"							
47	CAFE CHAIR (CH-9) "CAFE CHAIR (CH-9) MODEL:- FRESSCO Stackable chair without arms made up of Pre colored PP+GF20% (20% short glass fibre reinforced polypropylene) using injection moldeing with metal base structure and chrome plated metal four legs.Chair sould have BIFMA certificate. Approved Make:- Featherlite/Godrej/Wipro"	70	NO					
48	SEATING FOR WATING(GYM) steel chair 3 seater: "SEATING FOR WATING(GYM) steel chair 3 seater made up of MS poder coated rectangular M.S.ERW tube having 8=0.03cm X 4=0.03cm x 0.2+0.016cm size. Kegs & armrest-it is chrome plate made of	2	NO					

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	cold steelwith 0.12+0.013cm thickness saet back shell it is 1.6mm thk powder coated perforated shell made from cold rolled S.S. sheet 0.16+0.013cm thickness. the side bar is made of chrome plated solid steel 3+0.03cm X 1.2+0.3cm(DIN174) with fluting and plastic inserts. the shell is asembled on the cross beam with help of MB bolts per seat- 8nos. seat to bracket. Chair should have BIFMA certificate. Approved Make:- Featherlite/Godrej/Wipro"							
49	METAL LOCKER FOR GYM: "METAL LOCKER FOR GYM SIZE:-Height (MM): 1830 Widht (MM): 1140 Depth (MM): 457 Number of Shelves: 12 Standard Features: Cam lock with keys Concealed Hinges without brackets Approved Make:- Featherlite/Godrej/Wipro"	2	NO					
50	STORAGE MID HEIGHT (ST-1): "STORAGE MID HEIGHT (ST-1) SIZE:- 900W X 450D X 1350HT	32	NO					

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Supply and postioning of 3 - High Swing door cabinet(1200mmH x450mmD x900mmW) with Case and top constructed out of SPCC 0.8mm with a one-piece inner top and a patented side and top insert stiffener for upper support and reduced case racking.Lock housings to have a core removable lock which allows key numbers to be easily changed in the field.Height adjustable shelves at every 6"" increment.Leveling glides provide for 1” height adjustment.Die cast zinc alloy pulls storage sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth "							

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51	STORAGE MID HEIGHT (ST-1a): "STORAGE MID HEIGHT (ST-1a) SIZE:- 900W X 450D X 750HT Supply and postioning of 3 - High Swing door cabinet(1200mmH x450mmD x900mmW) with Case and top constructed out of SPCC 0.8mm with a one-piece inner top and a patented side and top insert stiffener for upper support and reduced case racking.Lock housings to have a core removable lock which allows key numbers to be easily changed in the field.Height adjustable shelves at every 6"" increment.Leveling glides provide for 1” height adjustment.Die cast zinc alloy pulls storage sould have Green Guard certificate and BIFMA certified. Approved Make:- Herman Miller/Steelcase/Haworth"	32	NO					

TOTAL (GROUP J) WITHOUT GST								

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TOTAL (GROUP J) WITH GST	

GROUP-K (A V SYSTEM)-SEC-A								
SL. NO.	DESCRIPTION OF WORK	QTY (A)	UNIT	RATE PER UNIT (IN WORDS & FIGURES) (B)		TOTAL AMOUNT C=(AXB)	SERVICE ACCOUNTING CODE (SAC)	SPECIFY % OF GST ON (C)
				FIGURES	WORDS			
1	8000 Lumens, WUXGA, 4 K LAZER LIGHT "8000 Lumens, WUXGA, 4 K Enhancement, Lazer light Source HD-BaseT, 360 Degree installation-Optional Lens RGB liquid crystal shutter projection system (3LCD)DVI-D; 1 BNC (SDI); 1 HDMI; 1 (with HDCP 2.2) HDBaseT (RX); RJ45 x 1 (with HDCP2.2 and Art-Net Support Contrast Ratio: 2,500,000:1 Fan Noise (Normal / Eco): 35dB/29dB White and Colour Brightness at 8,000lm WUXGA (1920 x 1200) Edge-blending to create large	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	panoramic images Curve and corner wall projection HDBaseT"							
2	250" aspect ratio 16:10 Motorized Screen 250" aspect ratio 16:10 Motorized Screen REMOTE, low voltage control, and the material is high gained MATTE WHITE	1	EA					
3	Executive Motorized Projector Executive Motorized Projector Mount 150 Cms Ceiling Depth 510mm, Max Load 40 Kg, Tubular Motor, Folding one-armed, Overall dimension 528x453x281mm, Traveling distance 500x500m/550x550mm, Distance from ceiling to false ceiling 510-1480mm, Traveling distance 281-1478mm, RF/RS232/485	1	EA					
4	High Power Full Range Passive/Bi-amp 15" LOUD SPEAKER High Power Full Range Passive/Bi-amp 15" Dual Concentric loudspeaker with RMS output Passive/LF - 400 W , HF -80 W @ 8 Ohms,IP55 rated, Frequency Response (-3 dB) 70 Hz - 25	2	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	kHz,Frequency Range (-10 dB) 58 Hz - 30 kHz,75 degrees conical dispersion, System Sensitivity: Passive-99 dB,LF-100 dB,HF- 106 dB,126 dB Maximum Average SPL.Standard Colour Black or White.							
5	MS Brackets for above speaker MS Brackets for above speaker	2	EA					
6	High Output Low Profile 2 x 12" Bandpass High Output Low Profile 2 x 12" Bandpass Subwoofer delivering 800 W rms @ 4 ohms,Frequency Response (-3 dB) 40 Hz - 160 Hz,Frequency Range (-10 dB) 35 Hz - 200 Hz,System Sensitivity 100 dB,Maximum SPL Average 129 dB;Peak 135 dB.Standard Colour Black or White.	2	EA					
7	2-Channel 2400 W power amplifier 2-Channel 2400 W power amplifier with Integrated DSP delivering 800 W @ 2 Ohms,1200 W @ 4 Ohms,600 W @ 8 Ohms,THD + N 20 Hz- 20 kHz for 1 W <0.01%,Signal-to-Noise ratio >102 dBA,Channel separation at 1 kHz	2	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	>80 dB,Frequency Response 2 Hz-42 kHz,Common Mode Rejection 50 dB,Networked control via IntelliDrive Controller™ touch-based GUI							
8	Compact 40-Input, 25-Bus Digital Mixing Compact 40-Input, 25-Bus Digital Mixing Console with 16 Programmable MIDAS Preamps, 17 Motorized Faders, Channel LCD's, FireWire/USB Audio Interface and iPad/iPhone* Remote Control	1	EA					
9	I/O Box with 16 Remote-Controllable MIDAS I/O Box with 16 Remote-Controllable MIDAS Preamps, 8 Outputs and AES50 Networking featuring KLARK TEKNIK SuperMac Technology	1	EA					
10	Compact 6" Coaxial Surface Mount Loudspeaker Compact 6" Coaxial Surface Mount Loudspeaker with RMS power handling capacity of 60 W @ 6 Ohms,90 degree controlled conical dispersion,Frequency Response (-3 dB) 80 Hz - 20 kHz,65 Hz - 30 kHz	4	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Frequency Range (-10 dB),Sensitivity 88 dB,Maximum SPL 105 dB Average; 111 dB Peak,4.3 kHz - 2nd order LF, 2nd order HF Crossover.Can be mounted vertically or horizontally.Supplied with Yoke bracket .Standard colour options Black or white							
11	2-Channel Class D Power Amplifier 2-Channel Class D Power Amplifier delivering 120W output power into 8,4,2 Ohms,60W into 16 Ohms,2 x 2 mix matrix,Signal-to-Noise Ratio >101 dBA,Frequency Respose 5Hz - 22 kHz,Input impedance 10 kOhm,CMR 40 dB.	1	EA					
12	4 inch active monitor speaker 4 inch active monitor speaker for control room	1	EA					
13	Wireless Handheld Microphone System "Wireless Handheld Microphone System SKM 100 G4 with e835 Capsule EM 100 G4 Rackmount Receiver 1680 Tunable Frequencies Across 42 MHz	2	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Auto Frequency Scan Finds Open Bands - 470 to 516 MHz)- Maximum 1680 receiving frequencies, adjustable in 25 kHz steps 20 frequency banks, each with up to 12 factory-preset channels, no intermodulation 1 frequency bank with up to 12 programmable channels- Up to 42 MHz- ±24 kHz / ±48 kHz- < 2.5 µV for 52 dBA (with HDX, peak deviation- Low: 5 dB µV Middle: 15 dB µV High: 25 dB µV- SKM 100 G4-S Handheld Transmitter with Mute Switch, No Capsule A1: (470 to 516 MHz) ≤ ±15 ppm- Maximum 30 mW at 50 Ohms- Total Harmonic Distortion (THD) ≤ 0.9%- Input Impedance 40 kOhms- Input Capacitance Switchable Input Sensitivity Range 48 dB, adjustable in 6 dB steps "							
14	Wireless Headworn Microphone System "Wireless Headworn Microphone System Signal-to-noise ratio ≥ 110 dBA	2	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Switching bandwidth up to 42 MHz Peak deviation ±48 kHz Nominal deviation ±24 kHz Modulation Wideband FM Power supply 12 V DC Antenna connector 2 BNC sockets Current consumption 300 mA Adjacent channel rejection Typically ≥ 65 dB Intermodulation attenuation Typically ≥ 65 dB Receiving frequency "							
15	Gooseneck Microphone with cardioid Capsule Gooseneck Microphone with cardioid Capsule MZH 3062 is a metal gooseneck with two flexible sections for use with the ME 34, ME 35 and ME 36 microphone heads. The rugged gooseneck is fitted with a balanced, floating XLR-3 output, enabling the	2	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	microphone to be powered from 12 - 48 V phantom power and has a length of 600 mm.							
16	Base for gooseneck with mute button Base for gooseneck with mute button	2	EA					
17	Equipment Rack	1	EA					
18	4sqmm speaker cable 4sqmm speaker cable	1	JOB					
19	2.5sqmm speaker cable 2.5sqmm speaker cable	1	JOB					
20	20/22AWG microphone cable 20/22AWG microphone cable	1	JOB					
21	Twisted cat 6 signal cable Twisted cat 6 signal cable	1	JOB					
22	Cables / Connectors and accessory : Cables / Connectors and accessory for complete audio system	1	JOB					
23	<u>Installation, Testing, Commissioning & Program:</u> Installation, Testing, Commissioning & Programming	1	JOB					
24	6000 lumens WUXGA, : 6000 lumens WUXGA, Manual Lens Shift, Laser Light Source, Miracast-Laser Light Source – Experience astonishing quality and	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	reliability, Up to 3x Brighter Colours, and reliable performance* – 3LCD, 3-chip technology, up to 2,500,000:1 dynamic contrast ratio, Transmit Full HD video and audio, Ethernet and Serial communication through a single CAT 5/6 cable that can be extended up to 100m, Up to ±50 percent vertical and ±20 percent horizontal manual lens shift.							
25	<u>Ceiling Mounting Kit for above Projector</u> Ceiling Mounting Kit for above Projector- Height Adjustment upto 3+3 = 6 feet	1	EA					
26	180" Motorized Screen : 180" Motorized Screen in 16:10 aspect ration, 16:10 Motorized Screen REMOTE, low voltage control, and the material is high gained MATTE WHITE	1	EA					
27	1 VGA with Audio, 1 HDMI, 2 Power cable: 1 VGA with Audio, 1 HDMI, 2 Power cable Management System	1	EA					
28	<u>Microphone Array</u> Microphone Array	10	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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29	<u>Ceiling Speakers</u> Ceiling Speakers	6	EA					
30	<u>FOH Speakers</u> FOH Speakers	2	EA					
31	<u>Dual Channel Amplifier</u> Dual Channel Amplifier	1	EA					
32	<u>Audio DSP with telephone line input :</u> Audio DSP with telephone line input for audio and video conferencing	1	EA					
33	<u>Dialer for DSP</u> Dialer for DSP	1	EA					
34	PoE injector for Dialer PoE injector for Dialer	1	EA					
35	<u>Control System</u> Control System	1	EA					
36	<u>Relay Controller</u> Relay Controller	2	EA					
37	<u>Button Processor</u> Button Processor	1	EA					
38	<u>Show My PC/LAM Button for Presenation</u> Show My PC/LAM Button for Presenation	12	EA					
39	<u>Ipad 16GB with Crestron App</u> Ipad 16GB with Crestron App	1	EA					
40	<u>Installation for the above equipments. :</u>	1	JOB					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Installation for the above equipments. This shall include cabling in the conduits provided by the electricians, installing of all the AV equipments, with proper cabling with wire ties to be incorporated in the rack.							
41	<u>Misc. types of Cables and connectors:</u> Misc. types of Cables and connectors to be used in above room	1	JOB					
42	<u>Programming - :</u> Programming - Complete systems integration programming of touch panel and processor with customer logo, etc.. Tailor made as per client need and equipments to be controlled. Also DSP - Digital sound processors if any would be programmed for optimal sound output.	1	JOB					
43	<u>Project Handover Documents:</u> Project Handover Documents, As Built Drawings and User and Admin Training	1	JOB					
44	<u>75" LED Display</u> 75" LED Display	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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45	<u>Tilt Wall Mounting kit for above display:</u> Tilt Wall Mounting kit for above display	1	EA					
46	<u>1 VGA with Audio, 1 HDMI, 2 Power cable Management System</u> 1 VGA with Audio, 1 HDMI, 2 Power cable Management System	4	EA					
47	<u>4x1 4K HDMI® Switcher :</u> 4x1 4K HDMI® Switcher	1	EA					
48	<u>Microphone Array:</u> Microphone Array	10	EA					
49	<u>Ceiling Speakers:</u> Ceiling Speakers	6	EA					
50	<u>FOH Speakers:</u> FOH Speakers	2	EA					
51	<u>Dual Channel Amplifier:</u> Dual Channel Amplifier	1	EA					
52	<u>Audio DSP with telephone line input :</u> Audio DSP with telephone line input for audio and video conferencing	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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53	<u>Dialer for DSP:</u> Dialer for DSP	1	EA					
54	<u>PoE injector for Dialer:</u> PoE injector for Dialer	1	EA					
55	<u>Installation for the above equipments.:</u> Installation for the above 1 equipments. This shall include cabling in the conduits provided by the electricians, installing of all the AV equipments, with proper cabling with wire ties to be incorporated in the rack.	1	JOB					
56	<u>Misc. types of Cables and connectors :</u> Misc. types of Cables and connectors to be used in above room	1	JOB					
57	<u>75" LED Display:</u> 75" LED Display	1	EA					
58	<u>Tilt Wall Mounting kit for above display:</u> Tilt Wall Mounting kit for above display	1	EA					
59	<u>1 VGA with Audio, 1 HDMI, 2 Power cable</u> 1 VGA with Audio, 1 HDMI, 2 Power cable Management System	1	EA					
60	<u>Installation for the above</u>	1	JOB					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	<u>equipments:</u> Installation for the above equipments. This shall include cabling in the conduits provided by the electricians, installing of all the AV equipments, with proper cabling with wire ties to be incorporated in the rack.							
61	<u>Misc. types of Cables and connectors :</u> Misc. types of Cables and connectors to be used in above room	1	JOB					
62	<u>75" LED Display:</u> 75" LED Display	1	EA					
63	<u>Tilt Wall Mounting kit for above display:</u> Tilt Wall Mounting kit for above display:	1	EA					
64	<u>1 VGA with Audio, 1 HDMI, 2 Power cable:</u> 1 VGA with Audio, 1 HDMI, 2 Power cable Management System	4	EA					
65	<u>Installation for the above equipments:</u> Installation for the above	1	JOB					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	equipments. This shall include cabling in the conduits provided by the electricians, installing of all the AV equipments, with proper cabling with wire ties to be incorporated in the rack.							
66	<u>Misc. types of Cables and connectors :</u> Misc. types of Cables and connectors to be used in above room	1	JOB					
67	<u>75" LED Display</u> 75" LED Display	1	EA					
68	<u>Tilt Wall Mounting kit for above display</u> Tilt Wall Mounting kit for above display	1	EA					
69	<u>1 VGA with Audio :</u> 1 VGA with Audio, 1 HDMI, 2 Power cable 1 VGA with Audio, 1 HDMI, 2 Power cable Management System	1	EA					
70	<u>RealPresence Group 500-720p: Group 500 H</u> RealPresence Group 500-720p: Group 500 HD codec, EagleEyeIV-12x camera, mic array, univ.	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	remote, NTSC/PAL. Cables: 2 HDMI 1.8m, 1 CAT 5E LAN 3.6m, 1 HDCI digital 3m, Power: UK-Type G, BS 1363. Maintenance Contract Required.							
71	<u>Multi Party Key for above RPG 500-720P</u> Multi Party Key for above RPG 500-720P	1	EA					
72	<u>Partner Premier, One Year, Real Presence:</u> Partner Premier, One Year, RealPresence Group 500-720p: Group 500 HD codec, EagleEyeIV-12x camera	1	EA					
73	<u>Microphone Array:</u> Microphone Array	10	EA					
74	<u>Ceiling Speakers:</u> Ceiling Speakers:	6	EA					
75	<u>FOH Speakers</u> FOH Speakers	2	EA					
76	<u>Dual Channel Amplifier</u> Dual Channel Amplifier	1	EA					
77	<u>Audio DSP with telephone line input :</u> Audio DSP with telephone line input for audio and video conferencing	1	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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78	Dialer for DSP: Dialer for DSP	1	EA					
79	PoE injector for Dialer PoE injector for Dialer	1	EA					
80	Control System: Control System:	1	EA					
81	Relay Controller Relay Controller	2	EA					
82	Button Processor: Button Processor	1	EA					
83	Show My PC/LAM Show My PC/LAM Button for Presenation	12	EA					
84	Ipad 16GB with Crestron App : Ipad 16GB with Crestron App	1	EA					
85	Installation for the above equipments. : Installation for the above equipments. This shall include cabling in the conduits provided by the electricians, installing of all the AV equipments, with proper cabling with wire ties to be incorporated in the rack.	1	JOB					
86	Misc. types : Misc. types of Cables and	1	JOB					

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	connectors :							
87	Programming - Programming - Complete systems integration programming of touch panel and processor with customer logo, etc.. Tailor made as per client need and equipments to be controlled. Also DSP - Digital sound processors if any would be programmed for optimal sound output.	1	JOB					
88	Project Handover Documents, : Project Handover Documents, As Built Drawings and User and Admin Training	1	JOB					
89	75" LED Display: 75" LED Display	1	EA					
90	Tilt Wall Mounting : Tilt Wall Mounting kit for above display	1	EA					
91	1 VGA with Audio, 1 HDMI, 2 Power cable: 1 VGA with Audio, 1 HDMI, 2 Power cable Management System	1	EA					
92	Microphone Array: Microphone Array	10	EA					

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93	<u>Ceiling Speakers:</u> Ceiling Speakers:	6	EA					
94	<u>FOH Speakers:</u> FOH Speakers	2	EA					
95	<u>Dual Channel Amplifier:</u> Dual Channel Amplifier:	1	EA					
96	<u>Audio DSP with telephone line input :</u> Audio DSP with telephone line input for audio and video conferencing	1	EA					
97	<u>Dialer for DSP:</u> Dialer for DSP	1	EA					
98	<u>PoE injector for Dialer:</u> PoE injector for Dialer	1	EA					
99	<u>Installation for the above equipments:</u> Installation for the above equipments. This shall include cabling in the conduits provided by the electricians, installing of all the AV equipments, with proper cabling with wire ties to be incorporated in the rack.	1	JOB					
100	<u>Misc. types of Cables and connectors :</u> Misc. types of Cables and connectors to be used in above	1	JOB					

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	room							
101	<u>Project Handover Documents:</u> Project Handover Documents, As Built Drawings and User and Admin Training	1	JOB					
102	<u>75" LED Display:</u> 75" LED Display	1	EA					
103	<u>Tilt Wall Mounting :</u> Tilt Wall Mounting kit for above display	1	EA					
104	<u>1 VGA with Audio, 1 HDMI, 2 Power cable:</u> 1 VGA with Audio, 1 HDMI, 2 Power cable Management System	1	EA					
105	<u>Microphone Arra:</u> Microphone Arra	10	EA					
106	<u>Ceiling Speakers:</u> Ceiling Speakers	6	EA					
107	<u>FOH Speakers:</u> FOH Speakers	2	EA					
108	<u>Dual Channel Amplifier</u>	1	EA					
109	<u>Audio DSP with telephone line input :</u> Audio DSP with telephone line input for audio and video conferencing	1	EA					

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110	Dialer for DSP: Dialer for DSP	1	EA					
111	PoE injector for Dialer: PoE injector for Dialer	1	EA					
112	Installation for the above equipments: Installation for the above equipments. This shall include cabling in the conduits provided by the electricians, installing of all the AV equipments, with proper cabling with wire ties to be incorporated in the rack.	1	JOB					
113	Misc. types of Cables and connectors : Misc. types of Cables and connectors to be used in above room	1	JOB					
114	43" LED Display: 43" LED Display	1	EA					
115	Tilt Wall Mounting: Tilt Wall Mounting kit for above display	1	EA					
116	1 VGA with Audio, 1 HDMI, 2 Power cable: 1 VGA with Audio, 1 HDMI, 2 Power cable Management System	1	EA					
117	Installation for the above equipments:	1	JOB					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Installation for the above equipments. This shall include cabling in the conduits provided by the electricians, installing of all the AV equipments, with proper cabling with wire ties to be incorporated in the rack.							
118	<u>Misc. types of Cables and connectors :</u> Misc. types of Cables and connectors to be used in above room	1	JOB					
119	<u>75" LED Display:</u> 75" LED Display	1	EA					
120	<u>Tilt Wall Mounting</u> Tilt Wall Mounting kit for above display	1	EA					
121	<u>1 VGA with Audio, 1 HDMI, 2 Power cable</u> 1 VGA with Audio, 1 HDMI, 2 Power cable Management System	4	EA					
122	<u>Installation for the above equipments:</u> Installation for the above equipments. This shall include cabling in the conduits provided by	1	JOB					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	the electricians, installing of all the AV equipments, with proper cabling with wire ties to be incorporated in the rack.							
123	Misc. types of Cables and connectors : Misc. types of Cables and connectors to be used in above room :	1	JOB					

TOTAL (GROUP K) WITHOUT GST								
TOTAL (GROUP K) WITH GST								

GROUP-L -LANDSCAPE WORK(HARD)								
SL. NO.	DESCRIPTION OF WORK	QTY (A)	UNIT	RATE PER UNIT (IN WORDS & FIGURES) (B)		TOTAL AMOUNT C=(AXB)	SERVICE ACCOUNTING CODE (SAC)	SPECIFY % OF GST ON (C)
				FIGURE S	WORDS			
1	Earth work in surface excavation :	1075	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Earth work in surface excavation not exceeding 30 cm in depth but exceeding 1.5 m in width as well as 10 sqm on plan including getting out and disposal of excavated earth upto 50 m and lift upto 1.5 m, as directed by Engineer-in-Charge:All kinds of soil							
2	"Earth work in rough excavation: "Earth work in rough excavation, banking excavated earth in layers not exceeding 20 cm in depth, breaking clods, watering, rolling each layer with ½ tonne roller or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up in embankments for roads, flood banks, marginal banks and guide banks or filling up ground depressions, lead upto 50 m and lift upto 1.5 m : All kinds of soil"	325	M3					
3	<u>Banking excavated earth in layers :</u> Banking excavated earth in layers not exceeding 20 cm in depth, breaking clods, watering, rolling each layer with ½ tonne roller, or	1000	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up, in embankments for roads, flood banks, marginal banks, and guide banks etc., lead upto 50 m and lift upto 1.5 m : All kinds of soil							
4	<u>Deduct for not rolling with power roller</u> Deduct for not rolling with power roller of minimum 8 tonnes for banking excavated earth in layers not exceeding 20 cm in depth.	1000	M3					
5	<u>Deduct for not watering the excavated earth:</u> Deduct for not watering the excavated earth for banking	500	M3					
6	<u>Earth work in excavation by mechanical means:</u> Earth work in excavation by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out	250	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. :- All kinds of soil.							
7	Filling available excavated earth Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.	500	M3					
8	Clearing jungle including uprooting : Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared.	7000	M2					
9	Preparation and consolidation : Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavating earth to an average of 22.5 cm depth, dressing to camber	3500	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earth with lead upto 50 metres.							
10	Extra for compaction of earth work in embankment Extra for compaction of earth work in embankment under optimum moisture conditions to give at least 95% of the maximum dry density (proctor density).	350	M2					
11	Supplying and stacking at site. :- 90 mm Supplying and stacking at site. :- 90 mm to 45 mm size stone aggregate	800	M3					
12	Supplying and stacking at site. : Supplying and stacking at site. :- 63 mm to 45 mm size stone aggregate.	360	M3					
13	Supplying and stacking at site. : Supplying and stacking at site.- Stone screening 13.2 mm nominal size (Type A)	150	M3					
14	Supplying and stacking at site Supplying and stacking at site. :- Stone screening 11.2 mm nominal size (Type B)	150	M3					
15	Supplying and stacking at site:	125	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Supplying and stacking at site: Moorum							
16	Laying, spreading and compacting : Laying, spreading and compacting stone aggregate of specified sizes to WBM specifications in uniform thickness, hand picking, rolling with 3 wheeled road / vibratory roller 8-10 tonne capacity in stages to proper grade and camber, applying and brooming requisite type of screening / binding material to fill up interstices of coarse aggregate, watering and compacting to the required density .	1160	M3					
17	Providing and laying in position cement CONCRETE: Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level : 1:4:8 (1 Cement : 4 coarse sand : 8 graded stone aggregate 40 mm nominal size).	385	M3					
18	Reinforced cement concrete work : Reinforced cement concrete work in walls (any thickness),	25	M3					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, foundations, posts and struts etc. up to floor five level excluding cost of centering, shuttering, finishing and reinforcement : 1:1.5:3 (1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)							
19	Centering and shuttering: Centering and shuttering including strutting, propping etc. and removal of form for : Foundations, footings, bases of columns, etc. for mass concrete.	50	M2					
20	Centering and shuttering : Centering and shuttering including strutting, propping etc. and removal of form for :Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	10	M2					
21	Centering and shuttering : Centering and shuttering including strutting, propping etc. and removal of form for :Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc. But	15	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	for Lintels, beams, plinth beams, girders, bressumers and cantilevers.							
22	Centering and shuttering : Centering and shuttering including strutting, propping etc. and removal of form for : - Columns, Pillars, Piers, Abutments, Posts and Struts.	35	M2					
23	Reinforcement for R.C.C. work Reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete. : - Thermo-Mechanically Treated bars.	3000	KG					
24	Brick work with FPS BRICKS Brick work with FPS bricks of class designation 75 in foundation and plinth in: Cement mortar 1:6 (1 cement : 6 coarse sand)	235	M3					
25	Brick work with FPS bricks Brick work with FPS bricks of class designation 75 in superstructure above plinth level up to floor V level in all shapes and sizes in : Cement mortar 1:6 (1 cement : 6 coarse sand)	30	M3					

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26	Providing and laying : Providing and laying factory made chamfered edge Cement Concrete paver blocks In foot path, park & lawns driveway or light & traffic parking etc. of required strength, thickness & size/ shape, made by table vibratory method using PU mould, laid in required colour & pattern over 50mm thick compacted bed of course sand, compacting and proper Embedding /laying of inter locking paver blocks into the sand bedding layer through vibratory compaction by using plate vibrator, filling the joints with sand and cutting of paver blocks as per required size and pattern, finishing and sweeping extra sand, all complete as per manufacturer's specifications & direction of Engineer-in- Charge. 60mm thick Cement concrete Grass paver block of M-40 grade with approved colour, design & pattern.	575	M2					
27	Providing and laying factory made chamfered edge Cement Concrete paver blocks In foot path, park &	3150	M2					

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	lawns driveway or light & traffic parking etc. of required strength, thickness & size/ shape, made by table vibratory method using PU mould, laid in required colour & pattern over 50mm thick compacted bed of course sand, compacting and proper Embedding /laying of inter locking paver blocks into the sand bedding layer through vibratory compaction by using plate vibrator, filling the joints with sand and cutting of paver blocks as per required size and pattern, finishing and sweeping extra sand, all complete as per manufacturer's specifications & direction of Engineer-in- Charge. 80mm thick Cement concrete paver block of M-40 grade with approved colour, design & pattern.							
28	<u>Rough Kota stone slab flooring over 20 mm</u> Rough Kota stone slab flooring over 20 mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab, including rubbing and polishing	900	M2					

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	complete with base of cement mortar 1 : 4 (1 cement : 4 coarse sand) :							
29	<u>Rough Kadappa stone slab flooring over 20mm</u> Rough Kadappa stone slab flooring over 20 mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab, including rubbing and polishing complete with base of cement mortar 1 : 4 (1 cement : 4 coarse sand) :	590	M2					
30	<u>Kadappa stone Coping over 20 mm :</u> Kadappa stone Coping over 20 mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab, including rubbing and polishing complete with base of cement mortar 1 : 4 (1 cement : 4 coarse sand) :	25	M2					
31	<u>Kadappa stone slabs 20 mm thick in riser</u> Kadappa stone slabs 20 mm thick in risers of steps, skirting, dado and pillars laid on 12 mm (average)	80	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	thick cement mortar 1:3 (1 cement: 3 coarse sand) and jointed with grey cement slurry mixed with pigment to match the shade of the slabs, including rubbing and polishing complete.							
32	<u>Providing and laying gang saw cut 50 mm</u> Providing and laying gang saw cut 50 mm thick, Leather Finished pre moulded and pre polished machine cut granite stone (Dark Steel Grey) of required size and shape of approved shade, colour and texture in footpath, flooring in road side plazas and similar locations, laid over 20mm thick base of cement mortar 1:4 (1 cement : 4 coarse sand) including grouting the joints with white cement mixed with matching pigment, epoxy touch ups etc. complete as per direction of Engineer-in-Charge.	280	M2					
33	<u>Providing and laying gang saw cut 50 mm</u> Providing and laying gang saw cut 50 mm thick, mirror polished pre moulded and pre polished machine cut granite stone (Tan Brown) of	180	M2					

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	required size and shape of approved shade, colour and texture in footpath, flooring in road side plazas and similar locations, laid over 20mm thick base of cement mortar 1:4 (1 cement : 4 coarse sand) including grouting the joints with white cement mixed with matching pigment, epoxy touch ups etc. complete as per direction of Engineer-in-Charge.							
34	Providing and laying Polished Granite st Providing and laying Polished Granite stone (25mm thick Prepolished Dark Grey Granite) flooring in required design and patterns, in linear as well as curvilinear portions of the building, all complete as per the architectural drawings, with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand), laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade, including rubbing, curing and polishing etc. all complete as	135	M2					

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	specified and as directed by the Engineer-in-Charge.							
35	<u>Providing and laying Calliberated finish</u> Providing and laying Calliberated finish Dark Grey Granite stone flooring in required design and patterns, in linear as well as curvilinear portions of the building all complete as per the architectural drawings with 25 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including curing etc. all complete as specified and as directed by the Engineer-in-Charge :	25	M2					
36	<u>Providing edge moulding including machine POLISH:</u> Providing edge moulding including machine polishing to edge to give high gloss finish etc. complete as per design approved by Engineer-in-Charge.	250	M					
37	<u>Providing and fixing Glass</u>	110	M2					

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	<u>mossaic tiles</u> Providing and fixing Glass mossaic tiles on finished plain wall surface of size 20 mm x 20 mm x 4 mm in all colour, design , fixing in approved design. The glass mosaic tiles shall be fixed on the wall surface with the help of approved adhesive applied at the rate of 2.5 kg per sqm and grouting of the same. All completed as per direction of Engineer-incharge.							
38	<u>Providing and laying Antiskid Pavit Ramp floor tiles</u> Providing and laying Antiskid Pavit Ramp floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS: 15622, of approved make, in all colours and shades, laid on 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand), jointing with grey cement slurry @ 3.3kg/sqm including grouting the joints with white cement and matching pigments etc., complete.	270	M2					

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TOTAL (GROUP L) WITHOUT GST								
TOTAL (GROUP L) WITH GST								
GROUP-M -LANDSCAPE WORK(HORTICULTURE)								
SL. NO.	DESCRIPTION OF WORK	QTY (A)	UNIT	RATE PER UNIT (IN WORDS & FIGURES) (B)		TOTAL AMOUNT C=(AXB)	SERVICE ACCOUNTING CODE (SAC) D	SPECIFY % OF GST ON (C)
				FIGURE S	WORDS			
1	Clearing jungle : Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a	3000	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	distance of 50 m outside the periphery of the area cleared.							
2	Earth work in surface excavation: Earth work in surface excavation not exceeding 30 cm in depth but exceeding 1.5 m in width as well as 10 sqm on plan including getting out and disposal of excavated earth upto 50 m and lift upto 1.5 m, as directed by Engineer-in-Charge: all kind of soil.	3000	M2					
3	Trenching in ordinary soil up to a depth: Trenching in ordinary soil up to a depth of 60 cm including removal and stacking of serviceable materials and then disposing of surplus soil, by spreading and neatly leveling within a lead of 50 m and making up the trenched area to proper levels by filling with earth or earth mixed with sludge or / and manure before and after flooding trench with water (excluding cost of imported earth, sludge or manure).	400	M3					

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4	<u>Supplying and stacking of good earth :</u> Supplying and stacking of good earth at site including royalty and carriage upto 5 km complete (earth measured in stacks will be reduced by 20% for payment).	450	M3					
5	<u>Supplying and stacking sludge:</u> Supplying and stacking sludge at site including royalty and carriage upto 5km complete (sludge measured in stacks will be reduced by 8% for payment).	250	M3					
6	<u>Supplying and stacking dump manure:</u> Supplying and stacking at site dump manure from approved source, including carriage upto 5 km complete (manure measured in stacks will be reduced by 8% for payment) : Screened through sieve of I.S. designation 20 mm	50	M3					
7	<u>Supplying and stacking at site dump manure</u> Supplying and stacking at site dump manure from approved source, including carriage upto 5 km complete (manure measured in stacks will be reduced by 8% for payment) : -Screened through sieve	50	M3					

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	of I.S. designation 16 mm							
8	<u>Supplying and stacking at site dump manure:</u> Supplying and stacking at site dump manure from approved source, including carriage upto 5 km complete (manure measured in stacks will be reduced by 8% for payment) :-Screened through sieve of I.S. designation 4.75 mm	50	M3					
9	<u>Rough dressing the trenched ground :</u> Rough dressing the trenched ground including breaking clods.	2500	M2					
10	<u>Uprooting weeds from the trenched area :</u> Uprooting weeds from the trenched area after 10 to 15 days of its flooding with water including disposal of uprooted vegetation.	3000	M2					
11	<u>Fine dressing of the ground.</u> Fine dressing of the ground.	3000	M2					
12	<u>Spreading of sludge, dump manure and/or good earth:</u> Spreading of sludge, dump manure and/or good earth in required thickness as per direction of officer-in-charge (cost of sludge,	550	M3					

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	dump manure and/ or good earth to be paid separately).							
13	<u>Mixing earth and sludge or manure :</u> Mixing earth and sludge or manure in the required proportion specified or directed by the Officer-in-charge	550	M3					
14	<u>Uprooting rank vegetation and weeds :</u> Uprooting rank vegetation and weeds by digging the area to a depth of 60 cm, removing all weeds and other growth with roots by forking repeatedly, reaking clods, rough dressing, flooding with water, uprooting fresh growths after 10 to 15 days and then fine dressing for planting new grass, including disposal of all rubbish with all leads and lifts.	2500	M2					
15	<u>Preparation of beds for hedging and shrubbery:</u> Preparation of beds for hedging and shrubbery by excavating 60 cm deep and trenching the excavated base to a further depth of 30 cm, refilling the excavated earth after breaking clods and mixing with sludge or manure in	150	M3					

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	the ratio of 8:1 (8 parts of stacked volume of earth after reduction by 20% : one part of stacked volume of sludge or manure after reduction by 8%), flooding with water, filling with earth if necessary, watering and finally fine dressing, leveling etc. including stacking and disposal of materials declared unserviceable and surplus earth by spreading and leveling as directed, within a lead of 50 m, lift up to 1.5 m complete (cost of sludge, manure or extra earth to be paid for separately)							
16	<u>Digging holes in ordinary soil and refilling:</u> Digging holes in ordinary soil and refilling the same with the excavated earth mixed with manure or sludge in the ratio of 2:1 by volume (2 parts of stacked volume of earth after reduction by 20% : 1 part of stacked volume of manure after reduction by 8%) flooding with water, dressing including removal of rubbish and surplus earth, if any, with all leads and lifts (cost of manure, sludge or extra good earth if needed to be	177	EA					

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	paid for separately) : Holes 1.2 m dia and 1.2 m deep.							
17	<u>Digging holes in ordinary soil and refilling:</u> Digging holes in ordinary soil and refilling the same with the excavated earth mixed with manure or sludge in the ratio of 2:1 by volume (2 parts of stacked volume of earth after reduction by 20% : 1 part of stacked volume of manure after reduction by 8%) flooding with water, dressing including removal of rubbish and surplus earth, if any, with all leads and lifts (cost of manure, sludge or extra good earth if needed to be paid for separately) : Holes 60 cm dia, and 60 cm deep	415	EA					
18	<u>Digging holes in ordinary soil and refilling:</u> Digging holes in ordinary soil and refilling the same with the excavated earth mixed with manure or sludge in the ratio of 2:1 by volume (2 parts of stacked volume of earth after reduction by 20% : 1 part of stacked volume of manure after reduction by 8%)	2694	EA					

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	flooding with water, dressing including removal of rubbish and surplus earth, if any, with all leads and lifts (cost of manure, sludge or extra good earth if needed to be paid for separately) : Holes 45 cm dia, and 45 cm deep.							
19	<u>Providing and fixing M.S. flat iron tree guard:</u> Providing and fixing M.S. flat iron tree guard 60 cm dia and 2 m high, above ground consisting 4 nos 25 x 6 mm, 2.25 m long and 8 nos 25 x 3 mm 2 m long verticals M.S. flats, riveted to 3 nos 25 x 6 mm M.S. flat iron rings in two halves, fixing together at site with required six numbers of 8 mm dia and 30 mm long bolts, including painting two coats with synthetic enamel paint of approved brand and manufacture over a coat of primer. One name plate of 1 mm thick M.S. sheet of size 250x100 mm shall be welded to the tree guard near the middle height and lettered CPWD / PWD/ any other approved name. The tree guard shall be suitably fixed to the ground by embedding four legs of tree guard in pits of	175	EA					

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	suitable dia and to a depth of 25 cm, refilling the pits with soil and ramming, complete in all respect as per satisfaction and direction of Officer-in-charge.							
20	<u>Edging with bricks laid dry length wise:</u> Edging with bricks laid dry length wise, including required excavation, refilling, consolidating with hand packing and spreading surplus earth neatly within a lead of 50 m : Common burnt clay F.P.S. (non modular) bricks of class designation 7.5	550	M					
21	<u>Filling mixture of earth and sludge or manure:</u> Filling mixture of earth and sludge or manure in the desired proportion in trenches, flooding with water and leveling (cost of supplying earth and sludge or manure and mixing excluded).	350	M3					
22	<u>Preparation of mounds of various size &shape:</u> Preparation of mounds of various size and shape by available excavated /supplied earth in layers not exceeding 20 cm in depth,	150	M3					

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	breaking clods, watering of each layer, dressing etc., lead upto 50 meter and lift upto 1.5 m complete as per direction of Officer-in-charge. Providing and laying Neelgiri/Mexican grass turf with earth 50mm to 60mm thickness of existing ground prepared with proper level and ramming with tools wooden (Dhurmos) and than rolling the surface with light roller make the surface smoothen and light watering with sprinkler and maintenance for 30 days or more till the grass establish properly, as per direction of officer-in-charge.							
23	<u>Providing and laying Neelgiri/Mexican grass turf:</u> Providing and laying Neelgiri/Mexican grass turf with earth 50mm to 60mm thickness of existing ground prepared with proper level and ramming with tools wooden (Dhurmos) and than rolling the surface with light roller make the surface smoothen and light watering with sprinkler and maintenance for 30 days or more till the grass establish properly, as	2200	M2					

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	per direction of officer-in-charge.							
24	Cutting of Hedge/Edge including removing Cutting of Hedge/Edge including removing of cut material, cleaning, hoeing of hedge/edge bed watering, manureing and applying insecticides and fungicides etc.(excluding the cost of material which shall be supplied by the department) and as per direction of officer in charge. UNIT-Sqm per month	550	M2					
25	Cost of supplying and planting Tree plants: Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk : Michelia champaca - Overall height - 2400mm (T-1)	9	EA					
26	Cost of supplying and planting Tree plants: Cost of supplying and planting	6	EA					

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	Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk : Plumeria Picta - Overall height - 1500mm (T-2)							
27	Cost of supplying and planting Tree plants: Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk : - Spathodea campanulata - 2400mm (T-3)	21	EA					
28	Cost of supplying and planting Tree plants: Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height	33	EA					

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	should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk : - Toona ciliata - Overall height - 2400mm (T-4)							
29	<u>Cost of supplying and planting Tree plants</u> Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk : - Mesua ferrea - Overall height - 2400mm (T-5)	28	EA					
30	<u>Cost of supplying and planting Tree plants</u> Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or	27	EA					

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	mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk : - Tabebuia rosea - Overall height - 2400mm (T-6)							
31	Cost of supplying and planting Tree plants Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk Cassia fistula - Overall height - 2400mm (T-7)	4	EA					
32	Cost of supplying and planting Tree plants Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min.	4	EA					

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	300mm dia. or as per size of trunk : - Araucaria - Overall height - 2400mm (T-8)							
33	Cost of supplying and planting Tree plants Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk : - Mimusops elengi - Overall height - 2400mm (T-9)	5	EA					
34	Cost of supplying and planting Tree plants Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk :	3	EA					

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	- Golden bamboo - Overall height - 2400mm (T-10)							
35	<u>Cost of supplying and planting Tree plants</u> Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk : - Magnolia grandiflora - Overall height - 2400mm (T-11)	5	EA					
36	<u>Cost of supplying and planting Tree plants</u> Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk : - Copernicia alba - Overall height - 1500mm (P-1)	2	EA					

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37	<u>Cost of supplying and planting Tree plants</u> Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk : - Washingtonia filifera - Overall height - 3000mm (P-2)	8	EA					
38	<u>Cost of supplying and planting Tree plants</u> Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk : - Areca catechu - Overall height - 3000mm (P-3)	18	EA					
39	<u>Cost of supplying and planting Tree plants</u>	4	EA					

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	Cost of supplying and planting Tree plants and there after maintenance for 180 days.(with replacement guarantee) The height should not be less than 1.2m or mentioning against the name of Tree. These should be supplied in polybag or earthen pot of min. 300mm dia. or as per size of trunk: Champagne palm - Overall height - 1800mm (P-4)							
40	<u>Supplying and stacking Shrub plantation:</u> Supplying and stacking Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Cycas revoluta - 60 leaves (P-5)	6	EA					
41	<u>Supplying and stacking Shrub plantation:</u> Supplying and stacking Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Raphis excelsa - Overall height - 600mm (P-6)	30	EA					

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42	<u>Supplying and stacking Shrub plantation:</u> Supplying and stacking Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Gardenia jasminoides - Overall height - 600mm (S-1)	24	EA					
43	<u>Supplying and stacking Shrub plantation:</u> Supplying and stacking Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Callistemon polandii - Overall height - 750mm (S-2)	55	EA					
44	<u>Supplying and stacking Shrub plantation:</u> Supplying and stacking Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Eugenia - Overall height - 750mm (S-3)	25	EA					
45	<u>Supplying and stacking Shrub plantation:</u> Supplying and stacking Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :-	60	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Lagerstromea indica white - Overall height - 750mm (S-4)							
46	<u>Supplying and stacking Shrub plantation:</u> Supplying and stacking Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Lagerstromea indica purple - Overall height - 750mm (S-5)	45	EA					
47	<u>Supplying and stacking Shrub plantation:</u> Supplying and stacking Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Francisia - Overall height - 600mm (S-6)	15	EA					
48	<u>Supplying and stacking Shrub plantation:</u> Supplying and stacking Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Jatropha pelargonii folia - Overall height - 600mm (S-7)	35	EA					
49	<u>Supplying and stacking Shrub plantation:</u> Supplying and stacking Shrub plantation and there after	15	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	maintenance for 180 days.(with replacement guarantee) :- Heliconia - Overall height - 450mm (S-8)							
50	<u>Supplying and stacking Shrub plantation:</u> Supplying and stacking Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Russelia juncea - Overall height - 200mm (S-9)	10	EA					
51	<u>Supplying and stacking Shrub plantation:</u> Supplying and stacking Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Melaleuca bracteata - Overall height - 750mm (S-10)	35	EA					
52	<u>Supplying and stacking Shrub plantation:</u> Supplying and stacking Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- . - Plumeria pudica - Overall height - 600mm (S-11)	35	EA					
53	<u>Supplying and stacking Shrub</u>	25	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	plantation Supplying and stacking Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Mussaenda - Overall height - 750mm (S-12)							
54	Supplying and stacking Shrub plantation Supplying and stacking small Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Pandanus baptistii - Overall height - 300mm (SS-1)	200	EA					
55	Supplying and stacking Shrub plantation Supplying and stacking small Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- - Allamanda dwarf - Overall height - 300mm (SS-2)	180	EA					
56	Supplying and stacking Shrub plantation Supplying and stacking small Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Hibiscus dwarf - Overall height - 450mm (SS-3)	165	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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57	<u>Supplying and stacking Shrub plantation</u> Supplying and stacking small Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Dracaena colorama red - Overall height - 600mm (SS-4)	25	EA					
58	<u>Supplying and stacking Shrub plantation</u> Supplying and stacking small Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Plumbago capensis - Overall height - 450mm (SS-5)	740	EA					
59	<u>Supplying and stacking Shrub plantation</u> Supplying and stacking small Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- - Galphimia glauca - Overall height - 450mm (SS-6)	370	EA					
60	<u>Supplying and stacking Shrub plantation</u> Supplying and stacking small Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :-	245	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Ravenia spectabilis - Overall height - 450mm (SS-7)							
61	<u>Supplying and stacking Shrub plantation</u> Supplying and stacking small Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Leucophyllum frutescens - Overall height - 450mm (SS-8)	65	EA					
62	<u>Supplying and stacking Shrub plantation</u> Supplying and stacking small Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- - Dwarf chinese bamboo - Overall height - 450mm (SS-9)	50	EA					
63	<u>Supplying and stacking Shrub plantation</u> Supplying and stacking small Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- - Crotons - Overall height - 450mm (SS-10)	295	EA					
64	<u>Supplying and stacking Shrub plantation</u> Supplying and stacking small Shrub plantation and there after	50	EA					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	maintenance for 180 days.(with replacement guarantee) :- Juniperus prostata - Overall height - 200mm (SS-11)							
65	<u>Supplying and stacking Shrub plantation</u> Supplying and stacking small Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- Acalypha red - Overall height - 450mm (SS-12)	300	EA					
66	<u>Supplying and stacking Shrub plantation</u> Supplying and stacking small Shrub plantation and there after maintenance for 180 days.(with replacement guarantee) :- - Lonicera japonica - Overall height - 200mm (C-1)	9	EA					
67	<u>Supplying and stacking ground covers plantation :</u> Supplying and stacking ground covers plantation and there after maintenance for 180 days.(with replacement guarantee) :- Ficus longisland (G-1)	25	M2					
68	<u>Supplying and stacking ground covers plantation :</u>	15	M2					

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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	Supplying and stacking ground covers plantation and there after maintenance for 180 days.(with replacement guarantee) :- Dianella (G-2)							
69	<u>Supplying and stacking ground covers plantation:</u> Supplying and stacking ground covers plantation and there after maintenance for 180 days.(with replacement guarantee) :- Spiderlily (G-3)	75	M2					
70	<u>Supplying and stacking ground covers plantation :</u> Supplying and stacking ground covers plantation and there after maintenance for 180 days.(with replacement guarantee) :- Golden fern (G-4)	15	M2					
71	<u>Supplying and stacking ground covers plantation :</u> Supplying and stacking ground covers plantation and there after maintenance for 180 days.(with replacement guarantee) :- Cuphea (G-5)	25	M2					
TOTAL (GROUP M) WITHOUT GST								
TOTAL (GROUP M) WITH GST								

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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GRAND TOTAL (GROUP A+B+C+D+E+F+G+H+I+J+K+L+M) WITHOUT GST =
GRAND TOTAL (GROUP A+B+C+D+E+F+G+H+I+J+K+L+M) WITH GST =

Special Notes:

1. The price/rate(s) quoted by the Bidders will be inclusive of all taxes except **GST** (i.e. IGST or CGST and SGST/UTGST as applicable in case of interstate supply or intra state supply respectively and Cess on GST , if applicable) on the final services. However, GST rate (including cess) to be provided in the respective places in the Price Bid.
2. OIL will prefer to deal with registered bidder under GST. Therefore, bidders are requested to get themselves registered under GST, if not registered yet.However, in case any unregistered bidder is submitting their bid, their prices will be loaded with applicable GST while evaluation of bid. Where OIL is entitled for input credit of GST, the same will be considered for evaluation of bid as per evaluation methodology of tender document."
- 3.. Price Bid uploaded without giving any of the details of the taxes (Including rates and amounts) will be considered as inclusive of all taxes including GST.
When a bidder mentions taxes as extra without specifying the rates & amount, the offer will be loaded with maximum value towards taxes received against the tender for comparison purposes. If the bidder emerges as lowest bidder after such loading, in the event of order on that bidder, taxes mentioned by OIL on the Purchase Order/ Contracts will be binding on the bidder."
5. Refer GST Clauses **(Clause no. 31 of GCC)**.
6. Bidders are required to quote for all the items as per Price Bid Format; otherwise the offer of the bidder will be straightway rejected.
7. Bidders are also requested to refer the Taxes and Duties clause during GST regime attached vide **Annexure-I** (refer bid document) for compliance

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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8. Amount of GST shall not be included by the Contractor in their quoted price. OIL will reimburse the GST to the CONTRACTOR against submission of invoices issued in accordance with GST Rules,

9. Bidder shall furnish this Form duly filled in all respects along with his price part. However, Bidder is required to furnish this **Form indicating only the Rate of Duty/ Tax (%)** as per Column (d) along with his un-priced part.

10. The rate of GST indicated in this format shall be considered for statutory variation as per the provisions of bidding document.

11. **GST quoted above shall be considered for evaluation as per provisions of Bidding Document.**

12. Contractor shall indicate total GST amount payable under the contract in this format. However, if Services, to be provided by the Contractor, falls under the category defined under reverse charge rule of GST then the liability of deposition of GST to the tax authority by the Contractor, and by the Owner shall be dealt in accordance with Notifications issued on reverse charge rule of GST by Government of India from time to time.

Notes:

(i) *Bidders are requested to quote for all the items mentioned above. Bids will be evaluated considering the entire requirement as above. **The Rates/amounts should be quoted by the Bidders inclusive of all applicable taxes and duties, however, GST payable to be shown separately.***

(ii) *Bidders are also requested to refer the Taxes and Duties clause during GST regime attached vide **Annexure-A** for compliance.*

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

Annexure –A

TAXES AND DUTIES CLAUSE - FOR VENDOR/SUPPLIER/CONTRACTOR
(For Supplies/ Services during GST Regime i.e., New Tender)

INDIRECT TAXES/ GST

1. For the purposes of levy and imposition of GST, the expressions shall have the following meanings:
 - (a) GST - means any tax imposed on the supply of goods and/or services under GST Law.
 - (b) Cess – means any applicable cess, existing or future on the supply of Goods and Services as per Goods and Services Tax (Compensation to States) Act, 2017.
 - (c) GST Law - means IGST Act 2017, CGST Act 2017, UTGST Act, 2017 and SGST Act, 2017 and all related ancillary Rules and Notifications issued in this regard from time to time.
2. **The rates quoted by the bidders shall be inclusive of all taxes, duties and levies.** However, bidders are required to provide separately the rate and amount of all types of taxes, duties and levies. In case, the quoted information related to various taxes, duties & levies subsequently proves wrong, incorrect or misleading, OIL will have no liability to reimburse the difference in the duty/ tax, if the finally assessed amount is on the higher side and OIL will have to right to recover the difference in case the rate of duty/ taxes finally assessed is on the lower side. Further, for the purpose of this contract, it is agreed between the parties that if Goods and Services Tax introduced during the tenure of this contract/agreement then the bidders have to clearly show the amount of GST separately in the Tax Invoices. Further, it is the responsibility of the bidders to make all possible efforts to make their accounting / IT system GST compliant in order to ensure availability of Input Tax Credit (ITC) to Oil India Ltd.
3. Offers without giving any of the details of the taxes (Including rates and amounts) as specified above will be considered as inclusive of all taxes including GST. When a bidder mentions taxes as extra without specifying the rates & amount, the offer will be loaded with maximum value towards taxes received against the tender for comparison purposes. If the bidder emerges as lowest bidder after such loading, in the event of order on that bidder, taxes mentioned by OIL on the Purchase Order/ Contracts will be binding on the bidder.
4. Bidders are required to pass on the benefit arising out of introduction of GST, including seamless flow of Input Tax Credit, reduction in Tax Rate on inputs as well as final goods by way of reduction of price as contemplated in the provision relating to Anti-Profiteering Measure vide Section 171 of the CGST Act, 2017. Accordingly, for supplies made under GST, the bidders should confirm that benefit of lower costs has been passed on to OIL by way of lower prices/taxes and also provide details of the same as applicable. OIL reserves the right to examine such details about costs of inputs/input services of the bidders to ensure that the intended benefits of GST have been passed on to OIL.
5. Oil India Ltd. shall declare the value of free issue of materials and services, if any, involved in the execution of the contract. The Contractor should consider the same while working out the

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6. *GST liability, if any. Further in cases where GST is leviable on any facilities provided by OIL and used by bidders and the consideration for which is recovered by OIL in the form of reduction in the invoice raised by bidders then OIL will raise GST invoices on such transactions and the same will be reimbursed by bidders.*

7. ***When Input tax credit is available for Set Off as per the end use certification given by User Department at the time of raising Purchase Requisition (P.R.)***

Evaluation of L-1 prices shall be done based on Quoted price after deduction of Input Tax Credit (ITC) of GST, if available to OIL. OIL shall evaluate the offers on the basis of the quoted rates only and any claim subsequently by the bidders for additional payment/liability shall not be admitted and has to be borne by the bidders

When Input tax credit is NOT available for Set Off

Evaluation of L-1 prices shall be done based on Quoted price only. OIL shall evaluate the offers on the basis of the quoted rates only and any claim subsequently by the bidders for additional payment/liability shall not be admitted and has to be borne by the bidders

8. *In a situation where Purchase Orders (POs)/ Contracts have been placed prior to GST Regime and supplies are effected during GST Regime, it is made clear that any statutory variation (increase/decrease) due to introduction of GST, as the case may be, but within the contractual delivery/completion period will be to the account of OIL subject to documentary evidence. However, any increase in statutory levy after the expiry of the scheduled date of delivery shall be to the supplier's account.*

9. *Bidders agree to do all things not limited to providing GST compliant Tax Invoices or other documentation as per GST law relating to the supply of goods and/or services covered in the instant contract like raising of and /or acceptance or rejection of credit notes / debit notes as the case may be, payment of taxes, timely filing of valid statutory Returns for the tax period on the Goods and Service Tax Network (GSTN), submission of general information as and when called for by OIL in the customized format shared by OIL in order to enable OIL to update its database etc. that may be necessary to match the invoices on GSTN common portal and enable OIL to claim input tax credit in relation to any GST payable under this Contract or in respect of any supply under this Contract.*

10. *In case Input Tax Credit of GST is denied or demand is recovered from OIL by the Central / State Authorities on account of any non-compliance by bidders, including non-payment of GST charged and recovered, the Vendor/Supplier/Contractor shall indemnify OIL in respect of all claims of tax, penalty and/or interest, loss, damages, costs, expenses and liability that may arise due to such non-compliance. OIL, at its discretion, may also withhold/recover such disputed amount from the pending payments of the bidders.*

10. *GST liability, if any on account of supply of free samples against any tender shall be to bidder's account.*

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PART-IV

PAYMENT TERMS

**AS PER ACTUAL MEASUREMENT CERTIFIED BY BOTH THE PARTIES. NOT
OFTENER THAN MONTHLY.**

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PART-V

OIL INDIA LIMITED
(A Government of India Enterprise)
CONTRACTS SECTION, PHQ
P.O. UdayanVihar – 781171, Guwahati, ASSAM

SCHEDULE OF COMPANY’S PLANTS, MATERIALS & EQUIPMENT

NIL

Part-VI-

ARCHITECTURE TENDER DRAWINGS Enclosed with this tender drawing. Working drawings will be furnished during execution as per requirement.

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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PART-VII - SAFETY MEASURES

To,
GM-CONTRACT
OIL INDIA LIMITED
Guwahati-781171

SUB: SAFETY MEASURES

Description of work/service: Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

Sir,

We hereby confirm that we have fully understood the safety measures to be adopted during execution of the above contract and that the same have been explained to us by the concerned authorities. We also give the following assurances.

- a) Only experienced and competent persons shall be engaged by us for carrying out work under the said contract.
- b) The names of the authorized persons who would be supervising the jobs on day to day basis from our end are the following:

i) _____

ii) _____

iii) _____

The above personnel are fully familiar with the nature of jobs assigned and safety precautions required.

- c) Due notice would be given for any change of personnel under item(b) above.

d) We hereby accept the responsibility for the safety of all the personnel engaged by us and for the safety of the Company's personnel and property involved during the course of our working under this contract. Any violation pointed out by the Company's engineers would be rectified forthwith or the work suspended till such time the rectification is completed by us and all expenditure towards this would be on our account.

- e) All losses caused due to inadequate safety measures or lack of supervision on our part would be fully compensated by us and the Company will not be responsible for any lapses on our part in this regard.

(Seal)

Yours Faithfully

Date_____

M/s_____

FOR & ON BEHALF OF BIDDER

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PART-VIII- INTEGRITY PACT
Annexure-A1

INTEGRITY PACT (Applicable)

Between

Oil India Limited (OIL) hereinafter referred to as "The Principal"

And

(Name of the bidder).....hereinafter referred to as "The
Bidder/Contractor"

Preamble:

The Principal intends to award, under laid down organizational procedures, contract/s for
..... The Principal values full compliance with all relevant laws and
regulations, and the principles of economic use of resources, and of fairness and transparency in its
relations with its Bidder/s and Contractor/s.

In order to achieve these goals, the Principal cooperates with the renowned international Non-
Governmental Organization "Transparency International" (TI). Following TI's national and
international experience, the Principal will appoint an external independent Monitor who will
monitor the tender process and the execution of the contract for compliance with the principles
mentioned above.

Section: 1 -Commitments of the Principal

(1) The Principal commits itself to take all measures necessary to prevent corruption and to observe
the following principles:

1. No employee of the Principal, personally or through family members, will in connection
with the tender for, or the execution of a contract, demand, take a promise for or accept, for
him/herself or third person, any material or immaterial benefit which he/she is not legally
entitled to.
2. The Principal will, during the tender process treat all Bidders with equity and reason. The
Principal will in particular, before and during the tender process, provide to all Bidders the
same information and will not provide to any Bidder confidential/additional information
through which the Bidder could obtain an advantage in relation to the tender process or the
contract execution.
3. The Principal will exclude from the process all known prejudiced persons.

(2) If the Principal obtains information on the conduct of any of its employees which is a criminal
offence under the relevant Anti-Corruption Laws of India, or if there be a Page 2 of 6 substantive

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suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section: 2 -Commitments of the Bidder/Contractor

(1) The Bidder/Contractor commits itself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

1. The Bidder/Contractor will not, directly or through any other person or firm, offer, promise or give to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material or immaterial benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2. The Bidder/Contractor will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, Subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

3. The Bidder/Contractor will not commit any offence under the relevant Anticorruption Laws of India; further the Bidder/Contractor will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

4. The Bidder/Contractor will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

(2) The Bidder/Contractor will not instigate third persons to commit offences outlined above or be an accessory to such offences.

(3) The Bidder/Contractor signing Integrity Pact shall not approach the Courts while representing the matters to IEMs and he/she will await their decision in the matter.

Section 3 -Disqualification from tender process and exclusion from future Contracts

If the Bidder, before contract award has committed a transgression through a violation of Section 2 or in any other form such as to put his reliability or risibility as Bidder into question, the Principal is entitled to disqualify the Bidder from the tender process or to terminate the contract, if already signed, for such reason.

1. If the Bidder/Contractor has committed a transgression through a violation of Section 2 such as to put his reliability or credibility into question, the Principal is entitled also to

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exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the circumstances of the case, in particular the number of

transgressions, the position of the transgressions within the company hierarchy of the Bidder and the amount of the damage. The exclusion will be imposed for a minimum of 6 months and maximum of 3 years.

2. The Bidder accepts and undertakes to respect and uphold the Principal's Absolute right to resort to and impose such exclusion and further accepts and undertakes not to challenge or question such exclusion on any ground, including the lack of any hearing before the decision to resort to such exclusion is taken. This undertaking is given freely and after obtaining independent legal advice.

3. If the Bidder/Contractor can prove that he has restored/recouped the Damage caused by him and has installed a suitable corruption prevention system, the Principal may revoke the exclusion prematurely.

4. A transgression is considered to have occurred if in light of available evidence no reasonable doubt is possible.

5. Integrity Pact, in respect of a particular contract, shall be operative from the date Integrity Pact is signed by both the parties till the final completion of the contract **or as mentioned in Section 9- Pact Duration whichever is later**. Any violation of the same would entail disqualification of the bidders and exclusion from future business dealings

Section 4 -Compensation for Damages

1. If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover from the Bidder liquidated damages equivalent to Earnest Money Deposit / Bid Security.

(2) If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to Section 3, the principal shall be entitled to demand and recover from the Contractor liquidated damages equivalent to Security Deposit / Performance Bank Guarantee.

3. The bidder agrees and undertakes to pay the said amounts without protest or demur subject only to condition that if the Bidder/Contractor can prove and establish that the exclusion of the Bidder from the tender process or the termination of the contract after the contract award has caused no damage or less damage than the amount or the liquidated damages, the Bidder/Contractor shall compensate the Principal only to the extent of the damage in the amount proved.

Section 5 -Previous transgression

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1. The Bidder declares that no previous transgression occurred in the last 3 years with any other Company in any country conforming to the TI approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

2. If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section: 6 -Equal treatment of all Bidders/Contractor/Subcontractors

1. The Principal will enter into Pacts on identical terms with all bidders and contractors.

2. The Bidder / Contractor undertake(s) to procure from all subcontractors a commitment in conformity with this Integrity Pact. The Bidder/Contractor shall be responsible for any violation(s) of the provisions laid down in this agreement/Pact by any of its sub-contractors/sub-vendors.

3. The Principal will disqualify from the tender process all bidders who do not sign this Pact or violate its provisions.

Section: 7 -Criminal charges against violating Bidders/Contractors/ Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor, which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section: 8 -External Independent Monitor/Monitors

1. The Principal appoints competent and credible external independent Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

2. The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the Chairperson of the Board of the Principal.

3. The Contractor accepts that the Monitor has the right to access without restriction to all Project documentation of the Principal including that provided by the Contractor. The Contractor will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The same is applicable to Subcontractors. The Monitor is under contractual obligation to treat the information and documents of the Bidder/Contractor/Subcontractor with confidentiality.

4. The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

5. As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or heal the

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violation, or to take other relevant action. The monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in

a specific manner, refrain from action or tolerate action. However, the Independent External Monitor shall give an opportunity to the bidder / contractor to present its case before making its recommendations to the Principal.

6. The Monitor will submit a written report to the Chairperson of the Board of the Principal within 8 to 10 weeks from the date of reference or intimation to him by the 'Principal' and, should the occasion arise, submit proposals for correcting problematic situations.

7. If the Monitor has reported to the Chairperson of the Board a Substantiated suspicion of an offence under relevant Anti-Corruption Laws of India, and the Chairperson has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8. The word 'Monitor' would include both singular and plural.

Section:9 -Pact Duration

This Pact begins when both parties have legally signed it. It expires for the Contractor 12 months after the last payment under the respective contract, and for all other Bidders 6 months after the contract has been awarded.

If any claim is made/ lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/determined by Chairperson of the Principal.

Section:10 -Other provisions

1. This agreement is subject to Indian Law. Place of performance and jurisdiction is the Registered Office of the Principal, i.e. New Delhi. The Arbitration clause provided in the main tender document / contract shall not be applicable for any issue / dispute arising under Integrity Pact.

2. Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

3. If the Contractor is a partnership or a consortium, this agreement must be, signed by all partners or consortium members.

4. Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

.....

For the Principal

.....

For the Bidder/Contractor

Witness 1:

Witness 2:

Place.

Date .

=====

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

CERTIFICATE FOR RESTRICTION OF PROCUREMENT (PROFORMA-A)

To
OIL INDIA LIMITED
For GM-C&P
PHQ, GUWAHATI
781171

Sub: IFB No. CGI6122P21

Gentlemen,

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. I hereby certify that this bidder fulfills all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

Dated this _____ day of _____

Authorised Person's Signature: _____

Name: _____

Designation: _____

Seal of the Bidder:

TENDER NO.: CGI 6122 P21
Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and
Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited
(OIL), Guwahati Assam.

=====

PROFORMA -B

PRICE BID AS PER FORMAT-A STATED ABOVE

=====

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

PROFORMA - C

BID FORM

To
THE GM (CONTRACTS)
OIL INDIA LIMITED
(A Govt. of India Enterprise)
P.O. GUWAHATI-781171
DIST. KAMRUP(M)
ASSAM

Sub: IFB No. : **CGI6122P21**

Dear Sir,

Having examined the General and Special Conditions of Contract and the Terms of Reference including all attachments thereto, the receipt of which is hereby duly acknowledged, we the undersigned offer to perform the services in conformity with the said conditions of Contract and Terms of Reference for the sum of ____ (Price not to be indicated) ____ stated below or such other sums as may be ascertained in accordance with the Price Bid Form attached herewith and made part of this Bid:

We undertake, if our Bid is accepted, to commence the work within (____) days calculated from the date of issue of Company's LOA.

We agree to abide by this Bid for a period of **120 days** from the date fixed for Bid opening and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

Until a formal Contract is prepared and executed, this Bid, together with your written acceptance thereof in your notification of award shall constitute a binding Contract between us.

We understand that you are not bound to accept the lowest or any Bid you may receive.

Dated this _____ day of _____ 2021.

Signature and seal of the Bidder: _____

(In the capacity of) : _____

Name of Bidder : _____

PROFORMA - D

STATEMENT OF COMPLIANCE /NON-COMPLIANCE

(Only exceptions/deviations to be rendered)

- 1.0 The Bidder shall furnish detailed statement of **exceptions/deviations**, if any, to the tender stipulations, terms and conditions in respect of each PART of Bid Document in the following format:

PART No.	Clause No. (Page No.)	Non-Compliance	Remarks

Authorised Person's Signature: _____

Name: _____

Designation: _____

Seal of the Bidder:

NOTE: OIL INDIA LIMITED expects the bidders to fully accept the terms and conditions of the bid document. However, should the bidders still envisage some exceptions/deviations to the terms and conditions of the bid document, the same should be indicated as per above format and submit along with their bids.

If the **“Statement of Compliance”** in the above Proforma is left blank (or not submitted along with the technical bid), then it would be construed that the bidder has not taken any exception/deviation to the tender requirements.

=====

=====

PROFORMA – E

DECLARATION FOR BID SECURITY

To,
M/s. Oil India Limited
.....,
.....

Sub:
Tender No:.....

Dear Madam/Sir,

After examining / reviewing provisions of above referred tender documents
(including all corrigendum/ Addenda), we M/s. (Name of Bidder) have
submitted our offer / bid no.....

We, M/s.(Name of Bidder) hereby understand that, according to
your conditions, we are submitting this Declaration for Bid Security.

We understand that we will be put on watch list/holiday/banning list (as per
policies of OIL INDIA in this regard), if we are in breach of our obligation(s) as per
following:

have withdrawn/modified/amended, impairs or derogates from the tender,
my/our Bid during the period of bid validity specified in the form of Bid; or

having been notified of the acceptance of our Bid by the OIL INDIA LIMITED
during the period of bid validity:

fail or refuse to execute the Contract, if required, or
fail or refuse to furnish the Contract Performance Security, in accordance
provisions of tender document.

Fail or refuse to accept 'arithmetical corrections' as per provision of tender
document.

having indulged in corrupt/fraudulent/collusive/coercive practice as per
procedure.

Place:
Bidder]
Date:

[Signature of Authorized Signatory of

Name:
Designation:
Seal:

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

PROFORMA-F

FORM OF PERFORMANCE BANK GUARANTEE

To:

M/s. OIL INDIA LIMITED,
(**GENERAL MANAGER -CONTRACTS**)
Guwahati, Assam, India, Pin – 781171

WHEREAS _____ (Name and address of Contractor)
(hereinafter called "Contractor") had undertaken, in pursuance of Contract No. _____ to execute (Name of Contract and Brief Description of the Work) _____ (hereinafter called "the Contract").

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee as security for compliance with Contractor's obligations in accordance with the Contract.

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee; NOW THEREFORE we hereby affirm that we are Guarantors on behalf of the Contractor, up to a total of (Amount of Guarantee in figures) _____ (in words _____), such amount being payable in the types and proportions of currencies in which the Contract price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of guarantee sum as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein. We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or the work to be performed thereunder or of any of the Contract documents which may be made between you and the Contractor shall in any way cease us from any liability under this guarantee, and we hereby waive notice of such change, addition or modification.

This guarantee is valid until the date _____ (calculated at **3 months** after Contract completion date).

SIGNATURE AND SEAL OF THE GUARANTORS _____

Designation _____

Name of Bank _____

Address _____

Witness _____

Address _____

Date _____

Place _____

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

Note: Bank details of Oil India Limited may be required by Bank for issuance of Bank Guarantee (BG):

BANK DETAILS OF BENEFICIARY		
a	Bank Name	AXIS BANK
b	Branch Name	GUWAHATI
c	Branch Address	CHIMBER HOUSE, G.S.ROAD, DISPUR ASSAM
d	Banker Account No.	140010200027654
e	Type of Account	CURRENT ACCOUNT
f	IFSC Code	UTIB0000140
g	MICR Code	781211002
h	SWIFT Code	Axisinbb140
i	Contact No.	8876501401
j	Contact Person Name	Mr. Dibakar Ghaosh
k	Fax No.	Not available
l	Email Id	<u>Guwahati.branchhead@axisbank.com</u>

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

PROFORMA-G**UNDERTAKING BY VENDOR ON SUBMISSION OF PERFORMANCE BANK GUARANTEE**

To,

The Oil India Limited

Materials/Contracts Department

Duliajan – 786 602

Assam

We

M/s

.....
 are submitting the performance security in favour of Oil India Limited, Duliajan in the form of bank guarantee bearing reference

no. for an amount of
 INR/USD/EUR valid up to

..... as per terms and conditions of our Purchase

Order/Contract No.....

PBG issuing bank details:-

Bank

Branch

IFS Code

Contact Details

E-mail Addresses Mobile

Telephone

Fax

Correspondence Address

H No/Street/City

State

Country

Pin Code

Declaration:-

We have arranged to send the confirmation of issuance of the performance bank guarantee via SFMS portal

through our bank using the details mentioned in the contract/purchase order and hereby confirming the correctness

of the details mentioned.

Authorised Signature_____

Name_____

Vendor Code_____

Email ID_____

Mobile No _____

Encl: Original performance bank guarantee

Mobile No _____

Encl: Original performance bank guarantee

.....
 =====

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

PROFORMA -H

LETTER OF AUTHORITY

To
THE GM (CONTRACTS)
OIL INDIA LIMITED
(A Govt. of India Enterprise)
P.O. GUWAHATI-781171
DIST. KAMRUP(M)
ASSAM

Sir,

Sub: IFB No. **CGI6122P21**

We _____ confirm that Mr. _____
(Name and address) as authorized to represent us to Bid, negotiate and conclude
the agreement on our behalf with you against Invitation
No.:_____ for

**“Construction of Office Building for Centre of Excellence for Energy Studies
(CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ)
Township, Oil India Limited (OIL), Guwahati Assam.”**

We confirm that we shall be bound by all and whatsoever our said representative
shall commit.

Yours Faithfully,

Signature: _____
Name : _____
Designation: _____
For & on behalf of: _____

Note: This letter of authority shall be printed on letter head of the Bidder and
shall be signed by a competent person to bind the Bidder.

=====

TENDER NO.: CGI 6122 P21
Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and
Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited
(OIL), Guwahati Assam.

=====

PROFORMA-I

AUTHORISATION FOR ATTENDING BID OPENING

Date: _____

TO
GM (C&P)
CONTRACTS & PURCHASE DEPARTMENT
OIL INDIA LTD., PHQ
GUWAHATI-781171
ASSAM, INDIA

Sir,

Sub: OIL's e-Tender No. CGI6122P21

We hereby authorise Mr. /Ms. _____ (Name and address) to be present at
the time of Pre-Bid Meeting / Un-priced Bid Opening / PriceBid Opening and for
any subsequent correspondence / communication of the above Tender due on
_____ on our behalf.

Yours Faithfully,

Authorised Person's Signature: _____

Name: _____

Designation: _____

Seal of the Bidder:

Note: This letter of authority shall be on printed letter head of the Bidder and
shall be signed by a person who signs the bid.

=====

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

PROFORMA – J**CERTIFICATE OF ANNUAL TURNOVER & NET WORTH**

[TO BE ISSUED BY PRACTISING CHARTERED ACCOUNTANTS' FIRM ON THEIR LETTER HEAD]

TO WHOM IT MAY CONCERN

This is to certify that the following financial positions extracted from the audited financial statements of M/s... .. (Name of the Bidder) for the last three (3) completed accounting years up to (as the case may be) are correct.

YEAR	TURN OVER In INR Crores	NET WORTH In INR Crores

Place :

Date:

Seal:

Membership No ..

Registration Code:

Signature :

PROFORMA- K

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

[TO BE FILLED-UP / SUBMITTED BY THE VENDOR ON ITS LETTER HEAD
FOR E-REMITTANCE]

Name:

FULL Address:

Phone Number :

Mobile Number :

E-mail address :

FAX Number :

Bank Account Number:
(in which the Bidder wants remittance against invoices)

Bank Name :

Branch :

Address of the Bank:

Bank Code :

IFSC/RTGS Code of the Bank:

NEFT Code of the Bank :

PAN Number :

GST Registration Number:

Signature of Vendor with Official Seal

Note: This declaration shall be printed on letter head of the Bidder and shall be signed by a competent person.

PROFORMA-L

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

FORMAT FOR UNDERTAKING
(IN TERMS OF **TENDER NO. CGI6122P21**
(On Non-Judicial Stamp Paper of Rs. 100/-)
TO BE NOTORISED

To
GM-CONTRACTS
OIL INDIA LIMITED
GUWAHATI

Dear Sirs,

UNDERTAKING/DECLARATION BY THE BIDDER IN RESPECT OF TENDER NO
CGI6122P21

This is in connection with the Bid submitted by me/us, ... (Name of Bidder), against Tender No. **CGI6122P21** for **“Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.”**

I/We, the afore mentioned Bidder against the subject tender, hereby declare that my/our quoted rates include the following -

- (a) Labour wages as per Minimum Wages Act and notifications issued by the Central Govt. from time to time, including P.F, insurance and Bonus.
- (b) Material and Equipment (if any) cost.
- (c) PPE cost.
- (d) IME (Initial Medical Examination) cost.
- (e) Other charges / cost including overheads, profit, insurance and handling charge..

I/We, the afore mentioned Bidder against the subject tender take note that minimum wages may increase from time to time as notified by statutory authority and Central Govt. and undertake that I/We shall not make Company (i.e. OIL) liable to reimburse me/us for such statutory increase in wage rates of the labours/workers engaged by me/us during the entire period of the contract, including extension if any. Currently, such increase in the wage rates is twice in a year. I/We have bid after considering this increase in wage rates for the entire period of Contract including extension provision.

I/We, the afore mentioned Bidder against the subject tender, further undertake that I/We will pay my/our workers the existing Daily wages as notified under the Minimum Wages Act from time to time by the Central Govt. and such statutory or any other increase in the wages rates including consequent increase in statutory contributions like provident fund etc. of contract labours engaged by me/us shall be

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

borne solely by me/us during the entire period of the contract, including extension if any, without any cost implication whatsoever upon the Company.

I/We further agree and undertake that in case of any violation of the above undertaking, Oil India Limited (OIL) shall be at liberty to take appropriate action against me/us in terms of the Tender/Contract including but not limited to termination of contract and debarment from future business with OIL. I shall duly comply with all the statutory obligations, more particularly under applicable labour laws. I further agree and undertake that in case of any dispute or claims arise out of my non-compliance of statutory obligations under the Contract, by the Labourers engaged by me or by any statutory authorities, I shall only be responsible for the same and hold the Company harmless against such dispute or claims. I further authorize the Company, in the event of my default or non-compliance of any statutory obligations, to deduct/recover and adjust such amount or claim against my Bills due under the Contract or against any other existing or future Contracts with the Company including performance security.

I/We declare that the information given above is true and any misstatement, misrepresentation, or suppression of facts in connection with the above undertaking may entail rejection of the bid and cancellation of contract, if awarded.

Yours faithfully,

1. Authorized Signatory with Seal

(Bidder)

Place:-

Date:-

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

PROFORMA-M

To,

General Manager (F&A)-PL

Oil India Limited

Pipeline HQ, Narangi , Guwahati ,Assam-781171

Dear Sir,

Sub: E-Payments vide RTGS/NEFT

I/We request and hereby authorise you to execute E-Payment vide RTGS/NEFT modes to My /Our Bank account as per the details given below:

(A) BANK DETAILS

1. Bank A/c No. (Must Enclose Cancelled Cheque)
2. Account Type Saving Bank/ Curent Account
3. Bank Branch
4. Bank Address
5. IFSC Code
6. MICR No.

(B) VENDOR DETAILS :

1. Vendor Code (See the vendor code given in the PO/Contract)
2. Name
3. PAN No. (Must enclosed self-attested photo copy of PAN Card)
4. Address with Mobile/Telephone No.
5. ~~VAT TIN No.~~
6. ~~CST Regn. No.~~
7. GST No.
8. ~~Central Excise Regn.No.~~
9. Email ID

I/We hereby declare that the particulars given above are correct and complete. I/We confirm that I/we shall bear the charges, if any levied by my/our bank for the credit in our above account through NEFT. If the transaction is delayed or lost because of incomplete or incorrect information, we would not hold the company responsible.

Thanking you,

Date:
Stamp

Authorised Signatory &

.....
.....

Bank Certificate

We confirm that the details given above are correct as per our records.

Date:

Place:

Bank Official

Signature, Code & Stamp of Authorised

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

PROFORMA-N

Format of Undertaking by Bidders towards submission of authentic information/documents

(To be typed on the letter head of the bidder)

To,

General Manager (Contracts)-PL

Oil India Limited

Pipeline HQ, Narangi , Guwahati ,Assam-781171

Subject: Undertaking of Authenticity of Information/documents submitted

Refer : Tender No.....Dated.....

Sir/Madam

With reference to our quotation against your above-referred tender, we hereby undertake that no fraudulent information/documents have been submitted by us.

We take full responsibility for the submission of authentic information/documents against the above cited bid.

We also agree that, during any stage of the tender/contract agreement, in case any of the information/documents submitted by us are found to be false/forged/fraudulent , OIL has right to reject our bid at any stage including forfeiture of our EMD and/or PBG and/or cancel the award of contract and/or carry out other penal action on us, as deemed fit.

Yours faithfully,

For (type name of the firm here)

Signature of Authorised Signatory

Name:

Designation:

Phone No:

Place:

Date:

(Affix seal of the Organization here, if applicable)

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

PROFORMA -O

Proforma of Bank Guarantee towards Purchase Preference – Local Content

Ref. No. _____ Bank Guarantee No. _____
Dated _____

To
Oil India Limited

India

Dear Sirs,

1. In consideration of _____ (hereinafter referred to as OIL, which expression shall, unless repugnant to the context or meaning thereof, include all its successors, administrators, executors and assignees) having entered into a CONTRACT No. _____ dated _____ (hereinafter called 'the CONTRACT' which expression shall include all the amendments thereto) with M/s _____ having its registered/head office at _____ (hereinafter referred to as the 'CONTRACTOR') which expression shall, unless repugnant to the context or meaning thereof include all its successors, administrators, executors and assignees) and OIL having agreed that the CONTRACTOR shall furnish to OIL a Bank guarantee for India Rupees/US\$ _____ for the faithful fulfillment of conditions pertaining to Local Content in accordance with the value mentioned in the certificate of Local Content submitted by the contractor for claiming purchase preference under the Purchase Preference Policy (linked with Local Content).

2. We (name of the bank) _____ registered under the laws of _____ having head/registered office at _____ (hereinafter referred to as "the Bank", which expression shall, unless repugnant to the context or meaning thereof, include all its successors, administrators, executors and permitted assignees) do hereby guarantee and undertake to pay to OIL immediately on first demand in writing any / all money to the extent of Indian Rs./US\$ (in figures) _____ (Indian Rupees/US Dollars (in _____ words) _____) without any demur, reservation, contest or protest and/or without any reference to the CONTRACTOR. Any such demand made by OIL on the Bank by serving a written notice shall be conclusive and binding, without any proof, on the bank as regards the amount due and payable, notwithstanding any dispute(s) pending before any Court, Tribunal, Arbitrator or any other authority and/or any other matter or thin whatsoever, as liability under these presents being absolute and unequivocal. We agree that the guarantee herein contained shall be irrevocable and shall continue to be enforceable until it is discharged by OIL in writing. This guarantee shall not be determined, discharged or affected by the liquidation, winding up, dissolution or insolvency of the CONTRACTOR and shall remain valid, binding and operating against the bank.

3. The Bank also agrees that OIL at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance, without proceeding against the CONTRACTOR and notwithstanding any security or other guarantee that OIL may have in relation to the CONTRACTOR's liabilities.

4. The Bank further agrees the OIL shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said CONTRACT or to extend time of performance by the said CONTRACTOR(s) from time to time or to postpone for any time or from time to time exercise of any of the powers vested in OIL against the said CONTRACTOR(s) and to forbear or enforce any of the terms and conditions relating to the said agreement and we shall not be relived from our liability by reason of any such variation, or extension being granted to the said CONTRACTOR(s) or for any forbearance, act or omission on the part of OIL or any indulgence by OIL to the said CONTRACTOR(s) or any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

=====

5. The Bank further agrees that the Guarantee herein contained shall remain in full force during the period that is taken for the performance of the CONTRACT and all dues of OIL under or by virtue of this CONTRACT have been fully paid and its claim satisfied or discharged or till OIL discharges this guarantee in writing, whichever is earlier.
6. This Guarantee shall not be discharged by any change in our constitution, in the constitution of OIL or that of the CONTRACTOR.
7. The Bank confirms that this guarantee has been issued with observance of appropriate laws of the country of issue.
8. The Bank also agrees that this guarantee shall be governed and construed in accordance with Indian Laws and subject to the exclusive jurisdiction of Indian Courts of the place from where the purchase CONTRACT has been placed.
9. Notwithstanding anything contained herein above, out liability under this Guarantee is limited to INR in figures) _____ (Indian Rupees/US Dollars (in words) _____) and our guarantee shall remain in force until _____ (indicate the date of expiry of bank guarantee).

Any claim under this Guarantee must be received by us before the expiry of this Bank Guarantee. If no such claim has been received by us by the said date, the rights of OIL under this Guarantee will cease. However, if such a claim has been received by us within the said date, all the rights of OIL under this Guarantee shall be valid and shall not cease until we have satisfied that claim.

In witness whereof, the Bank through its authorized officer has set its hand and stamp on this _____ date of _____ 20__ at _____

WITNESS NO.1

(Signature)
Full name and official address
(in legible letters)
Stamp

(Signature)
Full name, designation and address
(in legible letters)
With Bank

WITNESS NO.2

Attorney as per power of
Attorney No. _____
Dated _____

(Signature)
Full name and official address
(in legible letters)
Stamp

Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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APPENDIX-A

GENERAL HSE POINTS

1.0 It will be solely the Contractor's responsibility to fulfil all the legal formalities with respect in the Health, Safety & Environmental aspects of the entire job (namely, the persons employed by him, the equipment, the environment etc.) under the jurisdiction of the district of that state where it is operating. Ensure that all sub-Contractors hired by him comply with the same requirement as the Contractor himself and shall be liable for ensuring compliance all HSE laws by the sub or sub-Contractors.

2.0 Every person deployed by the Contractor in a mine must wear safety gadgets to be provided by the Contractor. The Contractor shall provide proper Personnel Protective Equipment as per the hazard identified and risk assessed for the job and conforming to statutory requirement and the Company PPE schedule. Safety appliances like protect footwear, safety helmet and full body harness has to be DGMS approved. Necessary supportive document shall have to be submitted as proof. If the Contractor fails to provide the safety items as mentioned above to the working personnel, the Contractor may apply to the Company (OIL) for providing the same. OIL will provide the safety items, if available, but in turn. OIL will recover the actual cost of the items by deducting from Contractor's bill. However, it will be the Contractor's sole responsibility to ensure that the persons engaged by him in the mines use the proper PPE while at work. All the safety gears mentioned above are to be provided to the working personnel before commencement of the work.

3.0 The Contractor shall prepare written Safe Operating Procedure (SOP) for the work to be carried out, including as assessment of risk, wherever possible and safe methods to deal with it/them. The SOP should clearly state the risk arising to men, machineries and materials from the mining operation/operations to be done by the Contractor and how it is to be managed.

4.0 The Contractor shall provide a copy of SOP to the person designated the Mine Owner who shall be supervising the Contractor's work.

5.0 Keep an up to date SOP and provide a copy to changes to a person designed by the Mine Owner/Agent/Manager

6.0 The Contractor has to ensure that all work is carried out in accordance with the Statute and SOP and for the purpose he may deploy adequate qualified and competent personnel for the purpose of carrying out the job in a safe manner. For work of a specified scope/nature, he should develop and provide to the Mine Owner a site

7.0 All persons deployed by the Contractor for working in mine must undergo Mines Vocational Training, initial medical examination, PME. They should be issued cards stating the name of the Contractor and the work and its validity period, indicating status of MVT, IME & PME.

8.0 The Contractor shall submit to DGMS indicating – name of his firm Registration Number, name 7 Address of person heading the firm, nature of work, type of deployment of work persons, No. of work persons deployed, how many work persons hold VT Certificate, how many work persons undergone IME and type of medical coverage given to the work persons.

9.0 The return shall be submitted quarterly (by 10th of April, July, October & January) for contracts of more than one year. However, for contracts of less than one year, returns shall be submitted monthly.

10.0 It will be entirely the responsibility of the Contractor/ his Supervisor/Representative to ensure strict adherence to all HSE measures and statutory rules during operation in Oil's installations and safety of workers engaged by him. The crew members will not refuse to follow any instruction given by the Company's Installation Manager/Safety Officer/Engineer/Official/Supervisor/Junior Engineer for safe operation.

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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11.0 Any compensation arising out of the job carried out by the Contractor whether related to pollution, Safety or Health will be paid by the Contractor only.

12.0 Any compensation arising due to accident of the Contractor's personnel while carrying out the job, will be payable by the Contractor.

13.0 The Contractor shall have to report all incidents including near miss to installation manager/Departmental Representative of concerned department of OIL.

14.0 The Contractor has to keep a register of the persons employed by him/her. The Contractor's supervisor shall take and main attendance of his men every day for the work, punctuality.

15.0 If the Company arranges any safety class/training for the working personnel at site (Company employees, Contractor worker etc.) the Contractor will not have any objection to any such training.

16.0 The health check-up of Contractor's personnel is to be done by the Contractor in authorized Health Centres as per Oil's requirement & proof of such test(s) is to be submitted to OIL. The frequency of periodic medical examinations should be every five years for the employees below 45 years of age and every three years for employees of 45 years of age and above.

17.0 To arrange daily tool box meeting and regular site safety meeting and maintain records.

18.0 Records of daily attendance, accident report etc. are to be maintained in Form B,E,J (as per Mines Rules 1955) by the Contractor

19.0 A Contractor employee must, while at work, take reasonable care for the health and safety of people who are all the employee's place of work and who may be affected by the employee's act or omissions at work.

20.0 A Contractor employee must, while at work, co-operate with his or her employer or other persons so far as is necessary to enable compliance with any requirement under the act or the regulations that is imposed in the interest of health, safety and welfare of the employee or any other person.

21.0 Contractor's arrangements for health for health and safety management shall be consistent with those for the mine owner.

22.0 In case Contractor is found non-compliant of HSE laws as required the Company will have the right for directing the Contractor to take action comply with the requirements, and for further non-compliance, the Contractor

23.0 When there is a significant risk to health, environment or safety of a persons or pace arising because of a non-compliance of HSE measure the Company will have the right to direct the Contractor to cease work until the non-compliance is corrected.

24.0 The Contractor should prevent the frequent change of his contractual employees as far as practicable.

25.0 The Contractor should frame a mutually agreed bridging document between OIL and the Contractor with roles and responsibilities clearly defined.

26.0 For any HSE matters not specified in the Contract document, the Contractor will abide the relevant and prevailing Acts/Rules/Regulations pertaining to Health, Safety and Environment.

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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Appendix-B

Procedure for obtaining Labour License under Contract Labour (R&A) Act, 1970 & Central Rules-1971

Every Contractor to whom this Act applies shall execute any work through Contract Labour only after obtaining valid license from Licensing Officer. To obtain license contractor is required to submit:

- i) Application in Form IV in triplicate duly filled (Name of the Proprietor/Partner or the Directors/Responsible person in case of firm/company, complete postal address including Pin Code number, Telephone Number, Fax Number & E-mail address, if any), correct details of PE and work to be executed etc. correctly against all columns;
- ii) In case contractor is registered under the Companies Act and applicant is other than Director then he should be holding valid Power of Attorney.
- iii) Original Form-V issued by PE
- iv) Demand Draft for license fees and security deposit payable in favour of Regional Labour Commissioner (Central), Ajmer along with duly filled central challan (in TR-6) duly signed by applicant in quadruplicate for each demand draft;
- v) Copy of Work Order;
- vi) Copy of Partnership Deed and in case of Company, the application should be accompanied with Memorandum of Association/Article of Association;

Note: 1. Application form complete in all respect shall be either personally delivered to the Licensing Officer or can be sent by Registered A.D. Post.

2. Contractors, may intimate Dy. Chief Labour Commissioner (Central), Ajmer for expediting/suitable action if they do not receive license nor any communication within a week.

3. Contractors are not required to visit office of Licensing Officer unnecessarily for obtaining license until and unless they have been specifically advised to appear in person. Appearance of contractors in the office of licensing officer for obtaining license by persuasion will be viewed seriously.

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APPENDIX- C

Provisions for procurement of Services pertaining to Oil & Gas business activities covered under Purchase Preference Policy (linked with Local Content) (PP-LC).

This tender will be governed by the Purchase preference policy (linked with Local Content) (PP-LC) of Ministry of Petroleum & Natural Gas, Government of India. Indian Bidders are advised to refer notification no. O-27011/44/2016-ONG-II/FP dtd. 25.04.2017 and subsequent amendments, if any, and submit the necessary documents, declaration, undertaking etc. as per the policy guidelines along with their bid. As per the PP-LC policy, 50% of the tendered quantity would be awarded to the lowest techno-commercially qualified LC (Local Content) manufacturer / supplier which are within the price band of 10% of the L1, subject to matching the L1 price. The tendered quantity is not splittable / non-dividable / cannot be procured from multiple sources. Hence, the entire procurement value shall be awarded to the lowest techno-commercially qualified LC bidder subject to matching with valid NLC L1 rates. Bidders seeking Purchase preference (linked with Local Content) (PP-LC) shall be required to meet / exceed the target of Local Content (LC) as per values furnished vide original notification of the policy and subsequent amendments applicable as on the bid closing date. The remaining quantity will be awarded to L1 (i.e. Non-Local Content (NLC) manufacturer / supplier not meeting prescribed LC criteria). In case a bidder is eligible to seek benefits under PP-LC policy as well as Public Procurement Policy for MSEs-Order 2012, then the bidders should categorically seek benefits against only one of the two policies i.e. either PP-LC or MSE policy. If a bidder seeks EMD exemption under the MSE policy, then it shall be considered that the bidder has sought benefit against the MSE policy and this option once exercised cannot be modified subsequently. Evaluation of bids with reference to PP-LC policy shall be done by OIL based on the documents submitted by the bidder. OIL shall not be responsible for any incorrect/incomplete submission of documents by bidder leading to non-compliance to PP-LC policy and denial of benefits under the policy.

The bidder, who has been awarded the contract after availing Purchase Preference linked with Local Content, shall have to submit additional Bank Guarantee (format attached at Proforma-FA) equivalent 10% of total contract value.

A bidder who has been awarded the contract after availing Purchase Preference is found to have violated the LC provision, in the execution of the procurement contract of goods and/or services shall be subject to financial penalty over and above the PBG value prescribed in the contract and shall not be more than an amount equal to 10% of the Contract Price.

--END OF TENDER DOCUMENT--

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Construction of Office Building for Centre of Excellence for Energy Studies (CoEES) and Pipeline Headquarters(PHQ) at Pipeline Headquarters(PHQ) Township, Oil India Limited (OIL), Guwahati Assam.

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CHECKLIST

DATE:

TENDER NO: CGI6122P21

BIDDER:

☒ = SUBMITTED, ☐= NOT SUBMITTED

<i>DOCUMENTS TO BE SUBMITTED ALONG WITH THE BID</i>	<i>SUBMITTED/NOT SUBMITTED</i>	<i>REMARKS</i>
Certificate for restriction of procurement (Proforma-A)		
Price Schedule Format, (Proforma-B)		
Bid Form, (Proforma-C)		
Statement of compliance/ Non compliance (Proforma-D)		
Bid Security declaration Form (Proforma-E)		
Performance Security Form, (Proforma-F)		
Undertaking on BG (Proforma-G)		
Letter of Authority (Proforma-H)		
Authorisation for attending (Proforma-I)		
Certificate of Annual Turnover (Proforma J)		
E-remittance declaration (Proforma K)		
Undertaking related to labour wages(Proforma L)		
E-remittance declaration (Proforma M)		
Format of undertaking by Bidders towards submission of authentic information/documents (Proforma –N)		

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PP-LC (Proforma O)		
INTEGRITY PACT –PART VIII (ANNEXURE-A1)		
