

TCE-7547A-H- OST-300	TATA CONSULTING ENGINEERS LIMITED		SHEET 1 OF 1
	Corrigendum No. 3		

Sl. No.	Section	Sheet no.	Spec No.	Clause No.	Modification / New Clause
Mechanical					
1	Section II	Sheet No 1,2 of 36 & 19,20, 21 of 36	TCE. 7547A-300-PP- 1101	2.7.1.Piping Material Specification	steam and steam condensate line flange type / facing mentioned as SORF shall be read as steam and steam condensate line flange type / facing mentioned as WNRF



**PROJECT : EPC OF STF WITH DEHYDRATION FACILITY AND ETP AT
MADHUBAN, DULIAJAN- IFB NO. CPG6533P15**



SL. No	Type of Query	Document No	Document Name	Clause /Note No	Subject	Bidders Query	Company Response
1	Commercial	GCC	GCC	8.0	TAXES – works contract tax deduction	Please confirm the rate at which Company would deduct 'Works Contract tax' against each invoice before making the payments to Contractor in the following cases – 1. If Contractor opts for Works Contract Composition scheme 2. If works contract composition scheme is not opted for.	Bidders are requested to check individually applicability of taxes, duties, benefits available with their expert personnel and quote accordingly.
2	Commercial	GCC	GCC	8.0	TAXES –BOCW Cess	Please confirm that Building and Other Construction Workers Welfare Cess is not applicable for the Project.	Bidders are requested to check individually applicability of taxes, duties, benefits available with their expert personnel and quote accordingly.
3	Commercial	GCC	GCC	9.7	DEEMED EXPORT BENEFITS	Bidder or its suppliers may import intermediate supplies & components under Advance Authorisation (License), for further manufacturing and	The provisions will apply under para 8.2 of FTP applicable for E&P Companies in India like OIL for availing NIL



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						incorporation in the finished product. Please confirm if Company can provide necessary Recommendatory Letter or Project Authority Certificate for the same.	Customs Duty read with Notification No.21/2002- Customs dated 01..3.2002 as amended from time to time. Therefore OIL will provide necessary Recommendatory Letter or Project Authority Certificate as applicable
4	Commercial	Proforma-I	PARENT COMPANY GUARANTEE - DEED OF GUARANTEE	4	Parent Company	<p>In Clause 4 of the Parent Company Guarantee form, please delete the last sentence "This will, however, be in addition to the forfeiture of the Performance Guarantee furnished by the Subsidiary."</p> <p>Since the limitation of liability clause at GCC 23.0 with the stated exclusions is applicable to Guarantor also, the referred sentence may please be deleted.</p>	Not Acceptable. Bidder to comply the tender conditions without any deviation.



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5	Commercial	Proforma-E	FORM OF PERFORMANCE BANK GUARANTEE	-	Bank's wording	<p>Kindly note that Banks usually add their regulatory wording at the end of the Bank Guarantee. A sample of the standard wording is reproduced below for reference –</p> <p>"Notwithstanding anything contained herein above:</p> <ol style="list-style-type: none"> 1. Our liability under this bank guarantee shall not exceed (guarantee value) 2. This bank guarantee shall be valid only upto (date of expiry) 3. We are liable to pay the guaranteed amount or any part thereof under this bank guarantee only and only if we receive a written claim or demand on or before (expiry date)." 	Not Acceptable. Bidder to comply the tender formats without any deviation.
6	Commercial	Proforma-D	FORM OF BID SECURITY (BANK GUARANTEE)	-	Bank's wording	<p>1, Kindly note that Banks usually add their regulatory wording at the end of the Bank Guarantee. (please refer to earlier query for</p>	Not Acceptable. Bidder to comply the tender formats without any deviation.



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						bank's standard wording) 2, In the 3 rd para beginning with "We undertake to..", please delete the words "/fax/cable". Banks take objection to mode of communication other than letter, as the authenticity of a fax or cable cannot be ascertained.	
7	Commercial	Forwarding Letter of IFB GCC	Forwarding Letter of IFB GCC	2, xvii 1.0, x	Duration of the Contract: Completion of the Project	Bidder requests for clarity on OIL's requirement for 3 months trial run – a) Is Mechanical Completion as defined under SPEC. NO. TCE.M4-912 to be achieved by end of 21 months? If yes, then pre-commissioning activities will be carried out after 21 months in the 3 month period leading to trial run. Please confirm if our understanding is correct.	(a) Refer clause no. 2.5 of GCC for the same which is self explanatory.



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						<p>b) Is there a specific requirement of minimum hours of operation for the 3 month trial run. How will interruptions be handled and counted. Please clarify.</p> <p>c) As per SPEC. NO. TCE. M4-915 for Performance Tests, the plant and equipment shall be continuously operated at full load for at least seventy-two (72) hours to prove its performance. Kindly confirm when will this Performance Guarantee Test Run (PGTR) be conducted? Will it be at the end of 3 month period?</p> <p>Kindly confirm on the above for preparing our project schedule and resource loading?</p>	<p>(b) Bidder to comply as per tender document</p> <p>(c) 3 months of PGTR trial run should include full load continuous operation for at least seventy-two (72) hours.</p>







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8						<p>Total price shown in the cost break up –Annexure A , shall be equal to Sl. 5 of Schedule of Prices Form SP0. (Total EPC amount quoted in Schedule of Rates).</p> <p>Total price in Form SP0 is the sum total of all prices for (1) Supply (2) Engineering (3) Services & (4) Service tax while cost break up statement (Annexure-A) does not have any provision for Design & Engineering & Service tax.</p> <p>Please clarify.</p>	<p>Design & Engineering cost should be included in the cost of respective equipment / item specified in the cost break up format. i.e Column no. 04 (Four of present format). The cost should be EXCLUSIVE of service tax.</p>



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SL.No	Type of Query	Document	Document	Clause	Subject	Bidders Query	Company Response	
		No	Name	/Note No				
CIVIL & STRUCTURE								
1			TCE 7547A-300-PP-1000	Tag No.- 112	ETP	For Effluent treatment plant of TCE 7547A-300-PP-1000 with Tag No 112, Please provide the Equipment layout/GA for Effluent treatment plant	Area Allocated for ETP in the Plot plan. Design, Engineering, development of Equipment Layout shall be carried out by successful bidder.	
2			TCE 7547A-300-PP-1000	Tag No.- 106	Cooling Tower Package	For Cooling tower + Heat Ex-changer in document no. TCE 7547A-300-PP-1000 with Tag No 106, Please provide the Equipment layout/GA for Cooling tower + Heat Ex-changer.	Cooling tower Capacity is made available in the tender document, Process Datasheets of Plate type Heat Exchangers made available in Tender document. Further detailing shall be done successful Bidder.	
3			TCE 7547A-300-PP-1000	Tag No 124	Guard Pond	For Guard Pond for document No. TCE 7547A-300-PP-1000 with Tag No 124, Please provide the Equipment layout/GA for Guard pond and provide the height of pond/capacity of the tank.	Capacity of Guard pond shall be 3200 m3 as mentioned in Section 5.1 (Scope of Civil, Structural and Architectural works) of the tender document.	
4					FGL	For Site grading, As per tender documents finished grade level (FGL) is EL+120.00 and High flood level (HFL) is EL+119.10. In general practice FGL has fixed by minimum 500mm above HFL. Hence we propose that FGL for the site will be EL+119.60 and its lead to minimize the height of earth filling for the site grading and depth of foundation. Also note that top 200mm soil shall be stripped as per geo investigation report. Please confirm.	FGL is decided based on the storm water disposal philosophy. Bidder to follow the tender document. Top soil stripping of 200 mm is confirmed.	
5			TCE.7547A-HOST-300	Technical specification for civil and Structural works	Future tanks	Bidder understands foundations for future tanks and dyke wall around future tanks are not included in contractor scope. Request company to confirm	Bidder Understanding is correct.	
6			TCE.7547A-HOST-300	Technical specification for civil and Structural works	Kerb wall	Bidder understands 600mm high masonry kerb walls to be provided around effluent water tanks, Company to confirm	Bidder Understanding is correct.	
7			TCE.7547A-HOST-300	Engineering & Architectural Design Basis Report	Anti-termite treatment	As per Clause 9.11 of design basis report bidder understands Anti termite treatment shall be provided only for the Admin and Canteen Building and not required for other structures like dyke wall, ring wall etc.,	Bidder Understanding is correct.	
8						For designing the Civil foundation for different MS storage tanks we require Seismic moment & shear, and Wind movement and shear at the base of the tank.	To follow tender document	



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		No	Name	/Note No			
PIPING							
1			TCE-5873A-590-PI-003-PO		Fuel Air & Fuel Gas System	P&ids line size and piping specification not shown. Please provide the details	Indicative Line sizes are shown in tender P&ID.(TCE.7547A-615-PI-1105). Actual Line size shall be arrived by successful bidder during detail engineering based on steam consumption to each distribution area. Refer Piping material specifaicton for piping specification.
2			TCE-7547A-615-PI-1106		Steam Generation System	P&ids line size and piping specification not shown. Please provide the details	Indicative Line sizes are shown in tender P&ID.(TCE.7547A-615-PI-1105). Actual Line size shall be arrived by successful bidder during detail engineering based on steam consumption to each distribution area. Refer Piping material specifaicton for piping specification.
3			TCE-7547A-300-PI-8037		Oily Water Package	P&ids line size and piping specification not shown. Please provide the details	Refer Piping Material Specification for Piping specification. Line sizes shall be arrived by successful Bidder based on the philosophy & design followed for development of OWS network by successful Bidder.
4			TCE-7547A-300-PI-8033		Effluent Treatment Plant	P&ids line size and piping specification not shown. Please provide the details	Refer Piping Material Specification for Piping specification. Line sizes shall be arrived by successful Bidder with the help of ETP package vendor (being package item).
5			TCE-7547A-300-PI-8034		Effluent Treatment Plant	P&ids line size and piping specification not shown. Please provide the details	Refer reply to point no. 4 above
6			TCE-7547A-300-PI-8035		Chemical/Additives Dosing System	P&ids line size and piping specification not shown. Please provide the details	Refer Piping Material Specification for Piping specification. Line sizes shall be arrived by successful Bidder with the help of Additive dosing package vendor (being package item).
7			TCE-7547A-300-PI-8036		Flare Distribution System	P&ids line size and piping specification not shown. Please provide the details	Refer Piping Material Specification for Piping specification. Line sizes shall be arrived by successful Bidder based on the Fuel Gas (Natural Gas) flaring requirement values from respective vendor.
8			TCE-7547A-300-PI-8038		Sludge Treatment Plant	P&ids line size and piping specification not shown. Please provide the details	Refer Piping Material Specification for Piping specification. Line sizes shall be arrived by successful Bidder with the help of Sludge Treatment package vendor (being package item).



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		No	Name	/Note No			
9			TCE-7547A-300-PI-8039		Ultrafiltration System),	P&ids line size and piping specification not shown. Please provide the details	Refer Piping Material Specification for Piping specification. Line sizes shall be arrived by successful Bidder with the help of ETP package vendor (being package item).
10			TCE-7547A-300-PI-8041		Sewage Treatment Plant	P&ids line size and piping specification not shown. Please provide the details	Piping specifications shall be developed by successful Bidder / Sewage Treatment Plant vendor & line sizes also shall be calculated by successful Bidder / Sewage Treatment Plant vendor being package item.
MECHANICAL & PROCESS							
1					General	Please clarify whether vendor scope are to be considered for taking Manual valve summary	Yes,Manual Valve summary under vendors scope.Successful bidder to do the details During Detail Engineering.
2					HVAC	HVAC layout (to determine the size of rooms requiring ACV).	Rooms / Building requiring HVAC are provided in sec 2.8.1.All the building layouts are enclosed along with the tender specification.Successful bidder to provide the HVAC details during detail engineering.
3					Demulsifier Dosing System	Mechanical and Process Data sheets for Pumps and tanks in Demulsifier dosing system and Equipment layout.	Shall be developed by successful Bidder / Additive dosing package (being package item).
4					WTP/ETP	For completing the RFQ for WTP/ETP/Oily /Sludge Treatment plant (1947-M-RFQ-0509), we are in need of process details. (Source of Oily water and its inlet & outlet parameters) for Oily water package.	Process details for WTP & ETP are made available in the tender documents. Sludge Treatment is depended on the outlets from ETP, hence process details shall be furnished by ETP vendor. Oily Water package shall be suitable for operating for 100mm/hr rain fall & shall designed as per applicable rules & regulations.
5					Natural Knock Out Drum	Please provide Mechanical and Process Data sheets for Natural Gas Knock out Drum.	Dia : 1m, Height : 3m these dimension are tentative. Actual dimension shall be finalized by successful bidder based on the Natural Gas consumption values from respective vendor.
6					Wtarer Treatment Plant	Please provide the P&ID for Chemical (NaOCl) Dosing System for raw water treatment and datasheet for Chemical (NaOCl) Dosing Tank.	Shall be developed by successful Bidder / ETP package vendor (being package item).

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		No	Name	/Note No			
7					Cooling Tower Package	Please provide P&ID for FRP Cooling tower.	Minimum requirements are mentioned in the tender specification.P&ID shall be made by successful bidder during detail engineering.
8			Section I, Process 4, TCE.M4-CH-T-PDS-436		PROCESS DATA SHEET FOR ELECTROSTATIC EMULSION TREATER	The viscosity of oil given in the datasheet is 3 to 75 cP is a very large variation and will have huge impact in the vessel sizing. Please confirm according to the given process condition.	Kindly Consider 20cP - 60 cP viscosity range.
9			Section I, Process 4, TCE.M4-CH-T-PDS-436		PROCESS DATA SHEET FOR INDIRECT BATH HEATER	Please confirm the burner required for Indirect bath heater is natural or forced draft.	Burner required for Indirect bath heater shall be preferably forced draft. IBH Package vendor shall decide the same based on the duty required.
10			TCE.M4-CH-E-PDS-404		DATASHEET FOR PLATE TYPE HEAT EXCHANGER	As per the datasheet, the type of Heat Exchanger mentioned is Plate type. Please provide the Specification for the same.	Kindly refer Plate Type Heat Exchanger Process datasheets Doc. No. TCE-7547A-CH-E-PDS-8703, TCE-7547A-CH-E-PDS-8721 & TCE-7547A-CH-E-PDS-8722. Specification doc. No. TCE-M4-101-04, TCE.M4-185-70 & TCE.M4-186-15 made available in Part - II, Technical Section (Process -3)
11			Addendum_Documents_Part-2 page no. 57 of 59			whether PDS or PDMS software to be used for preparing 3D model for STF facility.	Shall be PDMS. Please refer clause no.2.0 of section 2.7.28 , 3D MODEL DESIGN REVIEWS PROCEDURES.
12					Design of Heat Exchangers	Composition of Crude oil	The Crude Oil analysis provided vide corrigendum 2 dated 16-05-2015 is GC analysis on Dry Basis (i.e. excluding BS &W), which is essentially done on the basis of area of peak of each component. This composition is provided for reference only. Bidder to design the Equipment to meet the specifcatuion as per the tender document.
13			Corrigendum 2		Tank MOC of Shell	As per Corrigendum 2, Material of construction of shell is SA 537 CL.1 for 1st to 4th course for the spec nos. of TCE.7547A300MDS1003 –P1 & 1004 – P1. But the same attached and revised data sheet of tank in materials and specification, MOC of shell is mentioned as SA 537 CL.1 for 1st to 3rd course. Kindly confirm and revert back.	Bidder to follow as per revised MDS attached in Corrigendum 2
14			Pre - bid Queries Response	Corrigendum 2 Point NO 6 Sec 2.6; TCE.7574A-300-MDS-1003	MDS	MOC for shell plate ASTM A 537 Cl 1 for 1st to 4th Course, where as in the drawing ithas specified that 1st to 3rd Course SA 537 Cl 1 Kindly review and confirm which one to follow.	Bidder to follow as per revised MDS attached in Corrigendum 2

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SL.No	Type of Query	Document	Document	Clause	Subject	Bidders Query	Company Response
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15			Pre - bid Queries Response	Corrigendum 2 Water Treatment Plant and Water Supply Systems	Specification No M4-110-23	Data Sheet A Reverse Osmosis Plant ; Design Data Point No 9 Design Permeate flow rate per stream : 1.0 M3/hr Specification Clause 3.0 Design Requirement : Max Capacity of each stream of RO plant shall not exceed 120 m3/hr Please clarify which stream capacity should need to be followed. 1.0 m3/hr or 120 m3/hr	Bidder to follow as per Data Sheet attached Corrigendum 2
16					Oily Water Treatment Plant	Please specify the design capacity.	The OWS system shall be designed by the successful bidder considering 100 mm/hr rain intensity.
17					Static Mixers	Please furnish the technical data sheet for Static Mixers.	Technical datasheet shall be prepared by the Additive dossing package vendor / successful bidder, based on requirements of Additive dossing package (being package item / system)
18					Gas Conditioning Skid	We understand that Gas Conditioning skid is required for Gas Engines, Please clarifiy whether the Gas conditioning is required for Gas Engine Driven Pumps also. Specification missing	shall be decided by the package or equipment supply vendor / successful bidder, based on Natural Gas (quality) available & duty required from package or equipment.
19			Part-I: Process : Section-1 : Process equipment layout -plan note 4			Eye Wash & Safety Shower PFD required for estimation. Bidder request Company to provide the same.	Refer utility summary document no. TCE.7547A-300-US-8907 for quantity & flow requirement details. PFD & related documents shall be developed by successful bidder.
20		TCE.7547A-CH-300-DB-01, Rev.1	Part-I: Process : Section-1 : Process equipment layout -plan note 15			Whether Drinking water required CCTV cameras ?. Bidder requests Company to confirm requirement.	Please refer tender document section 4.6.8.

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	Type of Query	No	Name	/Note No			
21		TCE.7547A-300-PDS-8701 Rev.2 & TCE.7547A-CH-300-DB-01 Rev.1	Part-I: Process : Section-1 : Process equipment layout -plan note 16			Hose station requirement near each facility (Steam, Air, Water) is not mentioned. Bidder requests Company to provide the same.	Refer utility summary document no. TCE.7547A-300-US-8907 for quantity & other details. Rest documents shall be developed by successful bidder.
22		TCE.7547A-300-PI-8020 Rev.1	Part-I: Process : Section-1 : Process equipment layout -plan note 4			Tank pad height is also not given in FEED. Bidder Requests Company to provide the same.	Refer respective Civil drawings for the Tank pad height.
23		Piping Material Spec.	Part-I: Process : Section-1 : Process Piping Material Spec. page 19 of 36			SO flange has been used for Steam and Steam Condensate service. Bidder shall use WN RF flange instead of SO RF flange for these service as above mentioned service are not Category D fluids. Bidder requests Company to confirm.	Refer attached Piping Material Specification TCE.7547A-300-PP-1101
24		Piping Material Spec.	Part-I: Process : Section-1 : Process Piping Material Spec. General			Pipe thickness has been calculated as per line condition and NOT as per class condition as per the PMS provided in the FEED document. Bidder requests Company to confirm that during EPC stage same philosophy of calculating pipe thickness shall be followed i.e. pipe thickness shall be based on line design condition and not as per class condition	Refer attached Piping Material Specification TCE.7547A-300-PP-1101
25		TCE.7547A-CH-300-DB-01 Rev.1 & TCE.7547A-H-OST-300,	Part-II: Technical Section: Section II Mechanical -6 conceptual piping layout- plan & section			Pump suction lines (12-AW-2205-CB1-IP etc.) are run on pipe rack at BOP el 5500 as per section CC for pipe bridge 3. Pump suction lines are always run on sleepers and culverts considering pump NPSH requirement. Company to clarify the above discrepancy.	Around the tank farm area pipes are routed in sleeper. Since pump house is in other side of the road. The subject line is routed in pipe bridge. This is conceptual layout only, further detailing has to be done by successful bidder during detail engineering
26		TCE.7547A-300-MB-8011 and TCE.7547A-300-PDS-8701	Part-II: Technical Section: Section II Mechanical -6 conceptual piping layout- plan & section			There are lot of mismatches in the FEED layout-piping. E.g. line no.20-DCO-2209-CB1-ih is not shown in the section CC however the same is shown in the piping plan for dispatch pump house. Company to clarify the above discrepancy.	This is conceptual layout only, further detailing has to be done by successful bidder during detail engineering.

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27		TCE.7547A-CH-300-DB-01, Rev.1 TCE.7547A-300-MB-8011, Rev.1	Part-II: Technical Section: Section II Mechanical -6 conceptual piping layout- plan & section			Plant road below pipe bridge no 2, 3, 4 & 5 shall be considered as secondary road and major mobile equipment shall not pass through them as per the elevation shown in the respective section drawings. Company to confirm the above discrepancy.	Fire brigade in anticipated to travel along the encircling road of tank farm area. Hence BOP of 5.5 to be maintained.
28		TCE.7547A-H-OST-300	Part-II: Technical Section: Section II Mechanical -6 conceptual piping layout- plan & section			For pipe bridge1, section J J, pipe BOP is shown as El 3000. Since this is crossing a plant road, as per piping design basis requirement it shall be minimum 5000 el. Company to confirm the above discrepancy.	Bidder understanding is correct.
29		TCE.7547A-H-OST-300	Part-II: Technical Section: Section II Mechanical -6 Equipment layout- plan			5.5M wide pipe track shown around dyke of tanks T-001 to 006 & up to C. L . of tanks T-001 & T-003 respectively. But pipe track from/to various packages are not provided in the equipment layout-plan (Doc No TCE.7547A-300-GA-8005). Company to clarify the above discrepancy. Further please clarify whether pipe bridge to be considered or culvert to be considered for road crossings.	No culvert is envisaged in this project. Pipe bridge is considered for all road crossings.
30		TCE.7547A-H-OST-300	Part-II: Technical Section: Section II Mechanical -6 Equipment layout- plan			Extension of pipe sleeper is required in the "plot plan/equipment layout plan" in line with conceptual piping studies. Company to confirm the above.	Bidder understanding is correct.
31		TCE.7547A-CH-300-DB-01, Rev.1	General			Flare stack and existing flare header is not shown in the piping layout and plot plan. Bidder requests Company to provide the location.	Already replied

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32		TCE.7547A-CH-300-DB-01 Rev.1	Part-I: Process : Section-1 : Process equipment layout -plan note 4			FGL and RL/MSL not mentioned. Instead it is mentioned as XX.XX. Bidder requests Company to provide the same.	Refer Civil section for more clarity of FGL & MSL.
ELECTRICAL							
1					Load List & Single Line Diagram	Please provide Detailed load list (Including MCC loads mentioned in Key Line Diagram)	Please refer Electrical Load List (TCE.7547A-715-LL-3041) and Single Line Diagram for STF (TCE.7547A-715-AU-3001) in Tender.
2					Cable Schedule	Please provide the Cable schedule.	Cable Schedule will be prepared by EPC Contractor after Award of Contract.

TCE. 7547A-300-PP-1101	TATA CONSULTING ENGINEERS LIMITED	SECTION: TITLE
	PIPING MATERIAL SPECIFICATION	SHEET i OF iii



Oil India Limited
(A Govt. of India Enterprise)
Duliajan, Dist. Dibrugarh,
Assam, India

**CONSULTANCY FOR CONSTRUCTION OF SECONDARY
TANKFARM (STF) AT MADHUBAN NEAR DULIAJAN, ASSAM**

PIPING MATERIAL SPECIFICATION

(DOCUMENT NO.: TCE.7547A-300-PP-1101)



TATA CONSULTING ENGINEERS LIMITED

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REV. NO.	P0		R0		R1				ISSUE
	INITIALS	SIGN.	INITIALS	SIGN.	INITIALS	SIGN.	INITIALS	SIGN.	
PPD. BY	MA	-Sd/-	MA/TS	-Sd/-	MA/TS				R1
CHD. BY	SS	-Sd/-	JSA	-Sd/-	JSA				
APD. BY	RVK	-Sd/-	KVK	-Sd/-	KVK				
DATE	08-08-2014		16.10.2014		03.06.2015				

TCE.7547A-300-PP-1101	TATA CONSULTING ENGINEERS LIMITED	SECTION: REV STATUS
	PIPING MATERIAL SPECIFICATION	SHEET ii OF iii

REVISION STATUS

REV. NO.	DESCRIPTION	DATE
P0	PRELIMINARY ISSUE	08-08-2014
R0	As per OIL India Comments Dt:13.10.2014	16-10-2014
R1	Flange details updated	03-06-2015

ISSUE
R1

TCE.7547A-300-PP-1101	TATA CONSULTING ENGINEERS LIMITED	SECTION: REV STATUS
	PIPING MATERIAL SPECIFICATION	SHEET iii OF iii

CONTENTS

SL.NO.	ITEMS	MATERIAL	RATING	REV.	PG. NO.
1.	PIPING SPECIFICATION INDEX	-	-	P0	1
2.	LEGEND	-	-	P0	3
3.	PMS FOR 'CF' GRADE	API 5L Gr. B	600	P0	4
4.	BRANCH CONN. CHART FOR 'CF' GRADE	-	-	P0	6
5.	PMS FOR 'CD1' GRADE	API 5L Gr. B	300	P0	7
6.	BRANCH CONN. CHART FOR 'CD1' GRADE	-	-	P0	9
7.	PMS FOR 'CD2' GRADE	API 5L Gr. B	300	P0	10
8.	BRANCH CONN. CHART FOR 'CD2' GRADE	-	-	P0	12
9.	PMS FOR 'CB1' GRADE	API 5L Gr. B	150	P0	13
10.	BRANCH CONN. CHART FOR 'CB1' GRADE	-	-	P0	15
11.	PMS FOR 'CB2' GRADE	API 5L Gr. B	150	P0	16
12.	BRANCH CONN. CHART FOR 'CB2' GRADE	-	-	P0	18
13.	PMS FOR 'CC' GRADE	ASTM A106 Gr. B	150	P0	19
14.	BRANCH CONN. CHART FOR 'CC' GRADE	-	-	P0	21
15.	PMS FOR 'CA' GRADE	IS: 1239/3589	150	P0	22
16.	BRANCH CONN. CHART FOR 'CA' GRADE	-	-	P0	24
17.	PMS FOR 'GA' GRADE	IS: 1239/3589 (GALVANISED)	150	P0	25
18.	BRANCH CONN. CHART FOR 'GA' GRADE	-	-	P0	27
19.	PMS FOR 'SA' GRADE	ASTM A312 Gr.TP 304	150	P0	28
20.	BRANCH CONN. CHART FOR 'SA' GRADE	-	-	P0	30
21.	PMS FOR 'SB' GRADE	ASTM A312 Gr.TP 316	150	P0	31
22.	BRANCH CONN. CHART FOR 'SB' GRADE	-	-	P0	33
23.	PMS FOR 'SD' GRADE	ASTM A312 Gr.TP 316	300	P0	34
24.	BRANCH CONN. CHART FOR 'SD' GRADE	-	-	P0	36

ISSUE
R1

SPECIFICATION NO.				TATA CONSULTING ENGINEERS LIMITED						SECTION: D		
TCE.7547A-300-PP-1101				PIPING SPECIFICATION INDEX						SHEET 1 OF 36		
MATERIAL SPECIFICATION CODE	SERVICE		PIPE SIZE RANGE (INCH)	OPERATING CONDITION		DESIGN CONDITION		PRESSURE RATING, #	FLANGE TYPE / FACING	CORROSION ALLOWANCE (MM)	PIPE MATERIAL	
	FLUID IDENTIFICATION	TITLE		PRESSURE (Kg/CM ² (g))	TEMPERATURE (°C)	PRESSURE (Kg/CM ² (g))	TEMPERATURE (°C)					
CF	WCO	WET CRUDE OIL	8	70	30	74	65	600	WN RTJ	3.0	API 5L Gr. B	
	WCO	WET CRUDE OIL	12	80	30	84	65			3.0		
CD1	DCO	DRY CRUDE OIL	6 - 16	30H	45	33	65	300	WNRF	3.0		
CD2	NG	NATURAL GAS	2	17	AMB	18.7	65	300	WNRF	1.5		
	TW	CLARIFIED WATER	4 - 10	30	35	33	65			1.5		
CB1	WCO	WET CRUDE OIL (NOTE – 1 & 2)	1 - 20	8	60	9.7	90	150	WNRF	3.0		
	DCO	DRY CRUDE OIL	3 - 20	8	90	9.7	120			3.0		
	EW	FORMATION WATER	1 - 12	6.5	90	8.2	120			3.0		
	AW	ACCUMULATED WATER	3 - 12	3.5	45	5.2	65			3.0		
CB2	OWS	OILY WATER SEWER	1/2-12H	3.5	35	5.2	65	150	WNRF	1.5		
	NG	NATURAL GAS	1 - 6	2.5	AMB	4.2	65			1.5		
	PV	PROCESS VENT	1/2-16 H	1	45	3.5	65			1.5		
	GL	GLYCOL	1/2 - 2H	2.5	60	4.2	90			1.5		
	DR	DRAIN LIQUID	1/2 - 2H	1	90	3.5	120			1.5		
	OC	CONDENSATE OIL (NOTE – 3)	1 - 4	8H	30H	9.7	65			1.5		
CC	SL	STEAM	3/4 - 10	10.5	148	12.5	160	150	WNRF	1.5	ASTM A106 Gr.B CARBON STEEL	
	CL	STEAM CONDENSATE	3/4 - 10	3.5	148	5.2	160			1.5		
CA	CW	COOLING WATER	H	4	37	5.7	65	150	SO RF	1.5	IS:1239 / 3589 (or) ASTM A 53 Gr. B CARBON STEEL	
	FW	FIRE WATER	1/2 - 30	11	AMB	12.7	65			1.5		
	TW	CLARIFIED WATER	4 - 16	4	35	5.7	65			1.5		
GA	IA	INSTRUMENT AIR	1/2 - 4H	7	AMB	8.7	65	150	SO RF	1.5	IS:1239 / 3589 (or) ASTM A 53 Gr. B CARBON STEEL GALVANISED	
	PA	PLANT AIR	1/2 - 4H	7	AMB	8.7	65			1.5		
	PW	PROCESS WATER	1/2 -10H	4	AMB	5.7	65			1.5		
	RW	RAW WATER	1/2 -10H	4	AMB	5.7	65			1.5		
REV. NO.		R1			PPD. BY: MA/TS			JOB NO.		CLIENT: OIL INDIA LIMITED		ISSUE R1
DATE		03.06.2015			CHD. BY: JSA			TCE.		PROJECT:		
REV. BY		KVK			DATE: 03.06.2015			7547A		SECONDARY TANK FARM, DULIAJAN, ASSAM		

SPECIFICATION NO. TCE.7547A-300-PP-1101	TATA CONSULTING ENGINEERS LIMITED						SECTION: D	
	PIPING SPECIFICATION INDEX						SHEET 2 OF 36	

MATERIAL SPECIFICATION CODE	SERVICE		PIPE SIZE RANGE (INCH)	OPERATING CONDITION		DESIGN CONDITION		PPRESSURE RATING: #	FLANGE TYPE / FACING	CORROSION ALLOWANCE (MM)	PIPE MATERIAL
	FLUID IDENTIFICATION	TITLE		PRESSURE (Kg/Cm ² (g))	TEMPERATURE (°C)	PRESSURE (Kg/Cm ² (g))	TEMPERATURE (°C)				
SA	DMW	DEMINERALIZED WATER	1/2 - 10H	4	AMB	5.7	65	150	LJ RF	NIL	ASTM A312 Gr. TP304 STAINLESS STEEL
	AF	AQUEOUS FOAM	1/2 - 4	4	AMB	5.7	65			NIL	
SB	ADD1	CORROSION INHIBITOR (WET CRUDE OIL)	1/2 - 2	9	AMB	10.7	65	150	LJ RF	NIL	ASTM A312 Gr. TP316 STAINLESS STEEL
	ADD2	SULFATE REDUCING BACTERIA	1/2 - 2	9	AMB	10.7	65			NIL	
	ADD3	SCALE INHIBITOR	1/2 - 2	9	AMB	10.7	65			NIL	
	ADD4	DE EMULSIFIER	1/2 - 2	9	AMB	10.7	65			NIL	
SD	ADD5	POUR POINT DEPRESSANT	1/2 - 2	30H	AMB	33	120	300	WNRF	NIL	
	ADD6	CORROSION INHIBITOR (DRY CRUDE OIL)	1/2 - 2	30H	AMB	33	120			NIL	

H - HOLD, AMB- AMBIENT

NOTES:

1. ALL RECOVERED CRUDE OIL LINES AND FEW WET CRUDE OIL LINES SHALL BE PROVIDED WITH STEAM TRACING. FOR DETAILS REFER P&ID.
2. ALL RECOVERED CRUDE OIL LINES ARE INCLUDED IN WET CRUDE OIL LINES FOR PIPING SPECIFICATION.
3. MINIMUM OPERATING PRESSURE AND TEMPERATURE OF CONDENSATE OIL (FROM CGGS) TO BE CONFIRMED BY OIL.
4. PIPING MATERIAL CODE CF HAS PRESSURE RATING 600 CLASS BASED ON OIL TENDER DOCUMENT.

REV. NO.	R1			PPD. BY: MA/TS	JOB NO. TCE. 7547A	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.2015			CHD. BY: JSA		PROJECT: SECONDARY TANK FARM, DULIAJAN, ASSAM	
REV. BY	KVK			DATE: 03.06.2015			

TCE.7547A-300-PP-1101	TATA CONSULTING ENGINEERS LIMITED	SECTION: LEGEND
	PIPING MATERIAL SPECIFICATION	SHEET 3 OF 36

LEGEND

BW	BUTT WELDING
SW	SOCKET WELDING
CS	CARBON STEEL
SS	STAINLESS STEEL
CI	CAST IRON
CL	CLASS
ERW	ELECTRIC RESISTANT WELDED
EFW	ELECTRIC FUSION WELDED
SMLS	SEAMLESS
HVY	HEAVY
PE	PLAIN ENDS
BE	BEVELLED ENDS
TE	THREADED ENDS
SORF	SLIP-ON RAISED FACE
RTJ	RING TYPE JOINT
WN	WELDING NECK
LJ	LAP JOINT FLANGE
SCRW	SCREWED
RF	FLANGED RAISED FACE
FF	FLANGED FLAT FACE
SCH	SCHEDULE
GALV	GALVANISED
NPT	AMERICAN STD. PIPE THREAD (NATIONAL PIPE TAPER)
Gr	GRADE
POE	PLAIN ONE END
TOE	THREADED ONE END
PBE	PLAIN BOTH ENDS
TBE	THREADED BOTH ENDS
THK	THICKNESS

ISSUE
R1

FILE NAME: 7547A310PP1101R1.DOC
TCE FORM NO. 020 R4

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED										SECTION:	
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION						GRADE		CF		SHEET 4 OF 36	
SERVICE : WET CRUDE OIL (WCO)													
DESIGN	TEMP. °F/°C	REFER PIPING INDEX			CORR. ALL. inch/mm			3.0					
	PR. psig/kg/cm ² g	REFER PIPING INDEX			FLANGE FACING			RTJ					
NOM. PIPE SIZE	inch mm	15	20	25	40	50	80	100	150	200	250	300	350
OUTSIDE DIA.	inch mm	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273	323.9	355.6
THICKNESS	inch mm	SCH XXS	SCH XXS	SCH 160	SCH 160	SCH 160	SCH 80	SCH 80	SCH 80	SCH 80	SCH 80	SCH 80	SCH 80
NOM. PIPE SIZE	inch mm	400											
OUTSIDE DIA.	inch mm	406.4											
THICKNESS	inch mm	SCH 80											
LINE JOINT		≤ 40 - SW TO ASME B16.11											
		≥ 50 - BW TO ASME B16.25(NOTE-1)											
ITEM		NOMINAL PIPE SIZE RANGE inch/mm		MATERIAL SPECIFICATION		DIMENSIONAL STANDARD		REMARKS					
PIPES		≤ 40		API 5L Gr. B		ASME B 36.10		SMLS, PE					
		50 TO 400		API 5L Gr. B		ASME B 36.10		SMLS, BE					
PIPE NIPPLES		15 TO 40		API 5L Gr. B		ASME B 36.10		POE-TOE, TBE, PBE, SCH TO MATCH PIPE					
BW FITTINGS	ELBOWS, CAPS, REDUCERS, TEES	50 TO 400		ASTM A 234 GR.WPB		ASME B16.9		SMLS, SCH TO MATCH PIPE					
		STUB ENDS											
SW FITTINGS		≤ 40		ASTM A 105		ASME B16.11		6000 CL					
BENDS													
FABRICATED REDUCERS													
MITRES													
BRANCH CONNECTION		ALL		-		-		SEE BRANCH CONNECTION CHART					
FLANGES		15 TO 40		ASTM A 105		ASME B16.5		SW, 600 CL					
		50 TO 400		ASTM A 105		ASME B16.5		WN, 600 CL					
BLIND FLANGES		ALL		ASTM A 105		ASME B16.5		600 CL					
STUD BOLTS / NUTS		ALL		BOLT : ASTM A193 Gr.B7		ASME B18.2.1		THREADING SHALL BE AS PER ASME B1.1 CL.2A					
		ALL		NUT : ASTM A194 Gr.2H		ASME B18.2.2		THREADING SHALL BE AS PER ASME B1.1 CL.2B (NOTE-2)					
REV. NO.	R1			PPD. BY: MA/Ts		JOB NO.		CLIENT: OIL INDIA LIMITED				ISSUE R1	
DATE	03.06.15			CHD. BY: JSA		TCE.		PROJECT: SECONDARY TANK					
REV. BY	KVK			DATE: 03.06.15		7547A		FARM AT DULIAJAN, ASSAM					

SPECIFICATION NO. TCE.7547A-300-PP-1101		TATA CONSULTING ENGINEERS LIMITED					SECTION:	
		PIPING MATERIAL SPECIFICATION			GRADE		CF	
							SHEET 5 OF 36	

ITEM	NOMINAL PIPE SIZE RANGE inch/mm	MATERIAL SPECIFICATION	DIMENSIONAL STANDARD	REMARKS			
GASKETS	ALL	OCTAGONAL RINF + SOFT IRON	ASME B16.20	600 CL			
THREADED FITTINGS	≤ 40	ASTM A 105	ASME B 16.11	6000 CL, SCRW			

TYPE OF VALVE	SIZE RANGE inch./mm.	MATERIAL		PRESSURE RATING ANSI/AS	TYPE OF ENDS	SPECIFICATION OR TAG NUMBER	REMARKS
		BODY	TRIM				
GATE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	G83	
GATE	≥ 50 TO 400	ASTM A 216 Gr.WCB	13% Cr. STEEL	600	RTJ	G63	
GLOBE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	T83	
GLOBE	≥ 50 TO 400	ASTM A 216 Gr.WCB	13% Cr. STEEL	600	RTJ	T63	
LIFT TYPE CHECK	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	C83	
CHECK (DUAL PLATE)	≥ 50 TO 400	ASTM A 216 GR.WCB	13% Cr. STEEL	600	RTJ	C63X1	
BALL	≥ 15 TO 400	ASTM A 216 Gr.WCB	SS 304	600	RTJ	B63	TWO PIECE, REGULAR PORT (NOTE-3)
STRAINER (Y - TYPE)	≤ 40	ASTM A 105	SS 304	800	SW	-	
STRAINER (Y - TYPE)	50 TO 150	ASTM A 216 Gr.WCB	SS 304	600	RTJ	-	
STRAINER (T - TYPE)	≥ 200 TO 400	ASTM A 216 Gr.WCB	SS 304	600	RTJ	-	

NOTES:

- EDGE PREPARATION FOR BUTT WELDING TO BE DONE AT SITE.
- NUT SHALL BE ALONG WITH WASHER.
- BALL VALVES SHALL BE GEAR OPERATED FOR 150 NB & ABOVE.

REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED										SECTION:		
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION						GRADE		CD1		SHEET 7 OF 36		
SERVICE : DRY CRUDE OIL (DCO)														
DESIGN	TEMP. °F/°C	REFER PIPING INDEX			CORR. ALL. inch/mm			3.0						
	PR. psig/kg/cm ² g	REFER PIPING INDEX			FLANGE FACING			RF						
NOM. PIPE SIZE	inch mm	15	20	25	40	50	80	100	150	200	250	300	350	
OUTSIDE DIA.	inch mm	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273	323.9	355.6	
THICKNESS	inch mm	SCH 160	SCH 160	SCH 160	SCH 160	SCH 80	SCH 80	SCH 40	SCH 40	SCH 40	SCH 40	SCH STD	SCH STD	
NOM. PIPE SIZE	inch mm	400												
OUTSIDE DIA.	inch mm	406.4												
THICKNESS	inch mm	SCH STD												
LINE JOINT		≤ 40 - SW TO ASME B16.11												
		≥ 50 - BW TO ASME B16.25(NOTE-1)												
ITEM		NOMINAL PIPE SIZE RANGE inch/mm		MATERIAL SPECIFICATION		DIMENSIONAL STANDARD		REMARKS						
PIPES		≤ 40		API 5L Gr. B		ASME B 36.10		SMLS, PE						
		50 TO 400		API 5L Gr. B		ASME B 36.10		SMLS, BE						
PIPE NIPPLES		15 TO 40		API 5L Gr. B		ASME B 36.10		POE-TOE, TBE, PBE, SCH TO MATCH PIPE						
BW FITTINGS	ELBOWS, CAPS, REDUCERS, TEES	50 TO 400		ASTM A 234 GR.WPB		ASME B16.9		SMLS, SCH TO MATCH PIPE						
STUB ENDS														
SW FITTINGS		15 TO 20		ASTM A 105		ASME B16.11		6000 CL						
		25 TO 40		ASTM A 105		ASME B16.11		3000 CL						
BENDS														
FABRICATED REDUCERS														
MITRES														
BRANCH CONNECTION		ALL		-		-		SEE BRANCH CONNECTION CHART						
FLANGES		15 TO 40		ASTM A 105		ASME B16.5		SW, 300 CL						
		50 TO 400		ASTM A 105		ASME B16.5		WN, 300 CL						
BLIND FLANGES		ALL		ASTM A 105		ASME B16.5		300 CL						
STUD BOLTS / NUTS		ALL		BOLT : ASTM A193 Gr.B7		ASME B18.2.1		THREADING SHALL BE AS PER ASME B1.1 CL.2A						
		ALL		NUT : ASTM A194 Gr.2H		ASME B18.2.2		THREADING SHALL BE AS PER ASME B1.1 CL.2B (NOTE-2)						
REV. NO.	R1			PPD. BY: MA/TS		JOB NO.		CLIENT: OIL INDIA LIMITED						ISSUE R1
DATE	03.06.15			CHD. BY: JSA		TCE.		PROJECT: SECONDARY TANK						
REV. BY	KVK			DATE: 03.06.15		7547A		FARM AT DULIAJAN, ASSAM						

SPECIFICATION NO. TCE.7547A-300-PP-1101		TATA CONSULTING ENGINEERS LIMITED				SECTION:	
		PIPING MATERIAL SPECIFICATION			GRADE	CD1	SHEET 8 OF 36
ITEM	NOMINAL PIPE SIZE RANGE inch/mm	MATERIAL SPECIFICATION		DIMENSIONAL STANDARD	REMARKS		
GASKETS	ALL	SPIRAL WOUND SS 316 + GRAPHOIL FILLER		ASME B16.20	300 CL, 3.0 mm THK.		
THREADED FITTINGS	15 TO 20	ASTM A 105		ASME B 16.11	6000 CL, SCRW		
	25 TO 40	ASTM A 105		ASME B 16.11	3000 CL, SCRW		
TYPE OF VALVE	SIZE RANGE inch./mm.	MATERIAL		PRESSURE RATING ANSI/AS	TYPE OF ENDS	SPECIFICATION OR TAG NUMBER	REMARKS
		BODY	TRIM				
GATE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	G83	
GATE	≥ 50 TO 400	ASTM A 216 Gr.WCB	13% Cr. STEEL	300	RF	G33	
GLOBE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	T83	
GLOBE	≥ 50 TO 400	ASTM A 216 Gr.WCB	13% Cr. STEEL	300	RF	T33	
LIFT TYPE CHECK	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	C83	
CHECK (DUAL PLATE)	≥ 50 TO 400	ASTM A 216 GR.WCB	13% Cr. STEEL	300	RF	C33X1	
BALL	≥ 15 TO 400	ASTM A 216 Gr.WCB	SS 304	300	RF	B33	TWO PIECE, REGULAR PORT (NOTE-3)
STRAINER (Y - TYPE)	≤ 40	ASTM A 105	SS 304	800	SW	-	
STRAINER (Y - TYPE)	50 TO 150	ASTM A 216 Gr.WCB	SS 304	300	RF	-	
STRAINER (T - TYPE)	≥ 200 TO 400	ASTM A 216 Gr.WCB	SS 304	300	RF	-	
NOTES: 1. EDGE PREPARATION FOR BUTT WELDING TO BE DONE AT SITE. 2. NUT SHALL BE ALONG WITH WASHER. 3. BALL VALVES SHALL BE GEAR OPERATED FOR 150 NB & ABOVE.							
REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	R1
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED										SECTION:			
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION						GRADE		CD1		SHEET 9 OF 36			

BRANCH CONNECTION CHART

SIZE inch/mm	BRANCH															
RUN	15	20	25	40	50	80	100	150	200	250	300	350	400			
15	T															
20	RT	T														
25	RT	RT	T													
40	RT	RT	RT	T												
50	H	H	H	RT	T											
80	H	H	H	H	RT	T										
100	H	H	H	H	SR	RT	T									
150	H	H	H	H	SR	RT	RT	T								
200	H	H	H	H	SR	SR	RT	RT	T							
250	H	H	H	H	SR	SR	SR	RT	RT	T						
300	H	H	H	H	SR	SR	SR	SR	RT	RT	T					
350	H	H	H	H	SR	SR	SR	SR	SR	RT	RT	T				
400	H	H	H	H	SR	SR	SR	SR	SR	SR	RT	RT	T			

LEGEND :
T - STRAIGHT TEE
RT - REDUCING TEE
H - HALF COUPLING
SR - STUB-IN WITH R-PAD

REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	R1
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED										SECTION:	
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION						GRADE		CD2		SHEET 10 OF 36	
SERVICE : NATURAL GAS (NG) & CLARIFIED WATER (TW)													
DESIGN	TEMP. °F/°C	REFER PIPING INDEX			CORR. ALL. inch/mm			1.5					
	PR. psig/kg/cm ² g	REFER PIPING INDEX			FLANGE FACING			RF					
NOM. PIPE SIZE	inch mm	15	20	25	40	50	80	100	150	200	250	300	
OUTSIDE DIA.	inch mm	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273	323.9	
THICKNESS	inch mm	SCH 80	SCH 80	SCH 80	SCH 80	SCH 40	SCH 40	SCH 40	SCH 40	SCH 40	SCH 40	SCH STD	
NOM. PIPE SIZE	inch mm												
OUTSIDE DIA.	inch mm												
THICKNESS	inch mm												
LINE JOINT		≤ 40 - SW TO ASME B16.11											
		≥ 50 - BW TO ASME B16.25(NOTE-1)											
ITEM		NOMINAL PIPE SIZE RANGE inch/mm		MATERIAL SPECIFICATION		DIMENSIONAL STANDARD		REMARKS					
PIPES		≤ 40		API 5L Gr. B		ASME B 36.10		SMLS, PE					
		50 TO 300		API 5L Gr. B		ASME B 36.10		SMLS, BE					
PIPE NIPPLES		15 TO 40		API 5L Gr. B		ASME B 36.10		POE-TOE, TBE, PBE, SCH TO MATCH PIPE					
BW FITTINGS	ELBOWS, CAPS, REDUCERS, TEES	50 TO 300		ASTM A 234 GR.WPB		ASME B16.9		SMLS, SCH TO MATCH PIPE					
STUB ENDS													
SW FITTINGS		15 TO 20		ASTM A 105		ASME B16.11		6000 CL					
		25 TO 40		ASTM A 105		ASME B16.11		3000 CL					
BENDS													
FABRICATED REDUCERS													
MITRES													
BRANCH CONNECTION		ALL		-		-		SEE BRANCH CONNECTION CHART					
FLANGES		15 TO 40		ASTM A 105		ASME B16.5		SW, 300 CL					
		50 TO 300		ASTM A 105		ASME B16.5		WN, 300 CL					
BLIND FLANGES		ALL		ASTM A 105		ASME B16.5		300 CL					
STUD BOLTS / NUTS		ALL		BOLT : ASTM A193 Gr.B7		ASME B18.2.1		THREADING SHALL BE AS PER ASME B1.1 CL.2A					
		ALL		NUT : ASTM A194 Gr.2H		ASME B18.2.2		THREADING SHALL BE AS PER ASME B1.1 CL.2B (NOTE-2)					
REV. NO.	R1			PPD. BY: MA/T S			JOB NO.	CLIENT: OIL INDIA LIMITED					ISSUE R1
DATE	03.06.15			CHD. BY: JSA			TCE.	PROJECT: SECONDARY TANK					
REV. BY	KVK			DATE: 03.06.15			7547A	FARM AT DULIAJAN, ASSAM					

SPECIFICATION NO. TCE.7547A-300-PP-1101		TATA CONSULTING ENGINEERS LIMITED				SECTION:	
		PIPING MATERIAL SPECIFICATION			GRADE	CD2	SHEET 11 OF 36
ITEM	NOMINAL PIPE SIZE RANGE inch/mm	MATERIAL SPECIFICATION		DIMENSIONAL STANDARD	REMARKS		
GASKETS	ALL	SPIRAL WOUND SS 316 + GRAPHOIL FILLER		ASME B16.20	300 CL, 3.0 mm THK.		
THREADED FITTINGS	15 TO 20	ASTM A 105		ASME B 16.11	6000 CL, SCRW		
	25 TO 40	ASTM A 105		ASME B 16.11	3000 CL, SCRW		
TYPE OF VALVE	SIZE RANGE inch./mm.	MATERIAL		PRESSURE RATING ANSI/AS	TYPE OF ENDS	SPECIFICATION OR TAG NUMBER	REMARKS
		BODY	TRIM				
GATE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	G83	
GATE	≥ 50 TO 300	ASTM A 216 Gr.WCB	13% Cr. STEEL	300	RF	G33	
GLOBE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	T83	
GLOBE	≥ 50 TO 300	ASTM A 216 Gr.WCB	13% Cr. STEEL	300	RF	T33	
LIFT TYPE CHECK	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	C83	
CHECK (DUAL PLATE)	≥ 50 TO 300	ASTM A 216 GR.WCB	13% Cr. STEEL	300	RF	C33X1	
BALL	≥ 15 TO 300	ASTM A 216 Gr.WCB	SS 304	300	RF	B33	TWO PIECE, REGULAR PORT
STRAINER (Y - TYPE)	≤ 40	ASTM A 105	SS 304	800	SW	-	
STRAINER (Y - TYPE)	50 TO 150	ASTM A 216 Gr.WCB	SS 304	300	RF	-	
STRAINER (T - TYPE)	≥ 200 TO 400	ASTM A 216 Gr.WCB	SS 304	300	RF	-	
NOTES:							
1. EDGE PREPARATION FOR BUTT WELDING TO BE DONE AT SITE.							
2. NUT SHALL BE ALONG WITH WASHER.							
REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	R1
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED										SECTION:					
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION						GRADE		CD2		SHEET 12 OF 36					
BRANCH CONNECTION CHART																	
SIZE inch/mm		BRANCH															
RUN		15	20	25	40	50	80	100	150	200	250	300					
15		T															
20		RT	T														
25		RT	RT	T													
40		RT	RT	RT	T												
50		H	H	H	RT	T											
80		H	H	H	H	RT	T										
100		H	H	H	H	SR	RT	T									
150		H	H	H	H	SR	SR	RT	T								
200		H	H	H	H	SR	SR	SR	RT	T							
250		H	H	H	H	SR	SR	SR	SR	RT	T						
300		H	H	H	H	SR	SR	SR	SR	SR	RT	T					
LEGEND :																	
T - STRAIGHT TEE																	
RT - REDUCING TEE																	
H - HALF COUPLING																	
SR - STUB-IN WITH R-PAD																	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED										SECTION:	
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION						GRADE CB1		SHEET 13 OF 36			
SERVICE : WET CRUDE OIL (WCO), DRY CRUDE OIL (DCO), FORMATION WATER (EW) & ACCUMULATED WATER (AW)													
DESIGN	TEMP. °F/°C	REFER PIPING INDEX			CORR. ALL. inch/mm			3.0					
	PR. psig/kg/cm ² g	REFER PIPING INDEX			FLANGE FACING			RF					
NOM. PIPE SIZE	inch mm	15	20	25	40	50	80	100	150	200	250	300	350
OUTSIDE DIA.	inch mm	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273	323.9	355.6
THICKNESS	inch mm	SCH 160	SCH 160	SCH 160	SCH 80	SCH 80	SCH 40	SCH 40	SCH 40	SCH 20	SCH 20	SCH 20	SCH 10
NOM. PIPE SIZE	inch mm	400	450	500	600								
OUTSIDE DIA.	inch mm	406.4	457	508	610								
THICKNESS	inch mm	SCH 10	SCH 10	SCH 10	SCH 10								
LINE JOINT		≤ 40 - SW TO ASME B16.11											
		≥ 50 - BW TO ASME B16.25(NOTE-1)											
ITEM		NOMINAL PIPE SIZE RANGE inch/mm		MATERIAL SPECIFICATION		DIMENSIONAL STANDARD		REMARKS					
PIPES		≤ 40		APL 5L Gr. B		ASME B 36.10		SMLS, PE					
		50 TO 600		APL 5L Gr. B		ASME B 36.10		SMLS, BE					
PIPE NIPPLES		15 TO 40		APL 5L Gr. B		ASME B 36.10		POE-TOE, TBE, PBE, SCH TO MATCH PIPE					
BW FITTINGS	ELBOWS, CAPS, REDUCERS, TEES	50 TO 600		ASTM A 234 GR.WPB		ASME B16.9		SMLS, SCH TO MATCH PIPE					
STUB ENDS													
SW FITTINGS		≤ 40		ASTM A 105		ASME B16.11		3000 CL					
BENDS													
FABRICATED REDUCERS													
MITRES													
BRANCH CONNECTION		ALL		-		-		SEE BRANCH CONNECTION CHART					
FLANGES		15 TO 40		ASTM A 105		ASME B16.5		SW 150 CL					
		50 TO 600		ASTM A 105		ASME B16.5		WN, 150 CL					
BLIND FLANGES		ALL		ASTM A 105		ASME B16.5		150 CL					
STUD BOLTS / NUTS		ALL		BOLT : ASTM A193 Gr.B7		ASME B18.2.1		THREADING SHALL BE AS PER ASME B1.1 CL.2A					
		ALL		NUT : ASTM A194 Gr.2H		ASME B18.2.2		THREADING SHALL BE AS PER ASME B1.1 CL.2B (NOTE-2)					
REV. NO.	R1			PPD. BY: MA/TS			JOB NO.	CLIENT: OIL INDIA LIMITED					ISSUE R1
DATE	03.06.15			CHD. BY: JSA			TCE.	PROJECT: SECONDARY TANK					
REV. BY	KVK			DATE: 03.06.15			7547A	FARM AT DULIAJAN, ASSAM					

SPECIFICATION NO. TCE.7547A-300-PP-1101		TATA CONSULTING ENGINEERS LIMITED				SECTION:	
		PIPING MATERIAL SPECIFICATION			GRADE CB1		SHEET 14 OF 36
ITEM	NOMINAL PIPE SIZE RANGE inch/mm	MATERIAL SPECIFICATION		DIMENSIONAL STANDARD	REMARKS		
GASKETS	ALL	SPIRAL WOUND SS 316 + GRAPHOIL FILLER		ASME B16.20	150 CL, 3.0 mm THK.		
THREADED FITTINGS	≤ 40	ASTM A 105		ASME B 16.11	3000 CL, SCRW		
TYPE OF VALVE	SIZE RANGE inch./mm.	MATERIAL		PRESSURE RATING ANSI/IS	TYPE OF ENDS	SPECIFICATION OR TAG NUMBER	REMARKS
		BODY	TRIM				
GATE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	G83	
GATE	≥ 50 TO 600	ASTM A 216 Gr.WCB	13% Cr. STEEL	150	RF	G23	
GLOBE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	T83	
GLOBE	≥ 50 TO 600	ASTM A 216 Gr.WCB	13% Cr. STEEL	150	RF	T23	
LIFT TYPE CHECK	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	C83	
CHECK (DUAL PLATE)	≥ 50 TO 600	ASTM A 216 GR.WCB	13% Cr. STEEL	150	RF	C23X1	
BALL	≥ 15 TO 600	ASTM A 216 Gr.WCB	SS 304	150	RF	B23	TWO PIECE, REGULAR PORT (NOTE-3)
STRAINER (Y - TYPE)	≤ 40	ASTM A 105	SS 304	800	SW	-	
STRAINER (Y - TYPE)	50 TO 150	ASTM A 216 Gr.WCB	SS 304	150	RF	-	
STRAINER (T - TYPE)	≥ 200 TO 600	ASTM A 216 Gr.WCB	SS 304	150	RF	-	
NOTES: 1. EDGE PREPARATION FOR BUTT WELDING TO BE DONE AT SITE. 2. NUT SHALL BE ALONG WITH WASHER. 3. BALL VALVES SHALL BE GEAR OPERATED FOR 150 NB & ABOVE.							
REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED										SECTION:			
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION					GRADE		CB1		SHEET 15 OF 36				

BRANCH CONNECTION CHART

SIZE inch/mm	BRANCH															
RUN	15	20	25	40	50	80	100	150	200	250	300	350	400	500	600	
15	T															
20	RT	T														
25	RT	RT	T													
40	RT	RT	RT	T												
50	H	H	H	RT	T											
80	H	H	H	H	RT	T										
100	H	H	H	H	S	RT	T									
150	H	H	H	H	S	RT	RT	T								
200	H	H	H	H	S	S	RT	RT	T							
250	H	H	H	H	S	S	S	RT	RT	T						
300	H	H	H	H	S	S	S	S	RT	RT	T					
350	H	H	H	H	S	S	S	S	S	RT	RT	T				
400	H	H	H	H	S	S	S	S	S	S	RT	RT	T			
500	H	H	H	H	S	S	S	S	S	S	S	RT	RT	T		
600	H	H	H	H	S	S	S	S	S	S	S	S	RT	RT	T	

LEGEND :
T - STRAIGHT TEE
RT - REDUCING TEE
H - HALF COUPLING
S - STUB -IN

REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	R1
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED										SECTION:	
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION						GRADE CB2		SHEET 16 OF 36			
SERVICE : DRAIN LIQUID (DR), OILY WATER SEWER (OWS), NATURAL GAS (NG), PROCESS VENT(PV), FLARE GAS (FG),													
GLYCOL (GL) & CONDENSATE OIL (OC)													
DESIGN	TEMP. °F/°C	REFER PIPING INDEX			CORR. ALL. inch/mm			1.5					
	PR. psig/kg/cm ² g	REFER PIPING INDEX			FLANGE FACING			RF					
NOM. PIPE SIZE	inch mm	15	20	25	40	50	80	100	150	200	250	300	350
OUTSIDE DIA.	inch mm	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273	323.9	355.6
THICKNESS	inch mm	SCH 80	SCH 80	SCH 80	SCH 80	SCH 40	SCH 40	SCH 40	SCH 40	SCH 20	SCH 20	SCH 20	SCH 10
NOM. PIPE SIZE	inch mm	400											
OUTSIDE DIA.	inch mm	406.4											
THICKNESS	inch mm	SCH 10											
LINE JOINT		≤ 40 - SW TO ASME B16.11											
		≥ 50 - BW TO ASME B16.25(NOTE-1)											
ITEM		NOMINAL PIPE SIZE RANGE inch/mm		MATERIAL SPECIFICATION		DIMENSIONAL STANDARD		REMARKS					
PIPES		≤ 40		API 5L Gr. B		ASME B 36.10		SMLS, PE					
		50 TO 400		API 5L Gr. B		ASME B 36.10		SMLS, BE					
PIPE NIPPLES		15 TO 40		API 5L Gr. B		ASME B 36.10		POE-TOE, TBE, PBE, SCH TO MATCH PIPE					
BW FITTINGS	ELBOWS, CAPS, REDUCERS, TEES	50 TO 400		ASTM A 234 GR.WPB		ASME B16.9		SMLS, SCH TO MATCH PIPE					
STUB ENDS													
SW FITTINGS		≤ 40		ASTM A 105		ASME B16.11		3000 CL					
BENDS													
FABRICATED REDUCERS													
MITRES													
BRANCH CONNECTION		ALL		-		-		SEE BRANCH CONNECTION CHART					
FLANGES		15 TO 40		ASTM A 105		ASME B16.5		SW 150 CL					
		50 TO 400		ASTM A 105		ASME B16.5		WN, 150 CL					
BLIND FLANGES		ALL		ASTM A 105		ASME B16.5		150 CL					
STUD BOLTS / NUTS		ALL		BOLT : ASTM A193 Gr.B7		ASME B18.2.1		THREADING SHALL BE AS PER ASME B1.1 CL.2A					
		ALL		NUT : ASTM A194 Gr.2H		ASME B18.2.2		THREADING SHALL BE AS PER ASME B1.1 CL.2B (NOTE-2)					
REV. NO.	R1			PPD. BY: MA/TS		JOB NO.		CLIENT: OIL INDIA LIMITED				ISSUE R1	
DATE	03.06.15			CHD. BY: JSA		TCE.		PROJECT: SECONDARY TANK					
REV. BY	KVK			DATE: 03.06.15		7547A		FARM AT DULIAJAN, ASSAM					

SPECIFICATION NO. TCE.7547A-300-PP-1101		TATA CONSULTING ENGINEERS LIMITED				SECTION:	
		PIPING MATERIAL SPECIFICATION			GRADE CB2	SHEET 17 OF 36	
ITEM	NOMINAL PIPE SIZE RANGE inch/mm	MATERIAL SPECIFICATION		DIMENSIONAL STANDARD	REMARKS		
GASKETS	ALL	SPIRAL WOUND SS 316 + GRAPHOIL FILLER		ASME B16.20	150 CL, 3.0 mm THK.		
THREADED FITTINGS	≤ 40	ASTM A 105		ASME B 16.11	3000 CL, SCRW		
TYPE OF VALVE	SIZE RANGE inch./mm.	MATERIAL		PRESSURE RATING ANSI/IS	TYPE OF ENDS	SPECIFICATION OR TAG NUMBER	REMARKS
		BODY	TRIM				
GATE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	G83	
GATE	≥ 50 TO 400	ASTM A 216 Gr.WCB	13% Cr. STEEL	150	RF	G23	
GLOBE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	T83	
GLOBE	≥ 50 TO 400	ASTM A 216 Gr.WCB	13% Cr. STEEL	150	RF	T23	
LIFT TYPE CHECK	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	C83	
CHECK (DUAL PLATE)	≥ 50 TO 400	ASTM A 216 GR.WCB	13% Cr. STEEL	150	RF	C23X1	
BALL	≥ 15 TO 400	ASTM A 216 Gr.WCB	SS 304	150	RF	B23	TWO PIECE, REGULAR PORT (NOTE-3)
STRAINER (Y - TYPE)	≤ 40	ASTM A 105	SS 304	800	SW	-	
STRAINER (Y - TYPE)	50 TO 150	ASTM A 216 Gr.WCB	SS 304	150	RF	-	
STRAINER (T - TYPE)	≥ 200 TO 400	ASTM A 216 Gr.WCB	SS 304	150	RF	-	
NOTES:							
1. EDGE PREPARATION FOR BUTT WELDING TO BE DONE AT SITE.							
2. NUT SHALL BE ALONG WITH WASHER.							
3. BALL VALVES SHALL BE GEAR OPERATED FOR 150 NB & ABOVE.							
REV. NO.	R1			PPD. BY: MA/T S	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED										SECTION:	
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION					GRADE		CB2		SHEET 18 OF 36		

BRANCH CONNECTION CHART

SIZE inch/mm	BRANCH															
RUN	15	20	25	40	50	80	100	150	200	250	300	350	400			
15	T															
20	RT	T														
25	RT	RT	T													
40	RT	RT	RT	T												
50	H	H	H	RT	T											
80	H	H	H	H	RT	T										
100	H	H	H	H	S	RT	T									
150	H	H	H	H	S	RT	RT	T								
200	H	H	H	H	S	S	RT	RT	T							
250	H	H	H	H	S	S	S	RT	RT	T						
300	H	H	H	H	S	S	S	S	RT	RT	T					
350	H	H	H	H	S	S	S	S	S	RT	RT	T				
400	H	H	H	H	S	S	S	S	S	S	RT	RT	T			

LEGEND :
 T - STRAIGHT TEE
 RT - REDUCING TEE
 H - HALF COUPLING
 S - STUB -IN

REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED										SECTION:	
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION						GRADE		CC		SHEET 19 OF 36	
SERVICE : STEAM – IBR (SL) (REFER NOTE-4 & 5) & STEAM CONDENSATE – NON IBR (CL)													
DESIGN	TEMP. °F/°C	REFER PIPING INDEX			CORR. ALL. inch/mm			1.5					
	PR. psig/kg/cm ² g	REFER PIPING INDEX			FLANGE FACING			RF					
NOM. PIPE SIZE	inch mm	15	20	25	40	50	80	100	150	200	250		
OUTSIDE DIA.	inch mm	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273		
THICKNESS	inch mm	SCH 80	SCH 80	SCH 80	SCH 80	SCH 40	SCH 40	SCH 40	SCH 40	SCH 20	SCH 20		
NOM. PIPE SIZE	inch mm												
OUTSIDE DIA.	inch mm												
THICKNESS	inch mm												
LINE JOINT		≤ 40 - SW TO ASME B16.11											
		≥ 50 - BW TO ASME B16.25 (NOTE - 1)											
ITEM		NOMINAL PIPE SIZE RANGE inch/mm		MATERIAL SPECIFICATION		DIMENSIONAL STANDARD		REMARKS					
PIPES		≤ 40		ASTM A 106 GR. B		ASME B 36.10		SMLS, PE					
		50 TO 250		ASTM A 106 GR. B		ASME B 36.10		SMLS, BE					
PIPE NIPPLES		15 TO 40		ASTM A 106 GR. B		ASME B 36.10		POE-TOE, TBE, PBE, SCH TO MATCH PIPE					
BW FITTINGS	ELBOWS, CAPS, REDUCERS, TEES	50 TO 250		ASTM A 234 GR.WPB		ASME B16.9		SMLS, SCH TO MATCH PIPE					
STUB ENDS													
SW FITTINGS		≤ 40		ASTM A 105		ASME B16.11		3000 CL					
BENDS													
FABRICATED REDUCERS													
MITRES													
BRANCH CONNECTION		ALL		-		-		SEE BRANCH CONNECTION CHART					
FLANGES		≤ 40		ASTM A105		ASME B16.5		SW, 150 CL					
		≥ 50 TO 250		ASTM A105		ASME B16.5		WN, 150 CL					
BLIND FLANGES		ALL		ASTM A 105		ASME B16.5		150 CL, RF					
STUD BOLTS / NUTS		ALL		BOLT : ASTM A 193 Gr.B7		ASME B18.2.1		THREADING SHALL BE AS PER ASME B1.1 CL.2A					
		ALL		NUT : ASTM A 194 Gr.2H		ASME B18.2.2		THREADING SHALL BE AS PER ASME B1.1 CL.2B (NOTE-2)					
REV. NO.	R1			PPD. BY: MA/Ts		JOB NO.		CLIENT: OIL INDIA LIMITED				ISSUE R1	
DATE	03.06.15			CHD. BY: SS		TCE.		PROJECT: SECONDARY TANK					
REV. BY	KVK			DATE: 03.06.15		7547A		FARM AT DULIAJAN, ASSAM					

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED				SECTION:	
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION			GRADE CC		SHEET 20 OF 36
ITEM	NOMINAL PIPE SIZE RANGE inch/mm	MATERIAL SPECIFICATION		DIMENSIONAL STANDARD	REMARKS		
GASKETS	ALL	SPIRAL WOUND SS 316 + GRAPHOIL FILLER		ASME B16.20	150 CL, 3.0 mm THK.		
THREADED FITTINGS	≤ 40	ASTM A 105		ASME B 16.11	3000 CL, SCRW		
TYPE OF VALVE	SIZE RANGE inch./mm.	MATERIAL		PRESSURE RATING ANSI/AS	TYPE OF ENDS	SPECIFICATION OR TAG NUMBER	REMARKS
		BODY	TRIM				
GATE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	G83I	
GATE	≥ 50 TO 250	ASTM A 216 Gr.WCB	13% Cr. STEEL	150	RF	G23	
LIFT TYPE CHECK	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	C83I	
CHECK (DUAL PLATE)	≥ 50 TO 250	ASTM A 216 Gr.WCB	13% Cr. STEEL	150	RF	C23X1I	
GLOBE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	T83I	
GLOBE	≥ 50 TO 250	ASTM A 216 Gr.WCB	13% Cr. STEEL	150	RF	T23I	
BALL	≥ 15 TO 250	ASTM A 216 Gr.WCB	SS 304	150	RF	B23I	TWO PIECE, REGULAR PORT (NOTE-3)
STRAINER (Y - TYPE)	≤ 40	ASTM A 105	SS 304	800	SW	-	
STRAINER (Y - TYPE)	50 TO 150	ASTM A 216 Gr.WCB	SS 304	150	RF	-	
STRAINER (T - TYPE)	≥ 200 TO 250	ASTM A 216 Gr.WCB	SS 304	150	RF	-	
PISTON VALVES	≤ 50	ASTM A 216 Gr.WCB	13% Cr STEEL	150	RF	P23I	NOTE-6
STEAM TRAP	≤ 25	ASTM A 743 Gr.CA 40/AISI 420	ASTM A 240 (SCREEN)	MFR'S STD	SW	-	THERMODYNAMIC FOR LINE DRAINS
NOTES: <ol style="list-style-type: none"> EDGE PREPARATION FOR BUTT WELDING TO BE DONE AT SITE. NUT SHALL BE ALONG WITH WASHER. BALL VALVES SHALL BE GEAR OPERATED FOR 150 NB & ABOVE. PIPES, FITTINGS, FLANGES, VALVES AND SPECIALITIES SHALL BE IBR APPROVED. ALL PIPES, FITTINGS, FLANGES, FLANGED AND WELDED END VALVES SHALL HAVE CARBON CONTENT LESS THAN 0.25%.MOREOVER FOR FLANGES THE SULPHUR AND PHOSPHURUS SHALL BE LIMITED TO 0.05% . VALVE SHALL BE GLANDLESS PISTON VALVE. 							
REV. NO.	R1			PPD. BY: MA/T S	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.15			CHD. BY: SS	TCE.	PROJECT: SECONDARY TANK	
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED				SECTION:
TCE.7547A-300-PP-1101	PIPING MATERIAL SPECIFICATION		GRADE	CC	SHEET 21 OF 36

BRANCH CONNECTION CHART

SIZE inch/mm	BRANCH															
RUN	15	20	25	40	50	80	100	150	200	250						
15	T															
20	RT	T														
25	RT	RT	T													
40	RT	RT	RT	T												
50	H	H	H	RT	T											
80	H	H	H	H	RT	T										
100	H	H	H	H	S	RT	T									
150	H	H	H	H	S	RT	RT	T								
200	H	H	H	H	S	S	RT	RT	T							
250	H	H	H	H	S	S	S	RT	RT	T						

LEGEND :

- T - STRAIGHT TEE
- RT - REDUCING TEE
- H - HALF COUPLING
- S - STUB-IN

REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.15			CHD. BY: SS	TCE.	PROJECT: SECONDARY TANK	
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED								SECTION:			
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION						GRADE CA		SHEET 22 OF 36			
SERVICE : COOLING WATER(CW), FIRE WATER(FW) & CLARIFIED WATER(TW)													
DESIGN	TEMP. °F/°C		REFER PIPING INDEX			CORR. ALL. inch/mm			1.5				
	PR. psig/kg/cm ² g		REFER PIPING INDEX			FLANGE FACING			RF				
NOM. PIPE SIZE <small>inch mm</small>		15	20	25	40	50	80	100	150	200	250	300	350
OUTSIDE DIA. <small>inch mm</small>		21.8	27.3	34.2	48.8	60.8	89.5	115	166.5	219.1	273	323.9	355.6
THICKNESS <small>inch mm</small>		HVY	HVY	HVY	HVY	HVY	HVY	HVY	HVY	4.5 THK	5.0 THK	5.6 THK	5.6 THK
NOM. PIPE SIZE <small>inch mm</small>		400	450	500	600								
OUTSIDE DIA. <small>inch mm</small>		406.4	457	508	610								
THICKNESS <small>inch mm</small>		6.3 THK	6.3 THK	6.3 THK	6.3 THK								
LINE JOINT		≤ 40 - SW TO ASME B16.11											
		≥ 50 - BW TO ASME B16.25 (NOTE -1)											
ITEM		NOMINAL PIPE SIZE RANGE inch/mm		MATERIAL SPECIFICATION		DIMENSIONAL STANDARD		REMARKS					
PIPES		≤ 40		CS, IS 1239		IS 1239 PT-1		ERW, BLACK, PE					
		≥ 50 TO 150		CS, IS 1239		IS 1239 PT-1		ERW, BLACK, BE					
		≥ 200 TO 600		CS, IS 3589 Gr. FE 410		IS 3589		ERW, BLACK, BE					
PIPE NIPPLES		≥ 15 TO 40		CS, IS 1239		IS 1239 PT-1		POE-TOE, PBE, TBE, SCH TO MATCH PIPE					
BW FITTINGS	ELBOWS, CAPS, REDUCERS, TEES	≥ 50 TO 150		ASTM A234 Gr. WPB		ASME B16.9		SMLS, SCH TO MATCH PIPE					
		≥ 200 TO 600		ASTM A234 Gr. WPB		ASME B16.9		WELDED, SCH TO MATCH PIPE (NOTE -2)					
	STUB ENDS												
SW FITTINGS		≤ 40		ASTM A 105		ASME B16.11		3000 CL					
BENDS													
FABRICATED REDUCERS													
MITRES													
BRANCH CONNECTION		ALL		-		-		SEE BRANCH CONNECTION CHART					
FLANGES		15 TO 40		ASTM A105		ASME B16.5		SW, 150 CL					
		50 TO 150		ASTM A105		ASME B16.5		SO, 150 CL					
		≥ 200 TO 600		IS 2062 Gr. A		ASME B16.5		SO, 150 CL					
BLIND FLANGES		≤ 150		ASTM A105		ASME B16.5		150 CL					
		≥ 200 TO 600		IS 2062 Gr. A		ASME B16.5		150 CL					
MACHINE BOLTS/NUTS		ALL		BOLT : ASTM A 307 Gr.B		ASME B18.2.1		THREADING SHALL BE AS PER ASME B1.1 CL.2A					
		ALL		NUT : ASTM A 563 Gr.B		ASME B18.2.2		THREADING SHALL BE AS PER ASME B1.1 CL.2B (NOTE-3)					
REV. NO.	R1			PPD. BY: MA/TS			JOB NO.	CLIENT: OIL INDIA LIMITED				ISSUE R1	
DATE	03.06.15			CHD. BY: JSA			TCE.	PROJECT: SECONDARY TANK					
REV. BY	KVK			DATE: 03.06.15			7547A	FARM AT DULIAJAN, ASSAM					

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED				SECTION:	
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION			GRADE	CA	SHEET 23 OF 36
ITEM	NOMINAL PIPE SIZE RANGE inch/mm	MATERIAL SPECIFICATION		DIMENSIONAL STANDARD	REMARKS		
STUD BOLTS/NUTS	ALL	BOLT : ASTM A193 Gr.B7		ASME B18.2.1	THREADING SHALL BE AS PER ASME B1.1 CL.2A		
	ALL	NUT : ASTM A194 Gr.2H		ASME B18.2.2	THREADING SHALL BE AS PER ASME B1.1 CL.2B (NOTE-3)		
GASKETS	ALL	EPDM		ASME B16.21	SELF-CENTERING RING, 150 CL, 2 mm THK.		
THREADED FITTINGS	≤ 40	ASTM A 105		ASME B 16.11	3000 CL, SCRW		
TYPE OF VALVE	SIZE RANGE inch./mm.	MATERIAL		PRESSURE RATING ANSI/IS	TYPE OF ENDS	SPECIFICATION OR TAG NUMBER	REMARKS
		BODY	TRIM				
GATE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	G83	
GATE	≥ 50 TO 600	ASTM A 216 Gr.WCB	13% Cr. STEEL	150	RF	G23	
LIFT TYPE CHECK	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	C83	
CHECK (DUAL PLATE)	≥ 50 TO 600	ASTM A 216 Gr.WCB	EPDM	150	RF	C23X1	NOTE-6
GLOBE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	T83	
GLOBE	≥ 50 TO 600	ASTM A 216 Gr.WCB	13% Cr. STEEL	150	RF	T23	
BALL	≥ 15 TO 600	ASTM A 216 Gr.WCB	SS 304	150	RF	B23	TWO PIECE, REGULAR PORT (NOTE-4)
BUTTERFLY (WAFER)	50 TO 500	ASTM A 216 Gr.WCB	EPDM	150	RF	U23	NOTE-5 & 6
STRAINER (Y - TYPE)	≤ 40	ASTM A 105	SS 304	800	SW	-	
STRAINER (Y - TYPE)	50 TO 150	ASTM A 216 Gr.WCB	SS 304	150	RF	-	
STRAINER (T - TYPE)	≥ 200 TO 600	ASTM A 216 Gr.WCB	SS 304	150	RF	-	
NOTES: 1. EDGE PREPARATION FOR BUTT WELDING TO BE DONE AT SITE. 2. USE FLAT END COVERS INSTEAD OF CAPS FOR SIZE ≥ 200 mm. 3. NUT SHALL BE ALONG WITH WASHER. 4. BALL VALVES SHALL BE GEAR OPERATED FOR 150 NB & ABOVE. 5. BUTTERFLY VALVES SHALL BE GEAR OPERATED FOR 150 NB & ABOVE. 6. STUD BOLTS TO BE USED FOR BUTTERFLY & DUAL PLATE CHECK VALVE.							
REV. NO.	R1			PPD. BY: MA/T/S	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED			SECTION:
TCE.7547A-300-PP-1101	PIPING MATERIAL SPECIFICATION	GRADE	CA	SHEET 24 OF 36

BRANCH CONNECTION CHART

SIZE inch/mm	BRANCH															
RUN	15	20	25	40	50	80	100	150	200	250	300	350	400	450	500	600
15	T															
20	RT	T														
25	RT	RT	T													
40	RT	RT	RT	T												
50	H	H	H	RT	T											
80	H	H	H	H	RT	T										
100	H	H	H	H	RT	RT	T									
150	H	H	H	H	S	RT	RT	T								
200	H	H	H	H	S	S	RT	RT	T							
250	H	H	H	H	S	S	S	RT	RT	T						
300	H	H	H	H	S	S	S	S	RT	RT	T					
350	H	H	H	H	S	S	S	S	S	RT	RT	T				
400	H	H	H	H	S	S	S	S	S	S	RT	RT	T			
450	H	H	H	H	S	S	S	S	S	S	S	RT	RT	T		
500	H	H	H	H	S	S	S	S	S	S	S	S	RT	RT	T	
600	H	H	H	H	S	S	S	S	S	S	S	S	s	RT	RT	T

LEGEND :

T - STRAIGHT TEE
 RT - REDUCING TEE
 H - HALF COUPLING
 S - STUB -IN

REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	R1
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED										SECTION:	
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION						GRADE		GA		SHEET 25 OF 36	
SERVICE : INSTRUMENT AIR(IA), PLANT AIR(PA), PROCESS WATER(PW) & RAW WATER(RW)													
DESIGN	TEMP. °F/°C	REFER PIPING INDEX			CORR. ALL. inch/mm			1.5					
	PR. psig/kg/cm ² g	REFER PIPING INDEX			FLANGE FACING			RF					
NOM. PIPE SIZE	inch mm	15	20	25	40	50	80	100	150	200	250	300	
OUTSIDE DIA.	inch mm	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273	323.8	
THICKNESS	inch mm	HVY	HVY	HVY	HVY	HVY	HVY	HVY	HVY	4.5 THK	5.0 THK	5.6 THK	
NOM. PIPE SIZE	inch mm												
OUTSIDE DIA.	inch mm												
THICKNESS	inch mm												
LINE JOINT		≤ 40 - SW TO ASME B16.11											
		≥ 50 - BW TO ASME B16.25(NOTE-1)											
ITEM		NOMINAL PIPE SIZE RANGE inch/mm		MATERIAL SPECIFICATION		DIMENSIONAL STANDARD		REMARKS					
PIPES		≤ 40		CS, IS 1239 (GALVANISED)		IS 1239 PT-1		ERW, PE					
		≥ 50 TO 150		CS, IS 1239 (GALVANISED)		IS 1239 PT-1		ERW, BE					
		200 TO 300		CS, IS 3589 Gr. FE330 (GALVANISED)		IS 3589		ERW, BLACK, BE					
PIPE NIPPLES		≥ 15 TO 40		CS, IS 1239 (GALVANISED)		IS 1239 PT-1		POE-TOE, PBE, TBE, SCH TO MATCH PIPE					
BW FITTINGS	ELBOWS, CAPS, REDUCERS, TEES	≥ 50 TO 300		ASTM A234 Gr. WPB (GALVANISED)		ASME B16.9		SMLS, SCH TO MATCH PIPE					
	STUB ENDS												
SW FITTINGS		≤ 40		ASTM A105 (GALVANISED)		ASME B16.11		3000 CL, SW					
BENDS													
FABRICATED REDUCERS													
MITRES													
BRANCH CONNECTION		ALL		-		-		SEE BRANCH CONNECTION CHART					
FLANGES		≤ 40		ASTM A105 (GALVANISED)		ASME B16.5		SW, 150 CL					
		≥ 50 TO 150		ASTM A105 (GALVANISED)		ASME B16.5		SO, 150 CL					
		≥ 200		IS 2062 Gr. A (GALVANISED)		ASME B16.5		SO, 150 CL					
BLIND FLANGES		≤ 150		ASTM A105 (GALVANISED)		ASME B16.5		150 CL					
		≥ 200		IS 2062 Gr. A (GALVANISED)		ASME B16.5		150 CL					
REV. NO.	R1			PPD. BY: MA/T S			JOB NO.	CLIENT: OIL INDIA LIMITED					ISSUE R1
DATE	03.06.15			CHD. BY: JSA			TCE.	PROJECT: SECONDARY TANK					
REV. BY	KR			DATE: 03.06.15			7547A	FARM AT DULIAJAN, ASSAM					

SPECIFICATION NO. TCE.7547A-300-PP-1101		TATA CONSULTING ENGINEERS LIMITED				SECTION:	
		PIPING MATERIAL SPECIFICATION			GRADE GA		SHEET 26 OF 36
ITEM	NOMINAL PIPE SIZE RANGE inch/mm	MATERIAL SPECIFICATION		DIMENSIONAL STANDARD	REMARKS		
MACHINE BOLTS / NUTS	ALL	BOLT : ASTM A307 Gr.B (GALVANISED)		ASME B18.2.1	THREADING SHALL BE AS PER ASME B1.1 CL.2A		
	ALL	NUT : ASTM A563 Gr.B (GALVANISED)		ASME B18.2.2	THREADING SHALL BE AS PER ASME B1.1 CL.2B (NOTE-2)		
STUD BOLTS / NUTS	ALL	BOLT : ASTM A193 Gr.B7 (GALVANISED)		ASME B18.2.1	THREADING SHALL BE AS PER ASME B1.1 CL.2A		
	ALL	NUT : ASTM A194 Gr.2H (GALVANISED)		ASME B18.2.2	THREADING SHALL BE AS PER ASME B1.1 CL.2B (NOTE-2)		
GASKETS	ALL	EPDM		ASME B16.21	SELF-CENTERING RING, 150 CL, 2 mm THK.		
THREADED FITTINGS	≤ 40	ASTM A 105 (GALVANISED)		ASME B 16.11	3000 CL, SCRW		
TYPE OF VALVE	SIZE RANGE inch./mm.	MATERIAL		PRESSURE RATING ANSI/AS	TYPE OF ENDS	SPECIFICATION OR TAG NUMBER	REMARKS
		BODY	TRIM				
GATE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	G83	
LIFT TYPE CHECK	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	C83	
CHECK (DUAL PLATE)	≥ 50 TO 300	ASTM A 216 Gr.WCB	EPDM	150	RF	C23X1	NOTE-4
GLOBE	≤ 40	ASTM A 105	13% Cr. STEEL	800	SW	T83	
GLOBE	≥ 50 TO 300	ASTM A 216 Gr.WCB	13% Cr. STEEL	150	RF	T23	
BALL	≥ 15 TO 300	ASTM A 216 Gr.WCB	SS 304	150	RF	B23	TWO PIECE, REGULAR PORT (NOTE-3)
BALL	≤ 40	ASTM A 105	13% Cr. STEEL	800	SCRW	B23T	NOTE-6
BUTTERFLY (WAFFER)	50 TO 300	ASTM A 216 Gr.WCB	EPDM	150	RF	U23	NOTE-4&5
STRAINER (Y - TYPE)	≤ 40	ASTM A 105	SS 304	800	SW	-	
STRAINER (Y - TYPE)	50 TO 150	ASTM A 216 Gr.WCB	SS 304	150	RF	-	
STRAINER (T - TYPE)	200 TO 300	ASTM A 216 Gr.WCB	SS 304	150	RF	-	
NOTES: 1. EDGE PREPARATION FOR BUTT WELDING TO BE DONE AT SITE. 2. NUT SHALL BE ALONG WITH WASHER. 3. BALL VALVES SHALL BE GEAR OPERATED FOR 150 NB. 4. STUD BOLTS TO BE USED FOR WAFFER TYPE BUTTERFLY AND CHECK (DUAL PLATE) VALVES. 5. BUTTERFLY VALVES SHALL BE GEAR OPERATED FOR 150 NB. 6. SCREWED BALL VALVE TO BE USED FOR INSTRUMENT AIR SERVICE.							
REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	
REV. BY	KR			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO. TCE.7547A-300-PP-1101	TATA CONSULTING ENGINEERS LIMITED PIPING MATERIAL SPECIFICATION										GRADE GA	SECTION: SHEET 27 OF 36				
<u>BRANCH CONNECTION CHART</u>																
SIZE inch/mm	BRANCH															
RUN	15	20	25	40	50	80	100	150	200	250	300					
15	T															
20	RT	T														
25	RT	RT	T													
40	RT	RT	RT	T												
50	H	H	H	RT	T											
80	H	H	H	H	RT	T										
100	H	H	H	H	RT	RT	T									
150	H	H	H	H	S	RT	RT	T								
200	H	H	H	H	S	S	RT	RT	T							
250	H	H	H	H	S	S	S	RT	RT	T						
300	H	H	H	H	S	S	S	S	RT	RT	T					

LEGEND :
 T - STRAIGHT TEE
 RT - REDUCING TEE
 H - HALF COUPLING
 S - STUB -IN

REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	
REV. BY	KR			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED										SECTION:	
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION						GRADE SA		SHEET 28 OF 36			
SERVICE : DM WATER (DMW) & AQUEOUS FOAM (AF)													
DESIGN	TEMP. °F/°C	REFER PIPING INDEX			CORR. ALL. inch/mm			NIL					
	PR. psig/kg/cm ² g	REFER PIPING INDEX			FLANGE FACING			RF					
NOM. PIPE SIZE	inch mm	15	20	25	40	50	80	100	150	200	250		
OUTSIDE DIA.	inch mm	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273		
THICKNESS	inch mm	SCH 40S	SCH 40S	SCH 40S	SCH 40S	SCH 10S	SCH 10S	SCH 10S	SCH 10S	SCH 10S	SCH 10S		
NOM. PIPE SIZE	inch mm												
OUTSIDE DIA.	inch mm												
THICKNESS	inch mm												
LINE JOINT		≤ 40 - SW TO ASME B16.11											
		≥ 50 - BW TO ASME B16.25 (NOTE-1)											
ITEM		NOMINAL PIPE SIZE RANGE inch/mm		MATERIAL SPECIFICATION		DIMENSIONAL STANDARD		REMARKS					
PIPES		15 TO 40		ASTM A312 Gr.TP 304		ASME B 36.19		SMLS, PE					
		≥ 50 TO 250		ASTM A312 Gr.TP 304		ASME B 36.19		SMLS, BE					
PIPE NIPPLES		≤ 40		ASTM A312 Gr.TP 304		ASME B 36.19		POE-TOE, TBE, PBE, SCH TO MATCH PIPE					
BW FITTINGS	ELBOWS, CAPS, REDUCERS, TEES	≥ 50 TO 250		ASTM A403 Gr. WP 304		ASME B16.9		SMLS, SCH TO MATCH PIPE					
	STUB ENDS	≥ 50 TO 250		ASTM A403 Gr. WP 304		MSS-SP 43		SMLS, SCH TO MATCH PIPE					
SW FITTINGS		≤ 40		ASTM A 182 Gr. F304		ASME B16.11		3000 CL					
BENDS													
FABRICATED REDUCERS													
MITRES													
BRANCH CONNECTION		ALL		-		-		SEE BRANCH CONNECTION CHART					
FLANGES		≤ 40		ASTM A 182 Gr. F304		ASME B16.5		SW, 150 CL					
		≥ 50 TO 250		ASTM A 105		ASME B16.5		LJ, 150 CL					
BLIND FLANGES		ALL		ASTM A 182 Gr. F304		ASME B16.5		150 CL					
STUD BOLTS / NUTS		ALL		BOLT : ASTM A193 Gr.B7		ASME B18.2.1		THREADING SHALL BE AS PER ASME B1.1 CL.2A					
		ALL		NUT : ASTM A194 Gr.2H		ASME B18.2.2		THREADING SHALL BE AS PER ASME B1.1 CL.2B (NOTE-2)					
REV. NO.	R1			PPD. BY: MA/Ts			JOB NO.	CLIENT: OIL INDIA LIMITED					ISSUE R1
DATE	03.06.15			CHD. BY: JSA			TCE.	PROJECT: SECONDARY TANK					
REV. BY	KVK			DATE: 03.06.15			7547A	FARM AT DULIAJAN, ASSAM					

SPECIFICATION NO. TCE.7547A-300-PP-1101		TATA CONSULTING ENGINEERS LIMITED				SECTION: SHEET 29 OF 36	
PIPING MATERIAL SPECIFICATION				GRADE	SA		

ITEM	NOMINAL PIPE SIZE RANGE inch/mm	MATERIAL SPECIFICATION	DIMENSIONAL STANDARD	REMARKS			
GASKETS	ALL	EPDM	ASME B16.20	150 CL, 3.0 mm THK.			
THREADED FITTINGS	≤ 40	ASTM A 182 GR. F304	ASME B 16.11	3000 CL, SCRW			

TYPE OF VALVE	SIZE RANGE inch./mm.	MATERIAL		PRESSURE RATING ANSI/AS	TYPE OF ENDS	SPECIFICATION OR TAG NUMBER	REMARKS
		BODY	TRIM				
GATE	≤ 40	ASTM A182 Gr.F304	STELLITED	800	SW	G87	
GLOBE	≤ 40	ASTM A182 Gr.F304	STELLITED	800	SW	T87	
LIFT TYPE CHECK	≤ 40	ASTM A182 Gr.F304	STELLITED	800	SW	C87	
GATE	≥ 50 TO 250	ASTM A 351 Gr.CF8	SS 304	150	RF	G27	
GLOBE	≥ 50 TO 250	ASTM A 351 Gr.CF8	SS 304	150	RF	T27	
CHECK (DUAL PLATE)	≥ 50 TO 250	ASTM A 351 Gr.CF8	SS 304	150	RF	C27X1	
BALL	15 TO 250	ASTM A 351 Gr.CF8	SS 304	150	RF	B27	TWO PIECE, REGULAR PORT (NOTE-3)
STRAINER (Y - TYPE)	≤ 40	ASTM A 351 Gr.CF8	SS 304	800	SW	-	
STRAINER (T - TYPE)	≥ 50 TO 250	ASTM A 351 Gr.CF8	SS 304	150	RF	-	

NOTES:

- EDGE PREPARATION FOR BUTT WELDING TO BE DONE AT SITE.
- NUT SHALL BE ALONG WITH WASHER.
- BALL VALVES SHALL BE GEAR OPERATED FOR 150 NB.

REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED										SECTION:				
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION					GRADE		SA		SHEET 30 OF 36					
<u>BRANCH CONNECTION CHART</u>																
SIZE inch/mm		BRANCH														
RUN		15	20	25	40	50	80	100	150	200	250					
15		T														
20		RT	T													
25		RT	RT	T												
40		RT	RT	RT	T											
50		H	H	H	H	T										
80		H	H	H	H	S	T									
100		H	H	H	H	S	S	T								
150		H	H	H	H	S	S	S	T							
200		H	H	H	H	S	S	S	S	T						
250		H	H	H	H	S	S	S	S	S	T					

LEGEND :

T - STRAIGHT TEE

RT - REDUCING TEE

H - HALF COUPLING

S - STUB -IN

REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED							SECTION:					
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION					GRADE		SB		SHEET 31 OF 36			
SERVICE :CORROSION INHIBITOR - WET CRUDE OIL (ADD1), SULPHATE REDUCING BACTERIA (ADD2), SCALE INHIBITOR(ADD3)														
& DE EMULSIFIER (ADD4)														
DESIGN	TEMP. °F/°C	REFER PIPING INDEX			CORR. ALL. inch/mm			NIL						
	PR. psig/kg/cm ² g	REFER PIPING INDEX			FLANGE FACING			RF						
NOM. PIPE SIZE	inch mm	15	20	25	40	50	80	100						
OUTSIDE DIA.	inch mm	21.3	26.7	33.4	48.3	60.3	88.9	114.3						
THICKNESS	inch mm	SCH 40S	SCH 40S	SCH 40S	SCH 40S	SCH 10S	SCH 10S	SCH 10S						
NOM. PIPE SIZE	inch mm													
OUTSIDE DIA.	inch mm													
THICKNESS	inch mm													
LINE JOINT		≤ 40 - SW TO ASME B16.11												
		≥ 50 - BW TO ASME B16.25 (NOTE-1)												
ITEM		NOMINAL PIPE SIZE RANGE inch/mm		MATERIAL SPECIFICATION		DIMENSIONAL STANDARD		REMARKS						
PIPES		15 TO 40		ASTM A312 Gr.TP 316		ASME B 36.19		SMLS, PE						
		≥ 50 TO 100		ASTM A312 Gr.TP 316		ASME B 36.19		SMLS, BE						
PIPE NIPPLES		≤ 40		ASTM A312 Gr.TP 316		ASME B 36.19		POE-TOE, TBE, PBE, SCH TO MATCH PIPE						
BW FITTINGS	ELBOWS, CAPS, REDUCERS, TEES	≥ 50 TO 100		ASTM A403 Gr. WP 316		ASME B16.9		SMLS, SCH TO MATCH PIPE						
	STUB ENDS	≥ 50 TO 100		ASTM A403 Gr. WP 316		MSS-SP 43		SMLS, SCH TO MATCH PIPE						
SW FITTINGS		≤ 40		ASTM A 182 Gr. F316		ASME B16.11		3000 CL						
BENDS														
FABRICATED REDUCERS														
MITRES														
BRANCH CONNECTION		ALL		-		-		SEE BRANCH CONNECTION CHART						
FLANGES		≤ 40		ASTM A 182 Gr. F316		ASME B16.5		SW, 150 CL						
		≥ 50 TO 100		ASTM A 105		ASME B16.5		LJ, 150 CL						
BLIND FLANGES		ALL		ASTM A 182 Gr. F316		ASME B16.5		150 CL						
STUD BOLTS / NUTS		ALL		BOLT : ASTM A193 Gr.B7		ASME B18.2.1		THREADING SHALL BE AS PER ASME B1.1 CL.2A						
		ALL		NUT : ASTM A194 Gr.2H		ASME B18.2.2		THREADING SHALL BE AS PER ASME B1.1 CL.2B (NOTE-2)						
REV. NO.	R1			PPD. BY: MA/TS			JOB NO.	CLIENT: OIL INDIA LIMITED					ISSUE R1	
DATE	03.06.15			CHD. BY: JSA			TCE.	PROJECT: SECONDARY TANK						
REV. BY	KVK			DATE: 03.06.15			7547A	FARM AT DULIAJAN, ASSAM						

SPECIFICATION NO. TCE.7547A-300-PP-1101		TATA CONSULTING ENGINEERS LIMITED				SECTION:	
		PIPING MATERIAL SPECIFICATION			GRADE	SB	SHEET 32 OF 36
ITEM	NOMINAL PIPE SIZE RANGE inch/mm	MATERIAL SPECIFICATION		DIMENSIONAL STANDARD	REMARKS		
GASKETS	ALL	EPDM		ASME B16.20	150 CL, 3.0 mm THK.		
THREADED FITTINGS	≤ 40	ASTM A 182 GR. F316		ASME B 16.11	3000 CL, SCRW		
TYPE OF VALVE	SIZE RANGE inch./mm.	MATERIAL		PRESSURE RATING ANSI/AS	TYPE OF ENDS	SPECIFICATION OR TAG NUMBER	REMARKS
		BODY	TRIM				
GATE	≤ 40	ASTM A182 Gr.F316	STELLITED	800	SW	G88	
GLOBE	≤ 40	ASTM A182 Gr.F316	STELLITED	800	SW	T88	
LIFT TYPE CHECK	≤ 40	ASTM A182 Gr.F316	STELLITED	800	SW	C88	
GATE	≥ 50 TO 100	ASTM A 351 Gr.CF8M	SS 316	150	RF	G28	
GLOBE	≥ 50 TO 100	ASTM A 351 Gr.CF8M	SS 316	150	RF	T28	
CHECK (DUAL PLATE)	≥ 50 TO 100	ASTM A 351 Gr.CF8M	SS 316	150	RF	C28X1	
BALL	≥ 15 TO 100	ASTM A 351 Gr.CF8M	SS 316	150	RF	B28	TWO PIECE, REGULAR PORT
STRAINER (Y - TYPE)	≤ 40	ASTM A182 Gr.F316	SS 316	800	SW	-	
STRAINER (T - TYPE)	50 TO 100	ASTM A 351 Gr.CF8M	SS 316	150	RF	-	
NOTES: 1. EDGE PREPARATION FOR BUTT WELDING TO BE DONE AT SITE. 2. NUT SHALL BE ALONG WITH WASHER.							
REV. NO.	R1			PPD. BY: MA/T/S	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED						SECTION:					
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION						GRADE		SB		SHEET 33 OF 36	

BRANCH CONNECTION CHART

SIZE inch/mm	BRANCH															
RUN	15	20	25	40	50	80	100									
15	T															
20	RT	T														
25	RT	RT	T													
40	RT	RT	RT	T												
50	H	H	H	H	T											
80	H	H	H	H	S	T										
100	H	H	H	H	S	S	T									

LEGEND :
T - STRAIGHT TEE
RT - REDUCING TEE
H - HALF COUPLING
S - STUB -IN

REV. NO.	R1			PPD. BY: MATS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	R1
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED							SECTION:					
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION					GRADE		SD		SHEET 34 OF 36			
SERVICE : CORROSION INHIBITOR - DRY CRUDE OIL (ADD5) & CORROSION INHIBITOR - DRY CRUDE OIL (ADD6)														
DESIGN	TEMP. °F/°C	REFER PIPING INDEX			CORR. ALL. inch/mm			NIL						
	PR. psig/kg/cm ² g	REFER PIPING INDEX			FLANGE FACING			RF						
NOM. PIPE SIZE	inch mm	15	20	25	40	50	80	100						
OUTSIDE DIA.	inch mm	21.3	26.7	33.4	48.3	60.3	88.9	114.3						
THICKNESS	inch mm	SCH 40S	SCH 40S	SCH 40S	SCH 40S	SCH 10S	SCH 10S	SCH 10S						
NOM. PIPE SIZE	inch mm													
OUTSIDE DIA.	inch mm													
THICKNESS	inch mm													
LINE JOINT		≤ 40 - SW TO ASME B16.11												
		≥ 50 - BW TO ASME B16.25 (NOTE-1)												
ITEM		NOMINAL PIPE SIZE RANGE inch/mm		MATERIAL SPECIFICATION		DIMENSIONAL STANDARD		REMARKS						
PIPES		15 TO 40		ASTM A312 Gr.TP 316		ASME B 36.19		SMLS, PE						
		≥ 50 TO 100		ASTM A312 Gr.TP 316		ASME B 36.19		SMLS, BE						
PIPE NIPPLES		≤ 40		ASTM A312 Gr.TP 316		ASME B 36.19		POE-TOE, TBE, PBE, SCH TO MATCH PIPE						
BW FITTINGS	ELBOWS, CAPS, REDUCERS, TEES	≥ 50 TO 100		ASTM A403 Gr. WP 316		ASME B16.9		SMLS, SCH TO MATCH PIPE						
	STUB ENDS	≥ 50 TO 100		ASTM A403 Gr. WP 316		MSS-SP 43		SMLS, SCH TO MATCH PIPE						
SW FITTINGS		≤ 40		ASTM A 182 Gr. F316		ASME B16.11		3000 CL						
BENDS														
FABRICATED REDUCERS														
MITRES														
BRANCH CONNECTION		ALL		-		-		SEE BRANCH CONNECTION CHART						
FLANGES		≤ 40		ASTM A 182 Gr. F316		ASME B16.5		SW, 300 CL						
		≥ 50 TO 100		ASTM A 105		ASME B16.5		WN, 300 CL						
BLIND FLANGES		ALL		ASTM A 182 Gr. F316		ASME B16.5		300 CL						
STUD BOLTS / NUTS		ALL		BOLT : ASTM A193 Gr.B7		ASME B18.2.1		THREADING SHALL BE AS PER ASME B1.1 CL.2A						
		ALL		NUT : ASTM A194 Gr.2H		ASME B18.2.2		THREADING SHALL BE AS PER ASME B1.1 CL.2B (NOTE-2)						
REV. NO.	R1			PPD. BY: MATS		JOB NO.		CLIENT: OIL INDIA LIMITED				ISSUE R1		
DATE	03.06.15			CHD. BY: JSA		TCE.		PROJECT: SECONDARY TANK						
REV. BY	KVK			DATE: 03.06.15		7547A		FARM AT DULIAJAN, ASSAM						

SPECIFICATION NO.		TATA CONSULTING ENGINEERS LIMITED				SECTION:	
TCE.7547A-300-PP-1101		PIPING MATERIAL SPECIFICATION			GRADE	SD	SHEET 35 OF 36

ITEM	NOMINAL PIPE SIZE RANGE inch/mm	MATERIAL SPECIFICATION	DIMENSIONAL STANDARD	REMARKS			
GASKETS	ALL	EPDM	ASME B16.20	300 CL, 3.0 mm THK.			
THREADED FITTINGS	≤ 40	ASTM A 182 GR. F316	ASME B 16.11	3000 CL, SCRW			

TYPE OF VALVE	SIZE RANGE inch./mm.	MATERIAL		PRESSURE RATING ANSI/AS	TYPE OF ENDS	SPECIFICATION OR TAG NUMBER	REMARKS
		BODY	TRIM				
GATE	≤ 40	ASTM A182 Gr.F316	STELLITED	800	SW	G88	
GLOBE	≤ 40	ASTM A182 Gr.F316	STELLITED	800	SW	T88	
LIFT TYPE CHECK	≤ 40	ASTM A182 Gr.F316	STELLITED	800	SW	C88	
GATE	≥ 50 TO 100	ASTM A 351 Gr.CF8M	SS 316	300	RF	G38	
GLOBE	≥ 50 TO 100	ASTM A 351 Gr.CF8M	SS 316	300	RF	T38	
CHECK (DUAL PLATE)	≥ 50 TO 100	ASTM A 351 Gr.CF8M	SS 316	300	RF	C38X1	
BALL	≥ 15 TO 100	ASTM A 351 Gr.CF8M	SS 316	300	RF	B38	TWO PIECE, REGULAR PORT
STRAINER (Y - TYPE)	≤ 40	ASTM A182 Gr.F316	SS 316	800	SW	-	
STRAINER (T - TYPE)	50 TO 100	ASTM A 351 Gr.CF8M	SS 316	300	RF	-	

NOTES:

- EDGE PREPARATION FOR BUTT WELDING TO BE DONE AT SITE.
- NUT SHALL BE ALONG WITH WASHER.

REV. NO.	R1			PPD. BY: MA/TS	JOB NO.	CLIENT: OIL INDIA LIMITED	ISSUE R1
DATE	03.06.15			CHD. BY: JSA	TCE.	PROJECT: SECONDARY TANK	
REV. BY	KVK			DATE: 03.06.15	7547A	FARM AT DULIAJAN, ASSAM	

[illegible]