OIL INDIA LIMITED

(A Government of India Enterprise)
P.O. Duliajan, Pin – 786602
Dist-Dibrugarh, Assam
Website: www.oil-india.com

CORRIGENDUM NO. 1 DATED 30.10.2026 TO E-TENDER NO. CPI2972P27

IFB No. CPI2972P27 for "Engineering, Procurement, Construction & Commissioning of an Enclosed Ground Flare System of Capacity 4.5 MMSCMD at CGGS & OTP, Madhuban, Duliajan in the district of Dibrugarh in Assam".

This Corrigendum is issued to notify the following with respect to the tender:

1.0 Minutes of the Pre-Bid Meeting is attached as **Annexure-I**. OIL's responses to the pre-bid queries raised by the bidders is attached as **Annexure-II** and the attendance sheet is attached as **Annexure-III.**

2.0 A Plot Plan (in part) of the existing installation, indicating the tentative location of the new EGF and the tie in points has been incorporated in the SCC of the tender. The Plot Plan is attached as **Annexure-A** to this corrigendum.

3.0 Soil Test Report along with the topography report of an adjacent installation to CGGS Madhuban has been incorporated in the SCC of the tender. The Report is attached as **Annexure-B** to this corrigendum.

4.0 Certain clauses of the existing tender have been modified. Please refer to **Annexure-IV** for details.

5.0 All other terms and conditions of the tender remain unchanged.

All the prospective bidders are requested to regularly visit OIL's website: www.oil-india.com and e-procurement portal https://etender.srm.oilindia.in/irj/portal for further announcements/ latest information related to the tender.

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(A Govt. of India Enterprise)
P.O. DULIAJAN, DIST - DIBRUGARH
ASSAM, INDIA, PIN-786602

PROJECTS DEPARTMENT
TEL: (91) 374-2807207
E-mail: *prodproj@oilindia.in*
Website: www.oil-india.com

MINUTES OF PRE-BID MEETING

Tender No.	CPI2972P27
Description	Engineering, Procurement, Construction & Commissioning of an Enclosed Ground Flare System of Capacity 4.5 MMSCMD at CGGS & OTP, Madhuban, Duliajan in the district of Dibrugarh in Assam
Date & Time	27.10.2026, 10 AM onwards
Venue	Conference Room, CGGS Madhuban, Oil India Limited, Duliajan

The Pre-Bid conference was held in hybrid mode (physical as well as VC) in the Conference room of CGGS Madhuban, Duliajan. The meeting was attended by representatives from OIL and 0 (two) prospective bidders:

i) M/s Combustion Research Associates (CRA) (Physical)
ii) M/s ZEECO (Physical)
iii) M/s Hal Offshore Limited (Physical as well as VC)
iv) M/s SOPAN O&M Company Pvt. Ltd. (VC)
v) M/s L-Tech Industrial Solutions (VC)
vi) M/s Instrutech (Physical)

The pre-bid meeting was organized to address the queries raised by the bidders for the said tender within the pre-bid query submission deadline.

CE (Projects) opened the meeting by introducing the attendees from OIL and welcomed all representatives of the prospective bidders present in the meeting. The representatives of the prospective bidders also introduced themselves. This was followed by a short presentation from OIL regarding the project deliverables, evaluation criteria, payment terms etc.

As requested by several bidders prior to the pre-bid meeting, VC link was also provided to enable those representatives of the bidders to join virtually, who could not be physically present in the pre-bid meeting due to unavoidable reasons.

OIL discussed and clarified the pre-bid queries of all prospective bidders pointwise. It was mentioned in the meeting that the final reply against each pre-bid query shall be published in the tender portal and same will be treated as part of the tender conditions and shall be binding on both OIL and bidders. The queries received & clarifications given, during the meeting is enclosed as **Annexure–II**.

The meeting ended with a vote of thanks to the chair.

DETAILS OF PARTICIPANTS IN PRE-BID MEETING				
OIL's Representatives		**Bidder's Representatives**		
Sl. No.	**Name**	**Sl. No.**	**Name**	**Firm's Name**
1	Shri Lokrak Nilling, DGM (Projects-Electrical)	1	Shri Yandutt Mishra (Attended through VC)	M/s HAL Offshore Ltd
2	Shri Rajib Kumar Sarmah (DGM – Electrical) – *Through VC*	2	Shri Abhishek Jain (Attended through VC)	
3	Shri M. Bikramjit Singha, DGM-Projects (C&P)	3	Smt. Prachi Jadhav	
4	Shri Indra Kamal Kalita, DGM (GMS)	4	Shri Santosh Kr. Navik (Attended through VC)	
5	Shri Dhrubajyoti Kalita, DGM (GMS)	5	Shri Sagar Patil	M/s ZEECO
6	Shri Jogesh Deori, DGM (GMS)	6	Shri Aniket Gulavani	
7	Shri Sanjeev Thakur, CE-Projects	7	Shri Ashu Tiwari	M/s CRA
8	Shri Mirzanur Rahman, Dyce (GMS-Inst.)	8	Shri Aditya Shinde	M/s SOPAN
9	Shri Saurabh Baishya, Manager-Projects (C&P)	9	Shri Suraj Kumar	M/s L-Tech
10	Shri Nampelli Hareesh, Manager (F&A)	10	Shri M. Tamuly	M/s Instrutech
11	Shri Alwin M.N., SE (HSE)			
12	Shri Manish Baruah, SE(Projects)			
13	Shri Chintada Raja Rao, Sr.E(GMS-EE)			
14	Shri Debasish Das, Sr.E (GMS)			

Note: The attendance sheet of the pre-bid meeting is attached as **Annexure-III.**

PRE-BID RESPONSES

SI No.	Part/Volume of tender	Clause no.	Subject	Bidder's Query	OIL's Response
1	-	-	-	Technical specifications of all disciplines are required.	It should be as per standards specified in the tender.
2	-	-	-	Required overall plot plan (existing)	A plot plan (in part) of the existing installation has been provided as **Annexure-A** to this corrigendum, indicating the tentative location of the new EGF and the tie in points.
3	-	-	-	Equipment layout of proposed facilities is required.	It is under the scope of the bidder.
4	-	-	-	Tentative Sizes, dimensions, details of proposed facilities are required.	It is under the scope of the bidder.
5	-	-	-	Existing survey report, Topography report required.	Bidder may carry out necessary tests/survey prior to bid submission at their own costs and responsibilities. Necessary permission shall be provided by OIL. However, for reference only, a soil test report along with the topography report of an adjacent installation is provided as **Annexure-B** to this corrigendum.
6	-	-	-	As per tender document, Soil investigation is to be done by Bidder. In tender document only single page is provided as soil report which is insufficient. Kindly provide the complete existing soil investigation	Bidder may carry out necessary tests/survey prior to bid submission at their own costs and responsibilities. Necessary permission shall be provided by OIL. However, for reference only, a soil test report along with the topography report of an

SI No.	Part/Volume of tender	Clause no.	Subject	Bidder's Query	OIL's Response
				report including bore logs, test data and recommendations, if available.	adjacent installation is provided as **Annexure-B** to this corrigendum.
7	-	-	-	Detail drawings of existing facilities are required.	Response is same as under Sl no. 2 above.
8	-	-	-	Upon detailed review of the Bid Evaluation Criteria (BEC) / Bid Rejection Criteria (BRC), specifically Clause No. 4 (Financial Evaluation Criteria), Sub-Clause 4.4 (Bid Capacity), we note the prescribed minimum Available Bid Capacity requirement of ₹69,36,99,094.00 (Rupees Sixty-Nine Crore Thirty-Six Lakh Ninety-Nine Thousand Ninety-Four only). While our organization fully satisfies all other Technical/ financial eligibility parameters—including Average Annual Financial Turnover, Net Worth, and Working Capital—the current Bid Capacity stipulation acts as a constraint to our formal participation in this tender. To encourage wider participation and ensure competitive bidding, we respectfully request your good office to review Sub-Clause 4.4 and kindly	Bid Capacity as specified in the tender remains unchanged.

SI No.	Part/Volume of tender	Clause no.	Subject	Bidder's Query	OIL's Response
				consider a suitable relaxation in the minimum Bid Capacity requirement.	
9	-	-	-	With reference to the Bid Evaluation Criteria/Bid Rejection Criteria, Clause No. 4– Financial Evaluation Criteria, Sub-Clause 4.4 – Bid Capacity, we would like to humbly bring to your kind attention a concern regarding the prescribed bid capacity requirement of Rs. 69,36,99,094.00. We are pleased to inform you that we fulfil the specified turnover, net worth, and working capital criteria. However, due to the bid capacity requirement under Clause 4.4, we are facing difficulty in qualifying for this tender, despite having the relevant technical expertise and experience in the specialized field of gas flaring systems. We sincerely request your good office to kindly consider relaxing or suitably amending the bid capacity requirement under Clause 4.4 by either of the following options: 1. Kindly consider revising the	Bid Capacity as specified in the tender remains unchanged.

SI No.	Part/Volume of tender	Clause no.	Subject	Bidder's Query	OIL's Response
				minimum bid capacity requirement to Rs. 50,00,00,000.00; or 2. Alternatively, kindly consider revising the multiplier in the prescribed formula from 1.5 to 2.0, if deemed appropriate.	
10	-	-	-	We recommend to reducing the minimum qualifying capacity to 0.5 MMSCMD, may allow more experienced bidders to participate and increase competitions. We kindly request OIL to revisit the criterion under Clause 2.2 (i).	OIL shall review the BEC/BRC.
11	-	-	-	We sincerely request OIL to kindly review our submission and consider our executed project of 2.1 MMSCMD for compliance with the specified BQC requirements, subject to the applicable tender provisions.	OIL shall review the BEC/BRC.
12	-	-	-	We can provide the complete engineering, material supply along with supervision for installation and commissioning on a day-to-day basis. We kindly request OIL to confirm your acceptance of the above arrangement so that our team can proceed with the necessary actions accordingly.	Tender Conditions prevails.

SI No.	Part/Volume of tender	Clause no.	Subject	Bidder's Query	OIL's Response
13	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	9.2	Mechanical Fabrication & Erection Work	Kindly provide the plot plan showing all the tie-ins & battery limits for utilities (fuel gas, Instrument air, etc. as applicable) and location of KOD, Liquid Seal Drum (LSD), ruting flare header from KOD to LSD and LSD to EGF	A plot plan (in part) of the existing installation has been provided as **Annexure-A** to this corrigendum, indicating the tentative location of the new EGF and the tie in points.
14	Annexure-II		Available pressure, Operating temperature at the inlet of EGF	Kindly provide Available pressure and operating temperaure of flare gas at the inlet of EGF	Flare KOD pressure to be maintained @0.5ksc as mentioned in the tender with the gas composition as detailed in it.
15	Annexure-I		Plot plan	Kindly provide equipment layout and pipe routing	A plot plan (in part) of the existing installation has been provided as **Annexure-A** to this corrigendum, indicating the tentative location of the new EGF and the tie in points.
16	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	6.5.8 Knock-out Drum	KOD Pump	Kindly provide datasheet or critical process design parameters of KOD pumps	It is under bidder's scope as per tender requirements.
17	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	6.5.9	Water Seal Drum	Zeeco envisage that Water Seal drum should not be applicable for the EGF as there are no chnaces of back firing due to manifold and runner arnagment of flare gas lines in the combustion chamber. Removing WSD would also aloow us more vailable pressure at the inlet of EGF.	It is under bidder's scope as per tender requirements.
18	Part-II: Scope of	7	DETAILED ENGINEERING &	We request safety studies such as HAZOP, QRA, FERA, Environmental	All applicable studies to be carried out by the bidder as specified in the tender for EGF.

SI No.	Part/Volume of tender	Clause no.	Subject	Bidder's Query	OIL's Response
	Work/Terms of Reference (SOW/TOR)		DESIGN, Process Safety Studies:	Risk Assessment (ERA) shall be done by customer/client including Environment Clearance. However, bidder shall assist owner with required support of drawings and documentation related to Ground flare package.	
19	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	6.5 (6.5.6)	Detailed specifications of the sub systems: (6.5.6 Features required for the High Voltage Ignitor)	The High Energy ignition cable & High tempreature TC cable shall be zeeco standard cable.	Bidder is not restricted for the same in the tender.
20	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	6.2	GENERAL REQUIREMENTS & SPECIFICATIONS (Structural design)	Kindly provide specifications for Structural Design.	For any structures, it will be under bidder's scope referring the minimum specifications provided in the tender.
21	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	6.5.2	The Refractory Lining	Zeeco does not recommend refractory lining on combustion chamber. Zeeco design provides ceramic lining on combustion chamber.	Bidder is not restricted to use Ceramic Lining. In this regard, please refer to **Annexure-IV** of this corrigendum for revision of tender clauses.
22	General		Piping Material Specification (PMS)s & Valve Material Specifications (VMS)	We did not receive PMS & VMS with the tender documents. Kindly provide the same.	It should be decided by the bidder as per their design with necessary standards to be followed as detailed in the tender.

SI No.	Part/Volume of tender	Clause no.	Subject	Bidder's Query	OIL's Response
23	General		Area Lighting	Kindly clarify if the area lighting is in the bidder's scope.	Plant Area Lighting around EGF is not required. However, area lighting if required during construction phases shall be arranged by the bidder as detailed in the tender.
24	General		BOCW cess	We understand BOCW cess is not applicable for this tender. Kindly confirm.	Applicable.
25	General		Special tools and tackles	Special Tools & Tackles are not applicable to our scope of supply and hence excluded.	Any tools, equipment etc. required during construction are under the scope of the bidder.
26	General		Soil Investigation report	Client to provide latest Soil Investigation report at construction site.	Bidder may carry out necessary tests/survey prior to bid submission at their own costs and responsibilities. Necessary permission shall be provided by OIL. However, for reference only, a soil test report along with the topography report of an adjacent installation is provided as **Annexure-B** to this corrigendum.
27	General		Inspection and Testing	We understand bidder has to follow as under: 1. Material to be used for Carbon Steel Pressure parts and for parts welded to pressure parts shall have EN 10204 Type 3.1 Certification.	As per tender requirements.

SI No.	Part/Volume of tender	Clause no.	Subject	Bidder's Query	OIL's Response
				2. All Alloy Steel and non-ferrous materials shall have EN10204 Type 3.1 Certification. 3. All other material / Non-pressure parts shall have EN10204 Type 2.2 Certification	
28	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	1.0.i	Area Lighting	Kindly confirm whether the area lighting for the new EGF plant is in the bidder's scope of supply / installation.	Plant Area Lighting around EGF is not required. However, area lighting if required during construction phases shall be arranged by the bidder as detailed in the tender.
29	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	6.5.8	Knock-out Drum - Drain Pumps	Kindly confirm pump capacity / discharge pressure to decide the motor rating. Also confirm Elect power (Voltage) available for this motor.	Design of Pump Capacity/discharge pressure is under the scope of the bidder. 3-phase 415 V AC, motor feeders for 10 HP (1 No.) & 20 HP (1 No.) motors is available in the existing feeder in the substation. All electrical infrastructure such as incomer panels, motor starters, JBs etc. shall be Flameproof as be designed as per scope of work of the tender. In this regard, please refer to **Annexure-IV** of this corrigendum for revision of tender clauses.
30	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	6.5.8	Knock-out Drum - Drain Pumps	Kindly confirm whether MCC / Power and Control cables for these pump motors is in bidder scope of supply. If yes, please confirm location for the MCC. If it is to be located in 11KV	Yes. Shall be located at the substation. Exact location shall be shown inside the existing plant.

SI No.	Part/Volume of tender	Clause no.	Subject	Bidder's Query	OIL's Response
				substation, please confirm whether any modification for the substation is in bidder's scope for this MCC installation.	Additional Modification not required.
31	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	7.4.a	UPS	Please confirm whether UPS to be located in 11KV substation or DCS / Control Room or in field near PLC based control panel. Also confirm the back up duration time required for this UPS.	Location will be shown by OIL during execution. ***Minimum Back-up duration required for 4 hrs.*** In this regard, please refer to **Annexure-IV** of this corrigendum for revision of tender clauses.
32	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	7.4.e	Elect cable tray support	We presume that main cable rack (650m) is existing for installation of the new EGF elect cable tray installation, with only secondary supports for this cable tray installation is in bidder scope. Please confirm whether our understanding is correct.	Cable tray support, rack and its installation/erection will be under bidders scope as per tender.
33	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	9.3.b	Aviation lights with panel	Please confirm whether Aviation Warning Lights are applicable for this new EGF plant.	As per tender requirements.
34	General		Technical Specs for motors / UPS / MCC / cables etc	Please confirm if any specific project specs are applicable for any of the electrical items / installation material etc othe than specifically mentioned in	Shall be as per bidder's design with applicable standards and as mentioned in the tender.

SI No.	Part/Volume of tender	Clause no.	Subject	Bidder's Query	OIL's Response
				the tender documents. If yes, please share the same.	
35	General		Vendor list for Elect items	Please confirm if any specific project vendor is applicable. If yes, please share the same.	No restriction as per tender.
36	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	6.5.7 and 9.3.i	Control panel with DI/DO exchange with DCS	We presume that DI/DO exchange with the existing DCS is required only for remote Emergency operation of the EGF in case the digital communication link between DCS and Control panel is failed, as status for all the DI/DOs will be anyway available in DCS over the MODBUS serial link. Please confirm.	As per tender requirements.
37	Part-II: Scope of Work/Terms of Reference (SOW/TOR)	7.4.f	Instrumentation cable tray support	We presume that main cable rack (700m) is existing for installation of the new EGF Instrument cable tray installation, with only secondary supports for this cable tray installation is in bidder scope. Please confirm whether our understanding is correct.	Cable tray support, rack and its installation/erection will be under bidder's scope as per tender.
38	General		Vendor list for Instrument items	Please confirm if any specific project vendor is applicable. If yes, please share the same.	No restriction as per tender.
39	General		Technical Specs for instruments / PLCs / cables etc	Please confirm if any specific project specs are applicable for any of the field instruments / PLC / installation material etc other than specifically	As per tender requirements.

SI No.	Part/Volume of tender	Clause no.	Subject	Bidder's Query	OIL's Response
				mentioned in the tender documents. If yes, please share the same.	
40	General		Scope of supply	Please confirm scope of supply for Fire and Gas detection system, Fire Fighting System, Public Address System, Plant Communication System, Welding Sockets, Convenience Sockets (1 and 3 phase).	Fire Fighting System, Public Address System, Plant Communication System, Welding Sockets, Convenience Sockets (1 and 3 phase) are not mentioned to be mandatorily required against the subject tender, if the bidder needs to include it, they can do so without any additional cost. Moreover, for F&G system please refer to clause no. 6.5.10. of Annexure-IV of this corrigendum.

CGGS – MADHUBAN
OIL INDIA LIMITED

DATE: 27.10.2026 **SUBJECT:** Pre-bid Meeting (Tender No. - CPI2972P27)

SL NO.	NAME	DEPARTMENT	DESIGNATION	SIGNATURE
1	Debanish Das.	GMS	Sr. Engg.	
2	Alwin M.N	HSE	Suptdg Engineer (HSE)	
3	MIRZANUR RAHMAN	GMS-INST	Dy. CE (GMS-INST)	
4	N. Hareesh	F&A	Manager - F&A	
5	Chimtode Raja Rao	GMS	Sr. Engg (GMS-EE)	
6	Saurabh Baishya.	Projects (OIL)	Manager (P-C&P)	
7	M. BIKRAMJIT SINGHA	PROJECTS	DGM (P-C&P)	
8	Indra Kamal Kalita	FSO, CGGS	DGM - GMS	27.10.2026 S.K. Kalita
9	Dhrubajyoti Kalita	GMS	DGM - GMS	27.10.26
10	M. Tamuly	Instrutech.		
11	Ashu Tewari	Projects/BD	Manager (CRA)	
12	Prachi Jadhav	Projects Manager	~~ZEE~~ HAL offshore Manager	
13	Sagar Patil	Manager Sales	ZEECO	
14	Aniket Gulavani	Asst. Manger sales sales	AM ZEECO	
15	Jogesh Deori	GOGS	Dgm-Gms	
16	Lokrak Nilling	Projects	DGM-Projects	
17	Sanjeev Mehra	Projects	CE (Projects)	
18	Manish Baruah	Projects	SE-Projects	
19	Rajib Kumar Saumah	Electrical	DGM-Electrical	VC
20	Vanduti Mishra	HOL		VC
21	Aditya Shinde	Sopan		VC
22	Abhishek Jain	HOL		VC

Attendance Sheet

DATE- 27.10.2026 Subject: Pre-bid Meeting (Tender No.- CPI2972P27)

SL. NO.	NAME	DEPARTMENT	DESIGNATION	SIGNATURE
23	Santosh Kh. Naik	HOL		VC
24	Suraj Kumar	L-Tech		VC

Revision in Tender Clauses vis-à-vis Original Clauses

Sl. No.	Document & Clause No.	Original Clause	Revised Clause	Remarks
1	Scope of Work & Terms of Reference ; Clause no. 6.5.2	**The Refractory Lining:** a. In the combustion chamber, refractory lining: capable of resistant against the maximum temperature during the highest rate of flaring as per design. b. The total refractory thickness & density of material shall be as per the design. c. Type and sheath material of the thermocouples envisaged in the system.	**The Refractory/ Ceramic Lining:** a. In the combustion chamber, refractory/ ceramic lining: capable of resistant against the maximum temperature during the highest rate of flaring as per design. b. The total refractory/ ceramic thickness & density of material shall be as per the design. c. Type and sheath material of the thermocouples envisaged in the system..	Revision in existing tender clause.
2	Scope of Work & Terms of Reference ; Clause no. 6.5.8	**Knock-out Drum:** • Standard design codes as per ASME/API have to be followed for the design of the knock-out drum. • All the lines connected to the knock-out drum have to be of flanged type with suitable valves of standard make. • Party has to erect necessary pipeline interconnections from the knock-out drum to the flare system. • Pipeline material should be of Carbon steel, galvanized and designed pressure rating i) Material of construction- High Carbon Steel ii) Design pressure- As per the Flare system Design. iii) Design temperature- As per the Flare system Design.	**Knock-out Drum:** • Standard design codes as per ASME/API have to be followed for the design of the knock-out drum. • All the lines connected to the knock-out drum have to be of flanged type with suitable valves of standard make. • Party has to erect necessary pipeline interconnections from the knock-out drum to the flare system. • Pipeline material should be of Carbon steel, galvanized and designed pressure rating i) Material of construction- High Carbon Steel ii) Design pressure- As per the Flare system Design. iii) Design temperature- As per the Flare system Design.	Revision in existing tender clause.

Sl. No.	Document & Clause No.	Original Clause	Revised Clause	Remarks
		iv) Volume of the drum- As per the Flare system Design. • KOD should be installed with Level Indicators & Evacuation Pumps to maintain the level of liquid in the vessel. At least 2(two) nos. of pumps(01 working & 01 standby) shall be installed which shall remove the liquids from the KOD. The pumps shall be interlocked with the level indicators to maintain the designed interface level of the KOD. The delivery of the pumps shall be connected to the existing pipeline shown at site. Approximate length of pipeline to be laid from the proposed location to the existing pipeline is 100 m. • KOD should be complete with instruments as required for safe operation and automatic control. • The data from the KOD and its instruments such as pressure, temperature, interface level etc. shall be displayed at the DCS.	iv) Volume of the drum- As per the Flare system Design. • KOD should be installed with Level Indicators & Evacuation Pumps to maintain the level of liquid in the vessel. At least 2(two) nos. of pumps(01 working & 01 standby) shall be installed which shall remove the liquids from the KOD. The pumps shall be interlocked with the level indicators to maintain the designed interface level of the KOD. The delivery of the pumps shall be connected to the existing pipeline shown at site. Approximate length of pipeline to be laid from the proposed location to the existing pipeline is 100 m. • KOD should be complete with instruments as required for safe operation and automatic control. • The data from the KOD and its instruments such as pressure, temperature, interface level etc. shall be displayed at the DCS. • Design of Pump Capacity/discharge pressure is under the scope of the bidder. 3-phase 415 V AC, motor feeders for 10 HP (1 No.) & 20 HP (1 No.) motors is available in the existing feeder in the substation. All electrical infrastructure at EGF System such as incomer panels, motor starters, JBs etc. shall be Flameproof as be designed as per scope of work of the tender.	

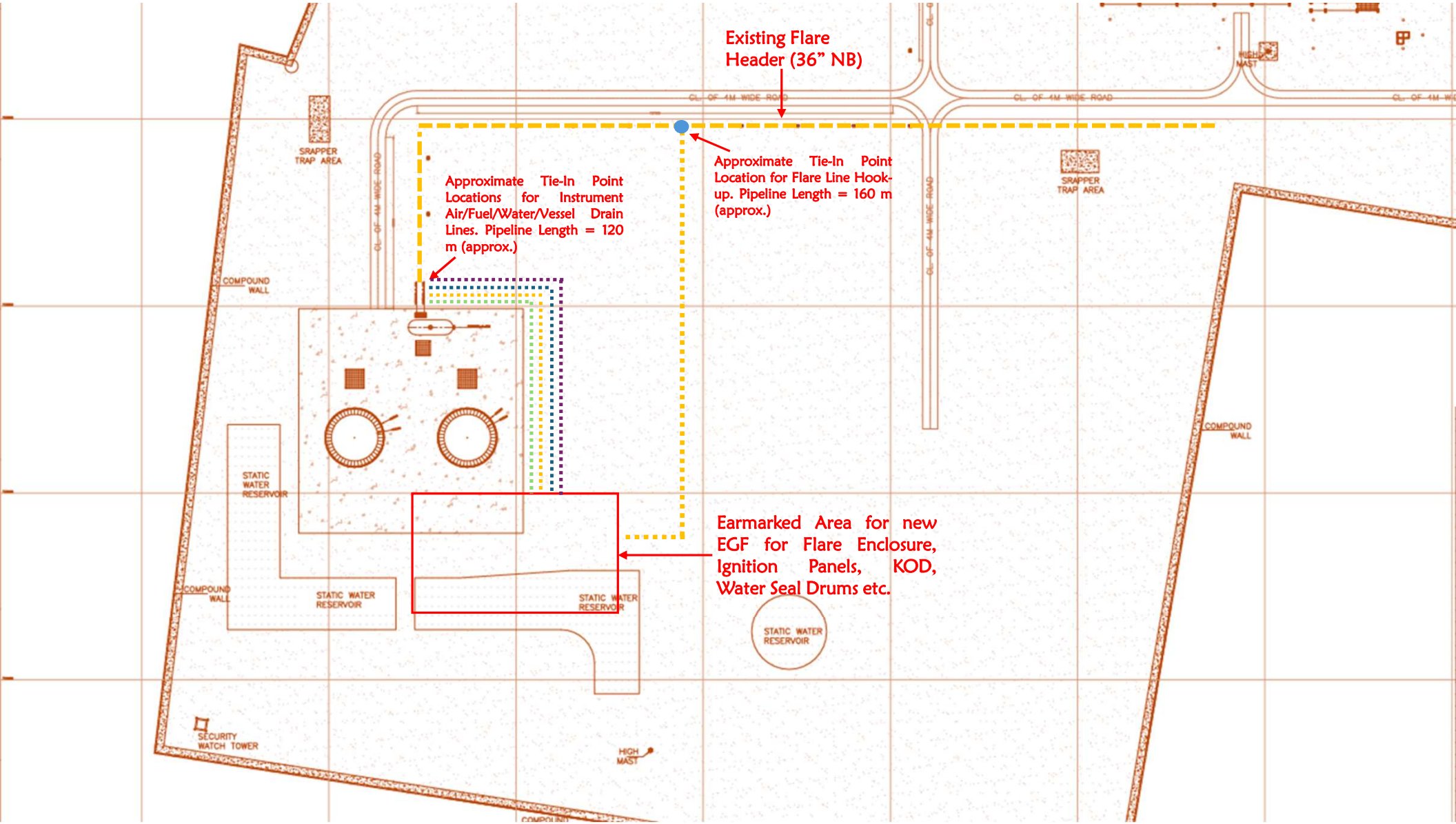
Sl. No.	Document & Clause No.	Original Clause	Revised Clause	Remarks
3	Scope of Work & Terms of Reference ; Clause no. 7.4 (a)	Design of Power Supply System to the new EGF. 230V AC Power Supply is available at site. Suitable UPS shall be designed & supplied along with the flare system to supply power to the system.	Design of Power Supply System to the new EGF. Power Supply is available at site. Suitable UPS (Minimum Back-up duration required for 4 hrs) shall be designed & supplied along with the flare system to supply power to the system. 3-phase 415 V AC, 63 Amps MCCB feeders (1 No.) is available in the existing feeder at sub-station. All electrical/instrumentation infrastructure such as panels, starters, DBs, JBs etc. shall be Flameproof as be designed as per scope of work of the tender.	Revision in existing tender clause.
4	Scope of Work & Terms of Reference ; Clause no. 6.5.10	**Other General Requirements:** a. Noise limits: The noise production at full capacity and at 1 meter outside the wind fence shall be: less than 45 dB. b. Storage, security, loading & unloading, shifting of all materials till the handover of the project shall be under the contractor's scope. OIL shall provide open space for the storage of the materials inside CGGS Madhuban. c. Fooding, Lodging & Transportation of the man & materials shall be under contractor's scope. d. All safety requirements to be fulfilled by the contractor during the course of the project. e. Bridging Documents & SIMOPS Documents shall be prepared between OIL & Contractor prior to start of construction jobs. Work Permits shall be issued by OIL.	**Other General Requirements:** a. Noise limits: The noise production at full capacity and at 1 meter outside the wind fence shall be: less than 45 dB. b. Storage, security, loading & unloading, shifting of all materials till the handover of the project shall be under the contractor's scope. OIL shall provide open space for the storage of the materials inside CGGS Madhuban. c. Fooding, Lodging & Transportation of the man & materials shall be under contractor's scope. d. All safety requirements to be fulfilled by the contractor during the course of the project. e. Bridging Documents & SIMOPS Documents shall be prepared between OIL & Contractor	

Sl. No.	Document & Clause No.	Original Clause	Revised Clause	Remarks
		f. Third Party Inspection (TPI) of the following as per approved design shall be carried out by OIL's approved TPI agencies: i. Pipes & fittings, ii. Vessels, iii. Electrical & Instrumentation panels & equipment, iv. Pilot Burners, v. Main Burners, vi. Valves g. List of OIL approved TPIA: (i) M/s. LRQA Inspection Services LLP (formerly Lloyds) (ii) M/s. Bureau Veritas (India) Pvt. Ltd. (iii) M/s. RITES Ltd. (iv) M/s. IRCLASS Systems and Solutions Pvt. Ltd. (v) M/s. DNV MES India Pvt. Ltd. (vi) M/s Tuboscope h. OIL may carry out Pre-Despatch Inspection of the major equipment. The contractor to intimate in advance the tentative date of readiness of such equipment. i. Only single-phase 230V AC power supply will be provided for lighting at free of cost. Power required for operating other machinery shall be arranged by the contractor at their own cost. j. Bridging Document & SIMOPS between the contractor & OIL shall be prepared after award	prior to start of construction jobs. Work Permits shall be issued by OIL. f. Third Party Inspection (TPI) of the following as per approved design shall be carried out by OIL's approved TPI agencies: i. Pipes & fittings, ii. Vessels, iii. Electrical & Instrumentation panels & equipment, iv. Pilot Burners, v. Main Burners, vi. Valves g. List of OIL approved TPIA: (i) M/s. LRQA Inspection Services LLP (formerly Lloyds) (ii) M/s. Bureau Veritas (India) Pvt. Ltd. (iii) M/s. RITES Ltd. (iv) M/s. IRCLASS Systems and Solutions Pvt. Ltd. (v) M/s. DNV MES India Pvt. Ltd. (vi) M/s Tuboscope h. OIL may carry out Pre-Despatch Inspection of the major equipment. The contractor to intimate in advance the tentative date of readiness of such equipment. i. Only single-phase 230V AC power supply will be provided for lighting at free of cost. Power required for operating other	

Sl. No.	Document & Clause No.	Original Clause	Revised Clause	Remarks
		of the contract. These documents shall be followed till the completion of the contract.	machinery shall be arranged by the contractor at their own cost. j. Bridging Document & SIMOPS between the contractor & OIL shall be prepared after award of the contract. These documents shall be followed till the completion of the contract. k. Flame & Gas detectors shall be considered for all the equipment under the EGF Package as per standards specified in the tender as well as safety studies to be carried out by the bidder.	

ANNEXURE-A To Corrigendum-1 to Tender No. CPI2972P27

Plot Plan



JOB NO.: *SHEET NO.:* 1

INTRODUCTION:

Sub-Soil Investigation was carried out at the site of

Madhuban, Assam to find out the Engineering properties of soil types.

This report consists of details of field investigation and laboratory analysis along with the rational interpretation of test results to find out the type of foundation to be adopted and safe bearing capacity for the same.

All the field investigation and laboratory test were conducted as per IS Specification.

FIELD INVESTIGATION:

Field investigation (IS-1892)at the site consists of vertical boring 0f 150mm dia in 05(Five) locations up to maximum depth of 20.00m from existing ground level. The depth of bore holes were fixed by the concerned Site Engineer during field work. As no rock layer is encountered at site therefore core drilling method was not used during field investigation. 5 nos of ERT were done at the site.

COLLECTION OF SAMPLES:

Disturbed and undisturbed samples were collected and Standard Penetration Test were done during boring. In addition to these study in change of strata, ground water level, visual identification of soil such as colour, nature and stiffness were recorded during boring.

DISTURBED SAMPLE:

Disturbed samples were collected at different depth and were properly packed after collection.

UNDISTURBED SAMPLE:

Undisturbed samples (IS-2132)were collected in cohesive soillayer by using 100mm thin walled sampling tube and properly sealed and labeled.

Contd.

LOCATION OF BORE HOLES :

BH no	Project
01,02	
03	
04	
05	

SUB-SURFACE WATER LEVEL :

Subsurfae water level during field investigation are as below:

BH No	Water level(M)	BH No	Water level(M)
01.	4.20	02.	4.00
03.	4.10	04.	3.90
05.	3.60		

STANDARD PENETRATION TEST :

Standard Penetration Test (IS-2131)were conducted by using standard split spoon sampler as per IS specification. A drive weight assembly of 63.50 Kg drop hammer for free fall of 75 cm is used. Nos. of blows required to drive the sampler for 1st 15 cm is neglected and blows for next 30 cm is counted and
is expressed as N-value. N-value at the site is found to vary from 03 to 72.

The observed N- value at site are as below:

DEPTH(M)	BORE HOLES				
	01	02	03	04	05
01.50	13	03	05	07	10
03.00	06	11	04	07	03
04.50	14	22	10	07	19
06.00	34	42	26	09	34
07.50	36	45	33	47	46
09.00	67	65	66	63	65
10.50	69	68	70	67	69
12.00	69	69	72	71	71
13.50	08	10	07	08	75
15.00	10	19	17	16	18
16.50	31	14	25	25	16
18.00	65	58	62	62	59
19.50	68	67	67	65	66

Contd.

The results of SPT are graphically shown in the bore hole log enclosed here with.

EARTH RESISTIVITY TEST :

The basic principle of electric resistivity theory is based on potential difference of different types of soil. Artificially generated electric current is passed through the soil and resulting potential differences are measured.
The significant difference in soil type and its heterogeneity gives immense difference in its resistivity.(IS-3043)

There are many configuration to find out the resistivity of soil but the most widely used configuration is Wenner configuration, proposed by Wenner in 1916.It usually requires four electrodes to transmit and receive the electric current, in which two electrodes are used to inject the current and the rest two are used to record the resulting potential difference. A direct voltage is imposed between the outer electrodes and the potential drop is measured in the inner electrodes.

The apparent resistivity of the soil is computed using the following equation: $\rho = 2\pi LR$ (i)In the equation ρ is defined as the soil resistivity in ohm-m, L is the distance in meter and R is defined as the measured resistance in ohm.

VARIATION OF ELECTRICAL RESISTIVITY VALUE:

The resistivity of the soil varies due to the following properties

i. Nature and soil elementary particle arrangement.
ii. Water content.
iii. Pore fluid Composition.
iv. Soil Stratification.
v. Temperature.
vi. Type of soil.
vii. Mineral and chemical content of the soil.

Table(1): Typical value with alter in changes in soil, moisture and temperature.

Type of Soil or Water	**Typical Resistivity Ohm-m**	**Usual Limit Ohm-m**
Sea water	2	0.1 to 10
Clay	40	8 to 70

Contd.

Type of Soil or Water	**Typical Resistivity Ohm-m**	**Usual Limit Ohm-m**
Ground water and spring water	50	10 to 150
Clay and sand mixtures	100	4 to 300
Shale,Slates,Sandstone etc	120	10 to 100
Peat, loam and mud	150	5 to 250
Lake and brook water	250	100 to 400
Sand	2000	200 to 3000
Moraine gravel	3000	40 to 10000
Ridge gravel	15000	3000 to 30000
Solid granite	25000	10000 to 50000
Ice	100000	10000 to 100000

METHODOLOGY:

There are basically two types of field procedures for electrical resistivity surveying. The first type is horizontal profiling in which the electrode spacing remains constant and the whole array is moved along a traverse. The second type is vertical profiling in which the center of the spread remains fixed and the electrode spacing is increased to determine apparent resistivity with increasing depth.
The combination of the above two method can also be used to come up with a third method.

Wenner configuration is used to find out the resistivity of soil,1916. In this method four probe or electrode is used to measure the resistivity of soil strata at different depth.
The current penetrates deeper into the soil as the distance between the electrodes increases hence resistivity of different strata of soil beneath the earth surface can be easily computed.

INSTRUMENT USED:

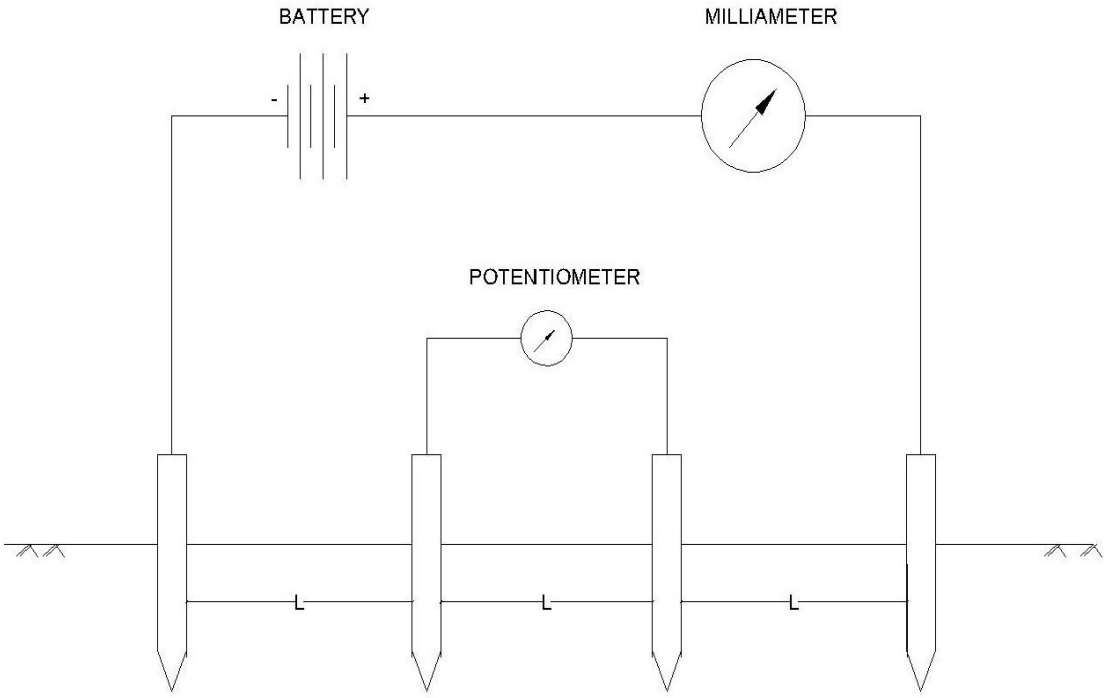
i) A 4-Pole Analog Ground Resistance Tester
ii) 4 Probes
iii) 4 Insulated Wire Conductors
iv) Measuring Tape

Contd.

PROCEDURE :

The following step used to test the soil resistivity

1. Placed the soil resistivity measure equipment on the center of the assessment location.
2. Put two potential electrode on the left and right side point of view based on the distance test required. This electrode embedded from 5 to 10 cm to ground, based on the soil condition.
3. Put two current electrode on the left and right side point of view based on the distance test required. This electrode embedded from 5 to 10 cm to ground based on the soil condition.
4. Connect all electrodes cable with the soil resistivity measuring equipment's.
5. Energize the electrode with the power supply form soil resistance measuring equipment's.
6. Please make sure no one touch the electrode when the electrode energize.
7. The value of soil resistivity will calculate and appear on the soil resistivity measuring equipment LCD's or monitor.



Contd.

RESULYS OF RESISTIVITY TEST:

TEST N0 -01
Average resistivity = 22.369 Ohm-meter
Area = 1562 Unit.
Dia = 44.60

TEST N0 -02
Average resistivity = 19.19 Ohm-meter
Area = 1263 Unit.
Dia = 40.10

TEST N0 -03
Average resistivity = 14.11 Ohm-meter
Area = 591 Unit.
Dia = 27.43

TEST N0 -04
Average resistivity = 14.43 Ohm-meter
Area = 662 Unit.
Dia= 29.03

TEST N0 -05
Average resistivity = 15.733 Ohm-meter
Area = 763 Unit.
Dia = 31.17

Formula used

$$\rho = 2\pi LR$$

Where,

ρ = Resistance in Ohm M.
L = Distance M.
R = Reading Ohm.

Field datasheet and Graphs are furnished herewith.

Details of field investigation are shown in the bore hole log enclosed here with.

LABORATORY ANALYSIS :

Selected soil samples are analyses in the laboratory(IS-2720). Following laboratory test were done on soil samples.

1. Natural Moisture content. 2. Specific gravity.
3. Bulk & Dry density. 4. Hydrometer analysis.

Contd.

5. Seive analysis. 6. Atterberg's limit test.
7. Shrinkage limit. 8. Consolidation test.
9. UCC test 10. Shear test.
11.Chemical analysis of soil and water sample.

Moisture content of the soil varies from 15.27% to 29.18% Specific gravity is in the range of 2.55 to 2.67 Bulk density varies from 1.73 gm/cc to 2.15 gm/cc while Dry density varies from 1.36 gm/cc to 1.84 gm/cc, Submerged density varies from 0.83 gm/cc to 1.15 gm/cc Void ratio is in the range of 0.454 to 0.901.
Grain size distribution curve shows the nature of soil deposits. From hydrometer analysis we obtain the clay and silt percentage and sieve analysis is donr for sand layer. Clay varies from 0.00% to 33.00%. Silt varies from 0.00% to 69.00%. Fine sand varies from 0.00% to 100.00%. grain size distribution graphs are enclosed herewith.
Liquid limit of the soil varies from 41.30% to 56.20%. Plastic limit varies from 24.51% to 28.42% while Plasticity

Index varies from 16.79% to 27.78%.
Cohesion of the soil varies from 0.00 Kg/Cm^2 to 0.52 Kg/Cm^2 and angle of internal friction varies from 6° to 34°. Ucc value in cohesive soil layer vaaries from .. Kg/Cm^2 to … Kg/Cm^2.

Results of consolidation test In cohesive soil layer is furnished herewith.

CHEMICAL TEST:

Chemical Test for soil is conducted on extract of soil sample collected at site. The results of chemical test for soil sample are as below :

BH. No.	pH Value	Chloride ppm	Sulphate ppm	Carbonates	Organic matter
		SOIL SAMPLE			
01.	6.85	31.25	19.76	Nil	Nil
02.	6.85	31.25	19.76	Nil	Nil
03.	6.85	31.25	19.76	Nil	Nil
04.	6.85	31.25	19.76	Nil	Nil
05.	6.85	31.25	19.76	Nil	Nil

Contd.

BH. No.	pH Value	Chloride ppm	Sulphate ppm	Carbonates	Organic matter
	WATER SAMPLE				
01.	6.92	25.64	14.25	Nil	Nil
02.	6.92	25.64	14.25	Nil	Nil
03.	6.92	25.64	14.25	Nil	Nil
04.	6.92	25.64	14.25	Nil	Nil
05.	6.92	25.64	14.25	Nil	Nil

Details of laboratory analysis are enclosed in the form of table & graphs.

DISCUSSION :

From field investigation the soil layer at site are found as below :

BH. NO.	Depth (M) From	To	Description
01.	0.00	1.00	Filled up soil.
	1.00	2.50	Silty sand and sand.
	2.50	7.00	Clayey silt with sand.
	7.00	12.60	Silty sand and sand.
	12.60	15.90	Clayey silt.
	15.90	29.00	Sand.
02.	0.00	0.90	Filled up soil.
	0.90	4.20	Clayey silt with sand.
	4.20	13.50	Silty sand and sand.
	13.50	16.50	Clayey silt .
	16.50	20.00	Sand.
03	0.00	1.30	Filled up soil.
	1.30	5.50	Clayey silt with sand.
	5.50	7.20	Silty sand and sand.
	7.20	12.80	Sand.
	12.80	16.30	Clayey silt .
	16.30	20.00	Sand.
04.	0.00	1.50	Filled up soil.
	1.50	7.00	Clayey silt with sand.
	7.00	13.50	Silty sand and sand.
	13.50	16.60	Clayey silt.
	16.60	20.00	Sand.

Contd.

BH. NO.	Depth (M) From	To	Description
05.	0.00	1.50	Filled up soil.
	1.50	4.00	Clayey silt with sand.
	4.00	6.00	Silty sand.
	6.00	14.30	Sand.
	14.30	17.00	Clayey silt.
	17.00	20.00	Sand

From field investigation and laboratory analysis it is seen that upper layer up to maximum depth of 1.50m consists of filled up soil followed by layer of clayey silt with sand up to maximumdepth of 7.00m It is under lain by layer of silty sand and sand up to maximum depth of 14.30m .A layer of clayey silt is encountered at this depth up to maximum depth oif 17.00m. Bottom most layer consists of sand up to termination depth of boring.

LIQUEFACTION ANALUSIS :

The liquefaction potential (IS-1893) of the site is calculated by using the equation(IS 1893):

$$F_s = \frac{\text{CRR (Cyclic Resistance)}}{\text{CSR (Cyclic Stress Ratio)}}$$

If F_s <1.0; Liquefaction
Where,

$$CSR = 0.65 \frac{\alpha max}{g} \frac{\sigma vo}{\sigma' vo} rd$$

$$CRR = CRR_{7.5} x k_m x k_\alpha x k_\sigma$$

F_s calculated for depth of 1.0m,1.50m,2.00m, 3.0m and 4.50m considering parameters of bore hole no1 is as follow :

Depth (M)	ϒ(sat)	σ_{vo}	vo	σ_v	Rd	σ_v/σ_{vo}
1.50	1.85	2.775	1.50	1.760	0.9885	2.183
3.00	1.84	5.520	3.00	2.640	0.9740	2.136
4.50	1.90	8.550	4.50	4.185	0.9655	2.070
6.00	1.98	11.880	6.00	5.880	0.9426	2.020

Contd.

Depth (m)	CRR	CSR	F_s	Soil Classification	Remark
1.5	0.135	0.3356	0.40<1	MI	Un-Liquefiable
3	0.135	0.3328	0.40<1	MI	Un-Liquefiable
4.5	0.235	0.318	0.73<1	MI	Un-Liquefiable
6	0.6	0.3007	1.99>1	SM	Un-Liquefiable

As per Cl. 6.5.3.5, IS 1893 Part I : 2016, submerged loose sand and soil falling under classification 'SP'with corrected 'N' value less 15 in Zone III to V may cause liquefaction. As the soil encounetered is silt, it is not susceptibale for liquefaction.

FOUNDATION :

From the results obtained it is seen that foundation for small structure may design on normal isolated footing at depth of 2.00m below existing ground level. Considering the liquefaction potential foundation should rest at 4.50m below existing ground level. Under sich condition normal footing is not feasible in the site . Here bored cast in situ pile of suitable dia and minimum length of 9.00 m may adopted for design purposes.

BEARING CAPACITY OF SOIL :

Bearing capacity (IS_6403)of soil from C/ϕ value is calculated by
using the equation:

$$Qs = 1/F\ (C\ Nc\ Sc\ dc\ ic + \gamma D\ (Nq-1)\ Sq\ dq\ iq + 0.5\ B\gamma\ N\gamma\ S\gamma\ d\gamma\ i\gamma)$$

Where,

Qs	=	Bearing capacity of soil.
F	=	Factor of safety.
C	=	Cohesion.
Nc,Nq,Nγ	=	Bearing capacity factor.
Dc,dq,dγ	=	Depth factor.
Ic,iq,iγ	=	Inclination factor.
Sc,Sq,Sγ	=	Shape factor.
B	=	Width of footing.

Now, bearing capacity at 2.00m is calculated by using the average parameters :

Contd.

C	=	0.13Kg/Cm^2	C′	=	0.0867kg/Cm^2
ϕ	=	24°	γ	=	0.86 gm/cc
Nc′	=	12.22	Nq′	=	4.73
Nγ′	=	3.53	Sc	=	1.3
Sq	=	1.2	Sγ	=	0.8
dc	=	1.308	dq,dγ	=	1.153
ic,iq,iγ	=	1	B	=	1.50m (assumed)

Now,

Qs = $\frac{1}{2.5}$ (1.8015+ 0.4442 + 0.2102)+0.086

= 1.068Kg/Cm^2

Say 10.68 MT/SM.

SETTLEMENT ANALYSIS :

Settlement (IS-8009)of soil in sand layer is calculated by using the equation :

$$S_i = qB \left(\frac{1-\mu^2}{Es}\right) I_w$$

Where,

Q = intensity of contact pressure

B = Least lateral dimension of footing

Es = Modulus of elasticity of soil

I_w = Influence factor.

Now at 1.50m settlement is calculated by using the parameters :

Q	=	10.68 MT/SM.	B	=	1.50m
μ	=	0.3	Es	=	766 MT/SM.

Now,

$$Si = 10.68 \times 1.50 \frac{1 - 0.3^2}{766} 0.95$$

= 0.01808m.

Say 18.08mm.

Here settlement of the soil is under permissible limit.

Safe bearing capacity of soil at different depth of different bore holes:

Contd.

BH N0	SAFE BEARING CAPACITY MT/SM				
	BH-1	**BH-2**	**BH-3**	**BH-4**	**BH-5**
2.00	10.58	4.94	6.05	8.02	9.57
2.50	9.40	8.23	6.03	8.60	7.94
3.00	8.29	11.80	6.26	9.11	6.29

LOAD CARRYING CAPACITY OF PILE:

Load carrying capacity (IS-2911)of bored cast in situ pile is calculated by using the equation :

$$Qu = Ap\ (\tfrac{1}{2}\ d\gamma\ n\gamma + Pd\ Nq) + \sigma \sum_{i=1}^{n} k\ Pdi \tan\delta\ Asi$$

where,

Ap = Cross-sectional area of pile toe.
D = Stem diameter.
γ = effective unit weight of soil at pile toe .
Pd = effective overburden pressure at pile toe.
$N\gamma$ and Nq = Bearing capacity factors depending upon the angle of internal friction ϕ at toe.
$\sigma_{i=1}^{N}$ = summation for n layers in which pile is installed.
k = coefficient of earth pressure.
pdi = effective overburden pressure for the ith layer where i varies from 1 to n.
δ = angle of wall friction between pile and soil, in degrees (may be taken equal to ϕ).
Asi = surface area of pile stem.

Loadcarrying capacity of 450mm dia and 9.00 length (Here workable length is considered as 9.00-4.50=4.50m)pile is calculated by using the parameters :

Ap	=	0.159 sm	D	=	450MM
γ	=	1.10 MT/CM	γ(avg)	=	1.03 MT/CM
p_d	=	3.30 MT/SM	ϕ	=	32°
$\sigma_{I=1}^{N}$	=	1	k	=	1.5
p_{dI}	=	4.635 MT/SM	Δ	=	28°
Nq	=	28	$N\gamma$	=	32.65
a_{SI}	=	6.3585 sm			

Contd.

Now

Qu = 0.159 (8.0809+ 92.40) + 23.506

= 39.482 MT each.

Now safe load = 15.79 MT, (fos=2.5).

Load carrying capacity pile (VerticalLoad and Lateral Load)are calculatred as per IS 2911.

Load carrying capacity of pile of different dia and length are furnished in the following table:

Depth of pile tip in M from EGL	Cut off level ion M	Length of pile in M	Dia of pile in mm	Safe Vertical Load Carrying Capacity (MT)	Uplift Load Carrying Capacity MT	Lateral Load Carrying Capacity (MT	Depth of fixity (M)
9.00	1.50	7.50	450	15.79	9.40	1.43	3.47
			500	18.40	10.45	1.94	3.79
			600	24.20	12.54	3.21	4.43
10.00	1.50	8.50	450	22.35	14.04	1.43	3.47
			500	25.98	15.60	1.94	3.79
			600	33.86	18.72	3.21	4.43
11.00	1.50	9.50	450	33.41	19.62	1.43	3.47
			500	38.91	21.80	1.94	3.79
			600	51.04	26.16	3.21	4.43

Length of pile should restrict at 11.00m below existing ground level. For deeper depth, length of pile should be 17.00m below existing ground level for tank foundations. The stiffness factor arre calculated as per clause C-2.1 of IS 2911.

As per the loading requirements, higher capacity piles are designed for BH-01 and BH-02.
Diameter of Pile : 750 mm, 900 mm and 1000 mm
Pile Cutoff Level : 0.8 m below FGL of R.L. 120 m
Length of Pile : 17.5 m below Pile Cutoff Level

Detail pile capacity calculations for BH-01 and Bh-02 are attached in the annexure A for the diameter of piles ranging between 750 mm to 1000 mm.

Contd.

The estimated and suggested pile capacities are as follows :

Pile Capacities in		0.75 m		0.90 m		1.0 m	
		BH-01	BH-02	BH-01	BH-02	BH-01	BH-02
Axial Compression :		165 T	165 T	165 T	165 T	165 T	165 T
Uplift :		55 T	55 T	55 T	55 T	55 T	55 T
Lateral :	Fixed Head :	8.4 T	8.85 T	11.24 T	11.85 T	13.3 T	14.03 T
	Free Head :	3.26 T	3.44 T	4.36 T	4.36 T	5.16 T	5.44 T

RECOMMENDATION :

From careful study of test results obtained conclusions are drawn as :

1. Upper layer up to maximum depth of 1.50m consists of clayey silt with sand followed by layer of compacted sand and sand fine to coarse with fine gravel up to maximum depth of 6.50m .It is under lein by layer of loose clayey silt with sand up to 11.00m.Bottom most layer consists of sand fine to coarse with fine gravel up to termination depth of boring.
2. Foundation for small structure may design on normal isolated footing at depth of 2.00m below existing ground level. For higher loading condition bored cast in situ pile of suitable dia and minimum length of 9.00 m may adopted for design purposes.
   Safe bearing capacity of soil for normal isolated footing may consider from the table in clause discussion.
3. **Tank foundation :** Based on the BH-01 and BH-02, bore cast in situ pile of 0.75 m diameter, of length 17.5 m below pile cutoff level is suggested. The suggested safe pile capacities are
   Axial Compression Capacity : 165 Ton
   Uplift Capacity : 55 Ton
   Lateral Pile Capacity : 8.4 Ton – Fixed Head Pile
   Lateral Pile Capacity : 3.25 Ton – Free Head Pile
4. Seismic co-efficient as per IS Specification should be considered during design.

Contd.

PHYSICAL PROPERTIES

B.H. No	Depth (m)	Moisture Content (%)	Specific Gravity	Bulk Density gm/cc	Dry Density gm/cc	Submerged Density gm/cc	Void Ratio
01.	1.50	17.68	2.66	1.74	1.48	0.92	0.799
	3.50	26.35	2.59	1.77	1.40	0.86	0.849
	5.00	21.42	2.64	1.84	1.52	0.94	0.742
	7.50	17.51	2.67	1.98	1.68	1.05	0.585
	10.50	15.46	2.67	2.04	1.77	1.11	0.511
	14.00	28.72	2.56	1.86	1.44	0.88	0.772
	16.50	17.23	2.67	2.06	1.76	1.10	0.519
	20.00	15.43	2.68	2.08	1.80	1.13	0.487
02.	2.00	27.45	2.58	1.73	1.36	0.83	0.901
	3.50	26.59	2.59	1.88	1.49	0.91	0.744
	4.50	18.26	2.66	1.91	1.62	1.01	0.647
	7.50	16.63	2.67	2.02	1.73	1.08	0.542
	10.50	15.42	2.67	2.09	1.81	1.13	0.475
	14.00	29.18	2.55	1.92	1.49	0.90	0.716
	18.00	16.54	2.67	2.07	1.78	1.11	0.503
	20.00	14.87	2.68	2.11	1.84	1.15	0.459
03.	2.00	27.54	2.58	1.77	1.39	0.85	0.859
	3.50	28.61	2.59	1.76	1.37	0.84	0.893
	4.50	23.46	2.64	1.79	1.45	0.90	0.821
	7.50	17.32	2.67	1.98	1.69	1.06	0.582
	10.50	15.27	2.67	2.08	1.80	1.13	0.480
	14.00	28.49	2.56	1.84	1.43	0.87	0.788
	16.50	16.39	2.67	2.06	1.77	1.11	0.509
	20.00	15.26	2.68	2.09	1.81	1.14	0.478
04.	2.00	27.32	2.59	1.81	1.42	0.87	0.822
	3.50	28.59	2.58	1.83	1.42	0.87	0.813
	5.00	25.18	2.59	1.78	1.42	0.87	0.821
	7.50	19.26	2.65	2.05	1.72	1.07	0.542
	10.50	16.35	2.67	2.10	1.80	1.13	0.479
	15.00	23.18	2.64	1.84	1.49	0.93	0.767
	18.00	16.72	2.68	2.04	1.75	1.10	0.533
	20.00	14.64	2.68	2.09	1.82	1.14	0.470

Contd.

B.H. No	Depth (m)	Moisture Content (%)	Specific Gravity	Bulk Density gm/cc	Dry Density gm/cc	Submerged Density gm/cc	Void Ratio
05.	2.00	27.43	2.58	1.81	1.42	0.87	0.816
	3.50	28.57	2.58	1.75	1.36	0.83	0.895
	4.50	23.73	2.63	1.81	1.46	0.91	0.798
	7.50	16.28	2.67	2.04	1.75	1.10	0.522
	10.50	15.42	2.67	2.12	1.84	1.15	0.454
	15.00	26.81	2.60	2.02	1.59	0.98	0.632
	18.00	17.26	2.67	2.06	1.76	1.10	0.520
	20.00	15.42	2.68	2.11	1.83	1.15	0.466

GRAIN SIZE ANALYSIS

B.H. No	Depth (M)	Clay (%)	Silt (%)	Fine Sand %)
		Hydrometer		Seive
01.	1.50	--	21.00	79.00
	3.50	21.00	65.00	14.00
	5.00	6.00	39.00	55.00
	7.50	--	17.00	83.00
	10.50	--	--	100.00
	14.00	32.00	68.00	--
	16.50	--	11.00	89.00
	20.00	--	--	100.00
02.	2.00	23.00	67.00	10.00
	3.50	18.00	65.00	17.00
	4.50	--	32.00	68.00
	7.50	--	--	100.00
	10.50	--	--	100.00
	14.00	33.00	67.00	--
	18.00	--	--	100.00
	20.00	--	--	100.00

Contd.

B.H. No	Depth (M)	Clay (%)	Silt (%)	Fine Sand %)
03.	2.00	27.00	63.00	10.00
	3.50	22.00	62.00	16.00
	4.50	8.00	53.00	39.00
	7.50	--	--	100.00
	10.50	--	--	100.00
	14.00	31.00	69.00	--
	16.50	--	--	100.00
	20.00	--	--	100.00
04.	2.00	21.00	65.00	14.00
	3.50	23.00	66.00	11.00
	5.00	18.00	69.00	13.00
	7.50	5.00	44.00	51.00
	10.50	--	--	100.00
	15.00	6.00	62.00	32.00
	18.00	--	--	100.00
	20.00	--	--	100.00
05.	2.00	25.00	64.00	11.00
	3.50	23.00	67.00	10.00
	4.50	--	44.00	56.00
	7.50	--	--	100.00
	10.50	--	--	100.00
	15.00	21.00	61.00	18.00
	18.00	--	--	100.00
	20.00	--	--	100.00

SHEAR PROPERTIES

B.H. No	Depth (M)	Porosity. (%)	Saturated density gm/cc.	"C" Kg/Cm^2	"ϕ" Degree	CCC Kg/Cm^2
01.	1.50	44.00	1.92	0.13	24	--
	3.50	46.00	1.86	0.21	8	0.46
	5.00	43.00	1.94	0.18	23	--
	7.50	37.00	2.05	0.09	28	--
	10.50	34.00	2.11	0.00	33	--
	14.00	44.00	1.88	0.27	6	0.58
	16.50	34.00	2.10	0.00	32	--
	20.00	33.00	2.13	0.00	33	--

Contd.

B.H. No	Depth (M)	Porosity. (%)	Saturated density gm/cc.	"C" Kg/Cm2	"ϕ" Degree	UCC Kg/Cm2
02.	2.00	47.00	1.83	0.14	7	0.32
	3.50	43.00	1.91	0.32	9	0.71
	4.50	39.00	2.01	0.16	21	--
	7.50	35.00	2.08	0.00	32	--
	10.50	32.00	2.13	0.00	33	--
	14.00	42.00	1.90	0.34	6	0.75
	18.00	33.00	2.11	0.00	32	--
	20.00	31.00	2.15	0.00	33	--
03.	2.00	46.00	1.85	0.18	7	0.41
	3.50	47.00	1.84	0.15	8	0.32
	4.50	45.00	1.90	0.21	16	--
	7.50	37.00	2.06	0.00	32	--
	10.50	32.00	2.13	0.00	33	--
	14.00	44.00	1.87	0.29	6	0.59
	16.50	34.00	2.11	0.00	32	--
	20.00	32.00	2.14	0.00	33	--
04.	2.00	45.00	1.87	0.24	8	0.53
	3.50	45.00	1.87	0.25	7	0.58
	5.00	45.00	1.87	0.26	7	--
	7.50	35.00	2.07	0.19	30	--
	10.50	32.00	2.13	0.00	33	--
	15.00	43.00	1.93	0.24	15	0.55
	18.00	35.00	2.10	0.00	32	--
	20.00	32.00	2.14	0.00	33	--
05.	2.00	45.00	1.87	0.31	7	0.62
	3.50	47.00	1.83	0.15	7	0.34
	4.50	44.00	1.91	0.18	19	--
	7.50	34.00	2.10	0.00	33	--
	10.50	31.00	2.15	0.00	34	--
	15.00	39.00	1.98	0.41	12	0.86
	18.00	34.00	2.10	0.00	32	--
	20.00	32.00	2.15	0.00	33	--

Contd.

ATTERBERG'S LIMIT TEST

B.H. No	Depth (M)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Shrinkage Limit	Swelling Index
01.	3.50	44.10	25.37	18.73	33.00	0.598
	5.00	55.40	27.65	27.75	30.00	0.518
02.	2.00	46.80	26.38	20.42	35.00	0.587
	3.50	41.30	24.51	16.79	29.00	0.644
	14.00	56.20	28.42	27.78	28.00	0.511
03.	2.00	50.60	26.18	24.42	33.00	0.544
	3.50	45.40	26.29	19.11	34.00	0.630
	14.00	54.50	27.12	27.38	31.00	0.523
04.	2.00	44.60	25.73	18.87	32.00	0.613
	3.50	46.20	26.35	19.85	32.00	0.619
	5.00	41.40	24.51	16.89	32.00	0.608
05.	2.00	48.50	26.72	21.78	32.00	0.566
	3.50	46.30	26.34	19.96	35.00	0.617

Contd.

CONSOLIDATION TEST

Bore Hole No	Sample NO.	Pressure Increment Kg/cm²	Dial Gauge Reading	Change in dial reading	Specimen height (cm)	Void ratio	Mv (kg/cm²/ cm)
01.	3.50	0.5	21	21	1.9979	0.830	0.0021
		1.0	84	63	1.9916	0.824	0.0063
		2.0	219	135	1.9781	0.812	0.0675
		4.0	540	321	1.9460	0.782	0.0081
		8.0	1108	568	1.8892	0.730	0.0073
	14.00	0.5	19	19	1.9981	0.883	0.0019
		1.0	61	42	1.9939	0.879	0.0042
		2.0	134	73	1.9866	0.872	0.0036
		4.0	318	184	1.9682	0.855	0.0080
		8.0	675	357	1.9325	0.821	0.0045
02.	2.00	0.5	28	28	1.9972	0.895	0.0028
		1.0	111	83	1.9889	0.887	0.0083
		2.0	263	152	1.9737	0.872	0.0076
		4.0	650	387	1.9350	0.836	0.0098
		8.0	1304	654	1.8696	0.773	0.0084
	3.50	0.5	15	15	1.9985	0.841	0.0015
		1.0	52	37	1.9948	0.838	0.0037
		2.0	113	61	1.9887	0.832	0.0031
		4.0	277	164	1.9723	0.817	0.0041
		8.0	515	238	1.9485	0.795	0.0030
	14.00	0.5	18	18	1.9982	0.813	0.0018
		1.0	64	46	1.9936	0.808	0.0064
		2.0	127	63	1.9873	0.803	0.0032
		4.0	338	211	1.9662	0.784	0.0053
		8.0	659	321	1.9341	0.754	0.0041
03.	2.00	0.5	24	24	1.9976	0.805	0.0024
		1.0	95	71	1.9905	0.799	0.0071
		2.0	241	146	1.9759	0.786	0.0073
		4.0	592	351	1.9408	0.754	0.0089
		8.0	1110	518	1.8890	0.707	0.0075

Contd.

Bore Hole No	Sample NO.	Pressure Increment Kg/cm²	Dial Gauge Reading	Change in dial reading	Specimen height (cm)	Void ratio	Mv (kg/cm²/ cm)
03.	3.50	0.5	26	26	1.9974	1.000	0.0026
		1.0	102	78	1.9896	0.994	0.0078
		2.0	261	159	1.9737	0.978	0.0080
		4.0	677	416	1.9321	0.936	0.0105
		8.0	1261	584	1.8737	0.877	0.0076
	14.00	0.5	19	19	1.9981	0.896	0.0019
		1.0	72	53	1.9928	0.891	0.0053
		2.0	154	82	1.9846	0.883	0.0041
		4.0	388	234	1.9612	0.861	0.0059
		8.0	849	461	1.9151	0.817	0.0059
04.	2.00	0.5	21	21	1.9979	0.931	0.0021
		1.0	89	68	1.9911	0.925	0.0089
		2.0	223	134	1.9777	0.912	0.0067
		4.0	552	329	1.9448	0.880	0.0083
		8.0	1017	465	1.8983	0.835	0.0060
	3.50	0.5	24	24	1.9976	0.924	0.0024
		1.0	95	71	1.9905	0.917	0.0071
		2.0	241	146	1.9759	0.903	0.0073
		4.0	592	351	1.9408	0.869	0.0089
		8.0	1110	518	1.8890	0.819	0.0067
	5.00	0.5	26	26	1.9974	0.931	0.0026
		1.0	98	72	1.9902	0.924	0.0072
		2.0	249	151	1.9751	0.909	0.0076
		4.0	577	328	1.9423	0.878	0.0083
		8.0	1113	536	1.8887	0.826	0.0069
05.	2.00	0.5	19	19	1.9981	0.924	0.0019
		1.0	75	56	1.9925	0.919	0.0075
		2.0	196	121	1.9804	0.907	0.0061
		4.0	474	278	1.9526	0.880	0.0070
		8.0	889	415	1.9111	0.840	0.0053
	3.50	0.5	27	27	1.9973	1.008	0.0027
		1.0	119	92	1.9661	0.977	0.0092
		2.0	283	164	1.9717	0.982	0.0083
		4.0	662	379	1.9338	0.944	0.0096
		8.0	1345	683	1.8655	0.876	0.0088

Contd.

RESULT OF ELECTRIC RESISTIVITY TEST

TEST 1				
Direction	**Distance in M(L)**	**Reading (R)**	**P=Ohm in M**	**Average Ohm**
NORTH	0.5	2.66	8.3524	16.5321
	1	2.25	14.13	
	2	1.05	13.188	
	3	1	18.84	
	4	0.76	19.0912	
	5	0.64	20.096	
	6	0.51	19.2168	
	7	0.44	19.3424	
			0	
SOUTH	0.5	3.71	11.6494	26.992225
	1	3.65	22.922	
	2	1.92	24.1152	
	3	1.42	26.7528	
	4	1.15	28.888	
	5	1.07	33.598	
	6	0.93	35.0424	
	7	0.75	32.97	
			0	
EAST	0.5	4.94	15.5116	21.68955
	1	2.7	16.956	
	2	1.65	20.724	
	3	1.15	21.666	
	4	0.95	23.864	
	5	0.76	23.864	
	6	0.71	26.7528	
	7	0.55	24.178	
WEST	0.5	5.82	18.2748	28.4327
	1	3.2	20.096	
	2	1.67	20.9752	
	3	1.22	22.9848	
	4	1.21	30.3952	
	5	1.18	37.052	
	6	1	37.68	
	7	0.91	40.0036	

Contd.

Direction	Distance in M(L)	Reading (R)	P=Ohm in M	Average Ohm
S-E	0.5	5.01	15.7314	20.16328571
	1	2.8	17.584	
	2	1.64	20.5984	
	3	1.07	20.1588	
	4	0.91	22.8592	
	5	0.7	21.98	
	6	0.59	22.2312	
N-W	0.5	5.8	18.212	23.87297143
	1	3.18	19.9704	
	2	1.65	20.724	
	3	1.19	22.4196	
	4	1.05	26.376	
	5	0.92	28.888	
	6	0.81	30.5208	
			0	
N-E	0.5	3.68	11.5552	17.3956
	1	2.25	14.13	
	2	1.18	14.8208	
	3	1.05	19.782	
	4	0.85	21.352	
	5	0.63	19.782	
	6	0.54	20.3472	
S-W	0.5	5.78	18.1492	23.27786667
	1	3.17	19.9076	
	2	1.64	20.5984	
	3	1.2	22.608	
	4	1.1	27.632	
	5	0.98	30.772	

Contd.

Test 2				
Direction	**Distance in M(L)**	**Reading (R)**	**P=Ohm in M**	**Average Ohm**
NORTH	0.5	3.66	11.4924	22.2312
	1	1.79	11.2412	
	2	1.29	16.2024	
	3	1.15	21.666	
	4	1.01	25.3712	
	5	0.94	29.516	
	6	0.85	32.028	
	7	0.69	30.3324	
SOUTH	0.5	4.54	14.2556	16.66555
	1	2.74	17.2072	
	2	1.22	15.3232	
	3	1.06	19.9704	
	4	0.85	21.352	
	5	0.54	16.956	
	6	0.4	15.072	
	7	0.3	13.188	
EAST	0.5	4.98	15.6372	20.87315
	1	2.17	13.6276	
	2	1.02	12.8112	
	3	0.98	18.4632	
	4	0.95	23.864	
	5	0.86	27.004	
	6	0.74	27.8832	
	7	0.63	27.6948	
WEST	0.5	4.97	15.6058	20.939875
	1	2.81	17.6468	
	2	1.09	13.6904	
	3	1.04	19.5936	
	4	0.9	22.608	
	5	0.79	24.806	
	6	0.71	26.7528	
	7	0.61	26.8156	

Contd.

Direction	Distance in M(L)	Reading (R)	P=Ohm in M	Average Ohm
N-W	0.5	4.96	15.5744	18.45422857
	1	2.79	17.5212	
	2	1.07	13.4392	
	3	0.98	18.4632	
	4	0.79	19.8448	
	5	0.68	21.352	
	6	0.61	22.9848	
S-E	0.5	4.96	15.5744	19.2168
	1	2.15	13.502	
	2	1	12.56	
	3	0.97	18.2748	
	4	0.89	22.3568	
	5	0.8	25.12	
	6	0.72	27.1296	
N-E	0.5	4.94	15.5116	19.18091429
	1	2.26	14.1928	
	2	1.04	13.0624	
	3	0.97	18.2748	
	4	0.88	22.1056	
	5	0.8	25.12	
	6	0.69	25.9992	
S-W	0.5	4.92	15.4488	15.96914286
	1	2.78	17.4584	
	2	1.06	13.3136	
	3	1	18.84	
	4	0.85	21.352	
	5	0.7	21.98	
	6	0.59	22.2312	

Contd.

Test 3				
Direction	**Distance in M(L)**	**Reading (R)**	**P=Ohm in M**	**Average Ohm**
NORTH	0.5	3.26	10.2364	15.86746667
	1	2.29	14.3812	
	2	1.56	19.5936	
	3	0.84	15.8256	
	4	0.7	17.584	
	5	0.56	17.584	
			0	
SOUTH	0.5	5.15	16.171	16.40964
	1	2.61	16.3908	
	2	1.49	18.7144	
	3	0.82	15.4488	
	4	0.61	15.3232	
			0	
EAST	0.5	3.38	10.6132	13.502
	1	2.21	13.8788	
	2	1.19	14.9464	
	3	0.69	12.9996	
	4	0.6	15.072	
WEST	0.5	5.54	17.3956	14.09232
	1	2.6	16.328	
	2	1.13	14.1928	
	3	0.77	14.5068	
	4	0.32	8.0384	
N-W	0.5	5.53	17.3642	14.13628
	1	2.58	16.2024	
	2	1.12	14.0672	
	3	0.77	14.5068	
	4	0.34	8.5408	

Contd.

Direction	Distance in M(L)	Reading (R)	P=Ohm in M	Average Ohm
S-E	0.5	3.41	10.7074	13.7218
	1	2.23	14.0044	
	2	1.21	15.1976	
	3	0.71	13.3764	
	4	0.61	15.3232	
N-E	0.5	3.39	10.6446	13.22725
	1	2.23	14.0044	
	2	1.2	15.072	
	3	0.7	13.188	
S-W	0.5	5.55	17.427	11.92415
	1	2.58	16.2024	
	2	1.12	14.0672	
	3	0.79	14.8836	

Test 4				
Direction	**Distance in M(L)**	**Reading (R)**	**P=Ohm in M**	**Average Ohm**
NORTH	0.5	5.21	16.3594	15.4174
	1	1.69	10.6132	
	2	1.39	17.4584	
	3	0.96	18.0864	
	4	0.58	14.5696	
SOUTH	0.5	3.55	11.147	14.1457
	1	2.43	15.2604	
	2	1.03	12.9368	
	3	0.82	15.4488	
	4	0.66	16.5792	
	5	0.43	13.502	

Contd.

Direction	Distance in M(L)	Reading (R)	P=Ohm in M	Average Ohm
EAST	0.5	4.72	14.8208	12.40928
	1	2.11	13.2508	
	2	1.02	12.8112	
	3	0.67	12.6228	
	4	0.34	8.5408	
			0	
WEST	0.5	6.39	20.0646	16.60536667
	1	2.01	12.6228	
	2	1.32	16.5792	
	3	1.08	20.3472	
	4	0.72	18.0864	
	5	0.38	11.932	
N-W	0.5	6.4	20.096	17.62168
	1	2.02	12.6856	
	2	1.31	16.4536	
	3	1.09	20.5356	
	4	0.73	18.3376	
	10		0	
S-E	0.5	4.7	14.758	13.1723
	1	2.09	13.1252	
	2	1	12.56	
	3	0.65	12.246	
N-E	0.5	4.69	14.7266	13.21155
	1	2.1	13.188	
	2	1.01	12.6856	
	3	0.65	12.246	
S-W	0.5	6.37	20.0018	13.29476
	1	2	12.56	
	2	1.3	16.328	
	3	1.06	19.9704	
	4	0.7	17.584	

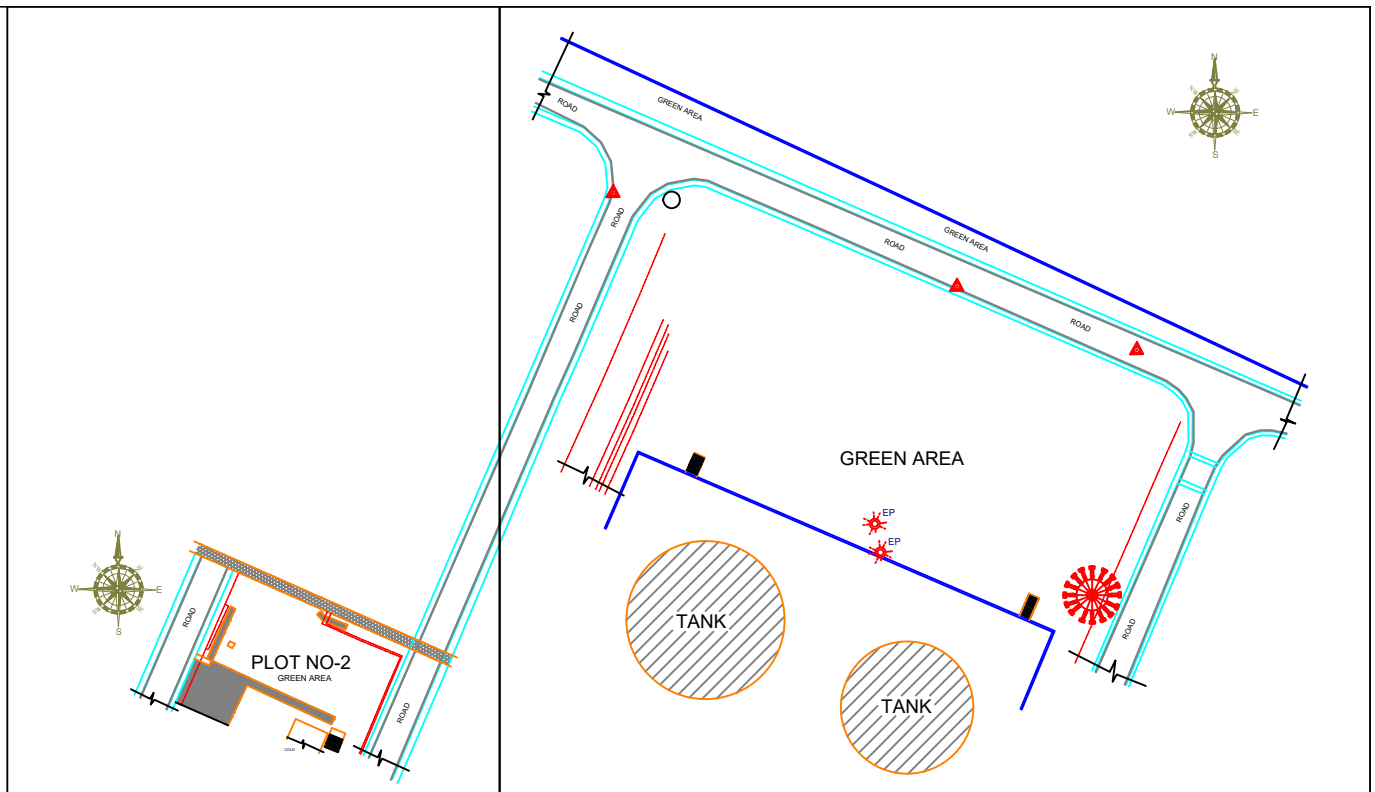
Contd.

Test 5				
Direction	**Distance in M(L)**	**Reading (R)**	**P=Ohm in M**	**Average Ohm**
NORTH	0.5	7.32	22.9848	17.0502
	1	2.92	18.3376	
	2	1.44	18.0864	
	3	0.84	15.8256	
	4	0.64	16.0768	
	5	0.35	10.99	
SOUTH	0.5	5.87	18.4318	16.05063333
	1	2.97	18.6516	
	2	1.1	13.816	
	3	0.81	15.2604	
	4	0.65	16.328	
	5	0.44	13.816	
EAST	0.5	6.31	19.8134	13.39524
	1	3.8	23.864	
	2	0.9	11.304	
	3	0.41	7.7244	
	4	0.17	4.2704	
			0	
WEST	0.5	6.18	19.4052	16.31544
	1	3.03	19.0284	
	2	1.22	15.3232	
	3	0.85	16.014	
	4	0.47	11.8064	
N-W	0.5	6.19	19.4366	16.71108
	1	3.04	19.0912	
	2	1.24	15.5744	
	3	0.91	17.1444	
	4	0.49	12.3088	

Contd.

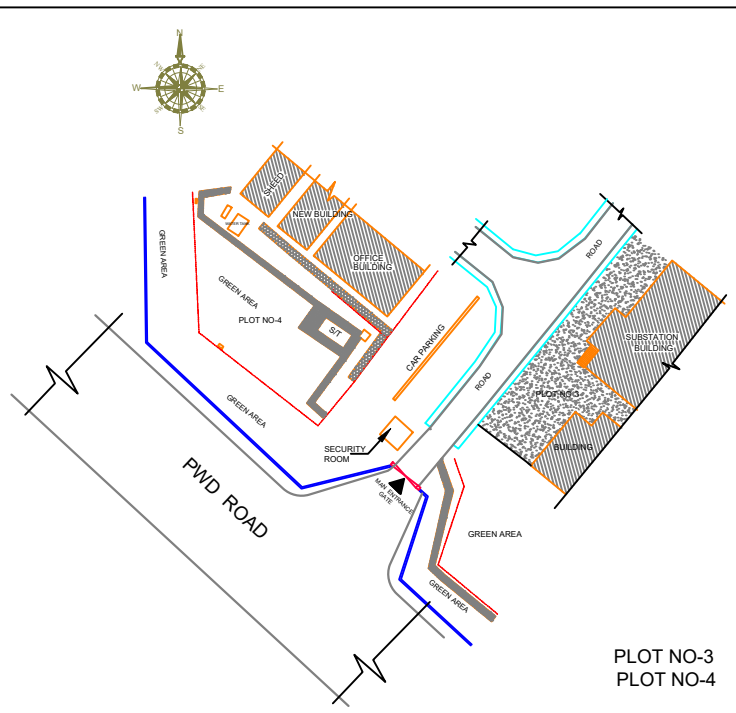
Direction	Distance in M(L)	Reading (R)	P=Ohm in M	Average Ohm
			0	
S-E	0.5	6.3	19.782	14.6167
	1	2.79	17.5212	
	2	1.01	12.6856	
	3	0.45	8.478	
	10		0	
			0	
N-E	0.5	7.3	22.922	18.6359
	1	2.9	18.212	
	2	1.43	17.9608	
	3	0.82	15.4488	
S-W	0.5	6.2	19.468	13.08752
	1	3.04	19.0912	
	2	1.22	15.3232	
	3	0.86	16.2024	
	4	0.46	11.5552	

Contd.



PLOT NO-2

PLOT NO-1



PLOT NO-3
PLOT NO-4

PLOT NO-1

LEGENDS:-		
SL NO.	DESCRIPTION	SYMBOL
1	ROAD	
2	BOUNDARY WALL	
3	RCC DRAIN	
4	STRUCTURE	
5	CULVERT	
6	HIGH MAST	
7	LIGHT POST	
8	TBM	

SITE PLAN OF PROPOSED FOUR SITE

TOPOGRAPHICAL SURVEY MAP
MADHUBON, DULIAJAN

PROJECT: –

CONTRACTOR : –

PLOT NO-1

LEGENDS:-

SL NO.	DESCRIPTION	SYMBOL
1	ROAD	
2	BOUNDARY WALL	
3	RCC DRAIN	
4	STRUCTURE	
5	CULVERT	
6	HIGH MAST	
7	LIGHT POST	
8	TBM	

T B M -1
X=730760.300
Y=3031327.981
Z=100.011

T B M - 2
X=730825.260
Y=3031310.275
Z=100.072

T B M -3
X=730859.249
Y=3031298.289
Z=100.102

EXISTING BOUNDARY WALL

GREEN AREA

ROAD

ROAD TOP RL:-100.069M

ROAD TOP RL:-100.038M

ROAD TOP RL:-100.180M

ROAD TOP RL:-100.035M

TO PLOT NO-2

T B M - A

TANK

TANK

TOPOGRAPHICAL SURVEY MAP
MADHUBON, DULIAJAN

PROJECT: –

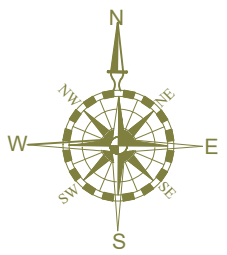
PLOT NO–1

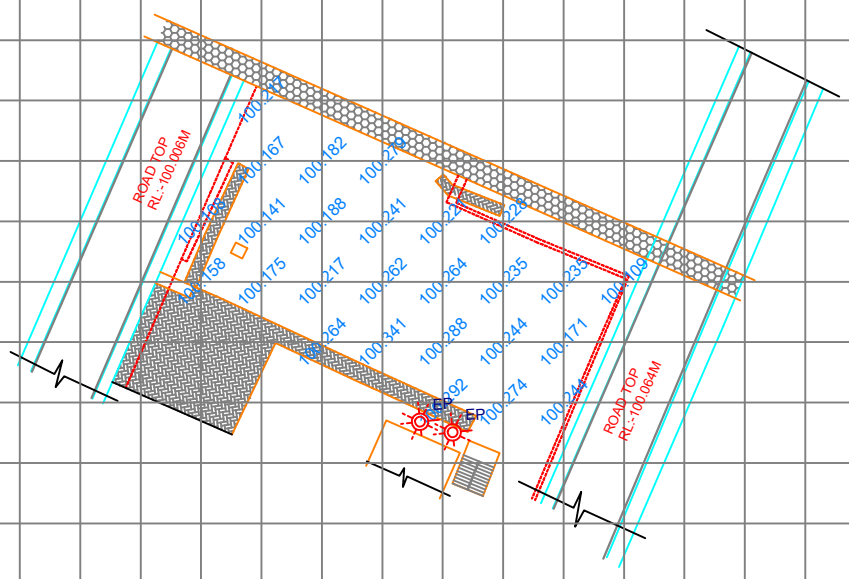
CONTRACTOR : –

SCALE =
1: 700 (A3 SIZE)

DATE: 16.12.2025

N 3031320
N 3031315
N 3031310
N 3031305
N 3031300
N 3031295
N 3031290
N 3031285
N 3031280
N 3031275
N 3031270
N 3031265
N 3031260
N 3031255
N 3031250
N 3031245
N 3031240
N 3031235
N 3031230
N 3031225
N 3031220
N 3031215
N 3031210
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N 3031185
N 3031180
N 3031175
N 3031170
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N 3031160
N 3031155
N 3031150
N 3031145
N 3031140





LEGENDS:-

SL NO.	DESCRIPTION	SYMBOL
1	ROAD	
2	BOUNDARY WALL	
3	RCC DRAIN	
4	STRUCTURE	
5	**CULVERT**	
6	**HIGH MAST**	
7	**LIGHT POST**	EP EP
8	**TBM**	

TOPOGRAPHICAL SURVEY MAP
MADHUBON, DULIAJAN

PROJECT: –

CONTRACTOR : –

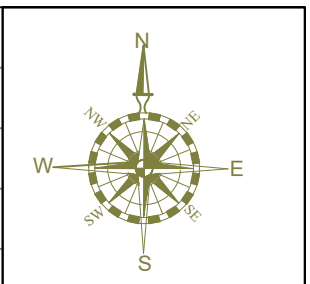
PLOT NO–2

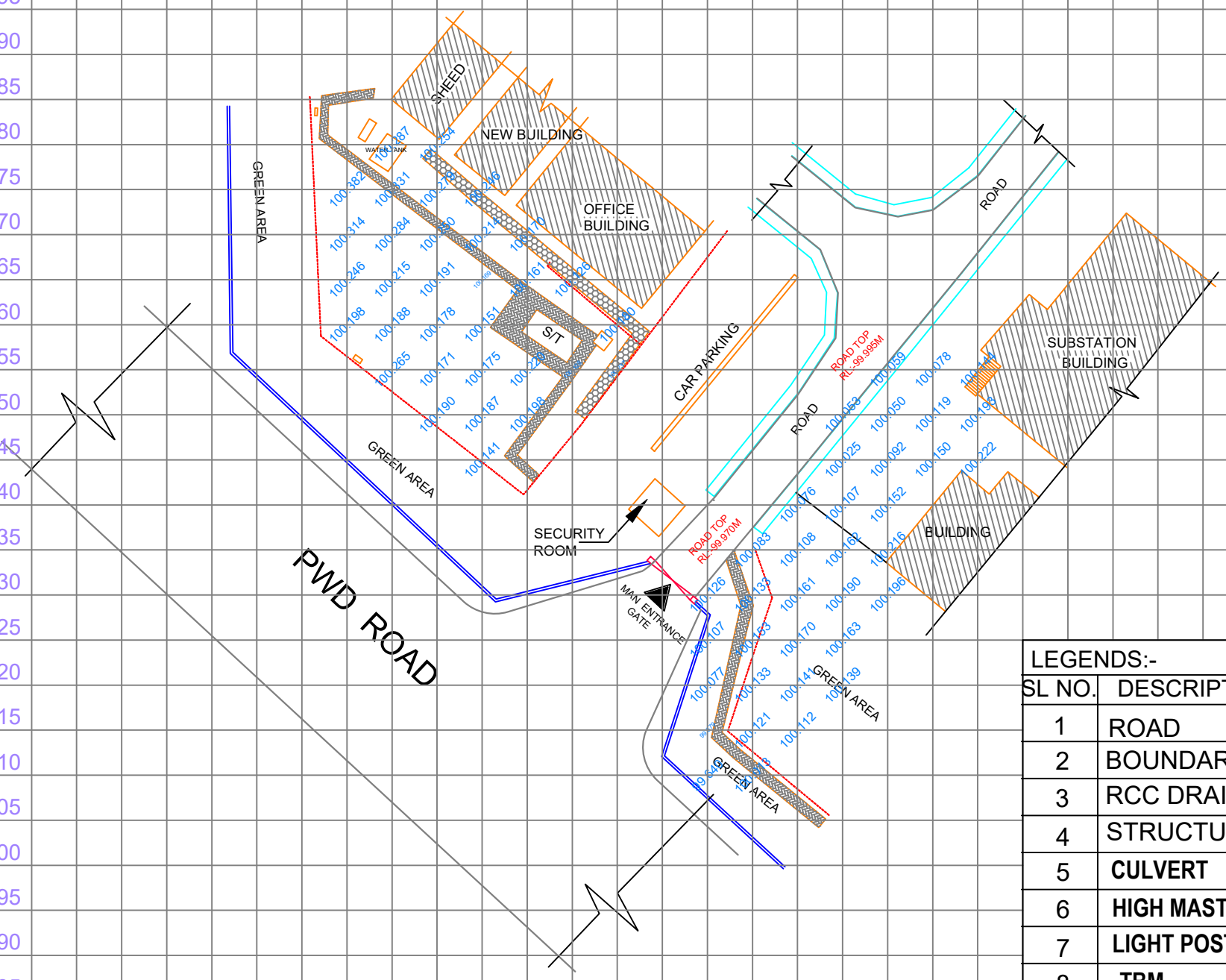
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N 3031130
N 3031125
N 3031120
N 3031115
N 3031110
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N 3031090
N 3031085
N 3031080
N 3031075
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N 3031065
N 3031060
N 3031055
N 3031050
N 3031045
N 3031040
N 3031035
N 3031030
N 3031025
N 3031020
N 3031015
N 3031010
N 3031005
N 3031000
N 3030995
N 3030990
N 3030985





LEGENDS:-

SL NO.	DESCRIPTION	SYMBOL
1	ROAD	
2	BOUNDARY WALL	
3	RCC DRAIN	
4	STRUCTURE	
5	**CULVERT**	
6	**HIGH MAST**	
7	**LIGHT POST**	EP EP
8	**TBM**	

TOPOGRAPHICAL SURVEY MAP
MADHUBON, DULIAJAN

PROJECT: –

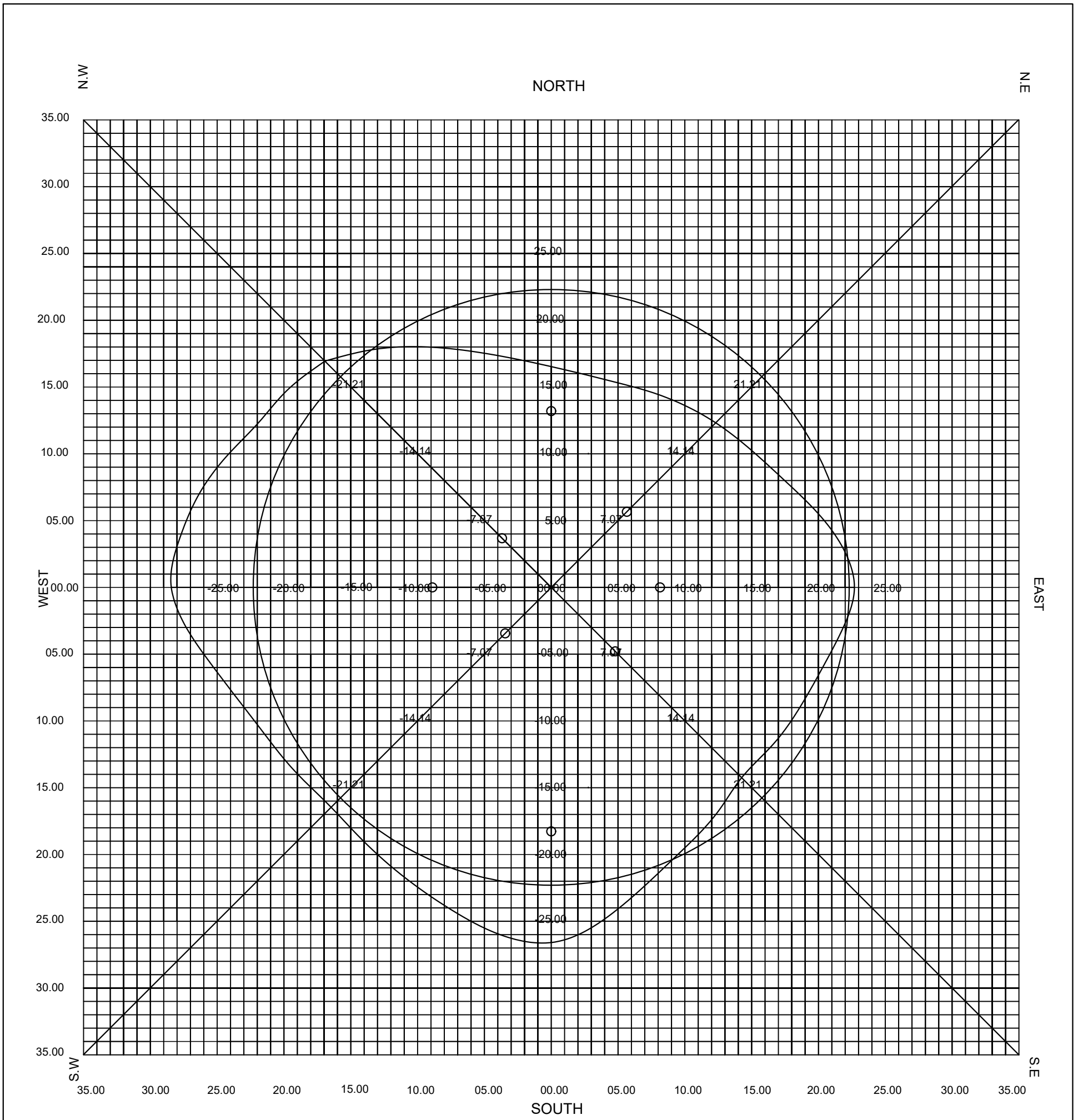
CONTRACTOR : –

PLOT NO–3 & 4

SCALE = 1: 700 (A3 SIZE)

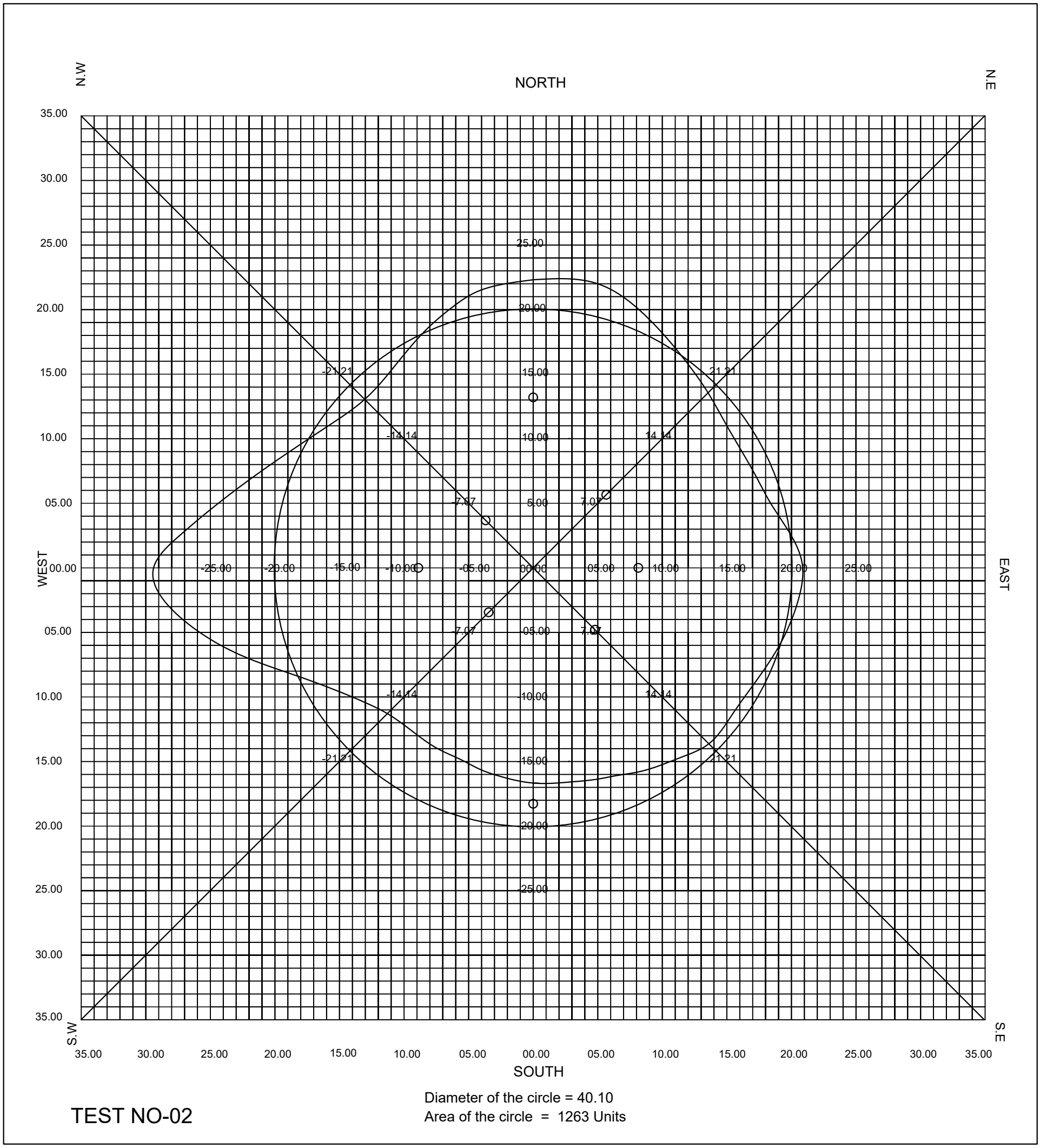
DATE: 16.12.2025

E 730515 E 730520 E 730525 E 730530 E 730535 E 730540 E 730545 E 730550 E 730555 E 730560 E 730565 E 730570 E 730575 E 730580 E 730585 E 730590 E 730595 E 730600 E 730605 E 730610 E 730615 E 730620 E 730625 E 730630 E 730635 E 730640 E 730645 E 730650 E 730655 E 730660 E 730665 E 730670



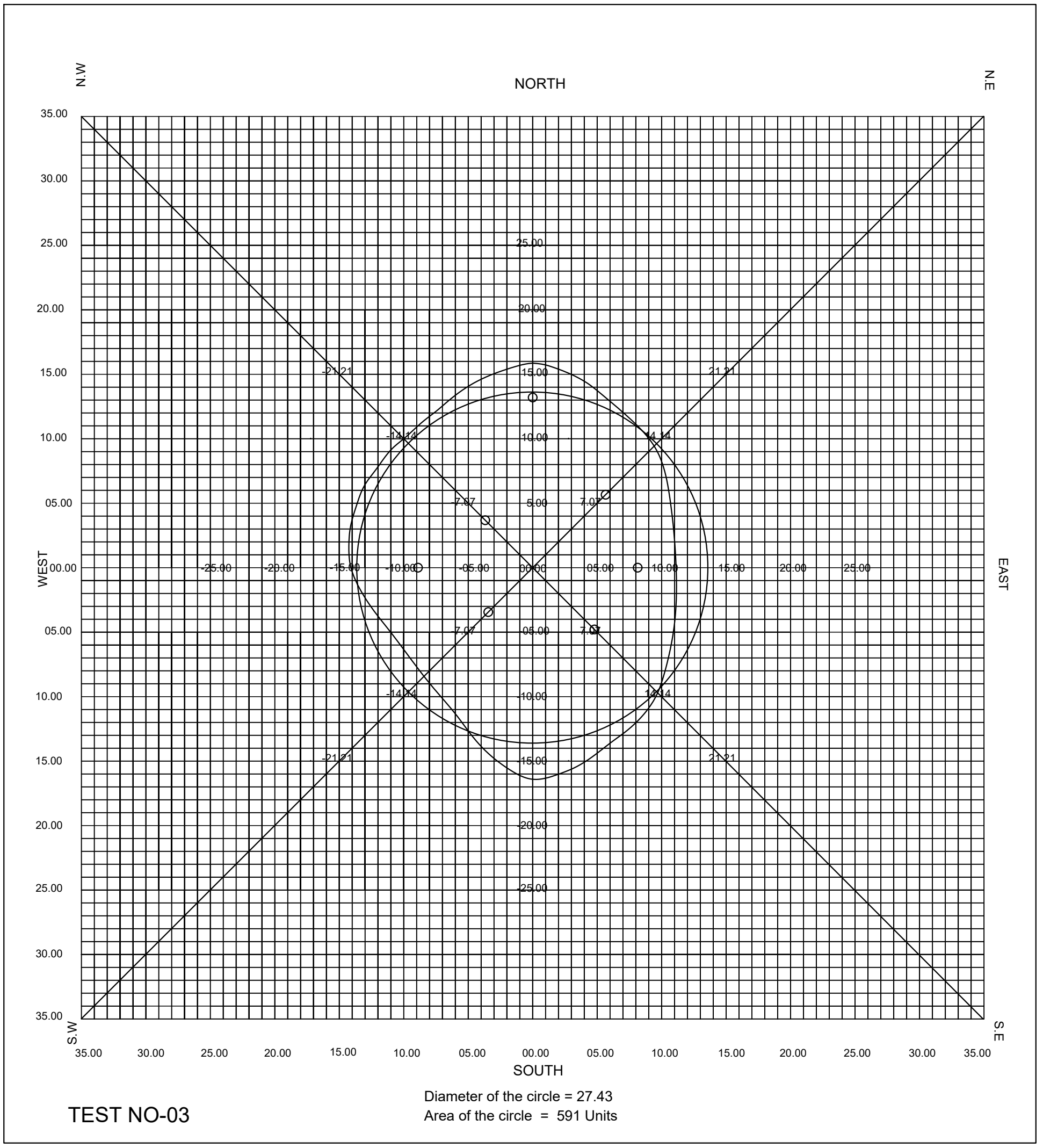
Diameter of the circle = 44.60
Area of the circle = 1562 Units

TEST NO-01



TEST NO-02

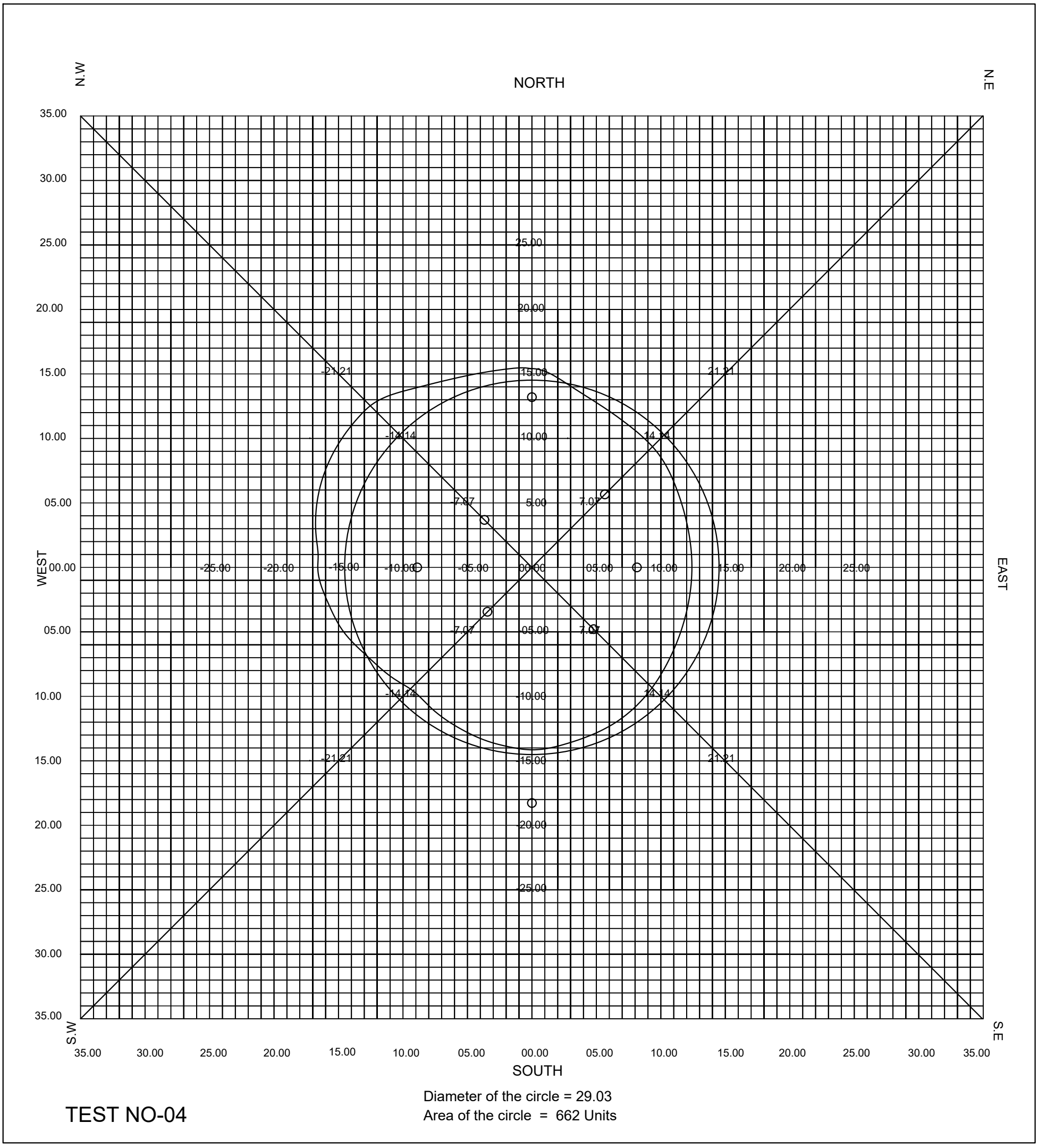
Diameter of the circle = 40.10
Area of the circle = 1263 Units



Diameter of the circle = 27.43

Area of the circle = 591 Units

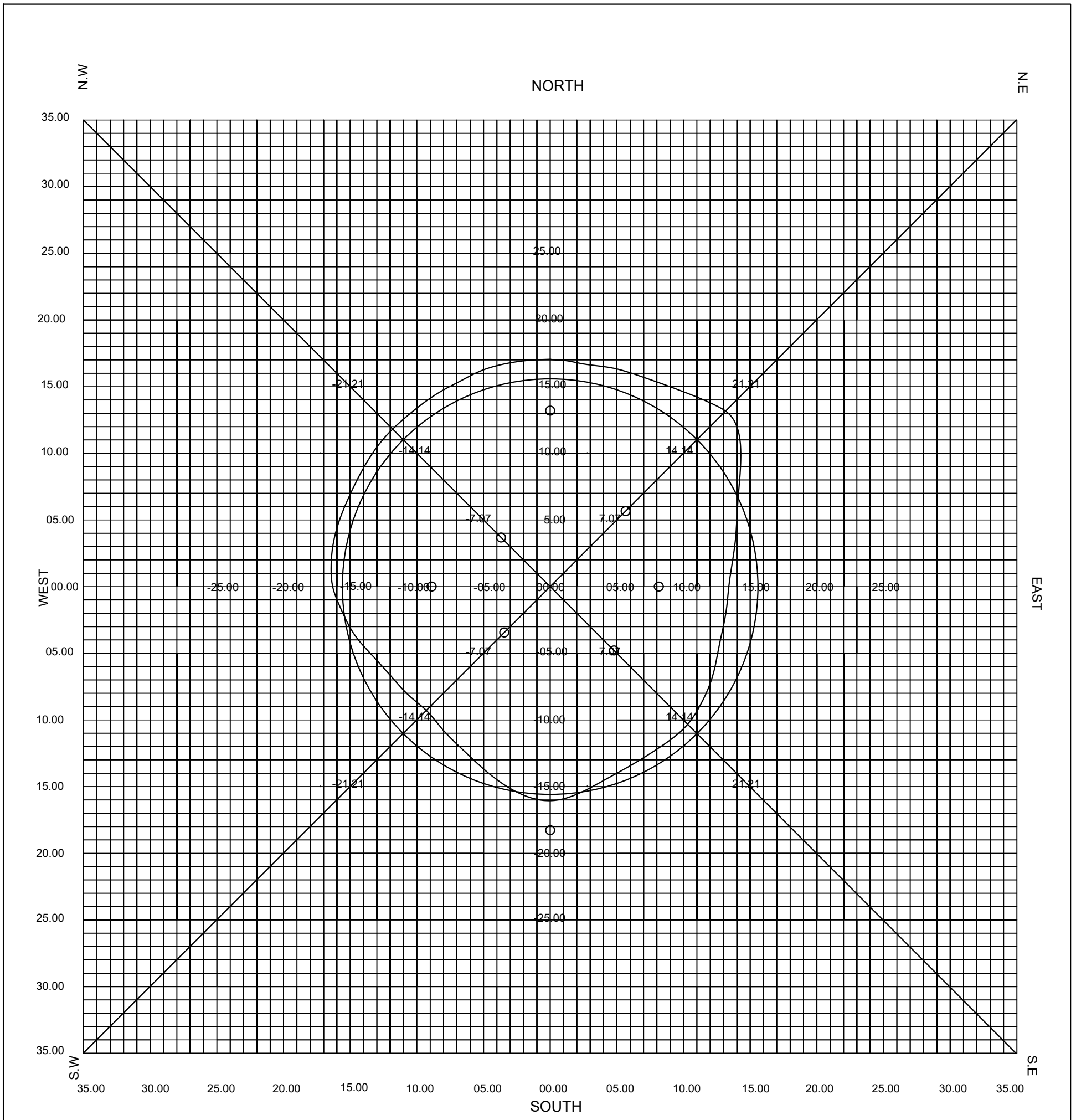
TEST NO-03



Diameter of the circle = 29.03

Area of the circle = 662 Units

TEST NO-04



Diameter of the circle = 31.17
Area of the circle = 763 Units

TEST NO-05

BORE HOLE CHART

BORE HOLE NO : 01
NAME OF WORK :

Madhuban.Assam.

TYPE OF BORING: Auger & Wash
DATE STARTED : 13.02.26
DATE COMPLETED: 14.02 .26

DESCRIPTION	DEPTH (M)	STRATA	SAMPLE COLLECTED D.S	SAMPLE COLLECTED U.S	G.W.L. 4.20m	S.P.T. 10	20	30	40	50	N–VALUE
Filled up soil .	01.00										
Silty sand .	02.00		01.50								13
	03.00		03.00		03.50						06
	04.00		04.50								14
Clayey silt with sand .	05.00				05.00						
	06.00		06.00								34
	07.00		07.50								36
	08.00										
	09.00		09.00								67
Sand .	10.00		10.50								69
	11.00										
	12.00		12.00								69
	13.00		13.50								08
Clayey silt .	14.00				14.00						
	15.00		15.00								10

D.S. : Disturbed Sample.
U.S. : Undisturbed Sample.

S.P.T. : Standard Penetration Test.
G.W.L. : Ground Water Level.

BORE HOLE CHART

BORE HOLE NO : 01
NAME OF WORK :

Madhuban.Assam.

TYPE OF BORING: Auger & Wash
DATE STARTED : 13.02.26
DATE COMPLETED: 14.02 .26

DESCRIPTION	DEPTH (M)	STRATA	SAMPLE COLLECTED D.S	SAMPLE COLLECTED U.S	G.W.L. 4.20m	S.P.T. 10 20 30 40 50	N–VALUE
Clayey silt with sand .	16.00		16.50				31
Sand .	17.00						
	18.00		18.00				65
	19.00						
	20.00		20.00				68

D.S. : Disturbed Sample.
U.S. : Undisturbed Sample.

S.P.T. : Standard Penetration Test.
G.W.L. : Ground Water Level.

BORE HOLE CHART

BORE HOLE NO : 02
NAME OF WORK :

Madhuban.Assam.

TYPE OF BORING: Auger & Wash
DATE STARTED : 14.02.26
DATE COMPLETED: 14.02 .26

DESCRIPTION	DEPTH (M)	STRATA	SAMPLE COLLECTED D.S	SAMPLE COLLECTED U.S	G.W.L. 4.00m	S.P.T. 10	20	30	40	50	N–VALUE
Filled up soil .	01.00										
Clayey silt with sand .	02.00		01.50	02.00							03
	03.00		03.00	03.50							11
	04.00		04.50								22
	05.00										
	06.00		06.00								42
	07.00		07.50								45
	08.00										
Sand .	09.00		09.00								65
	10.00										
	11.00		10.50								68
	12.00		12.00								69
	13.00										
Clayey silt .	14.00		13.50	14.00							10
	15.00		15.00								19

D.S. : Disturbed Sample.
U.S. : Undisturbed Sample.

S.P.T. : Standard Penetration Test.
G.W.L. : Ground Water Level.

BORE HOLE CHART

BORE HOLE NO : 02
NAME OF WORK :

Madhuban.Assam.

TYPE OF BORING: Auger & Wash
DATE STARTED : 14.02.26
DATE COMPLETED: 14.02 .26

DESCRIPTION	DEPTH (M)	STRATA	SAMPLE COLLECTED D.S	SAMPLE COLLECTED U.S	G.W.L. 4.20m	S.P.T. 10 20 30 40 50	N–VALUE
Clayey silt with sand .	16.00		16.50				14
Sand .	17.00						
	18.00		18.00				58
	19.00						
	20.00		20.00				67

D.S. : Disturbed Sample.
U.S. : Undisturbed Sample.

S.P.T. : Standard Penetration Test.
G.W.L. : Ground Water Level.

BORE HOLE CHART

BORE HOLE NO : 03
NAME OF WORK :

Madhuban.Assam.

TYPE OF BORING: Auger & Wash
DATE STARTED : 15.02.26
DATE COMPLETED: 15.02.26

DESCRIPTION	DEPTH (M)	STRATA	SAMPLE COLLECTED D.S	SAMPLE COLLECTED U.S	G.W.L. 4.10m	S.P.T. 10	20	30	40	50	N–VALUE
Filled up soil .	01.00										
Clayey silt with sand .	02.00		01.50	02.00							05
	03.00		03.00								04
	04.00			03.50							
	05.00		04.50								10
Silty sand .	06.00		06.00								26
	07.00										
	08.00		07.50	08.00							33
	09.00		09.00								66
Sand .	10.00										
	11.00		10.50								70
	12.00		12.00								72
	13.00										
Clayey silt .	14.00		13.50	14.00							07
	15.00		15.00								17

D.S. : Disturbed Sample.
U.S. : Undisturbed Sample.

S.P.T. : Standard Penetration Test.
G.W.L. : Ground Water Level.

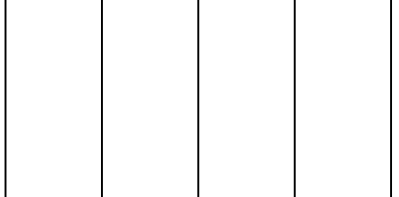
BORE HOLE CHART

BORE HOLE NO : 03
NAME OF WORK :

Madhuban.Assam.

TYPE OF BORING: Auger & Wash
DATE STARTED : 15.02.26
DATE COMPLETED: 15.02 .26

DESCRIPTION	DEPTH (M)	STRATA	SAMPLE COLLECTED D.S	SAMPLE COLLECTED U.S	G.W.L. 4.20m	S.P.T. 10 20 30 40 50	N–VALUE
Clayey silt with sand .	16.00		16.50				25
Sand .	17.00						
	18.00		18.00				62
	19.00						
	20.00		20.00				65



D.S. : Disturbed Sample.
U.S. : Undisturbed Sample.

S.P.T. : Standard Penetration Test.
G.W.L. : Ground Water Level.

BORE HOLE CHART

BORE HOLE NO : 04
NAME OF WORK :

Madhuban.Assam.

TYPE OF BORING: Auger & Wash
DATE STARTED : 16.02.26
DATE COMPLETED: 16.02 .26

DESCRIPTION	DEPTH (M)	STRATA	SAMPLE COLLECTED D.S	SAMPLE COLLECTED U.S	G.W.L. 3.90m	S.P.T. 10	S.P.T. 20	S.P.T. 30	S.P.T. 40	S.P.T. 50	N–VALUE
Filled up soil .	01.00										
	02.00		01.50	02.00							07
Clayey silt with sand .	03.00		03.00	03.50							07
	04.00		04.50								07
	05.00			05.00							
	06.00		06.00								09
	07.00		07.50								47
Sand .	08.00										
	09.00		09.00								63
	10.00										
	11.00		10.50								67
	12.00		12.00								71
	13.00										
Clayey silt with sand .	14.00		13.50								08
	15.00		15.00								16

D.S. : Disturbed Sample.
U.S. : Undisturbed Sample.

S.P.T. : Standard Penetration Test.
G.W.L. : Ground Water Level.

BORE HOLE CHART

BORE HOLE NO : 04
NAME OF WORK :

Madhuban.Assam.

TYPE OF BORING: Auger & Wash
DATE STARTED : 16.02.26
DATE COMPLETED: 16.02 .26

DESCRIPTION	DEPTH (M)	STRATA	SAMPLE COLLECTED D.S	SAMPLE COLLECTED U.S	G.W.L. 4.20m	S.P.T. 10 20 30 40 50	N-VALUE
Clayey silt with sand .	16.00		16.50				21
	17.00						
Sand .	18.00		18.00				62
	19.00						
	20.00		20.00				67

D.S. : Disturbed Sample.
U.S. : Undisturbed Sample.

S.P.T. : Standard Penetration Test.
G.W.L. : Ground Water Level.

BORE HOLE CHART

BORE HOLE NO : 05
NAME OF WORK :

Madhuban.Assam.

TYPE OF BORING: Auger & Wash
DATE STARTED : 17.02.26
DATE COMPLETED: 17.02 .26

DESCRIPTION	DEPTH (M)	STRATA	SAMPLE COLLECTED D.S	SAMPLE COLLECTED U.S	G.W.L. 3.60m	S.P.T. 10 20 30 40 50	N–VALUE
Filled up soil .	01.00		01.50	02.00			10
Clayey silt with sand .	03.00		03.00	03.50			03
Silty sand .	04.00		04.50				19
	06.00		06.00				34
Sand .	07.00		07.50				46
	09.00		09.00				65
	10.00		10.50				69
	12.00		12.00				71
Clayey silt with sand .	13.00		13.50				75
	14.00						
	15.00		15.00				18

D.S. : Disturbed Sample.
U.S. : Undisturbed Sample.

S.P.T. : Standard Penetration Test.
G.W.L. : Ground Water Level.

BORE HOLE CHART

BORE HOLE NO : 05
NAME OF WORK :

Madhuban.Assam.

TYPE OF BORING: Auger & Wash
DATE STARTED : 17.02.26
DATE COMPLETED: 17.02 .26

DESCRIPTION	DEPTH (M)	STRATA	SAMPLE COLLECTED D.S	SAMPLE COLLECTED U.S	G.W.L. 4.20m	S.P.T. 10 20 30 40 50	N–VALUE
Clayey silt with sand .	16.00		16.50				16
	17.00						
Sand .	18.00		18.00				59
	19.00						
	20.00		20.00				66

D.S. : Disturbed Sample.
U.S. : Undisturbed Sample.

S.P.T. : Standard Penetration Test.
G.W.L. : Ground Water Level.

PARTICLE SIZE IN M.M.

PERCENT FINER

100
90
80
70
60
50
40
30
20
10
0

Depth	Index
1.50m	○
3.50m	▭
5.00m	//
7.50m	◎
10.50m	△
14.00m	#
16.50m	✡
20.00m	⊕

2 2 5 10 2 5 10 2 5 10

0.002 0.075 0.425 2.00 4.75 20.00 80.00

CLAY	SILT	SAND			GRAVEL		COBBLE
		FINE	MEDIUM	COARSE	FINE	COARSE	

BORE HOLE NO. : 01

PARTICLE SIZE DISTRIBUTION

PARTICLE SIZE IN M.M.

PERCENT FINER

100
90
80
70
60
50
40
30
20
10
0

Depth	Index
2.00m	○
3.50m	▭
4.50m	//
7.50m	◎
10.50m	△
14.00m	#
18.00m	✡
20.00m	⊕

2 2 5 10 2 5 10 2 5 10

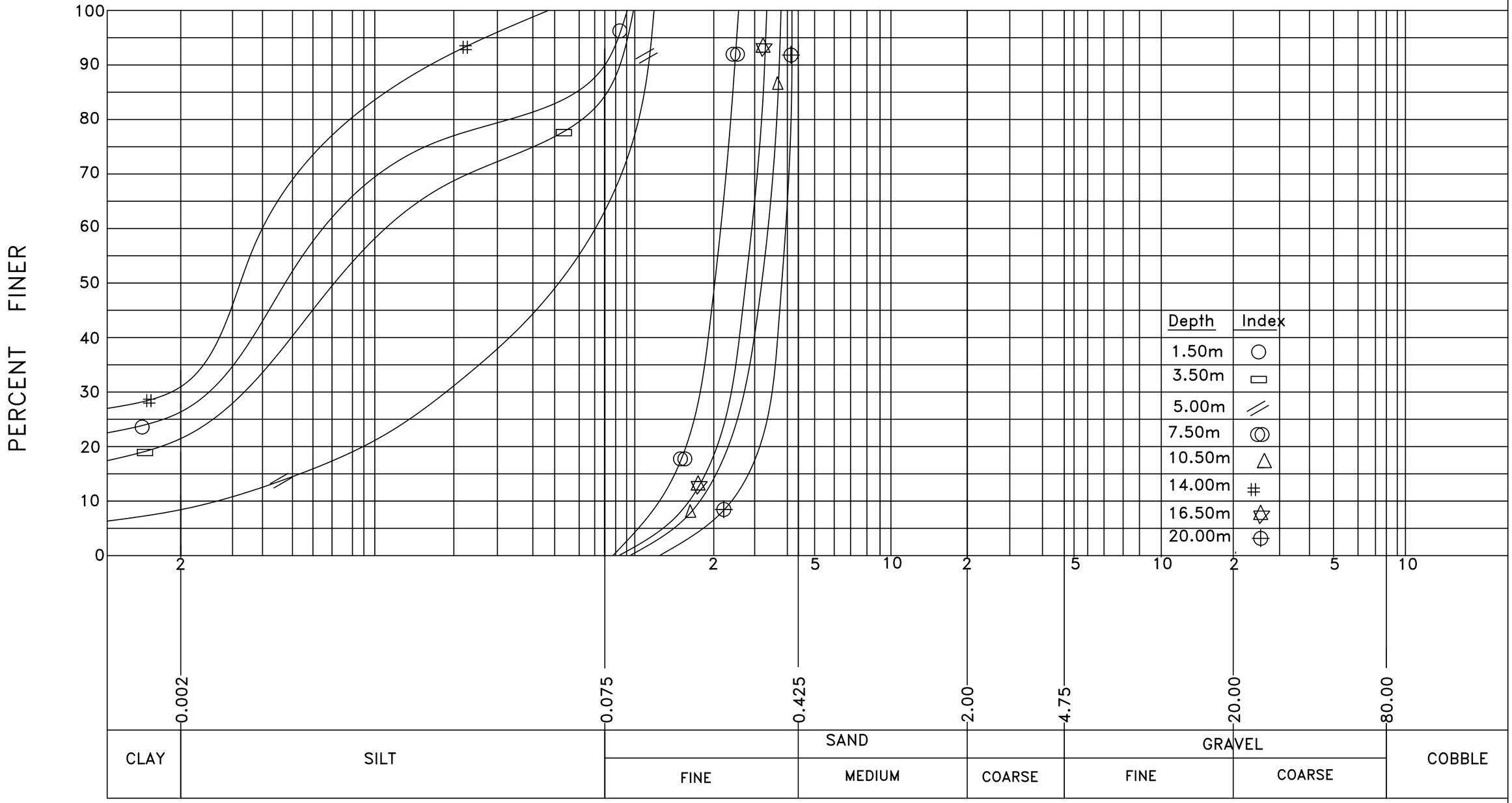
0.002 0.075 0.425 2.00 4.75 20.00 80.00

CLAY	SILT	SAND			GRAVEL		COBBLE
		FINE	MEDIUM	COARSE	FINE	COARSE	

BORE HOLE NO. : 02

PARTICLE SIZE DISTRIBUTION

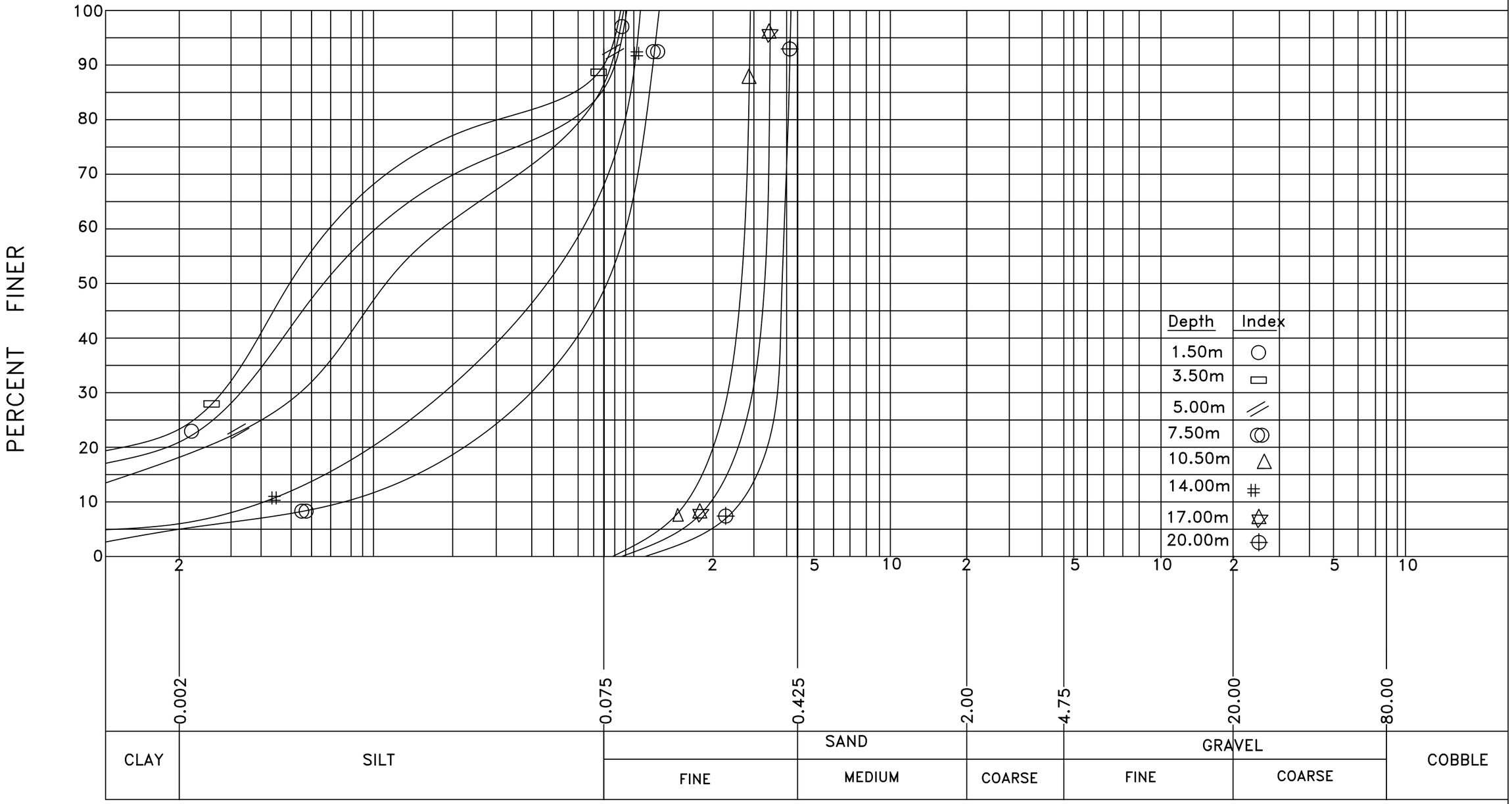
PARTICLE SIZE IN M.M.



BORE HOLE NO. : 03

PARTICLE SIZE DISTRIBUTION

PARTICLE SIZE IN M.M.



BORE HOLE NO. : 04

PARTICLE SIZE DISTRIBUTION

PARTICLE SIZE IN M.M.

PERCENT FINER

100
90
80
70
60
50
40
30
20
10
0

Depth	Index
1.50m	○
3.50m	□
5.00m	//
7.50m	◎
10.50m	△
14.00m	#
17.00m	✡
20.00m	⊕

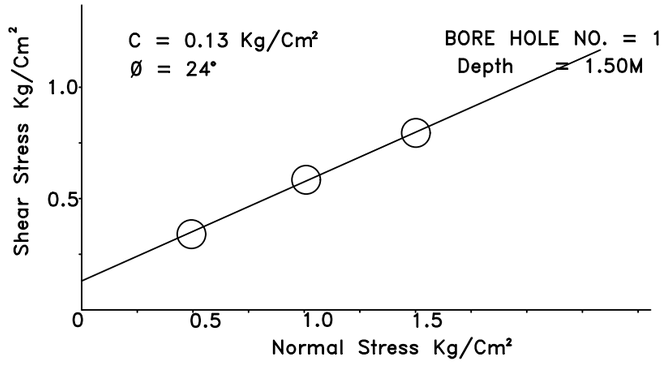
2 2 5 10 2 5 10 2 5 10

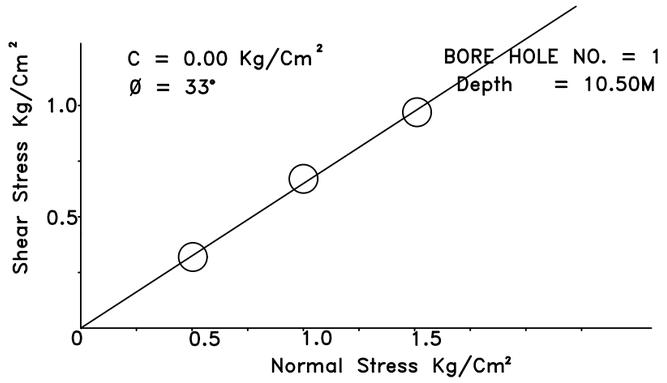
0.002 0.075 0.425 2.00 4.75 20.00 80.00

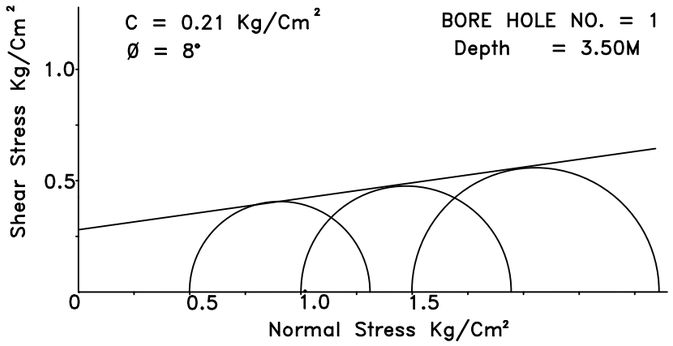
CLAY	SILT	SAND			GRAVEL		COBBLE
		FINE	MEDIUM	COARSE	FINE	COARSE	

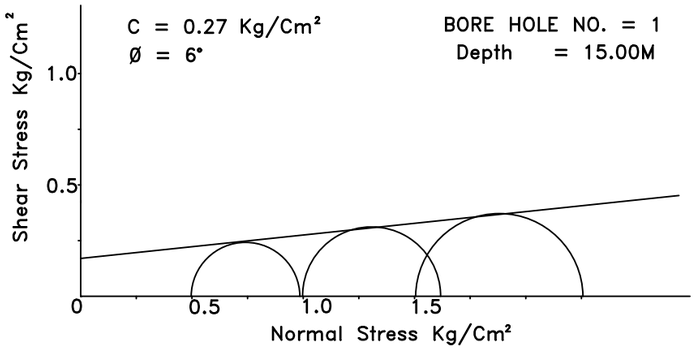
BORE HOLE NO. : 05

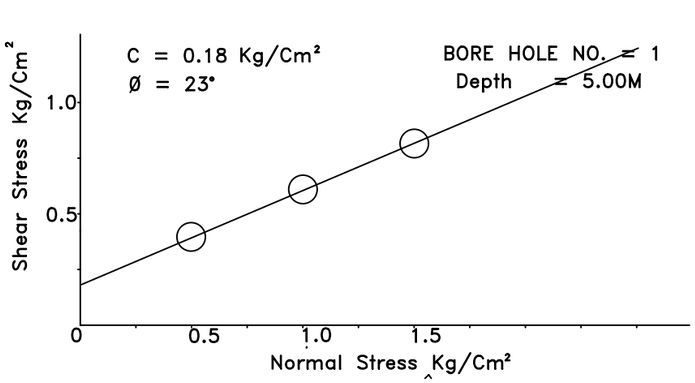
PARTICLE SIZE DISTRIBUTION

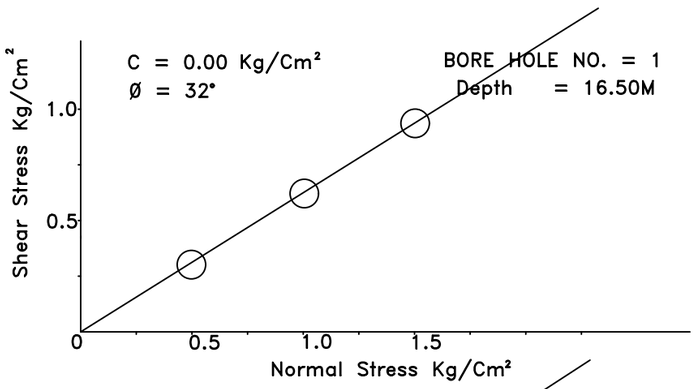

C = 0.13 Kg/Cm²
Ø = 24°
BORE HOLE NO. = 1
Depth = 1.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

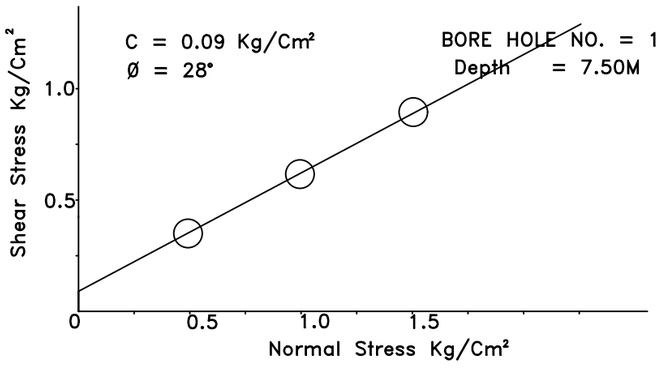

C = 0.00 Kg/Cm²
Ø = 33°
BORE HOLE NO. = 1
Depth = 10.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

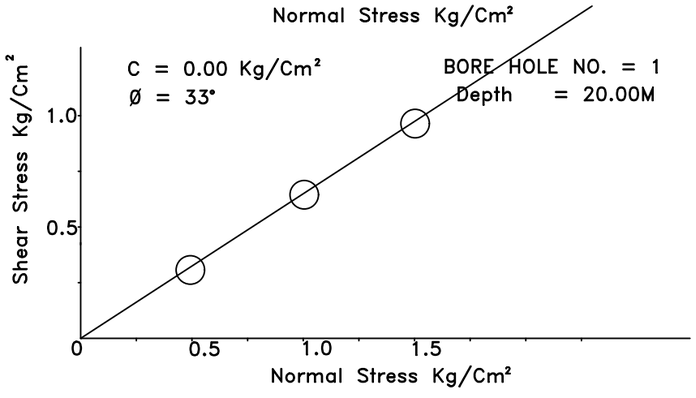

C = 0.21 Kg/Cm²
Ø = 8°
BORE HOLE NO. = 1
Depth = 3.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

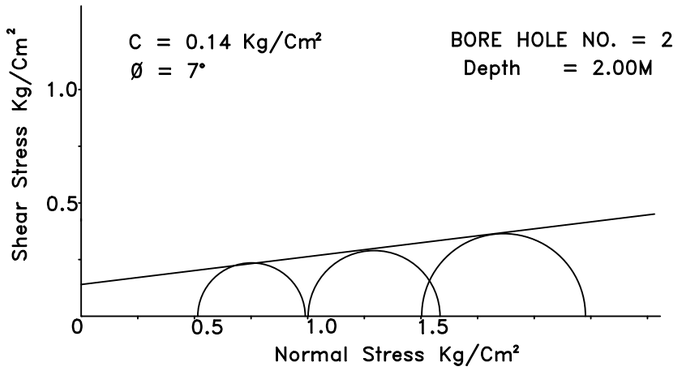

C = 0.27 Kg/Cm²
Ø = 6°
BORE HOLE NO. = 1
Depth = 15.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

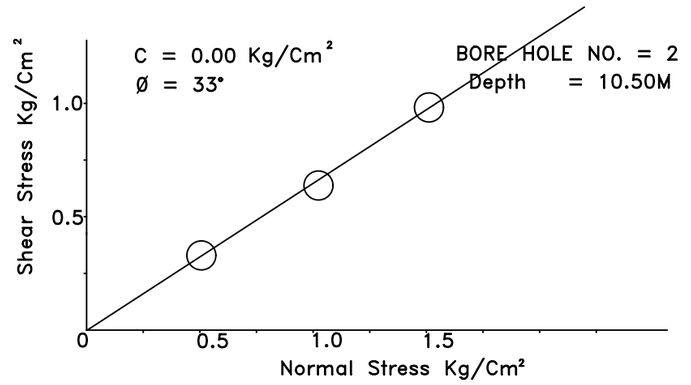

C = 0.18 Kg/Cm²
Ø = 23°
BORE HOLE NO. = 1
Depth = 5.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

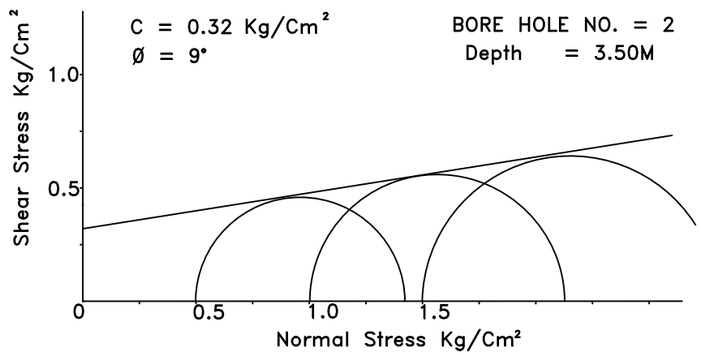

C = 0.00 Kg/Cm²
Ø = 32°
BORE HOLE NO. = 1
Depth = 16.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

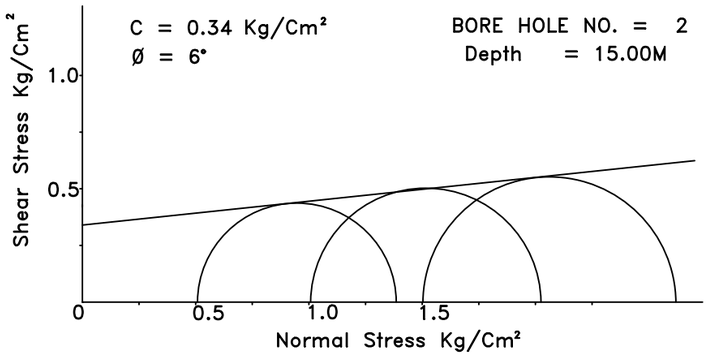

C = 0.09 Kg/Cm²
Ø = 28°
BORE HOLE NO. = 1
Depth = 7.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

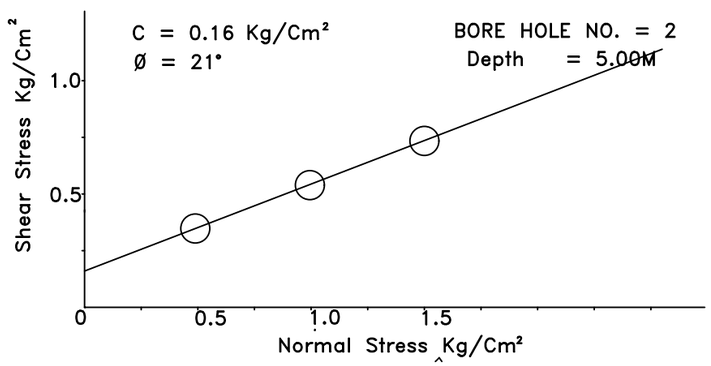

C = 0.00 Kg/Cm²
Ø = 33°
BORE HOLE NO. = 1
Depth = 20.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

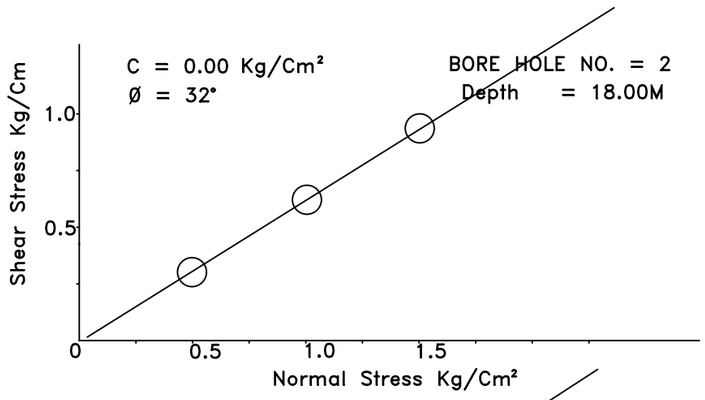

C = 0.14 Kg/Cm²
Ø = 7°
BORE HOLE NO. = 2
Depth = 2.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

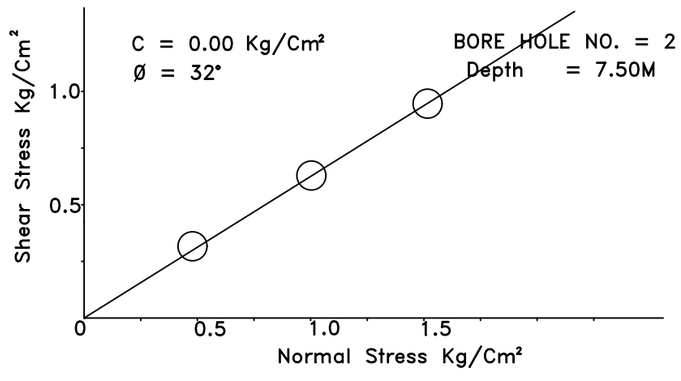

C = 0.00 Kg/Cm²
Ø = 33°
BORE HOLE NO. = 2
Depth = 10.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

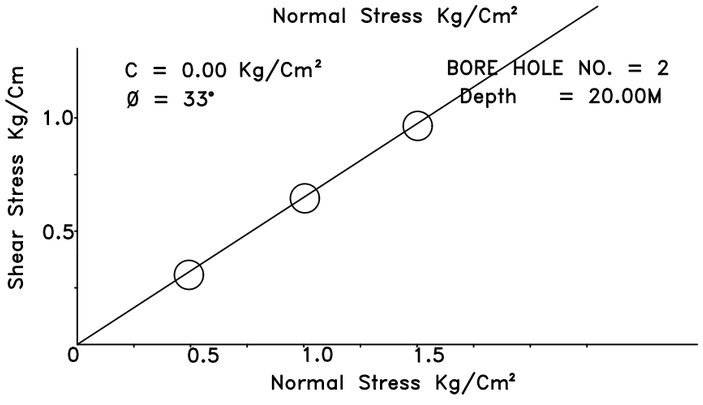

C = 0.32 Kg/Cm²
Ø = 9°
BORE HOLE NO. = 2
Depth = 3.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

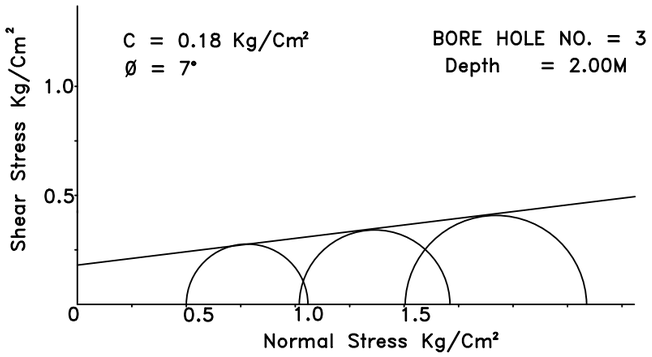

C = 0.34 Kg/Cm²
Ø = 6°
BORE HOLE NO. = 2
Depth = 15.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

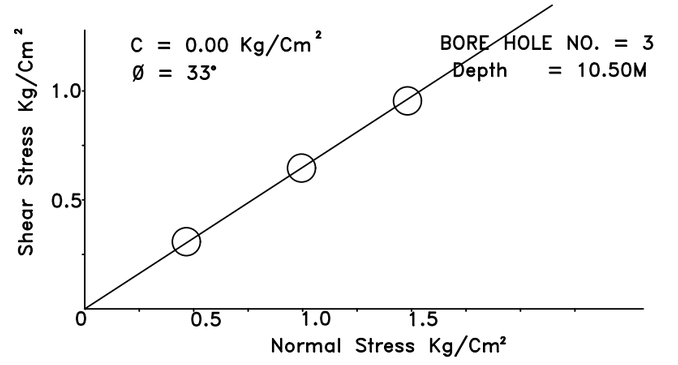

C = 0.16 Kg/Cm²
Ø = 21°
BORE HOLE NO. = 2
Depth = 5.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

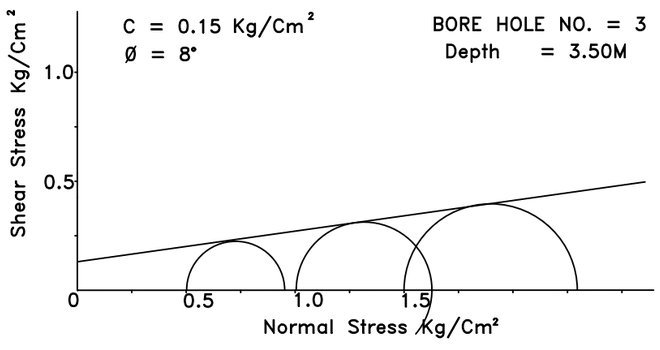

C = 0.00 Kg/Cm²
Ø = 32°
BORE HOLE NO. = 2
Depth = 18.00M
Shear Stress Kg/Cm
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

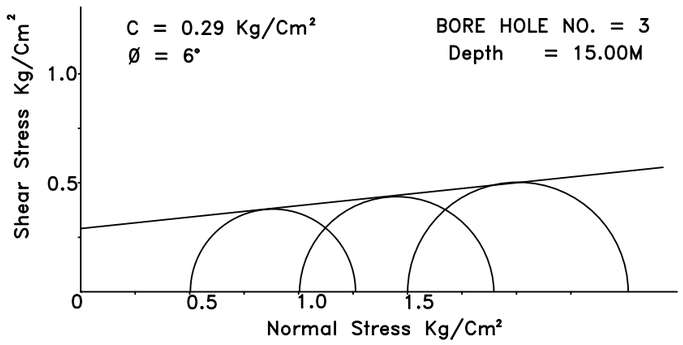

C = 0.00 Kg/Cm²
Ø = 32°
BORE HOLE NO. = 2
Depth = 7.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

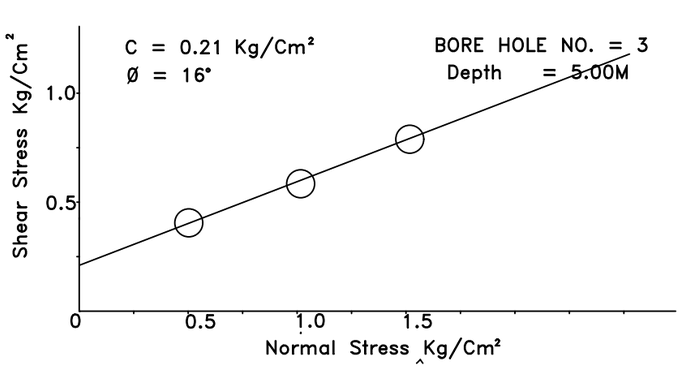

C = 0.00 Kg/Cm²
Ø = 33°
BORE HOLE NO. = 2
Depth = 20.00M
Shear Stress Kg/Cm
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

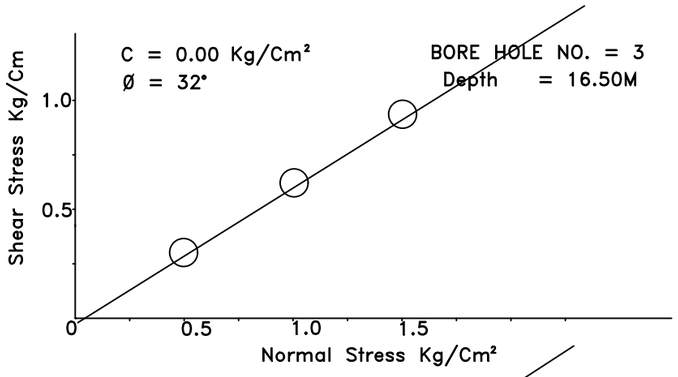

C = 0.18 Kg/Cm²
Ø = 7°
BORE HOLE NO. = 3
Depth = 2.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

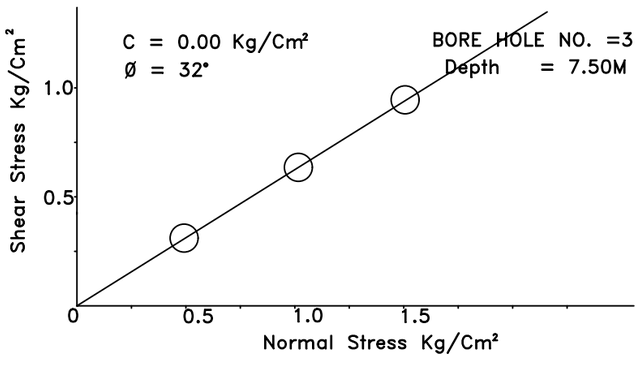

C = 0.00 Kg/Cm²
Ø = 33°
BORE HOLE NO. = 3
Depth = 10.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

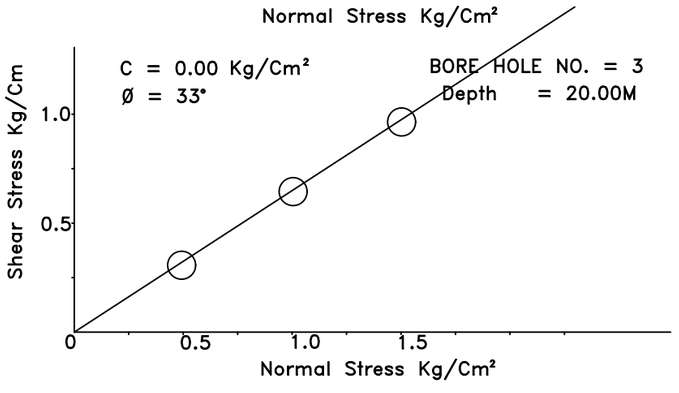

C = 0.15 Kg/Cm²
Ø = 8°
BORE HOLE NO. = 3
Depth = 3.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

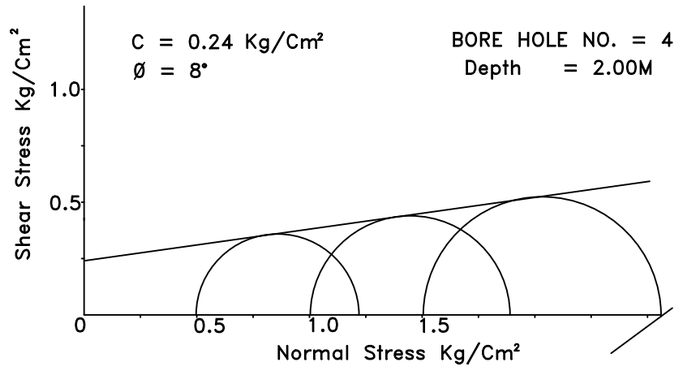

C = 0.29 Kg/Cm²
Ø = 6°
BORE HOLE NO. = 3
Depth = 15.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

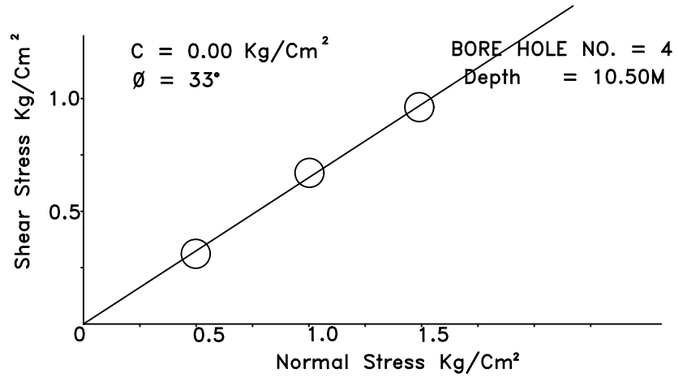

C = 0.21 Kg/Cm²
Ø = 16°
BORE HOLE NO. = 3
Depth = 5.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

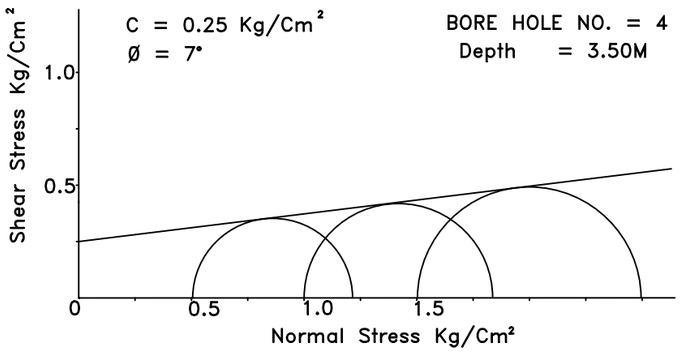

C = 0.00 Kg/Cm²
Ø = 32°
BORE HOLE NO. = 3
Depth = 16.50M
Shear Stress Kg/Cm
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

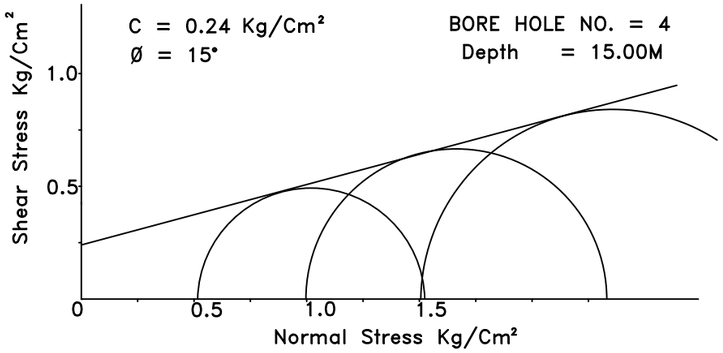

C = 0.00 Kg/Cm²
Ø = 32°
BORE HOLE NO. =3
Depth = 7.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

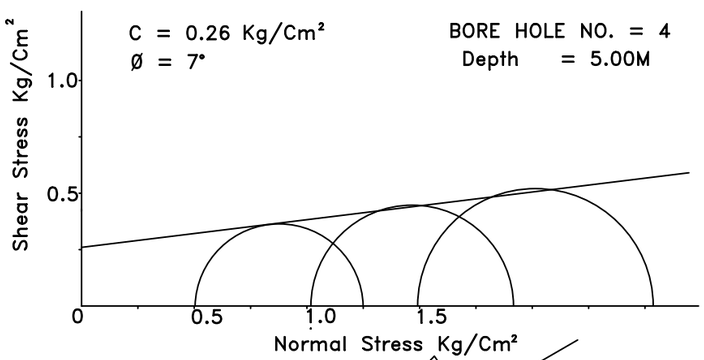

C = 0.00 Kg/Cm²
Ø = 33°
BORE HOLE NO. = 3
Depth = 20.00M
Shear Stress Kg/Cm
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

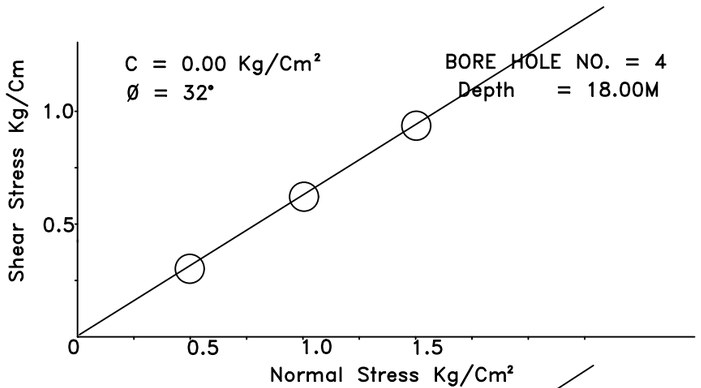

C = 0.24 Kg/Cm²
Ø = 8°
BORE HOLE NO. = 4
Depth = 2.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

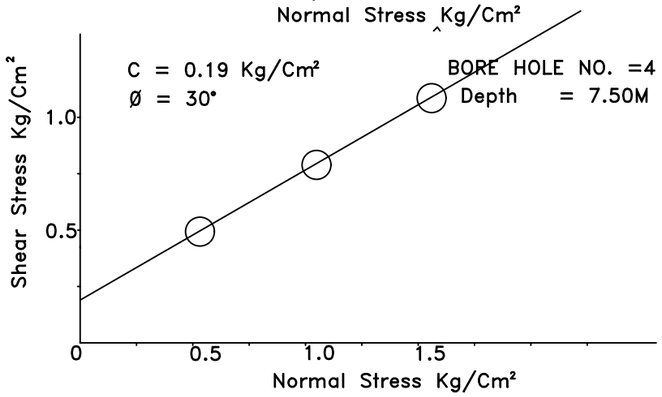

C = 0.00 Kg/Cm²
Ø = 33°
BORE HOLE NO. = 4
Depth = 10.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

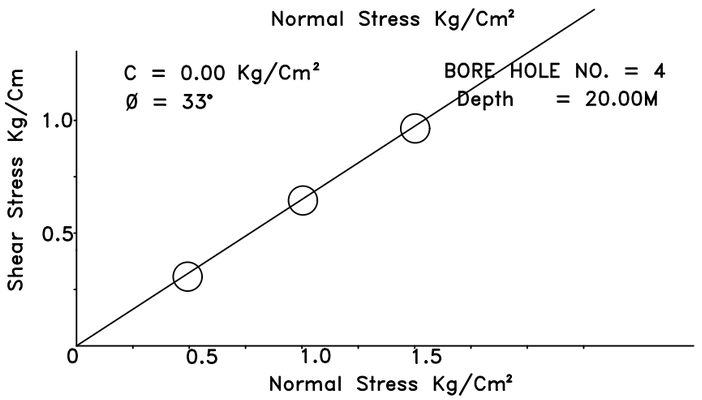

C = 0.25 Kg/Cm²
Ø = 7°
BORE HOLE NO. = 4
Depth = 3.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

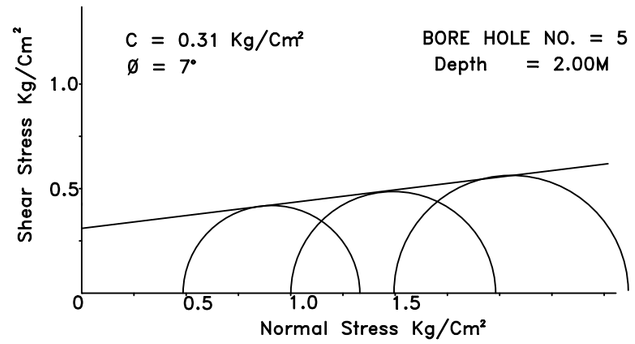

C = 0.24 Kg/Cm²
Ø = 15°
BORE HOLE NO. = 4
Depth = 15.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

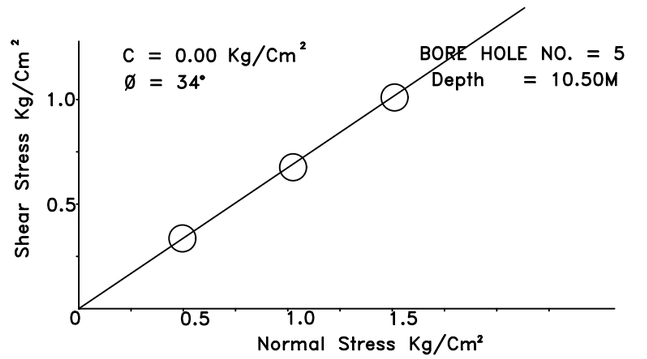

C = 0.26 Kg/Cm²
Ø = 7°
BORE HOLE NO. = 4
Depth = 5.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

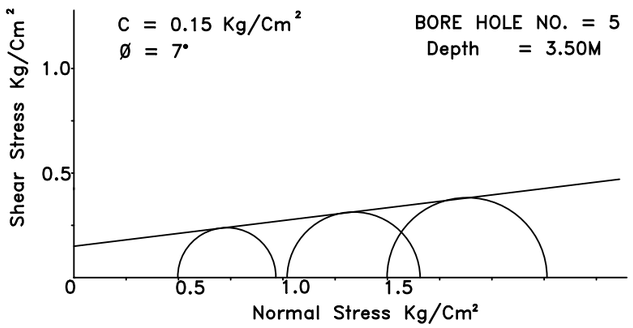

C = 0.00 Kg/Cm²
Ø = 32°
BORE HOLE NO. = 4
Depth = 18.00M
Shear Stress Kg/Cm
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

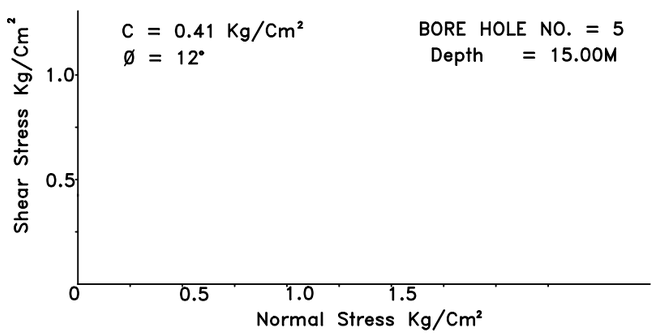

C = 0.19 Kg/Cm²
Ø = 30°
BORE HOLE NO. =4
Depth = 7.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

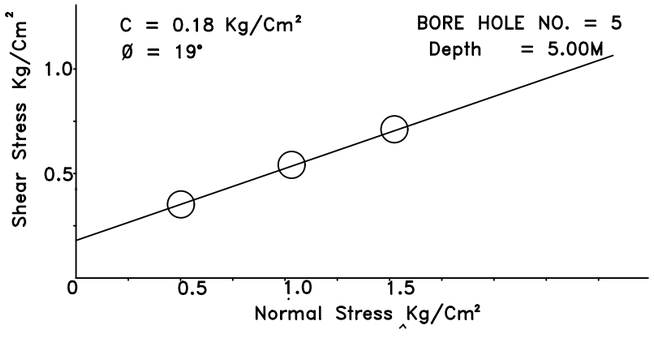

C = 0.00 Kg/Cm²
Ø = 33°
BORE HOLE NO. = 4
Depth = 20.00M
Shear Stress Kg/Cm
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

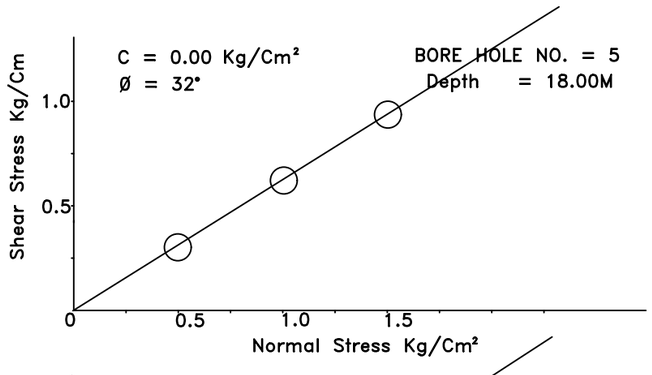

C = 0.31 Kg/Cm²
Ø = 7°
BORE HOLE NO. = 5
Depth = 2.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

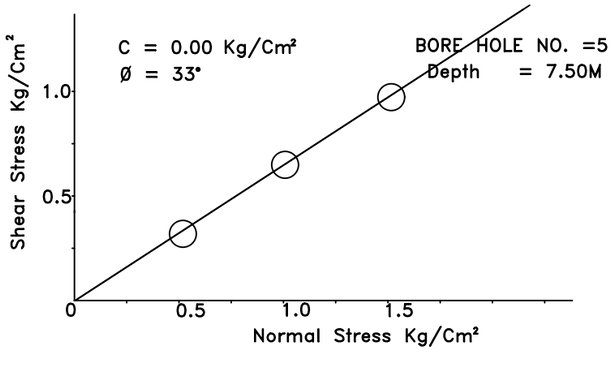

C = 0.00 Kg/Cm²
Ø = 34°
BORE HOLE NO. = 5
Depth = 10.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5

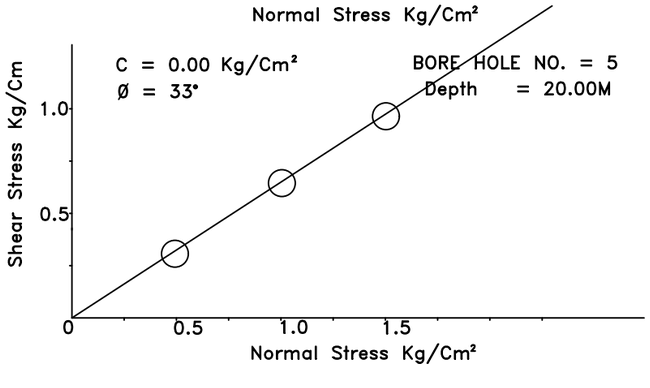

C = 0.15 Kg/Cm²
Ø = 7°
BORE HOLE NO. = 5
Depth = 3.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5


C = 0.41 Kg/Cm²
Ø = 12°
BORE HOLE NO. = 5
Depth = 15.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5


C = 0.18 Kg/Cm²
Ø = 19°
BORE HOLE NO. = 5
Depth = 5.00M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5


C = 0.00 Kg/Cm²
Ø = 32°
BORE HOLE NO. = 5
Depth = 18.00M
Shear Stress Kg/Cm
Normal Stress Kg/Cm²
0
0.5
1.0
1.5


C = 0.00 Kg/Cm²
Ø = 33°
BORE HOLE NO. =5
Depth = 7.50M
Shear Stress Kg/Cm²
Normal Stress Kg/Cm²
0
0.5
1.0
1.5


C = 0.00 Kg/Cm²
Ø = 33°
BORE HOLE NO. = 5
Depth = 20.00M
Shear Stress Kg/Cm
Normal Stress Kg/Cm²
0
0.5
1.0
1.5