VCS Quality Services Private Limited

CITY GAS DISTRIBUTION PROJECT OF NORTH GOA

BID DOCUMENT FOR PROCUREMENT OF ASSORTED VALVE

Document No: VCS-1023-000-PL-MR-02

Issued : 27/01/2021

Goa Natural Gas Pvt. Ltd.
A Joint Venture of Bharat Petroleum Corporation Limited
(BPCL) & GAIL GAS LIMITED

VCS Quality Services Private Limited

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ENERGISING QUALITY	**PROJECT NUMBER: 1023**	

MATERIAL REQUISITION FOR MAIN LINE - VALVES			Client Job Number	GNGPL/EPM/VCS/FOA/01 dt.06-11-2019	
			Total Sheets	14	
Document No	1023	000	PL	MR	002

M/s GOA NATURAL GAS PVT. LTD. (GNGPL)

CITY GAS DISTRIBUTION PROJECT OF NORTH GOA

MATERIAL REQUISITION FOR MAIN LINE AND ASSORTED - VALVES

REV	DATE	DESCRIPTION	PREP	CHKD	APPR
1	27.01.2021	ISSUED FOR PROCUREMENT	JR	DG	HK

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1. INTRODUCTION

M/s Goa Natural Gas Pvt. Ltd. is a Joint Venture (JV) of Bharat Petroleum Corporation Limited (BPCL), A Govt. of India Enterprise and GAIL Gas Limited, a fully owned subsidiary company of GAIL (India) Limited, has been set up to provide PNG (piped Natural Gas) to industrial, domestic, commercial sectors and CNG to automobile sector in North Goa GA.

VCS Quality Services Pvt. Ltd. (VCS has been appointed as Project Management Consultant for providing consultancy services for CGD Expansion Project for PNG & CNG in North Goa (hereinafter referred as Consultant), by GNGPL

2. PURPOSE

This document is for the design, manufacturing and purchase of valves for CONSORTIUM City gas distribution project in North Goa.

3. DEFINITIONS

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

PROJECT	City Gas Distribution Project Of North Goa
OWNER	GOA NATURAL GAS PVT. LTD. (GNGPL)
CONSULTANT	VCS Quality Services Private Limited (VCSQSPL) the party to act for and on behalf of OWNER for the Engineering Services.
MANUFACTURER	The party, which manufactures and supplies equipment and services to the OWNER or to Contractor
MR	Material Requisition

4. DOCUMENT PRECEDENCE

It shall be the responsibility of the MANUFACTURER/ BIDDER 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. Datasheet
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/ BIDDER 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.)

5. SCOPE OF SUPPLY

Design, procurement of materials and bought out components, manufacture, assembly at shop, inspection, testing at manufacturer's works, packing, handling, delivery of various valves (as per Table below), supply of all pre commissioning & commissioning spares & documentation as per the enclosed engineering standard, specifications and data sheets etc. attached or referred.

A. Ball Valves

S. No.	Size (inch)	Face	Material Description	Piping Class	Data Sheet	Unit	Total Qty.	Remark
01	8″	BW	BODY-ASTM A 216 GR.WCB, TRIM: SEAT: AISI 4140+0.003" ENP/AISI 410	30HC	1023-000-PL-DS-008A	Nos	1	*UG/ FB
02	6″	BW	BODY-ASTM A 216 GR.WCB, TRIM: SEAT: AISI 4140+0.003" ENP/AISI 410	30HC	1023-000-PL-DS-008A	Nos	5	*UG/ FB
03	4″	BW	BODY-ASTM A 216 GR.WCB, TRIM: SEAT: AISI 4140+0.003" ENP/AISI 410	30HC	1023-000-PL-DS-008B	Nos	5	*UG/RB
04	2″	BW	BODY-ASTM A 216 GR.WCB, TRIM: SEAT: AISI4140+0.003 "ENP/AISI410	30HC	1023-000-PL-DS-008A	Nos	10	*UG/ RB

B. Globe Valves

S. No.	Size (inch)	Face	Material Description	Piping Class	Data Sheet	Unit	Total Qty.	Remark
1	2″	BW	ASTM A216 GR.WCB, TRIM: SEAT: AISI,	30HC	1023-CGD-PL-DS-0003	Nos	10	*UG/ RB

			4140+0.003" ENP/AISI 410, conforming to BS 1873, ANSI					

- 30HC = Meant for 300# Carbon Steel for High Temperature service.
- 60HC= Meant for 600# Carbon Steel for High Temperature service.
- BW = Butt welded, FB = Full Bore, RB = Reduce Bore, AG = Above Ground, UG = Under Ground. MOV = Motor Operated Valve.
- Welding end, Thickness of valves shall be the connecting pipe thickness.

(*) These valves are intended to be installed in UG Pipeline and to be kept in valve chamber.

6. DELIVERY LOCATION

A. Ball Valves

S.No.	Size (inch)	North Goa
01	8", (300#)	1
02	6", (300#)	5
03	4" (300#)	5
04	2" (300#)	10
Refer Cl. 5-Scope of supply, table for details.		

B. Globe Valves

S.No.	Size (inch)	North Goa
01	2" (300#)	**10**
Refer Cl. 5-Scope of supply, table for details.		

7. NOTES

1. All valves (including all components) shall be designed and suitable for Natural Gas/ RLNG service and are to be in intended to be installed in pipeline.

2. Design Data for Project are:

- Pipeline Service : NATURAL GAS/ RLNG
- Max Design Temp (Above Ground) : 65°C
- Max Design Temp (Under Ground) : 60°C
- Min Design Temp : (-)29°C FOR CS

3. Bidder shall check, Valve body calculation based on design conditions and manufacturing requirements and submit necessary to company for approval. All valves shall have welded both construction.

4. For all 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 with the impact test provisions of ASTM A 370.

5. Certification shall be EN 10204 type 3.2.

6. 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.

7. Bidder shall quote separately spares for 2-year normal operation. List of spares quoted shall be furnished as per attached formats

8. 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.

9. Valves shall be delivered at owner's designated store yard at North GOA as shown in table Cl. No.6. All transportation, handling, delivery shall be in bidder's scope.

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

11. 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).

12. 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.

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

14. Purchaser's inspector reserves the right to perform stage wise inspection and witness tests, as indicated in specification for valves 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.

8. LIST OF ATTACHMENTS

1. Data Sheet – Ball Valves; 1023-000-PL-DS-008A
2. Data Sheet – Ball Valves; 1023-000-PL-DS-008B
3. Data Sheet – Globe Valves; 1023-CGD-PL-DS-0003.
4. Specification for Ball Valves; VPC-SS-PL-0004.
5. Specification for Globe Valve; VPC-SS-PL-0030.
6. Specifications for Painting; VPC-SS-PI-0008.
7. Inspection and Test Plan – Ball Valve; VPC-SD-ITP-007.
8. Inspection and Test Plan – Globe Valve; VCS-PL-ITP-008.
9. List of Recommended Third Party Inspection Agency (TPIA).
10. Checklist – Technical; VCS-SD-CK-001.
11. Compliance Statement; VCS-SD-CS-001.
12. Deviation Sheet; VCS-SD-DS-001.
13. Drawings and Documents; VCS-SD-DD-001.
14. Instruction to Bidder; VCS-SD-ITB-001.
15. List of Spares; VCS-SD-LS-001.
16. Reference List; VCS-SD-RL-001.
17. Piping Material Specification.VCS-PL-PI-001.

GLOBE VALVES - DATA SHEET				Client Job Number	GNGPL/EPM/VCS/FOA/01 dt.06-11-2019
				Total Sheets	4
Document no.	1023	000	PL	DS	008

GOA NATURAL GAS PRIVATE LIMITED (GNGPL)

CITY GAS DISTRIBUTION PROJECT OF NORTH GOA

DATA SHEET BALL VALVES

ENERGISING QUALITY	**PROJECT NUMBER: 1023**						
CLIENT	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)						
PMC	VCS QUALITY SERVICES PVT. LTD.						
DATA SHEET : BALL VALVES (4" to 8" SIZE) WELDED							
GENERAL SPECIFICATION							
Process Fluid	Natural Gas	**ANSI Pressure Rating**			300#		
Design Temperature	(-)29°C to 65°C	**Design Pressure (Barg)**			49 Barg		
Design Standard	API 6D	**Piping Class**			30HC		
Size, DN (inch)	50 to 200" (02" to 08")						
Valve Type	Full Bore/Reduced Bore, Trunion Mounted, Double Block & Bleed & welded body construction.						
End Connection Type	**Welded**	**Material Standard**			ANSI B16.25		
Face Finish	NA	**Special Requirement**			Vent, Drain & Sealant connection with Anti Blow Out Stem, Secondary Metal to Metal contact, Primary Soft Seat		
Locking Arrangement	Yes						
VALVE DESIGN CONDITIONS							
Corrosion Allowance	1.5 mm	**Design Factor**			0.5		
Installation	Under Ground	**Stem Ext Length, mm**			Not Applicable		
VALVE OPERATION							
Actuation Type	Not Applicable	**Type of Actuator**			Not Applicable		
PUP PIECE DETAILS							
Diameter / Length	300 mm (Applicable for 6& 8inch valve)	**Material & Thickness**			API 5L Gr. X-52 ,6.4 mm or Equivalent		
VALVE MATERIAL SPECIFICATION							
PART DISCRIPTION	**MATERIAL SPECIFIED**			**MATERIAL OFFERED (Equivalent or Higher)**			
Body	ASTM A216 GR. WCB						
Ball	13% Cr. Steel / SS-304 / SS-316 (Solid) /(ASTM A 216 Gr. WCB) + 0.003" ENP						
Seat Rings	(AISI 4140 + 0.003" ENP) / AISI 410						
Body Seat	R-PTFE with Secondary Metal to Metal						
Stem	13% Cr. Steel / SS-316 (No Casting)/(AISI 4140 + 0.003" ENP) / AISI 410						
Stem Seal	PTFE V-RINGS+GRAFOIL						
Gland	13% Cr. Steel / SS-304 / SS-316						
Handle / Lever / Hand Wheel	Carbon Steel						
TESTING REQUIREMENT							
Hydrostatic Test Pressure & Time	Body: 73.5 barg & 30 min				Seat: 53.9 barg & 30 min		
Pneumatic Test Pressure & Time	7.0 barg & 15 min						
Anti-Static Testing Requirement	As per API 6D Latest Edition						
Hardness Test	248 HV10 max						
Charpy Impact Test @ Temperature	Yes (at -29 °C)						
Fire Safe Test	API 6FA/ ISO10497						
Valve Painting Specification	High Build Epoxy Coating (R-95)						
Manufacturer's Painting Specification	XXX						
DOCUMENT NO.							
1023-000-PL-DS-008A	**C1**	**16.10.2020**	**JR**	**DG**	**HK**	**ISSUED FOR CLIENT REVIEW**	
SHEET NO.	**1 OF 2**	**REV**	**DATE**	**PRPD**	**CHKD**	**APVD**	**REMARKS**

ENERGISING QUALITY	**PROJECT NUMBER: 1023**	
CLIENT	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	
PMC	VCS QUALITY SERVICES PVT. LTD.	

DATA SHEET : BALL VALVES (2" to 8" SIZE)

NOTES

1	This Data Sheet shall be read in conjunction with Tender Documents & Specifications.
2	Dimension / Input Data as & where marked "XXX" shall be supplied by Vendor.
3	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.
4	Manufacturer shall have valid license to use API monogram.
5	Valve design shall ensure repair of stem seals / packing under full line pressure.
6	Valves shall have support foot & lifting lugs.
7	Wrench operated valves shall be supplied with wrench.
8	100.0 % Valve castings shall undergo Radiographic Examination.
9	Bidder to submit Soft Seal details and type, grade & class selected for R-PTFE from ASTM D4745 with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
10	The Charpy Impact temperature specified in data sheet shall superceded the Specification (VPC-SS-PL-0004) requirement at 0 ^{o}C
11	A supplementary air seat test as per API 6D (Annex B, Para B.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.
12	All the valves should have full bore/ reduced bore markings as per the API 6D Table 12.
13	Design of weld end valves shall be such that during field welding operations, the soft seals or plastic compnents of the valve (where ever used) is not liable to be damaged. The manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
14	Valves of size 8" and above shall have Sealant connection.

LEGEND

FB	Full Bore	RB	Reduced Bore
BW	Butt Welded Ends	RF	Raised Face - Flanged Ends
UG	Under Ground	AG	Above Ground
GOV	Gas Operated Valve	HOV	Hydraulically Operated Valve
FBV	Floating Ball Valve	TMBV	Trunion Mounted Ball Valve

ENERGISING QUALITY	PROJECT NUMBER: 1023	
CLIENT	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	
PMC	VCS QUALITY SERVICES PVT. LTD.	

DATA SHEET : BALL VALVES (2" to 8" SIZE) WELDED

GENERAL SPECIFICATION

Process Fluid	Natural Gas	**ANSI Pressure Rating**	300#
Design Temperature	(-)29°C to 65°C	**Design Pressure (Barg)**	49 Barg
Design Standard	API 6D	**Piping Class**	30HC
Size, DN (inch)	50 to 200" (02" to 08")		
Valve Type	Full Bore/ Reduced Bore/Trunion Mounted, Double Block & Bleed.		
End Connection Type	**Welded**	**Material Standard**	ANSI B16.5
Face Finish	RF/125AARH	**Special Requirement**	Vent, Drain & Sealant connection with Anti Blow Out Stem, Secondary Metal to Metal contact, Primary Soft Seat
Locking Arrangement	Yes		

VALVE DESIGN CONDITIONS

Corrosion Allowance	1.5 mm	**Design Factor**	0.4
Installation	Above Ground	**Stem Ext Length, mm**	Not Applicable

VALVE OPERATION

Actuation Type	Applicable	**Type of Actuator**	Not Applicable

PUP PIECE DETAILS

Diameter / Length	Not Applicable	**Material & Thickness**	Not Applicable

VALVE MATERIAL SPECIFICATION

PART DISCRIPTION	MATERIAL SPECIFIED	MATERIAL OFFERED (Equivalent or Higher)
Body	ASTM A216 GR. WCB	
Ball	13% Cr. Steel / SS-304 / SS-316 (Solid) /(ASTM A 216 Gr. WCB) + 0.003" ENP	
Seat Rings	(AISI 4140 + 0.003" ENP) / AISI 410	
Body Seat	R-PTFE with Secondary Metal to Metal	
Stem	13% Cr. Steel / SS-316 (No Casting)/(AISI 4140 + 0.003" ENP) / AISI 410	
Stem Seal	PTFE V-RINGS+GRAFOIL	
Gland	13% Cr. Steel / SS-304 / SS-316	
Body Stud	ASTM A 193 Gr.B7	
Body Nut	ASTM A Gr. 2H	
Handle / Lever / Hand Wheel	Carbon Steel	

TESTING REQUIREMENT

Hydrostatic Test Pressure & Time	Body: 73.5 barg & 30 min	Seat: 53.9 barg & 30 min
Pneumatic Test Pressure & Time	7.0 barg & 15 min	
Anti-Static Testing Requirement	As per API 6D Latest Edition	
Hardness Test	248 HV10 max	
Charpy Impact Test @ Temperature	Yes (at -29 °C)	
Fire Safe Test	API 6FA/ ISO10497	
Valve Painting Specification	As per painting Specification (Suitable for Corrosive Industrial Environment)	
Manufacturer's Painting Specification	XXX	

DOCUMENT NO.							
1023-000-PL-DS-008B		**C1**	**16.10.2020**	**JR**	**DG**	**HK**	**ISSUED FOR CLIENT REVIEW**
SHEET NO.	**1 OF 2**	**REV**	**DATE**	**PRPD**	**CHKD**	**APVD**	**REMARKS**

ENERGISING QUALITY	**PROJECT NUMBER: 1023**	
CLIENT	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	
PMC	VCS QUALITY SERVICES PVT. LTD.	

DATA SHEET : BALL VALVES (2" to 8" SIZE)

NOTES

1	This Data Sheet shall be read in conjunction with Tender Documents & Specifications.
2	Dimension / Input Data as & where marked "XXX" shall be supplied by Vendor.
3	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.
4	Manufacturer shall have valid license to use API monogram.
5	Valve design shall ensure repair of stem seals / packing under full line pressure.
6	Valves shall have support foot & lifting lugs.
7	Wrench operated valves shall be supplied with wrench.
8	100.0 % Valve castings shall undergo Radiographic Examination.
9	Bidder to submit Soft Seal details and type, grade & class selected for R-PTFE from ASTM D4745 with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
10	The Charpy Impact temperature specified in data sheet shall superceded the Specification (VPC-SS-PL-0004) requirement at 0 ^{o}C
11	A supplementary air seat test as per API 6D (Annex B, Para B.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.
12	All the valves should have full bore/ reduced bore markings as per the API 6D Table 12.
13	Design of weld end valves shall be such that during field welding operations, the soft seals or plastic compnents of the valve (where ever used) is not liable to be damaged. The manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
14	Valves of size 8" and above shall have Sealant connection.

LEGEND

FB	Full Bore	RB	Reduced Bore
BW	Butt Welded Ends	RF	Raised Face - Flanged Ends
UG	Under Ground	AG	Above Ground
GOV	Gas Operated Valve	HOV	Hydraulically Operated Valve
FBV	Floating Ball Valve	TMBV	Trunion Mounted Ball Valve

DOCUMENT NO.							
1023-000-PL-DS-008B		**C1**	**16.10.2020**	**JR**	**DG**	**HK**	**ISSUED FOR CLIENT REVIEW**
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GLOBE VALVES - DATA SHEET				Client Job Number	GNGPL/EPM/VCS/FOA/01 dt.06-11-2019
				Total Sheets	2
Document no.	1023	000	PL	DS	008

GOA NATURAL GAS PRIVATE LIMITED (GNGPL)

CITY GAS DISTRIBUTION PROJECT OF NORTH GOA

DATA SHEET GLOBE VALVES

ENERGISING QUALITY	**PROJECT NUMBER: 1023**						
CLIENT	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)						
PMC	VCS QUALITY SERVICES PVT. LTD.						
DATA SHEET : GLOBE VALVES (2" to 12" SIZE)							
GENERAL SPECIFICATION							
Process Fluid	Natural Gas	**ANSI Pressure Rating**	300#				
Design Temperature	(-)29°C to 65°C	**Design Pressure (Barg)**	49 Barg				
Design Standard	BS-1873	**Piping Class**	30HC				
Size, DN (inch)	50 to 300" (02" to 12")						
Valve Type	Rising Stem, Welded Ends						
End Connection Type	**Welded**	**Material Standard**	ANSI B16.25				
Face Finish	NA	**Special Requirement**	XXX				
Locking Arrangement	Yes						
VALVE DESIGN CONDITIONS							
Corrosion Allowance	1.5 mm	**Design Factor**	0.4				
Installation	Under Ground	**Stem Ext Length, mm**	Not Applicable				
VALVE OPERATION							
Actuation Type	Not Applicable	**Type of Actuator**	Not Applicable				
PUP PIECE DETAILS							
Diameter / Length	Not Applicable	**Material & Thickness**	Not Applicable				
VALVE MATERIAL SPECIFICATION							
PART DISCRIPTION	**MATERIAL SPECIFIED**		**MATERIAL OFFERED (Equivalent or Higher)**				
Body	ASTM A216 GR. WCB						
Disc	13% Cr. Steel Facing/ 13% Cr. Steel						
Seat Ring	13% Cr. Steel Facing/ 13% Cr. Steel						
Stem	13% Cr. Steel / SS-316 (No Casting)/(AISI 4140 + 0.003" ENP) / AISI 410						
Bonnet	ASTM A234 GR.WPB						
Gland/Stem Packing	Graphite Asbestos with Sacrificial Corrosion Inhibitor Inconel Wire Reinforcement.						
Body Stud	ASTM A 193 Gr. B7						
Body Nut	ASTM A 194 Gr. 2H						
Handle / Lever / Hand Wheel	Carbon Steel						
TESTING REQUIREMENT							
Hydrostatic Test Pressure & Time	Body: 73.5 barg & 30 min		Seat: 53.9 barg & 30 min				
Pneumatic Test Pressure & Time	7.0 barg & 15 min						
Hardness Test	248 HV10 max						
Charpy Impact Test @ Temperature	Yes (at -29 °C)						
Fire Safe Test	API 6FA/ ISO10497						
Valve Painting Specification	High Build Epoxy Coating (R-95)						
Manufacturer's Painting Specification	XXX						
DOCUMENT NO.							
1023-CGD-PL-DS-0003	**C1**	**16.10.2020**	**JR**	**DG**	**HK**	**ISSUED FOR CLIENT REVIEW**	
SHEET NO.	**1 OF 2**	**REV**	**DATE**	**PRPD**	**CHKD**	**APVD**	**REMARKS**

ENERGISING QUALITY	**PROJECT NUMBER: 1023**	
CLIENT	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	
PMC	VCS QUALITY SERVICES PVT. LTD.	

DATA SHEET : GLOBE VALVES (2" to 12" SIZE)

NOTES

1	This Data Sheet shall be read in conjunction with Tender Documents & Specifications.
2	Dimension / Input Data as & where marked "XXX" shall be supplied by Vendor.
3	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.
4	Manufacturer shall have valid license to use API monogram.
5	Valve design shall ensure repair of stem seals / packing under full line pressure.
6	Valves shall have support foot & lifting lugs.
7	Wrench operated valves shall be supplied with wrench.
8	100.0 % Valve castings shall undergo Radiographic Examination.
9	Bidder to submit Soft Seal details and type, grade & class selected for R-PTFE from ASTM D4745 with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
10	The Charpy Impact temperature specified in data sheet shall superceded the Specification (VPC-SS-PL-0004) requirement at 0 ^{o}C
11	A supplementary air seat test as per API 6D (Annex B, Para B.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.
12	All the valves should have full bore/ reduced bore markings as per the API 6D Table 12.
13	Design of weld end valves shall be such that during field welding operations, the soft seals or plastic compnents of the valve (where ever used) is not liable to be damaged. The manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
14	Valves of size 8" and above shall have Sealant connection.

LEGEND

FB	Full Bore	RB	Reduced Bore
BW	Butt Welded Ends	RF	Raised Face - Flanged Ends
UG	Under Ground	AG	Above Ground
GOV	Gas Operated Valve	HOV	Hydraulically Operated Valve
FBV	Floating Ball Valve	TMBV	Trunion Mounted Ball Valve

DOCUMENT NO.							
1023-CGD-PL-DS-0003		**C1**	**16.10.2020**	**JR**	**DG**	**HK**	**ISSUED FOR CLIENT REVIEW**
SHEET NO.	**2 OF 2**	**REV**	**DATE**	**PRPD**	**CHKD**	**APVD**	**REMARKS**

ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION

FOR

PIPELINE BALL VALES

VPC – SS – PL - 0004

REV. No	DATE	Purpose	Prepared By	Checked By	Approved By
00	23.06.2017	ISSUED AS STANDARD	AS	SM	AD

ABBREVIATIONS:

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
API	American Petroleum Institute
BHN	Brinell Hardness Number
DN	Nominal Size
HAZ	Heat Affected Zone
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
NDT	Non Destructive Testing
NPS	Nominal Pipe Size
RTJ	Ring Type Joint
SSPC	Steel Structures Painting Council
MPI	Magnetic Particle Inspection
DP	Dye Penetrant

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1 SCOPE

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

All valves shall be manufactured and supplied in accordance with the American Petroleum Institute (API) Specification 6D, Twenty Third Edition, April 2008/ ISO 14313:2007, Petroleum and Natural Gas Industries - Pipeline Transportation Systems - Pipeline Valves, with additions and modifications as indicated in the following sections of this specification.

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.

2.1 AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

B31.3	:	Process Piping.
B31.4	:	Pipeline Transportation System for Liquid Hydrocarbon & Other Liquids.
B 31.8	:	Gas Transmission and Distribution Piping Systems.
B16.5	:	Pipe Flanges and Flanged Fittings.
B16.10	:	Face to Face and End to End Dimensions of Valves.
B 16.25	:	Butt Welding Ends.
B 16.34	:	Valves-Flanged, Threaded and Welding Ends.
B 16.47	:	Large Diameter Steel Flanges.
Section VIII	:	Boiler and Pressure Vessel Code - Rules for Construction of Pressure Vessels.
Section IX	:	Welding and Brazing Qualifications.

2.2 AMERICAN PETROLEUM INSTITUTE (API)

1104	:	Specification for Welding Pipelines and Related Facilities.

2.3 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A370	:	Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
B 733	:	Auto catalytic (Electro less) Nickel - Phosphorus Coatings on Metal.

2.4 MANUFACTURERS STANDARDIZATION SOCIETY (MSS)

SP-6 : Standard Finishes for contact faces of Pipe Flanges and Connecting – End Flanges of Valves and Fittings.

SP-44 : Steel Pipeline Flanges.

2.5 STEEL STRUCTURES PAINTING COUNCIL (SSPC)

VIS-I : Visual Standard.

2.6 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 The material of major components of the ball 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 approval 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.

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 0.45 on check analysis for each heat of steel used, as calculated by the following formula:

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

3.4 CHARPY V-NOTCH TEST REQUIREMENTS

For valves specified to be used for Gas service or LPG service, Charpy V-notch test, on each heat of base material shall be conducted as per API 6D-Clause 8.5, for all pressure containing parts such as body, end flanges and welding ends as well as bolting material for pressure containing parts. Unless specified otherwise, the Charpy V-notch test shall be conducted at 0°C. Test procedure shall conform to ASTM A 370. The average absorbed energy value of three full sized specimens shall be 27 J. The minimum impact energy value of any one specimen of the three specimens analyzed as above shall not be less than 22 J.

When Low Temperature Carbon Steel (LTCS) materials are specified in Valve Data Sheet or offered by Manufacturer, the Charpy V-notch test requirements of applicable material standard shall be complied with.

3.5 HARDNESS TEST REQUIREMENTS

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 ELECTROLESS NICKEL PLATING REQUIREMENTS

For all such valves where Carbon Steel is used as ball material, the ball shall have 75 micrometers (0.003 inches) thick Electro less 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 GENERAL

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 valve body and other pressure containing parts shall be designed in compliance with ASME Boiler & Pressure Vessel Code, Section VIII, Div 1. Allowable stress requirements shall comply the provisions of ASME B31.3. Also corrosion allowance indicated in Valve Data Sheet shall be considered in valve design; however, the minimum wall thickness shall not be less than the minimum requirement of ASME B16.34. The manufacturer shall have valid license to use API monogram on valves manufactured as per API 6D.

4.2 VALVE INSTALLATION

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

4.3 VALVE BODY

4.3.1 Valve body design shall be either fully welded or bolted type. Valve body joints with threads are not permitted.

4.3.2 The Ball of valve shall be trunnion mounted. Valve design shall minimize the possibility of debris ingress into the trunnion as far as practicable.

4.4 BALL

Ball shall be of single piece, solid type construction.

4.5 VALVE CONFIGURATION

Valves shall be Full bore (FB) or Reduced bore (RB) as indicated in the Valve Data Sheet.

FULL OPENING VAVE

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 a full bore-valve shall be as per API 6D.

REDUCED OPENING VAVE

The bore size of reduced bore valve shall be as indicated in Table- 4.5 below:

TABLE – 4.5

Nominal Valve Size	**Reduced Bore**	**Nominal Valve**	**Reduced Bore Sizes**
DN mm (NPS	DN mm (NPS	DNmm(NPS**inches**	DNmm(NPS **inches**)
50 (2)	50 (2)	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)		

4.6 SEAT DESIGN

Valve seat shall comprise of a hard metallic seat ring energized with bellville or helical spring and shall provide bubble tight shutoff at high pressure. 'O' ring 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.

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

4.8 DOUBLE BLOCK & BLEED DESIGN

Valves shall have double block and bleed feature to facilitate complete flush, drain and venting of the valve body cavity. Cavity relief pressure shall be as per API 6D.

4.9 SEALANT INJECTION

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 an internal non-return valve. Valve design shall have a provision to replace the sealant injection fitting under full line pressure. Valves shall be provided with vent and drain connections. Drain sizes shall be in accordance with API 6D or MSS-SP-45. Drain sizes shall be as specified in MSS-SP-45 for valve size NPS 2 to NPS 24. For sizes larger than NPS 24, manufacturer shall specify suitable drain size for purchaser approval.

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 valves (Ball or Plug type). Number and size shall be as per Fig. 4.9.

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

4.11 SUPPORT FOOT

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 unless specified otherwise. 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.

4.12 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.

4.13 For valves to be used in liquid service, the body cavity over-pressure shall be prevented by self- relieving seat rings/ assemblies. Self-relieving seat rings shall relieve at a body cavity differential pressure not exceeding 50% of the valve class rating pressure.

4.14 VALVE ENDS

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.

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") and as per MSS-SP-44/ ASME B 16.47 Series A for valve sizes DN 550 mm (22") and for DN 650 mm (26 inches) and above. Flange face shall be either raised face or ring joint type (RTJ) as indicated in Valve Data Sheet. Flange face finish shall be serrated or smooth as indicated in Valve Data Sheet. In case of RTJ flanges, the groove hardness shall be minimum 140 BHN.

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. Valves shall be without transition pups. 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.

4.15 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. 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.

4.16 POSITION INDICATORS

Valve shall be provided with ball position indicator and stops of rugged construction at the fully open and fully closed positions.

4.17 STEM EXTENSIONS

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

a. 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 centerline of the valve opening and the top of mounting flange for valve operating device (gear operator/ power actuator as applicable).
b. 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. Fittings shall be ASTM A105/ ASTM A234 Gr. WPB, Socket welded ANSI class 600.
c. 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.
d. 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.
e. The Stem Extension shall be self-relieving.

4.18 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. 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. Manufacturer shall also indicate the number of turns of hand wheel (In case of gear operators) required

for Operating the valve from full open to full close position.

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.

4.19 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.

4.20 LOCKING DEVICES

When indicated in Material Requisition, 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.

4.21 WELDING

All welds shall be made by welders and welding procedures qualified in accordance with the provisions of ASME Section IX, except that only positions 5G and 2G shall qualify all-positional welding. The procedure qualification shall also include impact test and hardness test when required as per Clause 3.4 to 3.5 of this specification and shall meet the requirements as specified therein.

4.22 REPAIR WELDING

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 to 3.5 of this specification and shall meet the requirements as specified therein.

4.23 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.

5 INSPECTION & TESTS

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

5.2 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.

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

5.4 Chemical composition and mechanical properties shall be checked as per this specification

and relevant material standards, for each heat of steel used.

5.5 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 radio graphically examined as per ASME B16.34. 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	All sizes	Nil
ANSI 300 # Class	≤ DN 400 mm (16") ≥ DN 450 mm (18")	Nil 100%
ANSI 600 # Class and above	All sizes	100%

All castings shall be wet magnetic particle inspected 100% of the internal surfaces. Method and acceptance shall, comply with ASME B 16.34.

b. All valves, with body fabricated from plates or made by, forgings, shall be ultrasonically examined in accordance with the procedure and acceptance standard as per 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 5.5 (a) for cast components or 5.5 (b) for forged components and plates.

5.6 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.

5.7 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 (2007 edition), Division 1, Appendix 12 and, Appendix 6 respectively.

5.8 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.

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

b. 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.

5.9 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. No leakage is permissible during hydrostatic testing. The body cavity self-relieving feature meeting the requirements of clause 4.13 of this specification shall also be checked.

5.10 A supplementary air seat test as per API 6D (Annex B, Para B.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.

5.11 Valves shall be subjected to Operational Torque Test as per API 6D (Annex B, Para B.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 4.18 (C) of this specification.

5.12 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.

5.13 Subsequent to successful testing as specified in clause 5.11 and 5.12 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 5.9 and 5.10.

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.

5.14 Checks shall be carried out to demonstrate that the dissimilar metals used in the valves

are successfully insulated as per the requirement of clause 4.12 of this specification.

5.15 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 in accordance with EN 10204 3.2.

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. Report on heat treatment carried out.
c. Test certificates of hydrostatic and pneumatic tests complete with records of timing and pressure of each test.
d. Test reports of radiograph and ultrasonic inspection, MPI and DP Inspection
e. Test report on operation of valves conforming to clause 5.11, 5.12 and 5.13 of this specification.
f. 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

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 SP-6 in accordance with "Steel Structures Painting Council - Visual Standard SSPC-VIS-1". 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 three coats of suitable coal tar epoxy resin with a minimum dry film thickness of 300 microns.

8 MARKING & SHIPMENT

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

8.2 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.

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

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

8.5 The serial number of each valve indicated on its nameplate shall appear on all required documentation in accordance with EN 10204 3.2.

8.6 All valves shall be transported with ball in fully opened condition

8.7 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

9 SPARES & ACCESSORIES

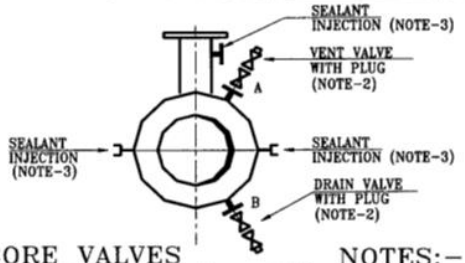
9.1 Manufacturer shall furnish list of recommended spares and accessories for valves required during start-up and commissioning and supply of such spares shall be included in the price quoted by Manufacturer.

9.2 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.

10 DOCUMENTATION

The Manufacturer shall supply documentation in accordance with the Vendor Data Requirements List (VDRL) as attached with Purchase Order.

ABOVE GROUND INSTALLATION



FULL BORE VALVES

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

REDUCED BORE VALVES

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

NOTES:–

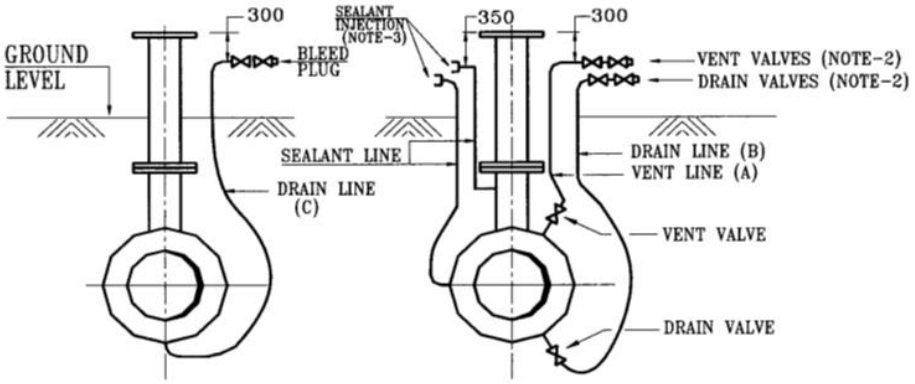
1 ALL VALVES (BALL OR PLUG) AND PLUGS FOR A AND B SHALL BE APPROVED BY THE PURCHASER.

2 VALVES OF SIZE 50 mm SHALL BE MANUFACTURED AS PER API-6D.

3 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.

4 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 AND 150	–	–	15
200 TO 300	25	25	–
350 TO 600	25	25	–
650 & ABOVE	50	50	–

REDUCED BORE (RB) VALVES

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

NOTES:–

1 ALL VALVES (BALL OR PLUG) AND PLUGS FOR A AND B SHALL BE APPROVED BY THE PURCHASER.

2 VALVES OF SIZE 50 mm SHALL BE MANUFACTURED AS PER API-6D.

3 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

4 ALL VENT/DRAIN CONNECTION IN BURIED SECTION SHALL BE OF WELDED CONSTRUCTION.

FIGURE–4.9

ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION

FOR
PIPELINE GLOBE VALVES

VPC – SS – PL - 0030

REV. No	DATE	Purpose	Prepared By	Checked By	Approved By
00	23.06.2017	ISSUED AS STANDARD	AS	SM	AD

ABBREVIATIONS:

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
API	American Petroleum Institute
BHN	Brinell Hardness Number
DN	Nominal Size
HAZ	Heat Affected Zone
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
NDT	Non Destructive Testing
NPS	Nominal Pipe Size
RTJ	Ring Type Joint
SSPC	Steel Structures Painting Council
MPI	Magnetic Particle Inspection
DP	Dye Penetrant

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1 SCOPE

This specification covers the minimum requirements for design, manufacture, testing and supply of carbon steel globe 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

All valves shall be manufactured and supplied in accordance with the Design Code BS 1873, with additions and modifications as indicated in the following sections of this specification.

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.

2.1 AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

BS 1873	:	Specification for Globe Valves
B31.3	:	Process Piping.
B31.4	:	Pipeline Transportation System for Liquid Hydrocarbon & Other Liquids.
B 31.8	:	Gas Transmission and Distribution Piping Systems.
B16.5	:	Pipe Flanges and Flanged Fittings.
B16.10	:	Face to Face and End to End Dimensions of Valves.
B 16.25	:	Butt Welding Ends.
B 16.34	:	Valves-Flanged, Threaded and Welding Ends.
B 16.47	:	Large Diameter Steel Flanges.
Section VIII	:	Boiler and Pressure Vessel Code - Rules for Construction of Pressure Vessels.
Section IX	:	Welding and Brazing Qualifications.

2.2 AMERICAN PETROLEUM INSTITUTE (API)

1104	:	Specification for Welding Pipelines and Related Facilities.

2.3 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A370	:	Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
A216	:	Specification for Carbon Steel Castings, Suitable for Fusion Welding for High Temperature Service.

2.4 MANUFACTURERS STANDARDIZATION SOCIETY (MSS)

SP-6	:	Standard Finishes for contact faces of Pipe Flanges and Connecting – End Flanges of Valves and Fittings.
SP-44	:	Steel Pipeline Flanges.

2.5 STEEL STRUCTURES PAINTING COUNCIL (SSPC)

VIS-I	:	Visual Standard.

2.6 In case of conflict between the requirements of this specification, BS-1873 and the Codes, Standards and Specifications referred in clause 2.0 above, the requirements of this specification shall govern.

3 MATERIALS

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 approval 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 intended for hydrocarbon gas service shall be resistant to explosive decompression.

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

The carbon equivalent (CE) of valve end connections which are subject to further field welding by Company shall not exceed 0.45 on check analysis for each heat of steel used, as calculated by the following formula:

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

3.1 CHARPY V-NOTCH TEST REQUIREMENTS

For valves specified to be used for Gas service or LPG service, Charpy V-notch test, on each heat of base material shall be conducted as per standard, for all pressure containing parts such as body, end flanges and welding ends as well as bolting material for pressure containing parts. Unless specified otherwise, the Charpy V-notch test shall be conducted at 0°C. Test procedure shall conform to ASTM A 370. The average absorbed energy value of three full sized specimens shall be 27 J. The minimum impact energy value of any one specimen of the three specimens analyzed as above shall not be less than 22 J.

When Low Temperature Carbon Steel (LTCS) materials are specified in Valve Data Sheet or offered by Manufacturer, the Charpy V-notch test requirements of applicable material standard shall be complied with.

3.2 HARDNESS TEST REQUIREMENTS

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}.

3.3 ELECTROLESS NICKEL PLATING REQUIREMENTS

For all such valves where Carbon Steel is used as ball material, the ball shall have 75 micrometers (0.003 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

GENERAL

Valve design shall meet the requirements of BS 1873 and shall be suitable for the service conditions indicated in the Valve Data Sheet. The valve body and other pressure containing parts shall be designed in compliance with ASME Boiler & Pressure Vessel Code, Section VIII, Div 1. The Corrosion allowance indicated in the Valve Data Sheet shall be considered in the design. However the minimum wall thickness shall not be less than the minimum requirement of ASME B16.34

The Cover shall be bolted to the body. Screwed connections are not acceptable.

Valve design shall provide for the repair of gland packing under full line pressure.

Valve ends:

- Valve ends shall be of the flanged type or butt welded as indicated in the Valve Data Sheet. Flanges shall be integrally cast with the body of the Valve. Face to face/end to end dimensions shall conform to the design codes.
- 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") and as per MSS-SP-44/ ASME B 16.47 Series A for valve sizes DN 550 mm (22") and for DN 650 mm (26 inches) and above. Flange face shall be either raised face or ring joint type (RTJ) as indicated in Valve Data Sheet. Flange face finish shall be serrated or smooth as indicated in Valve Data Sheet. In case of RTJ flanges, the groove hardness shall be minimum 140 BHN.
- 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.
- 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. 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.

The Valve stem shall be capable of withstanding the maximum operating torque requirement to operate the Valve against the maximum differential pressure as per the appropriate class. The combined stress shall not exceed the maximum allowable stresses specified in ASME Section VIII, Division 1. The design shall take into account a safety factor of 1.5 based on the maximum output torque of the operating mechanism.

OPERATING DEVICES

- Valves of 4" (DN100), and below shall be manually operated. Valves of 6" N.B (DN 150), and above, shall be gear operated. Gear operators shall be sized such that their output torque is at least 1.5 times the maximum operating torque of the Valve. The Valve design shall be such, that damage due to malfunctioning of the Operator, or its controls, will only occur in the gear train or power cylinder. Damaged parts should be able to be replaced without the Valve cover being removed.
- The diameter of the hand wheel for manually operated Valves, shall be such that under the maximum differential pressure, the torque required to operate the Valve does not exceed 350 Nm. The Manufacturer shall also indicate the number of turns of the hand wheel required for operating the Valve from the fully open to fully closed position.
- The Direction of operation of the hand wheel, shall be in a clock-wise direction for closing the Valves. Hand wheels shall not have protruding spokes.
- Gear operators, where provided, shall have a self-locking provision and shall be fully encased in a water proof/ splash proof enclosure (IP65) and shall be filled with suitable grease.

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.

Repair by welding is not permitted for forged Valves. However repair by welding as per ASME B 16.34 is permitted for cast Valves. Repairs shall be carried out before any heat treatment of the casting is done. Repair welding procedure qualifications shall include hardness tests and shall meet the requirements of Clause 3.2 of this Specification.

When specified in the Valve Data Sheet, Valves shall have locking devices to lock the Valve either in a fully open (LO) or fully closed (LC) position.

When specified in the Valve Data Sheet, Globe Valves shall be "fire safe" in accordance with API RP6FA, for which qualifying certificates, covering the range of items offered, shall be supplied by the Manufacturer

All Valves and Gear Operators shall have a stainless steel Nameplate permanently affixed with stainless steel pan head screws. Each Nameplate shall have, as a minimum, the following information stamped thereon:

- Manufacturer
- Year of Manufacture
- Serial No.
- Tag no
- Size

Together with all other data required by specification BS 1873.

5 INSPECTION & TESTS

Where called for in the Procurement Documents, the Manufacturer shall appoint a reputable Third Party Inspection Agency, to carry out all inspection and tests as per the requirements of this Specification and the relevant codes, at his Works, prior to shipment. The cost of such Third Party Inspection shall be included in the Tendered Sum; also, the

Third Party Inspection Agency shall be approved by the Purchaser prior to his appointment. Such inspection and tests shall be as a minimum, but not be limited to, the following:

- Visual inspection
- A Dimensional checks on all Valves shall be carried out as per the drawings approved by the Purchaser.
- Chemical composition and mechanical properties including hardness shall be checked as per relevant material standards and this Specification, for each heat of steel used.
  - Non-Destructive examination of individual Valve material and components consisting of, but not limited to, castings and forging, shall be carried out by the Manufacturer.
  - Body castings of the Valves shall be radiographically examined on 100% of the surface of critical areas as per ASME B16.34. Procedure and acceptance criteria shall be as per ANSI B16.34. All castings shall be subject to wet magnetic particle inspection on 100% of their internal surfaces. Method and acceptance shall be in accordance with MSS-SP-53.
  - All forgings shall be ultrasonically examined in critical areas in accordance with the procedure and acceptance standard of Annexure-E of ASME B 16.34. All forgings shall be subject to wet magnetic particle inspection on 100% of their forged surfaces. Method and acceptance shall be in accordance with MSS-SP-53.
- Cast Valves subject to field welding shall be 100% radiographically examined on their welding ends and acceptance criteria shall be as per ANSI B16.34.
- All finished wrought welding ends subject to field welding shall be ultrasonically tested on 100% of the welded area for lamination type defects for a distance of 50 mm from the end. Laminations more than 50mm shall not be acceptable.
- All the Valves shall be Hydrostatically tested in compliance with the requirements of BS 1873.
- A supplementary Air Seat Test shall be carried out for all Valves with leakage criteria in accordance with the Data Sheets.
- Valves shall be subjected to an Operational Torque Test as per standard under hydraulic pressure equal to the maximum differential pressure corresponding to the Valve rating. For manually operated Valves, it shall be established that the torque required to operate the Valve does not exceed 350 Nm.
- The Purchaser also reserves the right to witness tests as indicated above at the Manufacturer's works, prior to shipment. The Manufacturer shall give reasonable access and facilities required for inspection to the Purchaser's Inspector. The Purchaser reserves the right to require additional testing, at any time, to conform or further investigate, a suspected fault. The cost incurred shall be to the Manufacturer's account. In no case shall any action of the Purchaser, or his Inspector, relieve the Manufacturer of his responsibility for material, design, quality or operation of the Valves. Inspection and tests performed/witnessed by the Purchaser's Inspector shall in no way relieve the Manufacturer of his obligation to perform the required inspection and tests.

- The Purchaser may, at his discretion appoint a Third Party Inspection Agency to carry out inspection on behalf of, or together with, the Purchaser's Inspector

6 TEST CERTIFICATES

Manufacturer shall submit the following certificates in accordance with EN 10204 3.2.

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. Report on heat treatment carried out.
c. Test certificates of hydrostatic and pneumatic tests complete with records of timing and pressure of each test.
d. Test reports of radiograph and ultrasonic inspection, MPI and DP Inspection
e. Test report on operation of valves conforming to clause 5.11, 5.12 and 5.13 of this specification.
f. All other test reports and certificates as required by BS 1873 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

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 SP-6 in accordance with "Steel Structures Painting Council - Visual Standard SSPC-VIS-1". 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 three coats of suitable coal tar epoxy resin with a minimum dry film thickness of 300 microns.

8 MARKING & SHIPMENT

All valves shall be marked as per BS 1873. The units of marking shall be metric except nominal diameter, which shall be in inches.

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.

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

Packaging and shipping instructions shall be as per BS 1873.

The serial number of each valve indicated on its nameplate shall appear on all required documentation in accordance with EN 10204 3.2.

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

9 SPARES & ACCESSORIES

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.

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.

10 DOCUMENTATION

The Manufacturer shall supply documentation in accordance with the Vendor Data Requirements List (VDRL) as attached with Purchase Order.

ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION

FOR PAINTING

VPC – SS – PI - 0008

REV. No	DATE	Purpose	Prepared By	Checked By	Approved By
00	15.05.2017	ISSUED AS STANDARD	AS	SM	AD

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1.0 GENERAL

1.1 These standard specifications 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 VCS 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.

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: 2339 Aluminum paint for general purposes in dual container.

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 standards shall be followed for surface preparations:

1 Swedish Standard Institution- SIS-05 5900-1967

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 oldie 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:

- Cleaning (bright blast-cleaning);
- Mechanical cleaning;
- Manual derusting.

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 Sandblasting

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 low 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 SS 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 cleaning

If sandblasting is not permitted or if the metal structures are not easily accessible for blasting or blasting for one reason or another is technically unfeasible, mechanical derusting 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 Derusting

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 oft.

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.

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 CARRYING OUT THE PAINTWORK

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 10°C, 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 0°C 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.

9.3 Paint Materials

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%
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, Chlorinated rubber medium Plasticized with unsaponifiable plasticiser pigmented with zinc phosphate
Volume solids	35- 40%
DFT	50 MICRONS/COAT (MIT)
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%
DFT	35-50 microns/coat
Covering capacity	10-12 M²/Lit/coat
Heat resistance	Upto 100º C (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%
DFT	8-10 microns/coat
Covering capacity	7-8 M²/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 M2/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% 35 microns / coat (min)
Covering capacity	11-12 M²/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%
DFT	100 microns/coat (min)
Covering capacity	5.0 M²/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%
DFT	30 microns/coat (min)
Covering capacity	13-14 M/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%
DFT	50 microns/coat (min)
Covering capacity	10-12 M²/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%
DFT	20-25 microns/coat
Covering capacity	16-18 M/²lit/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 M²/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	30%
DFT	30 microns/coat (min)
Covering capacity	1 0.0 M² / 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%
DFT	65-75 microns/coat
Covering capacity	6.0-7.0 M² / 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%
DFT	25 microns/ coat
Covering capacity	15.0 M² /lit/ coat

o) Finish Coat (F-6)

Epoxy High Building Coating

Type and Composition	Two pack. Polyamide cured epoxy resin medium suitably pigmented.
Volume solids	60-65%
DFT	100 microns/coat (min)
Covering capacity	6.0-6.5 M² / 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%
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 Ethyl silicate solvent based Inorganic Zinc 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%
DFT	100 microns/coat (min)
Covering capacity	5.50-6.0 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%
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%
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 150°C.

Type and Composition	Single Pack, Synthetic medium rubber medium combined with leafing Aluminium,
DFT	25 microns/coat
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.

MANUFACTURERS

The paints shall conform to the specifications given above and Class-I quality in their products range of any of the-following manufacturers:

i) Asian Paints (India) Ltd,
ii) Bombay Paints
iii) Berger Paints India ltd.
iv) Gaodlass Nerolac Paints Ltd.
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. AlI 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

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 uninsulated 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.
V) Line coating shall meet DIN 30670 standard for external coating and API 5L RP – 2 for internal coating.
VI) The thickness for the epoxy should be 180 microns, adhesive 200 microns and balance should be PE
VII) The minimum coating thickness on weld seam shall be 3.2 mm and minimum coating thickness on body should be 3.2.
VIII) 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.

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.

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 2.
b) Corrosive industrial Environment, Table3
c) Coastal & Marine Environment, Table 4

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

Table – 1

Colour Coding Scheme for Pipes and Equipment

SI. No	Content	Ground Color	First Color Band	Second Color Band
1	**COMPRESSED AIR**			
a)	Plant Air	Sky Blue	Silver Grey	-
b)	Instrument Air	Sky Blue	French Blue	-
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	-
3	*ALL EQUIPMENT*			
a)	Such as vessels. columns, exchangers, etc. containing non-hazardous fluids.	Light Grey		
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		

Table 2

Normal Industrial Environment (Above Ground)

Sl. No.	Description	Temp. Range	Surface Preparation	Primer	Finish Coat	Total DFT	Remarks
1.0	**External surface of equipment's and piping.**						
1.1	-Do-	-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.
1.2	-Do-	21 to 60	SSPC-SP-6	Two coats P-1, 25 microns/ coat (min.)	Two coats of F-1, 20 microns/coat (min)	90	-
1.3	-Do-	61 to 80	SSPC-SP-6	Two coats P-3, 50 microns/ coat (min)	Two coats of F-13, 25 microns/coat (min)	150	-
1.4	-Do-	81 to 250	SSPC-SP-6	Covered in Finish coat	Three coats of F-11, 20 microns/ coat (min)	60	Paint application at ambient temp. curing at elevated temp. during start-up.
1.5	-Do-	251 to 400	SSPC-SP-10	Covered in Finish coat.	Three coats of F-12, 20 microns/ coat (min)	60	-do-

Table- 3

Corrosive Industrial Environment (Above Ground)

SI. No.	Description	Temp. Range	Surface preparation	Primer	Finish Coat	Total DFT	Remarks
1.0	**External surface of un-insulated and other equipment**						
I.1	- do -	-10 to 20	SSPC-SP-3	Two coat P-2, 50 microns) coat (min.)	Two coat F-3, 30 microns / coat (min.)	160	Primer and paint application at ambient temp.
1.2	- do -	21 to 80	SSPC-SP-10	Two coats P-5, 35 microns / coat (min.)	Two coats F-6, 100 microns coat (min.)	270	Paint application at ambient temp.
I.3	- do -	81 to 400	SSPC-SP-3	Covered in finish coat	Three coats F-12, 20 Microns / coat (min.)	60	Paint application. at ambient temp, and curing at 250'C for 4 hours,

Table – 4

Coastal and Marine Environment (Above Ground)

SI. No.	Description	Temp. Range	Surface Preparation	Primer	Finish Coat	Total DFT	Remarks
1.0	**External surface of equipment's and piping.**						
1.1	-do-	-10 to 60	SSPC-SP-3	Two coats P-2, 50 micron/ coat (min)	Two coats F-3, 30 Microns/coat (min.)	160	Primer and Finish coat application at Ambient temp.
1.2	do -	61 to 80	SSPC-SP-10	Two coats P-5. 35 Microns. coat (Min.)	Two coats of F-6, 100 Microns/Coat (min.)	270	-do-
1.3	- do -	81 to 400	SSPC-SP-I0	One coat F-9, 83 Microns/ Coat(Min.)	-	85	Paint application at Ambient temp. Primer is acting as primer cum finish coat.
1.4	- do -	i) Upto 80	SSPC-SP-10	One coat F-9, 6.5 microns / coat (Min)	One coat of F-2. 30 Microns/coat (min.)	95	Paint application at ambient temp.
		ii) 8l to 400	SSPC-SP-10	-do-	-do-	85	Paint application at ambient temp. Primer is acting as primer cum finish coat.

1.9.4 Precautions to be taken

Neither the environment of the site nor the marking labels of devices may be covered with paint and they must 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.

1.9.5 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 arc 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.

1.9.6 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.

1.9.7 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.

1.10 GROUND-LEVEL TRANSITION POINT

1.11 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.

1.11.1 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.

1.12 QUALITY CONTROLS AND GUARANTEE

1.12.1 The Contractor is responsible for checking the weather conditions to ascertain whether the paintwork can be carried out within the standard 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.

1.12.2 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.

1.12.3 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 wilt 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.

1.12.4 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.

INSPECTION AND TEST PLAN – BALL VALVE

0	16.06.2017	ISSUED FOR APPROVAL	GS	ADE	AD
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

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 REFERENCE DOCUMENTS:

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	RAW MATERIAL							
1.1	Casting : Body & Bonnet / Connector	Chemical : Chemical Analysis	All Heats	Material & Technical Specification	Vendor Test Certificate	100%	R	R
		Mechanical : Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	100%	R	R
		Impact (@ - 29 ^{o}C) : Impact Test	All Heats	ASME B 16.34	Test Report	100%	R	R
		Non Destructive Examination (NDT) : Radiography (100% Critical Area & BW Ends)	100%	ASME B 16.34	RT Report	100%	R	R
		Non Destructive Examination (NDT) : Magnetic Particle Examination (100% exterior & accessible interior)	100%	ASME B 16.34	MPI Report	100%	R	R

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
1.2	Forging : Ball, Seat Ring & Spindle/Stem	Chemical : Chemical Analysis	All Heats	Material & Technical Specification	Vendor Test Certificate	100%	R	R
		Mechanical : Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	100%	R	R
		Impact (@ - 29 ^{o}C) : Impact Test	All Heats	ASME B 16.34	Test Report	100%	R	R
		Non Destructive Examination (NDT) : Radiography (100% Critical Area & BW Ends)	100%	ASME B 16.34	RT Report	100%	R	R
		Non Destructive Examination (NDT) : Magnetic Particle Examination (100% exterior & accessible interior)	100%	ASME B 16.34	MPI Report	100%	R	R
		ENP (For Ball) : Visual, Thickness & Hardness	100%	25 microns (min) & 50 HRC (min)	Vendor Test Certificate	100%	R	R
2.0	INCOMING / BOF ITEMS							
2.1	Stem	Chemical : Chemical Analysis	All Heats	Material & Technical Specification	Vendor Test Certificate	100%	R	R
		Mechanical : Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	100%	R	R

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
2.2	Fasteners	Chemical : Chemical Analysis	All Heats	Material & Technical Specification	Vendor Test Certificate	100%	R	R
		Mechanical : Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	100%	R	R
		Impact (@ - 29 ^{o}C) : Impact Test	All Heats	ASME B 16.34	Test Report	100%	R	R
3.0	MACHINED COMPONENTS							
3.1	Body, Connector, Ball & Seat Ring	Surface examination & Dimension Inspection : Visual & Measurement	100%	Manufacturer's Drawing	GRN	100%	R	R
4.0	IN-PROCESS							
4.1	Body & Connector joint welding	Non Destructive Examination (NDT) : Magnetic Particle Examination (MPI)	100%	ASME Sec VIII - Appendix V & VI	MPI Report	100%	R	R
4.2	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

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
5.0	FINAL INSPECTION							
5.1	Finished Valve Assembly : Pressure Test & Final Inspection	Shell Test : Hydrostatic	100%	Testing Procedure as per Code	Test Record	~	W	W
		Seat Test : Hydrostatic				~	W	W
		Seat Test : Pneumatic				~	W	W
		Functional Test - Actuated Valve @ Atm. Pressure & Max. Diff. Pressure : Operation- Open / Close				~	W	W
		Double Block & Bleed : Hydrostatic				~	W	W
		Final Inspection : Visual, Dimension, TC Verification, Special Requirements & Marking as per sale order	100%	Approved GA Drawing (if applicable)	SCN	~	~	W
		Anti-Static Test	100%	API 6D & Technical Specification	Test Record	~	W	W
		Fire Safe Test	100%	API-6FA / ISO-10497	Fire safe type test report	~	~	R
5.2	Painting & Packing	Surface examination & DFT Inspection : Visual & Measurement	100%	As per Tender Specification	Painting Record	~	100%	W

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.

INSPECTION AND TEST PLAN – CHECK, GATE & GLOBE VALVES

0	14.12.2017	ISSUED FOR APPROVAL	MV	MC	AD
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

ABBREVIATIONS:

FCRI	Fluid Control Research Institute	MPT/MT	Magnetic Particle Testing
HT	Heat Treatment	MTC	Material Test Certificate
CE	Carbon Equivalent	MRT	Mechanical Run Test
DFT	Dry Film Thickness	NDT	Non Destructive Testing
DPT	Dye Penetrant Testing	NPSH	Net Positive Suction Head
DHT	De-hydrogen Heat Treatment	PO	Purchase Order
ERTL	Electronics Regional Test Laboratory	PESO	Petroleum Explosive Safety Organization
IGC	Inter Granular Corrosion	PQR	Procedure Qualification Record
VDR	Vendor Data Requirement	PR	Purchase Requisition
WPQ	Welders Performance Qualification	PMI	Positive Material Identification
ITP	Inspection and Test Plan	RT	Radiography Testing
IP	Ingress Protection	WPS	Welding Procedure Specification
IHT	Intermediate Heat Treatment	TC	Test Certificate
IC	Inspection Certificate	TPI or TPIA	Third Party Inspection Agency
UT	Ultrasonic Testing		

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Valves

2.0 REFERENCE DOCUMENTS:

PO / PR / Standards referred there in / Job specifications / Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS:

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	VCS/TPIA
1.0	**Procedure**						
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	**Material Inspection**						
2.1.	Castings & Forgings (Body, Bonnet, Disc, Stem, Body ring)	Chemical ,Mechanical , Heat Treatment, NDT,IGC & Other Properties as applicable	100%	Test Certificates	H	R	R

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	VCS/TPIA
2.2	Castings & Forgings (Body, Bonnet, Disc, Stem, Body ring)	Visual & Dimension	100%	Inspection Report	H	H	-
2.3	Body and Bonnet Castings	Radiography Examination	As per PR / Purchase Specification	Films and report	H	R	R
2.4	Bars for Trim material	Chemical Analysis	Each Heat	Test Certificates& Lab Report	H	R	-
2.5	Gaskets, Gear units, Fasteners, Gland, Packings, etc.	Physical / Chemical Properties	100%	Test Certificates& Lab Report	H	R	-
2.6	Actuators as applicable	Performance , Statutory Certificates as applicable	100%	Test Certificates& Lab Report	H	H	R
3.0	**In Process Inspection**						
3.1	Welding	Welding Parameters as per WPS / PQR	100%	Inspection Reports	-	H	-
3.2	Machining of components	Visual / Dimension	100%	Inspection Reports	-	H	-

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	VCS/TPIA
4.0	**Final Inspection**						
4.1	Hydrostatic / Pneumatic Test and Helium Leak test as applicable	Leak Check	As per PR / Purchase Specification	Test Report	-	H	RW (Note 1)
4.2	Visual / Dimension	Surface & Dimension Check	100%	Test Report	-	H	RW (Note 1)
4.3	Functional Test for Actuator Operated Valves	Satisfactory Performance	100%	Test Report	-	H	RW
4.4	PMI Check	Chemical	As per Spec.	Inspection Report	-	H	RW
4.5	Strip Check(As applicable)	Verify Components & Differential hardness if applicable	As per PR / Purchase Specification	Inspection Report	-	H	RW (Note 1)
4.6	Final Stamping	Stamping Of Accepted Valves	Stamping of Valves which are witnessed by VCS/TPIA.	Inspection Report	-	H	H (Note -1)

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	VCS/TPIA
5.0	**Painting**						
5.1	Painting and Colour coding as applicable	Visual / DFT Check	100%	Inspection Report	-	H	-
6.0	**Documentation & IC**						
6.1	Documentation & Inspection Certificate(IC)	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	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. For Non NACE & Non Hydrogen service Carbon Steel Valves up to size 12" will be accepted on review of Supplier Test Certificates. Supplier Test Certificate to be reviewed by VCS /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.

ENERGISING QUALITY	PROJECT:	CITY GAS DISTRIBUTION PROJECT AT NORTH GOA	
	CLIENT:	GOA NATURAL GAS PRIVATE LIMITED	
	CONSULTANT:	VCS QUALITY SERVICES PVT. LTD.	

LIST OF RECOMMENDED THIRD PARTY INSPECTION AGENCY (TPIA)

SL. NO	NAME OF TPI	ADDRE	PHONE NO	F
1	Tata Projects Ltd.	22,Sarvodaya Society,Nizampura,Baroda-390002	0265-2392863	0265-2785952
2	Bax counsel Insepection 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	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-	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

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.	☐

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 SHEET	VCS-SD-DS-001

DEVIATION/ EXCEPTION/ CLARIFICATION SHEET

Sr. 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)

0	16.10.2020	ISSUED AS STANDARDS	JR	GS	HK
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

	DRAWINGS & DOCUMENTS	VCS-SD-DD-001

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) & GAD for Purchaser's/ Consultant's approval. These QAPs shall be submitted in two copies within 05 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.

0	16.10.2020	ISSUED AS STANDARDS	JR	GS	HK
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

	INSTRUCTION TO BIDDER	VCS-SD-ITB-001

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

0	16.10.2020	ISSUED AS STANDARDS	JR	GS	HK
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

	LIST OF SPARES	VCS-SD-LS-001

LIST OF SPARES

S.No.	Part No.	Description	Quantity(Minimum)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

0	16.10.2020	ISSUED AS STANDARD	JR	GS	HK
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

	REFERENCE LIST	VCS-SD-RL-001

REFERENCE LIST

Sl No.	Project	Year of Supply	Client , Address and Contact No.	Email	Size and Rating / thk	Service	Bidder's Signature with stamp

REV	DATE	DESCRIPTION	PREP	CHK	APPR
0	16.10.2020	ISSUED AS STANDARDS	JR	GS	HK

ENERGISING QUALITY VCS Project Consultants Pvt. Ltd. (Engg.)	**PROJECT NUMBER: 1023**	

PIPING MATERIAL SPECIFICATION	Client Job Number	GNGPL/EPM/VCS/FOA/01 dt.06-11-2019
	Total Sheets	37

Document No	1023	PL	PI	PMS	001

GOA NATURAL GAS PRIVATE LIMITED (GNGPL)

CITY GAS DISTRIBUTION PROJECT OF NORTH GOA

REV	DATE	DESCRIPTION	PREP	CHKD	APPR
00	16.10.2020	ISSUED FOR TENDER	JV	DG	AD

ABBREVIATION

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
BS	British Standards
[Xx]	[Description]
[Xx]	[Description]
[Xx]	[Description]

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1. INTRODUCTION

This specification cover 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. 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. 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. CLASS DESIGNATION CODE

The piping class designation shall generally consist of three digits made up of a letter, number & letter e.g. 15HC, 15HLT, 30HC, 30 HLT, 60HC etc. as follows:

First two numerals letter indicates ASME class rating, e.g.,

15	-	150 Class
30	-	300 Class
60	-	600 Class

The first alphabet indicates differences in the specifications within the same class rating and material, e.g. H stands for Hydrocarbon, etc.

The last letter indicates type of material, e.g.,
C - Carbon steel
S - Stainless Steel
LT- LTCS

5. PIPELINE

5.1 Line pipe material grade and wall thickness details are indicated in PMS.

6. 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. 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 D i m e n s i o n s 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. 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 piggable section of pipeline, Elastic bends/ Cold field bends/ Hot formed long radius bends shall be used.
D = Specified Outside Diameter
Long Radius Bend shall be used only when indicated in AFC drawing.

8.3 Miters shall not be used.

9. 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. 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. 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 B 1.20.1 taper threads, unless specified otherwise.

11.6 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. THREAD SEALANT

12.1 Threaded joints shall be made with 1" wide PTFE jointing tape.

13. 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.
For ANSI class 600 -Hand wheel operated for size ≤ 10" NB.
Gear operated for size ≥ 12" NB.

13.8.2 **Globe Valves**

For ANSI class 150, 300, 600 and 900 -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. 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. 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. 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. 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 Co_2, H_2S 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 intended 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 H_2S.
- 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/cm^2 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. 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)

PIPING MATERIAL SPECIFICATION INDEX

Sr. No.	Piping Class	Rating	C. A.	Spl. Reqt.	Basic Material	Service	Remarks
1	15HC	150	1.5	NON IBR	CARBON STEEL	NON-CORROSIVE PROCESS-FLAMMABLE /NONFLAMMABLE, NON LETHAL- HYDROCARBONS	Page 14 of 38
2	15HLT	150	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	NON-CORROSIVE PROCESS-FLAMMABLE /NON-FLAMMABLE, NON LETHAL- HYDROCARBONS	Page 19 of 38
3	30HC	300	1.5	NON IBR	CARBON STEEL	NON-CORROSIVE PROCESS-FLAMMABLE / NONFLAMMABLE, NON LETHAL- HYDROCARBONS	Page 24 of 38
4	30HLT	300	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	FIRE WATER (ABOVE GROUND / UNDER GROUND)	Page 30 of 38
5	15FW	150	1.5	NON IBR	CARBON STEEL	FIRE WATER (ABOVE GROUND / UNDER GROUND)	Page 34 of 38

PIPE CLASS	**:**	**15HC**
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. 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. Connection	1.5"	Flanged, installation as per std. SD-PI-014 & 015, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. SD-PI-011, 012 & 013

BRANCH TABLE

															T	24
														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	S	0.50
0.05	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	

BRANCH PIPE

RUN PIPE

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	24.000	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	PBE, SEAMLESS
FLANGE GROUP						
FLNG.SW	00.500	01.500	M	B-16.5	ASTM A 105	150, RF/125AARH
FLNG.WN	2.000	24.000	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	00.500	24.000		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	24.000		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	26.000	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	26.000	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	26.000	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	26.000	M, M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW
REDUC. CONC	02.000	26.000	M, M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW
REDUC. ECC	02.000	26.000	M, M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW

Item	Lower Size (Inch)	Upper Size (Inch)	Sch. / Thk.	Dmn. STD	Material (Charpy)	Description
SWAGE. CONC	00.500	03.000	M, M	BS-3799	ASTM A 105 (Charpy)	PBE
SWAGE.ECC	00.500	03.000	M, M	BS-3799	ASTM A 105	PBE
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	18.000	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 GROUP						
VLV.GLOBE	00.250	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	18.000		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM- 13% CR.STEEL	FLGD, 150, B-16.5, RF/125AARH
VLV.CHECK	00.250	01.500		BS EN 1SO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11
VLV.CHECK	02.000	26.000		API-6D	BODY-ASTM A 216 GR.WCB,TRIM- 13% CR.STEEL	FLGD, 150, B-16.5, RF/125AARH
VLV.BALL	00.500	01.500		BS EN 1SO 17292	BODY-ASTM A 105,TRIM-13% CR.STEEL, SEAT-RPTFE	SW, 150, B-16.5, RF/125AARH
VLV.BALL	02.000	30.000		API-6D	BODY-ASTM A216 GR.WCB,TRIM/BA LL SEAT-(AISI 4140 + 0.003"ENP)/AISI 410	FLGD, 150, B-16.5, RF/125AARH
VLV.BALL	02.000	18.000		API-6D	BODY-ASTM A 216 GR.WCB, TRIM-BALL, SEAT-(AISI 4140 + 0.003"ENP) / AISI 410	BW, 150, B-16.25

Item	Lower Size (Inch)	Upper Size (Inch)	Sch. / Thk.	Dmn. STD	Material (Charpy)	Description
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	24.000		B-16.20-ANSI B16.5	SP.WND METTALIC WITH GRAPHITE FILLER	SPIRAL, 150
GASKET	26.000	48.000		B-16.20-ANSI B16.47A	SP.WND METTALIC WITH GRAPHITE FILLER	SPIRAL, 150

PIPE CLASS	**:**	**15HLT**
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. 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. Connection	1.5"	Flanged, installation as per std. SD-PI-014 & 015, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. SD-PI-011, 012 & 013

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	T	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)	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	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	PBE, 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	00.75		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	6.000	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D
ELBOW.45	00.500	00.75		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	00.75		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	6.000	M	B-16.9	ASTM A 420 GR.WPL6	BW

Item	Lower Size (Inch)	Upper Size (Inch)	Sch. / Thk.	Dmn. STD	Material (Charpy)	Description
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 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	PBE
SWAGE.ECC	00.500	03.000	M, M	BS-3799	ASTM A 350 GR.LF2	PBE
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 GROUP						

Item	Lower Size (Inch)	Upper Size (Inch)	Sch. / Thk.	Dmn. STD	Material (Charpy)	Description
VLV.GLOBE	00.50	01.500		BS EN 1SO 15761	BODY-ASTM A 350 GR.LF2,TRIMSTELLITED, STEMSS304	SW, 800, 3000, B-16.11
VLV.CHECK	00.50	01.500		BS EN 1SO 15761	BODY-ASTM A 350 GR.LF2,TRIMSTELLITED	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 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	:	**30HC**
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. 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. Connection	1.5"	Flanged, installation as per std. SD-PI-014 & 015, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. SD-PI-011, 012 & 013

BRANCH TABLE

BRANCH	0.05	0.75	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	30	32	36	42
42																				T
36																			T	T
32																		T	T	T
30																	T	T	T	T
24																T	T	T	T	T
20															T	T	T	T	T	T
18														T	T	T	T	T	T	T
16													T	T	T	T	T	T	T	T
14												T	T	T	T	T	T	T	T	T
12											T	T	T	T	T	T	T	T	T	T
10										T	T	T	T	T	T	T	T	T	T	T
8									T	T	T	T	T	T	T	W	W	W	W	W
6								T	T	T	T	T	T	W	W	W	W	W	W	W
4							T	T	T	T	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
2					T	T	T	W	W	W	W	W	W	W	W	W	W	W	W	W
1.5				T	T	T	T	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
0.75		T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
0.50	T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

RUN PIPE

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	6.4	API 5L	API 5L GR.X 52/60 PSL 2, (CHARPY)	BE, SEAMLESS
PIPE	10.000	10.000	6.4	API 5L	API 5L GR.X 52/60 PSL 2, (CHARPY)	BE, SEAMLESS
PIPE	12.000	16.000	7.1	API 5L	API 5L GR.X 52/60 PSL 2, (CHARPY)	BE, SEAMLESS
PIPE	18.000	18.000	7.9 / 7.1	API 5L	API 5L GR.X 52/60 PSL 2, (CHARPY)	BE, SAW
PIPE	20.000	20.000	8.7 / 7.9	API 5L	API 5L GR.X 52/60 PSL 2, (CHARPY)	BE, SAW
PIPE	24.000	24.000	10.3 / 9.5	API 5L	API 5L GR.X 52/60 PSL 2, (CHARPY)	BE, SAW
NIPPLE	00.500	01.500	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS
FLANGE GROUP						
FLNG.SW	00.500	01.500	M	B-16.5	ASTM A 105	300, RF/125AARH
FLNG.WN	02.000	16.000	M	B-16.5	ASTM A 105 (CHARPY)	300, RF/125AARH
FLNG.WN	18.000	24.000	M	B-16.5	ASTM A 694 GR.F-52/60 (CHARPY)	300, RF/125AARH
FLNG.WN	26.000	30.000	M	B-16.47-A	ASTM A 694 GR.F-52/60 (CHARPY)	300, RF/125AARH
FLNG.BLIND	00.500	01.500		B-16.5	ASTM A 105	300, RF/125AARH
FLNG.BLIND	02.000	24.000		B-16.5	ASTM A 105 (CHARPY)	300, RF/125AARH
FLNG.BLIND	26.000	30.000		B-16.47-A	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	24.000		ASME- B 16.48	ASTM A 105 (CHARPY)	300, FF/125AARH

Item	Lower Size (Inch)	Upper Size (Inch)	Sch ./ Thk	Dmn. STD	Material (Charpy)	Description
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.90	18.000	30.000	M	MSS-SP75	MSS SP-75 GR.WPHY-52/60	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
ELBOW.45	18.000	30.000	M	MSS-SP75	MSS SP-75 GR.WPHY-52/60	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.EQUAL	18.000	30.000	M	MSS-SP75	MSS SP-75 GR.WPHY-52/60	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	16.000	M, M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
T.RED	18.000	30.000	M, M	MSS-SP75	MSS SP-75 GR.WPHY-52/60	BW
REDUC. CONC	02.000	16.000	M, M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
REDUC. CONC	18.000	30.000	M, M	MSS-SP75	MSS SP-75 GR.WPHY-52/60	BW
REDUC. ECC	02.000	16.000	M, M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
REDUC. ECC	18.000	30.000	M, M	MSS-SP75	MSS SP-75 GR.WPHY-52/60	BW
SWAGE. CONC	00.500	03.000	M, M	BS-3799	ASTM A 105 (CHARPY)	PBE
SWAGE. ECC	00.500	03.000	M, M	BS-3799	ASTM A 105 (CHARPY)	PBE

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk	Dmn. STD	Material (Charpy)	Description
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
CAP	18.000	30.000	M	MSS-SP75	MSS SP-75 GR.WPHY-52/60	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, XX	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%	SW, 600, 3000, B-16.11
VLV.GLOBE	00.500	01.500		BS EN 1SO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM- 13%	SW, 600, 3000, B-16.11
VLV.GLOBE	02.000	12.000		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

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk	Dmn. STD	Material (Charpy)	Description
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, 300, B-16.5, RF/125AARH
VLV.BALL	26.000	30.000		API-6D	BODY-ASTM A 216 GR.WCC/A234 GR. WPC,TRIM: SEAT: AISI4140 + 0.003"ENP/ AISI 4140	FLGD, 300, B-16.47 A, RF/125AARH
VLV.BALL	02.000	30.000	M	API-6D	BODY-ASTM A 216 GR.WCC/A234 GR. WPC,TRIM: SEAT : AISI 4140+0.003"ENP/AISI 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	24.000		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	30.000		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H	
GASKET						
GASKET	00.500	24.000		B-16.20-ANSI B16.5	SP.WND METTALIC WITH GRAPHITEFILLER	SPIRAL, 300
GASKET	26.000	30.000		B-16.20-ANSI B16.47A	SP.WND METTALIC WITH GRAPHITEFILLER	SPIRAL, 300

PIPE CLASS	:	**30HLT**
RATING	:	300
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	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)

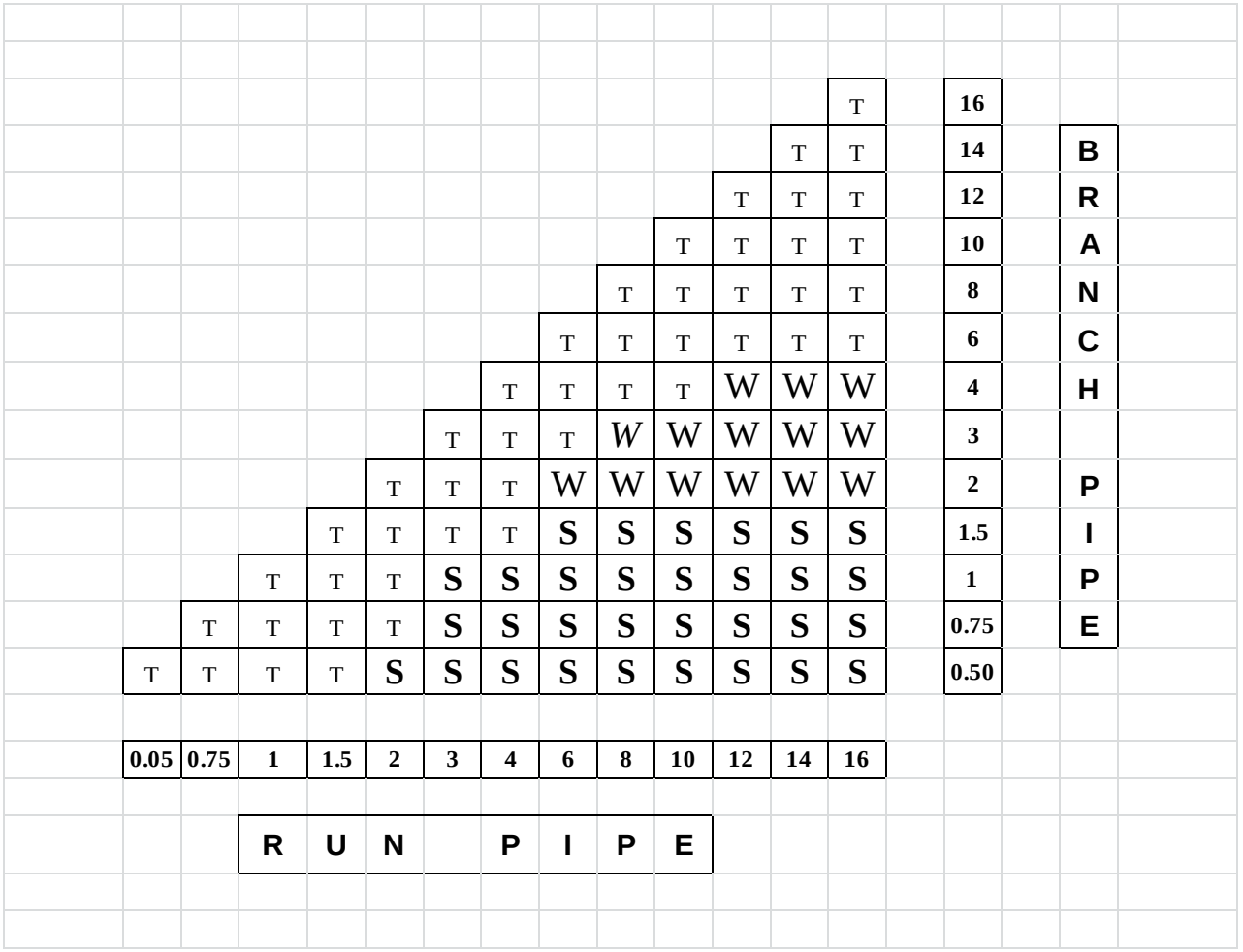
NOTES

a. All vents and drains shall be provided with gate valve with blind flange assembly unless otherwise indicated in P&ID.
b. Piping design as per ASME B 31.8 , OISD 226 & PNGRB Guidelines
c. Flanged end shall be as per ASME B 16.5 for valve up to 24" (excluding 22"), for 22" as per MSS-SP-44.
d. Impact testing is required at (-45) Deg C.
e. 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. 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 per Refer std. SD-PI-011, 012 & 013

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	PBE, SEAMLESS
NIPPLE	01.000	01.500	M	B-36.10	ASTM A 333 GR.6	PBE, 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						
VLV.GATE	00.500	01.500		API-602	BODY-ASTM A 350 GR.LF2,TRIM-STELLITED,STEM- SS	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- SS 304/ 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	:	**15FW**
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

1.0 All vents and drains shall be provided with gate valve with blind flange assembly unless otherwise indicated in P&ID.
2.0 Forgings are acceptable in Lieu of Plate material.
3.0 Sizes given in PMS are nominal bore for O.D. of IS 3589 pipes refer ANSI B36.10.
4.0 Butterfly Valves shall be lugged wafer type up to 24" and double flanged body for sizes beyond 24".
5.0 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.
6.0 NDT of welds shall be as follows:
Radiography : All Butt welds 10%
MPI : Socket welds 10%

SPECIAL NOTES

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 per Refer std.SD-PI-011, 012 & 013

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

BRANCH TABLE

BRANCH PIPE	0.05	0.75	1	1.5	2	3	4	6	8	10	12	14
14												T
12											T	R
10										T	R	R
8									T	R	R	R
6								T	P	R	R	R
4							T	R	P	R	R	R
3						T	P	R	P	R	R	R
2					T	P	P	R	P	R	R	R
1.5				T	T	H	H	H	H	H	H	H
1			T	T	H	H	H	H	H	H	H	H
0.75		T	T	T	H	H	H	H	H	H	H	H
0.50	T	T	T	T	H	H	H	H	H	H	H	H

RUN PIPE

Item Type	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	VCS 'STD	IS-1239 (BLACK)	PBE, 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 234 GR.WPB	BW, 1.5D
ELBOW.90	08.000	14.000	M	B-16.9	ASTM A 234 GR.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 234 GR.WPB	BW, 1.5D
ELBOW.45	08.000	14.000	M	B-16.9	ASTM A 234 GR.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 234 GR.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 234 GR.WPB	BW
T.RED	08.000	14.000	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW

Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk	Dmn. STD	Material	Description
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	PBE
SWAGE.ECC	00.500	03.000	M, M	BS-3799	ASTM A 105	PBE
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 A 105,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.

Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk	Dmn. STD	Material	Description
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						
STRNR.PERM	00.500	01.500		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800
STRNR.PERM	02.000	06.000	M	VCS'STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE
STRNR.PERM	08.000	14.000	M	VCS'STD	B:A234GR.WPBW;INT:SS304	BW, T-TYPE