NGN LETEKUJAN TERMINAL UP TO NRL IGGL RT PIPELINE PROJECT

BID DOCUMENT

FOR

ACTUATED & MANUAL BALL VALVES

BID DOCUMENT NO. AGCL/PROJ/VALVE-LETEKU/2023/03

OPEN DOMESTIC COMPETITIVE BIDDING

VOLUME - II OF II

PREPARED AND ISSUED BY

PIPELINE ENGINEERING CONSULTANTS PVT. LTD.
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ASSAM GAS COMPANY LTD
(A GOVT. OF ASSAM UNDERTAKING)

NGN LETEKUJAN UP TO NRL IGGL RT PIPELINE PROJECT

MATERIAL REQUISITION FOR ACTUATED (GOOV) & MANUAL BALL VALVES

Doc No: P158-MRR-P005

REV.	DATE	DESCRIPTION	ORG	REVIEW	APPROVED
TB	28.10.2023	Re-Issued with Tender	NK	SS	SM
TA	13.10.2023	Issued with Tender	NK	SM	AD
CA	30.08.2023	Issued for Client Review	NK	SM	AD
IA	23.08.2023	Issued for Internal Review	NK	SM	AD

ABBREVIATIONS

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
API	American Petroleum Institute
ASTM	American Society of Testing and Material
CS	Carbon steel
LTCS	Low Temperature Carbon steel
AGCL	Assam Gas Company Limited
BIS/IS	Bureau of Indian standards
EPMC	Engineering Project Management Consultant
GOOV	Gas Over Oil Actuated Valve
MMSCMD	Million Metric Standard Cubic Meter per Day
i.e.,	That is
MAOP	Maximum Allowable Operating Pressure
Max	Maximum
Min	Minimum
MOC	Material of Construction
OISD	Oil Industry Safety Directorate
TRV	Thermal Relief Valve
RTU	Remote Terminal Unit

CONTENTS

1.0 BACKGROUND

Assam Gas Company Ltd. (AGCL) is a 61 years old Natural Gas transmission and distribution company, wholly owned by the Govt. of Assam with its registered office at Duliajan, Dist. Dibrugarh, Assam 786602. The company transports Natural Gas through its integrated pipeline infrastructure to several market segments i.e., Power, Fertilizer, Petrochemicals, Industrial, Commercial and Domestic consumers primarily located in upper Assam. The present infrastructure of the company has a transportation capacity of about 6.0 MMSCM of gas per day.

AGCL plans to extend their existing NGN pipeline to transport natural gas to Numaligarh Refinery Limited (NRL) and Indradhanush Gas Grid Limited (IGGL), for which AGCL has taken up the NGN Letekujan Terminal to NRL IGGL RT pipeline project, covering approximately 6 kilometers in length.

Pipeline Engineering Consultants Pvt. Ltd. has been appointed as Engineering, Procurement and Construction Management consultant by AGCL for Engineering, Procurement, RFP Preparation, Site Supervision and Project Management for the Project.

2.0 PURPOSE

The Purpose of this document is for the Design, manufacture, procurement of materials, assembly at shop, inspection, testing at manufacturer's works, packing & delivery of the Actuated (GOOV) & Manual Ball Valves including documentation as per the enclosed Specification & Data sheets and other codes & standards enclosed or referred which shall be installed for NGN LETEKUJAN UP TO NRL IGGL RT PIPELINE PROJECT.

3.0 DEFINITION

Where used in this document, the following terms shall have the meanings indicated below, unless clearly indicated by the context to this order.

PROJECT	NGN LETEKUJAN UP TO NRL IGGL RT PIPELINE PROJECT
CLIENT	Assam Gas Company Limited
EPMC	Pipeline Engineering Consultants Pvt. Ltd. (PLECO).
CONTRACTOR	Agency appointed by CLIENT/ OWNER for execution of assigned tasks
PURCHASER	Either of CLIENT, OWNER or EPMC
VENDOR/ MANUFACTURER	Party, which manufactures and supplies equipment and services to the OWNER or to CONTRACTOR

4.0 PROJECT BRIEF

This project is envisaged to supply natural gas from Existing NGN Letekujan terminal to NRL Station (inside NRL Refinery) by laying an 8" x 6.0 KM (approx.) pipeline. The pressure available at NGN Letekujan terminal is 8 to 15 Kg/cm2g and shall be boosted up to delivery pressure of 40 Kg/cm2g by installing the Compressors on BOO basis (Not Under this project's scope).

The following table summarizes the pipeline system details:

Sr. No	Dispatch Terminal	Length (km)	Configuration	Receipt Terminal
1	Dispatch Terminal, at NGN Letekujan	6.0 km (Approx)	8" Pipeline	Receiving Terminal at NRL

5.0 DOCUMENT PRECEDENCE

It shall be the responsibility of the MANUFACTURER/ VENDOR to inform the PURCHASER of any errors, ambiguities, inconsistencies, discrepancies or conflict of information that may be found to exist in any document, specification or drawing submitted by the PURCHASER.

In case of conflict, the order of precedence shall be as follows:

a. Data Sheet

b. MR

c. Basic Documents (Specifications)

d. Codes and Standards

As a general rule in the event of any discrepancy between technical matter and local laws/ regulations (and documents above listed) the most stringent shall be applied.

MANUFACTURER/ VENDOR shall notify PURCHASER of any apparent conflicts between MR, specifications, related datasheets, any code and standards and any other specifications noted herein. (Resolution and/ or interpretation precedence shall be obtained from PURCHASER in writing before proceeding with the design/ manufacturer or completion of services.)

6.0 SCOPE OF SUPPLY

Sr. No.	Size (Inch)	Design Code	Piping Class	Rating	Bore	Ends	Data Sheet Number	Qty. (Nos)	Tag No.	Remarks
GROUP - A (GOOV - BALL VALVES) FULLY WELDED BODY DESIGN										
1.01	8	API-6D	P3C	300#	FB	BW	P158-DSH-P005 (Sheet-A)	2	GOOV -002 & GOOV -003	AG/FL
GROUP - B (GOOV - BALL VALVES) SPLIT BODY DESIGN										
2.01	8	API-6D	P3C	300#	RB	FE	P158-DSH-P005 (Sheet-B)	2	GOOV -001 & GOOV -004	AG/FL
GROUP - C (MANUAL BALL VALVES) SPLIT BODY DESIGN										
3.01	4	API-6D	P1L	150#	FB	FE	P158-DSH-P006 (Sheet-B)	2	-	AG/LO
3.02	2	API-6D	P3C	300#	FB	FE	P158-DSH-P006 (Sheet-A)	2	-	AG/LO
3.03	2	API-6D	P3C	300#	FB	FE	P158-DSH-P006 (Sheet-A)	7	-	AG

LEGENDS:

FE: Flanged End RB: Reduce Bore FB: Full Bore

BW: Butt Welded, AG: Above Ground FL: Fail Last

P3C: 300#, CS P1L: 150#, LTCS P1C: 150#, CS

LO: Locked Open GOOV: Gas Over Oil Operated Valve

7.0 NOTES

1. All Actuated (GOOV) & Manual Ball Valves (including all components) shall be designed and suitable for Natural Gas Services.
2. Design Data for the Project:
   - Pipeline Service : Natural Gas
   - Max Design Temp (Above Ground) : 65°C
   - Min Design Temp : (-) 29°C for CS
   - Design Pressure : 49 Kg/cm2
3. Vendor shall check valve body calculation based on design conditions and manufacturing requirements and submit necessary to company/ EPMC for approval. Minimum thickness shall not be less than ASME B16.34.
4. Vendor shall Design Valve body and other pressure containing parts as per ASME Sec VIII Div-1.
5. The bore of full bore butt-welded & flanged valve shall be in line with Connecting pipe, however in any case it shall not be less than minimum required shown in specification, Data sheet & API 6D.
6. All welded end of the valves shall match pipe thickness.
7. All Valves shall be Fire safe design.
8. All Ball Valves shall be designed as per API 6D.
9. Full bore valve shall be designed to minimize accumulation of debris in the seat ring region to ensure that valve movement is not impeded.
10. Full bore valves shall be suitable for the passage of all types of pipeline pigs in either direction including instrumented intelligent pigs and regular cleaning, batching and scraper pigs on regular basis without causing damage to either the valve component or the pig.
11. Painting for above ground valves shall be as per painting specification Doc. No.: P-SPC-410.
12. Bidder shall submit dully filled attached torque table (Doc. No. P-STD-009) along with the bid for actuated valves.
13. For all Ball valve Charpy V-notch test shall be conducted for each heat treatment lot and for each heat of steel used. Charpy V-notch test shall be conducted at -29°C for CS & -45°C for LTCS with the impact test provisions of ASTM A 370. Results of Charpy V-notch test shall be recorded.
14. Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) is not liable to be damaged. Valve manufacturer shall provide recommendation for field welding operations.
15. The quantities indicated above are indicative and are subject to variation up to ± 25 % (minimum of one number, any fraction shall be taken as next whole number). The price quoted for the items shall remain valid for any change in quantity within such variation.
16. Bidder shall quote separately spares for 2-year normal operation. List of spares quoted shall be furnished as per attached formats.

17. Bidder to include the startup and commissioning spares in the quoted price. However, list of spares (start up and commissioning) to be made available without prices as per attached formats. In case no startup/ commissioning spares are recommended by the bidder but the same are required at the time of startup/ commissioning, Bidder shall supply such spares free of cost.

18. Valves shall be delivered at AGCL store yard, Assam. Unloading of Valves at delivery point is in Vendor's scope. Also, Vendor shall arrange checking of all material as per item list before handling over. In case materials are packed in boxes, boxes shall be open for after inspection. All transportation, handling, delivery shall be in bidder's scope.

19. Bidder shall furnish quotation only in case he can supply material strictly as per this MR and specification/ data sheets forming part of MR.

20. The submission of prices by the bidder shall be construed to mean that he has confirmed compliance with all technical specifications of the corresponding item(s).

21. If the offer contains any technical deviations or clarifications or stipulates any technical specifications (even if in line with MR requirements) and does not include complete scope & Technical/ Performance Data required to be submitted with the offer, the offer shall be liable for rejection.

22. Bidder must submit all documents/ drawings/ calculations as specified in relevant specification along with his offer and after award of order.

23. Bidder must submit duly filled up and Signed data sheets, Compliance Statement, Check List, Torque Table etc.

24. Purchaser's inspector reserves the right to perform stage wise inspection and witness tests, as indicated in specification at manufacture's works prior to shipment. Manufacturer shall give reasonable notice of time and shall provide without charge reasonable access and facilities require for inspection to the purchaser's inspector. Inspection and tests performed/ witnessed by purchaser's inspector shall in no way relieve the manufacturer's obligation to perform the required inspection and test.

25. Vendors to note that for minimum inspection and testing requirement of the valves shall be governed by attached ITP with this MR. However, vendor shall submit their detailed ITP for review and approval covering the requirement specified in attached ITP, same shall be finalized during ITP approval stage after award.

26. Review/ Approval of the successful Bidder/ supplier drawings by Client/ EPMC would be only to review the compatibility with basic designs and concepts and in no way absolve the successful Bidder/ supplier of his responsibility/ contractual obligation to comply with tender requirements, applicable codes, specifications and statutory rules/ regulations. Any error/ deficiency noticed during any stage of manufacturing/ execution/ installation shall be promptly corrected by the successful Bidder/ supplier without any extra cost or time, whether or not comments on the same were received from Client/ EPMC during the drawing review stage.

27. Inspection shall be in accordance with EN 10204 3.2 certification shall be issued for each dispatched valve. Vendor shall appoint (at his own cost) anyone of the TPIA from the attached list for inspection purpose. Vendor has to intimate the TPIA name from attached listed agencies to Client/ EPMC prior to perform any inspection activity.

28. Vendor shall justify the equivalence/ superiority of any material proposed (With technical justification of material properties and availability) other than that specified in Datasheet.

29. Bidders to note that the valves supplied by them shall be capable to withstand the field hydro test pressure (i.e., 1.5 times of design pressure) for 6 to 24 hours test holding duration under field / site conditions.

8.0 LIST OF ATTACHMENTS

1. Data Sheet – Actuated Ball Valves (GOOV), Doc. No.: P158-DSH-P005 (Sheet A-B).
2. Data Sheet – Gas Over Oil Actuator (GOOV); Doc. No.: P158-DSH-I007.
3. Data Sheet – Manual Ball Valves Doc. No.: P158-DSH-P006 (Sheet A to B).
4. Specification for Pipeline Ball Valves; Doc. No.: P-SPC-305.
5. Specification for Assorted Valves; P-SPC-402.
6. Specification for SMLS line pipe; Doc. No. P-SPC-001.
7. Specifications for Painting; Doc. No.: P-SPC-410.
8. Standard Specification for Gas Over Oil Actuator (GOOV); Doc. No.: I-SPC-024.
9. Inspection and Test Plan – Gas Over Oil Actuator (GOOV); Doc. No. P158-ITP-I002.
10. Inspection and Test Plan – Pipeline Ball Valve; P-ITP-004.
11. Piping Material Specification (PMS); Doc. No. P158-PMS-401.
12. Checklist – Technical; Doc. No. P-STD-001.
13. Reference List; Doc. No. P-STD-002.
14. Compliance Statement; Doc. No. P-STD-003
15. Deviation Sheet; Doc. No. P-STD-004
16. Drawings and Documents; Doc. No. P-STD-005
17. Instruction to Bidder; Doc. No. P-STD-006
18. Vendor Drawing & Document Schedule; Doc. No. P-STD-007
19. List of Recommended Third Party Inspection Agency (TPIA)
20. List of Spares (Doc. No. P-STD-008).
21. Data Sheet for Torque Table; Doc. No. P-STD-009.
22. Vendor List for Bought out items; Doc. No. Z-STD-001.
23. P&ID; Doc. No. P158-00-PID-T001 Rev. CB.

NGN LETEKUJAAN TERMINAL UPTO NRL IGGL RT PIPELINE PROJECT

Datasheet for Actuated Ball Valves (GOOV)

Document Number - P158-DSH-P005

Rev.	Date	Description	ORG	REVIEW	APPROVAL
IA	21.08.2023	Issued for Internal Review	NK	SM	AD
CA	29.08.2023	Issued for Client Review	NK	SM	AD
TA	13.10.2023	Issued With Tender	NK	SM	AD

ASSAM GAS COMPANY LTD (A GOVT. OF ASSAM UNDERTAKING) PLECO	**AGC LIMITED**	**JOB NO. P158**
	NGN LETEKUJAAN TERMINAL UPTO NRL IGGL RT PIPELINE PROJECT	**Document Number - P158-DSH-P005**
	Data Sheet of 8 INCH Actuated Ball Valve (GOOV), Butt Welded Ends, Full Bore, Aboveground, 300# (P3C), Fully Welded Body Design	**Sht. A**

Rev.			
IA	**CA**	**TA**	
21.08.2023	**29.08.2023**	**13.10.2023**	

Sr. No.	GENERAL		
1	Valve Manufacturer		**-**
2	Tag Numbers/ Material Requisition item No.		**Refer P&ID & Material Requisition (Doc. No. P158-MRR-P005) MR Sr.No. 1.01**
3	Company Specification No.		**P-SPC-305**
4	Category		**-**
5	Pipeline Line No.		**Refer P&ID**
6	Class		**P3C**
7	**DESIGN AND TEST REQUIREMENTS**		
8	Size		**DN 200 (NPS 8")**
9	Type of Valve		**Trunion Mounted, Double Block and Bleed, Antistatic, Vent Drain/ Flush Connection with Anti Blowout Stem, Fully Welded Body Design**
10	Type of Port (Full/ Reduced)		**Full Bore**
11	Design Temperature (◦C)	Maximum	**65**
12		Minimum	**-29**
13	Corrosion Allowance (mm)		**1.5**
14	Installtion (Aboveground/ Underground)		**Aboveground**
15	Design Factor		**0.5**
16	Service		**Natural Gas (NG)**
17	End Connection		**Butt Welded**
18	Flange Face Finish		**Not Applicable**
19	End Connection Standard		**B-16.25**
20	ASME Class		**300#**
21	Stem Extension Requirement		**Not Required**
22	Length of Stem Extension (If Required)		**Not Required**
23	Orientation of Stem		**Not Required**
24	Type of Valve Actuator		**Gas Over Oil Actuated Valve (GOOV)**
25	Valve Actuator Opening Time		**Refer GOOV Datasheet (Doc. No.P158-DSH-I007)**
26	Requirement of Locking Mechanism (LO/ LC)		**Refer MR**
27	Length of Pup Piece (mm), (If Required)		**Required for Welded End Valves, as per Ball Valve Specification (Doc. No. P-SPC-305)**
28	Actuator Specification No.		**Refer Doc. No.: I-SPC-024**
29	Valve Design Pressure(Kg/cm2)		**49**
30	Hydrostatic Test Pressure (Kg/cm2) & Time		**Body: 78.77 kg/cm2 & 30 Min** / **Seat: 57.31 kg/cm2 & 30 Min.**
31	Pneumatic Test Pressure (barg) & Time		**7.0 barg & 15 Min**
32	Charpy Impact Test(◦C)		**Yes (at -29)**
33	Fire Safe Design		**API 6FA/ ISO 10497**
34	Anti Static Testing Requirement		**As per API 6D Latest Edition**
35	Hardness Test		**248 HV10 max**
36	Painting		**As per Painting Specification (Doc. No.: P-SPC-410) (Suitable for Industrial Corrosive Environment)**
37	Valve Design		**As per API 6D Latest Edition**
38	Actuator Data Sheet No.		**Refer Doc. No.P158-DSH-I001**
39	**CONNECTING PIPE DETAIL**		
40	Outside Diameter (Inch)		**8"**
41	Thickness (mm)		**6.4**
TA	Pipe Material		**API 5L GR.B , PSL2**
43	Design Code		**ASME B31.8**
44	ASME Rating		**300#**

45	**Part Description**	**Material Specified**	**Material Offered by Bidder**
46	Body	**ASTM A216 GR. WCB / ASTM A105**	
47	Ball (Single Piece, Solid Construction)	**SS-304 / SS-316 (Solid) /(ASTM A105/ ASTM A216 Gr. WCB) + 0.003" ENP**	
48			
49	Seat Rings	**(AISI 4140 +0.003" ENP)/ AISI 410/ SS 304/ SS 316**	
50	Seat Seal	**Primary Devlon V/ PEEK with Secondary Metal to Metal**	
51	Stem	**(AISI 4140 +0.003" ENP)/ AISI 410 (No Casting)/ SS 304 / SS 316 (NO CASTING)**	
52	Stem Seal	**GRAFOIL/ PTFE V-RINGS + GRAFOIL**	
53	Body Seal	**GRAFOIL / R-PTFE**	
54	Gland	**13% Cr. Steel/ SS 316 / SS 304**	
55	Stud Bolts/ Nut	**ASTM A 193 Gr. B7 / ASTM A 194 Gr. 2H**	
56	Handle/ Lever/ Hand Wheel	**Carbon Steel**	

	AGC LIMITED	JOB NO. P158				
ASSAM GAS COMPANY LTD (A GOVT. OF ASSAM UNDERTAKING) PLECO	NGN LETEKUJAAN TERMINAL UPTO NRL IGGL RT PIPELINE PROJECT	Document Number - P158-DSH-P005				
	Data Sheet of 8 INCH Actuated Ball Valve (GOOV), Butt Welded Ends, Full Bore, Aboveground, 300# (P3C), Fully Welded Body Design	Sht. A	Rev.			
			IA	CA	TA	
			21.08.2023	29.08.2023	13.10.2023	

NOTES :

1. Bidder to submit Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table.
2. This Data Sheet shall be read in conjunction with Piping Material Specification, valve Specification & other Tender Documents.
3. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
4. Manufacturer shall have valid API 6D license to use API monogram.
5. Valve design shall ensure repair of stem seals / packing under full line pressure.
6. 100.0 % Valve castings shall undergo Radiographic Examination.
7. Valves shall have support foot & lifting lugs as per valve Specification.
8. The Charpy Impact temperature shall be -29°C as specified in data sheet.
9. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
10. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease.
11. For the manual operation of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
12. Adequacy for Length of pup piece shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment.These pup pieces shall be welded to the valve body by the manufacturer before fitting the packings, seats & seals.
13. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25.
14. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34.
15. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs.
16. Valve shall be suitable for pigging operation in either direction and shall be designed to minimize accumulation of debris in the seat ring region.
17. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed".
18. All Elastomereric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
19. Bidder to Confirm that in offered valves, there shall not be any external leakage during fire and valve is capable of handling fire for the mentioned time as specified in API 6FA/ ISO 10497/API 6FD. Bidder also to confirm that in case of fire, the valve shall be unseated from the closed position against the high test pressure and mooved to the fully open position i.e. In case of fire, valve shall complete one open-close cycle.
20. Vendor has to submit Fire Test Certificate qualifing the valves as per API 6FA/API 607/ ISO 10497 carried out in last 7 years shall be furnished.

ASSAM GAS COMPANY LTD (A GOVT. OF ASSAM UNDERTAKING) / PLECO	AGC LIMITED	JOB NO. P158				
	NGN LETEKUJAAN TERMINAL UPTO NRL IGGL RT PIPELINE PROJECT	Document Number - P158-DSH-P005				
	Data Sheet of 8 INCH Actuated Ball Valve (GOOV), Flanged End, Reduced Bore, Aboveground, 300# (P3C), Split Body Design	Sht. B	Rev.			
			IA	CA	TA	
			21.08.2023	29.08.2023	13.10.2023	

Sr. No.	GENERAL			
1	Valve Manufacturer		-	
2	Tag Numbers/ Material Requisition item No.		Refer P&ID & Material Requisition (Doc. No. P158-MRR-P005) MR Sr.No. 2.01	
3	Company Specification No.		P-SPC-305	
4	Category		-	
5	Pipeline Line No.		Refer P&ID	
6	Class		P3C	
7	**DESIGN AND TEST REQUIREMENTS**			
8	Size		DN 200 (NPS 8")	
9	Type of Valve		Trunion Mounted, Double Block and Bleed, Antistatic, Vent Drain/ Flush Connection with Anti Blowout Stem, Split Body Design	
10	Type of Port (Full/ Reduced)		Reduced Bore	
11	Design Temperature (◦C)	Maximum	65	
12		Minimum	-29	
13	Corrosion Allowance (mm)		1.5	
14	Installtion (Aboveground/ Underground)		Aboveground	
15	Design Factor		0.5	
16	Service		Natural Gas (NG)	
17	End Connection		Flanged	
18	Flange Face Finish		RF/ 125 AARH	
19	End Connection Standard		B-16.5	
20	ASME Class		300#	
21	Stem Extension Requirement		Not Required	
22	Length of Stem Extension (If Required)		Not Required	
23	Orientation of Stem		Not Required	
24	Type of Valve Actuator		Gas Over Oil Actuated Valve (GOOV)	
25	Valve Actuator Opening Time		Refer GOOV Datasheet (Doc. No.P158-DSH-I007)	
26	Requirement of Locking Mechanism (LO/ LC)		Refer MR	
27	Length of Pup Piece (mm), (If Required)		Not Required	
28	Actuator Specification No.		Refer Doc. No.: I-SPC-024	
29	Valve Design Pressure(Kg/cm2)		49	
30	Hydrostatic Test Pressure (Kg/cm2) & Time		Body: 78.77 kg/cm2 & 30 Min	Seat: 57.31 kg/cm2 & 30 Min.
31	Pneumatic Test Pressure (barg) & Time		7.0 barg & 15 Min	
32	Charpy Impact Test(◦C)		Yes (at -29)	
33	Fire Safe Design		API 6FA/ ISO 10497	
34	Anti Static Testing Requirement		As per API 6D Latest Edition	
35	Hardness Test		248 HV10 max	
36	Painting		As per Painting Specification (Doc. No.: P-SPC-410) (Suitable for Industrial Corrosive Environment)	
37	Valve Design		As per API 6D Latest Edition	
38	Actuator Data Sheet No.		Refer Doc. No.P158-DSH-I001	
39	**CONNECTING PIPE DETAIL**			
40	Outside Diameter (Inch)		8"	
41	Thickness (mm)/ Schedule		Refer Piping Material Specification	
TA	Pipe Material		Refer Piping Material Specification	
43	Design Code		ASME B31.8	
44	ASME Rating		300#	

45	Part Description	Material Specified	Material Offered by Bidder
46	Body	ASTM A216 GR. WCB / ASTM A105	
47	Ball (Single Piece, Solid Construction)	SS-304 / SS-316 (Solid) /(ASTM A105/ ASTM A216 Gr. WCB) + 0.003" ENP	
48			
49	Seat Rings	(AISI 4140 +0.003" ENP)/ AISI 410/ SS 304/ SS 316	
50	Seat Seal	Primary Devlon V/ PEEK with Secondary Metal to Metal	
51	Stem	(AISI 4140 +0.003" ENP)/ AISI 410 (No Casting)/ SS 304 / SS 316 (NO CASTING)	
52	Stem Seal	GRAFOIL/ PTFE V-RINGS + GRAFOIL	
53	Body Seal	GRAFOIL / R-PTFE	
54	Gland	13% Cr. Steel/ SS 316 / SS 304	
55	Stud Bolts/ Nut	ASTM A 193 Gr. B7 / ASTM A 194 Gr. 2H	
56	Handle/ Lever/ Hand Wheel	Carbon Steel	

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			IA	CA	TA	
			21.08.2023	29.08.2023	13.10.2023	

NOTES :

1. This Data Sheet shall be read in conjunction with Piping Material Specification, valve Specification & other Tender Documents.
2. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
3. Manufacturer shall have valid API 6D license to use API monogram.
4. Valve design shall ensure repair of stem seals / packing under full line pressure.
5. 100.0 % Valve castings shall undergo Radiographic Examination.
6. Valves shall have support foot & lifting lugs as per valve Specification.
7. The Charpy Impact temperature shall be -29°C as specified in data sheet.
8. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
9. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease.
10. For the manual operation of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
11. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24” and 450 for valve size above 24”.
12. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25.
13. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34.
14. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
15. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed".
16. All Elastomereric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
17. Bidder to Confirm that in offered valves, there shall not be any external leakage during fire and valve is capable of handling fire for the mentioned time as specified in API 6FA/ ISO 10497/API 6FD. Bidder also to confirm that in case of fire, the valve shall be unseated from the closed position against the high test pressure and mooved to the fully open position i.e. In case of fire, valve shall complete one open-close cycle.
18. Vendor has to submit Fire Test Certificate qualifing the valves as per API 6FA/API 607/ ISO 10497 carried out in last 7 years shall be furnished.
19. Bidder to submit Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table.

ASSAM GAS COMPANY LTD
(A GOVT. OF ASSAM UNDERTAKING)

PLECO

NGN LETEKUJAN TERMINAL UP TO NRL IGGL RT PIPELINE PROJECT

DATA SHEET: GAS OVER OIL VALVE

P158-DSH-I007

Rev.	Date	Description	ORG	REVIEW	APPROVAL
CA	29-Aug-23	Issued for Client review	SC	NC	AD

		GAS OVER OIL VALVE				Rev.
	S.No					
GENERAL	1	Tag Number	Quanity	Refer Attachment -01	Refer Attachment -01	
	2	Location		Field		
	3	P&ID Number		P158-00-PID-T001		
	4	Service		Natural Gas		
	5	Hazardous Area Classification		Zone 1 Group IIA /IIB as per IEC, T3		
PIPELINE	6	Line No		Refer Attachment -01		
	7	Inlet Line Size/Sch	Outlet Line Size/Sch	Refer Attachment -01		
	8	Inlet line Material				
	9					
PROCESS DATA	10	Fluid	Phase	Natural Gas	Single	
	11	Erosive/corrosive/flammable/toxic		Refer Attachment -01		
	12	Flow (Min/Nor/Max)	MMSCMD	Refer Attachment -01		
	13	Operating Pressure	Barg	Refer Attachment -01		
	14	Operating Temperature	deg C	Refer Attachment -01		
	15	Design Pressure	Design Temperature	Refer Attachment -01	Refer Attachment -01	
	16	Viscosity (cP)		Refer Attachment -01		
	17	Density (kg/m3)	Mol. Wt	Refer Attachment -01	Refer Attachment -01	
	18	Sp Heat Ratio(Cp/Cv)	Compressibility(Z)	Refer Attachment -01	Refer Attachment -01	
	19	Ambient Temperature		Refer Attachment -01		
ACTUATOR	20	Actuator Type		Gas over oil		
	21	Min.Actuator Pressure for Actuator sizing		-		
	22	Supply Pressure Min./ Nor./ Max.		-		
	23	Power Gas Supply connection		-		
	24	Tube Material		SS316		
	25	Tube Size		3/4" *		
	26	Enclosure Protection		-		
	27	Filter Regulator		Required		
	28	Valve Position Indicator		Required		
	29	Manual Override		Required on The Actuator local Control Panel		
	30	Failure Position		Fail in last Position		
	31	Painting		As per painting specification		
	32	Local Control Panel	Material	Required	SS316	
	33	Logic Tubing Connection		SS316 (minimum)		
	34	Panel Enclosure Class		IP 67		
	35	Gas Storage and Hydraulic Cylinder Capacity		Min 2 Open & close operations		
	36	Stroke Time/Response Time		1 ~ 4 Seconds per inch		
	37	Position Switches		Required for both open and close positions		
	38	Solenoid Valves		Required		
	39	Adjustable Stoppers for Actuator		Required for both opening and closing		
	40	Stem Extension		Required		
	41	Certifying Agency		UL / FM / BASEEFA or Equal		
	42					
MISC.	43	Manufacturer	Actuator	*		
	44	Model No.		*		
	45					

Notes:

1	* By Vendor
2	Vendor shall submit detailed catalogue with model decodification sheet with datasheet.
3	Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).
4	Vendor to furnish actuator sizing calculations and to finalize the actuator size.
5	Vendor shall submit detailed GA drawing along with part names and MOC of the parts along with datasheets.
6	Actuator stall torque shall not exceed maximum allowable valve stem torque at all conditions. Safety margin of 25% in the valve torque shall be considered while stroking the actuator.

PLECO	CLIENT:	ASSAM GAS COMPANY LIMITED					
	PROJECT:	NGN LETEKUJAN TERMINAL UP TO NRL IGGL RT PIPELINE PROJECT	CA	29.08.2023	SC	NC	AD
			REV.	DATE	PRPD	CHKD	APPD

Attachment - 1 (Gas Over Oil VALVE)																			
S.No.	Tag.No.	P&ID No.	Line No. / Equipment No.	Operating Pressure (Kg/cm^2g)	Operating Temperature (deg ˚C)	Explosive/corrosive/toxic	Flow (Min/Max)	Viscosity (cP)	Density (kg/m3)	Mol. Wt	Sp Heat Ratio(Cp/Cv)	Compressibility(Z)	Ambient Air Temperature (˚C) Min /Max	Design Temp. (deg C)	Design Pressure (Kg/cm^2g)	Location	Inlet Line Size/Sch	Outlet Line Size/Sch	Valve fail position	Remarks
1	P158-00-GOOV-001	P158-00-PID-T001	8"-T-P3C-023	7.5 - 14.5	20-30	Yes / Yes / No	0.19 - 0.28	0.01108 - 0.01160	7.388 - 13.93	21.20	1.269 - 1.301	0.9433 - 0.9694	16 - 40	-29/65	49	Field	8"	8"	Fail Last	
2	P158-00-GOOV-002	P158-00-PID-T001	8"-T-P3C-043	7.5 - 14.5	20-30	Yes / Yes / No	0.19 - 0.28	0.01108 - 0.01160	7.388 - 13.93	21.20	1.269 - 1.301	0.9433 - 0.9694	16 - 40	-29/65	49	Field	8"	8"	Fail Last	
3	P158-00-GOOV-003	P158-00-PID-T001	8"-T-P3C-043	6.5 - 13.5	20-30	Yes / Yes / No	0.19 - 0.28	0.01105 - 0.01157	6.496 - 13.08	21.20	1.265 - 1.298	0.9458 - 0.9730	16 - 40	-29/65	49	Field	8"	8"	Fail Last	
4	P158-00-GOOV-004	P158-00-PID-T001	8"-T-P3C-062	6.5 - 13.5	20-30	Yes / Yes / No	0.19 - 0.28	0.01105 - 0.01157	6.496 - 13.08	21.20	1.265 - 1.298	0.9458 - 0.9730	16 - 40	-29/65	49	Field	8"	8"	Fail Last	

NGN LETEKUJAAN TERMINAL UPTO NRL IGGL RT PIPELINE PROJECT

Datasheet for Manual Ball Valves (Station)

Document Number - P158-DSH-P006

Rev.	Date	Description	ORG	REVIEW	APPROVAL
IA	18.08.2023	Issued for Internal Review	NK	SM	AD
CA	28.08.2023	Issued for Client Review	NK	SM	AD
TA	11.10.2023	Issued With Tender	NK	SM	AD

ASSAM GAS COMPANY LTD (A GOVT. OF ASSAM UNDERTAKING) / PLECO	**AGC LIMITED**	**JOB NO. P158**
	NGN LETEKUJAAN TERMINAL UPTO NRL IGGL RT PIPELINE PROJECT	**Document Number - P158-DSH-P006**
	Data Sheet of 2 INCH Manual Ball Valve, Flanged End, Full Bore, Aboveground, 300# (P3C), Split Body Design	**Sht. A**

Rev.			
IA	**CA**	**TA**	
18.08.2023	**28.08.2023**	**11.10.2023**	

Sr. No.	GENERAL		
1	Valve Manufacturer		**-**
2	Tag Numbers/ Material Requisition item No.		**Refer P&ID And Material Requisition (Doc. No. P158-MRR-P006) MR Sr. No. 3.02, 1.03**
3	Company Specification No.		**P-SPC-402**
4	Category		**-**
5	Pipeline Line No.		**Refer P&ID**
6	Class		**P3C**
7	**DESIGN AND TEST REQUIREMENTS**		
8	Size		**DN 50 (NPS 2")**
9	Type of Valve		**Trunnion Mounted, Double Block and Bleed, Antistatic, Vent Drain/ Flush Connection with Anti Blowout Stem**
10	Type of Port (Full/ Reduced)		**Full Bore**
11	Design Temperature (◦C)	Maximum	**65**
12		Minimum	**-29**
13	Corrosion Allowance (mm)		**1.5**
14	Installation (Aboveground/ Underground)		**Aboveground**
15	Design Factor		**0.5**
16	Service		**Natural Gas (NG)**
17	End Connection		**Flanged**
18	Flange Face Finish		**RF/ 125 AARH**
19	End Connection Standard		**B-16.5**
20	ASME Class		**300#**
21	Stem Extension Requirement		**Not Required**
22	Length of Stem Extension (If Required)		**Not Required**
23	Orientation of Stem		**Perpendicular to Valve Axis**
24	Type of Valve Operator		**DN ≤ 100 mm (4") - Wrench / Lever - Pull Force 350N max.**
25	Valve Actuator Opening Time		**Not Applicable**
26	Requirement of Locking Mechanism (LO/ LC)		**Refer MR**
27	Length of Pup Piece (mm), (If Required)		**Not Required**
28	Actuator Specification No.		**Not Applicable**
29	Valve Design Pressure(kg/cm2)		**49**
30	Hydrostatic Test Pressure (kg/cm2) & Time		**Body: 78.77 kg/cm2 & 30 Min** / **Seat: 57.31 kg/cm2 & 30 Min.**
31	Pneumatic Test Pressure (barg) & Time		**7.0 barg & 15 Min**
32	Charpy Impact Test(◦C)		**Yes (at -29)**
33	Fire Safe Design		**API 6FA/ ISO 10497**
34	Anti Static Testing Requirement		**As per API 6D Latest Edition**
35	Hardness Test		**248 HV10 max**
36	Painting		**As per Painting Specification (Doc. No.: P-SPC-410) (Suitable for Industrial Corrosive Environment)**
37	Valve Design		**As per API 6D Latest Edition**
38	Actuator Data Sheet No.		**Not Applicable**
39	**CONNECTING PIPE DETAIL**		
40	Outside Diameter (Inch)		**2"**
41	Thickness (mm)/ Schedule		**Refer Piping Material Specification (P158-PMS-401)**
42	Pipe Material		**Refer Piping Material Specification (P158-PMS-401)**
43	Design Code		**ASME B31.8**
44	ASME Rating		**300#**

45	**Part Description**	**Material Specified**	**Material Offered by Bidder**
46	Body	**ASTM A216 GR. WCB/ ASTM A105**	
47	Ball (Single Piece, Solid Construction)	**SS-304 / SS-316 (Solid) /(ASTM A105/ ASTM A216 Gr. WCB) + 0.003" ENP**	
48			
49	Seat Rings	**(AISI 4140 +0.003" ENP)/ AISI 410/ SS 304/ SS 316**	
50	Seat Seal	**Primary Devlon V/ PEEK with Secondary Metal to Metal**	
51	Stem	**(AISI 4140 +0.003" ENP)/ AISI 410 (No Casting)/ SS 304 / SS 316 (NO CASTING)**	
52	Trunnion	**ASTM A216 GR. WCB / A105**	
53	Stem Seal	**GRAFOIL/ PTFE V-RINGS + GRAFOIL**	
54	Body Seal	**GRAFOIL / R-PTFE**	
55	Gland	**13% Cr. Steel/ SS 316 / SS 304**	
56	Stud Bolts/ Nut	**ASTM A 193 Gr. B7 / ASTM A 194 Gr. 2H**	
57	Handle/ Lever/ Hand Wheel	**Carbon Steel**	

	AGC LIMITED	JOB NO. P158				
ASSAM GAS COMPANY LTD (A GOVT. OF ASSAM UNDERTAKING) PLECO	NGN LETEKUJAAN TERMINAL UPTO NRL IGGL RT PIPELINE PROJECT	Document Number - P158-DSH-P006				
	Data Sheet of 2 INCH Manual Ball Valve, Flanged End, Full Bore, Aboveground, 300# (P3C), Split Body Design	Sht. A	Rev.			
			IA	CA	TA	
			18.08.2023	28.08.2023	11.10.2023	

NOTES :

1. This Data Sheet shall be read in conjunction with Piping Material Specification, valve Specification & other Tender Documents.
2. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
3. Manufacturer shall have valid API 6D license to use API monogram.
4. 100.0 % Valve castings shall undergo Radiographic Examination.
5. Valves shall have support foot & lifting lugs as per valve Specification.
6. Valve design shall ensure repair of stem seals / packing under full line pressure.
7. The Charpy Impact temperature shall be -29°C as specified in data sheet.
8. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
9. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease.
10. For the manual operation of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
11. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24” and 450 for valve size above 24”.
12. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34 + Corrosion Allowance as specified.
13. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
14. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed".
15. All Elastomeric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
16. Bidder to Confirm that in offered valves, there shall not be any external leakage during fire and valve is capable of handling fire for the mentioned time as specified in API 6FA/ ISO 10497/API 6FD. Bidder also to confirm that in case of fire, the valve shall be unseated from the closed position against the high test pressure and moved to the fully open position i.e. In case of fire, valve shall complete one open-close cycle.
17. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25
18. Minimum all pressure containing parts of the valve shall be provided with EN 10204-3.2 certificate.
19. Vendor has to submit Fire Test Certificate qualifying the valves as per API 6FA/API 607/ ISO 10497 carried out in last 7 years shall be furnished.

ASSAM GAS COMPANY LTD (A GOVT. OF ASSAM UNDERTAKING) / PLECO	AGC LIMITED		JOB NO. P158	
	NGN LETEKUJAAN TERMINAL UPTO NRL IGGL RT PIPELINE PROJECT		Document Number - P158-DSH-P006	
	Data Sheet of 4 INCH Manual Ball Valve, Flanged End, Full Bore, Aboveground, 150# (P1L), Split Body Design		Sht. B	Rev. IA 18.08.2023 / CA 28.08.2023 / TA 11.10.2023

Sr. No.	GENERAL		
1	Valve Manufacturer		-
2	Tag Numbers/ Material Requisition item No.		Refer P&ID And Material Requisition (Doc. No. P158-MRR-P006) MR Sr. No. 3.01
3	Company Specification No.		P-SPC-402
4	Category		-
5	Pipeline Line No.		Refer P&ID
6	Class		P1L
7	**DESIGN AND TEST REQUIREMENTS**		
8	Size		DN 100 (NPS 4")
9	Type of Valve		Trunnion Mounted, Double Block and Bleed, Antistatic, Vent Drain/ Flush Connection with Anti Blowout Stem
10	Type of Port (Full/ Reduced)		Full Bore
11	Design Temperature (◦C)	Maximum	65
12		Minimum	-45
13	Corrosion Allowance (mm)		1.5
14	Installation (Aboveground/ Underground)		Aboveground
15	Design Factor		0.5
16	Service		Natural Gas (NG)
17	End Connection		Flanged
18	Flange Face Finish		RF/ 125 AARH
19	End Connection Standard		B-16.5
20	ASME Class		150#
21	Stem Extension Requirement		Not Required
22	Length of Stem Extension (If Required)		Not Required
23	Orientation of Stem		Perpendicular to Valve Axis
24	Type of Valve Operator		DN ≤ 100 mm (4") - Wrench / Lever - Pull Force 350N max.
25	Valve Actuator Opening Time		Not Applicable
26	Requirement of Locking Mechanism (LO/ LC)		Refer MR
27	Length of Pup Piece (mm), (If Required)		Not Required
28	Actuator Specification No.		Not Applicable
29	Valve Design Pressure(kg/cm2)		19
30	Hydrostatic Test Pressure (kg/cm2) & Time		Body: 29.97 kg/cm2 & 30 Min / Seat: 21.97 kg/cm2 & 30 Min.
31	Pneumatic Test Pressure (barg) & Time		7.0 barg & 15 Min
32	Charpy Impact Test(◦C)		Yes (at -45)
33	Fire Safe Design		API 6FA/ ISO 10497
34	Anti Static Testing Requirement		As per API 6D Latest Edition
35	Hardness Test		248 HV10 max
36	Painting		As per Painting Specification (Doc. No.: P-SPC-410) (Suitable for Industrial Corrosive Environment)
37	Valve Design		As per API 6D Latest Edition
38	Actuator Data Sheet No.		Not Applicable
39	**CONNECTING PIPE DETAIL**		
40	Outside Diameter (Inch)		4"
41	Thickness (mm)/ Schedule		Refer Piping Material Specification (P158-PMS-401)
42	Pipe Material		Refer Piping Material Specification (P158-PMS-401)
43	Design Code		ASME B31.8
44	ASME Rating		150#

45	Part Description	Material Specified	Material Offered by Bidder
46	Body	ASTM A352 GR. LCB/ ASTM A350 GR. LF2	
47	Ball (Single Piece, Solid Construction)	13% Cr. Steel/SS-304 / SS-316 (Solid) /(ASTM A350 Gr. LF2/ ASTM A352 Gr. LCB) + 0.003" ENP	
48			
49	Seat Rings	(AISI 4140 +0.003" ENP)/ AISI 410/ SS 304/ SS 316	
50	Seat Seal	Primary Devlon V/ PEEK with Secondary Metal to Metal	
51	Stem	(AISI 4140 +0.003" ENP)/ AISI 410 (No Casting)/ SS 304 / SS 316 (NO CASTING)	
52	Trunnion	ASTM A352 GR. LCB/ ASTM A350 GR. LF2	
53	Stem Seal	GRAFOIL/ PTFE V-RINGS + GRAFOIL	
54	Body Seal	GRAFOIL / R-PTFE	
55	Gland	13% Cr. Steel/ SS 316 / SS 304	
56	Stud Bolts/ Nut	ASTM A 320 Gr. L7 / ASTM A 194 Gr. 4	
57	Handle/ Lever/ Hand Wheel	Carbon Steel	

ASSAM GAS COMPANY LTD (A GOVT. OF ASSAM UNDERTAKING) / PLECO	**AGC LIMITED**	**JOB NO. P158**
	NGN LETEKUJAAN TERMINAL UPTO NRL IGGL RT PIPELINE PROJECT	**Document Number - P158-DSH-P006**
	Data Sheet of 4 INCH Manual Ball Valve, Flanged End, Full Bore, Aboveground, 150# (P1L), Split Body Design	**Sht. B**

Rev.				
IA	CA	TA		
18.08.2023	28.08.2023	11.10.2023		

NOTES :

1. This Data Sheet shall be read in conjunction with Piping Material Specification, valve Specification & other Tender Documents.
2. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
3. Manufacturer shall have valid API 6D license to use API monogram.
4. Valve design shall ensure repair of stem seals / packing under full line pressure.
5. 100.0 % Valve castings shall undergo Radiographic Examination.
6. Valves shall have support foot & lifting lugs as per valve Specification.
7. The Charpy Impact temperature shall be -45°C as specified in data sheet.
8. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
9. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease.
10. For the manual operation of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
11. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24" and 450 for valve size above 24".
12. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34 + Corrosion Allowance as specified.
13. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
14. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed".
15. All Elastomeric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
16. Bidder to Confirm that in offered valves, there shall not be any external leakage during fire and valve is capable of handling fire for the mentioned time as specified in API 6FA/ ISO 10497/API 6FD. Bidder also to confirm that in case of fire, the valve shall be unseated from the closed position against the high test pressure and moved to the fully open position i.e. In case of fire, valve shall complete one open-close cycle.
17. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25.
18. Minimum all pressure containing parts of the valve shall be provided with EN 10204-3.2 certificate.
19. Vendor has to submit Fire Test Certificate qualifying the valves as per API 6FA/API 607/ ISO 10497 carried out in last 7 years shall be furnished.

STANDARD SPECIFICATION FOR PIPELINE BALL VALVES (ONSHORE)

P-SPC-305

Rev.	Date	Purpose	Prepared by	Reviewed by	Approved by	Approved by
0	19.02.2023	ISSUED AS STD SPECIFICATION	SS	SM	AD	SK

ABBREVIATIONS

API	American Petroleum Institute
ASTM	American Society for Testing and Materials
ASME	American Society of Mechanical Engineers
BM	Base Metal
BHN	Brinell hardness number
CE	Carbon Equivalent
CVN	Charpy V-Notch
DN	Nominal Size
FBH	Flat Bottomed Holes
HAZ	Heat Affected Zone
ID	Inside Diameter
K*v*L	Charpy value in pipe longitudinal direction
KvT	Charpy value in pipe transversal direction
LC	Lock Close (valve locked in full close position)
LO	Lock Open (valve locked in full open position)
MSS-SP	Manufacturers Standardization Society — Standard Practice
MPQT	Manufacturing Procedure Qualification Tests
MPS	Manufacturing Procedure Specification
NDT	Non Destructive Testing
NPS	Nominal Pipe Size
OD/D	Outside Diameter, Specified
RJ	Ring Joint
SAWL	Submerged Arc Longitudinal Welded
SMAW	Shielded Metal Arc Welding
SSPC	The Society for Protective Coatings
s_r	Sizing ratio of the pipe
t	Wall Thickness, Specified
UT	Ultrasonic testing

CONTENTS

1 SCOPE

1.1 Coverage

This specification covers the minimum requirements for design, manufacture, testing and supply of carbon steel ball valves of size DN 50 mm (2") and above and ANSI pressure rating Class 150# thru 900# for use in onshore pipeline systems handling non-sour hydrocarbons in liquid or gaseous phase including Liquefied Petroleum Gas (LPG).

2 REFERENCE DOCUMENTS

2.1 All valves shall be manufactured and supplied in accordance with the American Petroleum Institute (API) Specification 6D, Twenty-Fourth Edition, August 2014, Specification for Pipeline and Piping Valves, with additions and modifications as indicated in the following sections of this specification.

2.2 Reference has also been made in this specification to the latest edition (edition enforce at the time of issue of enquiry) of the following Codes, Standards and Specifications.

ASME B31.3	-	Process Piping.
ASME B31.4	-	Pipeline Transportation Systems for Liquids and Slurries.
ASME B31.8	-	Gas Transmission and Distribution Piping Systems.
ASME B16.5		Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/ Inch Standard.
ASME B 16.10	-	Face-To-Face and End-To-End Dimensions of Valves.
ASME B 16.25	-	Buttwelding Ends.
ASME B 16.34	-	Valves - Flanged, Threaded and Welding Ends.
ASME B16.47	-	Large Diameter Steel Flanges: NPS 26 through NPS 60 Metric/ Inch Standard.
API 1104	-	Welding of Pipelines and Related Facilities
ASME Sec VIII	-	Boiler and Pressure Vessel Code - Rules for Construction of Pressure Vessels
ASME Sec IX	-	Boiler and Pressure Vessel Code - Welding, Brazing and Fusing Qualifications
ASTM A-370	-	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM B 733	-	Standard Specification for Autocatalytic (Electroless) Nickel-Phosphorous Coatings on Metal.
MSS-SP-6	-	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings.
MSS-SP-44	-	Steel Pipeline Flanges.
SSPC-VIS-1	-	Steel Structures Painting Council Visual Standard-Guide and Reference Photographs for Steel Surfaces prepared by Dry Abrasive Blast Cleaning.

2.3 In case of conflict between the requirements of this specification, API 6D and the Codes, Standards and Specifications referred in clause 2.2 above, the requirements of this specification shall govern.

3. MATERIALS

3.1 Material for major components of the valves shall be as indicated in Valve Data Sheet. Other components shall be as per Manufacturer's standard (suitable for the service conditions indicated in Data Sheet) and shall be subject to approval by Company. In addition, the material shall also meet the requirements specified hereinafter.

All process-wetted parts, metallic and non-metallic, sealant and lubricants shall be suitable for the service specified by the Company. Manufacturer shall confirm that all wetted parts are suitable for treated water/seawater environment, which may be used during field testing.

Non-metallic parts of the valves (including 0-rings, soft seals etc.) intended for hydrocarbon gas service shall be resistant to explosive decompression.

3.2 Carbon steel used for the manufacture of valves shall be fully killed.

3.3 The carbon equivalent (CE) of valve end connections which are subject to further field welding by Company shall not exceed 0.43 on check analysis for each heat of steel used, as calculated by the following formula:

$$CE(IIW) = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

3.4 Charpy V-notch test on each heat of base material shall be conducted for all pressure containing parts such as Body, End Flanges, Stem and Welding Ends as well as Bolting materials for pressure containing parts.

Test procedure for Charpy V-Notch Test shall conform to ASTM A370.

For Carbon Steel, alloy steel & Stainless Steel (except Austenitic Grades) Materials, The impact test temperature shall be 0 °C or minimum design temperature indicated in valve datasheet, whichever is lower. The average absorbed energy value of three full sized specimens shall be 27 J (for materials with Specified Minimum Tensile Strength <=100,000 psi)/ 34 J (for materials with Specified Minimum Tensile Strength >100,000 psi). The minimum impact energy value of any one specimen of the three specimens analysed as above, shall not be less than 22 J (for materials with Specified Minimum Tensile Strength <=100,000 psi)/ 26 J (for materials with Specified Minimum Tensile Strength >100,000 psi).

For Low Temperature Carbon Steel Materials, The impact test temperature shall be as per requirement of Material Standard or minimum design temperature indicated in valve data sheet, whichever is lower. The average absorbed energy value of three full sized specimens shall be 27 J (for materials with Specified Minimum Tensile Strength <=100,000 psi)/ 34 J (for materials with Specified Minimum Tensile Strength >100,000 psi). The minimum impact energy value of any one specimen of the three specimens analysed as above, shall not be less than 22 J (for materials with Specified Minimum Tensile Strength <=100,000 psi)/ 26 J (for materials with Specified Minimum Tensile Strength >100,000 psi).

Where the material specification requires impact values to be higher than specified in the above paragraphs, the higher values shall apply.

For duplex & super duplex stainless steel the Charpy V-Notch test values and test temperature shall be as per API 6D.

3.5 For Valves specified to be used for Gas service or LPG service, Hardness test shall be carried out as per ASTM A370 for each method of manufacture and each heat of steel used in the manufacture of valves. A full thickness cross section shall be taken for this purpose and the maximum hardness of the materials of valve components shall not exceed 248 HV_{10}.

3.6 For all such valves where Carbon Steel/ Low Temperature Carbon Steel is used as ball material, the ball shall have 75 micrometres (.003 inches) thick Electroless Nickel Plating (ENP) as per ASTM B 733 with following classification:

- SC2, Type II, Class 2.

The hardness of plating shall be minimum 50 RC.

4. DESIGN AND CONSTRUCTION REQUIREMENTS

4.1 Valve design shall meet the requirements of API Specification 6D and shall be suitable for the service conditions indicated in the Valve Data Sheet. The ASME Boiler & Pressure Vessel Code, Section VIII, Division 1 shall be used to design the valve body. Allowable stress requirements shall comply the provisions of above code. In addition, corrosion allowance indicated in Valve Data Sheet shall be considered in valve design. The manufacturer shall have valid license to use API monogram on valves manufactured as per API 6D.

4.2 For above ground valves, body design shall be either fully welded or bolted type. For buried valves, valve body design shall be fully welded type only. Valve body joints with threads are not permitted.

4.3 Ball shall be of single piece, solid type construction

4.4 Valves shall be Full bore (FB) or Reduced bore (RB) as indicated in the Valve Data Sheet. Full bore valves shall be suitable for the passage of all types of pipeline pigs including instrumented intelligent pigs and regular cleaning, batching and scraper pigs on regular basis without causing damage to either the valve component or the pig. The full bore valve shall provide an unobstructed profile for pigging operations in either direction. Full bore valves shall be designed to minimize accumulation of debris in the seat ring region to ensure that valve movement is not impeded.

The bore size of reduced bore valves shall be corresponding to that of a full bore valve of smaller nominal diameter as indicated in Table 4.4 of this specification. For sizes of a particular rating not covered in API 6D, the bore size of the reduced bore valve shall be as per Manufacturer's standard.

TABLE-4.4

Nominal Valve Size	Nominal Valve size for Reduced Bore	Nominal Valve Size	Nominal Valve size for Reduced Bore
DN_{mm} (NPS_{inches})	DN_{mm} (NPS_{inches})	DN_{mm} (NPS_{inches})	DN_{mm} (NPS_{inches})
50 (2)	40 (1.5)	600 (24)	500 (20)
80 (3)	50 (2)	650 (26)	550 (22)
100 (4)	80 (3)	700 (28)	600 (24)
150(6)	100 (4)	750 (30)	600 (24)
200 (8)	150(6)	800 (32)	650 (26)
250 (10)	200 (8)	850 (34)	700 (28)
300 (12)	250 (10)	900 (36)	750 (30)
350 (14)	250 (10)	950 (38)	800 (32)
400 (16)	300 (12)	1000 (40)	850 (34)
450 (18)	350 (14)	1050 (42)	900 (36)
500 (20)	400 (16)	1200 (48)	1050 (42)
550 (22)	450 (18)		

4.5 Ball mounting shall be trunnion or pivot type only. Valve design shall minimize the possibility of debris ingress into the trunnion as far as practicable.

4.6 The valves shall either be a soft seated valve or metal seated valve or with primary metal-to-metal contact and secondary soft seats.

For soft seated valves, Metal seat rings may be provided with soft insert. The same shall be positively locked in position in Metal seat rings.

For valves with primary metal to metal contact and secondary soft seats, O-rings or other seals if used for drip tight sealing shall be encased in a suitable groove in such a manner that it cannot be removed from seat ring and there is no extrusion during opening or closing operation of valve at maximum

differential pressure corresponding to valve class rating. The seat rings shall be so designed as to ensure sealing at low as well as high differential pressures.

4.7 Valves shall be designed to withstand a sustained internal vacuum of at least 1 (one) milli-bar in both open and closed positions.

4.8 Valves shall have double block and bleed feature to facilitate complete flush, drain and venting of the valve body cavity.

4.9 Full Bore valves of nominal valve size DN 200 mm (8") & above and Reduced Bore valves of nominal valve size DN 250 mm (10") & above, shall have provision for secondary sealant injection under full line pressure for seat and stem seals. All sealant injection connections shall be provided with a block valve and internal non-return valve. Valve design shall have a provision to replace the sealant injection fitting under full line pressure. Location and arrangement of sealant point shall be as per Fig. 4.9.

4.10 Valves shall be provided with vent and drain connections. Location and arrangement of vents and drains shall be as per Fig. 4.9. Body vent and drain shall be provided with isolation valves (Ball or Plug type). Number and size shall be as per Fig. 4.9.

4.11 Valve design shall ensure repair of stem seals/packing under full line pressure.

4.12 Full Bore valves of nominal valve size DN 200 mm (8") & above and Reduced Bore valves of nominal valve size DN 250 mm (10") & above, shall be equipped with support foot and lifting lugs. Tapped holes and eyebolts shall not be used for lifting lugs. Height of support foot shall be kept minimum. The location and size of support foot/lifting lugs shall ensure unrestrictive operation of vent/drain valves. The design of support foot shall be such that it shall take minimum double the weight of the valve assembly.

4.13 Valve design shall be such as to avoid bimetallic corrosion between carbon steel and high alloy steel components. Suitable insulation shall be provided as required.

4.14 The valve body cavity over-pressure shall be prevented by self-relieving seat rings/assemblies. Valve Cavity relief pressure when added to the valve pressure rating shall not exceed 133% of the pressure rating of the valve at its maximum specified design temperature.

4.15 **a)** Valve ends shall be either flanged/or butt welded or one end flanged and one end butt welded as indicated in the Valve Data Sheet. Flanges of the flanged end cast/forged body valves shall be integrally cast/forged with the body of the valve. Face to face/end to end dimensions shall conform to API 6D. Face-to-face and end-to-end dimensions for valve sizes not specified in API 6D shall be in accordance with ASME B 16.10. Face-to-face and end-to-end dimensions not shown in API 6D or in ASME B 16.10 shall be as per Manufacturer Standard and shall be subject to approval by Company.

b) Flanged ends, if specified, shall have flanges as per ASME B16.5 for valve sizes up to DN 600 mm (24") excluding DN 550 mm (22"), as per MSS-SP-44 for valve sizes DN 550 mm (22") and as per ASME B 16.47 Series A for DN 650 mm (26 inches) and above. Flange face shall be either raised face or ring joint (RJ) with raised face as indicated in Valve Data Sheet. Flange face finish shall be serrated or smooth as indicated in Valve Data Sheet. In case of RJ flanges, the groove hardness shall be minimum 140 BHN.

c) Butt weld end preparation shall be as per ASME B 16.25. The thickness of the pipe to which the valve has to be welded shall be as indicated in the Valve Data Sheet. In case difference exists between thickness of welding ends of valve and connecting pipe, the welding ends of valve shall have bevel preparation as per ASME B31.4 or ASME B31.8 as applicable.

d) In case of all Butt welded end valves (including soft seated valves or valves with primary metal to metal and secondary soft seats), actual yield strength of valve body shall not be less than 2/3 "I of the specified minimum yield strength (SMYS) of the connecting pipe material.

e) For soft seated valves with Butt welded end, valves shall be provided with pup pieces on either side of length 200 mm each for size up-to 8" & 250 mm for size 10" and above, with material as specified in valve data sheet. Length of pup piece shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment. Pup piece thickness shall be calculated for the class rating. Vendor shall provide for each type (considering size, grade and thickness of the pup pieces used for all offered valves) of pup piece, test rings (500 mm long) from pup piece material for field weld procedure qualification. Valves shall be tested along-with pup piece.

4.16 Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) are not liable to be damaged. The manufacturer shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.

4.17 Valve shall be provided with ball position indicator and stops of rugged construction at the fully open and fully closed positions. For actuated valves, additionally mechanical means of position indicator shall be provided.

4.18 Valves shall be suitable for either buried or above ground installation as indicated in Valve Data Sheet.

4.19 When stem extension requirement is indicated in Valve Data Sheet, the valves shall have the following provisions.

a) In case of below ground LTCS valves, Stem extension material shall be equivalent to Stem Material.

b) Valves provided with stem extension shall have water proof outer casing. Length of stem extension shall be as indicated in Valve Data Sheet. The length indicated corresponds to the distance between centreline of the valve opening and the top of mounting flange for valve operating device (gear operator/power actuator as applicable).

c) Vent and drain connections and sealant injection lines shall be terminated adjacent to the valve operator by means of suitable piping anchored to the valve body. The pipe used shall be API 5L Gr. B / ASTM A 106 Gr. B, with Sch. 160 for carbon steel valves and ASTM A 333 Gr. 6, with Sch. 160 for low temperature carbon steel valves. The material for the fittings for carbon steel valves shall be ASTM A105 and material for the fittings for low temperature carbon steel valves shall be ASTM A 350 Gr. LF2 Cl. 1. The fittings and valve ends shall be Socket Welded ANSI 6000# as per ASME B 16.11 (for piping class up to 600#) and BW ends (for piping class 900#).

d) Stem extension and stem housing design shall be such that the complete assembly will form a rigid unit giving positive drive under all conditions with no possibility of free movement between valve body, stem extension or its operator.

e) Outer casing of stem extension shall have 3/8" or 1/2" NPT plugs at the top and bottom, for draining and filling with oil to prevent internal corrosion.

4.20 Operating Devices

a) Valves shall have a power actuator or manual operator as indicated in the Valve Data Sheet. In case of manual operator, valve sizes, DN 100 mm (4") shall be wrench operated and valve sizes, DN 150 mm (6") shall be gear operated. The length of the wrench shall not be longer than twice the face-to-face or end-to-end dimension of the valve. Each wrench-operated valve shall be supplied with wrench. Valve design shall be such that damage due to malfunctioning of the operator or its controls

will only occur in the operator gear train or power cylinder and that damaged parts can be replaced without the valve cover being removed.

b) The power actuator shall be in accordance with the Company Specification issued for the purpose and as indicated in the Valve and Actuator Data Sheet. Operating time shall be as indicated in Valve Data Sheet. Valve operating time shall correspond to full close to full open /full open to full close under maximum differential pressure corresponding to the valve rating. For actuated valves, the actuator's rated torque output shall be 1.25 times the break torque required to operate the ball valve under the maximum differential pressure corresponding to the Valve Class Rating.

c) For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N. However, failing to meet above requirement, vendor shall offer Gear operated valves. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for operating the valve from full open to full close position. The number of turns shall not exceed 250 for valve sizes up-to 24" and 450 for valve sizes above 24".

d) Direction of operation of hand wheel or wrench shall be in clock-wise direction while closing the valve. Hand wheels shall not have protruding spokes.

e) Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/splash proof enclosure and shall be filled with suitable grease.

4.21 The tolerance on internal diameter and out of roundness at the ends for welded ends valves shall be as per connected pipe specification as indicated in the Valve Data Sheet.

4.22 When indicated in Material Requisition/ Tender, valves shall have locking devices to lock the valve either in full open (LO) or full close (LC) positions. Locking devices shall be permanently attached to the valve operator and shall not interfere with operation of the valve.

4.23 All welds shall be made by welders and welding procedures qualified in accordance with the provisions of ASME Section IX. The procedure qualification shall also include impact test and hardness test when required as per Clause 3.4 and 3.5 of this specification and shall meet the requirements as specified therein.

4.24 Repair by welding is not permitted for fabricated and forged body valves. However, repair by welding as per ASME B16.34 is permitted for cast body valves. Such repairs shall be carried out at casting supplier's care only. Repair shall be carried out before any heat treatment of casting is done. Repair welding procedure qualification shall also include impact test and hardness test when required as per Clause 3.4 and 3.5 of this specification and shall meet the requirements as specified therein. Heat treatment and radiography shall be repeated after the weld repair.

4.25 No casting is permitted for stem and stem extension material of all valves. Valve stem shall be capable of withstanding the maximum operating torque required to operate the valve against the maximum differential pressure corresponding to applicable class rating. The combined stress shall not exceed the maximum allowable stresses specified in ASME section VIII, Division 1. For power actuated valves, the valve stem shall be designed for maximum output torque of the selected power actuator (including gear box, if any) at valve stem.

4.26 Wherever specified for the parts of valve in valve datasheets, minimum thickness of stell ring shall be 1.6 mm.

4.27 All soft seated valves shall be fire safe design and qualified as per API 6FA/ API 607/ ISO 10497.

4.28 Soft-seated valves shall have an antistatic device.

5. INSPECTION AND TESTS

5.1 The Manufacturer shall perform all inspection and tests as per the requirements of this specification and the relevant specifications, codes, prior to shipment, at his Works. Such inspection and tests shall be, but not limited to, the following:

5.1.1 All valves shall be visually inspected. The internal and external surfaces of the valves shall be free from any strikes, gouges and other detrimental defects. The surfaces shall be thoroughly cleaned and free from dirt, rust and scales.

5.1.2 Dimensional check on all valves shall be carried out as per the Company approved drawings.

5.1.3 Chemical composition and mechanical properties shall be checked as per this specification and relevant material standards, for each heat of steel used.

5.1.4 Non-destructive examination of individual valve material and component consisting of but not limited to castings, forgings, plates and assembly welds shall be carried out by the Manufacturer.

a) Body castings of all valves shall be radiographically examined as per ASME B 16.34. Procedure and acceptance criteria shall be as per ASME B 16.34. The extent of the radiography shall be as under:

Pressure Class Rating	**Valve Size**	**Extent of Radiography**
ANSI 150 # Class	≤ DN 600 mm (24") ≥ DN 650 mm (26")	Nil 100%
ANSI 300 # Class	≤ DN 400 mm (16") ≥ DN 450 mm (18")	Nil 100%
ANSI 600 # Class and above	All sizes	100%

Radiography shall be performed after the final heat treatment also.

All castings shall be wet magnetic particle inspected 100% of the internal surfaces. Method and acceptance shall comply with ASME B16.34.

b) All valves, with body fabricated from plates or made by forgings, shall be ultrasonically examined in accordance with the procedure and acceptance standard of Appendix IV of ASME B16.34.

All forgings shall be wet magnetic particle inspected 100% of the internal surfaces. Method and acceptance shall comply with ASME B16.34.

c) Bodies and bonnets made by welded assembly of segments of castings, forgings, plates or combinations thereof shall be examined, as applicable, by methods of 5.1.4 (a) for cast components or 5.1.4 (b) for forged components and plates.

5.1.5 Full inspection by radiography shall be carried out on all welds of pressure containing parts. Acceptance criteria shall be as per ASME **B** 31.4 or ASME B31.8 as applicable and API 1104.

5.1.6 Welds, which in Company's opinion cannot be inspected by radiographic methods, shall be checked by ultrasonic or magnetic particle methods and acceptance criteria shall be as per ASME Sec. VIII, Division 1, Appendix 12 and Appendix 6 respectively.

5.1.7 **a)** All finished wrought weld ends subject to welding in field shall be 100% ultrasonically tested for lamination type defects for a distance of 50 mm from the end. Laminations shall not be acceptable.

b) Weld ends of all cast valves subject to welding in field shall be 100% radiographically examined and acceptance criteria shall be as per ASME B16.34.

c) After final machining, all bevel surfaces shall be inspected by dye penetrant or wet magnetic particle methods. All defects longer than 6.35 mm are rejected, as are the defects between 6.35 mm and 1.59 mm that are separated by a distance less than 50 times their greatest length. Rejectable defects must be removed. Weld repair of bevel surface is not permitted.

5.1.8 All valves shall be tested in compliance with the requirements of API 6D. During pressure testing, valves shall not have sealant lines and other cavities filled with sealant, grease or other foreign material. The drain, vent and sealant lines shall be either included in the hydrostatic shell test or tested independently. Test pressure shall be held for at least 30 minutes for both Shell & Seat test. No leakage is permissible during hydrostatic testing. The body cavity self-relieving feature meeting the requirements of clause 4.14 of this specification shall also be checked.

5.1.9 A supplementary air seat test as per API 6D (Annex H, Para H.3.3, Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.

5.1.10 Valves shall be subjected to Operational Torque Test as per API 6D (Annex H, Para H.6) under hydraulic pressure equal to maximum differential pressure corresponding to the applicable ANSI class rating of valve. It shall be established that the force required to operate the valve does not exceed the requirements stated in section 4.20 (c) of this specification.

5.1.11 Power actuated valves shall be tested after assembly of the valve and actuator, at the valve Manufacturer's works. At least five Open-Close-Open cycles without internal pressure and five Open-Close-Open cycles with maximum differential pressure corresponding to the valve rating shall be performed on the valve actuator assembly. The time for Full Open to Full Close shall be recorded during testing. If required, the actuator shall be adjusted to ensure that the opening and closing time is within the limits stated in Valve Data Sheet.

Hand operator provided on the actuator shall also be checked after above testing, for satisfactory manual over-ride performance.

These tests shall be conducted on minimum one valve out of a lot of five (5) valves of the same size, rating and the actuator model/type. In case, the tests do not meet the requirements, retesting/rejection of the lot shall be decided by the Company's Inspector.

5.1.12 Subsequent to successful testing as specified in clause 5.1.10 and 5.1.11 above, one (1) valve out of the total ordered quantity shall be randomly selected by the Company Representative for cyclic testing as mentioned below:

a) The valve shall be subjected to at least 100 Open-Close-Open cycles with maximum differential pressure corresponding to the valve rating.

b) Subsequent to the above, the valve shall be subjected to hydrostatic test and supplementary air seat test in accordance with clause 5.1.8 and 5.1.9. In case this valve fails to pass these tests, the valve shall be rejected and two more valves shall be selected randomly and subjected to testing as indicated above. If both valves pass these tests, all valves manufactured for the order (except the valve that failed) shall be deemed acceptable. If either of the two valves fails to pass these tests, all valves shall be rejected or each valve shall be tested at the option of manufacturer.

Previously carried out test of similar nature shall be considered acceptable if the same has been carried out by Manufacturer in last two years. Valves of two sizes below and two sizes above the size

of valve previously tested, and rating similar or one rating lower of valve tested previously, shall be qualified.

5.1.13 Checks shall be carried out to demonstrate that the dissimilar metals used in the valves are successfully insulated as per the requirement of clause 4.13 of this specification.

5.1.14 Anti-static testing for soft seated valves in accordance with H.5 of API 6D.

5.2 Company reserves the right to perform stage wise inspection and witness tests as indicated in clause 5.1 above at Manufacturer's works prior to shipment. Manufacturer shall give reasonable access and facilities required for inspection to the Company's Inspector. Company reserves the right to require additional testing at any time to confirm or further investigate a suspected fault. The cost incurred shall be to Manufacturer's account.

In no case shall any action of Company or his inspector shall relieve the Manufacturer of his responsibility for material, design, quality or operation of valves.

Inspection and tests performed/witnessed by the Company's Inspector shall in no way relieve the Manufacturer's obligation to perform the required inspection and tests.

6. TEST CERTIFICATES

Manufacturer shall submit the following certificates:

a) Mill test certificates relevant to the chemical analysis and mechanical properties of the materials used for the valve construction as per the relevant standards.

b) Test certificates of hydrostatic and pneumatic tests complete with records of timing and pressure of each test.

c) Test reports of radiograph and ultrasonic inspection.

d) Test report on operation of valves conforming to clause 5.1.10, 5.1.11 and 5.1.12 of this specification.

e) All other test reports and certificates as required by API 6D and this specification.

The certificates shall be considered valid only when signed by Company's Inspector. Only those valves which have been certified by Company's Inspector shall be dispatched from Manufacturer's works.

7. PAINTING, MARKING AND SHIPMENT

7.1 Valve surface shall be thoroughly cleaned, freed from rust and grease and applied with sufficient coats of corrosion resistant paint. Surface preparation shall be carried out by shot blasting to SA-2-1/2 / SSPC-SP10. For coastal area, painting shall be suitable for industrial marine environment. For the valves to be installed underground, when indicated in Valve Data Sheet, the external surfaces of buried portion of the valve shall be painted with 100% solid high build epoxy with a minimum dry film thickness of 800 microns or 1.5 mm thick polyurethane coating.

7.2 All valves shall be marked as per API 6D. The units of marking shall be metric except nominal diameter, which shall be in inches.

7.3 Valve ends shall be suitably protected to avoid any damage during transit. All threaded and machined surfaces subject to corrosion shall be well protected by a coat of grease or other suitable material. All valves shall be provided with suitable protectors for flange faces, securely attached to the valves. Bevel ends shall be protected with metallic or high impact plastic bevel protectors.

7.4 All sealant lines and other cavities of the valve shall be filled with sealant before shipment.

7.5 Packaging and shipping instructions shall be as per API 6D**.**

7.6 On packages, following shall be marked legibly with suitable marking ink:

a) Order Number

b) Manufacturer's Name

c) Valve size and rating

d) Tag Number

e) Serial Number

8. SPARES AND ACCESSORIES

8.1 Manufacturer shall furnish list of recommended spares and accessories for valves required during start-up and commissioning and supply of such spares shall be included in the price quoted by Manufacturer.

8.2 Manufacturer shall furnish list of recommended spares and accessories required for two years of normal operation and maintenance of valves and price for such spares shall be quoted separately.

9. DOCUMENTATION

Documentation to be submitted by Manufacturer to Company is summarized below. Number of Copies (Hard copies / soft copies etc.) shall be as indicated in CONTRACT document.

9.1 At the time of bidding, Manufacturer shall submit the following documents:

a) Reference list of similar ball valves manufactured and supplied in last seven years indicating all relevant details including project, year, client, location, size, rating, service etc.

b) Torque curves for the power actuated valves along with the break torque, running torque for the valve stem and maximum allowable stem torque.

c) Copy of valid API 6D Certificate.

d) Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.

e) Details of support foot including dimensions and distance from valve centreline to bottom of support foot.

List of recommended spares required during start-up and commissioning & 2 years of normal operation and maintenance.

9.2 After placement of order, the Manufacturer shall submit the following drawings, documents and specifications for Company's approval:

a) General arrangement & detailed sectional drawings showing all parts with reference numbers and material specifications, overall dimensions and features. Number of turns of hand wheel required for operating the valve from full open to full close position for Gear Operated valves, painting/ coating scheme, Complete dimensional details of support foot (where applicable), shall be indicated in the GA.

Manufacture of valves shall commence only after approval of the above documents. Once the approval has been given by Company, any changes in design, material and method of manufacture shall be notified to Company whose approval in writing of all changes shall be obtained before the valve is manufactured.

9.3 Within 30 days from the approval date, Manufacturer shall submit to Company the approved drawings, documents and specifications as listed in clause 9.2 above.

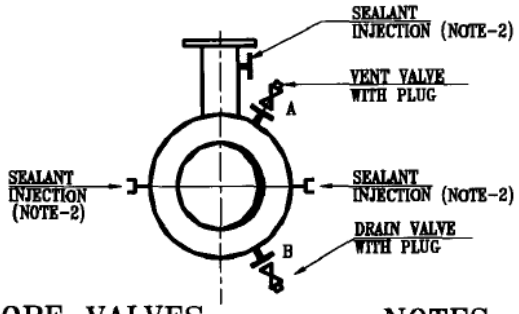
9.4 Prior to shipment, Manufacturer shall submit to Company following:

a) Test certificates as per clause 6.0 of this specification.

b) Manual for installation, erection, maintenance and operation instructions including a list of recommended spares for the valves.

9.5 All documents shall be in English language only.

ABOVE GROUND INSTALLATION



FULL BORE VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)
50 TO 150	–	15
200 TO 600	15	25
650 & ABOVE	15	40

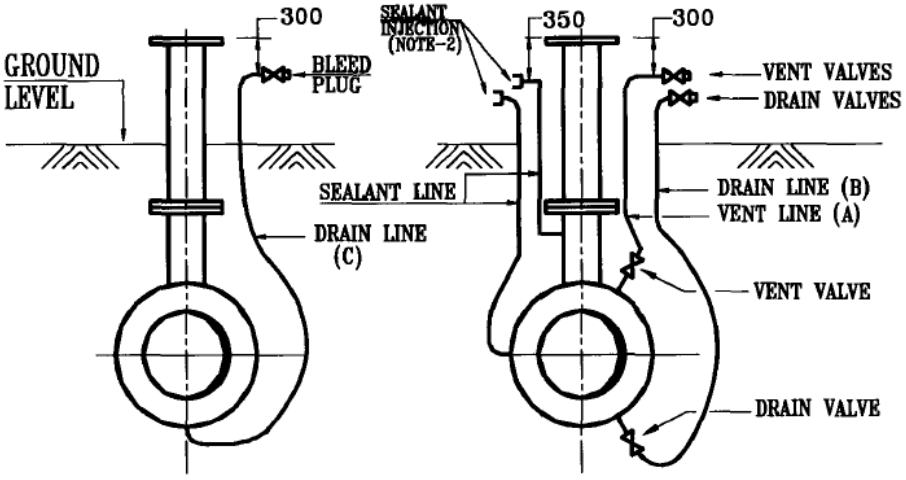
REDUCED BORE VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)
50 TO 200	–	15
250 TO 750	15	25
ABOVE 750	15	40

NOTES:–

1 ALL VALVES (BALL OR PLUG) AND PLUGS FOR A AND B SHALL BE APPROVED BY THE PURCHASER.
2 SEALANT POINTS SHALL BE PROVIDED FOR FULL BORE VALVES OF NOMINAL VALVE SIZE 200 mm (8") & ABOVE AND REDUCED BORE VALVES OF NOMINAL VALVE SIZE, DN 250 mm (10") AND ABOVE ONLY. SEALANT LINES SHALL HAVE PROVISION TO REPLACE THE SEALANT INJECTION FITTING UNDER FULL LINE PRESSURE. SEALANT LINES SHALL HAVE BLOCK VALVE & INTERNAL NON RETURN VALVE.
3 ALL VENT/DRAIN CONNECTION SHALL BE WELDED WITH THE BODY.

UNDERGROUND INSTALLATION



FB VALVES DN 50 mm(2") TO DN 150 mm(6") FB VALVES > DN 200 mm(8")
RB VALVES DN 50 mm(2") TO DN 200 mm(8") RB VALVES > DN 250 mm(10")

FULL BORE (FB) VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)	C, DN(mm)
50 TO 150	–	–	15
200 TO 300	25	25	–
350 TO 600	25	25	–
650 & ABOVE	40	40	–

REDUCED BORE (RB) VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)	C, DN(mm)
50 TO 200	–	–	15
250 TO 400	25	25	–
450 TO 750	25	25	–
800 & ABOVE	40	40	–

NOTES:–

1 ALL VALVES (BALL OR PLUG) AND PLUGS FOR A AND B SHALL BE APPROVED BY THE PURCHASER.
2 SEALANT POINTS SHALL BE PROVIDED FOR FULL BORE VALVES OF NOMINAL VALVE SIZE 200 mm (8") & ABOVE AND REDUCED BORE VALVES OF NOMINAL VALVE SIZE, DN 250 mm (10") AND ABOVE ONLY. SEALANT LINES SHALL HAVE PROVISION TO REPLACE THE SEALANT INJECTION FITTING UNDER FULL LINE PRESSURE. SEALANT LINES SHALL HAVE BLOCK VALVE & INTERNAL NON RETURN VALVE.
3 ALL VENT/DRAIN CONNECTION IN BURIED SECTION SHALL BE OF WELDED CONSTRUCTION. ALL PIPING INCLUDING VALVE ENDS IN BURIED PORTIONS OF VENT & DRAIN SHALL BE WELDED TYPE.

FIGURE-4.9

STANDARD SPECIFICATION FOR ASSORTED VALVES

P-SPC-402

Rev.	Date	Purpose	Prepared by	Reviewed by	Approved by	Approved by
0	02.02.2022	ISSUED AS STANDARD SPECIFICATION	PNS	MD	AD	SK

ABBREVIATIONS

AARH	:	Arithmetic Average Roughness Height
ANSI	:	American National Standards Institute
API	:	American Petroleum Institute
ASME	:	American Society of Mechanical Engineers
ASTM	:	American Society for Testing & Materials
BGO	:	Bevel Gear Operator
BHN	:	Brinnel Hardness Number
BIS	:	Bureau of Indian Standards
BS	:	British Standard
BVIS	:	Bureau Veritas Industrial Services
BW	:	Butt Weld
CAT	:	Category
CS	:	Carbon Steel
DFT	:	Dry Film Thickness
DNV	:	Det Norske Veritas
DP	:	Dye-Penetrant
IBR	:	Indian Boiler Regulations
IGC	:	Inter Granular Corrosion
IS	:	Indian Standard
LT	:	Low Temperature
LTCS	:	Low Temperature Carbon Steel
MOV	:	Motor Operated Valve
MP	:	Magnetic Particle
MR	:	Material Requisition
NDT	:	Non Destructive Testing
PMI	:	Positive Material Identification
PO	:	Purchase Order
PR	:	Purchase Requisition
RFQ	:	Request for Quotation
SCRD	:	Screwed
SS	:	Stainless Steel
SW	:	Socket Weld

CONTENTS

1.0 GENERAL

1.1 This specification defines the minimum requirements for design, manufacturing, inspection and testing of Valves (Gate, Globe, Ball, Plug and Check Valves). Vendor shall supply valves in accordance with the valve specification sheets along with auxiliaries, if any, such as gear operator, bypasses, drains, locking arrangements etc. wherever specified in the specification sheets, subject notes and other enclosures to the material requisition (MR).

1.2 Vendor shall quote in strict adherence with the valve data/ specification sheets, technical requirements and all other enclosures to the MR. For valves, no deviations whatsoever shall be accepted. Post Order Waiver/ Deviation format as mentioned in specification for Quality Management System Requirements from Bidder is not applicable for valves. Valves, if exceptions/ deviations become absolutely must, the same shall be requested as explained giving reasons for seeking such exceptions/ deviations.

1.3 All codes and standards for manufacture, testing, inspection etc. shall be of latest editions as on issue date of MR.

3.0 DESIGN AND CONSTRUCTION

GENERAL

3.1 Valve design, manufactured, tested, inspected and marked shall meet the requirements of applicable standard and shall be suitable for the service conditions indicated in the valve data sheet. Any conflict between the requisition, enclosures, specification sheets and referred standards/ codes shall be brought to the notice of the purchaser for clarifications and resolution, before proceeding with the manufacture. The purchaser's decision shall be final and binding to the vendor. The drawings submitted for review shall not include any deviations except as communicated in writing in Deviation permits. The Drawings shall be reviewed only for design and construction features. After issue of the Purchase Requisition (PR), no deviation to specification/ standards shall be permitted through vendor drawing approval. Approval of drawings shall be valid only for design/ constructional features.

3.2 CHECK VALVE

Swing Type

3.2.1 Valve shall be provided with drain connection as per Manufacturer’s Standard. Drain tapping shall be provided in a position suitable to completely drain the valve with valve in horizontal position.

3.2.2 The disc hinge shall be mounted on the valve body and shall not be attached to the valve body cover. Valve body cover joint shall be of bolted design and screwed covers shall not be used.

Dual Plate Type

3.2.3 Valves shall be non-slam type

Piston Type

3.2.4 Valves shall be non-slam type

Check valves with single plate wafer type design are not acceptable.

3.3 GATE AND GLOBE VALVE

3.3.1 By-pass requirement shall be as follows unless otherwise mentioned.

ASME 150 Class : On sizes 26" and above

ASME 300 Class : On sizes 16" and above

ASME 600 Class : On sizes 6" and above

ASME 900 Class : On sizes 4" and above

ASME 1500 Class : On sizes 4" and above

ASME 2500 Class : On sizes 3" and above

3.3.2 The by-pass piping arrangement shall be such that clearance between main valve body and bypass assembly shall be the minimum possible for layout reasons.

3.3.3 By-pass valve shall be a globe valve. The sizes shall be as under:

On main valve ≤ 4" : 1/2" or more

On main valve 6" to 8" : 3/4" or more

On main valve 10" & above : 1" or more

By-pass piping shall be of same metallurgy as main valve. The by-pass piping, fittings and valve tag numbers shall be as specified in Specification. In case details of by-pass arrangement for any Valve tag number is missing, Vendor shall bring the same to notice of PLECO and provide by-pass as per details specified.

3.3.4 Vendor shall supply the by-pass valve duly tested and fitted to the main valve. Valves with by-pass shall have the direction of flow marked on the main valve. By-pass attachment to the main valve body shall not be screwed. All fillet welds for by-pass installation shall be 100% examined by DP/MP test and Butt-weld joints shall be 100% examined by radiography.

3.3.5 When indicated in data sheets / Purchase Requisition, valves shall have devices to lock the valve either in full open (LO) or full close (LC) positions. Locking devices shall be permanently attached to the valve operator and shall not interfere with operation of the valve.

3.4 Ball / Plug Valves

3.4.1 As a prequalification, fire safe test as per API 607 / API 6FA / BS EN ISO 10497 (Supersedes BS 6755 Part II) shall be carried out on soft seated ball and plug valves and also on lubricated plug valves. The test shall be witnessed and certified by a third party inspection agency mutually agreed. The vendor has to submit test certificate for the particular design of the valve offered, if fire safe design is required as per the Valve Material Specification sheet.

3.4.2 Each valve shall be supplied with a lever / wrench except for gear operated / motor operated valves.

3.4.3 Soft-seated ball and plug valves shall be supplied with antistatic devices.

3.4.4 BW / SW end ball valves shall have a 100 mm long seamless pipe nipple welded to each end of the valve. Nipples are to be welded prior to assembling seats / seals. Specifications of the nipples shall be as indicated in the MR.

3.4.6 The ball of ball valve shall not protrude outside the end flanges of valve.

3.4.7 Ball valves shall be of floating ball/trunnion mounted type as per following:

150#	Below 2"	Floating ball
	2” & above	Trunnion Mounted
300#	Below 2"	Floating ball
	2" & above	Trunnion mounted

600# & above	Below 2"	Floating ball
	2" & above	Trunnion mounted

3.4.8 Unless otherwise specified in the data sheets, bore of all reduced bore ball valves shall be limited to one size lower than the nominal bore.

3.4.9 The MOVs are to be installed in an open area and the actuators shall be suitable for all weather conditions. The testing of complete assemblies of MOVs along with the actuators shall be done by the supplier at his works.

3.5 FLANGES

3.5.1 All flanged valves shall have flanges integral (except forged valves) with the valve body. Flange face finish shall be normally specified in the valve specification sheet as 125 AARH etc. The interpretation for range of face finish shall be as follows:

Stock Finish : 1000 µ in AARH max

125 AARH : Serrations with 125 to 250 µ in AARH

63 AARH : 32 to 63 µ in AARH

3.5.2 For all weld end valves with bevel end as per ASME B 16.25, the contour of bevel shall be as follows:

Material	Wall Thickness	Weld Contour
Carbon Steel (Except Low Temp. Carbon Steel)	Upto22 mm	Figure 2 Type A
	>22mm	Figure 3 Type A
Alloy Steel, Stainless Steel & Low Temp. Carbon Steel	Upto 10 mm	Figure 4
	> 10 mm & Upto 25 mm	Figure 5 Type A
	>25mm	Figure 6 Type A

Valve ends shall match thickness of the connecting pipe. Sloping of inside contour of valves shall be done wherever necessary to achieve this.

3.5.3 The hardness for flanged valves with ring joint flanges shall be as follows:

Flange Material	Min. Hardness of Groove (BHN)
Carbon Steel	140
1% Cr to 5% Cr, 9% Cr	150
Type 304,316,321,347	160
Type 304L, 316L	140

MATERIAL OF CONSTRUCTION

The Material of major components of the valves shall be as indicated in Valve Data Sheet. Remaining components shall be as per Manufacturer's standard (suitable for the service indicated in the data Sheet) and as approved by Company.

All process-wetted parts, metallic and non-metallic, and lubricants shall be suitable for the service specified by the Company. Manufacturer shall confirm that all wetted parts are suitable for treated water/ seawater environment, which may be used during field testing.

Non-metallic parts of the valves (including O-rings, soft seals etc.) intended for hydrocarbon gas service shall be resistant to explosive decompression.

The Carbon steel used for the manufacture of valves assemblies shall be fully killed.

Each heat of steel used for the manufacture of valves shall have carbon equivalent (CE) not greater than 0.45 calculated based on product analysis in accordance with following formula:

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

For all carbon steel materials including welds and heat affected zone (HAZ), if applicable, hardness test shall be carried out in accordance with ASTM A370. Hardness value shall be as per applicable material specification only. However when such value is not specified in material specifications or elsewhere in Purchase Requisition, same shall not exceed 248 BHN. For welded pressure containing parts, maximum difference in hardness of base material, weld material and heat affected zone (HAZ) shall be less than 80 points BHN.

BODY

Valve body/ bonnet shall be forged/ cast as specified. Forgings are acceptable in place of casting but not vice-versa.

YOKE

Material of construction of yoke shall be minimum equivalent to body/ bonnet material.

STEM

Stem shall be forged or machined from forged/ rolled bar. No casting is permitted. However, integral stem of cast stainless steel valve is acceptable.

4.0 OPERATION

4.1 Gear operation shall be provided as under:

Valve Type	Class	Size Requiring Gear-Operator
Gate Valve & Globe Valve	150 Class	12” and larger
	300 Class	12” and larger
	600 Class	10" and larger
	900 Class	6" and larger
	1500 Class	3” and larger
	2500 Class	3” and larger
Ball Valve / Plug Valve (Other than pressure balance plug valves)	150 Class	6" and larger
	300 Class	6" and larger
	600 Class	4” and larger
	900 Class	3" and larger
	1500 Class	3” and larger

For sizes lower than these ranges, hand wheel / lever / wrench shall be provided. For pressure balance plug valves manufacturer's recommendation shall be acceptable provided the requirements specified in clause 4.2.

4.2 Valve shall be designed in such a manner that body mounted assembly i.e. gear box and stem extension protector shall not accumulate any pressure in the event of stem seal leakage.

Valve shall be provided with positions indicator for open and close.

Valve design shall ensure repair of gland packing under full line pressure.

Valve stem shall be designed in such a manner that the stem is completely covered and no part is exposed to atmosphere during operation of the valve.

When stem extension requirement is indicated in the valve data sheet, the valves shall have water proof outer casing. Length of stem extension shall be as indicated in the valve data sheet. The length indicated corresponds to the distance between centreline of the valve opening and the centreline of the rim of the hand-wheel on a vertical shaft or centreline of the hand-wheel (or bottom of gearbox in case of gear operator) on a horizontal shaft. In case of gearbox operated valves, length of stem extension corresponds to distance between centreline of the valve opening and bottom of gearbox. Stem extension and stem housing design shall be such that the complete assembly will form a rigid unit giving positive drive under all conditions with no possibility of free movement between valve body, stem extension or its operator. Outer casing of stem extension shall have 3/8” or ½” NPT plugs at the top and bottom for draining and filling with oil to prevent internal corrosion.

Valve design shall be such that damage due to malfunctioning of the operator or jamming of valve will only break the shear pin and prevent the valve from any damage and that damaged parts can be replaced without the valve cover being removed. Hand wheel diameter shall not exceed 750mm and lever length shall not exceed 500mm on either side. Maximum effort to operate the hand-wheel shall not exceed 350 N under full differential line pressure. Manufacture shall also indicate the number of turns of hand wheel required to operate the valve from full open to full close position. Direction of hand wheel shall be in clock-wise direction while closing the valve. Hand wheels shall not have protruding spokes. Gear operator, when provided, shall have a self-locking provision and shall be fully encased in water proof / splash proof enclosure and shall be filled with suitable grease.

Gear operator shall be provided, with position indicators for open / close positions and with limit stops. (Limit stops are not applicable for gate and globe valves).

4.3 Where gear operator is not called for as per Clause 4.1 but vendor recommends a gear operator, the same shall be highlighted.

4.4 Gear operator shall be so designed as to operate effectively with the differential pressure across the closed valve equal to the cold non-shock pressure rating.

4.5 Ball and plug valves even with wrench or lever operators shall have "Open" position indicators with limit stops.

5.0 INSPECTION AND TESTING

5.1 Every valve shall be subjected to all the mandatory tests and checks called in the respective codes / data sheet & ITP by PLECO or any third party as approved by the purchaser.

5.2 Every valve, its components and auxiliaries must be subjected to all the mandatory tests and checks called for in the respective codes, data sheets etc. by the manufacturer.

5.3 For all austenitic stainless steel valves Inter Granular Corrosion (IGC) test shall be conducted as per the following:

5.3.1 ASTM A262 Practice "B" with acceptance criteria of "60 mils/year (max.)" for all materials - forged, rolled, wrought and casting.

ASTM A262 Practice "E" with acceptance criteria of "No cracks as observed from 20X magnification" for all materials other than castings. "Microscopic Structure to be observed from 250X magnification" in addition.

5.3.2 When specifically asked for in MR for high temperature application of some grades of austenitic stainless steel (e.g. SS309, 310, 316, 316H etc.) ASTM A262 Practice "C" with acceptance criteria of "15 mils/year (max.)" shall be conducted.

5.3.3 For the IGC test as described in Clauses 5.3.1 & 5.3.2, two sets of samples shall be drawn from each solution annealing lot. One set shall correspond to the highest Carbon content and the other to the highest pressure rating. When testing is conducted as per practice 'E', photograph of the microscopic structure shall be submitted for record.

5.4 Though the extent of inspection shall be as under, exact extent with hold points shall be decided by PLECO regional inspection office and recorded in the form of inspection plan. In case of third party inspection, the inspection plan shall be approved by the purchaser.

Forged Valves:

1. Visual and dimensional inspection.
2. Review of material test certificates.
3. Any mandatory or supplementary test.
4. Hydrostatic test on 10% valves selected on random basis.
5. Strip check is required for 1% of total ordered quantity of Gate & Globe valves (min. 1 No.) for each Valve sheet no., however, strip check is not required for CS/ Brass/ Bronze material valves with 13% Cr/ Brass/ Bronze trims.

Cast Steel Valves:

1. Visual and dimensional inspection.
2. Review of material test certificates.
3. Review of radiographs/radiographic reports or any other NDT tests wherever applicable as per data sheet.
4. Any mandatory or supplementary test.
5. Hydrostatic test 100% for body, 10% other test.
6. Strip check is required for 1% of total ordered quantity of Gate & Globe valves (min. 1 No.) for each Valve sheet no., however, strip check is not required for CS/ Brass/ Bronze material valves with 13% Cr/ Brass/ Bronze trims.

Samples for strip check shall be selected at random and shall generally be in the highest size in the lot.

5.5 In case of motor operated or actuator operated valves, functional / operational checks as per the requirements of the specifications shall be made on each valve.

6.0 NON DESTRUCTIVE EXAMINATION

6.1 Body castings of all valves shall be radio graphically examined on 100% of the surface of critical areas as per ASME B16.34. Procedure and acceptance criteria shall be as per ASME B16.34. The extent of radiography examination shall be as follows:

Material	Rating	Size Range	Radiography
All	150#	24" and below	NIL**
		26" and above	100%
	300#	16" and below	NIL**
		18" and above	100%
	600# & above	All sizes	100%

6.2 Non-destructive examination of individual valves material and component consisting of but not limited to castings, forgings, plates and assembly welds shall be carried out by manufacturer.

6.3 All castings shall be wet magnetic particle inspected 100% of the internal surfaces. Method and acceptance criteria shall be as per ASME B16.34.

6.4 All pressure containing parts made by forgings and plate components shall be ultrasonically examined in accordance with procedure and acceptance standard of Appendix IV of ASME B16.34.

6.5 Bodies and bonnets made by welded assembly of segments of castings, forgings, plates or combinations thereof shall be examined as per applicable method mentioned above.

6.6 Full inspection by radiography shall be carried out on all welds of pressure containing parts. Acceptance criteria shall be as per API 1104.

6.7 Welds which in Company's opinion cannot be inspected by radiographic method shall be checked by ultrasonic or magnetic particle methods and acceptance criteria shall be as per ASME Sec VIII, Division 1, Appendix 12 and Appendix 6 respectively.

6.8 All finished wrought weld ends subject to welding shall be 100% ultrasonically tested for lamination type defects for a distance of 50 mm from end. Laminations shall not be acceptable.

6.9 Weld ends of all cast valves subject to welding shall be 100% radiographically examined and acceptance criteria shall be as per ASME B16.34.

6.10 After final machining, all bevel surfaces shall be inspected by dye penetrant or wet magnetic particle methods. All defects longer than 6.35 mm are rejected. Rejected defects must be removed. Weld repair of bevel surface is not permitted.

7.0 MARKING

7.1 Valve markings, symbols, abbreviations etc. shall be in accordance with MSS-SP-25 or the standard referred in specification sheet as applicable. Vendor's name, valve rating, material designation, nominal size, direction of flow (if any) etc. shall be integral on the body.

7.2 Each valve shall have a corrosion resistant tag giving size, valve tag / code no., securely attached to the valve body.

7.3 Paint or ink for marking shall not contain any harmful metal or metal salts such as zinc, lead or copper which cause corrosive attack on heating.

7.4 Carbon Steel / Alloy Steel valves shall be painted with one coat of inorganic zinc silicate (minimum DFT 65 to 75 microns).

8.0 DOCUMENTATION

8.1 VENDOR SHALL SUBMIT THE FOLLOWING WITH THE OFFER

8.1.1 Manufacturer's complete descriptive and illustrative catalogue/ literature.

8.1.2 Detailed dimensioned cross section drawing with parts/ material lists, weight etc. for the globe valves, ball valves, check valves, gate valves, plug valves and valves to manufacturer's standard.

8.1.3 Drawings for valves with accessories like gear operator, hydraulic/ pneumatic operator, motor, extension bonnet, extended stems with stands, bypass etc. giving major salient dimensions.

8.1.4 One copy of the valve specification sheets signed as "Accepted" by the manufacturer with all deviations marked clearly.

8.1.5 If the valve is regretted or has no deviation, the manufacturer shall write clearly on valve specification sheets as "Regret" or "No Deviation".

8.1.6 For subject notes, if there is any deviation, the same shall be listed clause wise. Even clauses which are acceptable shall be categorically confirmed as "Accepted".

8.1.7 On failure to submit documents as specified in clauses 8.1.1 to 8.1.6 above, the offer is likely to be rejected.

8.1.8 All documentation shall be in English language only.

8.2 THE FOLLOWING DOCUMENTS SHALL BE SUBMITTED AFTER PLACEMENT OF THE ORDER

8.2.1 Vendor shall submit for approval drawings mentioned in clauses 8.1.2 & 8.1.3 before start of manufacture. No other drawing shall be submitted for approval.

8.2.2 Test report shall be supplied for all mandatory tests as per the applicable code. Test reports shall also be furnished for any supplementary tests as specified in clauses 5.3.

8.2.3 Material test certificates (physical properties, chemical composition & heat treatment report) of the pressure containing parts shall be furnished for the valves supplied. Material test certificates for the other parts shall also be furnished for verification during inspection.

9.0 DISPATCH

9.1 Valve shall be dry, clean and free from moisture, dirt and loose foreign materials of any kind.

9.2 Valves shall be protected from rust, corrosion and any mechanical damage during transportation, shipment and storage.

9.3 Rust preventive on machined surfaces to be welded shall be easily removable with a petroleum solvent or shall not be harmful to welding.

9.4 Each end of valve shall be protected with the following materials:

Flange Face	:	Wood or Plastic Cover
Bevelled End	:	Wood or Plastic Cover
SW & SCRD. End	:	Plastic Cap

9.5 End protectors of wood / plastic to be used on flange faces shall be attached by at least three bolts and shall not be smaller than the outside diameter of the flange. However, plastic caps for SW & SCRD end valves shall be press fit type.

9.6 End protectors to be used on bevelled end shall be securely and tightly attached.

9.7 For special service valves additional requirement for despatch shall be as prescribed in data sheet.

STANDARD SPECIFICATION FOR SEAMLESS (SMLS) LINE PIPE (ONSHORE)

P-SPC-001

Rev.	Date	Purpose	Prepared by	Reviewed by	Approved by	Approved by
0	11.02.2023	ISSUED AS STD SPECIFICATION	SS	SM	AD	SK

ABBREVIATIONS

API	American Petroleum Institute
ASTM	American Society for Testing and Materials
BM	Base Metal
CE	Carbon Equivalent
CVN	Charpy V-Notch
FBH	Flat Bottomed Holes
HAZ	Heat Affected Zone
ID	Inside Diameter
K*v*L	Charpy value in pipe longitudinal direction
KvT	Charpy value in pipe transversal direction
MPQT	Manufacturing Procedure Qualification Tests
MPS	Manufacturing Procedure Specification
NDT	Non Destructive Testing
OD/D	Outside Diameter, Specified
SAWL	Submerged Arc Longitudinal Welded
SMAW	Shielded Metal Arc Welding
SMLS	Seamless
SMYS	Specified Minimum Yield Strength
s_r	Sizing ratio of the pipe
t	Wall Thickness, Specified
UT	Ultrasonic testing

CONTENTS

1. SCOPE

1.1. Coverage

This specification establishes the minimum requirements for the manufacture of seamless steel line pipe for onshore service in accordance with the requirements of API (American Petroleum Institute) Specification 5L, Forty-Sixth Edition, 2018 and makes restrictive amendments to API Specification 5L. Unless modified and/ or deleted by this specification, the requirements of API Specification 5L shall remain applicable.

The sections, paragraphs and annexes contained herein have the same numbering as that of API Specification 5L in order to facilitate reference. Additional requirements, which are not specified in API Specification 5L, have also been numbered and marked as "(New)" The coverage by this specification is limited to seamless line pipe to be used for onshore pipelines transporting non-sour hydrocarbons in liquid or gaseous phase. The product specification level for line pipe to be supplied as per this specification shall be "PSL 2".

1.2. Application of the API Monogram

The Manufacturer shall have a valid license to use API Monogram and line pipes supplied as per this specification shall bear API Monogram in accordance with the requirements of Annex A of API Specification 5L, Forty- Sixth Edition, April 2018 for Product Specification Level PSL 2.

1.3. Pipe Size

This Specification shall be applied to line pipe of size 4.5" (114.3 mm) OD thru 16" (406.4 mm) OD, both size included.

2. NORMATIVE REFERENCES

2.1. Additional Normative References

The latest edition (edition enforce at the time of issue of enquiry) of following additional references are included in this specification:

ASTM E112: Standard Test Methods for Determining Average Grain size

6. PIPE GRADES AND STEEL GRADES, AND DELIVERY CONDITION

6.1. Pipe Grades and Steel Grades

6.1.2. Line pipe supplied to this specification shall conform to Product Specification Level 2 (PSL 2) as given in Table 1 of this specification and consists of an alpha or alphanumeric designation that identifies the strength level of the pipe. The steel name (designating a steel grade), linked to the chemical composition of the steel, additionally includes a suffix that consists of a single letter (N or Q) that identifies the delivery condition as per Table 3 of this specification.

Table 1 of API Specification 5L stands replaced by Table 1 of this specification.

Table 1— Pipe Grade and Steel Grades, and Acceptable Delivery Conditions

PSL	Delivery Condition	Pipe Grade/ Steel Grade [a,b]
PSL2	Normalized	BN, X42N, X46N, XS2N
	Quenched and tempered	BQ, X42Q, X46Q, XS2Q, XS6Q, X60Q, X6SQ&X70Q

PSL	Delivery Condition	Pipe Grade/ Steel Grade [a,b]
a	Intermediate grades are not allowed	
b	The suffix (N or Q) for PSL 2 grades belongs to steel grade.	

6.2. Delivery condition

6.2.3. The delivery condition for starting material shall be in accordance with Table 1 of this specification.

8. MANUFACTURING

8.1. Process of Manufacture

Pipe furnished to this specification shall be manufactured in accordance with the applicable requirements and limitations given in Table 2 of API Specification 5L and Table 3 of this specification.

Table 3 of API Specification 5L stands replaced by Table 3 of this specification.

Table 3 — Acceptable Manufacturing Routes for PSL 2 Pipe

Type of pipe	Starting Material	Pipe forming	Pipe heat treatment	Delivery condition
SMLS	Ingot, bloom, or billet	Normalizing forming	None	**N**
		Hot forming	Normalizing or Quenching and Tempering	N or Q
		Hot forming and cold finishing		N or Q

8.3. Starting Material

8.3.2. Line pipe furnished to this specification shall be made from steel produced in basic oxygen or electric arc furnace. Steel shall be made by continuous casting only.

8.3.3. The steel used for manufacture of pipe shall be fully killed and fine grained with ASTM grain size number 7 or finer as per ASTM E 112.

8.9. Cold Sizing and Cold Expansion

8.9.1. Pipes furnished to this specification shall be non-expanded.

8.11. Jointers

8.11.1 Jointers are not permitted.

9. ACCEPTANCE CRITERIA

9.2. Chemical Composition

9.2.2. For pipes supplied as per this specification, the chemical composition of each heat of steel on product analysis shall be as given in Table 5 of this specification.

Table 5 of API Specification 5L stands replaced by Table 5 of this specification.

Table 5 — Chemical Composition for Pipe

Element	Mass Fraction based on Heat and Product Analyses (%)	
C[b]	0.16	max.
Si	0.15[m(New)]	min.
	0.40	max. (For Grade B to X46)
	0.45	max. (For Grade X52 to X70)
Mn[b]	1.20	max. (For Grade B to X42)
	1.40	max. (For Grade X46 to X52) for delivery condition N
	1.50	max. (For Grade X46 to X56) for delivery condition Q
	1.60	max. (For Grade X60 to X70) for delivery condition Q
P	0.020	max.
S	0.010	max.
V	[c]	(For Grade B)
	0.05	max. (For Grade X42 to X52)
	0.07g	max. (For Grade X56)
	0.08g	max. (For Grade X60 to X70)
Nb	[c]	(For Grade B)
	0.05[g]	max. (For Grade X42 to X70)
Ti	0.04[g]	max. (For Grade B to X60)
	0.06[g]	max. (For Grade X65 to X70)
Al [n(New)]	0.07	max.
Cr	0.20	
Mo	0.10	
Cu [o(New)]	0.35	
Ni [O(New)]	0.20	
N [n(New)]	0.012	
B	0.0005	

a. Based upon product analysis as per clause 9.2.4 and 9.2.5 of API Specification 5L, the CE_{uw} limits apply if C > 0.12% and CE_{PCM} limits apply if C≤0.12%. For pipes of all grades, sizes and wall thicknesses, Carbon Equivalent shall comply with the following limits:

CE_{PCM} ≤ 0.20%

CE_{IIW} ≤ 0.40 %

Boron content shall be considered in CEPcm formula even ifit is less than 0.0005%.

b. Deleted
c. Nb + V ≤0.06%.
d. Deleted
e. Deleted
f. Deleted
g. Nb+V+Ti≤0.15%
h. to i Deleted
m. Minimum for Si is not applicable for Al killed steel.
n. Al / N shall be min. 2 (not applicable to titanium-killed steel or titanium-treated steel).
o Cu + Ni ≤ 0.40 %

9.2.3. For heat analysis and product analysis, all the elements listed in Table 5 of this specification shall be analysed and reported, even if those are not purposely added but are present as residuals only.

If alloying elements other than those specified in Table 5 of this specification are added to the steel, the limits of the additional components shall be agreed with the Purchaser.

9.3. Tensile Properties

9.3.2. The finished pipe (after all heat treatment) shall conform to the requirements of Table 7 of API Specification 5L and as modified herein.

The actual yield strength shall be as close as possible to the specified minimum yield strength (SMYS) but in no case it shall exceed the limits specified here under:

API Specification 5L Grade	Permissible in excess of SMYS, MPa (psi)
Up to and including X46	131 (19,000)
X52 to X60	125 (18,000)
X65 to X70	120 (17,400)

The ratio of body yield strength and body tensile strength of each test pipe on which body yield strength and body tensile strength are determined, shall not exceed 0.90.

The minimum elongation of base metal shall be determined in accordance with the formula given in foot note (f) of Table 7 of API Specification 5L. However, minimum elongation shall be at least 20% for t < 12.7 mm and 22% for t > 12.7 mm.

9.8. CVN Impact Test for PSL 2 Pipe

9.8.1. General

9.8.1.2. From the set of three Charpy V-notch impact test pieces, only one is allowed to be below the specified average absorbed energy value and shall meet the minimum single absorbed energy value requirement as specified in Table 8 of this specification.

9.8.2. Pipe Body Tests

9.8.2.1. The average (set of three test pieces) absorbed energy value (Kv7) for each pipe body test shall be as specified in Table 8 of this specification, based upon full sized test pieces at a test temperature of 0°C (32°F) or at a lower test temperature as specified in the Purchase Order.

Table 8 of API Specification 5L stands replaced by Table 8 of this specification.

Table 8 — CVN Absorbed Energy Requirements for Pipe Body of PSL 2 Pipe

Pipe Grade	**Full-size CVN Absorbed Energy** (Kv]) a,b [J]	
	Average	*Minimum*
B	40	32
X42	40	32
X46	40	32
X52	40	32
X56	40	32
X60	42	34
X65	45	36
X70	50	40

a	The required K_vL (longitudinal direction test pieces) values shall be 50% higher than the required K_vT values.
b	Testing shall be performed at a test temperature of 0°C (32°F) or at a lower temperature as specified in the Purchase Order.

9.8.2.2. The minimum average (set of three test pieces) shear fracture area shall be at least 85% with one minimum value of 75%, based at a test temperature of 0 °C (32 °F) or at a lower test temperature as specified in the Purchase Order.

9.10. Surface Conditions, Imperfections, and Defects

9.10.1. General

9.10.1.2. All pipes shall be free from cracks, sweats, leaks and slivers. Pipe containing such defects shall be treated in accordance with clause C.3 b) or C.3 c) of API Specification 5L.

9.10.4. Laminations

Any lamination or inclusion either extending into the face or bevel of the pipe or present within 50 mm from pipe ends shall be classified as defect. Pipes that contain such defects shall be rejected or cut back until no lamination or inclusion is present at the pipe ends and shall be treated in accordance with clause C.3 b) or C.3 c) of API Specification 5L.

9.10.5. Geometric Deviations

9.10.5.2. For dents, the length in any direction shall be < 0.5 D and the depth, measured as the gap between the extreme point of the dent and the prolongation of the normal contour of the pipe, shall not exceed the following:

a) 1 mm for cold-formed dents with sharp-bottom gouges and not encroaching upon the minimum specified wall thickness.

b) 2 mm for other dents

c) 1 mm at pipe ends, i. e. within a length of 100 mm at each of the pipe ends.

Dents that exceed the above specified limits shall be considered as defect and shall be treated in accordance with C.3 b) or C.3 c) of API Specification 5L. Acceptable cold formed dents with sharp-bottom gouges shall be treated in accordance with clause C.2 of API Specification 5L & as modified in this specification.

9.10.6. Hard Spots

Any hard spot larger than 50 mm (2.0 in) in any direction and hardness greater than 248HVio shall be classified as defect and treated in accordance with clause C.3 b) or C.3 c) of API Specification 5L.

9.10.7. Other Surface Imperfection

Other surface imperfections found by visual inspection or non-destructive inspection shall be investigated, classified and treated as follows:

a) Imperfections that have a depth ≤ 0.05 t shall be classified as acceptable imperfections and shall be treated in accordance with Clause C.1 of this specification.

b) Imperfections that have a depth > 0.05 t and do not encroach on the minimum specified wall thickness shall be classified as defects, and shall be dressed-out by grinding in accordance with Clause C.2 of API Specification 5L and as modified in this specification or shall be treated in accordance with Clause C.3 b) or C.3 c) of API Specification 5L.

c) Imperfections that have a depth > 0.05 t and encroach on the minimum specified wall thickness shall be classified as defects and treated in accordance with Clause C.3 of API Specification 5L.

9.11. Dimensions, Mass, and Tolerances

9.11.3. Tolerances for Diameter, Wall thickness, Length and Straightness

9.11.3.1. The diameter and out-of-roundness shall be within the tolerances given in Table 10 of this specification.

Table 10 of API Specification 5L stands replaced by Table 10 of this specification.

Table 10 - Tolerances for Diameter and Out-of-roundness

Specified outside diameter *(D)* mm (in)	**Diameter Tolerances**d		**Out-of-Roundness Tolerance**	
	Pipe Except the Enda	**Pipe End** a, bc,	**Pipe Except the End**a	**Pipe End** a, b,C
114.3 (4½) *D* 168.3 (6.625)	± 0.0075 *D*	- 0.4 mm to + 1.6mm	*0.020D*	2.0mm
168.3 (6.625) <*D* 273.1 (10.750)		±0.005 *D,* but maximum of ±I.6mm		2.0mm
273.1 (10.750) <*D* 406.4 (16)				3.0mm

a The pipe end includes a length of I 00 mm at each of the pipe extremities.
b Deleted
c The diameter tolerance and out-of-roundness tolerance shall apply on inside diameter. The inside diameter, based on circumferential measurement, shall be calculated as ID = (D - *2t).*
d For determining compliance to the diameter tolerances, the pipe diameter is defined as the circumference of the pipe in any circumferential plane divided by Pi (1t).
e Out-of-roundness tolerances apply to maximum and minimum diameters as measured with bar gage, caliper, or device measuring actual, maximum and minimum diameters.

9.11.3.2. In addition to API requirements, the wall thickness of each pipe shall be checked along the circumference at both ends and at the mid location of pipe body at 12 O' clock, 3 O' clock, 6 O' clock and 9 0' clock positions. The tolerances for wall thickness shall be as given in Table 11 of this specification.

Table 11 of API Specification SL stands replaced by Table 11 of this specification.

Table 11 **- Tolerances for Wall Thickness**

Wall Thickness (mm)	**Tolerances** (mm)
t < 10.0	+ 0.225 *t* -0.05 *t*
10.0≤ *t* < 25.0	+ 0.20 *t* -0.05 *t*
t ≥ 25.0	+ 5.00 -1.25
a. to d Deleted	

9.11.3.3. All pipes shall be supplied with length between 11.5 m and 12.5 m. However pipe with length between 10.0 m and 11.5 m can also be accepted for a maximum of 5% of the ordered quantity. The minimum average length of the entire ordered quantity in any case shall be 12.0 m. Overall length tolerance shall be (-) Zero and (+) One pipe length to complete the ordered quantity. Table 12 of API Specification 5L

stands deleted.

9.11.3.4 The tolerances for straightness shall be as follows:

a) The total deviation from a straight line over the entire pipe length shall not exceed 12 mm, as shown in Figure 1 of API Specification 5L.

b) The local deviation from straight line in 1.5 m (5.0 ft) portion at each pipe end shall be < 3.0 mm (0.120 in), as shown in Figure 2 of API Specification 5L.

9.12. Finish of Pipe Ends

9.12.5. Plain Ends

9.12.5.6. During removal of inside burrs at the pipe ends, care shall be taken not to remove excess metal and not to form an inside cavity on bevel. Removal of excess metal beyond the minimum wall thickness as indicated in clause 9.11.3.2 of this specification shall be a cause for re-bevelling. In case root face of bevel is less than that specified, the pipe ends shall be re-bevelled and rectification by filing or grinding shall not be done.

9.12.5.7. Bevel Protectors

Each pipe ends of each pipe shall be provided with metallic or high impact plastic bevel protectors as per Manufacturer's standard. Bevel protectors shall be of a design such that they can be re-used by coating applicator for providing on externally anti-corrosion coated pipes subsequent to coating of line pipe.

10. INSPECTION

10.1. Types of Inspection and Inspection Documents

10.1.3. Inspection Documents for PSL 2 Pipes

10.1.3.1. Inspection certificate 3.2 in accordance with EN 10204 shall be issued for each dispatched pipe by Purchaser's authorized representative.

10.2. Specific Inspection

10.2.3. Inspection Frequency

10.2.3.2. For PSL 2 pipe, the inspection frequency shall be as given in Table 18 of this specification.

Table 18 of API Specification 5L stands replaced by Table 18 of this specification.

Table 18 - Inspection Frequency of Pipe

Sl. no.	Type of Inspection	Frequency of Inspection
1.	Heat analysis[a]	One analysis per heat of steel
2.	Product analysis[b]	Two pipes per lot (maximum 100 pipes) per heat
3.	Tensile testing of the pipe body	Two pipes per lot (maximum 100 pipes) per heat
4.	CVN impact testing of the pipe body	Once per test unit of not more than 100 pipes
5.	Vickers hardness testing of pipe body	Once per test unit of not more than 50 pipes

6.	Hydrostatic testing	Each pipe
7.	Visual inspection	Each pipe
8.	Pipe diameter and out-of-roundness for pipe[d]	Each Pipe
9.	Wall thickness measurement	Each pipe
10.	Straightness[d]	At least 3 times per operating shift (12 hours maximum)
11.	Other dimensional testing	Random testing, with the details left to the discretion of the manufacturer
12.	Weighing of pipe	Each pipe shall be measured and recorded
13.	Non-destructive inspection	In accordance with Annex E of API Specification SL and as modified in this specification
14.	Length	Each length of pipe shall be measured and recorded

a. Where the steel mill is not a part of an integrated pipe mill, heat analysis shall be reported by the Manufacturer prior to start of pipe production.

b. Pipes selected shall be such that one at the beginning of the heat and one at the end of the heat are also represented.

c. Deleted

d. Measurement shall be recorded at least 3 times per operating shift (12 hrs maximum).

e. "Test unit" is as defined in clause 3. J .60 of API Specification SL.

10.2.4. Samples and Test Pieces for Product Analysis

Samples shall be taken, and test pieces prepared, in accordance with ISO 14284 or ASTM E 1806. Samples used for product analysis shall be taken from finished pipes only.

10.2.5. Samples and Test Pieces for Mechanical Tests

10.2.5.1. General

In addition to API Specification 5L requirements, samples and test pieces for various types of tests shall be taken from Figure 5 a) of API Specification 5L and Figure 10.2.4.8.1 of this specification, whichever is applicable, and as given in Table 20 of this specification.

Table 20 of API Specification 5L stands replaced by Table 20 of this specification.

Table 20 — Number, Orientation and Location of Test Pieces per Sample for Mechanical Tests for PSL2 Pipe

Sample Location	**Type of Test**	**Number, Orientation and Location of Test Pieces per Sample[a]**	
		Specified outside diameter *(D)* mm (in)	
		< 219.1 mm (8.625 in)	**≤ 219.1 mm (8.625 in)**

Pipe body	Tensile	IL[b]	IL[b],IT[C]
	CVN	3T	3T
	Hardness	1T	1T

a See figure 5(a) of API Specification SL for an explanation of the symbols used to designate orientation and location of samples and test pieces.

b Longitudinal tensile tests shall be carried out on a strip specimen with full wall thickness prepared according to ASTM A370.

c The transverse tensile tests shall be carried out on a round cross-section and shall be obtained from non-flattened samples prepared according to ASTM A370.

10.2.5.2. Test Pieces for the Tensile Test

Tensile test specimens shall be taken from finished pipes only. Heating or artificial ageing of tests pieces is not permitted.

Transverse test pieces shall have a round cross-section and shall be obtained from non -flattened samples prepared according to ASTM A370.

Longitudinal tensile tests shall be carried out on a strip specimen representing full wall thickness of the pipe prepared according to ASTM A370.

10.2.5.3. Test Pieces for the CVN Impact Test

In addition to the API Specification 5L requirements, following shall also be applicable:

The test pieces shall be prepared in accordance with ASTM A370. Non-flattened test pieces shall be used. Test specimen shall be taken from the body of the finished pipe only. The axis of the notch shall be perpendicular to the pipe surface.

Charpy V-notch impact testing shall be performed on full—sized test pieces, wherever possible. However, if preparation of full size test piece is not possible, then standard subsized test pieces shall be prepared as per ASTM A370.

In case of lower pipe sizes wherein preparation of transverse sub-sized specimen is not possible, CVN impact testing shall be carried out on longitudinal test specimen (see Note `a' of Table 8 of this specification).

10.2.5.8. Test Pieces for the Hardness Test

Test pieces for hardness tests shall be taken transverse to the pipe body [see Figure 5 a) key 2] from the pipe ends.

10.2.6. Test Methods

10.2.6.3. CVN Impact Test

The Charpy test shall be carried out in accordance with ASTM A370.

10.2.6.8. Hardness Test

In addition to the requirements of API Specification 5L, following shall also be applicable:

Vickers hardness tests shall be carried out in accordance with ISO 6507-1. The resulting Vickers hardness value at any point shall not exceed 248 HV10. Hardness test locations shall be as shown in Figure 10.2.4.8.1 of this specification.

Modalities of retest shall be in accordance with clause 10.2.12.7 of API Specification 5L.

10.2.6. Hydrostatic Test

10.2.6.1. Test pressure shall be held for a minimum period of 15 seconds for all sizes and grades of pipes.

10.2.6.2. In addition to the requirements of API Specification 5L, following shall also be applicable:

The pressure gauge used for hydrostatic testing shall have a minimum range of 1.5 times and maximum range of 4 times the test pressure. The test-pressure measuring device shall be calibrated by means of a dead-weight tester only. The test configuration shall permit bleeding of trapped air prior to pressurization of the pipe.

10.2.6.5. The test pressure for all sizes and grades of pipe shall be such that hoop stress (fibre stress) generated is at least 95% of SMYS, computed based on the Equation (6) indicated in clause 10.2.6.5 of API Specification 5L. Table 26 of API Specification 5L stands deleted.

10.2.7. Visual Inspection

10.2.7.1. Each pipe shall be visually examined for entire external surface and internal surface to the extent feasible and shall be free of defects in finished condition. Visual examination shall be carried out in a sufficiently illuminated area; minimum 1000 lx. If required additional lights shall be used to obtain good contrast and relief effect between imperfections and backgrounds.

10.2.8. Dimensional Testing

10.2.8.1. Diameter measurements shall be made with a circumferential tape only.

10.2.8.7. The measuring equipment requiring calibration or verification under the provisions of API Specification 5L shall be calibrated with manual instruments at least once per operating shift (12 hours maximum). Such calibration records shall be furnished to Purchaser's Representative on request.

10.2.10. Non-destructive Inspection

Non-destructive inspection shall be performed in accordance with Annex E of API Specification 5L and as modified herein.

10.2.11. Reprocessing

This clause of API Specification 5L stands cancelled.

10.2.12. Retesting

10.2.12.1. Recheck Analyses

Modalities of recheck analysis shall be as per API Specification 5L as applicable to the lot being tested (see Table 18 of this specification). However, during individual testing, each pipe shall be fully analyzed to meet the requirements of Table 5 of this specification.

11. MARKING

11.1. General

11.1.3. Pipe manufactured in accordance with this specification shall be marked by the manufacturer as per the requirements of API Specification 5L and as modified herein. Marking shall be in English language and International System (SI) of Units.

11.1.5. Marking shall also include Purchase Order number, item number, pipe number and heat number.

11.2. Pipe Markings

11.2.1. k) Actual length in metres and actual pipe weight in kg shall be marked.

11.2.3. c) Paint used for stencil marking shall withstand a temperature up to 250°C expected to be experienced during further external anti-corrosion coating operations of line pipe by coating applicator.

11.2.4. The pipe number shall be placed by cold rolling or low stress dot marking or vibro-etching on the outside

surface of the pipe at an approximate distance of 50 mm from both ends. In case of non-availability of either cold rolling or low stress dot marking facility in pipe mill, an alternative marking scheme of a permanent nature may be proposed by the Manufacturer.

11.2.8. A color code band shall be marked on inside surface of finished pipe for identification of pipes of same diameter but different wall thickness, as indicated in the Purchase Order.

The color code band shall be 50 mm wide and shall be marked at a distance of 150 mm from the pipe ends.

12. COATINGS AND THREAD PROTECTORS

12.1.1. Unless otherwise specified in the Purchase Order, the pipes shall be delivered bare, free of any trace of oil, stain, grease and paint. Varnish coating shall be applied on the marking area. Bevels shall be free of any coating.

13. RETENTION OF RECORDS

In addition to the records indicated in API Specification 5L, the Manufacturer shall retain the records of all additional tests and calibration records mentioned in this specification including the hard copy records of ultrasonic testing carried out on pipe/coil as well as pipe ends.

15. PRODUCTION REPORT

The Manufacturer shall provide one electronic copy and six hard copies of production report in English language indicating at least the following for each pipe. International system of units (SI) shall be adopted.

- Pipe number

- Heat number from which pipe is produced

- Pipe length and weight

- Pipe grade

The Manufacturer shall provide one electronic copy and six hard copies of acceptance certificates which shall include the results of all tests required as per this specification and performed on delivered material giving details of, but not limited to, the following:

- All test certificates as per clause 10.1.3 of API Specification 5L and as modified herein.

- Certified reports of dimensional inspection, surface imperfections & defects.

- Data on test failures, rejected heats/lots, etc.

- Information on production and shipping

- All other reports and results required as per this specification.

The certificates shall be valid only when signed by the Purchaser's Representative. Only those pipes, which have been certified by the Purchaser's Representative, shall be dispatched from the pipe mill.

In the event of small quantities of pipes supplied against this specification, the production report may consist of only test certificates required as per clause 10.1.3 of API Specification 5L and as modified herein and other test reports/results required as per this specification.

16. INSPECTION OF FIELD TESTS & WARRANTY

Purchaser shall be reimbursed by Manufacturer for any pipe furnished on this order that fails under field hydrostatic test if such failure is caused by a material/ manufacturing defect in the pipe. The reimbursement cost shall include pipe, labour and equipment rental for finding, excavating, cutting out

and installation of replaced pipe in position. The field hydrostatic test pressure will not exceed that value which will cause a calculated hoop stress equivalent to 95% of specified minimum yield strength.

In case Manufacturer so desires, he will be advised at least two weeks in advance so that his Representative may witness the hydrostatic test in field, however, the testing and leak (if any) finding and repair operation shall not be postponed because of absence of the Manufacturer's Representative.

Annex B
Manufacturing Procedure Qualification for PSL 2 Pipe

B.1 INTRODUCTION

B.1.1 This annex specifies additional provisions that apply for the PSL 2 pipes ordered as per this specification.

B.1.2 Two lengths each of completely finished pipes from two different heats (i.e. a total of four pipe lengths) shall be selected at random for testing as per clause B.5.1 of this specification to verify that the manufacturing procedure results in the quality of pipes which are in complete compliance with this specification. The pipes thus tested shall be considered to be the test pipes required per heat or per lot as per relevant clauses of this specification.

These manufacturing procedure qualification tests (MPQT) shall be repeated upon any change in the manufacturing procedure as deemed necessary by Purchaser Representative. The manufacturing procedure qualification tests shall be carried out on pipes for each wall thickness, each diameter and each grade of steel.

B.1.3 Verification of the manufacturing procedure shall be by qualification in accordance with clause B.3, B.4 and B.5 of API Specification 5L and as modified herein.

Note: In the event of small quantities of pipes (i. e. less than 50 numbers) ordered against this specification, like those for bends and other similar applications, as specifically called out in the Purchase Order, the manufacturing procedure qualification test as per clause B.5.1 of this specification shall not be carried out. Pipes in such case shall be accepted based on regular production tests.

B.3 CHARACTERISTICS OF THE MANUFACTURING PROCEDURE SPECIFICATION

Before pipe production commences, Manufacturing Procedure Specification (MPS) for manufacturing of pipes and Statistical process control charts shall be prepared by pipe manufacturer (including all information as per clause B.3 a), b) and f) of API Specification 5L) and submitted for approval of the Purchaser.

B.5 MANUFACTURING PROCEDURE QUALIFICATION TESTS (MPQT)

B.5.1 For the qualification of the manufacturing procedure, all tests & inspections specified in Table 18 and clause B.5.2 of this specification shall be conducted on all the pipes selected for testing as per clause B.1.2 of this specification.

B.5.2 The Manufacturer shall submit to Purchaser a report giving the results of all tests mentioned below. The report shall be agreed and signed by Purchaser Representative, prior to start of regular production.

The various tests to be conducted on each pipe shall be as follows. The test method and acceptance values shall be as per this specification unless specified differently in this Annex.

a. **Visual Examination**

All pipes shall be examined visually for dimensional tolerances and apparent surface defects

b. Ultrasonic Examination

All pipes shall be examined ultrasonically by automatic ultrasonic equipment.

c. Mechanical Properties

The mechanical properties of all pipes shall be tested and shall meet the requirements of this specification. Purchaser Representative will select the places in pipe from where the test specimen shall be removed.

The following tests shall be conducted:

i) Tensile test

Tensile tests as per Table 20 and clause 10.2.3.2 of this specification shall be conducted on:

Two (2) transverse specimen for pipes of D> 219.1mm

Two (2) longitudinal specimen

ii) CVN impact tests

Five (5) sets of three transverse specimens shall be extracted from base metal for CVN impact tests including fracture toughness testing. The specimen shall be tested at -40°C, -20°C -10°C, 0°C, +20°C for shear area and absorbed energy to produce full transition curve. The value for shear area and absorbed energy at the test temperature specified in clause 9.8 and Table 8 of this specification respectively shall be complied with. For other temperatures, test values shall be for information only.

iii) Hardness test

Hardness test shall be conducted on selected pipes as per requirement of clause 10.2.4.8 of this specification.

In addition to the above tests, all the tests and inspections required to be conducted as per this specification shall be conducted on all the pipes selected for testing during MPQT.

Annex C
Treatment of Surface Imperfections and Defects

C.1 TREATMENT OF SURFACE IMPERFECTIONS

Surface imperfection not classified as defect as per this specification shall be cosmetically dressed—out by grinding.

C.2 TREATMENT OF DRESSABLE SURFACE DEFECTS

C.2.3 Complete removal of defects shall be verified by local visual inspection and by suitable non-destructive inspection. To be acceptable, the wall thickness in the ground area shall be in accordance with clause 9.11.3.2 of this specification.

Annex E
Non-destructive Inspection for Pipe Not Required to Meet Annex H, J, or N

The Purchaser reserves the right to depute its Representative(s) to perform inspection and witness tests in all phases of manufacturing and testing starting from steel-making to finished line pipe ready for shipment. Manufacturer shall comply with the provisions regarding inspection notice, plant access, compliance and rejection mentioned in the Annex Q (New) of this specification. The Manufacturer shall give the Purchaser reasonable notice of the starting date of normal production and the work schedule. Any action or omission on part of Purchaser's Representative shall not relieve the Manufacturer of his responsibility and obligation to supply material in strict accordance with this specification.

E.1 QUALIFICATION OF PERSONNEL

E.1.1 All personnel performing NDT activities shall be qualified in the technique applied, in accordance with latest edition of ISO 9712, ISO 11484 or ASNT No. SNT-TC-1A or equivalent.

All NDT shall be performed in accordance with written procedures. These procedures shall have prior approval of the Purchaser.

Inspector Qualification

Acceptable qualification for NDT inspectors shall be as specified below:

(i) For UT

For UT, at least one Level III qualified inspector shall be available to the mill for overall supervision. Level III inspectors shall be ASNT Level III or ACCP Professional Level III and certified in applicable method.

A level II inspector is required for shift supervision and calibration of all systems (both manual and automated).

(ii) For all other NDT methods

Evaluation of indications: Level II and Level III inspector

E.3 METHODS OF INSPECTION

E.3.1 **General**

E.3.1.2 All SMLS pipes shall be non-destructively inspected full length (100%) in accordance with applicable methods given in Table E.2 of API Specification 5L using automatic ultrasonic equipment in accordance with clause E.5 and as modified herein.

E.3.3 **Pipe End Inspection — SMLS Pipe**

E.3.3.1 Pipe ends not covered by automatic ultrasonic equipment shall be inspected by manual ultrasonic equipment with same sensitivity and capability as automatic equipment, or, such non-inspected pipe end shall be cut-off. Records in accordance with E.5.4 of API Specification 5L shall be maintained.

E.3.3.2 Ultrasonic inspection in accordance with the method described in ISO 10893-8 shall be used to verify that the 50 mm (2.0 in) wide zone at each pipe end is free of any laminar imperfections in the circumferential direction.

E.3.3.3 Bevel face at each pipe end shall be magnetic particle inspected for the detection of laminar imperfections in accordance with ISO 10893-5.

E.5 ULTRASONIC AND ELECTROMAGNETIC INSPECTION

E.5.1 **Equipment**

E.5.1.1 In addition to the API Specification 5L requirements, all automatic ultrasonic equipment shall have an

alarm device, which continuously monitors the effectiveness of the coupling.

The equipment for the automatic inspection shall allow the localization of both longitudinal and transverse defects corresponding to the signals exceeding the acceptance limits of the reference standard. The equipment shall be fitted with a paint spray or automatic marking device and alarm device for areas giving unacceptable ultrasonic indications. All ultrasonic testing equipment shall be provided with recording device.

E.5.2 **Ultrasonic and Electromagnetic Inspection Reference Standards**

E.5.2.1 The reference standard shall be, according to the cases, taken from the production to be controlled, and of such dimensions as to allow the static and dynamic calibration of the control system.

E.5.2.3 **Reference Standards**

The primary reference sensitivity level shall be adjusted on the following reference reflectors:

Examination Type	**Seamless**
Lamination Detection	FBH (6.4 mm)
Surface Defect Detection	Notch N5
Defect Detection of Body and Pipe Ends	Notch N5

Acceptance limit signals shall be equal to the primary reference sensitivity level.

Flat Bottomed Holes (FBH) for lamination detection shall be drilled to the mid-wall position.

E.5.3 **Instrument Standardization**

E.5.3.2 The instrument shall be calibrated with appropriate reference standard (refer E.5.2 of API Specification 5L and as modified herein) under the same inspection conditions of pipes of normal production at following intervals:

- Once at the beginning of each operating shift (12 hours maximum).

- Once in between of each operating shift i.e. 3 hrs to 4 hrs after the first.

- Every time there is change in probes or working condition of the UT machine.

- Every time the running of the system gives rise to doubts on its efficiency.

If during the calibration verification, it is found that notches or holes of the reference standard are not revealed or if the signals caused by notches and holes of the calibration samples do not switch on the automatic alarm or marking and selection device, all pipes already checked from the previous verification shall be re-inspected at manufacturer's cost.

E.5.5 **Acceptance Limits**

E.5.5.1 For all examination types, indications exceeding the acceptance limit signals are unacceptable. For lamination detection in seamless pipe body and pipe ends, the acceptance limits shall be based on the lamination size and frequency as given below:

Any lamination in the body of the pipe exceeding both of the following is considered a defect:

a) Greater than or equal to 12.0 mm in the minor dimension.

b) Greater than or equal to 5000 mm2 in area.

Any lamination or inclusion either extending into the face or bevel of the pipe or present within 50 mm of pipe ends is classified as defect and treated in accordance with clause E.10 (c) or (d) of API Specification 5L.

Bevel face at each pipe end shall be magnetic particle inspected for the detection of the laminar imperfections in accordance with ISO 10893-5.

E.5.6 **Disposition of Defects Found by Ultrasonic and Electromagnetic Inspection**

Disposition of any imperfection in pipe that produces an indication greater than the acceptable limits of this specification shall be classified as defect and shall be given disposition as specified in (c) or (d) of E.10 of API Specification 5L.

E.5.8 **Laminar Imperfection in the Pipe Body**

The individual laminations exceeding the acceptance limits as given in clause E.5.5.1 of this specification shall be classified as defects.

Compliance with such requirements shall be verified by ultrasonic inspection in accordance with ISO 10893-8 amended as follows:

— The distance between adjacent scanning tracks shall be sufficiently small to ensure detection of minimum allowed imperfection size.

The minimum coverage during automatic inspection shall be > 25 % of the pipe surface.

E.5.9 **Suspect pipe**

Pipe giving rise to indications producing a trigger/ alarm condition as a result of the specified non-destructive inspection operation shall be deemed suspect. Locations showing indications above the acceptance limits during ultrasonic inspection shall be re-examined by radiography. If no defects are located during re-examination, the original findings may be ignored. Additional scanning may be requested by the Purchaser Representative to check questionable areas.

E.7 RESIDUAL MAGNETISM

E.7.2 The longitudinal magnetic field shall be measured on all sizes of pipes. Measurement on pipe in stack shall not be considered valid. Such measurements shall be taken on the root face or square cut face of finished plain-end pipes.

E.7.3 Measurements shall be made using Hall — effect gaussmeter only.

E.7.4 Measurements shall be made on each end of a pipe for 5% of the pipes produced but at least once per 4 hr per operating shift (12 hrs maximum).

E.7.6 Four readings shall be taken approximately 90° apart around the circumference of each end of the pipe. The average of the four readings shall not exceed 2.0 mT (20 gauss) and no single reading shall exceed 2.5 mT (25 gauss). All residual magnetism measurements shall be recorded.

E.10 DISPOSITION OF PIPES CONTAINING DEFECTS

e) The repaired area shall be 100% rechecked by magnetic particle or ultrasonic inspection to ensure complete removal of defects. However, for repair of cosmetic type of defects, not be conducted if so directed by Purchaser's Representative on case to case basis. The pipes having a thickness less than the minimum allowed in accordance with this specification, after repair by grinding shall be treated for disposition in accordance with (c) or (d) of clause E.10 of API Specification 5L.

E.11 SUPPLEMENTARY NON-DESTRUCTIVE INSPECTION

E.11.1 Pipe shall be 100% ultrasonically inspected for the detection of transverse imperfections and inclined embedded defects in accordance with ISO 10893-10 acceptance level U2/C.

E.11.1 Pipe shall be full-body inspected using the flux leakage method in accordance with ISO 10893-3 acceptance level F2 for the surface testing of the pipes for longitudinal and transverse imperfections.

Annex Q
Purchaser Inspection

Q.1 INSPECTION NOTICE

Advance notice shall be given by the manufacturer prior to the start of production to the purchaser to inspect/witness the manufacturing activities including tests.

Q.2 PLANT ACCESS

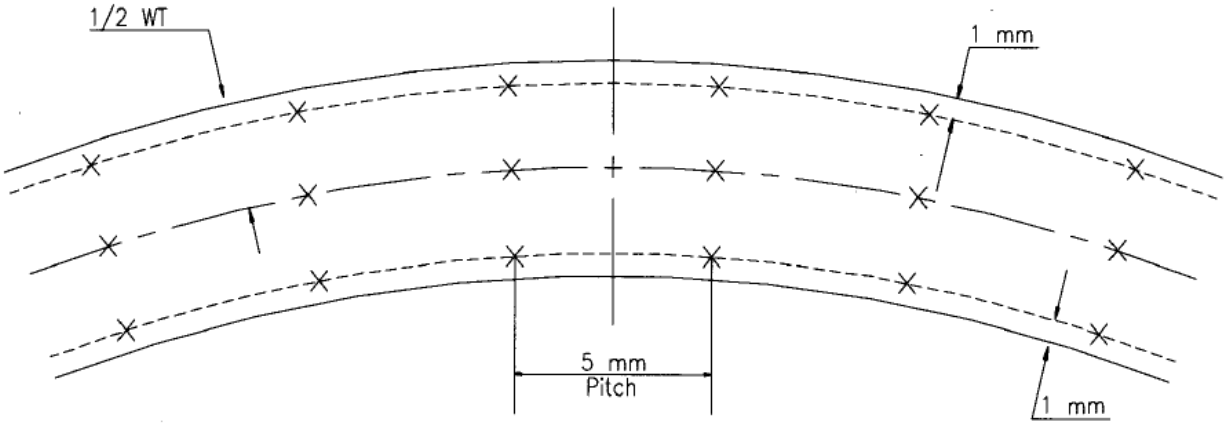
The inspector representing the purchaser shall have unrestricted access, at all times while work of the contract of the purchaser is being performed, to all parts of the manufacturer's works that will concern the manufacture of the pipe ordered. The manufacturer shall afford the inspector all reasonable facilities to satisfy the inspector that the pipe is being manufactured in accordance with this specification. All inspections should be made at the place of manufacture prior to shipment, unless otherwise specified on the purchase order, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Q.3 COMPLIANCE

The manufacturer is responsible for complying with all of the provisions of this specification. The purchaser may make any investigation necessary to be satisfied of compliance by the manufacturer and any reject any material that does not comply with this specification.

Q.4 REJECTION

If the Purchaser Representative rejects pipes repeatedly for any recurring cause, this shall be adequate reason to refuse final inspection of subsequent pipes until the cause has been investigated and corrective action taken by the Manufacturer.



Notes:

1. Number of hardness measurement required on each specimen shall be min. 12.

FIGURE 10.2.4.8.1

LOCATIONS FOR HARDNESS MEASUREMENT

STANDARD SPECIFICATION FOR PAINTING

P-SPC-410

Rev.	Date	Purpose	Prepared by	Reviewed by	Approved by	Approved by
0	04.01.22	ISSUED AS STANDARD SPECIFICATION	RK	MD	AD	SK

CONTENTS

1.0 GENERAL

1.1 This technical specification shall be applicable for the work covered by the contract, and without prejudice to the provisions of various codes of practice, standard specifications etc. It is understood that contractor shall carry out the work in all respects with the best quality of materials and workmanship and in accordance with the best engineering practice and instructions of Engineer-In-Charge.

Wherever it is stated in the specification that a specific material is to be supplied or a specific work is to be done, it shall be deemed that the same shall be supplied or carried out by the contractor. Any deviation from this standard without written deviation permit from appropriate authority will result in rejection of job.

1.2 SCOPE

1.2.1 Scope of work covered in the specification shall include, without being limited to the following.

1.2.2 This specification defines the requirements for surface preparation, selection and application of primers and paints on external surfaces of equipment, vessels, machinery, piping, ducts, steel structures, external & internal protection of storage tanks for all services, MS Chimney without Refractory lining and Flare lines etc. The items listed in the heading of tables of paint systems is indicative only, however, the contractor is fully responsible for carrying out all the necessary painting, coating and lining on external and internal surfaces as per the tender requirement.

1.2.3 Extent of Work

1.2.3.1 The following surfaces and materials shall require shop, pre-erection and field painting:

a. All un-insulated C.S. & A.S. equipment like columns, vessels, drums, storage tanks (both external & internal surfaces), heat exchangers, pumps, compressors, electrical panels and motors etc.

b. All un-insulated carbon and low alloy piping, fittings and valves (including painting of identification marks), furnace ducts and stacks.

c. All items contained in a package unit as necessary.

d. All structural steel work, pipe, structural steel supports, walkways, handrails, ladders, platforms etc.

e. Flare lines, external surfaces of MS chimney with or without refractory lining and internal surfaces of MS chimney without refractory lining.

f. Identification colour bands on all piping as required including insulated aluminium clad, galvanised, SS and nonferrous piping.

g. Identification lettering/numbering on all painted surfaces of equipment/piping insulated aluminium clad, galvanized, SS and non-ferrous piping.

h. Marking / identification signs on painted surfaces of equipment/piping including hazardous service.

i. Supply of all primers, paints and all other materials required for painting (other than Owner supplied materials)

j. Over insulation surface of equipments and pipes wherever required.

k. Painting under insulation for carbon steel, alloy steel and stainless steel as specified.

l. Painting of pre-erection/fabrication and Shop primer.

m. Repair work of damaged pre-erection/fabrication and shop primer and weld joints in the field/site before and after erection as required.

n. All CS Piping, equipments, storage tanks and internal surfaces of RCC tanks in ETP plant.

1.2.3.2 The following surfaces and materials shall not require painting in general. However, if there is any specific requirement by the owner, the same shall be painted as per the relevant specifications:

a. Un-insulated austenitic stainless steel.
b. Plastic and/or plastic coated materials
c. Non-ferrous materials like aluminum.

1.2.4 Documents

1.2.4.1 The contractor shall perform the work in accordance with the following documents issued to him for execution of work.

a. Bill of quantities for piping, equipment, machinery and structures etc.
b. Piping Line List.
e. Painting specifications including special civil defence requirements.

1.2.5 Unless otherwise instructed, final painting on pre-erection/ shop primed pipes and equipments shall be painted in the field, only after the mechanical completion, testing on systems are completed as well as after completion of steam purging wherever required.

1.2.6 Changes and deviations required for any specific job due to clients requirement or otherwise shall be referred to PLECO for deviation permit.

2.0 CODES & STANDARDS

Without prejudice to the specifications of the contract, the following codes and standards shall be followed for the work covered by this contract.

IS: 5 Colors for ready mixed paints and enamels.

RAL DUTCH International Standard for colour shade (Dutch Standard)

IS: 101 Methods of test for ready mixed paints and enamels,

IS: 161 Heat resistant paints.

IS: 2074 Specifications for ready mixed paint, red oxide zinc chrome priming.

IS: 2379 Color code for identification of pipelines.

IS: 2932 Specification for enamel, synthetic, exterior (a) undercoating. (b) Finishing.

3.0 CONDITIONS OF DELIVERY

Packaging

Every recipient will be fitted with a hermetically-sealed lid with an opening that is sufficiently large to allow the contents to be stirred: the outside and inside are protected against oxidation, and, the lid, are marked with a strip of color identical to the contents.

4.0 COMPOSITION OF THE PAINT PRODUCTS USED

a) Quality

The composition and quality of the products may not differ from batch to batch. A batch is all of the products of a specified manufacture. If the analyses of products bring to light that the composition does not conform to the specifications of the paint manufacturer, the OWNER may refuse to use this batch of products. The paint products must comply with the following conditions

- They must have the viscosity necessary for the described use and the established condition: use of the brush - paint roller (spray gun only for special cases and in the workshop)

b) Quality control - Sampling

While the works are in progress on the construction site, the OWNER may carry out sampling on the paint being used for the purpose of checking conformity. The paint products must be made available free of charge to the laboratory or the approved supervisory body in sufficient quantities so that all the tests can be carried out on the same batch.

If analyses reveal a non-conformity in the composition of the products used (tolerance of $\pm$ 3 % of the dosage of every component), the OWNER may refuse application of the product under consideration, halt the work and have the nonconforming product already applied removed.

Before proceeding the work, a product that does conform will be required. The only Purpose of the analysis is to reveal any nonconformity of the composition of the products. Their purpose is therefore not to assess the quality of the different components. The analyses concerned are not acceptance tests of the products supplied and in no way affect the obligations of the contractor specified in the contract towards the OWNER.

5.0 IDENTIFICATION

Every recipient will bear the following information:

- Name of the manufacturer
- Date and number of manufacture
- Name of the product type
- Batch no
- Net weight of the produced or the contents of the recipient
- Date of the expiry.

At the time of delivery, this packaging must bear labels in conformity with the legal stipulations in force.

Leaving the site after work

After completion of a job a general clean-up shall be carried out by the Contractor to remove all debris, materials or irregularities that his work has brought to the site so that it is left tidy:

The restoration work includes among other things:

- The removal of abrasives.
- The removal of the different protective coverings.
- The Contractor will make the required repairs to any damage after refitting the supports.
- The removal of paint and cleaning of the stains on the floor.

6.0 SURFACE PREPARATION STANDARDS

Following latest edition of standards shall be followed for surface preparations:

1. Swedish Standard Institution- SIS-05 5900-1967/ISO 8501-1
2. Steel Structures Painting Council, U.S.A. (Surface Preparation Specifications (SSPC-SP)
3. British Standards Institution (Surface Finish of Blast-cleaned for Painting) BS-4232.
4. National Association of Corrosion Engineers. U.S.A. (NACE).
5. IS-1477-1971 (Part-1) - Code of Practice for Painting of Ferrous metals in Buildings. (Part 1, Pre-treatment)

    a) The contractor shall arrange, at his own cost to keep a set of latest edition of above standards and codes at site.

    b) The paint manufacturer's instruction shall be followed as far as practicable at all times. Particular attention shall be paid to the following:

- Proper storage to avoid exposure as well as extremes of temperature.
- Surface preparation prior to painting.
- Mixing and thinning.
- Application of paints and the recommended limit on time intervals between coats.

c) Any painting work (including surface preparation) on piping or equipment shall be commenced only after the system tests have been completed and clearance for taking up painting work is given by the OWNER, who may, however, at his discretion authorize in writing, the taking up of surface preparation or painting work in any specific location, even prior to completion of system test.

7.0 PREPARATION OF THE SURFACES

7.1 General Specifications

The cases that occur in practice on building sites, with regard to painted surfaces, can be broken down as follows:

- Material of which the oxide content disappears by natural oxidation.
- Material that has already been covered with a layer of paint in the workshop.
- Material that is covered with old paint layers that show different degrees of weathering.

Good preparation of surface is the best guarantee for good anti-corrosion protection.

Paintwork may never begin until the surface to be treated is dry and is independent of the base coat and cleared of dirt, dust, rust, scale, grease, salt attack, cement powder, cement mud-scale, sand, oil, etc.

Based on the environmental conditions of coastal and saline nature, the Painting specification for station pipes defines the complete requirements like:

- Surface preparation standards like NACE etc.
- Sand blasting process
- Color Codes for piping
- Paint materials types and their DFT measurement.
- Selection and application of paints on external surfaces.

The pipeline passes through the coastal and marine environment, the **Table-4** of this specification to be followed for the painting works.

The method of preparation of the surface will be implemented in accordance with the preparation methods described below:

- Bright blast-cleaning
- Mechanical or Power tool cleaning
- Manual or hand tool cleaning

The Contractor should have the required material at his disposal to clean the surfaces to be coated thoroughly in accordance with the preparation methods regardless of the form or the condition of such surfaces. The cleaning devices that might be damaged during the surface preparation shall be screened off by the Contractor.

7.2 Air blast cleaning with abrasive

Before beginning cleaning by blasting, the person carrying out the work will take the following measures:

- Clear the steel surface of oil and/or grease;
- Ensure that each flange collar (section where the sealing is applied) is properly screened off against the blasting and the subsequent works;
- Check that no blasting grains can act into the pipes during this process. Any openings not sealed off must be screened off;
- Where there are valves, regulators and other devices, the manufacturer's identification plate will be dismantled so that all surfaces can be treated. The plate will then be put back again.
- Screen off all non-metal structures such as rubber where there is a filter;
- With valves, operators and other devices, care should be taken to ensure that no metal filings or paint get into the apparatus:
- The OWNER reserves the right to carry out part or all of these works himself.

To prevent rust forming quickly as the result of humidity on the blasted surface, cleaning by blasting may only be carried out when the temperature of the steel surface is at least 3°C higher than the dew-point of the ambient air.

Blasting may not be carried out if the relative degree of humidity exceeds 80%. The choice of the type of blasting medium used depends on local circumstances such as the possible presence of gas and the material to be blasted.

The abrasive to be used must conform to the local law i.e. it may contain no carbon and less than 1% free silicon dioxide. The Sa 3 will always be requested and must at least reach Sa 2½ during the initial stage of the paintwork. For blasting followed by metallization, the surface preparation degree to be achieved is always Sa 3. The degree of cleanliness to be obtained will be inspected in accordance with the Swedish standard SVENSK STANDARD ISO 8501-1-1988 SIS 05.5900.

- Sa 3: surface blasted down to the bare metal; when the surface is inspected with a magnifying glass, scale, rust and foreign bodies must be completely removed and it should be possible to raise a metallic -shine on the treated surface.

- Sa 2 1/2: blasted very carefully. Scale, rust and foreign bodies must be removed in such a way that anything left behind will only be visible as nuances (shading) or strips.

The blast-cleaning will be carried out by means of compressed air free of water and oil.

After the blasting and before painting, the surface should be completely cleaned of blasting material and so forth with a soft brush, a dry cloth or dry compressed air.

7.3 Mechanical or Power tool cleaning

If sandblasting is not permitted or if the metal structures are not easily accessible for blasting or blasting for one reason or other is technically unfeasible, mechanical de rusting can be used instead. With mechanical cleaning by means of chipping, rotating steel brushes and sanding discs, a degree of cleanliness St. 3 should be reached.

St 3: removal of the old paint layers of which the adhesion leaves something to be desired and/or of which the paint layer no longer fulfills the requirements.

If parts are present that are so corroded that St 3 is difficult to achieve, this should be notified to the OWNER representative prior to the start of the works.

N.B:
St. 3: means removal of every old paint layer. Retouching means local polishing with St. 3 or Sa 3 followed by application of the desired painting system.

After mechanical cleaning, the surface should be made dust-flee with a cloth or a so brush, washed with an organic solvent and thoroughly dried off with a dry cloth (e.g. with 1.1.1. Trichoroethane such as Solvethane, Chloroethene).

7.4 Manual or Hand tool cleaning

Manual derusting with the aid of scrapers. steel brushes, sandpaper etc. shall only be permitted in exceptional cases for local repairs. Any deviation there from must be requested from the OWNER/ OWNER 's Representative.

With manual derusting, a surface preparation degree St 3 must be obtained. The length of the handles of the equipment used may not exceed 50 cm.

7.5 Preparation of a surface covered with a layer of paint in the workshop.

This layer is in general applied by the manufacturer, for example, on valves, regulators etc. Layers of this kind will be checked for their proper adhesion in accordance with ASTM D 3359, method A (Standard Test Method for measuring adhesion by tape test). The adhesion should be at least.

If the paint layer shows less adhesion or is incompatible with the rest of the system it should be completely removed. If the paint layer is not removed, the Contractor accepts it in the state in which the coating is found and the guarantee remains in force. The adhesion does not have to be examined if system 63 has already been applied in the workshop on behalf of the OWNER.

The Contractor, who must provide for the protection on the construction site, must therefore obtain the information regarding the treatment of the surface and the quality of the paint that was used and must, moreover, examine the adhesion of the layer on the construction site, the percentage of damage and weathering as well as the value of the preparation of the surface in the workshop together with the thickness thereof that must be supplemented if necessary.

a) Galvanized surface

Galvanized surfaces, both old and new will be carefully roughened up. Every foreign body (concrete splatters, chalk marks, grease and oil stains, etc.) will be removed. Thereafter, rub the surfaces with abundant water and, if necessary, with cleaning products.

To this end, nylon brushes will be used for every kind of dirt as well as for removing zinc salt residue. Thereafter, the surfaces will be treated in accordance with system 21. Where the zinc layer is lacking, it will be derusted manually to a degree of cleanliness St 3, after which a primer coat will be applied in accordance with system 22.

b) Metallized surfaces treated with an impregnation layer

- Degrease with the desired degreasing product:
- Clean under high pressure or with a product prescribed by the paint supplier.

If the paint layer adheres well and is applied on a clean base, the painting system described may be continued. If the percentage of damage and weathering does not exceed 5 % m. retouching may be considered. These partial repairs will be carried out.

If on the other hand, the percentage of damage does exceed 5 %/m or if the layer applied in the workshop comes loose the Contractor must draw the attention of the OWNER to this and carry out the complete application system.

7.6 Preparation of surfaces covered with earlier paint layers that show different degrees of weathering.

If the surfaces do not show deep weathering limited to the spread of rust by small pitted areas or non-penetrative rust in spots, it will very often be sufficient to clean the surfaces with abrasives or with an abrasive disc, then to rub them down with steel wool, remove the dust and wash off. If thick rust appears, in spots, scale rust and active rust canker, this should be removed with needle hammers or stripped away directly by blasting, removing the dust and washing off.

7.7 Preparation of concrete or cement plaster surfaces

Remove unsound paint layers and loose components with scrapers, blades or rotating steel brushes. Thoroughly clean the entire surface with water containing ammonia. Thoroughly remove moss, algae and fungal growths. Where these growths have been removed, treat the area with a fungicide in accordance with the instructions for use.

Once the entire area is completely dry, brush off the dead residue of moss, algae and fungus with a hard brush. In the case of reinforcement steel that has been laid bare, remove as rust, dust and grease as possible and treat with a printer coat. When painting concrete surfaces, they must first be checked for cracks. Cracks larger than 0.3 mm must be repaired with an appropriate system in accordance with the type and extent of the repairs (e.g. injection with epoxy mortar). Repair damage such as cracks and bursts to concrete parts with a two-component mortar or preferably with micro-mortars. Finally check the alkalinity of the surface with the aid of litmus paper and neutralize it if necessary.

7.8 Use of solvents

It is sometimes necessary to use solvents when the surfaces to be painted are streaked with grease or oil. In this case a suitable organic solvent should be applied. The operation should be carried out with the aid of clean brushes or rags and clean solvent.

All the legal specifications in connection with solvents etc. must be adhered to. The OWNER/OWNER's Representative will be informed in advance of any toxicity or flammability. All measures must be taken to prevent any risk of fire and to nick out any possibility of poisoning (ventilation). The Contractor will provide drip collectors to keep the environment free of pollution.

7.9 Condition of the metal after stripping

The Contractor must call in a representative of the OWNER/OWNER's representative or of the Approved supervisory Body responsible for checking the condition of the metal during stripping and informing the OWNER/OWNER's representative immediately of any damage that he might have noticed.

- Deep corrosion of the plates - rivets - bolts
- Faulty welding
- Fittings that appear to be dangerous because of their age.

7.10 Removing coating from surface pipelines

The Contractor must have the equipment necessary for the removal of asphalt from the pipe without damaging the latter (scratching, impact, etc,). The Contractor undertakes to carry out the work in accordance with an approved procedure.

TABLE-1 (FOR CLAUSE 7.0)
SURFACE PREPARATION STANDARDS

SL. NO.	DESCRIPTION	VARIOUS INTERNATIONAL STANDARDS (EQUIVALENT)			REMARKS
		ISO 8501-1/ SIS-05 59 00	SSPC-SP, USA	NACE, USA	
1	Manual or hand tool cleaning Removal of loose rust, loose mill scale and loose paint, chipping, scrapping, standing and wire brushing. Surface should have a faint metallic sheen	ST.2	SSPC-SP-2	-	This method is applied when the surface is exposed to normal atmospheric conditions when other methods cannot be adopted and also for spot cleaning during maintenance painting.
2	Mechanical or power tool cleaning Removal of loose rust loose mill scale and loose paint to degree specified by power tool chipping, de-scaling, sanding, wire brushing and grinding, after removal of dust, surface should have a pronounced metallic sheen.	ST.3	SSPC-SP-3	-	
3	Dry abrasive Blast cleaning There are four common grades of blast cleaning				

3.1	White metal Blast cleaning to white metal cleanliness. Removal of all visible rust. Mill scale, paint & foreign matter 100% cleanliness with desired surface profile.	SA 3	SSPC-SP-5	NACE#1	Where extremely clean surface can be expected for prolong life of paint system.
3.2	Near white metal Blast cleaning to near white metal cleanliness, until at least 95% of each element of surface area is free of all visible residues with desired surface profile.	SA 2½	SSPC-SP-10	NACE#2	The minimum requirement for chemically resistant paint systems such as epoxy, vinyl, polyurethane based and inorganic zinc silicate paints, also for conventional paint systems used under fairly corrosive conditions to obtain desired life of paint system.
3.3	Commercial Blast Blast cleaning until at least two-third of each element of surface area is free of all visible residues with desired surface profile.	SA 2	SSPC-SP-6	NO.3	For steel required to be painted with conventional paints for exposure to mildly corrosive atmosphere for longer life of the paint systems.
3.4	Brush-off Blast Blast cleaning to white metal cleanliness, removal of all visible rust, mill scale, paint & foreign matter. Surface profile is not so important.	SA 1	SSPC-SP-7	NO.4	

8.0 METALLISATION

8.1 Applying the metallization

Metallization must be carried out in accordance with ISO 2063,

Metallization is carried out as rapidly as possible after blasting in order to limit corrosion of the pipes (max. 3 hours later). With metallization, a surface preparation degree Sa 3 is compulsory. The roughness of the blasted surfaces should be from 25 to 50µ R_{Max}.

- The metallizing is always carried out on dry parts in good weather conditions (maximum relative humidity 80 %);

- For metallization, a wire composed of 85 % zinc and 15 % aluminum with a minimum guaranteed degree of purity of 99.5 % is used (subject to other specifications). The application thereof is always carried out in accordance with the conditions of the manufacturer and may at all times be submitted to the OWNER's representative.

- The sealant should be applied maximum 3 hours alter metallization.

- The sealant must be thinned and applied as per the present specifications. A visual inspection whereby the sealant completely covers the metallization will suffice here.

- When evaluating the metallization, a negative deviation from the minimum coating thickness, to 80 µ for 20% of the measurements will be permitted.

9.0 COATING PROCEDURE AND APPLICATION

9.1 Conditions for carrying out paintwork

Painting may not be carried out in unsuitable conditions.

All preparatory work and painting may only he carried out in dry weather and at a minimum temperature of 108C, except for special eases requested by the OWNER's Representative.

Unless otherwise stipulated in the specifications of the paint supplier, application of the paint is forbidden if it is forecast that the temperature will fall to below 08C before the paint is dry. The temperature of-the surface to be painted must be at least 3°C higher than the dew point of the ambient air. Application of the paint is also not permitted if there is a danger that the coat of paint will not be dry before dew or condensation sets in.

The work must be stopped:

- If the temperature of the surface to be painted is higher than that described by the supplier.

- In rain, snow, mist or fog or when the relative humidity is higher than 80 %.

Coats that have not yet dried and have been exposed to frost, mist, snow or rain and might thereby be damaged must be removed after drying and the surfaces must be repainted at the expense of the Contractor.

Working in direct sunlight or in hot weather must be avoided,

The first coat of paint must be applied maximum 3 hours after the preparation of the surface of the relative humidity of the air is between 50% and 80%. This time span may be increased to 6 hours if the relative humidity is less than 50%. In all cases, the preparation of the surface must exhibit degree Sa 3 and at the very least the appearance of degree Sa 2 ½ at the time of painting.

The coats of paint may only be applied on carefully cleaned surfaces that must be dry and free of grease and dust.

9.2 Special conditions

Painting may be carried out when the Contractor can be sure that the instructions of the paint supplier have been scrupulously followed with regard to the parameters in the following (non-exhaustive) list:

- Ambient temperature.
- Surface temperature.
- Relative humidity.
- Dew point.
- Drying times.

The Contractor must in this respect be able to produce the instructions for the paint on the site. The OWNER/CONSULTANT will guarantee 100% supervision in this regard during the execution of the work.

In addition, the paintwork may only be carried out to a minimum ambient temperature of 5°C and/or to a maximum relative degree of humidity of 85 %. Application of the paint is also not permitted if there is a danger that the coat of paint will not be dry before dew or condensation sets in.

10.0 PAINT MATERIAL

Manufacturers shall furnish the characteristics of all paints indicating the suitability for the required service conditions. Primer and finish coats shall be of class-I quality and shall conform to the following:

a) Primer (P-1)

Red oxide Zinc Chromate Primer

Type and Composition	Single pack, Modified phenolic alkyd medium pigmented with red oxide and zinc chromate.
Volume solids	30 - 35% (min)
DFT	25 microns/coat (min)
Covering capacity	12 - 13 M^2/Lit/coat

b) Primer (P-2)

High build chlorinated rubber zinc phosphate primer

Type and Composition	Single pack, Air Drying Chlorinated rubber medium Plasticized with unsaponifiable plasticiser pigmented with zinc phosphate

Volume solids	35 - 40% (min)
DFT	30 - 40 microns/coat (min)
Covering capacity	7 - 8 M^2/Lit/Coat

c) Primer (P-3)

High build zinc phosphate primer

Type and Composition	Single Pack, Synthetic medium, pigmented with zinc phosphate.
Volume solids	40 - 45% (min)
DFT	35 - 50 microns/coat (min)
Covering capacity	10 - 12 M^2/Lit/coat
Heat resistance	Upto 80 ºC (dry)

d) Primer (P-4)

Etch Primer / Wash Primer

Type and Composition	Two pack Poly vinyl butyral resin medium cured with phosphoric acid solution pigmented with zinc tetroxy chromate.
Volume solids	7 - 8% (min)
DFT	8 - 10 microns/coat (min)
Covering capacity	7 - 8 M^2/lit/coat

e) Primer (P-5)

Epoxy Zinc Chromate Primer

Type and Composition	Two packs, Polyamide cured epoxy resin medium pigmented with zinc chromate.
Volume solids	40 % (min)
DFT	35 microns/coat (min)
Covering capacity	11 - 12 M^2/lit/Coat

f) Primer (P-6)

Epoxy Zinc Phosphate Primer

Type and Composition	Two packs, Polyamide cured Epoxy resin medium pigmented with zinc phosphate.
Volume solids	40% (min)

DFT	35 - 50 microns/coat (min)
Covering capacity	11 - 12 M^2/lit/coat

g) Primer (P-7)

Epoxy high build M10 Paint (Intermediate Coat)

Type and composition	two pack Poly Polyamide cured epoxy resin medium pigmented with micaceous iron oxide. Volume solids 7- 8%
Volume Solids	50% (min)
DFT	100 microns/coat (min)
Covering capacity	5.0 M^2/lit/coat

h) Primer (P-8)

Epoxy Red Oxide zinc phosphate primer

Type and Composition	two pack. Polyamine cured epoxy resin pigmented with Red oxide and Zinc phosphate.
Volume solids	42% (min)
DFT	30 microns/coat (min)
Covering capacity	13 - 14 M^2/lit/coat

i) Primer (P-9)

Epoxy based tie coat (suitable for conventional alkyd based coating prior to application of acrylic polyurethane epoxy finishing coat)

Type and Composition	Two packs, Polyamide cured epoxy resin medium suitably pigmented.
Volume solids	50 - 60% (min)
DFT	50 microns/coat (min)
Covering capacity	10 - 12 M^2/Lit/Coat

j) Finish Coats (F-1)

Synthetic Enamel

Type and Composition	Single pack, Alkyd medium pigmented with superior quality water and weather resistant pigments
Volume solids	30 - 40% (min)
DFT	20 - 25 microns/coat
Covering capacity	16 - 18 M^2/lit/Coat

k) Finish coat (F-2)

Acrylic Polyurethane paint

Type and Composition	Two pack, Acrylic resin and iso-cyanate hardener suitably pigmented.
Volume Solids	40% (min)
DFT	30 - 40 microns / coat
Covering Capacity	10 - 12 M^2/lit/ coat

l) Finish Coat (F-3)

Chlorinated Rubber Paint

Type and Composition	Single pack, Plasticised chlorinated rubber medium with chemical & weather resistant pigments.
Volume solids	40% (min)
DFT	30 - 40 microns/coat (min)
Covering capacity	8 - 10 M^2/lit /coat

m) Finish Coat (F-4)

High build chlorinated rubber M10 paint.

Type and Composition	Single pack Chlorinated rubber based high build pigmented with micaceous iron oxide.
Volume solids	40 - 50% (min)
DFT	65 - 75 microns/coat
Covering capacity	6.0 - 7.0 M^2/lit/coat

n) Finish coat (F-5)

Chemical Resistant Phenolic based Enamel

Type and Composition	Single pack phenolic medium suitably pigmented.
Volume solids	35 - 40% (min)
DFT	25 microns/ coat
Covering capacity	15.0 M^2/lit/coat

o) Finish Coat (F-6)

Epoxy High Building Coating

Type and Composition	Two pack. Polyamide-amine cured epoxy resin medium suitably pigmented.
Volume solids	60 - 65% (min)

DFT	100 microns/coat (min)
Covering capacity	6.0 - 6.5 M^2/lit/coat

p) Finish Coat (F-7)

High build Coal Tar Epoxy

Type and Composition	Two pack, Polyamine cured epoxy resin blended with Coal Tar.
Volume solids	65% (min)
DFT	100 - 125 microns/coat
Covering capacity	6.0 - 6.5 M^2/lit/coat

q) Finish Coat (F-8)

Self-priming epoxy high build coating (complete rust control coating)

Type and Composition	Two packs. Polyamide-amine cured epoxy resin suitably pigmented. Capable of adhering to manually prepared surface and old coatings.
Volume solids	65 - 80% (min)
DFT	125 - 150 microns/coat
Covering capacity	4 - 5 M^2/lit/coat

r) Finish Coat (F-9)

Inorganic Zinc Silicate coating

Type and Composition	Two packs, self-cured solvent based inorganic zinc silicate coating.
Volume solids	60% (min)
DFT	65 - 75 microns/coat
Covering capacity	8 - 9 M^2/lit/coat

s) Finish coat (F-10)

High build Black

Type and Composition	Single pack. Reinforced bituminous composition phenol based resin.
Volume solids	55 - 60% (min)
DFT	100 microns/coat (min)
Covering capacity	5.5 - 6.0 M^2/lit/coat

t) Finish Coat (F-11)

Heat Resistant Aluminium Paint Suitable up to 250°C.

Type and Composition	Duel container (paste & medium). Heat resistant spec varnish medium combined with aluminium flakes.
Volume solids	20 - 25% (min)
DFT	20 microns/coat (min)
Covering capacity	10 - 12 M^2/lit/coat

u) Finish Coat (F-12)

Heat Resistant Silicon Paint suitable up to 400º C.

Type and Composition	Single pack Silicone resin based with aluminium flakes.
Volume solids	20 - 25% (min)
DFT	20 microns/coat (min)
Covering capacity	10 - 12 M^2/lit/coat

v) Finish Coat (F-13)

Synthetic Rubber Based Aluminium Paint Suitable up to 1508C.

Type and Composition	Single Pack, Synthetic medium rubber medium combined with leafing Aluminium,
DFT	25 microns/coat (min)
Covering capacity	9.5 M^2/lit/coat

Notes:

1 Covering capacity and DFT depends on method of application Covering capacity specified above is theoretical. Allowing the losses during application, min specified DFT should be maintained.

2. All paints shall be applied in accordance with manufacturer's instructions for surface preparation, intervals, curing and application. The surface preparation quality and workmanship should be ensured.

3. Selected chlorinated rubber paint should have resistance to corrosive atmosphere and suitable for marine environment,

4 All primers and finish coats should be cold cured and air-drying unless otherwise specified.

5. Technical data sheets for all paints shall be supplied at the time of submission of quotations.

6. In case of use of epoxy tie coat, manufacturer should demonstrate satisfactory test for inter coat adhesion. In case of limited availability of epoxy tie coat (P-9) alternate system may be used taking into the service requirement of the system.

7. In case of F-6, F-9, F-1 1 & F-1 2 Finish Coats, No Primer are required.

11.0 MANUFACTURERS

The paints shall conform to the specifications given above and Class-I quality in their products range of any of the-following manufacturer or other approved vendors:

i) Asian Paints (India) Ltd.
ii) Bombay Paints
iii) Berger Paints India Ltd.
iv) Akzo Nobel
v) Jenson & Nicholson
vi) Shalimar Paints

STORAGE

All paints and painting material shall be stored only in rooms to be provided by contractor and approved by OWNER/ OWNER 's Representative for the purpose. All necessary precautions shall be taken to prevent fire. The storage building shall preferably be separate from adjacent, building.

A signboard bearing the words given below shall be clearly displayed outside:
PAINT STORAGE No NAKED LIGHT highly -inflammable

12.0 COLOR CODE FOR PIPING:

i) For identification of pipelines, the color code as per Table -1 shall be used.

ii) The color code scheme is intended for identification of the individual group of the pipeline. The system of color coding consists of a ground color and color bands superimposed on it.

iii) Colors (Ground) as given in Table-2 shall be applied throughout the entire length of un insulated pipes, on the metal cladding & on surfaces. Ground color coating of minimum 2m length or of adequate length not to be mistaken as color band shall be applied at places requiring color bands. Color bands shall be applied as per approved procedure.

iv) Line coating shall meet DIN 30670 standard for external coating and API 5L RP – 2 for internal coating.

v) The thickness for the epoxy should be 180 microns, adhesive 200 microns and balance should be PE .

vi) The minimum coating thickness on weld seam shall be 3.2 mm and minimum coating thickness on body should be 3.2.

vii) Minimum thickness for liquid epoxy for internal coating should be 100 ± 20 microns.
Max design temperature for coating should be considered +80 ºC.

COLOR CODE:

A) Ball Valve (Above Ground) : Off White
B) Globe Valve (Above Ground) : Oxford Blue-RAL 5005, IS-519941005

C) Check Valve(Above Ground) : Oxford Blue-RAL 5005, IS-519941005
D) Launcher / Receiver : Yellow Golden
E) Jib Crane / Trolley : Yellow Golden
F) All underground valves shall have epoxy base coating after surface finish of SA 2:5
G) Valves and above ground pipes need to be properly blasted to achieve surface finish of Sa 2:5 before the application of paints.

Table 12.1 Colour Coding Scheme for Pipes and Equipment

Sl. No.	**Description**	**Ground Color**	**First Color Band**	**Second Color Band**
1	**COMPRESSED AIR**			
a)	Plant Air	Sky Blue	Silver Grey	-
b)	Instrument Air	Sea Green	Black	-
2	GASES			
a)	Charge Gas	Canary Yellow	Signal Red	Smoke Grey
b)	Regeneration Gas	Canary Yellow	White	Dark Violet
c)	Residue Gas	Canary Yellow	White	French Blue
d)	LPG	Canary Yellow	Brilliant Green	White
e)	Acetylene	Canary Yellow	Dark violet	-
	Flare Lines	Heat resistant aluminium		
f)	Fire water and Foam & Extinguisher	Post office red		
3	ALL EQUIPMENT			
a)	Vessels. Columns, exchangers, etc. containing non- hazardous fluids.	Light Grey		
b)	Base Frame/Structure	Black		
b)	All equipment containing hazardous fluids	Canary Yellow		

c)	Pipe carrying hazardous fluids	Bar is to be replaced by Hazardous Marking as per IS:2379 Clause 7.1C		

IDENTIFICATION SIGN

i) Colors of arrows shall be black or white and in contrast to the color on which they are superimposed.

ii) Product names shall be marked at pump inlet, outlet and battery limit in a suitable size as approved by OWNER.

iii) Size of arrow shall be either of the following:

a) Color Bands

Minimum width of color band shall be as per approved procedure.

b) Whenever it is required by the OWNER to indicate that a pipeline carries a hazardous material, a hazard marking of diagonal stripes of black and golden, yellow as per IS:2379 shall be painted on the ground color.

IDENTIFICATION OF EQUIPMENT

All equipment shall be stenciled in black or white on each vessels, column, equipment, and painting as per approved procedure.

INSPECTION AND TESTING

1. All painting materials including primers and thinners brought to site by contractor for application shall be procured directly from manufactures as per specifications and shall be accompanied by manufacturer's test certificates Paint formulations without certificates are not acceptable.

2. The painting work shall be subject to inspection by OWNER/ OWNER's Representative at all times. In particular, following stage wise inspection will be performed and contractor shall offer the work for inspection and approval at every stage before proceeding with the next stage.

In addition to above. record should include type of shop primer already applied on equipment e.g. Red oxide zinc chromate or zinc chromate or Red lead primer etc.

Any defect noticed during the various stages of inspection shall be rectified by the contractor to the entire satisfaction of OWNER/ OWNER's Representative before proceeding further. Irrespective of the inspection, repair and approval at intermediate stages of work. Contractor shall be responsible for

making good any defects found during final inspection/guarantee period/defect liability period as defined in general condition of contract. Dry film thickness (DFT) shall be checked and recorded after application of each coat and extra coat of paint should be applied to make-up the DFT specified without any extra cost to OWNER.

PRIMER APPLICATION

i. The contractor shall provide standard thickness measurement instrument with appropriate range(s) for measuring.

Dry film thickness of each coat, surface profile gauge for checking of surface profile in case of sand blasting. Holiday detectors and pinhole detector and protector whenever required for checking in case of immerse conditions.

ii. At the discretion of OWNER/ OWNER's Representative, contractor has to provide the paint manufacturers expert technical service at site as and when required. For this service, there should not be any extra cost to the OWNER.

iii. Final Inspection shall include measurement of paint dry film thickness, check of finish and workmanship. The thickness should be measured at as many points/ locations as decided by OWNER/ OWNER's Representative and shall be within +10% of the dry film thickness.

iv. The contractor shall produce test reports from manufacturer regarding the quality of the particular batch of paint supplied. The OWNER shall have the right to test wet samples of paint at random for quality of same. Batch test reports of the manufacturer's for each batch of paints supplied shall be made available by the contractor.

18.0 PAINT SYSTEMS

The paint system should vary, with type of environment envisaged in and around the plants. The types of environment as given below are considered for selection of paint system. The paint system is also given for specific requirements.

a) Normal Industrial Environment, Table 18.2.
b) Corrosive industrial Environment, Table 18.3
c) Coastal & Marine Environment, Table 18.4

Notes 1. Primers and finish coats for any particular paint systems shall be from same manufacturer in order to ensure compatibility.

TABLE 18.1: LIST OF PRIMERS & FINISH PAINTS

PRIMERS	
P-1	Red oxide Zinc chromate Primer
P-2	Chlorinated rubber zinc Phosphate Primer
P-3	High build Zinc phosphate Primer
P-4	Etch Primer/Wash Primer
P-5	Epoxy Zinc Chromate Primer

P-6	Two component Epoxy Zinc Phosphate Primer cured with polyamine hardener
P-8	Epoxy red oxide zinc phosphate primer
FINISH COATS / PAINTS	
F-1	Synthetic Enamel
F-2	Two component Acrylic – Polyurethane finish paint
F-3	Chlorinated Rubber finish paint
F-5	Chemical resistant phenolic based enamel
F-6	High Build Epoxy finish coating cured with **polyamide** hardener
F-7	High build Coal Tar Epoxy coating cured with **polyamine** hardener
F-8	Self priming surface Tolerant High Build epoxy coating. cured with **polyamine** hardener
F-9	Two component Inorganic Zinc Silicate coating
F-10	High build Reinforced bituminous composition phenol based resin.
F-11	Heat resistant synthetic medium based Aluminium paint suitable for 250 deg C
F-12	Two component Heat resistant Silicone Aluminium paint. suitable for 400 deg C
F-13	Synthetic based aluminium Paint suitable for 150 deg C

Table – 18.2: Painting System for Normal Industrial Environment for Piping and Equipment (Above Ground)

Sl. No.	Temp. Range	Surface Preparation	Primer	Finish Coat	Total DFT	Remarks
1	-10 to 20	SSPC-SP-3	One coat P-2 50 microns / coat (min)	One coat F-4 65 microns/ coat (min) Two coats F-3, 30 Microns/coat (min)	175	Primer and Finish coat can be applied at ambient temp.
2	21 to 60	SSPC-SP-6	Two coats P-1, 25 microns/ coat (min.)	Two coats of F-1, 20 microns/coat (min)	90	-
3	61 to 80	SSPC-SP-6	Two coats P-3, 50 microns/ coat (min)	Two coats of F-13, 25 microns/coat (min)	150	-
4	81 to 250	SSPC-SP-6	-	Three coats of F-11, 20 microns/ coat (min)	60	Paint application at ambient temp. curing at elevated temp. during start-up.
5	251 to 400	SSPC-SP-10	-	Three coats of F-12, 20 microns/ coat (min)	60	-do-

Table – 18.3: Painting System for Corrosive Industrial Environment for Piping and Equipment (Above Ground)

Sl. No.	Temp. Range	Surface preparation	Primer	Finish Coat	Total DFT	Remarks
1	-14 to 80	SSPC-SP-10	Two coats P-6, 35 microns / coat (min.)	One coats F- 6, 100 microns coat (min.) and one coats F- 240 microns coat (min.)	210	Paint application at ambient temp.

2	81 to 250	SSPC-SP-10	-	Three coats F-11, 20 Microns / coat (min.)	60	Paint application at ambient temp. and curing at 250°C for 4 hours
3	81 to 400	SSPC-SP-10	-	Three coats F-12, 20 Microns / coat (min.)	60	Paint application at ambient temp. and curing at 250°C for 4 hours

Table – 18.4 : Painting System for Coastal and Marine Environment for Piping and Equipment (Above Ground)

Sl. No.	Temp. Range	Surface Preparation	Primer	Finish Coat	Total DFT	Remarks
1	-14 to 80	SSPC-SP-10	Two coats P-6. 35 Microns. coat (Min.)	Two coats F-6, 100 microns /coat (min.) and one coats F-2 40 Microns /coat (min.)	310	Primer and Finish coat application at Ambient temp.
2	81 to 400	SSPC-SP-I0	-	- Three coats F- 12, 20 Microns / coat (min.)	60	Paint application. at ambient temp, and curing at 250°C for 4 hours
3	401 to 550	SSPC-SP- 10	-	Three coats F-12, 20 Microns / coat (min.	60	Paint application. at ambient temp, and curing at 250°C for 4 hours

Table – 18.5 : Painting System for External Side of Underground Tanks in all areas.

Sl. No.	Temp. Range	Surface Preparation	Primer	Finish Coat	Total DFT	Remarks
External side of un-insulated underground storage tanks:						

1	-40 to 80	SSPC-SP-10	1 coat of F-9 @ 65-75µ DFT/ coat	3 coats of F-7 @ 100µ DFT/coat (3x100=300)	365-375	

18.2 Precautions to be taken

Neither the environment of the site nor the marking labels of devices may be covered with paint nor must they be kept free of paint splashes. To this end, it is advisable to use removable masking tape.

Paint splashes, leaks, etc. on any adjacent installations such as measuring apparatus, valves, pipes. Sources of light, insulation, heat insulators, walls, concrete, etc, must immediately be wiped up and the damage repaired before the paint is dry.

Otherwise, the OWNER will be obliged to have the cleaning carried out at the expense of the Contractor. The paint recipient will only be opened at the time of use (unless otherwise specified by the manufacturer).

The product will be mixed in the recipient with the aid of suitable tools and thus homogenized.

18.3 Method of application

Normally, three methods of application will be used on the construction site for the paint products. i.e. with a brush, with a roller or with a spray gun.

- The brush method makes it possible to obtain good penetration of the paint over irregularities in the metal.
- Only this method will be used for application of the base coats, for retouching and for protrusions, welded areas, riveted joints or bolted joints:
- The roller method may be used on large flat surfaces for the intermediate and topcoats.
- The spray gun method must be used in accordance with the instructions of the manufacturer and carried out by qualified personnel.

The Contractor must guarantee that all safety measures have been taken for such work. The spray gun method may only he used on site for places that are difficult to reach with the brush. In this case, a request must be made to the OWNER/ OWNER's Representative for a deviation.

All paintwork will be carried out with good brushes or rollers that are suitable for the type of paint being used and for the form of the material to be painted and fitted with short handles. The maximum length of the brush and roller handles will be 50 cm; longer handles may only be used for places that are absolutely inaccessible. The maximum width of a brush will be 13 cm.

18.4 Application of the coating

Application of the paint will be carried out in accordance with best practice in order to obtain a homogeneous and continuous layer. The OWNER or the Approved Supervisory body demands that

painting of a layer will only be started after acceptance by them of the surface preparation or of the previous layer of paint.

The layers of paint must have a uniform thickness. They must he spread in such a way that all concave parts are dried out and that the surface is completely covered and has a glossy appearance without leaving brush marks and without exhibiting bubbles, foam, wrinkles, drips, craters, skins or gums that arise from weathered paint,

Each layer must have the color stipulated in the tables of the present specifications, which clearly differs from the previous layer, taking account of the Color of the top layer, all of which for the purpose of being able to identify the number of coats and their order of sequence. If the color of the coats is not mentioned in the tables the color difference in consecutive coats must, if possible, he at least 100 RAL. The color of the top layer is given in the table.

The coating power should be such that the underlying layer is not visible. Only 1 layer per day may be applied, unless otherwise specified by the OWNER or the Approved Supervisory Body.

The drying times prescribed by the paint manufacturer must be strictly observed in relation to the environmental conditions before proceeding with the application of the next layer.

The dry coating thickness indicated in the description of the paint systems are minimum thickness. In this connection, the Contractor is obliged to contact the paint manufacturer and conform to his guidelines. The Contractor must respect the thickness specified by the supplier.

18.5 Transporting treated items

In the case of works being carried out in a workshop, the metal structures will be surrounded by ventilated contraction film that prevents damage during transportation. This film may only be applied after complete polymerization of the paint.

19.0 GROUND-LEVEL TRANSITION POINT

19.1 Polyester protection system

The Contractor will provide system 02 over the entire length of the pipes above ground and below ground and up to a height of 20 cm and a depth of 40 cm. perpendicular to the ground level mark. In each case, he must ensure that the jointing below the asphalt is in good condition and assures' faultless adhesion. He will apply the following products over the entire surface area, prepared in accordance with is Sa 3:

1) The primer of system 01.

2) Reinforced polyester ± 20 cm above the ground level marker and ± 5 cm on the asphalt cleaned beforehand (application of reinforced polyester is carried out in accordance with the work method prescribed by the manufacturer). Moreover, in the case of PE, in contrast to asphalt, he will apply a polygon primer to PE immediately before applying the reinforced polyester.

3) He will then apply the other coats of system 01a to the surface section and thus cover the reinforced polyester with about 5 cm.

4) For new constructions, the polygon primer will be applied to PE and then subsequently processed as described under point 2.

20.0 USE OF SCAFFOLDING

Mounting, maintenance and dismantling of scaffolding for carrying out adaptation and/or paintwork to surface gas pipes or gas transport installations in use;

- The Contractor will specify the cost of scaffolding in the price list.
- The supplementary rental price for delays attributable to the Contractor will be charged to him:
- In his price quotation the Contractor should present the OWNER with diagrams of the scaffolding that he intends to install for carrying out the works of the OWNER.

21.0 QUALITY CONTROLS AND GUARANTEE

21.1 The Contractor is responsible for checking the weather conditions to ascertain whether the paintwork can be carried out within the technical specifications.

The Contractor should have the required calibrated monitoring apparatus for this purpose on site (with calibration certificates). The personnel who will have to use this apparatus should have the training for this purpose.

The OWNER or his representative and possibly the approved supervisory body indicated by the OWNER will maintain supervision during the works and inspect the works with random checks. A daily report will be drawn up in relation to the department that maintains supervision of these works.

The supplementary inspection and the supervision by the OWNER or the approved supervisory body do not diminish in any way the liability of the Contractor. The proper execution of the work and the materials used may be checked at any time.

21.2 Reference Surfaces

At the start of the works. The OWNER or the approved supervisory body will indicate a few surfaces that the Contractor will prepare and cover in accordance with the recognized method of operation under the inspection and to the satisfaction of all parties; the OWNER or his representative, the approved supervisory body, the contractor and possibly the paint manufacturer. These reference surfaces will serve as a point of comparison for the good adhesion of the paint on the installations as a whole. The parties will together work out a system for the identification of these surfaces in order to be able to monitor the conditions of the coatings over time. If the paintwork on a section of the installations is in a worse condition than the reference surfaces, the Contractor may be obliged to treat these parts again.

21.3 Measures to be taken in the event of a dispute

If on delivery of the works no agreement can be reached between the Contractor and the OWNER regarding the conformity of the works to the requirements of these specifications, an Approved Supervisory Body will he Called in. The Approved Supervisory Body will then carry out inspections' on site whereby the following assessment criteria will be used:

- The Swedish standards ISO 8501-1 1988 SS 05.5900 concerning the degree of cleanliness of the areas derusted by blasting, by machine or by hand.
- The wet film thickness of the paint will be measured in accordance with ISO 2808 or ASTM DI 212;
- The dry layer thickness of the film will be measured electronically, will complete statistical information. in accordance will, ISO 2808 or ASTM D 1186.
- The thickness of each layer will be measured in accordance with ISO 2808. ASTM 4138 or DIN 50986.
-
- Adhesion tests will be carried out in accordance with ISO 2409. ASTM 3359 or DIN 53151.
- Traction tests will he carried out in conformity with ISO 4624 or ASTM D 4541.
- The rugosity will be measured electronically in accordance with DIN 4768;
- The non-porosity will be measured with a test tension depending on the type of coating, the layer thickness and after consultation with the Paint manufacturer.
- Any defects in the paint film may be inspected visually by means of a magnifying glass or microscope. If necessary a photographic report may be drawn up in accordance with ASTM Standard D 4121-82.

The final judgment of the Approved Supervisory Body is irrevocable and binding for the Contractor and the OWNER. In the event of non-conformity of the works with the criteria of these specifications, all costs arising from the inspection by the Approved Supervisory Body shall be borne by the Contractor.

21.4 Guarantee

a) General Principles

The Contractor declares that he is aware of:

- The maximum operating temperature of the surfaces to be covered.
- The maximum permitted degree of humidity of the bearing surface.
- The properties of the environment to which the surfaces to be covered are: subject.

b) Summary of the Guarantee.

The contractor fully guarantees the following without reservation:

- The observance of all stipulations of the specifications for paintwork regarding, among other things:

- The preparation of the surfaces.
- The thickness of each layer.
- The total thickness of the covering.

- The uniformity of the materials used.

- The repair of all defects before delivery of the works.

The Contractor will carry out the requested repair work as promptly as possible.

STANDARD SPECIFICATION
FOR
GAS OVER OIL ACTUATOR

I-SPC-024

Rev.	Date	Purpose	Prepared by	Reviewed by	Approved by
0	04.02.23	ISSUED AS STANDARD	SC	JS	AD

ABBREVIATIONS

ANSI	:	American National Standards Institute
ASME	:	American Society of Mechanical Engineers
ASTM	:	American Society of Testing and Materials
API	:	American Petroleum Institute
FAT	:	Factory acceptance Test
IEC	:	International Electro-technical Commission
IS	:	Indian Standards
NACE	:	National Association of Corrosion Engineers
ISO	:	International Organization for Standardization
IP	:	Ingress Protection
SS	:	Stainless Steel
SAT	:	Site Acceptance Test
NPT	:	Nominal / National Pipe Thread
OD		Outer Diameter

CONTENTS

1.0 SCOPE

This Standard Specification, together with the Data Sheets attached herewith, establishes the minimum technical and functional requirements for design, engineering, materials, fabrication, inspection and testing, documentation, marking, packing and shipping of Gas over Oil Actuator along with its accessories.

2.0 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

Owner/ Purchaser/ Company	Owner of the particular Project (Project Specific).
Consultant	The party which comes out all or part of the engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
Bidder/ Manufacturer / Supplier / Vendor	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.
Works/ Shop	The place where the ITEM / UNIT is fabricated and tested and transported to Purchaser.
Datasheet	Technical data provided by the Purchaser / Owner / Company.
Standard Specification	Specifications Developed as Standard by the Company.
Job Specification	Specifications Developed pertaining to particular project / Job in regard.
Material Requisition	Requisition as raised to Supplier for Quotation of the item
Purchase Requisition	Requisition as raised to Supplier for Procurement of the item
Purchase Order	Legal Order supplied to Supplier for procurement of the Engineered Item
Site	The work place where the equipment is installed and commissioned.

3.0 REFERENCE DOCUMENTS

3.1. Codes & Standards

The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the Purchaser's enquiry.

American Society for Mechanical Engineers (ASME)

ASME B 1.20.1	Pipe Threads, General Purpose (Inch)
ASME B 31.3	Process Piping
ASME B 31.4	Pipeline transportation systems for liquid hydrocarbons and other liquids
ASME B 31.8	Gas Transmission And Distribution Piping Systems
ASME B16.5	Pipe flange and flange fittings Valves Flanged, threaded and weld ended
ASME Sec V	Non - destructive examination
ASME Sec VII Div-1	Rules for construction of Pressure Vessels
ASME Sec VIII	Boiler and Pressure Vessels code & Sec- IX
ASME Sec IX	Welding and Brazing qualification

American Petroleum Institute (API)

API 6D	Specification for Pipeline valves

International Electro-technical Commission (IEC)

IEC 60079	Electrical apparatus for explosive gas atmosphere
IEC 60529	Degrees of protection provided by enclosures (IP Code)

National Association for Corrosion Engineers

NACE MR-0175	Material Requirements - Sulphide Stress Cracking Resistant Metallic Materials for Oilfield Equipment

3.2. Order of Precedence

In the event of conflict between Specifications, Data Sheets, related standards, codes etc., and the order of precedence shall be as follows:

a. Data sheets
b. Job Specifications
c. Standard Specifications
d. Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

4.0 MATERIAL

Materials selected shall be in accordance with the Data Sheets and Company's Standard specifications. For Corrosion service the material selected shall be in compliance with the requirements of NACE MR-0175 / IS0-15156 latest editions.

5.0 DESIGN

The following design requirement covers the general requirements of Gas over Oil Actuator. But for the exact requirements and applications, the relevant specific project Specifications and design basis shall be referred and complied.

5.1. General

The basic requirements for Actuators are as follows:

A. Actuator shall be Gas over Oil type, quarter turn operation type

B. Actuator torque shall be, minimum 1.25 times the maximum valves break torque required at full rated differential pressure of valve.

C. Vendor shall indicate actuator model no., valve torque and actuator torque figures in a tabular form along with the quotation. Vendor shall submit the form for Buyer's review

The torque figure shall be expressed in Newton Metres (NM) and shall be given for the following valve positions:

I. Start to open torque (Breakaway torque)

II. Lowest running torque during opening of the valve

III. End of opening torque (Valve fully open)

IV. Start to close torque (Breakaway torque)

V. Lowest running torque during closing of valve

VI. End of closing torque (Reset torque, valve fully closed)

In addition, the maximum torque the valve shaft can withstand shall be stated. The results of the actuator sizing calculations, together with the selected actuator type / size and above stated torque figures, shall be submitted for approval.

D. Pneumatic connections shall be of 3/8" NPT (F) size as minimum. Pneumatic tubing shall be SS-316L, 3/8" 00 x 0.065" WT minimum, exact size shall be decided based on actual requirements.

E. Valve with actuator shall be suitable for installation in horizontal pipeline.

F. All Pneumatic tube fittings shall be of SS-316L and of SWAGELOK / PARKER make.

G. All accessories as applicable shall be mounted on the SS back plate, which in turn shall be mounted on the actuator.

H. Actuators shall be equipped with adjustable stoppers for opening and closing of the valves. At normal operating conditions these stoppers at the actuators shall be limiting the opening and closing of the valves

l. The actuator local control panel shall be weatherproof to IP-66 as a minimum. The logic components / tubing inside the panel shall be of SS-316L materials as minimum. All the electrical components mounted inside the panel shall be intrinsic safe and shall be certified by a statutory body like UL / BASEEFA or Equal.

   Local/ Remote selector switch shall be provided on the actuator control panel for local/ Remote operation.

   The Control logic shall enable the following:

   a. Local and Remote operation of the Valve.

   b. Local Function shall include open/close facilities.

   c. Remote function shall facilitate remote closure and opening of the valve (without any manual intervention if all the process interlocks are met). In case electrical signal to solenoid valve fails, the valve shall remain in the last position and shall not be "Closed" i.e. "Stay Put Position".

   d. Manual local hydraulic operation of the valve, with hand pumps, in case of non-availability of the pneumatic (gas).

   e. High differential pressure inhibit switch shall inhibit the operation of the valve, when the differential pressure becomes high.

   f. Close command (or open command) shall be inhibited during valve opening (or valve closing) and be made effective only after 100% opening (or closing) is achieved.

Gas storage tank and Hydraulic cylinders shall be sized so that the Actuator / operator shall be capable of minimum, two open & close operations in the event of loss of line pressure.

Vendor shall supply gas filter regulators to derive power gas pressure to required level for the operation of the logic. Actuator sizing shall be based on minimum gas pressure as indicated in Data Sheet.

Solenoid Valves shall be mounted inside the actuator control panel for the remote open/close operation of the Valve actuators. Solenoid Valves shall be intrinsically safe and certified.

Proximity type switches shall be provided for indication of Valve position. These shall be mounted in intrinsic safe enclosure and certified.

Fire proof enclosures for actuators and controls, shall be provided by the Vendor High differential pressure inhibit switch shall be provided on the actuator control panel. The switch shall be intrinsically safe and certified.

All equipment and accessories shall be tropicalized and provided with anticorrosion protection, suitable for use in corrosive atmosphere.

Steel castings, if any, of actuators shall be radio graphically examined.

The opening / closing timings for gas over oil-actuated valves shall be 45 seconds unless otherwise specified.

Material for Studs shall be ASTM A193, Grade B7 and Nuts material shall be ASTM A 194 Grade 2H.

Vendor shall provide the following contacts for Purchaser's use.

a. Local/Remote selector switch in REMOTE position

b. High differential pressure

c. Valve OPEN indication

d. Valve CLOSE indication

All the contacts and the "Remote Open & Closed" commands shall be provided at a terminal block in the actuator control panel.

Vendor shall provide 6 Nos. plus one spare W' NPT (F) cable entry on the Actuator control panel.

5.2. Name Plate

Each Control Valve shall have a SS name plate attached firmly to it at a visible place, furnishing the following information:

a. Tag number as per Data Sheet

b. Body and port sizes in inches.

c. Stem travel in millimetres

d. Action on air failure

e. Spring range

f. Air supply pressure.

g. Manufacturer's model number for the Valve body, actuator and positioner.

6.0 FABRICATION AND PAINTING

Vendor shall obtain approval in writing from the Purchaser before start of fabrication of Gas over Oil Actuator. Vendor shall submit the required Specification, drawings & documents for approval. Also, Vendor shall refer the relevant codes and standards for manufacturing herein. Painting of Gas over Oil Actuator Shall be in accordance with Standard Painting Specifications.

All equipment's and Valves shall be coated with anticorrosive paints for a corrosive, near shore environment. Vendor in compliance with the written procedures recommended by the Manufacturer shall prepare his own coating procedures including surface preparation and application of coating and curing. Vendor's painting/coating system shall be submitted along with the bid for Purchaser's review and approval. All material shall be new, clean and free from rust, pits and obvious defects.

7.0 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per job Specification requirements, and as per relevant codes, prior to shipment. The inspection and testing for Gas over Oil Actuator shall be carried out as per approved Inspection and Test Plan. Vendor shall submit the Inspection and Testing Plan for Proprietary items / Special items for Approval.

Vendor shall submit the test certificates to the Company for the tests conducted during the manufacturing process like hydro test, material test, hazardous area certification test, calibration test and any other before Factory Acceptance Testing (FAT).

7.1. Factory Acceptance Testing (FAT)

Prior to FAT, Vendor shall submit to the Company a detailed FAT procedure, for review and approval, listing all the Gas over Oil Actuator complete with the project approved tags, and highlighting the inspection and testing requirements of all such devices. FAT shall be carried out as per approved Inspection and Test Plan. FAT shall be carried out prior to shipment of the Gas over Oil Actuator.

FAT procedures shall be submitted at least 4 weeks prior to FAT testing taking place. FAT shall be carried out at the manufacturing facilities. The tests shall be witnessed by the Company or their approved representative. FAT procedure will be signed off by the

Vendor and Company or their approved representative at the successful completion and conclusion of testing.

The FAT shall be consisting of the following as a minimum:

a. Visual Inspection

b. Dimensional check

c. Chemical and mechanical properties as per relevant material standards.

d. Calibration

e. Actuator functional test shall be carried out by mounting the actuator on a test rig and applying the pneumatic fluid pressure. The actuator shall be successfully stroked at least five times for open and close by suitably applying the pneumatic fluid pressure. Actuator position indication shall be checked for correct operations during the test.

f. Non-destructive examination of individual actuator material and components consisting of but not limited to castings, forgings, plate and assembly welds shall be carried out by the Manufacturer.

g. All casting of pressure containing parts shall be radio graphically examined as per ASTM E94 and E186 / E280 or E446 as applicable, at quality level 2-2T. Category A, B or C defects shall not exceed the severity level for Class 2. Category D, E, F or G defects shall not be accepted.

    i. All forgings shall be ultrasonically examined to ASTM E609. Quality 1 will be the minimum level of acceptance.

    ii. All machined surfaces shall be liquid penetrant examined as per ASTM E165. Surface discontinuities shall not be acceptable.

    iii. Sealing areas within the actuator body shall be completely inspected by magnetic particle methods in accordance with ASTM E709. Surface discontinuities shall not be acceptable

Complete actuator housing with internals including the open / close hydraulic circuits of all actuators shall be subjected to a hydrostatic pressure test by applying 1.5 times the actuator design pressure for a minimum period of 2 hours. Chart recorder shall monitor pressure. No leakage shall be permitted during the hydrostatic test. for a minimum period of 2 hours. Chart recorder shall monitor pressure. No leakage shall be permitted during the hydrostatic test.

h. Valve / Actuator assembly test

i. Any other tests

After testing of individual actuators has been completed, the actuators shall be mounted on Valves. Integrated Valve and actuator tests shall be carried out at the Valve Manufacturer's Works, in compliance with the requirements stated in Purchaser Specification for Ball Valves enclosed with the Material Requisition/Purchase Order.

A certificate to detail the results and records obtained during the FAT shall be made available for ratification by the Vendor on the date of test. Following certificates shall be submitted by the Vendor:

a. Mill test certificates relevant to the chemical analysis and mechanical properties of the materials used for the actuator pressure containing parts as per the relevant standards and Specifications.

b. NDT reports for radiography, ultrasonic, magnetic particle and liquid penetrate inspection.

c. Test report on operation of actuators including operating time.

d. Test report on hydrostatic test of actuators.

e. Test report on actuator/valve assembly tests.

f. All other actuator test reports and certificates as required by this Specification.

The certificates shall be valid only when signed by Purchaser's Inspector. Only those actuators which have been certified by Purchaser's Inspector shall be dispatched from Manufacturer's works.

7.2. Site Acceptance Testing (SAT)

A SAT shall be carried out on completion of the installation of the equipment at site which shall be witnessed by the Company / Owner's representative. SAT shall be performed on the Gas over Oil Actuator as per the approved test procedure. A comprehensive test procedure in compliance with the Standard Specification shall be developed and issued to Company / Owner for review and approval.

The Site Acceptance Test (SAT), in general, shall demonstrate that the Gas over Oil Actuator functions correctly and properly in accordance with the specified requirements.

Actuator shall be mounted on the valve and tested as follows:

(For buried valves stem extension shall be installed before testing)

a. Cycle (open and shut) each valve with its actuator, at least five (5) times to ensure smoothness of operation. Valve / Operator shall be adjusted and tested for 100% opening and closing at actuator stoppers. It shall be tested for both Local/Remote operations.

b. Apply the actual differential pressure as given in the Data Sheet, across the Valve and check the Valve operation. Valve operation should not be jerky or binding. This shall be repeated at least 3 times and shutdown time noted at minimum supply pressure.

c. The electrical signal to the solenoid Valves on the actuator control panel shall be disconnected and Valve shall be tested for stay put conditions.

d. Test shall be witnessed by Purchaser or their representatives.

e. Final testing and approval made by Purchaser's representative inspector shall not relieve the Manufacturer from his own responsibilities, guarantees and contract obligations.

8.0 MARKING, PACKING AND SHIPMENT

Following FAT completion, Vendor responsible for Gas over Oil Actuator shall ensure that all equipment and associated materials and accessories are designed properly, marked and packed, and secured for transit to site without damage.

Vendor shall provide and submit his standard 'Marking, Packing and Shipping Procedures' for review by Company / Owner.

Vendor shall specify any conditions, normal or special, to be verified in intermediate storage and during transport.

Equipment shall be suitably packed including any dismantling, transit fastening and bracing necessary to prevent distortion or damage during transit.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the job site.

After inspection and testing, equipment shall be completely free of water and dry before start of preparation for shipment.

Preparation for shipment and packing will be subject to inspection and rejection by Company's / Contractor's inspectors. All costs occasioned by such rejection shall be to account of the Vendor.

9.0 SPARES AND ACCESSORIES

The following spare philosophy shall be followed in case it is not covered in Job Specification.

The Vendor shall include recommended spare parts list for start-up, pre-commissioning and two years operation as per the following:

a. Itemized recommended spare parts list for start-up and pre-commissioning.

b. Itemized recommended spare parts list for two years operation.

Vendor shall recommend accessories and special tools required for operation and maintenance of Gas over Oil Actuator, for Company review.

All the spare parts furnished by Vendor shall be wrapped and packaged to preserve an original as-new condition under normal conditions of storage. The same parts shall be properly tagged with stainless steel tags and coded so that later identification as to their intended equipment usage shall be clear.

All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment.

10.0 DOCUMENTATION

The following documentation shall be fulfilled by the Vendor, if it is not covered in Job Specification.

10.1. Documentation Required with Technical Bid

During bidding stage Vendor shall submit in his offer the following documents as a minimum:

a. Specification, Data Sheets

b. Bill of Materials including Vendor list, details for third party items

c. Catalogues and manuals

d. Test procedures

e. Quality Assurance Plan

f. Control Valve sizing calculations

g. Outline drawings of the assembled unit, showing dimensions, dismantling areas and weights

h. Material of construction of all components of Valves

i. Site Planning, Erection and Installation Procedures

10.2. Documentation Required for Approval

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings, documents and Specifications for the Company's approval:

a. Specifications, Data Sheets

b. Bill of Materials including Vendor list, details for third party items

c. Catalogues, manuals and relevant drawings and documents

d. Dimensional drawings

e. Calibration certificates

f. Material test certificates

g. Procedures for FAT

h. Quality Assurance Plan

i. Field test procedures for existing Valves

j. Functional diagram (pneumatic, hydraulic and electric) pointing out external connections.

10.3. Guarantee / Warranty

Vendor shall guarantee that the complete scope of supply shall be safely and reliably meet all of the requirements of this Company Specification.

Vendor shall provide warranty support for a period of 12 months from the date of supply or 18 months from the date of manufacturing. Warranty shall apply to defective material workmanship and facility design. Warranty work shall be done at Owner's local facilities. The cost of correction I replacement of any warranty items shall be borne by the Vendor.

The job Specifications / Data Sheets shall be referred for any specific warranty I guarantee.

NGN LETEKUJAN TERMINAL UP TO NRL IGGL RT PIPELINE PROJECT

Inspection & Test Plan for GOOV

Doc No.: P158-ITP-I002

REV.	DATE	DESCRIPTION	ORG	REVIEW	APPROVED
CA	28.08.2023	Issued for Client review	SC	NC	AD

CONTENTS

1.0 BACKGROUND

Assam Gas Company Ltd. (AGCL) is a 60-year-old Natural Gas transmission and distribution company, wholly owned by the Govt. of Assam with its registered office at Duliajan, Dist. Dibrugarh, Assam 786602.

The company transports Natural Gas through its integrated pipeline infrastructure to several market segments i.e., Power, Fertilizer, Petrochemicals, Industrial, Commercial and Domestic consumers primarily located in upper Assam. The present infrastructure of the company has a transportation capacity of about 6.0 MMSCM of gas per day.

AGCL plans to extend their existing pipeline to transport natural gas from NGN Letekujan Terminal upto NRL IGGL RT pipeline project of approx. 6km length.

Pipeline Engineering Consultants Pvt. Ltd. has been appointed as Engineering, Procurement and Construction Management consultant by AGCL for Engineering, Procurement, RFP Preparation, Site Supervision and Project Management for the Project.

2.0 DEFINITION

Where used in this document, the following terms shall have the meanings indicated below, unless clearly indicated by the context to this order

PROJECT	NGN LETEKUJAN TERMINAL UP TO NRL IGGL RT PIPELINE PROJECT.
CLIENT/ OWNER	ASSAM GAS COMPANY LIMITED.
EPMC	Pipeline Engineering Consultants Pvt. Ltd. (PLECO) the party to act for and on behalf of OWNER for the Detailed Engineering Services and Project Management.
CONTRACTOR	Agency appointed by CLIENT/ OWNER for execution of assigned tasks
PURCHASER	Either of CLIENT, OWNER or EPMC

2.1 BRIEF DESCRIPTION OF PROJECT

The primary objective of the Project is to transport the volume of 0.19 - 0.28 MMSCMD of natural gas from NGN Letekujan terminal to NRL IGGL receiving station via newly proposed 8” x 6.2 km (approx.) pipeline:

Dispatch Terminal	Receiving Station	Size & length
NGN Letekujan	NRL IGGL	8” x 6.2 km

3.0 QAP FOR INSTRUMENTS

INSTRUCTIONS FOR FILLING UP:
1. QAP shall be submitted for each equipment separately with breakup of assembly / sub-assembly & part/component or for group of equipment having same specification.
2. Use numerical codes as indicated for extent of inspection & tests and submission of test certificates & documents. Additional codes & description for extent of inspection & test may be added as applicable for the plant and equipments.
3. Separate identification number with quantity for equipment shall be indicated wherever equipment having same specifications belonging to different facilities are grouped together.
4. Weight in kilogram must be indicated under column 5 for each item. Estimated weights may be indicated wherever actual weights are not available.

ABBREVIATION USED:
CONTR: Contractor
MFR: Manufacturer
TPI: Third Party Inspection Agency
*: Vendor / Bidder to provide
P: Performer, R: Review; W: Witness

EN 10204, Type 3.2 certificates shall be provided for bought out items. Those shall be inspected by TPI appointed by Vendor

CODES FOR EXTENT OF INSPECTION, TESTS, TEST CERTIFICATES & DOCUMENTS :

CODE DESCRIPTION	CODE DESCRIPTION	CODE DESCRIPTION	CODE DESCRIPTION
1. Visual 2. Dimensional 3. Fitment & alignment 4. Physical Test (Sample) 5. Chemical Test (Sample) 6. Ultrasonic Test 7. Magnetic Particle Test (MPT) 8. Radiography Test 9. Dye Penetrant Test 10. Measurement of IR value a) Before HV Test b) After HV Test 11. High voltage Test / Dielectric Test	12. Routine Test as per relevant IS / other standard 13. Type test as per relevant IS / other standard 14. Impulse Test 15. Partial Discharge Test 16. Heat run risk test / temper 17. Enclosure protection test 18. Calibration 19. Noise & Vibration 20. Test certificate of bought out components 21. Tank pressure test 22. Paint shed vibration	23. Short time rating 24. Operational & functional Test 25. Over speed Test 26. Flame proof Test 27. Clearance and creepage distance 28. Acceptance Test 29. Honing Test 30. Hydro test/ Shell leak Test 31. Pneumatic Seat leak Test 32. Impact test	D1. Approved GA Drawing. D2. Approved single Line / schematic diagram D3. Test certificates D4. Approved Bill of materials D5. Un-priced P.O. copy D6. Calibration certificates of all measuring instrument and gauges.

Equipment Details							Inspection & Test								
							In-Process Stage			Final Inspection					
Sl. No.	Item	Identification Number	Qty	Weight Kg	Exp Date of Inspection	MFR Name & Address	MFR	CONTR & TPI	CLIENT	MFR	CONTR & TPI	CLIENT	Test certificate & Document to be submitted to CLIENT	Acceptance Criteria standards/ IS/BS/ASME/ Norms and documents	Remark / Sampling Plan

1.	GOOV Actuator	Refer P&ID	*	*	*	Client Approved	1, 2, 3, 4, 5-P	-	-	1, 2, 3, 18, 20-P	1, 2, 3, 18, 20-R, 24-W	1, 2, 3, 18, 20, 24-R	1, 2, 3, 4, 5, 18, 20, 24, D3, D6	D3, D6, Tech. Spec	100%

INSPECTION AND TEST PLAN

FOR

BALL VALVE

Rev.	Date	Purpose	Prepared by	Reviewed by	Approved by
0	04.01.22	ISSUED AS INSPECTION AND TEST PLAN	PNS	MD	AD

ABBREVIATIONS:

CE	Carbon Equivalent	NPSH	Net Positive Suction Head
DFT	Dry Film Thickness	PO	Purchase Order
DPT	Dye Penetrant Testing	PESO	Petroleum Explosive Safety Organization
DHT	De-hydrogen Heat Treatment	PQR	Procedure Qualification Record
ERTL	Electronics Regional Test Laboratory	PR	Purchase Requisition
FCRI	Fluid Control Research Institute	PMI	Positive Material Identification
HT	Heat Treatment	RT	Radiography Testing
HIC	Hydrogen Induced Cracking	SSCC	Sulphide Stress Corrosion Cracking
ITP	Inspection and Test Plan	TC	Test Certificate
IP	Ingress Protection	TPI or TPIA	Third Party Inspection Agency
IHT	Intermediate Heat Treatment	UT	Ultrasonic Testing
IC	Inspection Certificate	VDR	Vendor Data Requirement
IGC	Inter Granular Corrosion	WPS	Welding Procedure Specification
MRT	Mechanical Run Test	WPQ	Welders Performance Qualification
NDT	Non-Destructive Testing	MPT / MT	Magnetic Particle Testing

1.0 SCOPE

This Inspection and Test Plan covers the minimum testing requirements of Ball Valves.

2.0 REFERENCES

PO/ PR/ Standards referred there in/ Job specifications/ Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS / METHOD OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT & ACCEPTENCE CRITERIA	FORMAT OF RECORD	SCOPE OF INSPECTION		
						SUB SUPPLIER	SUPPLIER	TPIA
1.0	**PROCEDURES**							
1.1	Hydrostatic Test, Heat Treatment, NDT and Other Procedures	Documented Procedures	100%	-	Procedure Documents	-	H	R
1.2	WPS,PQR & WPQ	Welding Parameters & Qualification Record	100%	-	WPS ,PQR & WPQ	-	H	W- New R- Existing
1.3	Pre-Qualification Tests	Fire safe, Cryogenic & Other Test as applicable	As per PR/Purchase Specification	-	Acceptance Report	-	H	H (If new)
2.0	**RAW MATERIAL**							
2.1	Casting & Forging: Body & Bonnet / Connector	Visual & Dimension	100%	Material & Technical Specification	Inspection Report	H	H	-
		Chemical: Chemical Analysis	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R

		Mechanical: Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
		Impact Test (@ -29°C): for CS Impact Test (@ -45°C): for LTCS	All Heats	Material & Technical Specification/ ASME B 16.34	Test Report	H	R	R
		Non-Destructive Examination (NDT): Radiography (100% Critical Area & BW Ends)	100%	Material & Technical Specification/ ASME B 16.34	RT Report	H	R	R
		Non-Destructive Examination (NDT): Magnetic Particle Examination (100% exterior & accessible interior)	100%	ASME B 16.34	MPI Report	H	R	R
2.2	Forging & Casting: Ball, Seat Ring, Spindle/Stem (Trim Material)	Visual & Dimension	100%	Material & Technical Specification	Inspection Report	H	H	-
		Chemical: Chemical Analysis	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
		Mechanical: Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
		Impact Test (@ -29°C): for CS	All Heats	Material & Technical Specification / ASME B 16.34	Test Report	H	R	R

		Impact Test (@ -45°C): for LTCS						
		Non-Destructive Examination (NDT): Radiography (100% Critical Area & BW Ends)	100%	Material & Technical Specification /ASME B 16.34	RT Report	H	R	R
		Non-Destructive Examination (NDT): Magnetic Particle Examination (100% exterior & accessible interior)	100%	Material & Technical Specification /ASME B 16.34	MPI Report	H	R	R
		ENP (For Ball): Visual, Thickness & Hardness	100%	25 microns (min) & 50 HRC (min)	Vendor Test Certificate	H	R	R
3.0	**INCOMING / BOF ITEMS**							
3.1	Stem	Chemical: Chemical Analysis	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
		Mechanical: Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
3.2	Fasteners	Chemical: Chemical Analysis	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
		Mechanical: Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R

		Impact Test (@ -29°C): for CS Impact Test (@ -45°C): for LTCS	All Heats	Material & Technical Specification /ASME B 16.34	Test Report	H	R	R
3.3	Gaskets, Gear units, Gland, Packings, etc.	Physical / Chemical Properties	100%	Material & Technical Specification	Test Certificates & Lab Report	H	R	R
4.0	**MACHINED COMPONENTS**							
4.1	Body, Connector, Ball & Seat Ring	Surface examination & Dimension Inspection: Visual & Measurement	100%	Manufacturer's Drawing	Inspection Reports	100%	R	R
5.0	**IN-PROCESS**							
5.1	Body & Connector joint welding	Non-Destructive Examination (NDT): Magnetic Particle Examination (MPI)	100%	ASME Sec VIII - Appendix V & VI	MPI Report	100%	R	R
5.2	Valve & Pup Piece Bevel Ends joint welding	Non-Destructive Examination (NDT): Radiography (100% on weld joint)	100%	ASME B16.34	RT Report	100%	R	R
6.0	**FINAL INSPECTION**							
6.1	Finished Valve Assembly: Pressure Test & Final Inspection	Shell Test: Hydrostatic	100%	Testing Procedure as per Code	Test Record	-	H	RW
6.2		Seat Test: Hydrostatic				-	H	RW

6.3		Seat Test: Pneumatic				-	H	RW
6.4		Functional Test - Actuated Valve @ Atm. Pressure & Max. Diff. Pressure: Operation- Open / Close				-	H	RW
6.5		Double Block & Bleed: Hydrostatic				-	H	RW
6.6		Final Inspection: Visual, Dimension, TC Verification, Special Requirements & Marking as per sale order	100%	Approved GA Drawing (if applicable)	Test Report	-	H	RW
6.7		Anti-Static Test	100%	API 6D & Technical Specification	Test Record	-	H	RW
6.8		Fire Safe Test	100%	API-6FA / ISO-10497	Fire safe type test report	-	H	RW
6.9	PMI Check	Chemical	Technical Specification	Technical Specification	Inspection Report	-	H	RW
6.10	Final Stamping	Stamping Of Accepted Valves	Stamping of Valves which are witnessed by PLECO/ TPIA	As per Tender Specification	Inspection Report	-	H	H
7.0	**PAINTING & PACKING**	Surface examination & DFT Inspection: Visual & Measurement	100%	As per Tender Specification	Painting Record	-	H	RW

8.0	**DOCUMENTATION & INSPECTION CERTIFICATE(IC)**	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	As per Tender Specification	Supplier TC & IC	-	H	H

Legend

- H - Hold (Do not proceed without approval),
- P - Perform,
- RW - Random Witness [As specified or 10% (min.1 no. of each size and type of Bulk items)],
- R - Review,
- W - Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable):

1. Supplier Test Certificates to be reviewed by CLIENT / TPIA.
2. This document describes the generic test requirements. Any additional test or Inspection scope if specified/required in contract documents shall also be Applicable (unless otherwise agreed upon).
3. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in/ Job Specification /Approved Documents.
4. For orders placed on stockist, items shall be accepted based on manufacturer's TC with EN310204 type 3.2 certification from approved suppliers.

ASSAM GAS COMPANY LTD
(A GOVT. OF ASSAM UNDERTAKING)

NGN LETEKUJAN TERMINAL UP TO NRL IGGL RT PIPELINE PROJECT

PIPING MATERIAL SPECIFICATION

DOCUMENT NO.: P158-PMS-P401

REV.	DATE	DESCRIPTION	ORG	REVIEW	APPROVED
CB	25.09.2023	Issued for Client Approval	SS	SM	AD
CA	24.07.2023	Issued for Client Review	SS	SM	AD
IA	22.07.2023	Issued for Internal Review	SS	SM	AD

ABBREVIATION

PMS	Piping Material Specification
IBR	Indian Boiler Regulations
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AARH	Arithmetic Average Roughness Height
NDT	Non-Destructive Testing
BS	British Standards
CS	Carbon Steel
MS	Mild Steel
IS	Indian Standard Code
NFPA	National Fire Protection Association
OISD	Oil Industry Safety Directorate
PNRGB	Petroleum & Natural Gas Board
ERW	Electric Resistance Welding
BE	Bevel End
BW	Butt Welded
SW	Socket Weld
FF	Flat Face
PEB	Plain Bevel End
PE	Plain End
RF	Raised Face
SCRF	Screwed End Female
SCRM	Screwed End Male
M	Matching – Schedule / Thickness
BHN	Brinell Hardness Number
MP Test	Magnetic Particle Test

1.0 SCOPE

This specification covers minimum requirements for the material specification for pipe, fittings, flanges, line blinds, bolts, gaskets, and valves that shall be used for natural gas pipeline and associated facilities in accordance with ASME B31.8, OISD-226 and PNGRB guideline

This specification also defines, by piping class for each listed service, and defines the pressure/temperature limitations within which they may be used.

This specification shall be read in conjunction with various codes and standards as applicable.

2.0 CODES AND STANDARDS

2.1 Pipeline and pipeline terminal facilities envisaged as part of this project shall be designed and engineered primarily in accordance with the provisions of the latest edition of the following codes:

i. ASME B 31.8 - Gas transmissions and Distribution Piping System

ii. ASME B 31.3 - Chemical Plant and Petroleum Refinery Piping

iii. OISD Standard 226 - Natural Gas Transmission Pipelines.

iv. PNGRB - Petroleum & Natural Gas Regulatory Board

2.2 All codes, standards and specifications referred herein shall be the latest edition of such documents.

2.3 For sake of brevity the initials of the society to which the codes are referred may be omitted in the specifications, for example, B16.5 is a code referring to ASME A106 is a code referring to ASTM.

2.4 In addition to this PMS, various piping and pipeline materials shall also be applicable.

3.0 MATERIAL SPECIFICATIONS

Individual piping class has been generally designed to cover a set of service operating within pressure-temperature consideration as per ASME B16.5/ B16.34 or part of it. Deviations of material from class specifications may occur due to specific design conditions and/or availability. These deviations are permissible if they equal or better the individual class requirements and shall be subjected to approval on case-to-case basis.

4.0 CLASS DESIGNATION CODE

The piping class designation shall generally consist of three digits made up of a letter, number & letter e.g., P1C, P1L, P3C, P3L, P1F & P1U as follows:

First alphabet shall represent Pleco as well as Pipe, second place numeral is for class, 1/3 for 150# & 300# respectively and last alphabet shall represent the material; CS, LTCS, Fire Water, Portable water.

5.0 PIPELINE

Line pipe material grade and wall thickness details are indicated in PMS.

6.0 PIPES

6.1 Carbon steel pipe shall be made by open hearth, electric furnace or basic oxygen process only. The steel used shall be fully killed and made with fine grain structure. The grade and wall thickness of various sizes of pipes shall be as per piping material specification for the applicable class.

6.2 Pipe dimensions shall be in accordance with ASME B 36.10 for carbon steel ASTM standard pipes & API 5L for carbon steel API 5L grade pipes.

6.3 All pipe threads shall conform to American Standard taper as per ASME B 1.20.1 NPT, unless otherwise specified.

6.4 For butt weld end, bevel shall be in accordance with API specification 5L or ASME B16.25 as applicable.

7.0 FITTINGS

7.1 Fully killed carbon steel shall be used in the manufacture of fittings. The fitting shall have carbon equivalent not exceeding 0.45, based on check analysis.

7.2 Threaded joints, if used, shall conform to American Standard taper as per ASME B1.20.1 NPT.

7.3 Dimensions of socket welded/screwed fittings shall conform to ASME B 16.11. Swage shall be as per BS 3799.

7.4 Dimensions of steel butt welded fittings shall be as per ASME B 16.9.

7.5 Bore of socket welded fittings shall suit outside diameter (OD) of pipe and its thickness.

7.6 Butt welding ends shall conform to API specification 5L or ASME B 16.25 as applicable. In case of difference in thickness of matching ends, requirements of ASME B 31.4 shall apply.

7.7 Integrally reinforced forged branch fittings such as Sockolet, Weldolet etc. shall be as per MSS-SP-97. Fittings not covered in ASME B16.9 and MSS-SP-97 shall conform to manufacturer's standard.

7.8 Fittings thickness tolerances shall match pipe thickness tolerance.

8.0 BENDS

8.1 Unless otherwise specified for process piping, elbow of radius R = 1.5 D shall only be used.

8.2 In order to accommodate changes in vertical and horizontal alignment in pig gable section of pipeline, Elastic bends/ Cold field bends/ Hot formed long radius bends shall be used.

8.3 D = Specified Outside Diameter

8.4 Long Radius Bend shall be used only when indicated in AFC drawing.

8.5 Miters shall not be used.

9.0 FLANGES

9.1 Pressure Temperature rating of flanges shall conform to B16.5/ MSS-SP44/ B16.47 Series A, as applicable.

9.2 Dimensions of flanges shall be in accordance with B16.5/ MSS-SP44/ B16.47 Series A, as applicable.

9.3 Neck of weld neck (WN) flanges shall suit pipe bore and thickness.

9.4 Bore of socket welded (SW) flanges shall suit pipe O.D. and its thickness.

9.5 Threads for screwed flanges, if used, shall conform to American Standard taper as per ASME B 1.20.1 NPT.

9.6 Sizes for blind flanges shall be indicated by nominal pipe size.

9.7 Unless specified otherwise in Piping Material Specification the flange face finish shall be as per ASME B16.5.

9.8 Butt welding ends of WN flanges shall conform to ASME B 16.25.

9.9 Spectacle blind/spacer & blinds shall be in accordance with ASME B 16.48/ manufacturer's standard.

10.0 GASKETS

10.1 Spiral wound metallic gasket with Graphite filled winding with SS304 inner ring and CS outer ring and shall conform to ASME B 16.20/ API 601.

10.2 Spiral wound gasket shall be self-aligning type.

11.0 BOLTING & THREADS

11.1 Nuts for stud bolts shall be American Standard Hexagon Heavy Series and double chamfered.

11.2 Dimension and tolerances for stud bolts and nuts shall be as per ASME B 18.2.1 and 18.2.2 with full threading to ASME B 1.1 Class 2A thread for bolts and Class 2B for nuts. Diameter and length of stud bolts shall be as per ASME B 16.5/ASME B16.47 with full threading.

11.3 Threads for nuts shall be as per ASME B 1.1 as follows,

Nuts for stud bolts dia ¼" to 1"	:	UNC-2B
Nuts for stud bolts dia 1⅛" to 3¼"	:	8UN-2B

11.4 Threads for stud bolts shall be as per ASME B 1.1, as follows:

Stud bolts dia ¼" to 1"	:	UNC-2A
Stud bolts dia 1⅛" to 3¼"	:	8UN-2A

11.5 Threads for threaded pipe, fitting, flanges and valve shall be in accordance with 2B

11.6 1.20.1 taper threads, unless specified otherwise.

11.7 Heads of jack screws shall be heavy hexagonal type. Jack screw end shall be rounded. Stud bolts shall be fully threaded with two hexagonal nuts.

12.0 THREAD SEALANT

12.1 Threaded joints shall be made with 1" wide PTFE jointing tape.

13.0 VALVES

13.1 Valve ends shall be as per valve data sheets for various piping class.

13.2 Sectionalizing valves, Block valves and other isolation valves installed on the main pipeline shall be ball valves with butt welding ends. All inline isolation valves on the mainline (pipeline) shall be full bore valves to allow smooth passage of cleaning as well as intelligent pigs.

13.3 All buried valves shall be provided with stem extension, sealant, vent/drain and shall have butt welded ends as per relevant specification/ data sheet.

13.4 Flange dimensions and face finish of flanged end valves shall conform to clause 9.0 of this specification.

13.5 Butt welding ends of Butt-Welded valves shall conform to ASME B 16.25.

13.6 Face to face and end to end dimensions shall conform to applicable standards.

13.7 Valves shall conform to following standards unless specified otherwise in piping material specification for various piping class.

Flanged/Socket Welded end valves (1½" and below)

Design STD. for Process lines

Gate Valves	:	API 602
Globe Valves	:	BS EN ISO 15761
Check Valves	:	BS EN ISO 15761
Ball Valves	:	BS EN ISO 17292
Plug Valves	:	BS 5353

Flanged/Butt Welded end valves (2" and above)

Design STD. for Process Lines

Gate Valves	:	API 6D
Globe Valves	:	BS 1873
Check Valves	:	API 6D
Ball Valves	:	API 6D
Plug Valves	:	API 6D

13.8 All manual operated valves shall be provided with wrench / hand wheel or gear operator as specified here in below.

13.8.1 Gate Valves

For ANSI class 150 and 300	-	Hand wheel operated for size ≤ 12" NB Gear operated for size ≥ 14" NB.

13.8.2 Globe Valves

For ANSI class 150, 300	-	Hand Wheel operated for all size

13.8.3 Ball valves & Plug Valves

For all ANSI class	-	Wrench operated for size ≤ 4" NB.Gear operated for size ≥ 6" NB.

13.8.4 Actuated Valves

Actuated valves shall be as per P & IDs. The actuator shall have provision for remote operation as per P & IDs. All Actuated valves shall have additional provision of hand wheel operation.

14.0 QUICK OPENING END CLOSURE

Quick opening end closure to be installed on scraper traps shall be designed in accordance with Section VIII of ASME Boiler and Pressure Vessel Code and equipped with safety locking devices in compliance with Section VIII, division 1, UG-35.2 of ASME Boiler and Pressure Vessel Code.

15.0 HYDROTESTING VENTS AND DRAINS

In terminal piping, high point vents and low point drains required for the purpose of hydro testing shall be of size 0.75". These vents & drains shall consist of gate valves with blind flange assembly.

16.0 PIPELINE SPECIATLITY ITEMS

Pipeline specialty items viz. scraper traps, flow tees, insulating joints, LR bends etc. shall be as per data sheets and specification.

For Mainline Items, corrosion allowance shall be as per data sheet

17.0 INSULATING GASKET, SLEEVE AND WASHER

The insulating gasket shall consist of a PTFE (Teflon) spring-energized face seal, or an elastomeric O-ring, seated in an isolating laminate, which shall be permanently bonded to a high strength metal gasket core. Due to this unique pressure activated sealing mechanism, the gasket requires far less bolt stress to seal than any other gasket. The gasket inner diameter shall be exactly matched to the flange bore to eliminate turbulent flow and flange face erosion/ corrosion. The seal elements shall be replaceable in the reusable gasket retainer. The core of gasket shall be made of annealed 316 stainless steel or other metals including duplex and Inconel etc.

Insulating gasket shall include the following applications,

- Flange isolation in conjunction with cathodic protection.
- Isolation between dissimilar metals to prevent galvanic corrosion.
- Mating mismatched ring-joint to raised –face flanges.
- Eliminate fluid trap corrosion between ring-joint (RTJ) flanges where high concentrations of Co2, H2S and other aggressive hydrocarbon media are present.
- Eliminate turbulence and flow induced erosion between ring-joint (RTJ) flanges.
- Protect against coating impingement on coated flange faces.
- To seal between flanges subjected to vibration/ cavitation.

17.1 Insulating Gasket, sleeves and washers' material properties:

Compressive strength	:	65000 PSI
Average Dielectric strength	:	15 KV
Electrical resistance	:	> 1 Mega Ohm (When tested with 500- 1000 V DC megger)
Max. Operating temp.	:	302°F (150°C)
Min. Operating temp.	:	(minus) -200°F
Water absorption	:	5%
Flexural strength	:	70000 PSI
Tensile strength	:	50000 PSI
Bond strength	:	2600 lb
Shear strength	:	22000 lb.

17.2 Seal Material

The sealing elements shall intend to provide an impervious barrier through which no contained media or other substance can penetrate. The composite retainer backing material behind the seal remains uncontaminated and thus permanently holds the seal in place in a static, fully encapsulated manner.

Viton as a seal material shall consist following properties,

- General purpose oilfield elastomer.
- Excellent resistance to aliphatic hydrocarbons, glycols and H2S.
- Good resistance to aromatic hydrocarbons.

Isolating Sleeve

Mylar as a seal material shall consist following properties,

- Spiral wound Mylar is a general-purpose material recommended for bolting application with flange temperatures below 250°F.
- Material shall be fair resistance to crushing, cracking, breaking and thread pinch.

Isolating washer: 1/8" (0.125) Thick washer

Steel Washer: ZPS standard – Zinc plated steel washers.

Butt weld (BW) ends of the insulating assembly shall be protected by metallic or high impact plastic bevel protectors.

The dimensions of insulating components (gaskets, sleeves and washers) shall be as indicated in Data Sheet. The insulating gasket and washers shall have adequate compressive strength to permit proper tightening of flange bolts for leak proof joint.

The insulating material shall be suitable for pressure and temperature indicated in Data Sheet under connecting pipeline details and shall be resistant to the fluid to be handled through the pipeline.

I.D. and O.D. of insulating washers shall be designed to fit over insulating sleeves and within spot faces on flanges.

After the hydrostatic test, insulating flange assembly shall be tested with air at 5 kg/cm2 for 10 minutes. The tightness shall be checked by immersion or with a frothing agent. No leakage shall be accepted.

Insulating gasket, sleeve and washer after the field hydrostatic test shall be tested for dielectric integrity at 5000 V A.C., 50 Hz for one minute and the leakage current before and after shall be equal. Testing time, voltage and leakage shall be recorded and certified. The test shall be carried out in dry conditions.

18.0 CHARPY V-NOTCH TEST

All piping material like valves, fittings, flanges bolting etc. shall be Charpy impact tested. Charpy V-notch impact tests are required for the base metal weld metal and heat-affected zone (HAZ)

Sr. No.	Piping Class	Rating	C. A.	Spl. Reqt.	Basic Material	Service	Remarks
1	P1C	150	1.5	NON-IBR	CARBON STEEL	NON-CORROSIVE PROCESS-FLAMMABLE/ /NONFLAMMABLE, NON-LETHAL - HYDROCARBONS	Page 11 of 15
2	P1L	150	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	NON-CORROSIVE PROCESS-FLAMMABLE/ NON-FLAMMABLE, NON-LETHAL - HYDROCARBONS	Page 16 of 21
3	P3C	300	1.5	NON-IBR	CARBON STEEL	NON-CORROSIVE PROCESS-FLAMMABLE / NON-FLAMMABLE, NON-LETHAL- HYDROCARBONS	Page 22 of 26
4	P3L	300	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	NON-CORROSIVE PROCESS-FLAMMABLE / NON-FLAMMABLE, NON-LETHAL- HYDROCARBONS	Page 27 of 31
5	P6C	300	1.5	NON-IBR	CARBON STEEL	NON-CORROSIVE PROCESS-FLAMMABLE / NON-FLAMMABLE, NON-LETHAL- HYDROCARBONS	Page 32 of 37
6	P6L	300	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	NON-CORROSIVE PROCESS-FLAMMABLE / NON-FLAMMABLE, NON-LETHAL- HYDROCARBONS	Page 38 of 42

7	P1F	150	1.5	NON-IBR	CARBON STEEL	FIRE WATER (ABOVE GROUND / UNDER GROUND)	Page 43 of 47

PIPE CLASS : P1C

RATING : 150

BASE MATERIAL : Carbon Steel

CORROSION ALLOWANCE : 1.5 MM

SPECIAL REQUIREMENT : Non-IBR

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

SERVICE

Natural Gas, Utilities (water, inst. air, plant air, nitrogen, carbon dioxide)

NOTES

1. All vents and drains shall be provided with gate valve with blind flange assembly unless otherwise indicated in P&ID.
2. NDT of welds shall be as follows:

   Radiography : All butt welds 100%

   MPI : Socket welds 100%
3. Piping design as per ASME B 31.8, OISD 226 & PNGRB Guidelines
4. Charpy V notch test and hardness test shall be conducted for pipes, fittings and flanges at (-) 29°C.
5. All branch connections including vent, drain, pressure and temperature connection shall be as per branch connection table.
6. For valves, refer valve data sheets.

ITEM	SIZE	DESCRIPTION
Maintenance joints	ALL	Flanged, to be kept minimum
Pipe joints	1.5" & BELOW	SW coupling
	2.0" & ABOVE	Butt welded
Drains	ON LINES <= 1.5"	Refer std. P-STD-419
	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std. P-STD-418
Vents	ON LINES <= 1.5"	Refer std. P-STD-419
	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std. P-STD-418
Temp. Connection	1.5"	Flanged, installation as per std. P-STD-414 & 415, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. P-STD-411, 412 & 413

BRANCH TABLE

														T	24	BRANCH PIPE
													T	T	20	
												T	T	T	18	
											T	T	T	T	16	
										T	T	T	T	T	14	
									T	T	T	T	T	T	12	
								T	T	T	T	T	T	T	10	
							T	T	T	T	T	T	T	W	8	
						T	T	T	T	T	T	W	W	W	6	
					T	T	T	W	W	W	W	W	W	W	4	
				T	T	T	W	W	W	W	W	W	W	W	3	
			T	T	T	W	W	W	W	W	W	W	W	W	2	
		T	T	T	T	S	S	S	S	S	S	S	S	S	1.5	
	T	T	T	S	S	S	S	S	S	S	S	S	S	S	1	
T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	0.75	
T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	0.50	
0.05	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	
				RUN PIPE												

CODE DESCRIPTION

T	TEES
W	WELDOLETS
S	SOCKOLETS

Item	Lower Size (Inch)	UpperSize (Inch)	Sch./Thk.	Dmn. STD	Material (Charpy)	Description
Pipe Group						
PIPE	00.500	00.750	S160	B-36.10	ASTM A 106 GR. B	PE, SEAMLESS
PIPE	01.000	01.500	XS	B-36.10	ASTM A 106 GR. B	PE, SEAMLESS
PIPE	02.000	02.000	XS	B-36.10	ASTM A 106 GR. B (Charpy)	BE, SEAMLESS
PIPE	03.000	20.000	STD	B-36.10	ASTM A 106 GR. B (Charpy)	BE, SEAMLESS
NIPPLE	00.500	01.500	M	B-36.10	ASTM A 106 GR. B	PE, SEAMLESS
Flange Group						
FLNG.SW	00.500	01.500	M	B-16.5	ASTM A 105	150, RF/ 125AARH
FLNG.WN	2.000	20.000	M	B-16.5	ASTM A 105 (Charpy)	150, RF/ 125AARH
FLNG.BLIND	00.500	01.500		B-16.5	ASTM A 105	150, RF/ 125AARH
FLNG.BLIND	2.000	20.000		B-16.5	ASTM A 105 (Charpy)	150, RF/ 125AARH
FLNG.FIG.8	00.500	08.000		ASME B16.48	ASTM A 105 (Charpy)	150, FF/ 125AARH
SPCR&BLND	10.000	20.000		ASME B16.48	ASTM A 105 (Charpy)	150, FF/ 125AARH
Fitting Group						
ELBOW.90	00.500	01.500		B-16.11	ASTM A 105	SW, 6000
ELBOW.90	02.000	20.000	M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW, 1.5D
ELBOW.45	00.500	01.500		B-16.11	ASTM A 105	SW, 6000
ELBOW.45	02.000	20.000	M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW, 1.5D
T. EQUAL	00.500	01.500		B-16.11	ASTM A 105	SW, 6000
T. EQUAL	02.000	20.000	M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW
T.RED	00.500	01.500		B-16.11	ASTM A 105	SW, 6000
T.RED	02.000	20.000	M, M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW

Item	Lower Size (Inch)	UpperSize (Inch)	Sch./Thk.	Dmn. STD	Material (Charpy)	Description
REDUC. CONC	02.000	20.000	M, M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW
REDUC. ECC	02.000	20.000	M, M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW
SWAGE. CONC	00.500	03.000	M, M	BS-3799	ASTM A 105 (Charpy)	PE
SWAGE. ECC	00.500	03.000	M, M	BS-3799	ASTM A 105 (Charpy)	PE
CAP	00.500	00.750		B-16.11	ASTM A 105	SCRF, 6000
CAP	01.000	01.500		B-16.11	ASTM A 105	SCRF, 3000
CAP	02.000	20.000	M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW
PLUG	00.500	00.750		B-16.11	ASTM A 105	SCRM, 6000
O' let						
WELDOLET	02.000	06.000	M, S160	MSS-SP97	ASTM A 105 (Charpy)	BW
SOCKOLET	00.500	00.750		MSS-SP97	ASTM A 105	SCRF, 6000
SOCKOLET	01.000	01.500		MSS-SP97	ASTM A 105	SW, 3000
Valves						
VLV.GLOBE	00.250	01.500		BS EN ISO 15761	BODY-ASTM A 105, TRIM-STELLITED, STEM-13%CR STEEL	SW, 800, 3000,B-16.11
VLV.GLOBE	02.000	18.000		BS-1873	BODY-ASTM A 216 GR.WCB, TRIM-13%CR. STEEL	FLGD, 150, B-16.5, RF/125AARH
VLV.GLOBE	02.000	08.000		BS-1873	BODY-ASTM A 216 GR.WCB, TRIM- 13% CR. STEEL	BW, 150, B-16.25
VLV.CHECK	00.250	01.500		BS EN ISO 15761	BODY-ASTM A 105, TRIM-STELLITED	SW, 800, 3000,B-16.11
VLV.CHECK	02.000	20.000		API-6D	BODY-ASTM A 216 GR.WCB, TRIM-13%CR. STEEL	FLGD, 150, B-16.5,

Item	Lower Size (Inch)	UpperSize (Inch)	Sch./Thk.	Dmn. STD	Material (Charpy)	Description
						RF/125AARH
VLV.BALL	00.500	01.500		BS EN ISO 17292	BODY-ASTM A 105, TRIM-13% CR. STEEL, SEAT-RPTFE	SW, 150,B-16.5, RF/125AARH
VLV.BALL	02.000	20.000		API-6D	BODY-ASTM A216 GR.WCB, TRIM/BALLSEAT-(AISI 4140 + 0.003"ENP)/AISI 410	FLGD, 150, B-16.5, RF/125AARH
VLV.BALL	02.000	20.000		API-6D	BODY-ASTM A 216 GR.WCB, TRIM- BALL, SEAT-(AISI 4140 + 0.003"ENP) / AISI 410	BW, 150,B-16.25
VLV.PLUG	00.500	01.500		BS-5353	BODY-ASTM A 105, PLUG - A105 +0.003" ENP	SW, 800, 3000, B-16.11,
Bolt Group						
BOLT.STUD	00.500	48.000		B-18.2	BOLT: A193 GR. B7, NUT: A194 GR.2H	
Gasket Group						
GASKET	00.500	20.000		B-16.20-ANSI B16.5	SP.WND METTALIC WITH GRAPHITE FILLER	SPIRAL, 150

PIPE CLASS	**:**	**P1L**
RATING	:	150
BASE MATERIAL	:	Carbon Steel
CORROSION ALLOWANCE	:	1.5 MM
SPECIAL REQUIREMENT	:	Low Temperature Service

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93
PRESS	18.63	18.63	17.57

SERVICE

Natural Gas, Utilities (water, inst. air, plant air, nitrogen, carbon dioxide)

NOTES

1. All vents and drains shall be provided with gate valve with blind flange assembly unless otherwise indicated in P&ID.
2. NDT of welds shall be as follows:

   Radiography : All butt welds 100%

   MPI : Socket welds 100%
3. Piping design as per ASME B 31.8 OISD 226 & PNGRB Guidelines
4. Charpy V notch test and hardness test shall be conducted for pipes, fittings and flanges at (-) 45°C.
5. All branch connections including vent, drain, pressure and temperature connection shall be as per branch connection table.
6. For valves, refer valve data sheets.

ITEM	SIZE	DESCRIPTION
Maintenance joints	ALL	Flanged, to be kept minimum
Pipe joints	1.5" & BELOW	SW coupling
	2.0" & ABOVE	Butt welded
Drains	ON LINES <= 1.5"	Refer std. P-STD-419
	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std. P-STD-418
Vents	ON LINES <= 1.5"	Refer std. P-STD-419
	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std. P-STD-418
Temp. Connection	1.5"	Flanged, installation as per std. P-STD-414 & 415, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. P-STD-411, 412 & 413

BRANCH TABLE

							T	6
						T	T	4
					T	T	T	3
				T	T	T	W	2
			T	T	T	T	S	1.5
		T	T	T	S	S	S	1
	T	T	T	T	S	S	S	0.75
T	T	T	T	S	S	S	S	0.50
0.05	**0.75**	**1**	**1.5**	**2**	**3**	**4**	**6**	

BRANCH PIPE

RUN PIPE

CODE DESCRIPTION

T	TEES
W	WELDOLETS
S	SOCKOLETS

Item	Lower Size (Inch)	UpperSize (Inch)	Sch./Thk.	Dmn. STD	Material (Charpy)	Description
Pipe Group						
PIPE	00.500	00.750	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
PIPE	01.000	01.500	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
PIPE	02.000	02.000	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS
PIPE	03.000	06.000	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS
NIPPLE	00.500	01.500	M	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
Flange Group						
FLNG.WN	00.500	06.00	M	B-16.5	ASTM A 350 GR.LF2	150, RF/125AARH
FLNG.BLIND	00.500	06.00		B-16.5	ASTM A 350 GR.LF2	150, RF/125AARH
FLNG.FIG.8	00.500	06.00		ASME B16.48	ASTM A 350 GR.LF2	150, FF/ 125AARH
Fitting Group						
ELBOW.90	00.500	00.750		B-16.11	ASTM A 350 GR.LF2	SW, 6000
ELBOW.90	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
ELBOW.90	02.000	8.000	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D
ELBOW.45	00.500	00.750		B-16.11	ASTM A 350 GR.LF2	SW, 6000
ELBOW.45	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
ELBOW.45	02.000	6.000	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D
T. EQUAL	00.500	00.750		B-16.11	ASTM A 350 GR.LF2	SW, 6000
T. EQUAL	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
T. EQUAL	02.000	6.000	M	B-16.9	ASTM A 420 GR.WPL6	BW
T.RED	00.500	00.750		B-16.11	ASTM A 350 GR.LF2	SW, 6000
T.RED	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
T.RED	02.000	6.000	M, M	B-16.9	ASTM A 420 GR.WPL6	BW
REDUC. CONC	02.000	6.000	M, M	B-16.9	ASTM A 420 GR.WPL6	BW
REDUC. ECC	02.000	6.000	M, M	B-16.9	ASTM A 420 GR.WPL6	BW
SWAGE. CONC	00.500	03.000	M, M	BS-3799	ASTM A 350 GR.LF2	PE
SWAGE.ECC	00.500	03.000	M, M	BS-3799	ASTM A 350 GR.LF2	PE
CAP	00.500	01.500		B-16.11	ASTM A 350 GR.LF2	SCRF, 3000
CAP	02.000	6.000	M	B-16.9	ASTM A 420 GR.WPL6	BW
PLUG	00.500	01.500		B-16.11	ASTM A 350 GR.LF2	SCRM, 3000
COUPLING FULL	00.500	00.75		B-16.11	ASTM A 350 GR.LF2	SW, 6000
COUPLING FULL	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
COUPLING HALF	00.500	00.75		B-16.11	ASTM A 350 GR.LF2	SW, 6000
COUPLING HALF	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
O' let						
WELDOLET	02.000	06.000	M, XXS	MSS-SP97	ASTM A 350 GR.LF2	BW
SOCKOLET	00.500	00.750		MSS-SP97	ASTM A 350 GR.LF2	SW, 6000

SOCKOLET	01.000	01.500		MSS-SP97	ASTM A 350 GR.LF2	SW, 3000
Valves						
VLV.GLOBE	00.500	01.500		BS EN 1SO 15761	BODY-ASTM A 350 GR.LF2, TRIM STELLITED, STEM SS304	SW, 800, 3000, B-16.11
VLV.GLOBE	02.000	8.000		BS-1873	BODY-ASTM A 350 GR.LF2, TRIM STELLITED, STEM SS304	FLGD, 150, B-16.5, RF/125AARH
VLV.CHECK	00.500	01.500		BS EN 1SO 15761	BODY-ASTM A 350 GR.LF2, TRIM STELLITED	SW, 800, 3000, B-16.11
VLV.CHECK	02.000	6.000		API-6D	BODY-ASTM A352 GR.LCB, TRIM STELLITED	FLGD, 150, B-16.5, RF/125AARH
VLV.BALL	00.500	01.500		BS EN 1SO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1, TRIM-BODY SEAT-RPTFE	SW, 800, 3000, B-16.11
VLV.BALL	02.000	6.000		API-6D	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1, TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH
VLV.BALL	02.000	6.000		API-6D	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1, TRIM-BODY SEAT-RPTFE	BW, 150, B-16.25
Bolt Group						
BOLT.STUD	00.500	6.000		B-18.2	BOLT: A320 GR. L7, NUT: A194 GR.4	
Gasket Group						

GASKET	00.500	6.000		B-16.20-ANSI B16.5	SP.WND SS316+GRAFOIL	SPIRAL, 150

PIPE CLASS	**:**	**P3C**
RATING	:	300
BASE MATERIAL	:	Carbon Steel
CORROSION ALLOWANCE	:	1.5 MM
SPECIAL REQUIREMENT	:	Non-IBR

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343
PRESS	52.02	52.02	47.45	46.05	44.64	42.18	38.66	37.61

SERVICE

Natural Gas, Utilities (water, inst. air, plant air, nitrogen, carbon dioxide)

NOTES

1. All vents and drains shall be provided with gate valve with blind flange assembly unless otherwise indicated in P&ID
2. NDT of welds shall be as follows:

   Radiography : All butt welds 100%

   MPI : Socket welds 100%
3. Piping design as per ASME B 31.8, OISD 226 & PNGRB Guidelines
4. Charpy V notch test and hardness test shall be conducted for pipes, fittings and flanges at (-) 29°C.
5. Corrosion allowance of 1.5 mm has been considered for terminal piping.
6. All branch connections including vent, drain, pressure and temperature connection shall be as per branch connection table.
7. For valves, refer valve data sheets as enclosed.
8. Design factor 0.5.
9. Ball Valve to be used in main pipeline shall have butt welded ends.

ITEM	SIZE	DESCRIPTION
Maintenance Joints	All	Flanged, to be kept minimum
Pipe joints	1.5" & below	SW coupling
	2.0" & above	Butt welded
Drains	on lines <= 1.5"	Refer std. P-STD-419
	on lines >= 2.0"	As per P&ID or 0.75". Refer std. P-STD-418
Vents	on lines <= 1.5"	Refer std. P-STD-419
	on lines >= 2.0"	As per P&ID or 0.75". Refer std. P-STD-418
Temp. Connection	1.5"	Flanged, installation as per std. P-STD-414 & 415, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. P-STD-411, 412 & 413

BRANCH TABLE

RUN PIPE	0.05	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	30	32	36	42	BRANCH PIPE
0.50	T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
0.75		T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
1			T	T	T	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
1.5				T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	S	S	
2					T	T	T	W	W	W	W	W	W	W	W	W	W	W	W	W	
3						T	T	T	*W*	W	W	W	W	W	W	W	W	W	W	W	
4							T	T	T	T	W	W	W	W	W	W	W	W	W	W	
6								T	T	T	T	T	T	W	W	W	W	W	W	W	
8									T	T	T	T	T	T	T	W	W	W	W	W	
10										T	T	T	T	T	T	T	T	T	T	T	
12											T	T	T	T	T	T	T	T	T	T	
14												T	T	T	T	T	T	T	T	T	
16													T	T	T	T	T	T	T	T	
18														T	T	T	T	T	T	T	
20															T	T	T	T	T	T	
24																T	T	T	T	T	
30																	T	T	T	T	
32																		T	T	T	
36																			T	T	
42																				T	

CODE DESCRIPTION

T TEES

W WELDOLETS

S SOCKOLETS

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
PIPE GROUP						
PIPE	00.500	00.750	S160	B-36.10	ASTM A 106 GR. B	PE, SEAMLESS
PIPE	01.000	01.500	XS	B-36.10	ASTM A 106 GR. B	PE, SEAMLESS
PIPE	02.000	02.000	XS	B-36.10	ASTM A 106 GR. B (CHARPY)	BE, SEAMLESS
PIPE	03.000	03.000	STD	B-36.10	ASTM A 106 GR. B (CHARPY)	BE, SEAMLESS
PIPE	04.000	06.000	XS	B-36.10	ASTM A 106 GR. B (CHARPY)	BE, SEAMLESS
PIPE	08.000	10.000	STD	B-36.10	ASTM A 106 GR. B (CHARPY)	BE, SEAMLESS
NIPPLE	00.500	01.500	M	B-36.10	ASTM A 106 GR. B	PE, SEAMLESS
FLANGE GROUP						
FLNG.SW	00.500	01.500	M	B-16.5	ASTM A 105	300, RF/125AARH
FLNG.WN	02.000	8.000	M	B-16.5	ASTM A 105 (CHARPY)	300, RF/125AARH
FLNG.BLIND	00.500	01.500		B-16.5	ASTM A 105	300, RF/125AARH
FLNG.BLIND	02.000	20.000		B-16.5	ASTM A 105 (CHARPY)	300, RF/125AARH
FLNG.FIG.8	00.500	01.500		ASME- B 16.48	ASTM A 105	300, FF/125AARH
FLNG.FIG.8	02.000	08.000		ASME- B 16.48	ASTM A 105 (CHARPY)	300, FF/125AARH
SPCR & BLND	10.000	20.000		ASME- B 16.48	ASTM A 105 (CHARPY)	300, FF/125AARH
FITTING GROUP						
ELBOW.90	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
ELBOW.90	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
ELBOW.90	02.000	8.000	M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW, 1.5D
ELBOW.45	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
ELBOW.45	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
ELBOW.45	02.000	8.000	M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW, 1.5D
T. EQUAL	00.500	00.750		B-16.11	ASTM A 105	SW, 6000

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
T. EQUAL	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
T. EQUAL	02.000	8.000	M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
T.RED	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
T.RED	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
T.RED	02.000	8.000	M, M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
REDUC. CONC	02.000	8.000	M, M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
REDUC. ECC	02.000	8.000	M, M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
SWAGE. CONC	00.500	03.000	M, M	BS-3799	ASTM A 105 (CHARPY)	PE
SWAGE .ECC	00.500	03.000	M, M	BS-3799	ASTM A 105 (CHARPY)	PE
CAP	00.500	00.750		B-16.11	ASTM A 105	SCRF, 6000
CAP	01.000	01.500		B-16.11	ASTM A 105	SCRF, 3000
CAP	02.000	8.000	M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
PLUG	00.500	00.750		B-16.11	ASTM A 105	SCRM, 6000
PLUG	01.000	01.500		B-16.11	ASTM A 105	SCRM, 3000
CPLNG. FULL	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
CPLNG. FULL	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
CPLNG.HALF	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
CPLNG.HALF	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
CPLNG.LH	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
CPLNG.LH	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
CPLNG.RED	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
CPLNG.RED	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
O'let						
SOCKOLET	00.500	00.750		MSS-SP97	ASTM A 105	SW, 6000

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
SOCKOLET	01.000	01.500		MSS-SP97	ASTM A 105	SW, 3000
WELDOLET	02.000	08.000	M, XXS	MSS-SP97	ASTM A 105 (CHARPY)	BW
VALVE GROUP						
VLV.GATE	00.500	01.500		API-602	BODY-ASTM A 105, TRIM-STELLITED, STEM-13% CR. STEEL	SW, 600,3000, B-16.11
VLV.GLOBE	00.500	01.500		BS EN 1SO 15761	BODY-ASTM A 105, TRIM-STELLITED, STEM-13% CR STEEL	SW, 600, 3000, B-16.11
VLV.GLOBE	02.000	8.000		BS 1873	BODY-ASTM A 216 GR.WCB, TRIM-13% CR. STEEL	FLGD, 300, B-16.5, RF/125AARH
VLV.CHECK	00.500	01.500		BS EN 1SO 15761	BODY-ASTM A 105, TRIM- STELLITED	SW, 600, 3000 ,B-16.11
VLV.BALL	00.500	01.500		BS EN 1SO 17292	BODY-ASTM A 105, TRIM-BODY SEAT - RPTFE	SW, 600, B-16.5, RF/125AARH
VLV.BALL	02.000	8.000		API-6D	BODY-ASTM A 216 GR.WCC/A234 GR.WPC, TRIM: SEAT: AISI4140+0.003 "ENP/AISI410	FLGD, 300, B-16.5, RF/125AARH
VLV.BALL	02.000	8.000	M	API-6D	BODY-ASTM A 216 GR.WCC/A234 GR. WPC, TRIM: SEAT: AISI 4140+0.003"ENP/AI SI 410	BW, 300, B-16.25
VLV.PLUG	00.500	01.500		BS-5353	BODY-ASTM A 105, PLUG-A105 +0.003" ENP	SW, 600, 3000, B-16.11
VLV.PLUG	02.000	8.000		API-6D	BODY- A 216GR. WCB, PLUG: A216 GR.WCB + 0.003" ENP	FLGD, 300, B-16.5, RF/125AARH
VLV.PLUG	02.000	02.000	M	API-6D	BODY-ASTM A 216 GR.WCB, PLUG: A216 GR.WCB + 0.003"ENP	BW, 300, B-16.25
BOLT GROUP						
BOLT.STUD	00.500	8.000		B-18.2	BOLT: A193 GR. B7,NUT: A194 GR.2H	
GASKET						

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
GASKET	00.500	8.000		B-16.20-ANSI B16.5	SP.WND METTALIC WITH GRAPHITEFILLER	SPIRAL, 300

PIPE CLASS	**:**	**P3L**
RATING	:	300
BASE MATERIAL	:	Carbon Steel
CORROSION ALLOWANCE	:	1.5 MM
SPECIAL REQUIREMENT	:	Low Temperature Service

EMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	120	149	204
PRESS	48.86	48.86	46.05	45.54	44.99	43.59

SERVICE

Natural Gas, Utilities (water, inst. air, plant air, nitrogen, carbon dioxide)

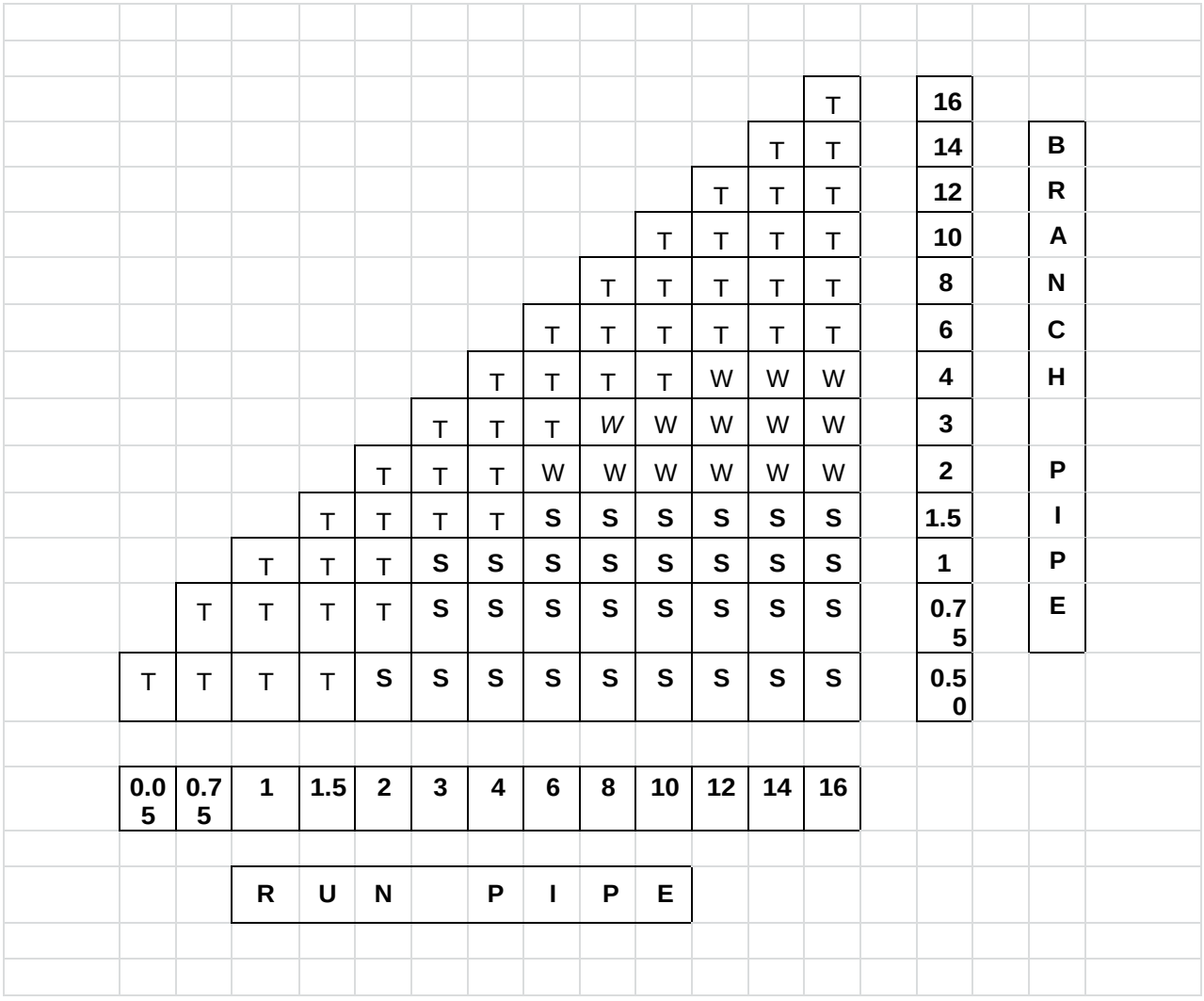
NOTES

1. All vents and drains shall be provided with gate valve with blind flange assembly unless otherwise indicated in P&ID.
2. Piping design as per ASME B 31.8, OISD 226 & PNGRB Guidelines
3. Flanged end shall be as per ASME B 16.5 for valve up to 24" (excluding 22"), for 22" as per MSS-SP-44.
4. Impact testing is required at (-45) Deg C.
5. NDT of welds within terminal shall be as follows:

Radiography	:	All Butt welds 100%
MPI	:	Socket welds 100%

ITEM	SIZE	DESCRIPTION
Maintenance Joints	all	Flanged, to be kept minimum
Pipe joints	1.5" & below	SW coupling
	2.0" & above	Butt welded
Drains	on lines <= 1.5"	Refer std. P-STD-419
	on lines >= 2.0"	As per P&ID or 0.75". Refer std. P-STD-418
Vents	on lines <= 1.5"	Refer std. P-STD-419
	on lines >= 2.0"	As per P&ID or 0.75". Refer std. P-STD-418
Temp. conn	1.5"	Flanged, installation as per std. P-STD-414 & 415, except skin temperature measurement.
Press. conn	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. P-STD-411, 412 & 413

BRANCH TABLE



CODE DESCRIPTION

T TEES

W WELDOLETS

S SOCKOLETS

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
PIPE GROUP						
PIPE	00.500	00.750	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
PIPE	01.000	01.500	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
PIPE	02.000	02.000	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS
PIPE	03.000	03.000	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS
PIPE	04.000	04.000	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS
PIPE	06.000	10.000	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS
NIPPLE	00.500	00.750	M	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
NIPPLE	01.000	01.500	M	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
FLANGE GROUP						
FLNG.SW	00.500	01.500	M	B-16.5	ASTM A 350 GR.LF2	300, RF/125AARH
FLNG.WN	02.000	10.000	M	B-16.5	ASTM A 350 GR.LF2	300, RF/125AARH
FLNG.BLIND	00.500	10.000		B-16.5	ASTM A 350 GR.LF2	300, RF/125AARH
FLNG.FIG.8	00.500	08.000		ASME- B 16.48	ASTM A 350 GR.LF2	300, FF/125AARH
SPCR&BLND	10.000	10.000		ASME-B16.48	ASTM A 350 GR.LF2	300, FF/125AARH
FITTINGS						
ELBOW.90	00.500	00.750		B-16.11	ASTM A 350 GR.LF2	SW, 6000
ELBOW.90	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
ELBOW.90	02.000	10.000	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D
ELBOW.45	00.500	00.750		B-16.11	ASTM A 350 GR.LF2	SW, 6000
ELBOW.45	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
ELBOW.45	02.000	10.000	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D
T. EQUAL	00.500	00.750		B-16.11	ASTM A 350 GR.LF2	SW, 6000
T. EQUAL	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
T. EQUAL	02.000	10.000	M	B-16.9	ASTM A 420 GR.WPL6	BW
VALVE GROUP						

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
VLV.GATE	00.500	01.500		API-602	BODY-ASTM A 350 GR.LF2, TRIM-STELLITED, STEM- SS 304	SW, 600, 3000, B-16.11
VLV.GLOBE	00.500	01.500		BS EN ISO 15761	BODY-ASTM A 350 GR.LF2, TRIM-STELLITED, STEM-SS304	SW, 600, 3000, B-16.11
VLV.CHECK	00.500	01.500		BS EN ISO 15761	BODY-ASTM A 350 GR.LF2, TRIM-STELLITED	SW, 600, 3000, B-16.11
VLV.PLUG	00.500	01.500		BS-5353	BODY-ASTM A 350 GR.LF2, PLUG: A350 GR.LF2 + 0.003" ENP	SW, 600, 3000, B-16.11
VLV.PLUG	02.000	10.000		API-6D	BODY-ASTM A 352 GR.LCB / A350 GR.LF2, STEM-SS 304/SS316	FLGD, 300, B-16.5, RF/125AARH
VLV.PLUG	02.000	10.000		API-6D	BODY-ASTM A 352 GR.LCB/ ASTM A350GR.LF2, TRIM-SS304/ SS316	BW, 300, B-16.25
BOLT & GASKET						
BOLT.STUD	00.500	10.000		B-18.2	BOLT: A320 GR. L7,NUT: A194 GR.4	
GASKET	00.500	10.000		B-16.20-ANSI B16.5	SP.WND METTALIC WITH GRAPHITEFILLER	SPIRAL, 300

PIPE CLASS : P6C

RATING : 600

BASE MATERIAL : Carbon Steel

CORROSION ALLOWANCE : 1.5 MM

SPECIAL REQUIREMENT : Non-IBR

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-29	38	93	149	204	260	316	343
PRESS	104.05	104.05	94.91	92.45	89.29	84.36	79.68	75.58

SERVICE

Natural Gas, Utilities (water, inst. air, plant air, nitrogen, carbon dioxide).

NOTES

1. All vents and drains for hydrotest shall be provided with gate valve with blind flange assembly unless otherwise indicated in P&ID
2. NDT of welds shall be as follows:

   Radiography : All butt welds 100%

   MPI : Socket welds 100%
3. Piping design as per ASME B 31.8, OISD 226 & PNGRB Guidelines
4. Charpy V notch test and hardness test shall be conducted for pipes, fittings and flanges at (-) 29°C.
5. Corrosion allowance of 1.5 mm has been considered for terminal piping.
6. All branch connections including vent, drain, pressure and temperature connection shall be as per branch connection table.
7. For valves, refer valve data sheets as enclosed.
8. Design factor 0.5
9. Ball Valve to be used in main pipeline shall have butt welded ends.

ITEM	SIZE	DESCRIPTION
Maintenance Joints	all	Flanged, to be kept minimum
Pipe joints	1.5" & below	SW coupling
	2.0" & above	Butt welded
Drains	on lines <= 1.5"	Refer std. P-STD-419
	on lines >= 2.0"	As per P&ID or 0.75". Refer std. P-STD-418
Vents	on lines <= 1.5"	Refer std. P-STD-419
	on lines >= 2.0"	As per P&ID or 0.75”. Refer std. P-STD-418
Temp. Connection	1.5"	Flanged, installation as per std. P-STD-414 & 415, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. P-STD-411, 412 & 413

BRANCH TABLE

RUN PIPE	0.05	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	30	32	36	42	BRANCH
0.50	T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
0.75		T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
1			T	T	T	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
1.5				T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	S	S	E
2					T	T	T	W	W	W	W	W	W	W	W	W	W	W	W	W	P
3						T	T	T	W	W	W	W	W	W	W	W	W	W	W	W	I
4							T	T	T	T	W	W	W	W	W	W	W	W	W	W	P
6								T	T	T	T	T	W	W	W	W	W	W	W	W	
8									T	T	T	T	T	W	W	W	W	W	W	W	H
10										T	T	T	T	T	T	T	T	T	T	T	C
12											T	T	T	T	T	T	T	T	T	T	N
14												T	T	T	T	T	T	T	T	T	A
16													T	T	T	T	T	T	T	T	R
18														T	T	T	T	T	T	T	B
20															T	T	T	T	T	T	
24																T	T	T	T	T	
30																	T	T	T	T	
32																		T	T	T	
36																			T	T	
42																				T	

CODE DESCRIPTION

T TEES

W WELDOLETS

S SOCKOLETS

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
PIPE GROUP						
PIPE	00.500	00.750	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS
PIPE	01.000	01.500	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS
PIPE	02.000	02.000	XS	B-36.10	ASTM A 106 GR.B (CHARPY)	BE, SEAMLESS
PIPE	03.000	03.000	STD	B-36.10	ASTM A 106 GR.B (CHARPY)	BE, SEAMLESS
PIPE	04.000	06.000	XS	B-36.10	ASTM A 106 GR.B (CHARPY)	BE, SEAMLESS
PIPE	08.000	08.000	SCH 60	B-36.10	ASTM A 106 GR.B (CHARPY)	BE, SEAMLESS
FLANGE GROUP						
FLNG.SW	00.500	01.500	M	B-16.5	ASTM A 105	600, RF/125AARH
FLNG.WN	02.000	16.000	M	B-16.5	ASTM A 105 (CHARPY)	600, RF/125AARH
FLNG.BLIND	00.500	01.500		B-16.5	ASTM A 105	600, RF/125AARH
FLNG.BLIND	02.000	24.000		B-16.5	ASTM A 105 (CHARPY)	600, RF/125AARH
FLNG.FIG.8	00.500	01.500		ASME- B 16.48	ASTM A 105	600, FF/125AARH
FLNG.FIG.8	02.000	08.000		ASME- B 16.48	ASTM A 105 (CHARPY)	600, FF/125AARH
FITTING GROUP						
ELBOW.90	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
ELBOW.90	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
ELBOW.90	02.000	16.000	M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW, 1.5D
ELBOW.45	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
ELBOW.45	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
ELBOW.45	02.000	16.000	M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW, 1.5D
T.EQUAL	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
T.EQUAL	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
T.EQUAL	02.000	16.000	M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
T.RED	00.500	00.750		B-16.11	ASTM A 105	SW, 6000

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
T.RED	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
T.RED	02.000	16.000	M, M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
REDUC. CONC	02.000	16.000	M, M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
REDUC. ECC	02.000	16.000	M, M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
SWAGE. CONC	00.500	03.000	M, M	BS-3799	ASTM A 105 (CHARPY)	PE
SWAGE. ECC	00.500	03.000	M, M	BS-3799	ASTM A 105 (CHARPY)	PE
CAP	00.500	00.750		B-16.11	ASTM A 105	SCRF, 6000
CAP	01.000	01.500		B-16.11	ASTM A 105	SCRF, 3000
CAP	02.000	16.000	M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
PLUG	00.500	00.750		B-16.11	ASTM A 105	SCRM, 6000
PLUG	01.000	01.500		B-16.11	ASTM A 105	SCRM, 3000
CPLNG.FULL	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
CPLNG.FULL	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
CPLNG.HALF	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
CPLNG.HALF	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
CPLNG.LH	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
CPLNG.LH	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
CPLNG.RED	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
CPLNG.RED	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
O'let						
SOCKOLET	00.500	00.750		MSS-SP97	ASTM A 105	SW, 6000
SOCKOLET	01.000	01.500		MSS-SP97	ASTM A 105	SW, 3000
WELDOLET	02.000	08.000	M, XXS	MSS-SP97	ASTM A 105 (CHARPY)	BW
VALVE GROUP						

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
VLV.GATE	00.500	01.500		API-602	BODY-ASTM A 105,TRIM-STELLITED,STEM- 13% CR.STEEL	SW, 800, 3000,B-16.11
VLV.GLOBE	00.500	01.500		BS EN 1SO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM- 13% CR STEEL	SW, 800, 3000,B-16.11
VLV.GLOBE	02.000	12.000		BS 1873	BODY-ASTM A 216 GR.WCB, TRIM-13% CR.STEEL	FLGD, 600, B-16.5, RF/125AARH
VLV.CHECK	00.500	01.500		BS EN 1SO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000,B-16.11
VLV.BALL	00.500	01.500		BS EN 1SO 17292	BODY-ASTM A 105, TRIM-BODY SEAT -RPTFE	SW, 600,B-16.5, RF/125AARH
VLV.BALL	02.000	24.000		API-6D	BODY-ASTM A 216 GR.WCC/A234 GR.WPC,TRIM:SEAT: AISI4140+0.003 "ENP/AISI410	FLGD, 600, B-16.5, RF/125AARH
VLV.BALL	02.000	24.000	M	API-6D	BODY-ASTM A 216 GR.WCC/A234 GR. WPC,TRIM: SEAT : AISI 4140+0.003"ENP/AISI 410	BW, 600, B-16.25
VLV.PLUG	00.500	01.500		BS-5353	BODY-ASTM A 105,PLUG-A105 +0.003" ENP	SW, 800, 3000,B-16.11
VLV.PLUG	02.000	24.000		API-6D	BODY- A 216GR. WCB,PLUG: A216 GR.WCB + 0.003" ENP	FLGD, 600, B-16.5, RF/125AARH
VLV.PLUG	02.000	02.000	M	API-6D	BODY-ASTM A 216 GR.WCB,PLUG: A216 GR.WCB + 0.003"ENP	BW, 600, B-16.25
BOLT GROUP						
BOLT.STUD	00.500	30.000		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H	
GASKET						

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
GASKET	00.500	24.000		B-16.20-ANSI B16.5	SP.WND METTALIC WITH GRAPHITEFILLER	SPIRAL, 600

PIPE CLASS	**:**	**P6L**
RATING	:	600
BASE MATERIAL	:	Carbon Steel
CORROSION ALLOWANCE	:	1.5 MM
SPECIAL REQUIREMENT	:	Low Temperature Services

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	-45	38	93	120
PRESS	98.07	98.07	92.79	91.27

SERVICE

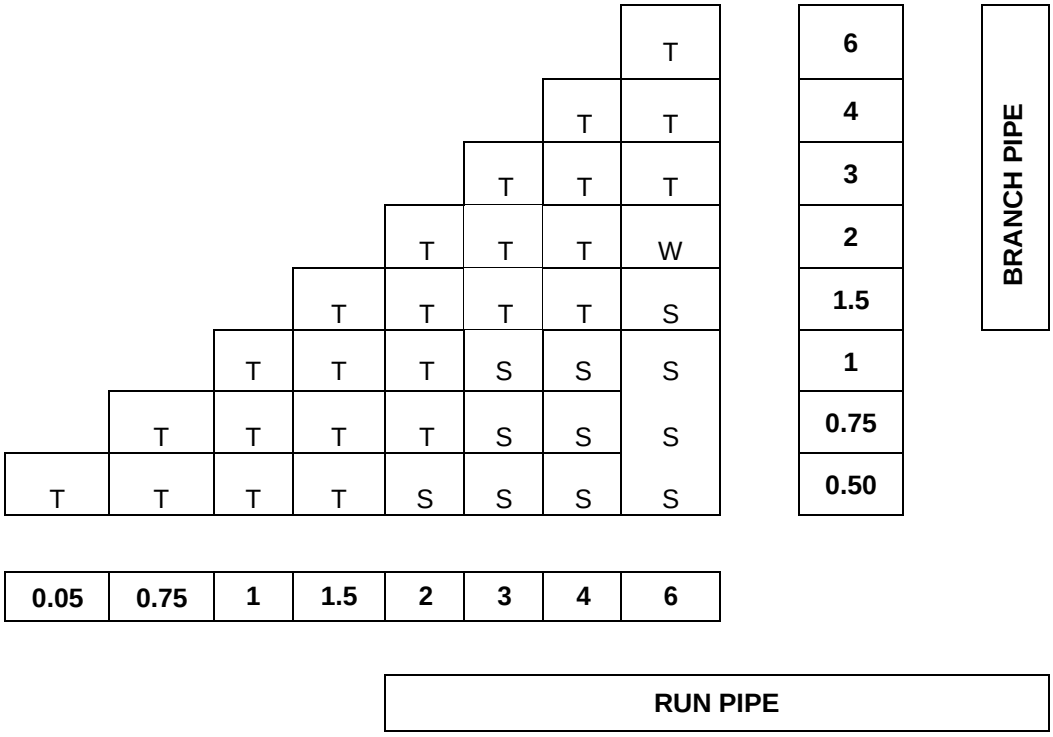
Natural Gas, Utilities (water, inst. air, plant air, nitrogen, carbon dioxide)

NOTES

1. All vents and drains for hydro test shall be provided with gate valve with blind flange assembly unless otherwise indicated in P&ID
2. NDT of welds shall be as follows:
3. Radiography: All butt welds 100% MPI : Socket welds 100%
4. Piping design as per ASME B 31.8, OISD 226 & PNGRB Guidelines
5. Charpy V notch test and hardness test shall be conducted for pipes, fittings and flanges at (-) 45°C.
6. Corrosion allowance of 1.5 mm has been considered for terminal piping.
7. All branch connections including vent, drain, pressure and temperature connection shall be as per branch connection table.
8. For valves, refer valve data sheets as enclosed.
9. Design factor 0.5
10. Ball Valve to be used in main pipeline shall have butt welded ends.

ITEM	SIZE	DESCRIPTION
Maintenance Joints	all	Flanged, to be kept minimum
Pipe joints	1.5" & below	SW coupling
	2.0" & above	Butt welded
Drains	on lines <= 1.5"	Refer std. P-STD-419
	on lines >= 2.0"	As per P&ID or 0.75". Refer std. P-STD-418
Vents	on lines <= 1.5"	Refer std. P-STD-419
	on lines >= 2.0"	As per P&ID or 0.75". Refer std. P-STD-418
Temp. Connection	1.5"	Flanged, installation as per std. P-STD-414 & 415, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. P-STD-411, 412 & 413

BRANCH TABLE



CODE DESCRIPTION

T	TEES
W	WELDOLETS
S	SOCKOLETS

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
PIPE GROUP						
PIPE	00.500	00.750	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
PIPE	01.000	01.500	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
PIPE	02.000	06.000	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS
NIPPLE	00.500	01.500	M	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
FLANGE GROUP						
FLNG.SW	00.500	01.500	M	B-16.5	ASTM A 350 GR.LF2	600, RF/125AARH
FLNG.WN	02.000	06.000	M	B-16.5	ASTM A 350 GR.LF2	600, RF/125AARH
FLNG.BLIND	00.500	06.000		B-16.5	ASTM A 350 GR.LF2	600, RF/125AARH
FLNG.FIG.8	00.500	06.000		ASME- B 16.48	ASTM A 350 GR.LF2	600, FF/125AARH
FITTING GROUP						
ELBOW.90	00.500	00.75		B-16.11	ASTM A 350GR.LF2	SW, 6000
ELBOW.90	01.000	01.500		B-16.11	ASTM A 350GR.LF2	SW, 3000
ELBOW.90	02.000	6.000	M	B-16.9	ASTM A 420GR.WPL6	BW, 1.5D
ELBOW.45	00.500	00.75		B-16.11	ASTM A 350GR.LF2	SW, 6000
ELBOW.45	01.000	01.500		B-16.11	ASTM A 350GR.LF2	SW, 3000
ELBOW.45	02.000	6.000	M	B-16.9	ASTM A 420GR.WPL6	BW, 1.5D
T.EQUAL	00.500	00.75		B-16.11	ASTM A 350GR.LF2	SW, 6000
T.EQUAL	01.000	01.500		B-16.11	ASTM A 350GR.LF2	SW, 3000
T.EQUAL	02.000	6.000	M	B-16.9	ASTM A 420GR.WPL6	BW
T.RED	00.500	00.75		B-16.11	ASTM A 350 GR.LF2	SW, 6000
T.RED	01.000	01.500		B-16.11	ASTM A 350GR.LF2	SW, 3000

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
T.RED	02.000	6.000	M, M	B-16.9	ASTM A 420 GR.WPL6	BW
REDUC. CONC	02.000	6.000	M, M	B-16.9	ASTM A 420 GR.WPL6	BW
REDUC. ECC	02.000	6.000	M, M	B-16.9	ASTM A 420 GR.WPL6	BW
SWAGE. CONC	00.500	03.000	M, M	BS-3799	ASTM A 350 GR.LF2	PE
SWAGE.ECC	00.500	03.000	M, M	BS-3799	ASTM A 350 GR.LF2	PE
CAP	00.500	01.500		B-16.11	ASTM A 350 GR.LF2	SCRF, 3000
CAP	02.000	6.000	M	B-16.9	ASTM A 420 GR.WPL6	BW
PLUG	00.500	01.500		B-16.11	ASTM A 350 GR.LF2	SCRM, 3000
COUPLING FULL	00.500	00.75		B-16.11	ASTM A 35 0 GR.LF2	SW, 6000
COUPLING FULL	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
COUPLING FULL	00.500	01.500		B-16.11	ASTM A 350 GR.LF2	SCRF, 3000
COUPLING HALF	00.500	00.75		B-16.11	ASTM A 350 GR.LF2	SW, 6000
COUPLING HALF	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
COUPLING HALF	00.500	01.500		B-16.11	ASTM A 350 GR.LF2	SCRF, 3000
O'let						
WELDOLET	02.000	04.000	M, XXS	MSS-SP97	ASTM A 350 GR.LF2	BW
SOCKOLET	00.500	00.750		MSS-SP97	ASTM A 350 GR.LF2	SW, 6000
SOCKOLET	01.000	01.500		MSS-SP97	ASTM A 350 GR.LF2	SW, 3000
VALVE GROUP						

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk.	Dmn. STD	Material (Charpy)	Description
VLV.GATE	00.50	01.500		API 602	BODY-ASTM A 350 GR.LF2,TRIMSTELLITED , STEM-SS 304	SW, 800, 3000, B-16.11
VLV.GLOBE	00.50	01.500		BS EN 1SO 15761	BODY-ASTM A 350 GR.LF2,TRIMSTELLITED , STEM-SS304	SW, 800, 3000, B-16.11
VLV.CHECK	00.50	01.500		BS EN 1SO 15761	BODY-ASTM A 350 GR.LF2,TRIM-STELLITED	SW, 800, 3000, B-16.11
VLV.BALL	00.500	01.500		BS EN 1SO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,TRIM-BODY SEAT-RPTFE	SW, 800, 3000, B-16.11
VLV.BALL	02.000	6.000		API-6D	BODY-ASTM A 352 GR.LCB / A 350GR.LF2,TRIM: SEAT: SS 304, SS316	FLGD, 600, B-16.5, RF/125AARH
VLV.BALL	02.000	6.000		API-6D	BODY-ASTM A 352 GR.LCB / A 350GR.LF2,TRIM: SEAT: SS 304, SS316	BW, 600, B-16.25
VLV.PLUG	00.500	01.500		BS-5353	BODY-ASTM A 350GR.LF2, PLUG: A350 GR.LF2 + 0.003" ENP	SW, 800, 3000, B-16.11
VLV.PLUG	02.000	06.000		API-6D	BODY-ASTM A 352GR.LCB / A350 GR.LF2,STEM-SS 304/SS316	FLGD, 600, B-16.5, RF/125AARH
VLV.PLUG	02.000	06.000	M	API-6D	BODY-ASTM A 352GR.LCB / A350 GR.LF2, STEM-SS 304/SS316	BW, 600, B-16.25
BOLT GROUP						
BOLT.STUD	00.500	06.000		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.4	
GASKET						
GASKET	00.500	6.000		B-16.20-ANSI B16.5	SP.WND SS316+ GRAFOIL	SPIRAL, 600

PIPE CLASS : P1F

RATING : 150

BASE MATERIAL : Carbon Steel

CORROSION ALLOWANCE : 1.5 MM

SPECIAL REQUIREMENT : NON-IBR

TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq. cm g) RATINGS

TEMP	0	38	50	65
PRESS	18.9	18.9	18.9	18.9

SERVICE

Fire Water (Above Ground/ Under Ground)

NOTES

1. All vents and drains for hydro test shall be provided with gate valve with blind flange assembly unless otherwise indicated in P&ID
2. Forgings are acceptable in Lieu of Plate material.
3. Sizes given in PMS are nominal bore for O.D. of IS 3589 pipes refer ANSI B36.10.
4. Butterfly Valves shall be lugged wafer type up to 24" and double flanged body for sizes beyond 24".
5. Pipe thicknesses are job specific based on the soil properties of job site and depth of top of pipe of 1.5m. No live load has been considered for calculation of pipe thickness. Live loads wherever expected shall be suitably taken care of.
6. NDT of welds shall be as follows:

   Radiography : All Butt welds 10%

   MPI : Socket welds 10%

ITEM	SIZE	DESCRIPTION
MAINTENANCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM
PIPE JOINTS	1.5" & BELOW	SW COUPLING
	2.0" & ABOVE	BUTT WELDED
DRAINS	ON LINES <= 1.5"	Refer std. SD-PI-019
	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std. SD-PI-018
VENTS	ON LINES <= 1.5"	Refer std. SD-PI-019
	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std. SD-PI-018
TEMP.CONN	1.5"	Flanged, installation as per std. SD-PI-014 &015, except skin temperature measurement.
PRESS.CONN	0.75"	SW nipple with Plug/ Ball Valve to spec. as perRefer std.SD-PI-011, 012 & 013

BRANCH TABLE

											T	**14**
										T	R	**12**
									T	R	R	**10**
								T	R	R	R	**8**
							T	P	R	R	R	**6**
						T	R	P	R	R	R	**4**
					T	P	R	P	R	R	R	**3**
				T	P	P	R	P	R	R	R	**2**
			T	T	H	H	H	H	H	H	H	**1.5**
		T	T	H	H	H	H	H	H	H	H	**1**
	T	T	T	H	H	H	H	H	H	H	H	**0.75**
T	T	T	T	H	H	H	H	H	H	H	H	**0.50**
0.05	**0.75**	**1**	**1.5**	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**14**	
				R	**U**	**N**		**P**	**I**	**P**	**E**	

RANCH PIPE

CODE DESCRIPTION

F	SADDLE FUSED JT	T	TEES
H	H. COUPLING	W	WELDOLETS
P	PIPE TO PIPE	I	INSTRUMENT TEE
R	REINFORCED	X	Refer Notes
S	SOCKOLETS	L	SWEEPOLET

ItemType	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk	Dmn. STD	Material	Description
Pipe Group						
PIPE	00.500	01.500	HVY	IS-1239-I	IS-1239 (BLACK)	PE, C. WELDED
PIPE	02.000	06.000	HVY	IS-1239-I	IS-1239 (BLACK)	BE, C. WELDED
PIPE	08.000	12.000	6.0	IS-3589	IS-3589 GR.410	BE, WELDED
PIPE	14.000	14.000	8.0	IS-3589	IS-3589 GR.410	BE, WELDED
NIPPLE	00.500	01.500	HVY	STD	IS-1239 (BLACK)	PE, C. WELDED
Flange Group						
FLNG.SW	00.500	01.500	M	B-16.5	ASTM A 105	150, RF/125AARH
FLNG.SO	02.000	14.000		B-16.5	ASTM A 105	150, RF/125AARH
FLNG.BLIND	00.500	14.000		B-16.5	ASTM A 105	150, RF/125AARH
FLNG.FIG.8	00.500	08.000		ASME- B16.48	ASTM A 105	150, FF/125AARH
SPCR&BLND	10.000	14.000		ASME- B16.48	ASTM A 105	150, FF/125AARH
Fitting Group						
ELBOW.90	00.500	01.500		B-16.11	ASTM A 105	SW, 3000
ELBOW.90	02.000	06.000	STD	B-16.9	ASTM A 234GR.WPB	BW, 1.5D
ELBOW.90	08.000	14.000	M	B-16.9	ASTM A 234GR.WPB-W	BW, 1.5D
ELBOW.45	00.500	01.500		B-16.11	ASTM A 105	SW, 3000
ELBOW.45	02.000	06.000	STD	B-16.9	ASTM A 234GR.WPB	BW, 1.5D
ELBOW.45	08.000	14.000	M	B-16.9	ASTM A 234GR.WPB-W	BW, 1.5D
T. EQUAL	00.500	01.500		B-16.11	ASTM A 105	SW, 3000
T. EQUAL	02.000	06.000	STD	B-16.9	ASTM A 234GR.WPB	BW
T. EQUAL	08.000	14.000	M	B-16.9	ASTM A 234 GR.WPB-W	BW
T.RED	00.500	01.500		B-16.11	ASTM A 105	SW, 3000
T.RED	02.000	06.000	STD, STD	B-16.9	ASTM A 234GR.WPB	BW
T.RED	08.000	14.000	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW
Fitting Group						
REDUC.CONC	02.000	06.000	STD, STD	B-16.9	ASTM A 234 GR.WPB	BW
REDUC.CONC	08.000	14.000	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW
REDUC.ECC	02.000	06.000	STD, STD	B-16.9	ASTM A 234GR.WPB	BW
REDUC.ECC	08.000	14.000	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW
SWAGE. CONC	00.500	03.000	M, M	BS-3799	ASTM A 105	PE

ItemType	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk	Dmn. STD	Material	Description
SWAGE. ECC	00.500	03.000	M, M	BS-3799	ASTM A 105	PE
CAP	00.500	01.500		B-16.11	ASTM A 105	SCRF, 3000
CAP	02.000	06.000	STD	B-16.9	ASTM A 234 GR.WPB	BW
CAP	08.000	14.000	M	B-16.9	ASTM A 234 GR.WPB	BW
CPLNG.FULL	00.500	01.500		B-16.11	ASTM A 105	SW, 3000
CPLNG.HALF	00.500	01.500		B-16.11	ASTM A 105	SW, 3000
CPLNG.LH	00.500	01.500		B-16.11	ASTM A 105	SW, 3000
CPLNG.RED	00.500	01.500		B-16.11	ASTM A 105	SW, 3000
SOCKOLET	00.500	01.500		MSS-SP97	ASTM A 105	SW, 3000
UNION	00.500	01.500		BS-3799	ASTM A 105	SW, 3000
Valves Group						
VLV.GATE	00.500	01.500		API-602	BODY-ASTM A 105, TRIM-STELLITED, STEM- 13%CR. STEEL	SW, 800, 3000, B-16.11.
VLV.GATE	02.000	24.000		API-600	BODY-ASTM A 216 GR.WCB, TRIM- 13% CR. STEEL	FLGD, 150, B-16.5, RF/125AARH.
VLV.GLOBE	00.500	01.500		BS-5352	BODY-ASTM A105, TRIM-STELLITED, STEM-	SW, 800, 3000, B-16.11.
VLV.GLOBE	02.000	16.000		BS-1873	BODY-ASTM A 216 GR.WCB, TRIM- 13% CR. STEEL	FLGD, 150, B-16.5, RF/125AARH.
VLV.CHECK	00.500	01.500		BS-5352	BODY-ASTM A 105, TRIM- STELLITED	SW, 800, 3000, B-16.11.
VLV.CHECK	02.000	24.000		BS 1868	BODY-ASTM A 216 GR.WCB, TRIM- 13% CR. STEEL	FLGD, 150, B-16.5, RF/125AARH.
Valves Group						
VLV.BTRFLY	03.000	24.000		BS-5155	BODY-ASTM A 216 GR.WCB, TRIM- 13% CR. STEEL	WAFL, 150, B-16.5, WAF/125AARH.
Bolt Group						
BOLT.STUD	00.500	14.000		B-18.2	BOLT: A193 GR. B7, NUT: A194 GR.2H	
Gasket Group						
GASKET	00.500	14.000		B-16.21-ANSI B16.5	IS-2712-GR. W/3	RING, 150, 2 MM
Trap/Strainer Group						

ItemType	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk	Dmn. STD	Material	Description
STRNR.PERM	00.500	01.500		MNF'STD	B: A105; INT:SS304	SW, Y-TYPE, 800
STRNR.PERM	02.000	06.000	M	PLECO'STD	B: A234GR.WPB; INT: SS304	BW, T-TYPE
STRNR.PERM	08.000	14.000	M	PLECO'STD	B: A234GR.WPBW; INT: SS304	BW, T-TYPE

CHECKLIST – TECHNICAL

Bidder confirms following, as a minimum, has been enclosed in the offer.

S.NO.	Requirements	Compiled by Bidder(Tick)
1	Reference List of previous supply of Procured item	☐
2	Filled – up Data Sheets, duly signed and stamped by bidder enclosed.	☐
3	List of recommended commissioning spares and accessories for Procured item.	☐
4	List of recommended spares and accessories for two year normal operation for procured item.	☐
5	Compliance statement duly filled and stamped enclosed.	☐
6	GA & assembly drawings, cross section drawings including part list & material list enclosed.	☐
7	Other technical details & vendor's product catalogues enclosed.	☐

REFERENCE LIST

Sl No.	Project	Year of Supply	Client , Address and Contact No.	Email	Size and Rating/ thk	Service

Bidder's Signature with stamp

COMPLIANCE STATEMENT

S.No	Requirement	Bidder's Confirmation
1	Bidder confirms that all materials proposed by the bidder are same/ superior to those specified in specification/ data sheets enclosed.	
2	Bidder confirms that the offer is in total compliance with the Technical requirements of the Material Requisition. Bidder confirms that deviation expressed or implied anywhere else in the offer shall not be considered valid.	
3	Bidder confirms that all spares and accessories required for two years of normal operation have been quoted separately.	
4	Bidder confirms that prices for start-up/commissioning spares and accessories have been included in the quoted items.	
5	Bidder confirms that in the event of securing order for the requisitioned item(s), good for manufacturing drawings of ordered item(s) shall have complete details with dimensions, part list and material list including back-up calculations in the first submission, failing which the vendor shall be solely responsible for any likely delay in delivery of item(s).	

Bidder's Signature with Stamp

DEVIATION/ EXCEPTION/ CLARIFICATION SHEET

S.No.	Contractor's Inquiry Reference	Contractor's Requirement	Proposed Deviation by Supplier, with Technical Justification	Cost Impact, if any	Contractor's Conclusions

NOTES

1- Bidder confirms that apart of from the deviations/exceptions/clarifications listed above, the bid is in full compliance with Inquiry requisition.
2- Bidder shall submit this sheet duly filled up and signed by him along with his bid. In case there is no deviation, then also supplier shall submit this sheet along with his bid indicating NIL deviation.

(Contractor's Name and Signature with Seal)

INFORMATION/ DOCUMENTS / DRAWINGS TO BE SUBMITTED BY SUCCESSFUL BIDDER

Successful Bidder shall submit four copies unless noted otherwise, each of the following:

1. Inspection & test reports for all mandatory tests as per the applicable code as well as test reports for any supplementary tests, in nicely bound volumes.

2. Filled in Quality Assurance Plan (QAP) for Purchaser's/ Consultant's approval. These QAPs shall be submitted in two copies within 15 days from LOI/ FOI.

3. Detailed completion schedule activity wise (Bar Chart), within one week of placement of order.

NOTE:- All drawings, instructions, catalogues, etc., shall be in English language and all dimensions shall be metric units.

INSTRUCTION TO BIDDERS

1. Bidder to note that no correspondence shall be entered into or entertained after the bid submission.

2. Bidder shall furnish quotation only in case he can supply material strictly as per this Material Requisition and specification/data sheet forming part of Material Requisition.

3. If the offer contains any technical deviations or clarifications or stipulates any technical specifications
   (even if in line with MR requirements) and does not include complete scope & technical/ performance data required to be submitted with the offer, the offer shall be liable for rejection.

4. Bidder must submit all documents as listed in checklist with his offer.

5. Supplier must note that stage wise inspection for complete fabrication, testing including the raw material inspected to be carried out.

6. Vendors for bought out items to be restricted to the approved vendor list attached with bid document. Approval of additional vendor if required, for all critical bought out items shall be obtained by the supplier from the purchaser before placement of order. Credentials/PTR of the additional vendor proposed to be submitted by supplier for review and approval of Purchaser/ Purchaser's representative

PLECO	**VENDOR DRAWINGS DOCUMENT SCHEDULE**	**DOCUMENT NO.** **P-STD-007**

VENDOR DRAWINGS

DOCUMENT SCHEDULE

	Vendor Drawing/ Document Submission Schedule	Status: Date:

Client	Project		Vendor Name	
Item Description	PO No.		Address	
	Date		Contact Person:	Fax:
PLECO Department		Contact Person(PLECO)	Phone:	Email:

S. No.	Equipment/ Item Number	Drg./Doc. Nomenclature	Vendor Drg./ Doc. Number	Vendor Drg./Doc. Title	Category Review (R) / Records	Scheduled date of 1st submission (Rev.0)	Form Electronic/ Print	Remarks

0	04.01.2022	ISSUED AS STANDARDS	PNS	MD	AD
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

PLECO	LIST OF RECOMMENDED THIRD PARTY INSPECTION AGENCY (TPIA)			
	CONSULTANT:	**Pipeline Engineering Consultants Private Limited (PLECO)**		
SL. NO	**NAME OF TPI**	**ADDRESS**	**PHONE NO**	**FAX NO**
1	Tata Projects Ltd.	22,Sarvodaya Society,Nizampura,Baroda-390002	0265-2392863	0265-2785952
2	Bax counsel Inspection Bureau Pvt. Ltd.	303, Madhava,Bandra Kurla Complex, Bandra(E),Mumbai-400051	022-26591526,022-26590236	022-26591526
3	Germanischer Lloyd	4th Floor, Dakshna Building, Sec-11, Plot NO.2, CBD Belapur, Navi Mumbai 400 614	022-4078 1000	022-4024 2935
4	ABS Industrial Verification Ltd., Mumbai	404,Mayuresh Chambers,Sector-11,CBD Belapur(E),Navi Mumbai-400614	022-27578780 /1 /2	022-27578784 / 5
5	Certification Engineers International Ltd.	EIL Bhavan,5th floor,1,Bhikaji Camma Place, New Delhi-110066	011-26167539,26102121	011-26101419
6	Dalal Mott MacDonald	501, Sakar -II, Ellisbridge,Ahemedabad-380006	079-26575550	079-6575558
7	International Certification Systems	E-7,Chand Society, Juhu Road, Juhu, Mumbai-4000049	022-26245747	022-226248167
8	SGS	SGS India Pvt. Ltd.,SGS House,4B,A.S.Marg,Vikhroli(W),Mumbai-400083	022-25798421 to 28	022-25798431 to 33
9	Intertek Moody	9th Floor, Kanchenjunga Building, 18-Barakhamba Road, New Delhi-110001	011-4713 3900	011-4713 3999
10	TUV SUD South Asia	C-153/1, Okhla Industrial Ara, Phase-1, New Delhi-110020	011-3088 9611/9797	011-3088 9598
11	TUV Rheinland (India) Pvt. Ltd.	F-51, Kailash Complex GF, Veer Savarkar Marg, Vikhroli Park Site, Vikhroli(W), Mumbai-400079	022-4215 5435	022-4215 5434
12	Vincott International India Assessment Service Pvt. Ltd.	C-301, Mangalya Premises Cooperative Soc. Ltd, Off. Marol Maroshi Road, Andheri(E), Mumbai-400959	022-4247 4100	022-4247 4101
13	Meenar Global Consultants	Mr. Nitin Taneja (Project Manager)	M: +91-9711212783 T: +91-129-4072836	Web : www.meenaar.in Email : nitin.taneja@meenaar.in
14	VCS Quality Services Pvt. Ltd.	505, 5th floor, 360 Degree Business Park, Next to R-Mall, L.B.S. Marg, Mulund West, Mumbai 400080	Tel: 91 22 21649720	091 22 21646392
15	Edlipse Engg. Global Pvt. Ltd.	Office No. - 24 , Upper ground floor, Parsvnath Bibhab Plaza, Alpha-1, Commercial Belt, Greater Noida UP . Mobile - +91 9910502293 Landline - +91 120 4922792	Mobile - +91 9910502293 Landline - +91 120 4922792	www.edlipse.com

LIST OF SPARES

S. No.	Part No.	Description	Quantity (Minimum)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

PLECO

DOCUMENT NO.

P-STD-009

DATA SHEET FOR TORQUE VALUES

Item No.	TAG No.	Valve Torque Data (To be furnished by Valve Manufacturer			Min. Actuator Torque Required (With Safety Factor of 1.5)		Actuator Generated Torques (Note-1) (For Selected Model)		Actuator Model (8)
		Break Torque [Nm] (1)	Running Torque [Nm] (2)	Max. Allowable Torque for Valve Stem [Nm] (3)	Break Torque [Nm] (4)	Running Torque [Nm] (5)	Running Torque [Nm] (6)	Stall Torque [Nm] (7)	
1	GOOV-001								
2	GOOV-002								
3	GOOV-003								
4	GOOV-004								

NOTES:

1. These figures shall be used as basis for testing the actuator performance during factory testing. The actuator acceptance would be carried out after verifying successful testing of complete ball valve with actuator assembly.

DATA SHEET FOR TORQUE VALUES

2. Actuator running torque shall be greater than or equal to minimum required torque indicated under column (5) and actuator stall torque shall be greater than or equal to minimum required torque under column (4).
3. Actuator stall torque shall be less than max allowable torque for valve stem. Valve manufacturer shall ensure that valve stem is designed to withstand actuator stall torque.

LIST OF APPROVED PARTIES FOR BOUGHT OUT ITEMS

Z-STD-001

Rev.	Date	Purpose	Prepared by	Reviewed by	Approved by	Approved by
0	26.08.22	ISSUED FOR STANDARD	PNS	MD	AD	SK

CONTENTS

LIST OF SUPPLIERS OF MAJOR BOUGHT - OUT ITEMS

1. (MECHANICAL & FIRE FIGHTING EQUIPMENT)

i) Pipe Carbon Steel to Indian Standards

1. A.S.T. Pipes Pvt. Ltd. (AST Group)
2. Advance Steel Tube Ltd.
3. Apl Apollo Tubes Ltd. (Er. Bihar Tubes Ltd.
4. Asian Mills Pvt. Ltd.
5. Asrani Tubes Limited
6. Dadu Pipes (P) Ltd.
7. Essar Steel Limited (Er Hazira Pipes Mill)
8. Gaurang Products Pvt Ltd. (Ast Group)
9. Goodluck Steel Tubes Ltd.
10. Hi-Tech Pipes Limited
11. Indus Tube Limited
12. Jindal Industries Ltd
13. Jindal Pipes Ltd.
14. Jindal Saw Ltd (Kosi Works)
15. Jotindra Steel & Tube Ltd
16. Lalit Pipes and Pipes Ltd.
17. Maharashtra Seamless Ltd.
18. Man Industries (India) Ltd. – Pithampur
19. Man Industries (India) Ltd. Anjar
20. Mukat Tanks & Vessels Ltd.
21. Nezone Tubes Limited
22. North Eastern Tubes Limited
23. Pratibha Industries Limited
24. Pratibha Pipes & Structural Ltd.

25. Psl Ltd (Chennai)

26. Psl Ltd (V1, V2 & Nc)

27. Rama Steel Tubes Ltd.

28. Ratnamani Metals and Tubes Ltd.

29. Ravindra Tubes Limited

30. Samshi Pipe Industries Limited

31. Surya Roshni Ltd.

32. Swastik Pipes Ltd.

33. Utkarsh Tubes & Pipes Ltd. (Formly Bmw)

34. Welspun Corp. Limited (Dahej)

35. Zenith Birla (India) Limited

ii) Pipe & Tubulars To A.P.I. Standards

1. Arcelormittal Tubular Products Roman Sa, Romania

2. Bhel (Trichy), India

3. Dalmine Spa (Enquiry To Tenaris),Uae

4. Eewkorea Co. Ltd (Germany), Korea

5. Eew Korea Co. Ltd. (Korea), Korea

6. Eisenbau Kramer Gmbh, Germany

7. Hyundai Rb Co. Ltd. South Korea

8. Ilva Lamiere E Tubi Srl (Enq to Ilva Spa, Italy

9. Inox Tech. Spa, Italy

10. Ismt Ltd. Ahmednagr, India

11. Ismt Ltd. Baramati, India

12. Jindal Pipes Ltd., India

13. Jindal Saw Ltd. (Kosi Works), India

14. Jindal Saw Ltd. (Nashik Works), India

15. Lalit Pipes and Pipes Ltd. India

16. Maharashtra Seamless Ltd., India
17. Man Industries (I) Ltd. (Pithampur), India
18. Mukat Tanks & Vessels Ltd., India
19. Pratibha Industries Limited, India
20. Ratnamani Metals and Tubes Ltd., India
21. Siderca S.A.I.C (Enquiry Totenaris), Uae
22. Sumitomo Metal Ind. Ltd., India
23. Surya Roshni Ltd., India
24. Swastik Pipes Ltd, India
25. Tata Steel Uk Limited (Formerly C702)
26. Tubos De Acero De Mexico Sa (Enq. Tenaris), Uae
27. Tubos Reunidos Sa Spain
28. Umran Steel Pipe Inc (Turkey), Turkey
29. Valcovny Trub Chomutov, Czech Republic
30. Vallourec and Mannesmann Tubes, France
31. Welspun Corp Limited (Dahej), India

iii) <u>Pipe/Tube CS (Seamless) To ASTM Stds</u>

1. Arcelormittal Tubular Products Roman Sa, Romania
2. Bhel (Trichy), India
3. Changshu Seamless Steel Tube Co. Ltd., China
4. Dalmine Spa (Enquiry to Tenaris, Uae
5. Heavy Metals & Tubes Limited (Mehsana), India
6. Ismt Ltd. Ahmedngr, India
7. Ismt Ltd. Baramati India
8. Jfe Steel Corporation, Uae
9. Jindal Sdaw Ltd (Nashik Works) India
10. Klt Automotive and Tubular Products Ltd., India

11. Mahalaxmi Seamless Limited, India

12. Maharashtra Seamless Ltd, India

13. Products Tubulares S.A.U, Spain

14. Ratnadeep Metal Tubes Ltd., India

15. Staineest Tubes Pvt Ltd., India

16. Sumitomo Metal Ind. Ltd., India

17. Tubos Reunidos Sa Spain

18. Valcovny Trub Chomutov, Czech Republic

19. Vallourec Andmannesmann Tubes France

20. Yangzhou Chengde Steel Pipe Co. Ltd Dubai (UAE)

iv) Pipe Carbon Steel (Welded) To ASTM Stds

1. Eew Korea Co. Ltd. (Germany), Korea

2. Eew Korea Co. Ltd. (Korea), Korea

3. Eisenbau Kramer Gmbh, Germany

4. Hyundai Rb Co. Ltd., South Korea

5. Inox Tech. Spa, Italy

6. Jindal Saw Ltd (Kosi Works), India

7. Lalit Pipes And Pipes Ltd., India

8. Man Industeries (I) Ltd.(Pithampur), India

9. Man Industries (India) Ltd. Anjar, India

10. Mukat Tanks & Vessels Ltd., India

11. Ratnamani Metals And Tubes Ltd., India

12. Sumitomo Metal India Ltd., India

13. Tata Steel Uk Limited

v) Valve

a) Globe Valves

1) M/s BDK (New Delhi)

2) M/s Datre Corpn (Calcutta)

3) M/s KSB Pumps (New Delhi)

4) M/s L&T (New Delhi)

5) M/s Neco Schuber & Salzer Ltd. (New Delhi)

6) M/s Niton Valve (Mumbai)

7) M/s Ornate Valves (Mumbai)

8) M/s Panchavati Valves (Mumbai)

9) AV Valves Ltd.

10) BHEL (Trichy), India

11) Econo Valves Pvt Ltd, India

12) Fouress Engg (I) Ltd (Aurangabad)

13) Guru Industrial Valves Pvt Ltd

14) Leader Valves Ltd, India

15) NSSL Ltd. (Neco Schubert & Salzerltd)

16) Oswal Industries Ltd, India

17) Petrochemical Engineering Enterprises, India

18) Sakhi Engineers Pvt Ltd

19) Shalimar Valves Pvt Ltd

20) Steel Strong Valves India Pvt Ltd, India

21) Petro Valves Pvt. Limited, Ahmedabad

b) Check Valves

1. M/s Advance Valves Pvt. Ltd., Noida

2. M/s Aksons & Mechanical Enterprises, Mumbai

3. M/s Larsen & Toubro Limited (M/s Audco India Limited, Chennai)

4. M/s AV valves Ltd., Agra

5. M/s BDK engineering India Ltd., Hubli

6. M/s BHEL,OFE&OE Group, New Delhi

7. M/s Datre Coroportion Limited, Calcutta

8. M/s Leader Valves Ltd., Jalandhar

9. M/s Neco schubert &Salzer Ltd., New Delhi

10. M/s Niton Valves Industries (P) Ltd., Mumbai

11. M/s Precision Engg.Co., Mumbai

12. Econo Valves Pvt Ltd, India

13. Fouress Engg (I) Ltd (Aurangabad)

14. KSB Pumps Ltd (Coimbattore), India

15. NSSL Ltd. (Neco Schubert & SalzerLtd)

16. Oswal Industries Ltd, India

17. Panchvati Valves & Flanges Pvt Ltd, India

18. Petrochemical Engineering Enterprises, India

19. Sakhi Engineers Pvt Ltd

20. Shalimar Valves Pvt Ltd

21. Steel Strong Valves India Pvt Ltd, India

c) Plug Valves

1. M/s Breda Energia Sesto Industria Spa, Italy

2. M/s Fisher Sanmar Ltd., Chennai

3. M/s Larsen & Toubro Ltd., New Delhi

4. M/s Nordstrom Valves, USA

5. M/s Serck Audco Valves, UK

6. M/s Sumitomo Corporation India Pvt. Ltd., New Delhi

7. M/s Z Corporation, Korea

8. M/s Hawa Valves (India) Pvt. Ltd., Mumbai

9. M/s Steel Strong Valves India Pvt. Ltd., Navi Mumbai

10. M/s Econo Valves

11. M/s Flow-Serve PTE (Mfr. SERCK), India

d) Ball Valves

1. M/s Hawa Valves (India) Pvt. Ltd, Navi Mumbai
2. M/s Larsen & Toubro, Delhi
3. M/s Microfinish Valves Pvt. Ltd., Noida
4. M/s Oswal Industries Ltd., Gandhi nagar
5. M/s Virgo Engineers Ltd., Delhi
6. M/s Boteli Valve Group Co. Ltd., China
7. M/s Cameron (Malaysia) SDN BHD, Malaysia
8. M/s Dafram S.P.A., Italy
9. M/s Fangyuan Valve Group Co. Ltd., China
10. M/s Franz Schuck GmbH, Germany
11. O.M.S. Saleri (Italy)
12. Pibi Viesse S.P.A (Italy)
13. Nuovo Pignone (Italy)
14. Perar S.P.A (Italy)
15. Pietro Fiorentini (Italy)
16. Cooper Cameron Valv Italy SRL-FRM, Itly
17. Petrol Valves SRL
18. Tormene Gas Technology S.P.A (VALVITALIA)

vi) Flow Tee

1. M/s Coprosider SPA, Italy
2. M/s GEA Energy System India Limited, Chennai
3. M/s Multitex Filteration
4. M/s Pipeline Engineering, UK
5. M/s Scomark Engg. Limited (U.K.)
6. M/s Skeltonhall Limited, Engaland(U.K.)
7. M/s Technospecial SPA, Italy

8. M/s Tectubi SPA, Italy
9. M/s RMA Germany
10. M/s Pipefit Engineers Pvt. Ltd.
11. M/s PSN Energy Systems (up to 24”NB, 600#)

vii) Split Tee

1. M/s T D Williamson India Private Limited, India
2. M/s Furmanite International Ltd., USA
3. M/s Huwelco Inc., South Houston
4. M/s Plant-Tech Power Technical Services Pvt. Ltd., India
5. M/s VKVC, India
6. Teemans, UK

viii) Flanges

1. M/s Aditya Forge Ltd., Vadodara
2. M/s Amforge Industries Ltd., Mumbai
3. M/s CD Engineering Co., Ghaziabad
4. M/s Echjay Forgings Pvt. Ltd. (Bombay), Mumbai
5. M/s Echjay Industries Ltd., Rajkot
6. M/s Forge & Forge Pvt. Ltd., Rajkot
7. M/s Golden Iron & Steel Works, New Delhi
8. M/s JK Forgings, New Delhi
9. M/s Metal Forgings Pvt. Ltd., Mumbai
10. M/s Perfect Marketings Pvt. Ltd., New Delhi
11. M/s Sky Forge, Faridabad
12. M/s S&G, Faridabad
13. Chaudhry Hammer Works Ltd, India
14. JAV Forgings (P) Ltd, India
15. Kunj Forgings Pvt Ltd, India

16. MS Fittings
17. R.N. Gupta & Co. Ltd, India
18. R.P. Engineering Pvt Ltd, India
19. Sanghvi Forgings & Engineering Ltd
20. Shri Ganesh Forgings Ltd., India
21. Uma Shankar Khandelwal & Co., India
22. Sawan Engineers, Baroda
23. Stewarts & Lloyds of India Ltd., Kolkata
24. Engineering Services Enterprises
25. Pipefit Engineers Pvt. Ltd.

ix) Fittings

1. M/s Commercial Supplying Agency, Mumbai
2. M/s Dee Development Engineers Ltd.
3. M/s Eby Industries, Mumbai
4. M/s Flash Forge Pvt. Ltd., Vishakhapatnam
5. M/s Gujarat Infra Pipes Pvt. Ltd., Vadodara
6. M/s M.S. Fittings Mfg. Co. Pvt. Ltd., Kolkata
7. M/s Stewarts & Lloyds of India Ltd., Kolkata
8. M/s Teekay Tubes Pvt. Ltd., Mumbai
9. M/s Pipe Fit,Baroda
10. M/s Sky Forge, Faridabad
11. M/s S&G, Faridabad
12. M/s Sawan Engineers, Baroda
13. Eby Fasteners, India
14. Leader Valves Ltd, India
15. R.N. Gupta & Co. Ltd, India
16. Exten Engg Pvt Ltd

17. Sivananda Pipe & Fittings Ltd
18. Sawan Engg - Vadodara
19. P.K. Tubes –rajastan
20. CSA fittings
21. Dee Development Engineers Limited (Palwal)
22. Fittech Industries Pvt Ltd (Thane)
23. Gujrat Infrapipes Pvt Ltd ,Vadodara
24. K.S Pipe Fittings (P) Ltd, Palwal
25. Teekay Tubes Pvt Ltd (New Mumbai)
26. Petro Chem Industries,Vadodara
27. Topaz Piping Industires ,Vadodara
28. Tube Bend ,Calcutta
29. Tube Turn India Pvt Ltd , Navi Mumbai
30. Sidharth & Gautam Engineers

x) Gaskets

1. IGP Engineers (P) Ltd., Madras
2. Madras Industrial Products, Madras
3. Dikson & Company, Bombay
4. Banco Products (P) Ltd., Vadodara
5. Goodrich Gaskets Pvt Ltd
6. Starflex Sealing India Pvt Ltd, India
7. Teekay Meta Flex Pvt Ltd
8. UNIKLINGER Ltd
9. HEM Engg. Corp.
10. Unique Industrial Packing Pvt. Ltd.

xi) Fasteners

1. Nireka Engg. Co. (P) Ltd., Calcutta

2. Precision Taps & Dies, Bombay
3. AEP Company, Vithal Udyoug Nagar
4. Fix Fit Fasteners, Calcutta
5. Precision Engg. Industries, Baroda
6. Echjay Forgings Pvt. Ltd., Bombay
7. Capital Industries, Bombay
8. Boltmaster India Pvt Ltd, India
9. Deepak Fasteners Limited, India
10. Fasteners & Allied Products Pvt Ltd, India
11. Hardwin Fasteners Pvt Ltd, India
12. J.J. Industries, India
13. Multi Fasteners Pvt Ltd, India
14. Nexo Industries, India
15. Pacific Forging & Fasteners Pvt Ltd, India
16. Pioneer Nuts & Bolts Pvt Ltd, India
17. Precision Auto Engineers, India
18. President Engineering Works, India
19. Sandeep Engineering Works, India
20. Syndicate Engineering Industries, India

xii) Welding Electrodes

1. For Mainline – Lincon make
2. For Terminal – For root pass - Lincon Make
3. For other passes – Lincon, D&H or equivalent make

xiii) Fire Fighting Equipment's

a) Fire Extinguishers

1. Avon Services (Production & Agencies) Pvt. Ltd., Bombay
2. Kooverji Devshi & Co., Bombay

3. Zenith Fire Services, Bombay
4. Safex Fire Services, Bombay
5. Reliable (Fire Protection) India Ltd., Bombay
6. Brijbasi Hi-Tech Udyog ltd.
7. Bharat Engg Works, India
8. Gunnebo India Ltd
9. Nitin Fire Protection Industries Ltd, India
10. Supremex Equipments, India
11. Vimal Fire Controls Pvt Ltd., India

b) Fire Hydrants, Monitors, Deluge Valve, Nozzles

1. Zenith
2. Minimax
3. Newage
4. HD Fire
5. Vijay Fire
6. Asco Strumech Pvt Ltd, India
7. Brij Basi Hi
8. tech Udyog
9. Gunnebo India Ltd
10. Nitin Fire Protection Pvt Ltd
11. Shah Bhogilal Jethamal & Brothers
12. Venus Pumps & Engineering Works

c) RRL Hose

1. Jayshree
2. Newage

d) Hoses

1. Ashit Sales Corporation, Bombay

2. Royal India Corporation, Bombay
3. Gayatri Industrial Corporation
4. Simplex Rubber Products Ltd., Ahmedabad
5. Zaverchand Marketing Pvt. Ltd., Baroda
6. Presidency Rubber Mill, Calcutta
7. The Cosmopolite, Calcutta
8. Simplex Rubber Products, Thane

e) Hose Delivery

1. Chhatarya Rubber & Chemical Industries,
2. Nitin Fire Protection Industries Ltd, India

f) Fire Hose Accessories

1. Asco Strumech Pvt Ltd
2. Brij Basi Hi-tech Udyog
3. Gunnebo India Ltd
4. Shah Bhogilal Jethamal & Brothers
5. Vimal Fire Controls Pvt Ltd., India

g) Heat Shrinkable Sleeves

1. Seal for Life - Covalence
2. Canusa

h) Cold Applied Tapes

1. Denso GmBH
2. Polyken (Berry Plastics Corporation)

i) PUR Coating

1. Powercrete (Berry Plastics Corporation)

j) Casing End Closure

1. Raci, Italy
2. Raychem RPG Limited

k) Casing Insulators

1. Raci, Italy
2. Raychem RPG Limited

l) Rockshield

1. Raychem RPG Limited

m) Warning Tape /Mesh

1. Sparco Multiplast Pvt. Ltd., Ahmedabad
2. M/s Raychem RPG Limited
3. Singhal Industries Private Limited

n) High Build Epoxy Coating

1. Berry Plastics – Powercrete
2. Specialty Polymer Canada
3. Denso Protal, Canada

o) Casing Insulators

1. Raci, Italy
2. Raychem RPG Limited
3. Veekay Vikram

xiv) DRY GAS FILTER & FILTER SEPERATOR

1. Grand Prix Fab (Pvt.) Ltd.(New Delhi)
2. Perry Equipment, USA
3. Faudi Filter, Germany
4. Forain S.r.l., Italy
5. ABB, Faridabad
6. Burgess Manning, USA
7. Multitex Filtration Engineers India
8. Triveni Plenty Engg. Ltd. (New Delhi)
9. Siirtec International Contractor S.P.A (Italy)

10. Flashpoint, Pune india
11. Filteration Engineers (I) Pvt Ltd, India
12. Gujarat Otofilt, India
13. Tormene Gas Technology
14. Ultrafilter (India) Pvt Ltd, India
15. Ravi Techno Systems Pvt Ltd, India
16. Siirtec Nigi S.P.A
17. Filtan Filter Anlagenbau Gmbh
18. Fairley Arlon BV
19. PECO Facet
20. EPE Epenstenner GMBH
21. Filtrex srl
22. Petromar Engineered Soln
23. Plenty Filter
24. Eurofiltec
25. PTI Technologies Inc

xv) QUICK OPENING END CLOSURE (QOEC)

1. Forain S.R.L.
2. GD Engineering
3. Pipeline Engineering, UK
4. Siirtec Nigi S.P.A
5. TD Williamson
6. Peerless
7. Grinelli
8. Huber Yale
9. Tube Turn (U.S.A.)
10. Pipeline Technologies, France

11. M/s Grand Prix Engineering Pvt. Ltd.
12. M/s VKVC LLP
13. M/s Multitex Filtration Engineers Ltd

xvi) FILTER ELEMENT

1. Peco – Facet
2. Velcon
3. Pall – Filterite
4. Burgress Manning

xvii) NDT Agency

1. NDT Services, Ahmedabad
2. GEECY Industrial Services Pvt. Ltd., Mumbai
3. Corrosion Control Services, Mumbai
4. Perfect Metal Testing & Inspection Agency, Calcutta
5. Inter Ocean Shipping Co., New Delhi
6. RTD, Mumbai
7. Sievert, Mumbai
8. X-Tech, Vizag

xviii) Long Radius Bends

1. M/s BHEL, Trichy, Tamilnadu
2. M/s Jindal SAW Limited, (Koshi Works), U.P.
3. M/s PSL Limited, Gandhidham, Gujarat
4. M/s Welspun, Gujarat
5. M/s Fabricon, Belgium
6. M/s Sawan
7. M/s Gujarat Infra
8. M/s P K Tubes
9. M/s DEE Development

10. Pipefit Engineers Pvt. Ltd.

xix) PIG LAUNCHERS/ RECEIVERS/ PIG SIGNALERS

1. Bassi Luigi Fittings B.V., Holland
2. BRAUN STAHL PIPE TEC, GERMANY
3. FORAIN, ITALY
4. Fluidel SRL, ITALY
5. RMA Maschinen- und, GERMANY
6. Siiritec Nigi, Itlay
7. SCHUCK ARMATUREN, GERMANY
8. T.D. Williamson Inc., USA
9. Tectubi SPA, Italy
10. Taylor Forge Engineering System INC, USA
11. Tormene Americana S.A. (Argentina)
12. Tormene Gas Technology S.p.A., Italy
13. PIPELINE ENGINEERING, UNITED KINGDOM
14. Krohne, Oil & Gas BV, Drive Houston,
15. Multitex Filtration Engrs. Ltd, New Delhi
16. BGR ENERGY SYSTEMS LIMITED New Delhi
17. Glapwell Contracting Services Ltd. UK
18. FULGOSI GIOVANNI S.n.c di Corrado & C, ITALY
19. VEEKAY VIKRAM & CO, GUJRAT
20. GBM S.R.L, ITALY
21. Multitex F iltration Engineers Ltd., India
22. Cardew Ltd., Alexeander
23. Forain S.R.L.
24. GD Engineering, India

25. Pipeline Engineering, UK

26. Siirtec Nigi SPA

LIST OF MATERIALS OF APPROVED BRAND AND/ OR MANUFACTURE

2. (CIVIL & STRUCTURE)

Unless otherwise specifically mentioned in the Schedule of Items, Contractor has to use materials as listed below of only these brand names/ Company's names, which are mentioned in the approved list for civil, water supply and sanitary items thereon.

a. CIVIL

S. NO.	ITEMS/ NAME OF PRODUCTS	MAKE/ BRANDS/ MANUFACTURES
1.	Reinforcement Steel	TATA,SAIL,RINL,IISCO,RATHI
2.	Cement	Ambuja, ACC, JK, Grasim, Ultratech, Birla, L&T, Cement Corporation of India, Maihar
3.	Structural Steel	TATA, SAIL, RINL, IISCO, ESSAR, ISPAT
4.	Pre- engineered building (PEB) firms	Kirby Building system India ltd, Interach Building Product limited, Tata blue scope steel, Lloyd Insulation India ltd, Everest Industries. Ltd. Modern Prefab System Pvt Ltd, Aster Building Solution Pvt.Ltd, Octamec Engineering Ltd, Jindal Mectec Pvt Ltd, Fedders Lioyd Corporation Ltd.
5.	Structural Steel Tubes	TATA, JINDAL , SURYA , SWASTIK
6.	(a) Zincalume colour coated steel sheet (COIL) (b) Profile of Sheet (as per tender specification)	(a) Tata Blue scope, Dongbu Steel, Union Steel, JSW STEEL Ltd., Kirby Building system India ltd, Interach Building Product limited, Tata blue scope steel, Lloyd Insulation India ltd, Everest Industries. Ltd., Modern Prefab System Pvt Ltd, Aster Building Solution Pvt. Ltd, Octamec Engineering Ltd, Jindal Mectec Pvt Ltd, Fedders Lioyd Corporation Ltd.
7.	Polycarbonate Sheet	Sabic Innovative Plastic , Everest
8.	Mineral wool for thermal insulation of ceilings (Under deck insulation)	Rock wool (india) Ltd. Minwool Rock Fibres Ltd., Lloyd Insulation,

9.	Rolling shutters (ISI marked)	Swastic, Hercules, Shubdwar, M/s Bharat Rolling Shutters Industries Agra, Bengal Rolling Shutter Rama Rolling Shutter Works, Gandhi Entrance Automations Private Limited
10.	Wind driven air Ventilators	Apurva Enterprises (Mumbai), SVS Wind Driven Turbo Ventilator(Ahmadnagar), Real Green Engineers Pvt. Ltd., Bangalore, Sun Green Ventilation system Pvt. Ltd., Mylapore-Chennai, Citadel, Mumbai, Multi colour, Anchit Ispat Pvt Ltd. (Faridabad),
11.	Synthetic Enamel Paint (1st quality only)	ICI Paint (Dulux), Asian Paint (Apcolite), Berger Paints (Luxol). Goodlass Nerolac Paints (Nerolac), Jenson & Nicholson Paints Ltd (Borolac), Shalimar, Garware & Goodlass.
12.	G.I SHEET	ESSAR, JSW, SAIL
13.	Sheeting Screw	Corroshield, Buildex.
14.	Chemical for Antitermite treatment	DE-NOCIL Bombay, Pest Control of India, Trishul.
15.	Factory made Panelled Door shutter	M/s Goel Brothers Raipur New Industrial Area, Raipur (CG) M/s Hindustan Housing Factory Ltd, New Delhi M/s Delhi Construction Eqpt Sadar Bazar, Delhi M/s Joinery Manufacturing Co., Calcutta M/s Goyal Industries, Faridabad M/s Surbhi Metal (India) Ltd., Jodhpur M/s Jain wood Industries Sonipat/ Rohini, Delhi (HO) M/s Poineer Timber Products, Chandigarh

16.	Flush doors IS-2191, 2202	M/s Mysore Wood Products M/s Laxmi Doors, Faizabad Road, Chinhat, Lucknow M/s Merino flush doors M/s Poineer Timber Products, Chandigarh, M/s Goyal Industries Faridabad M/s National M/s Century Plyboards (i) Limited.
17.	Fly proof doors (Made out of solid block marine grade)	M/s Laxmi Doors, Faizabad Road, Chinhat, Lucknow, Northern doors Kanpur
18.	Natural Fibre Thermo Composite door/ window shutter & frames, roofing sheets etc.	Durosam
19.	PVC Panel Door (Solid Core)	Rajshri Plastiwood Limited, Sintex, Hindopan, Marino.
20.	Pressed steel door frames/ cupboard and window frames (manufacturers)	M/s SAIL, M/s TATA
21.	Pressed steel door frames/ cupboard and window frames (fabricators)	M/s Loyal safe works Mayapuri, New Delhi M/s Multiwyn Industrial Corpn., Calcutta M/s Metal Window Corpn., New Delhi M/s Chhabra Steel Udyog, 260 Sadar Bazar, Meerut Cantt. M/s Delite safe works, Rani Jhansi Road, New Delhi M/s Ishwar Industries, 175/A Bombay Bazar, Meerut Cantt. M/s Chandni Industries, J-142, Patel Nagar 1st, Ghaziabad.

22.	Steel Windows, Ventilators (as per IS-1038 of 1983) & frames pressed steel door/ window	M/s Multiwyn Industrial Corpn., Calcutta M/s Metal Window Corp N/ Delhi Govind Enterprises, Delhi M/s Chhabra Steel Udyog 260, Sadar Bazar, Meerut Cantt., Agent steel MFG Pvt Ltd, Ahmedabad, Godrej, M/s Chandni Industries, J-142, Patel Nagar 1st, Ghaziabad.
23.	Al Section for Al Door/ Window/ Partitions	Hindalco, Indal, Ajit India, Jindal
24.	AluminumI Door/ Window/ Glazing Fabricated and Anodized	M/s Ahlcon M/s Alumilite Pvt Ltd, M/s Ajit India Pvt Ltd, M/s Ramniklal S Raste Agra, Argent Industries, M/s Aluminium Tech Industries, I-2249 DSIDC Narela, Delhi,
25.	Aluminium door and windows Fittings	M/s Elite Enterprises C/6 Shalimar Hardware 133, Jarg Mahal, Dhobitalao Mumbai 400002. M/s Mohan Metal Industries 178/2-A, Bhola Nath Nagar, Shahadara, Delhi 110032. M/s Mepro, Argent New Delhi, Classic, New Delhi. M/s Jindal, Argent New Delhi, M/s Golden Industries Pvt. Ltd. M/s ECIE (P) ltd.
26.	Automatic Glass Door	Ditec (Gandhi)
27.	Aluminium Grill	Alu Grill, Arihant Aluminium Corporation, Decogrille
28.	Door Closer	Everite, Golden, Gandhi
29.	Floor Spring	Prabhat, Everite
30.	Builders Hardware	M/s Golden Industries Pvt. Ltd., Everite, Solo, Hardwyn.

31.	Plywood for general purpose (IS-303)	National Plywood Inds Pvt Ltd, S Fancy lane, 8th floor, Calcutta-700001, Merino Plywood, Archid Ply, Kitply, Swastik, Universal
32.	Pre laminated Particle board	Kitply, Bhutan board, Ecoboard, Novapan, Archid ply, Merinova, Merino
33.	Laminated Sheets	Formica, Merino Lam, Greenlam, National
34.	Modular Partitions	Godrej, Blowplast
35.	False Ceiling (Mineral Fibre Board)	Armstrong, Daiken, Luxalon, Llyods, Gypboard, Trac, Aerolite
36.	False Ceiling (POP/ Gypsum Board)	Gypboard, Anchor ceiling tiles, LA
37.	Aluminium False	Lloyds, Armstrong, Luxlon, Trac
38.	Flooring Tiles (Mosaic/ Terrazzo/ PCC) (1st quality only)	M/s Mehtab Tiles, NITCO, Royal Tiles, Gem Tiles, Hindustan Tiles, M/s National Tiles & Industries, Ultra Tiles
39.	Glazed Ceramic Tiles, Non-Skid (Floor/ Wall), (1st quality only)	Kajaria, Somany, NITCO. Murudeshwar Ceramic Ltd (Navin Diamond tile), Johnson (Marbonite), Marbito, Somany, Orient, Asian
40.	Vitrified/ Designer Vitrified Tiles (1st quality only)	Asian, Marbonite (Johnson), Kerrogres (Kajaria), NITCO, Orient
41.	PVC Tiles/ Flooring (IS 3461) (1st quality only)	Marblex Tiles, Krishna Tiles, Polyfin, Armstrong, Wonder floor.
42.	False Flooring	Godrej or equivalent
43.	Glass Mosaic Tiles	Paladio, Coral, Accura, Bisazza, Italia, Mridul.
44.	Designer Paver Tiles/ Interlocking tiles ISI marked/ Grass-jointed Tiles (1st quality only)	Pavit, Ultra, Hindustan, Eurocon, Vyara, National Tiles, Gem, Unistone, Konkrete, Unitile
45.	Glass reinforced Paver block	Unistone or equivalent

46.	Wall care Putty for Base preparation (1st quality only)	Birla Wall care putty, Berger, Jenson & Nicholson, JK White
47.	White Cement	Birla, JK
48.	Cement based Paints (1st quality only)	Super Snowcem, Duracem, Super Acrocem.
49.	Dry Distemper/ Oil bound Distemper (1st quality only)	Goodlass Nerolac Paint, Shalimar Paint, Jenson & Nicholson, Asian Paint, Berger. ICI Dulux
50.	Acrylic Washable Distemper (1st quality only)	Asian, Berger, ICI Dulux, Jenson & Nicholson, Nerolac, Shalimar, Garware & Goodlass.
51.	Plastic Emulsion Paint (1st quality only)	Asian, Berger, ICI, Nerolac, Jenson & Nicholson, Shalimar, Garware & Goodlass.
52.	Exterior Acrylic Emulsion (1st quality only)	ICI (Weathercoat), Excel (Nerolac), Apex (Asian), Berger, Jenson & Nicholson, Shalimar, Garware & Goodlass
53.	Polymer based Paint	STP, CICO
54.	Textured Paint / Wall Tile (1st quality only)	Unitile, Heritage, Spectrum, Iokos, Acropaints, Asian
55.	Flexible board for Expansion joint	STP or equivalent
56.	Grout	Shrinkomp, Fosroc, Fairmate
57.	Integral water proofing compound	STP, Pidilite, Fosroc, CICO, Sika.
58.	Concrete Admixture	Pidilite, Fosroc, CICO, Sika.
59.	Water proofing for cementations surface IS-2645	Acrocrete & Acrocote, CICO, Fosroc, STP
60.	Bituminous Product	M/s Faridabad Spinning & Woolen Mills Pvt Ltd, 837, SP Mukherjee Marg Delhi, M/s STP Ltd (Formerly Shalimar Tar Products) M/s Bitufelt Pvt Ltd 123/377 Fazalm Ganj Kanpur-208012, Texas, Texas India Ltd, Multiplas, IWL Chennai

61.	Hardeners	Ironite, Ferrok, Hardonate
62.	Construction	Choksey, CICO, Forsroc, Sika
63.	Non Metalic Surface	CICO, Fosroc, STP, Sika
64.	Corrugated, Semi Corrugated & AC Sheets (IS-459-1970,IS-2098)	M/s Everest Bldg Products Ltd., Jata Sankar Bosa Marg, Muland (west), Bombay 400080 M/s Ramco AC Sheets “SWASTIK”, M/s Eternit Everest Ltd, UP Asbestos Ltd
65.	GI Sheet - ISI Marked	Multicolor, TATA, Bluescope, JSW, Colour Plus, Interarch, Lloyds, Jindal, Everest
66.	Sheet Glass/ Structural Glazing	Hindustan Pilkington Glass Works, Saint Gobain, Modi Float, Triveni Float Glass, ASI, Fresca, Emirates.
67.	Multiell/ Multiwall Polycorbonate Panel	M/s Coxwell Domes Engineering, Delhi M/s Lexan, M/s Gallina India Pvt. Ltd. M/s Vijaynath Interiors & exteriors products
68.	Stainless Steel	Jindal
69.	Punch Tape	Global Technocrat, S.G.Engineers, Delhi
70.	Punch Tape in Plastic Spool	Global Technocrat, S.G.Engineers, Delhi
71.	Stainless Steel Railing	Jindal
72.	FRP/ HDPE Garbage	Sintex, Swift, Nutech, Sheetal
73.	Thermoplastic Road	Shalimark (STP)
74.	Bollard	STP
75.	Cateye	TATA, STP
76.	Readymade Speed	STP
77.	Fountain	Ripples, Green Evolutions, Agritech Services, Premier
78.	Multi-Vent	Multicolor

79.	Sanitary ware	Neycer Kermag (standard), Hindustan Sanitary Ware (Ist quality), Parryware (superfine), Cera (Ist quality), Classica (Ist/ standard)
80.	WC seat cover - ISI Marked	Parryware, Neycer Kermag (standard), Hindustan Sanitary Ware (Ist quality), Cera (Ist quality), Classica (Ist / standard)
81.	PVC Flushing Cistern IS: 774-1984 (ISI Certified)	Parryware, Hindustan Sanitary Wares, Cera.
82.	Faucets & Taps, Stop Valves & Pillar Taps, Surgical basin mixer, Shower rose etc.	Gem, Parko, Parryware, HSW, Jaquar,Orient
83.	Kitchen Stainless Steel	Diamond, Nirali, Neel Kanth, Jayna
84.	Looking Mirror	Saint Gobain, Modi Float, Triveni Float Glass, Crown, Atul, Ashai
85.	Readymade Bathroom Cabinets	Commander Gratings (I) Pvt Ltd, Gratolite Cabinet, A-4 Sector Viii, Noida-202701, Alpina, Cera.
86.	Float Valve	Leader, Bombay Metal & Alloy Co, Bombay superflow.
87.	SGSW Pipes (IS-651) ISI Marked	Perfect Agra, Devraj Ind Gaziabad, Buran, RK, Prince, Supreme pipe and Fittings.
88.	CI (Centrifugally Cast) Pipes for sewage disposal ISI marked.	NICCO, SRIF, A-1 Singhal Casting Co Agra, Jindal Saw, Kesoram, NECO.
89.	PVC rain water/ sewage pipes (IS-4985)	Reliance, Finolex, Supreme, Kisan, Prince, Hindustan Plastic & machine corporation, Polypack industries (P) Ltd.
90.	HDPE Water storage tanks (Rotational Moulded)	Sintex, Swift, Nutech, Sheetal
91.	Cast Iron Pipes and Fittings	Hindustan Engineering Products Company Calcutta, S.L.C., Standard approved manufacturers of any other brand of fittings having ISI marking, RIF, BIS.

92.	RCC Pipes	Indian Hume Pipe Company, Delhi/ Prayagraj/ Chandigarh/ Lucknow; Hindustan Pressure Pipes, Kolhapur Dhere Concrete Products, Pune or any other approved manufacturer conforming B.I.S. Standard
93.	Brass Fittings	Leader Engineering Works, Jalandhar; L & K Mathura; Luster Sanitary, Jalandhar; Annapurna Metal Works, Calcutta; Neta Metal Works, Jalandhar; Honey Industrial Corporation, Bombay.
94.	C.P. Fittings	Ego Metal Works, Ballabhgarh; Jaquar Industries, Delhi; Soma Plumbing Fixtures Limited, Calcutta; Gem Sanitary Appliances Pvt. Ltd.,Delhi; Essco Sanitations, Delhi; Bilmet, Bombay.
95.	Stone Ware (Salt-Glazed) Pipes	Hind Ceramics Limited, Orissa; Ceramic Industries Limited, Sambalpur; Shrikamakshi Agencies, Madras; Binary Udyog Pvt. Limited, Howrah; Tirumati Moulds Limited, Nagpur; Kiran Potteries, Hyderabad; Perfect Sanitary Pipes, Bharatpur.
96.	Asbestos Cement Pipes and Fittings	Ganga Asbestos Limited, U.P.; Hyderabad Asbestos Cement Products Limited; J.K. Super Pipe Industries, Nanded; Konark Cement and Asbestos Limited, Orissa; Maharashtra Asbestos Limited, Bombay; Poddar Industrial Corporation, Patna; Sarbamangala Mfg. Company, Calcutta.
97.	HDPE pipes and fittings	ORI-PLAST, HASTI

b. STRUCTURE

S. NO.	ITEMS/ NAME OF PRODUCT	MAKES/BRANDS/MANUFACTURES
1	Structural Steel	SAIL / TATA / RINL / IISCO / ESSAR / ISPAT
2	Structural Steel	TATA / JINDAL / SURYA / SWASTIK

3	Synthetic Enamel Paint (Ist Quality only)	ICI Paint (Deluxe), Asian Paint (Apcolite), Shalimar Paint (Superlac), Goodlass, Nerolac Paint(Nerolac), Berger Paints.

Any materials not fully specified in these specification and which may be offered for use in the works shall be subject to approval of Engineer, without which it shall not be used anywhere in the construction works.

LIST OF SUPPLIERS OF MAJOR BOUGHT-OUT ITEMS

3. (ELECTRICAL)

i) Air Conditioner

1. O General
2. Daikin
3. Hitachi

ii) Batteries (Lead Acid)

1. Amco Batteries Ltd.
2. Exide Industries Ltd.
3. HBLNIFE Power System Ltd.
4. Amara Raja Batteries Ltd.

iii) Batteries (Nickel Cadmium)

1. Amco Batteries Ltd.
2. HBLNIFE Power Systems Ltd.

iv) Batteries Charger/DC-DC Converter

1. Amara Raja Power System(P)Ltd.
2. BCH.
3. Chhabi Electricals Pvt. Ltd.
4. Caldyne Automatics Limited
5. Dubas
6. HBL Nife Power Systems Ltd.
7. Universal Industries Products
8. Universal Instrument Mfg Co Pvt Ltd

v) Cable – Fire Alarm & Communication Cables

1. Cords Cable Industries Ltd.
2. CMI
3. Delton cables Ltd.

4. ELKAY Telelinks

5. KEI Industries Ltd.

6. Reliance Engineers Ltd.

vi) Cable – HT (XLPE)

1. Universal Cable Ltd.

2. KEI Industries Ltd.

3. Industrial Cables

4. NICCO Corporation Ltd.

5. Uniflex

6. Polycab.

7. Torrent cables Ltd.

vii) Cable – LT Power and Control

1. Cords Cable Industries Ltd.

2. Universal Cable Ltd.

3. KEI Industries Ltd.

4. Havells.

5. Delton

6. Elkay Telelinks

7. Evershine Electricals

8. Ecko

9. Ravin

10. Rallison.

11. Suyog

12. Netco

13. Uniflex

14. Paramount

15. Gloster

16. Associated cables Pvt Ltd.
17. CMI
18. Gemscab
19. Industrial cables
20. NICCO
21. Polycab
22. Torrent

viii) Cable – Gland

1. Baliga
2. Comet
3. Flexpro
4. Flameproof
5. FCG
6. Electro Werke
7. Dowels
8. CCI

ix) Cable – Lugs

1. Dowels
2. Jainson
3. Ismal

x) Cable – Tray

1. Ercon Composites
2. Yamuna Power & Infrastructure Ltd.

xi) Cable Termination and Jointing Kit

1. CCI
2. Raychem
3. M-Seal

xii) Ceiling/Exhaust/Pedestal Fans & Circulators

1. Bajaj Electricals Ltd.
2. Crompton Greaves Ltd.
3. Khaitan Electricals Ltd.
4. Havell's

xiii) Contractors – AC Power

1. Andrew Yule
2. ABB
3. BHEL
4. C&S
5. Havell's
6. L&T
7. Schneider
8. Siemens Ltd.
9. Telemechanique

xiv) Control Transformer

1. AE
2. Indushree
3. Intra Vidyut
4. Kalpa Electrikals
5. Transpower Industries Ltd.
6. Siemens

xv) DG Set

1. Sterling and Wilson.
2. GD ankalesaria.
3. Deev Genset.

4. Jackson Limited.

5. Sudhir Gensets.

6. Power Engineering (India) Pvt Ltd.

7. Prasha Technologies Limited.

8. Kumar Generator house.

9. Ashok Leyland Ltd.

10. Powerica Limited.

11. Supernova Engineers Limited.

12. Bhaskar Power Products (P) Ltd.

13. Caterpillar India (P) Ltd.

14. Cummins India Ltd.

15. Escorts Ltd.

16. Greaves Cotton Ltd.

17. Kirloskar ltd.

18. Mahindra & Mahindra Ltd.

19. Honda.

20. Perkins.

21. Eicher.

22. Tata Motors.

23. Ashok Leyland.

xvi) Earthing Materials

1. Rukmani Electrical & Components Pvt Ltd.

2. Indiana Grating Pvt Ltd.

3. Jef Techno Solutions Pvt Ltd

xvii) Flame proof LDB's/ JB's/ Control Station/ switches

1. FCG

2. Sudhir

3. Prompt Engineering Works

4. Flame Proof equipments pvt. Ltd.

5. Baliga Lighting Equipments Pvt. Ltd.

6. Flexpro Electricals Pvt. Ltd.

xviii) High Mast

1. Bajaj Electricals Limited

2. Crompton Greaves Limited.

3. Philips India Limited

4. Surya Roshani

xix) High Voltage PCC/ MCC panels

1. BHEL

2. Control and Switchgear

3. Siemens

4. Tricolite Electrical Industries

5. Schneider

6. CGL

7. L&T

xx) Indicating Lamps

1. Alstom Ltd.

2. BCH

3. L&T Ltd.

4. Siemens Ltd.

5. Vaishno Electricals

xxi) Indicating Meters

1. ABB

2. AMCO

3. AE

4. Alstom Ltd. (EE)
5. Conzerv/Schneider
6. Elecon Measurement Pvt. Ltd.
7. HPL Electric & Power Pvt. Ltd.
8. MECO Instruments Ltd.
9. Minilec
10. Rishabh Instruments Pvt. Ltd.
11. Trinity energy system
12. kaycee
13. Salzer

xxii) Lighting Fixtures

1. GE Lighting Pvt. Ltd.
2. Bajaj Electricals Ltd.
3. Crompton Greaves Ltd.
4. Philips India Ltd.

xxiii) Lighting Fixtures – Flameproof

1. Bajaj Electricals Ltd.
2. Baliga Lighting Equipment Pvt. Ltd.
3. Crompton Greaves Ltd.
4. CEAG Flameproof Controlgear Pvt. Ltd.
5. Flexpro Electricals Pvt. Ltd.
6. Philips India Ltd.
7. Sudhir Switchgears Pvt. Ltd.
8. FCG.

xxiv) Miniature Circuit Breakers (MCBs) and Lighting DB

1. ABB
2. Hagger

3. Havell's India Ltd.
4. Indo Asian Fusegear Ltd.
5. Legrand
6. MDS Switchgear Ltd.
7. Schneider
8. Siemens Ltd.
9. HPL

xxv) Moulded Case Circuit Breaker (MCCBs)

1. ABB
2. Andrew yule
3. Larsen & Toubro
4. Schneider
5. Siemens
6. Control and Switchgear

xxvi) Protection Relays – Thermal

1. BCH
2. L&T Ltd.
3. Siemens Ltd.
4. Telemenchanique & Controls (India) Ltd.

xxvii) Low Voltage Power Control Center (PCC)/ MCC/ PDB/ MLDB/ LDB

1. ABB
2. BCH
3. C & S
4. Elecmech Switchgear & Instrumentation
5. KMG ATOZ
6. L&T
7. Pyrotech Electronics Pvt. Ltd.

8. Risha control Engineers Pvt. Ltd.

9. Siemens

10. Tricolite Electrical Industries

11. Unilec Engineers ltd.

12. Vidyut Control India Pvt. Ltd.

13. Control and Schematic

14. Zenith Engineering

xxviii) Push Buttons

1. BCH

2. Alstom Ltd.

3. L&T

4. Siemens Ltd.

5. Telemenchanique & Controls (India) Ltd.

6. Vaishno Electricals

xxix) Switches-Control

1. BCH

2. Easum Reyrolle Relays & Devices Ltd.

3. Alstom

4. Kaycee Industries Ltd.

5. L&T

6. Siemens Ltd.

xxx) Switches – 5/15A Piano/ Plate, Switch Socket

1. Anchor Electronics & Electricals Pvt. Ltd.

2. Kingal Electricals Pvt. Ltd.

3. North-West Switchgear Ltd.

xxxi) Switch Socket Outlets (Industrial)

1. Alstom Ltd.

2. Best & Cromption Engineering Ltd.
3. BCH
4. Crompton Greaves Ltd.
5. Essen Engineering Company Pvt. Ltd.

xxxii) Solar Modules

1. Tata BP Solar (I) Ltd.
2. REIL, Jaipur.
3. CEIL, Sahibabad.
4. HBL Power

xxxiii) Solar Street Lighting

1. Tata BP Solar (I) Ltd.
2. REIL, Jaipur.
3. CEIL, Sahibabad.
4. HBL.

xxxiv) Terminals Blocks

1. Connectwell
2. Controls & Switchgear Co. Ltd.
3. Elmex Controls Pvt. Ltd.
4. Essen Engineering Co. Pvt. Ltd.

xxxv) Transformers

1. ABB
2. Andrew Yule
3. Areva
4. BHEL
5. Bharat Bijlee
6. Crompton Greaves
7. EMCO Ltd.

8. Intra Vidyut

9. Indushree

10. Indcoil

11. Kirloskar

12. Skippers Electricals

13. Transformers & Rectifiers (I) Ltd.

14. Voltamp

xxxvi) UPS System and Inverter

1. DB Power

2. Aplab

3. Keltron

4. Hi-Rel

5. Dubas

6. Toshiba Corporation

7. Fuzi Electric Co Ltd

xxxvii) GI-Octogonal Pole

1. Bajaj

2. Transrail

3. Wipro

xxxviii) List of Recommended Manufacturers for Heater

1. Escorts Limited, Faridabad, Haryana
2. Spherehot/ Kanti Lal Chuni Lal & Sons Appliances Pvt Ltd. Surat
3. Kerone, Bhayander (E), Thane - 401105
4. Excel Heaters, Andheri (West), Mumbai - 400 053, India
5. Nirmal Industrial Controls Pvt. Ltd., Mulund(W), Mumbai - 400 080

NOTES: Item/ Vendor, which are not listed above, shall be subject to prior approval from Client/ Consultant.

LIST OF MATERIALS OF APPROVED BRAND AND/ OR MANUFACTURE

4. (INSTRUMENTATION)

i) OFC

Manufacture/ Procurement, Testing and supply of suitable OFC Joint closures including all necessary accessories of any of the following make:

1. Raychem
2. 3M
3. Siemens
4. Any other make from the approved vendor list of client with supporting paper.

ii) METERING SKID

1. M/s Chemtrols Industries Ltd., Mumbai
2. M/s Daniel Measurement Solutions Pvt Ltd, Vadodara.
3. M/s Elster-Instromet India Pvt Ltd, Vadodara
4. M/s INEL Gas Controls Pvt Ltd, Vadodara.
5. M/s Nirmal Industrial Controls Pvt. Ltd., Mumbai
6. M/s Oswal Industries Limited, Ahmedabad
7. M/s Autometer energytech ltd, NOIDA
8. M/s Rockwin Flowmeter india Pvt Ltd, Ghaziabad.
9. M/s Intromet international Ny Rajkmakeriaan 9, B-2910, Essen, Belgium
10. M/s Pietro Fiorentini Spa, 20124, Milino, Itally
11. M/s FMC Measurement Solutions, 6 Braidway, thetford, Norfolk, IP24 1 JA, England.
12. M/s Petrogas Gas system BV, Doesburgweg, 7, 203 PL Gouda, PO Box 20, 2800, AA Gouda, Netherland.
13. Tormene Gas Technology SpA, via campolongo, 97, 35020 – Due carrare (Padova), Itally
14. M/s ODS BV, Donk 6, 2291 Berendrecht, Netherland.
15. M/s RMG Regel + Messtechnik Gmbh Osterholzstr, 45, D-34123 Kassel, Germany.

iii) PRESSURE GAUGES

1. AN Instruments Pvt Ltd

2. Badotherm Process Instruments B.V.
3. Baumer Bourdon Haenni S.A.S
4. British Rototherm Co Ltd
5. Budenberg Gauge Co Ltd
6. Dresser Inc
7. Forbes Marshall (Hyd) Pvt Ltd
8. General Instrument Consortium
9. H. Guru Instruments (South India) Pvt Ltd
10. Manometer (India) Pvt Ltd
11. Nagano Keiki Seisakusho Ltd
12. Hirlekar Precision, India
13. Waaree Instruments Ltd
14. Walchandnagar Industries Ltd (Tiwac Divn)
15. Wika Alexander Wiegand & Co GmbH
16. Wika Instruments India Pvt Ltd
17. Ashcroft India Pvt Ltd.

iv) TEMPERATURE GAUGES

1. AN Instruments Pvt Ltd.
2. Badotherm Process Instruments B.V.
3. Bourdon Haenni S.A.
4. Dresser Inc.
5. General Instruments Consortium
6. H. Guru Instruments (South India) Pvt Ltd
7. Nagano Keiki Seisakusho Ltd
8. Solartron ISA
9. Walchandnagar Industries Ltd (Tiwac Divn)
10. Wika Alexander Wiegand & Co GmbH

11. Wika Instruments India Pvt Ltd
12. Pyro Electric, Goa
13. Ashcroft India Pvt Ltd.

v) TEMPERATURE ELEMENTS, THERMO-WELLS

1. ABB Automation Ltd
2. Altop Industries Ltd
3. Bourdon Haenni S.A.
4. Detriv Instrumentation & Electronics Ltd
5. General Instruments Consortium
6. Japan Thermowell Co Ltd
7. Tecnomatic S.P.A
8. Tempsen Instrument India Ltd
9. Thermo Electric Co. Inc.
10. Thermo-Couple Products Co
11. Thermo-Electra B.V.
12. Wika Alexander Wiegand & Co GmbH
13. Altop Industries Ltd., Baroda
14. Nagman Sensors (Pvt.) Ltd.
15. Pyro Electric, Goa

vi) TURBINE METERS

1. Daniel (USA)
2. RMG (Germany)
3. Instromet International (Belgium)
4. Sensus Metering System Inc
5. Rockwin Flowmeter (India)
6. Vemmtec Messtechnik Gmbh, (Germany)
7. ITRON GmbH (Germany)

vii) POSITIVE DISPLACEMENT FLOW METERS

1. Actaris
2. RMG (Germany)
3. Instromet International (Belgium)
4. Romet
5. Dresser
6. Itron GmbH (Germany)

viii) ORIFICES (METER RUN, FLOW CONDITIONER, ORIFICE PLATE AND ASSEMBLY)

1. Emerson
2. FMC, USA
3. Pietro Fiorentini S.P.A (Italy)
4. Canalta Controls, Canada

ix) ULTRASONIC FLOW METERS

1. Daniel (USA)
2. RMG (Germany)
3. Instromet International (Belgium)
4. Sick Maihak, Germany
5. FMC, Germany

x) MASS FLOW METERS

1. Daniel Measurement & Control Asia Pacific
2. Endress + Hauser Instruments International
3. FMC Measurements Solutions
4. Heinrichs Messtechnik GMBH
5. Rheonik MessGerate GMBH

xi) LEVEL GAUGES/ LEVEL INSTRUMENTS

1. Bliss Anand
2. Chemtrols

3. V-Automat
4. Levcon
5. Nivo Controls
6. Sbeletro Mechanicals
7. TRAC

xii) FIELD INSTRUMENTS (P, DP, F, L, T)

1. ABB Ltd
2. Honeywell
3. Fuji Electric Instruments Co Ltd
4. Yokogawa
5. Invensys India Pvt.Ltd

xiii) FLOW COMPUTERS

1. Emerson
2. Instromet International (Belgium)
3. FMC Measurement Solutions (UK)
4. RMG (Germany)
5. OMNI Flow Computers Inc.
6. Thermo Fisher, USA

xiv) PRESSURE REGULATOR AND SLAM SHUT VALVE

1. Pietro Fiorentini S.P.A. (Italy)
2. Emerson
3. RMG-Regel Messtechnik (Germany
4. Mokveld Valves BV (Netherlands)
5. Schlumberger (USA)
6. Gorter Controls B V (Netherlands)
7. Instromet International NV
8. Nirmal Industrial Controls Pvt Ltd. (up to 6” size only)

9. ESME Valves Ltd
10. Kaye & Macdonald Inc.
11. Nuovo Pignone S.P.A (Italy) (GE Oil Co.)
12. Richards Industries (Formerly Treloar)
13. Samson AG Mess-und Regeltechnik
14. Tormene Gas Technology
15. Dresser Inc, USA (upto 8" size, 300# class only)

xv) PRESSURE SAFETY VALVES

1. Keystone Valves (India) Pvt. Ltd.
2. Larson & Toubro Ltd.
3. Lesser GmbH & Co KG
4. Mekaster Engg Ltd.
5. Tyco Sanmar Ltd. (New Delhi)
6. Anderson Greenwood Crosby
7. BHEL (Trichy)
8. Curtiss Wright Flow Control Corporation
9. Dresser Inc.
10. Fukui Seisakusho Co. Ltd
11. Nakakita Seisakusho Co Ltd
12. Nuovo Pignone S.P.A (Italy) (GE Oil co)
13. Parcol S.P.A
14. Safety Systems UK Ltd
15. Tai Milano S.P.A
16. Weir Valves & Controls France
17. Bliss Anand Pvt Ltd.

xvi) FLOW CONTROL VALVES

1. Fouress Engg. (New Delhi)

2. Fisher Xomox (New Delhi)
3. MIL Control Ltd. (Noida)
4. KOSO India Pvt ltd
5. Samson Control (Thane)
6. Dresser Valves India Pvt Ltd.
7. Fisher Controls
8. Valvitalia Italy
9. CCI Valve technology
10. Flowserve Pvt Ltd.
11. Metso Singapore Pvt Ltd.
12. Instrumentation Ltd Palghat
13. Dresser Inc. USA

xvii) MOV actuator:

1. Rotork- UK, USA & INDIA
2. Limitorque
3. Auma- India
4. Biffi- Italy

xviii) Pneumatic actuator (Solenoid Operated ON-OFF type)

1. Metso Automation
2. Tyco
3. Samson Controls
4. L&T
5. Emerson
6. Fisher
7. Masoneilan Process Control
8. Instrumentation Limited (IL)-Palghat
9. Micro Finish

10. Rotex

xix) Solenoid Valves

1. Avcon
2. Festo

xx) Electro – Hydraulic Actuator

1. Avcon Rotork controls (Deutchland Gmbh)
2. Biffi Italia Srl
3. Ledeen (Italy)
4. Virgo Valves and Controls ltd.-India
5. Limittorque
6. Reineke
7. Voith
8. Bettis
9. Rotork- UK, USA & INDIA
10. Rotex
11. Schuck Group

xxi) CONTROL PANEL & ACCESSORIES

1. Keltron Controls Ltd., Kerala
2. Elechmec Corporation Ltd., Mumbai
3. Industrial Controls & Appliances Pvt. Ltd.,
4. Alstom System Ltd., Noida
5. Emerson Process Management (I) Pvt. Ltd.
6. ABB Instruments Ltd., New Delhi
7. Larsen & Toubro Ltd.
8. Control & Automation, New Delhi
9. GE Fanuc Systems Pvt. Ltd., New Delhi
10. Rockwell Automation (I) Ltd., Ghaziabad

11. Honeywell Automation Ltd.
12. Rittal
13. Pyrotech Elcronics Pvt Ltd.
14. Positronics Pvt Ltd.
15. Electronics Corporation of India Ltd.

xxii) JUNCTION BOXES AND CABLES GLANDS

1. Ex-Protecta
2. Flameproof Control Gears
3. Baliga
4. Flexpro Electricals

xxiii) CONTROL AND SIGNAL CABLES

1. Associated Cables
2. Brook
3. Associated Flexibles & Wires (Pvt) Ltd
4. Universal Cables Ltd,India
5. Delton Cables Ltd, India
6. KEI Industries Ltd INDIA
7. CMI Limited
8. Cords Cable Industries Ltd, India
9. Elkay Telelinks (P) Ltd., India
10. Udey Pyrocables Pvt Ltd, India
11. Goyolene Fibres (I) Pvt Ltd, India
12. Netco Cable Industries Pvt Ltd, India
13. Nicco Corporation Ltd, India
14. Paramount Communications Ltd, India
15. Polycab Wires Pvt Ltd, India
16. Radiant Cables Pvt Ltd, India

17. Reliance Engineers Ltd., India
18. Suyog Electricals Ltd, India
19. Thermo Cables Ltd

xxiv) INDICATORS & CONTROLLERS

1. Yokogawa
2. Eurotherm Chessel
3. Honeywell
4. Emerson

xxv) BARRIERS

1. MTL
2. STHAL
3. P&F
4. Phoenix

xxvi) GAS CHROMATOGRAPH

1. ABB
2. Emerson
3. Instromet International, NV
4. RMG Regal+Messtechnik GmbH
5. Yokogawa

xxvii) I/P CONVERTERS

1. ABB
2. Emerson
3. IMI Watson Smith Ltd.
4. Moore Controls Ltd
5. Shreyas Instruments Pvt Ltd, India
6. Thermo Brandt Instruments

xxviii) SS FITTINGS, INSTRUMENT VALVES & MANIFOLDS

1. Aura Inc.
2. Hoke
3. Excelsior Engg Works, India
4. Parker
5. Swagelok Co.
6. Swastic Engineering Works, India
7. Comfit & Valves Pvt.Ltd
8. Arya Crafts & Engg.Pvt. Ltd

xxix) SS TUBES

1. Sandvik
2. Hoke
3. Parker
4. Swagelok Co.
5. Heavy metal & tubes LTD
6. Nuclear Fuel Complex. India
7. Ratnamani Metal & Tube Ltd
8. Jindal Saw

xxx) GAS DETECTION SYSTEM

1. Crowcon Detection Instruments Ltd
2. Detection Instruments (I) Pvt Ltd
3. Detector Electronics Corporation
4. Drager Safety AG & Co. KGAA
5. General Monitors Ireland Ltd
6. Mine Safety Appliances Company
7. MSA – Mines Safety Appliances(India) Ltd
8. Industrial Scientific Oldham France S.A.
9. Riken Keiki Co Ltd

10. Simrad Optronics Icare
11. Honeywell Analytics
12. Net Safety Monitoring Inc.
13. Simtronics SAS

LIST OF RECOMMENDED MANUFACTURERS

5. (SHOP & FIELD PAINTING)

i) Indian Vendors

1. Asian Paints(I) Ltd.
2. Berger Paints Ltd.
3. Goodlass Nerlolac Paints Ltd.
4. Jenson And Nicholson Paint Ltd & chokuGu Jenson & Nicholson Ltd.
5. Shalimar Paints Ltd.
6. Sigma Coating, Mumabai
7. CDC Carboline Ltd.
8. Premier Products Ltd.
9. Coromandel Paints & Chemicals Ltd.
10. Anupam Enterprises
11. Grand Polycoats
12. Bombay Paints Ltd.
13. Vanaprabha Esters & Glycer, Mumbai
14. Sunil Paints and Varnishes Pvt. Ltd.
15. Courtaulds Coating & Sealants India (Pvt.) Ltd.
16. Mark-chem Incorporated, Mumbai (for phosphating chemicals only)
17. VCM Polyurethane Paint (for polyurethane Paint only)

ii) Foreign Vendors for Overseas Products

1. Sigma Coating, Singapore
2. Ameron, USA
3. Kansai Paint, Japan
4. Hempel Paint, USA
5. Valspar Corporation, USA
6. Courtaulds Coating, UK.

Notes:

1. Bidder can select equipment of two different makes, selected from this VENDOR LIST and mention the same in the checklist for technical evaluation attached with the tender. The offered bid must include filled datasheet indicating make, model, size, rating of offered instrument/ equipment duly supported by sizing calculation of offered equipment (wherever applicable).

2. Vendors who have already supplied above equipment in other terminals of same Client/ Owner, shall also be considered qualified for this tender provided the supplied equipment are commissioned and running successfully and they have not been put on holiday in list of Client/PLECO/ Other PSU

3. Equipment / Instruments of any make which is offered by one bidder and acceptable to Client/ Owner shall be accepted for other bidder also. After placement of order, on request of the successful bidder list of other qualified makes for a particular item (for which successful bidder wants to change the vendor) shall be provided.

4. Bidder shall take prior approval of the make / model no of the offered item and it shall be from the list given above. However additional vendors will be considered in exceptional cases, provided they have supplied for similar application to reputed gas transmission/distribution companies, in quantities at least half the numbers being supplied for this tender, and working satisfactorily for minimum 6 months. Documentary evidence substantiating above shall be submitted for taking approval.

5. For procuring bought out items from vendors other than those listed above, the same may be acceptable subject to the following: -

   a) The vendor/ supplier of bought out item(s) is a manufacturer/ supplier of said item(s) for intended services and the sizes being offered is in their regular manufacturing supply range.

   b) Should have supplied at least one single random length (i.e. 5.5 meters to 6.5 meters) for item assorted pipes / tubes and for other items, which are to be supplied in quantity on number-basis (other than assorted pipes / tubes) minimum 01 (One) number of same or higher in terms of size and rating as required for intended services. The bidder should enclose documentary evidences i.e. PO copies, Inspection Certificate etc. for the above, along with their bids.

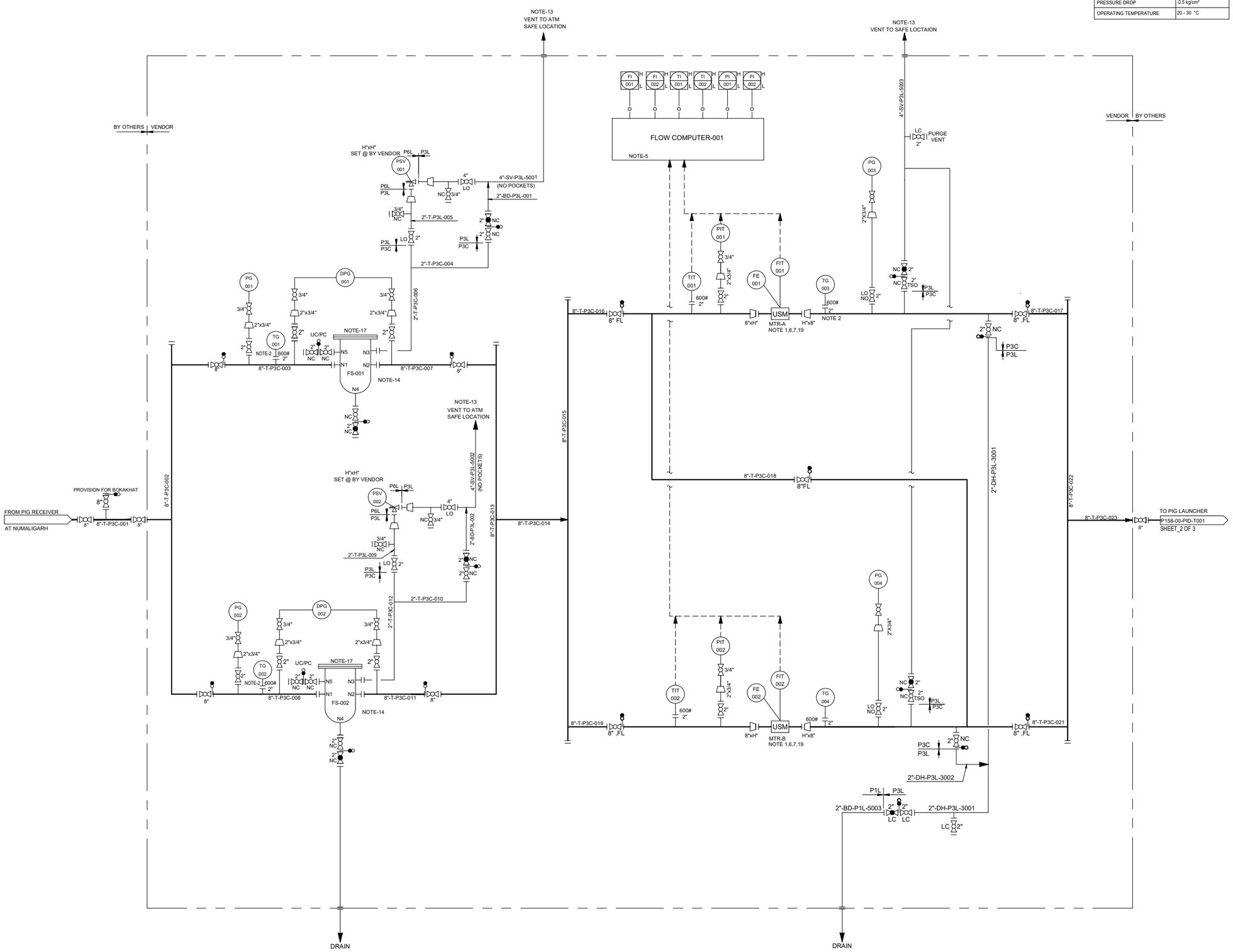
6. For any other item(s) for which the vendor list is not provided, bidders can supply those item(s) from vendors/ suppliers who have earlier supplied same item(s) for the intended services in earlier projects and the item(s) offered is in their regular manufacturing/ supply range. The bidder is not required to enclose documentary evidences (PO copies, Inspection Certificate etc.) along with their

offer, however in case of successful bidder, these documents shall require to be submitted by them within 30 days from date of Placement of Order for approval to CLIENT / PLECO.

7. The details of vendors indicated in this list are based on the information available with PLECO, Contractor shall verify capabilities of each vendor for producing the required quantity with. PMC does not guarantee any responsibility on the performance of the vendor. It is the contractor's responsibility to verify the correct status of vendor and quality control of each parties and also to expedite the material in time.

CARTRIDGE FILTER	
TAG NO.	FS-001/002
SERVICE FLUID	NATURAL GAS
DESIGN FLOWRATE	0.50 MMSCMD
OPERATING FLOWRATE (MIN. / MAX.)	0.19 - 0.28 MMSCMD
DESIGN PRESSURE	49 kg/cm²g
DESIGN TEMPERATURE	-29 / 65 °C
OPERATING PHILOSOPHY	1WORKING + 1 STAND BY
OPERATING PRESSURE	8 - 15 kg/cm²g
OPERATING TEMPERATURE	20 - 30 °C
MAX. PRESSURE DROP (CLEAN / DIRTY)	0.1 / 0.5 kg/cm²

METERING SKID	
ITEM NO.	MS-001
SERVICE FLUID	NATURAL GAS
DESIGN FLOW RATE	0.50 MMSCMD
OPERATING FLOW RATE (MIN. / MAX.)	0.19 - 0.28 MMSCMD
INLET PRESSURE	8 - 15 kg/ cm²g
OUTLET PRESSURE	7.5 - 14.5 kg/ cm²g
DESIGN PRESSURE	49 kg/ cm²g
OPERATION PHILOSOPHY	1W+1S
DESIGN TEMPERATURE (MIN./MAX)	-29°C TO 65°C
PRESSURE DROP	0.5 kg/cm²
OPERATING TEMPERATURE	20 - 30 °C



REFERENCE DRAWINGS	
DRAWING TITLE	DRAWING NUMBER
P & ID LEGENDS	P158-00-LGD-T000

GENERAL NOTES:-

1. ALL LINE NUMBERING AND EQUIPMENT TAG NUMBERING SHALL BE PRE-FIXED WITH PROJECT CODE & AREA CODE "P158".
2. ALL INSTRUMENT TAG NUMBER SHALL BE PRE-FIXED WITH PROJECT CODE & AREA CODE "P158".

NOTES :-

1. METER SHALL BE ULTRASONIC METER TYPE.
2. THERMOWELL SHALL BE OF 600# RATING.
3. JUMPER SHALL BE PROVIDED ACROSS ALL FLANGES.
4. PROVIDE UPSTREAM / DOWNSTREAM STRAIGHT LENGTH AS PER INSTRUMENT REQUIREMENT.
5. FLOW COMPUTER SHALL BE CONTROL ROOM PANEL MOUNTED.
6. MTR "B" WILL BE IN OPERATION AND MTR "A" AS STANDBY. IN CASE THE ACTIVE MTR FAILS,THE STANDBY MTR SHALL BE MANUALLY LINED UP.
7. DETAILS SHOWN IN THE P&ID ARE MINIMUM. VENDOR TO CONSIDER THE REQUIRED INSTRUMENTS / VALVES ETC., IN THEIR SCOPE.
8. DETAILS OF METERING STATION COMPUTER SHALL BE ELABORATED BY MTR PACKAGE VENDOR.
9. INLET, OUTLET & CROSS OVER VALVE SHALL NORMALLY BE OPERATED & MANUALLY CONTROLLED.
10. ALL THE STATUS SIGNALS SHALL BE AVAILABLE IN CONTROL ROOM AND REPEATED TO RTU.
11. FILTER IS CARTRIDGE TYPE (1 OPERATING + 1 STAND BY).
12. FILTER SHALL BE PROVIDED WITH MANUAL CHANGEOVER.
13. ALL VENTS SHALL BE PROVIDED MIN. 3M HIGH FROM HIGHEST OPERATING PLATFORM ON NEARBY STRUCTURE WITH IN 15M WHICHEVER IS HIGHER NON SPARKING MATERIAL (BRASS) SHALL BE USED FOR FLAPPER TYPE VENT CONNECTION.
14. WHEREVER SPACER ARE SHOWN SPADE SHALL ALSO BE PROCURED DE AND VICE VERSA.
15. LOW POINT DRAIN SHALL BE PROVIDED AT MINIMUM DISTANCE FROM RISER PIPE OF VENT. ADEQUATE SLOPE TO BE MAINTAINED IN HORIZONTAL SECTION OF THE PIPE FOR LOW POINT DRAIN CONNECTION.
16. THE ITEMS GIVEN IS THIS P&ID IS INDICATIVE ONLY. ALL DETAIL ENGG. / RESIDUAL ENGG. INCLUDING LINE SIZE FINALIZATION SHALL BE DONE BY VENDOR POST AWARD OF CONTRACT WITHOUT ANY COST IMPLICATIONS TOWARDS CLIENT.
17. FILTER COVER SHALL BE OF PRESSURE CLOSURE TYPE AND SHALL NOT OPEN UNLESS THE FILTER IS FULLY DEPRESSURIZED. END COVER SHALL BE BODY FLANGE WITH BLIND FLANGE AND DAVIT. VALVE POSITION SHALL BE FAIL LAST.
18. VALVE SHALL BE GO TO FAIL CLOSE POSITION IN CASE OF POWER SIGNAL FAILURE. ALL OTHER CASE FAIL LAST.
19. MINIMUM DISTANCE FOR STRAIGHT RUN SHALL BE EITHER 10D OR 15D WHICH EVER IS HIGHER.

REV	DATE	DESCRIPTION	BY	CHKD	APPD
CB	04.08.23	ISSUED FOR CLIENT APPROVAL	SKU	GST	AD
CA	01.07.23	ISSUED FOR CLIENT REVIEW	SKU	GST	AD
IA	21.06.23	ISSUED FOR IDC	SKU	GST	AD

OWNER: ASSAM GAS COMPANY LTD (A GOVT. OF ASSAM UNDERTAKING)

ENGINEERING CONSULTANT : PLECO — PIPELINE ENGINEERING CONSULTANTS PVT. LTD.

PROJECT:

NGN LETEKUJAAN TERMINAL UPTO NRL IGGL RT PIPELINE

DWG. TITLE :

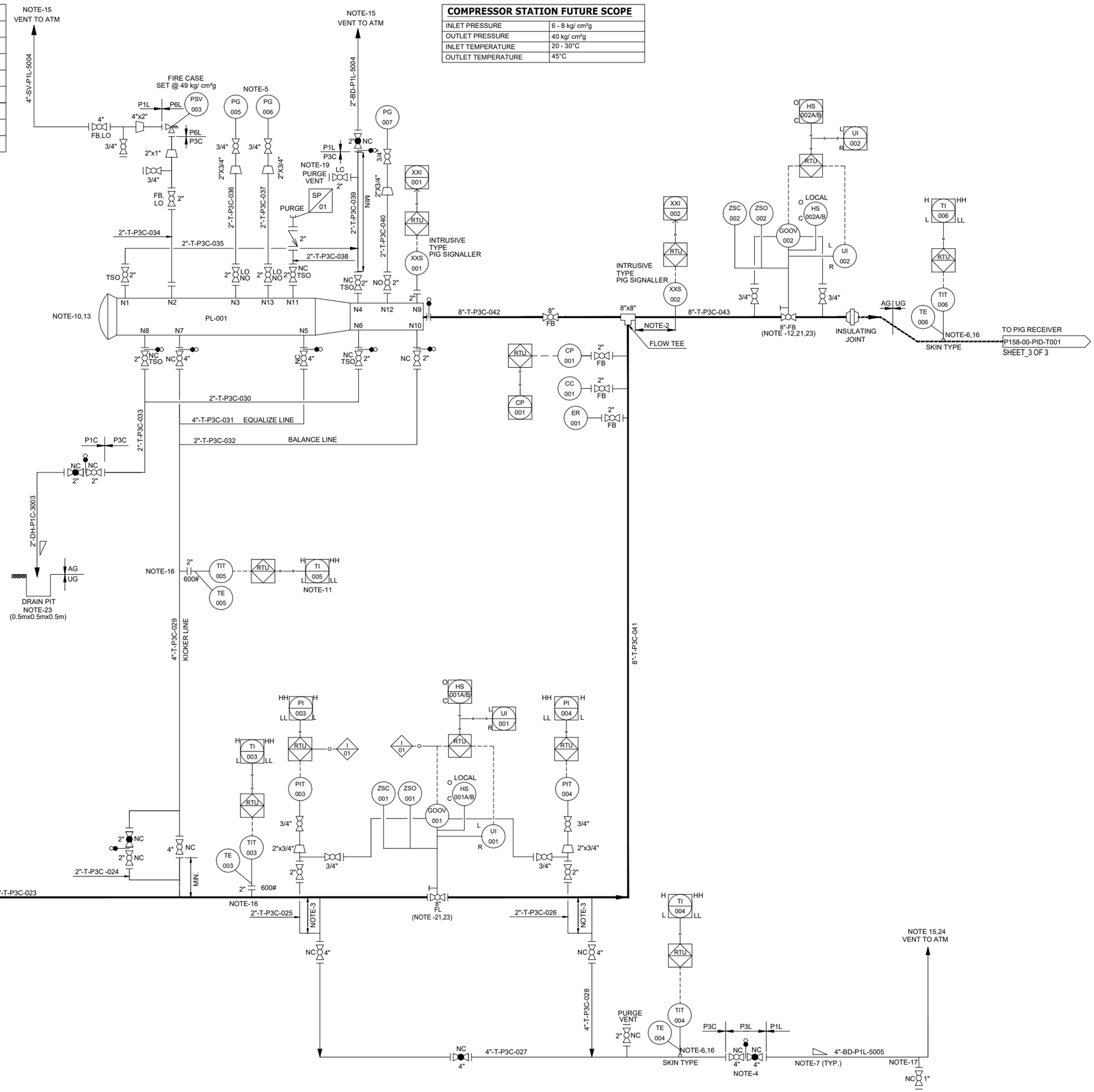
P&ID FOR FILTER CUM METERING SKID AT LETEKUJAAN TERMINAL

SCALE.	JOB NO.	DRAWING NUMBER	REV.
NTS	P158	P158-00-PID-T001	CB
SHEET	1 OF 3		

SHEET SIZE : A1 (841 mm x 594 mm)

PIG LAUNCHER	
TAG NO.	PL-001
SIZE MAJOR / MINOR	14" x 8"
DESIGN PRESSURE	49 kg/ cm²g
DESIGN TEMPERATURE	-29°C TO 65°C
OPERATING PRESSURE	7.5 - 14.5 kg/ cm²g
MAX. ALLOWABLE OPERATING PRESSURE	40 kg/ cm²g
OPERATING TEMPERATURE	20°C TO 30°C
MAX. OPERATING TEMPERATURE	45°C

COMPRESSOR STATION FUTURE SCOPE	
INLET PRESSURE	6 - 8 kg/ cm²g
OUTLET PRESSURE	40 kg/ cm²g
INLET TEMPERATURE	20 - 30°C
OUTLET TEMPERATURE	45°C



REFERENCE DRAWINGS

DRAWING TITLE	DRAWING NUMBER
P & ID LEGENDS	P158-00-LGD-T000

GENERAL NOTES:-

1. ALL LINE NUMBERING AND EQUIPMENT TAG NUMBERING SHALL BE PRE-FIXED WITH PROJECT CODE & AREA CODE "P158".
2. ALL INSTRUMENT TAG NUMBER SHALL BE PRE-FIXED WITH PROJECT CODE & AREA CODE "P158".

NOTES :-

1. VALVES UP TO 4" SHALL BE LEVER OPERATED TYPE & ABOVE 4" SHALL BE GEAR OPERATED TYPE.
2. DISTANCE SHALL BE AT LEAST EQUAL TO THE LENGTH OF THE LONGEST INTELLIGENT PIG.
3. DELETED.
4. DEPRESSURIZATION VALVE SHALL BE LOCATED IN SUCH A WAY THAT PIT-003/004 & TIT-004 CAN BE READ DURING VENTING.
5. LOW RANGE PRESSURE GAUGE (0-2 kg/cm²g) PROVIDED WITH GAUGE SAVER.
6. TEMPERATURE INSTRUMENT SHALL BE SKIN TYPE.
7. ADEQUATE SLOPE TO BE MAINTAINED IN HORIZONTAL SECTION OF PIPE IF ANY FOR LOW POINT DRAIN CONNECTION.
8. JUMPERS SHALL BE PROVIDED ACROSS ALL FLANGES.
9. MAINLINE BALL VALVES SHALL BE FULL BORE TYPES.
10. PROVISION OF A TROLLEY WITH PUSH ROD & PULLING LINE SHALL BE CONSIDERED TO ASSIST LOADING OR REMOVAL OF PIGS FROM THE SCRAPPER TRAP.
11. TIT SHALL BE INSTALLED CLOSED TO THE PIG BARREL .
12. VALVE SHALL GO TO FAIL CLOSE POSITION IN THE EVENT OF FIRE. IN ALL OTHER CASES POSITION SHALL BE FAIL LAST.
13. QUICK OPENING END CLOSURE TYPE DOOR. CANNOT BE OPENED UNLESS PIG BARREL IS FULLY DEPRESSURIZED.
14. GAS DETECTORS TO BE PROVIDED IN DOWNWIND DIRECTION NEAR PIG BARRELS & OTHER STRATEGIC LOCATIONS TO MONITOR THE LEAKAGE FROM FAILURE PRONE EQUIPMENTS PARTS, ACCESSORIES, VALVE & PIPES.
15. ALL VENTS SHALL BE PROVIDED MIN. 3M HIGH FROM HIGHEST OPERATING PLATFORM ON NEARBY STRUCTURE WITH IN 15M WHICHEVER IS HIGHER NON SPARKING MATERIAL (BRASS) SHALL BE USED FOR FLAPPER TYPE VENT CONNECTION.
16. THERMOWELL CONNECTION SHALL BE 600#.
17. HIGH POINT VENT & LOW POINT DRAIN SHALL BE PROVIDED WHENEVER APPLICABLE.
18. MONOLITHIC INSULATION JOINT.
19. PURGE / FLUSH CONNECTION SHALL BE PROVIDED WHENEVER APPLICABLE.
20. THIS VALVE SHALL BE GAS OVER OIL OPERATED TYPE WITH REMOTE OPERATION.
21. NECESSARY I/O's AND SIGNALS FOR INTERFACE WITH SCADA SHALL BE DEVELOPED BY INSTRUMENTATION.
22. ACTUATOR DETAILS OF GOOV-001 / 002 & CONTROL LOGIC SHALL BE DEVELOPED BY VENDOR.
23. 5% OF PIG TRAP VOLUME. DRAIN PIT SHALL BE COVERED WITH CHEQUERED PLATE.
24. QUICK OPENING AND QUICK CLOSING FOR VENTING SHALL BE USED.

INTERLOCK:

I 01 GOOV-001 SHALL CLOSE ON PIAH-003

REV	DATE	DESCRIPTION	BY	CHKD	APPD
CB	04.08.23	ISSUED FOR CLIENT APPROVAL	SKU	GST	AD
CA	01.07.23	ISSUED FOR CLIENT REVIEW	SKU	GST	AD
IA	21.06.23	ISSUED FOR IDC	SKU	GST	AD

OWNER: ASSAM GAS COMPANY LTD (A GOVT. OF ASSAM UNDERTAKING)

ENGINEERING CONSULTANT : PLECO PIPELINE ENGINEERING CONSULTANTS PVT. LTD.

PROJECT:

NGN LETEKUJAAN TERMINAL UPTO NRL IGGL RT PIPELINE

DWG. TITLE :

P&ID FOR PIG LAUNCHER AT LETEKUJAAN TERMINAL

SCALE.	JOB NO.	DRAWING NUMBER	REV.
NTS	P158	P158-00-PID-T001	CB
SHEET	2 OF 3		

SHEET SIZE : A1 (841 mm x 594 mm)

PIG RECEIVER	
TAG NO.	PR-001
SIZE MAJOR / MINOR	14" x 8"
DESIGN PRESSURE	49 kg/ cm²g
DESIGN TEMPERATURE	-29°C TO 65°C
OPERATING PRESSURE	6.5 - 13.5 kg/ cm²g
MAX. ALLOWABLE OPERATING PRESSURE	38.5 kg/ cm²g
OPERATING TEMPERATURE	20°C TO 30°C
MAX. OPERATING TEMPERATURE	45°C

ULTRASONIC METER	
ITEM NO.	FM-001
SERVICE FLUID	NATURAL GAS
DESIGN FLOW RATE	0.50 MMSCMD
OPERATING FLOW RATE (MIN. / MAX.)	0.19 - 0.28 MMSCMD
INLET PRESSURE	6.5 - 13.5 kg/ cm²g
OUTLET PRESSURE	6 - 13 kg/ cm²g
MAX. INLET PRESSURE	38.5 kg/ cm²g
MAX. OUTLET PRESSURE	38 kg/ cm²g
DESIGN TEMPERATURE (MIN./MAX)	-29°C TO 65°C
OPERATING TEMPERATURE	20 - 30 °C
MAX. OPERATING TEMPERATURE	45°C

ULTRASONIC METER	
ITEM NO.	FM-002
SERVICE FLUID	NATURAL GAS
DESIGN FLOW RATE	0.50 MMSCMD
OPERATING FLOW RATE (MIN. / MAX.)	0.19 - 0.28 MMSCMD
INLET PRESSURE	6.5 - 13.5 kg/ cm²g
OUTLET PRESSURE	6 - 13 kg/ cm²g
MAX. INLET PRESSURE	38.5 kg/ cm²g
MAX. OUTLET PRESSURE	38 kg/ cm²g
DESIGN TEMPERATURE (MIN./MAX)	-29°C TO 65°C
OPERATING TEMPERATURE	20 - 30 °C
MAX. OPERATING TEMPERATURE	45°C

REFERENCE DRAWINGS

DRAWING TITLE	DRAWING NUMBER
P & ID LEGENDS	P158-00-LGD-T000

GENERAL NOTES:-

1. ALL LINE NUMBERING AND EQUIPMENT TAG NUMBERING SHALL BE PRE-FIXED WITH PROJECT CODE & AREA CODE "P158".
2. ALL INSTRUMENT TAG NUMBER SHALL BE PRE-FIXED WITH PROJECT CODE & AREA CODE "P158".

NOTES :-

1. VALVES UP TO 4" SHALL BE LEVER OPERATED TYPE & ABOVE 4" SHALL BE GEAR OPERATED TYPE.
2. DISTANCE SHALL BE AT LEAST EQUAL TO THE LENGTH OF THE LONGEST INTELLIGENT PIG.
3. MINIMUM DISTANCE FOR STRAIGHT RUN SHALL BE EITHER 10D OR 15D WHICH EVER IS HIGHER.
4. DEPRESSURIZATION VALVE SHALL BE LOCATED IN SUCH A WAY THAT PIT 005 / 006 & TIT-008 CAN BE READ DURING VENTING.
5. LOW RANGE PRESSURE GAUGE (0-2 kg/cm²g) PROVIDED WITH GAUGE SAVER.
6. TEMPERATURE INSTRUMENT SHALL BE SKIN TYPE.
7. ADEQUATE SLOPE TO BE MAINTAINED IN HORIZONTAL SECTION OF PIPE IF ANY FOR LOW POINT DRAIN CONNECTION.
8. JUMPERS SHALL BE PROVIDED ACROSS ALL FLANGES.
9. MAINLINE BALL VALVES SHALL BE FULL BORE TYPES.
10. PROVISION OF A TROLLEY WITH PUSH ROD & PULLING LINE SHALL BE CONSIDERED TO ASSIST LOADING OR REMOVAL OF PIGS FROM THE SCRAPPER TRAP.
11. TIT SHALL BE INSTALLED CLOSED TO THE PIG BARREL .
12. 5% OF PIG TRAP VOLUME. DRAIN PIT SHALL BE COVERED WITH CHEQUERED PLATE.
13. VALVE SHALL GO TO FAIL CLOSE POSITION IN THE EVENT OF FIRE. IN ALL OTHER CASES POSITION SHALL BE FAIL LAST.
14. ALL VENTS SHALL BE PROVIDED MIN. 3M HIGH FROM NEAREST HIGHEST OPERATING PLATFORM OR NEARBY STRUCTURE WITHIN 15M WHICHEVER IS HIGHER. NON SPARKING MATERIAL (BRASS) SHALL BE USED FOR FLAPPER TYPE VENT CONNECTION.
15. QUICK OPENING END CLOSURE TYPE DOOR CANNOT BE OPENED UNLESS PIG BARREL IS FULLY DEPRESSURIZE.
16. THERMOWELL CONNECTION SHALL BE 600#.
17. QUICK OPENING AND QUICK CLOSING FOR VENTING SHALL BE USED.
18. LOW DRAIN POINT SHALL BE PROVIDED WHEREVER APPLICABLE ARRIVING GAS.
19. THIS VALVE SHALL BE GAS OVER OIL OPERATED TYPE WITH REMOTE OPERATION.
20. NECESSARY I/O's AND SIGNALS FOR INTERFACE WITH SCADA SHALL BE DEVELOPED BY INSTRUMENTATION.
21. ACTUATOR DETAILS OF GOOV003/004 & CONTROL LOGIC SHALL BE DEVELOPED BY VENDOR.

INTERLOCK:

I 02 — GOOV-004 SHALL CLOSE ON PIAH-005

REV	DATE	DESCRIPTION	BY	CHKD	APPD
CB	04.08.23	ISSUED FOR CLIENT APPROVAL	SKU	GST	AD
CA	01.07.23	ISSUED FOR CLIENT REVIEW	SKU	GST	AD
IA	21.06.23	ISSUED FOR IDC	SKU	GST	AD

OWNER: ASSAM GAS COMPANY LTD (A GOVT. OF ASSAM UNDERTAKING)

ENGINEERING CONSULTANT : PLECO — PIPELINE ENGINEERING CONSULTANTS PVT. LTD.

PROJECT:

NGN LETEKUJAAN TERMINAL UPTO NRL IGGL RT PIPELINE

DWG. TITLE :

P&ID FOR PIG RECEIVER AT NRL & CHECK METERING AT NRL & IGGL

SCALE.	JOB NO.	DRAWING NUMBER	REV.
NTS	P158	P158-00-PID-T001	CB
SHEET	3 OF 3		

SHEET SIZE : A1 (841 mm x 594 mm)