INDRAPRASTHA GAS LIMITED

TENDER DOCUMENT

FOR

SUPPLY OF CS FITTINGS, FLANGES, VALVES, INSULATING JOINTS & OTHER MISC. ITEMS

Tender No: IGL/ET2/CP18455

Technical Volume

Indraprastha Gas Ltd.

INDEX

INDRAPRASTHA GAS LIMITED

CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI, UP, HARYANA AND RAJASHTAN

MATERIAL REQUISITION FOR INSULATING JOINT

ABBREVIATION

MT	Metric Tonne
QOEC	Quick Opening End Closure
DFT	Dry Film Thickness
EN	European Norm
ASME	American Society of Mechanical Engineers
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
MSS	Manufacturers Standardization Society
WPHY	High Yield strength of Wrought Pipe
WNRF	Weld Neck Raised Flange
PSV	Pressure Safety Valve
Pr.	Pressure
Conn.	Connection
SS	Stainless Steel
NPTF	National Pipe Thread Female

CONTENTS

1. INTRODUCTION

INDRAPRASTHA GAS LTD. (IGL) plans to augment the Steel pipeline Network. It supplies natural gas to domestic & commercial consumers in the city of Delhi, Uttar Pradesh, Haryana and Rajasthan.

IGL is now inviting tenders on Domestic Competitive Bidding basis for procurement of Carbon Steel Fittings, Flanges, Insulating Joints & Other Misc. Items for this project.

The present document covers the technical specifications for the enquiry.

2. PURPOSE

This document is to define the scope of supply, which shall cover Design, engineering, manufacture, inspection, testing at manufacturer's works, packing, transportation/ shipping, Handling, delivery of Insulating Joints, as per this material requisition, including supply of documentation/ drawings as per the enclosed specifications and other codes and standards enclosed or referred for City Gas Distribution project in NCT of Delhi, NCR, Haryana, Uttar Pradesh and Rajasthan.

3. DOCUMENT PRECEDENCE

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

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

a. Data Sheets

b. MR

c. Project Specifications

d. Basic Documents

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

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

4. SCOPE OF SUPPLY

S.NO.	DESCRIPTION	QTY.	REMARKS
1.1	Insulating Joint	1 LOT	As per Bill of Material Clause 5 of this MR
1.2	Spare Parts and Special Tools	1 LOT	As per specification
1.3	Painting	1 LOT	As per specification
1.4	Inspection and Testing	1 LOT	As per specification
1.5	Inspection and Test plan	1 LOT	As per specification
1.6	Test Certificates	1 LOT	As per specification
1.7	Vendor Documentation	1 LOT	As per specification
1.8	Marking, Packaging & Transportation	1 LOT	As per specification
1.9	Preparation for Shipment	1 LOT	As per specification
1.10	Delivery Point	Delivery schedule as defined in the tender.	
1.11	Delivery Schedule	Delivery schedule as defined in the tender.	

5. BILL OF MATERIAL

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

INSULATING JOINT							
S. No.	**Size (inch)**	**Spec.**	**IJ Material**	**Connecting Pipe Material & WT**	**Data Sheet**	**Qty.**	**Remarks**
1	2	30HC	ASTM A 105 (Charpy)	ASTM A106, Gr. B (Charpy) SCH 80	18455-000-PP-DS-2001	50	AG
2	4	30HC	ASTM A694, Gr. F 42	API 5L, GR. B	18455-000-PP-DS-2001	60	AG

Legends:

WT- Specified Wall Thickness (mm)

IJ- Insulating Joint

AG-Above Ground.

6. NOTES:

1. Vendor shall ensure that internal bore size of Insulating Joints should match with the adjacent pipe. The Insulating Joints shall be suitable for all type of pipeline pigging operation.
2. Butt welding end of Insulating Joints shall be beveled as per API 5L to match connecting pipe wall thickness.
3. Vendor shall confirm the heat generated during welding at site is not detrimental to the insulation and filler materials and internal coating. Vendor shall propose appropriate measure needs be taken during field welding.
4. Supply of Pup of length min. 500 mm shall be welded on both side of Insulating joint shall be in vendor Scope. Pup piece material shall be same as line pipe.
5. Insulating Joints (including all components) shall be designed and suitable for Natural Gas Insulating Joints material shall be subjected to Charpy V-notch tests & Hardness test as per standard specification for insulating joint (Doc. No. IGL-SS-PP-2029) & data sheets.
6. Design Data for the Project are:

   - Pipeline Service : Natural Gas
   - Max Design Temp (Above Ground) : 65^{o}C
   - Min Design Temp : (-)29^{o}C
   - Design Pressure : 49 kg/cm^{2}

7. All materials shall be Charpy V-notch tested for each heat of steel. Test shall confirm to the provisions of ASTM A-370 and at temp of -29^{O}C.
8. Insulating Joints shall be internally coated with liquid epoxy paint with DFT of 30 to 50 microns.
9. Certification shall be EN 10204 type 3.2.

10. Vendor shall check all calculations of insulating Joints based on design conditions and manufacturing requirements and submit necessary documents to company for approval. Vendor must submit all documents for review within 07days after the placement of PO/LOA by IGL.
11. Vendor shall furnish the allowable forces and moments for the axial, lateral and transverse (i.e., x, y and z directions) along with Bending and transverse forces for review.
12. Insulating Joints shall be delivered at designated warehouse / construction site as per construction requirement. All transportation, handling, delivery unloading shall be in the Bidder's scope.
13. Bidder shall furnish quotation only in case he can supply material strictly as per this MR and specification/ data sheets forming part of MR.
14. 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).
15. 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.
16. Bidder must submit all documents/ drawings/ calculations as specified in relevant specification along with his offer and after award of order.
17. The internal and external coating of Insulating Joint shall be as per Clause no. 6 of Specification & requisition of Insulating Joint (Doc No. IGL-SS-PP-2029) & Painting specification (Doc. No. IGL-SS-PP-2502).
18. Purchaser's inspector reserves the right to perform stage wise inspection and witness tests, as indicated in specification for Insulating Joint 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.
19. All items shall be provided with EN 10204 type 3.2 Certification. TPIA shall be in Vendor scope. Vendor shall appoint anyone of the TPIA from Approved list for inspection purpose.

20. The vendor shall be completely responsible for the design, materials, fabrication, coating, testing, inspection, preparation for shipment, loading of the above item strictly in accordance with the Material Requisition and all attachments thereto

7. LIST OF ATTACHMENTS

1. Data Sheet for Insulating Joint, Doc. No. - 18455-000-PP- DS-2001.
2. Standard Specification for Insulation joint, Doc No. - IGL-SS-PP-2029.
3. Specification for Seamless (SMLS) Line Pipe (Onshore), Doc. No. - IGL-PP-SS-2036.
4. Standard Specification for HFW Line Pipe, Doc No. - IGL-SS-PP-2008.
5. Specification for Painting, Doc No. - IGL-SS-PP-2502.
6. ITP for Insulation joint, Doc. No. - IGL-ITP-PP-2006.
7. Compliance Statement, Doc. No. IGL-SD-CS-001
8. Deviation Sheet, Doc. No.IGL-SD-DS-001
9. Instruction to Bidder, Doc. No.IGL-SD-ITB-001
10. Check List, Doc. No. IGL-SD-CK-001
11. List of Spares, Doc. No.IGL-SD-LS-001
12. Reference List, Doc. No. IGL-SD-RL-001
13. Vendor Dwg. Document Schedule, Doc. No. IGL-SD-VS-001
14. Drawings & Documents, Doc. No. IGL-SD-DD-001
15. Standard Specification for Quality Management System Requirement from Vendors, Doc. No. IGL-SS-PP-2044
16. Standard Specification for Documents Required from Suppliers, Doc. No. IGL-SS-PP-2043

INDRAPRASTHA GAS LIMITED

CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI, UP, HARYANA AND RAJASHTAN

DATA SHEET FOR INSULATING JOINT

Insulating Joint Manufacturer	-
IJ Specification No.	IGL-SS-PP-2029
DESIGN DATA FOR INSULATING JOINT FOR CS LINE	
Service, Design Life	NG, 25 yrs.
Size (OD), mm (inch)	60.33 (2") to 114.4 (4")
Design Pressure	49 Kg/cm^{2}g
ASME Rating / Design Factor	300# / 0.4
Design Temperature (°C)	-29 to 65.0
Corrosion Allowance (mm)	1.5
Hydrostatic Test Pressure	73.5 Kg/cm^{2}g
Design Code (Pipeline / Insulating Joint)	ASME B31.8 / ASME Sec VIII, Div. -I
End Connection	Butt weld ends
Installation	Above Ground
Charpy Impact Test	Required, at (-)29 Deg. C
Hardness Test	Required, as per specification

INSULATING JOINT MATERIAL (EQUIVALENT OR SUPERIOR)

Part	**Material of Construction**	
	Specified	**Offered**
Body	For 2" - ASTM A105 (Charpy) For 4" - ASTM A694 Gr. F42	
Pups	For 2" - ASTM A106, Gr. B (Charpy) For 4" - API 5L, GR. B	
Insulation	As per Manufacturer's standard	

ATTACHED PIPE SPECIFICATION

S. No.	**Outside Diameter, OD mm (inch)**	**Wall Thickness, (mm/ Schedule)**	**Material**
1.	60.33 (2") to 114.4 (4")	Refer PMS	Refer PMS (30HC)

Notes:

1. For the welding end, the out of roundness (i.e. difference between maximum and minimum ID at pipe end) shall be 3.0 mm and tolerance on internal diameter at pipe ends shall be same as diameter tolerance for the pipe ends indicated in API 5L.
2. Insulating Joint shall be suitable for pigging operation, including intelligent pigging.
3. Insulating Joint shall be monolithic boltless.
4. The Charpy Impact temperature specified in data sheet shall supersede the temperature requirement specified in Specification.

INDRAPRASTHA GAS LIMITED

STANDARD SPECIFICATION
FOR INSULATING JOINT

IGL-SS-PP-2029

ABBREVIATIONS:

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
API	American Petroleum Institute
BHN	Brinell Hardness Number
HAZ	Heat Affected Zone
MSS-SP	Manufacturers Standardization Society - Standard Practice
RTJ	Ring Type Joint
SSPC	Steel Structures Painting Council

CONTENTS

1.0 SCOPE

This Specification covers the minimum requirement for the design, manufacture, testing and supply of carbon steel insulating joints to be installed in onshore pipeline systems handling non sour hydrocarbons in liquid or gaseous phase including Natural Gas or Liquefied Petroleum Gas (LPG).

2.0 REFERENCE DOCUMENTS

The design, materials, fabrication, inspection, testing and supply of insulating joints shall comply with the latest edition of the following codes and standards.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

B31.4	:	Pipeline Transportation System for Liquid and slurries.
B 31.8	:	Gas Transmission and Distribution Piping Systems.
B16.9	:	Factory made Wrought Butt Weld Fittings.
B 16.25	:	Butt Welding Ends.
BPVC Section VIII	:	Boiler and Pressure Vessel Code - Rules for Construction of Pressure Vessels, Division 1.
BPVC Section IX	:	Welding and Brazing Qualifications.
BPVC Section V	:	Non-Destructive Examination.

AMERICAN PETROLEUM INSTITUTE (API)

Specification 5L	:	Specification for Line Pipe.
1104	:	Specification for Welding Pipelines and Related Facilities.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A370	:	Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
D2000	:	Classification System of Rubber Products.
D709	:	Laminated Thermosetting Material.

MANUFACTURERS STANDARDIZATION SOCIETY (MSS)

SP-25	:	Standard Marking System for Valves, Fittings, Flanges and Unions.
SP-75	:	Specification for High Test Wrought Butt Welding Fittings.
SP-53	:	Quality Standard for Steel Castings and Forgings for Valves, Flanges and Fittings and Other Piping Components - Magnetic Particle Examination Method.

National Association of Corrosion Engineers (NACE)

RP 0286	:	Standard Recommended Practice, Electrical Isolation of Cathodically Protected Pipelines.

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

VIS-I	:	Visual Standard.
SP-10	:	Surface Preparation.

PNGRB REGULATIONS :

G.S.R 808(E) T4S : Regulations for Natural Gas Pipelines

G.S.R. Infra/ T4S/ P&PPL : Regulations for Petroleum and Petroleum products pipelines

G.S.R. 612(E) T4S : Regulations for CGD Network

MISCELLANEOUS

NEC	:	National Electric Code.
ISO 2409	:	Paints and Varnishes - Cross-Cut test.

In case of conflict between various requirements of this specification and reference standards, codes and regulations mentioned above, more stringent requirement shall apply unless otherwise agreed by Purchaser.

3.0 MATERIALS

3.1 METALLIC COMPONENTS

3.1.1 Material for the pressure containing parts of the insulating joints shall be as indicated in the Insulating joint Data Sheet. Other parts shall be as per the Manufacturer's standard (Suitable for the service conditions indicated in the Insulating Joint Data Sheets/Material requisition), which shall be subject to approval by Company. In addition, the material shall also meet the requirements specified hereinafter.

3.1.2 All process-wetted parts, metallic and non-metallic shall be suitable for the commissioning fluid and 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.

3.1.3 All carbon steel used for fabrication of various components of insulating joints shall be fully killed.

3.1.4 For Insulating joints specified to be used for Gas Service or LPG Service, hardness test shall be carried out as per ASTM A370 for each heat of steel used for all pressure containing parts. A full thickness cross section shall be taken for this purpose and the maximum hardness of base metal, weld metal & HAZ of all the pressure containing parts shall not exceed 248 HV10. Hardness shall be recorded.

3.1.5 The carbon equivalent (CE) based on product analysis calculated by the formula shall not exceed 0.45 based on check analysis for each heat of steel used.

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

3.1.6 The Manufacturer shall select materials as indicated in the data sheet along with the defined operating (Temperature/ Pressure) parameters and in accordance with ASME B 31.4/ B 31.8, as applicable and ANSI B16.25 for butt welding ends. Internal bore of weld joints shall not impede the pigging process or represent potential pig damage. The Manufacturer shall perform post weld heat treatment (PWHT) if required by the corresponding approved weld procedures. The Manufacturer shall prove by calculations to ASME VIII Division 1 that the materials supplied satisfy the pressure/temperature rating as specified in Data Sheet.

3.1.7 For Insulating Joint Specified to be used for Gas Service or LPG Service. Charpy V-notch test shall be conducted on each heat of steel used in manufacturing of the pressure containing parts including pipe pups and retainer ring of Insulating joint in accordance with ASTM A370. Unless otherwise stated Charpy V-notch test shall be conducted at 0°C or at lower temperature as specified in data sheet / material requisition. The specimens shall be taken in the direction of principal grain flow and notch perpendicular to original sample of plate or forging.

The minimum average absorbed impact energy value of the set of three (3) full size specimens tested at 0°C shall be 27J. The minimum impact energy value of any one specimen of three specimen analyzed as above shall not be less than 22J. Result of Charpy shall be recorded.

In case of Low Temperature Carbon Steel (LTCS) material specified in data sheet or offered manufacturers, the Charpy-V notch test requirement of applicable material standard shall be compiled with.

3.2 NON METALLIC COMPONENTS

Minimum thickness requirement of insulating material shall comply with NACE RP 0286.

Epoxy resin filler material used shall be CIBA Araldite CY-220 & Araldite HT-951 hardener or an approved equivalent.

Insulating rings (Spacing Ring) and joint filler material shall be flame resistant and capable of safely withstanding the maximum operating temperature without distortion or loss of insulating properties. Non-metallic seal materials, if provided, shall be resistant to amine-based corrosion inhibitors and explosive decompression.

The spacing ring shall be of epoxy glass fiber reinforced laminate. It shall possess high insulating properties that would comply with ASTM D 709 Type IV, Group G-11 properties. The materials compressive properties shall be equal to or greater than 450 MPa. The epoxy glass fiber laminates material shall possess anti-aging properties. The spacing ring, sealing gasket / Ring and filling material shall be resistant to flames and diffusion of gases, absorption of moisture and shall be capable of maintaining their required compressive strength and insulating properties over the design life of the pipeline.

Adhesive sealant or a low viscosity, cold curing thermosetting resin shall be used as filling material. Its compressive strength shall be equal to or greater than 150 MPa.

Plastic material shall be compatible to the materials they are in contact with. The Manufacturer shall give the details of the plastic used and its mechanical, chemical and temperature resistance properties.

3.3 INSULATING MATERIAL

- The design of insulating material shall conform to following requirements

- The electric resistance does not decrease with time.
- The insulating material shall not deform.
- The insulating material shall be resistance to chemical attack by transferred fluid under design temperature and pressure.
- The transferred fluid does not penetrate into the structure of the insulating material under design conditions of pressure and temperature.

4.0 DESIGN AND MANUFACTURE

4.1 GENERAL

a. The monolithic insulating joints as per figure shall be designed so as to provide an effective electrical barrier by isolation between the buried pipeline and the above ground pipeline and other pipelines. Suitable for above or below ground installation as defined in the data sheet. The Manufacturer shall provide a proven design.

b. The insulating joints shall be of the monolithic bolt-less design comprising of forged sections assembled together by welding to form an integral unit. Insulating joint shall be fabricated by welding the forged retainer to pre-assembled insulating components and hub, under compression, so as to ensure effective sealing. Final assembly of joint shall be by welding only. Crimped and screwed closing joints are not permitted.

c. The hydrostatic test pressure for the insulating joints shall be 1.5 times the design pressure.

d. The insulating joints shall be designed for welding to the line pipe with weld ends. Bolted and flanged connections are not allowed.

e. The insulating joint shall have a smooth clear bore and be suitable for uninterrupted passage of all type pigs, spheres and on-line inspection tools. The internal bore of insulating joint shall match the bore of connected pipe as indicated in data sheet.

f. The design shall ensure that over the time of service the carrier product shall not permeate in the cavity.

g. The selected seal material shall be resistant to the chemicals and the operating temperature and pressure of the pipe system. At least 90% of the gasket shall be in contact with bare metal surface. The sealing gasket shall be of sufficient thickness and shall be made out of one piece of material, no joints are permitted.

h. **T**he insulating joint shall be able to sustain an internal vacuum of one (1) millibar.

i. No stress inducing recess, protrusions or notches, are permitted in the internal surface of the supplied joint. Additional fillers are not permitted to fill these flaws.

j. The cavities inside the joint shall be filled with low viscosity dielectric material that solidifies on curing. Air pockets and impurities in the dielectric material shall not be accepted.

k. The Manufacturer shall submit the detailed sectional drawing of the longitudinal face of the joint. The cross-sectional drawing shall show all parts, materials, dimensions surface finishes and tolerances.

l. The electrical resistance of the joint shall not decrease with time. The joint shall include permanent terminals for survey lead connections.

m. The insulating joint material shall be resistant to creep.

n. The external fasteners shall be hot dip galvanized as per ASTM A 153.

4.2 DESIGN

4.2.1 MECHANICAL DESIGN

a. Main components of insulating joints such as forged hub, the stub end and the retainer ring, gaskets etc. shall be designed in accordance with Section VIII, Division 1, Appendix-2 of ASME, Boiler and Pressure Vessel Code. Design factor shall be in accordance with the data sheet.

b. Insulating joints shall be designed using the design principles of ASME Section VIII Div. 1. The design shall be checked for the following two cases:

CASE-1: Design pressure (as per Data Sheet) and Axial Force (F).

The Axial force shall be calculated as under:

F= 0.1 x S x A

Where S= SMYS of connected pipe (refer Data Sheet)

A= Metal cross-sectional area of connected pipe.

The allowable stress in this case shall be less than or equal to 0.5 x SMYS of insulating joint material.

CASE-2: Hydrostatic Test Design pressure

The allowable stress in this case shall be less than or equal to 90% of SMYS of insulating joint

material. All design parameters shall be as per Insulating Joint Data Sheet. Detailed design calculations shall be submitted for Company approval.

c. A corrosion allowance, as indicated in data sheets, shall be considered in design for operating condition.

d. Surfaces of the annular space between pup and retainer shall be abrasive blasted to a SA 2½ finish. Assembly of the insulating joint shall commence within two hours of completion of abrasive blasting. The annular space between the retainer and the spool shall be filled with epoxy resin.

e. The joint shall be assembled in a way that the internal components are firmly locked in position. The completed joint shall be capable of withstanding the operating and testing stresses. The neck of the bell shall be sealed with mastic. The design shall consider the position of the spacing ring, sealing gasket and filling material, so that the temperature of these materials remains below 60^{o}C during tie-in welding operation.

4.2.2 PUPS

a. Insulating joints shall be supplied with pup pieces welded to each end by the Manufacturer. Pipe material used shall be as indicated in data sheets. The pup pieces shall be of equal length. The length of pup pieces shall be minimum 500mm or as specified on the data sheet.

b. The end of the pups to be field welded shall be beveled in accordance with ASME B 31.4/31.8, as applicable. Pipe pups shall be welded to the insulation joint assembly prior to hydrostatic strength and leak testing.

c. When LSAW pipes are used as pups, the reinforcement of inside weld seam shall be removed for a distance of at least 50 mm from each end.

d. The joint between pipe pup pieces and main forging shall be full penetration butt weld type. Weld design shall be such as resulting in a weld joint factor of 1.0.

e. The tolerance on internal diameter and out of roundness at the ends for Insulating joints shall be as per applicable connected pipe specification as indicated in the Data Sheet.

4.2.3 ELECTRICAL

a. The average dielectric strength of the insulating joint shall be minimum 15 KV or more.

b. Two cleats/cable terminators shall be welded on pups on each side of insulating joint. The cleats shall be suitable for connecting 10mm² and 50mm² cables for measurement/shorting purposes. Cleat Shall be attached to Insulating joint by welding. Refer Fig 4.1 for details.

4.2.4 WELDING

a. All welds except closing weld shall be butt welds. The closing weld shall be full penetration girth weld in accordance with ASME BPVC Section VIII, Division 1. The weld design shall conform to the ASME acceptable standards. Fillet welds if required, shall have minimum two passes.

b. Butt weld end shall have end prepared as per ASME B 16.25. However, end preparation for butt welding end having unequal thickness w.r.t connecting Pipe, shall be shall be prepared in accordance with ASME B31.4/ B31.8, as applicable. All butt weld ends shall be checked for surface defects using dye penetrate (As per Appendix 8 of ASME Section VIII) prior to welding.

c. All welding shall be carried out by welders and welding procedure qualified in accordance with ASME Section IX. The procedure quantification to include hardness and impact test shall meet the requirement of clause 3.1.4 & 3.1.7.

d. No repairs by welding shall be carried out on base metal of any component of insulating joint. Manufacturer shall obtain Purchaser approval prior to carrying out any repair of welds. The repair welding shall be carried out by welders and welding procedures duly qualified per ASME Section IX and records for each repair shall be maintained. Welding procedure and repair welding procedure qualification shall include requirements for impact testing & hardness test when required as per Clause 3.1.4 & 3.1.7 of this specification and shall meet the requirement therein.
Radiography shall be performed after the repair

e. Cold die stamping on insulating joints or pups is not permitted on the body. Cold die stamping can be done on the pipe bevel.

f. The repair of the forging by welding is not permitted. All production welding, including tacking shall be done as per the qualified procedure by the qualified welder/ operators. The acceptable weld processes are:

- Shielded Metal Arc Welding (SMAW)
- Submerged Arc Welding (SAW)

- Gas Metal Arc Welding (GMAW)

g. The Manufacturer shall ensure that all the mechanical works are completed prior to the post weld heat treatment and hydrostatic test. Any re-work (welding, cutting and grinding) on the surface of the material after the PWHT or hydrostatic testing is not permitted.

h. The need for Post Weld Heat Treatment (PWHT) shall be assessed by the Manufacturer in accordance with the relevant weld procedure.

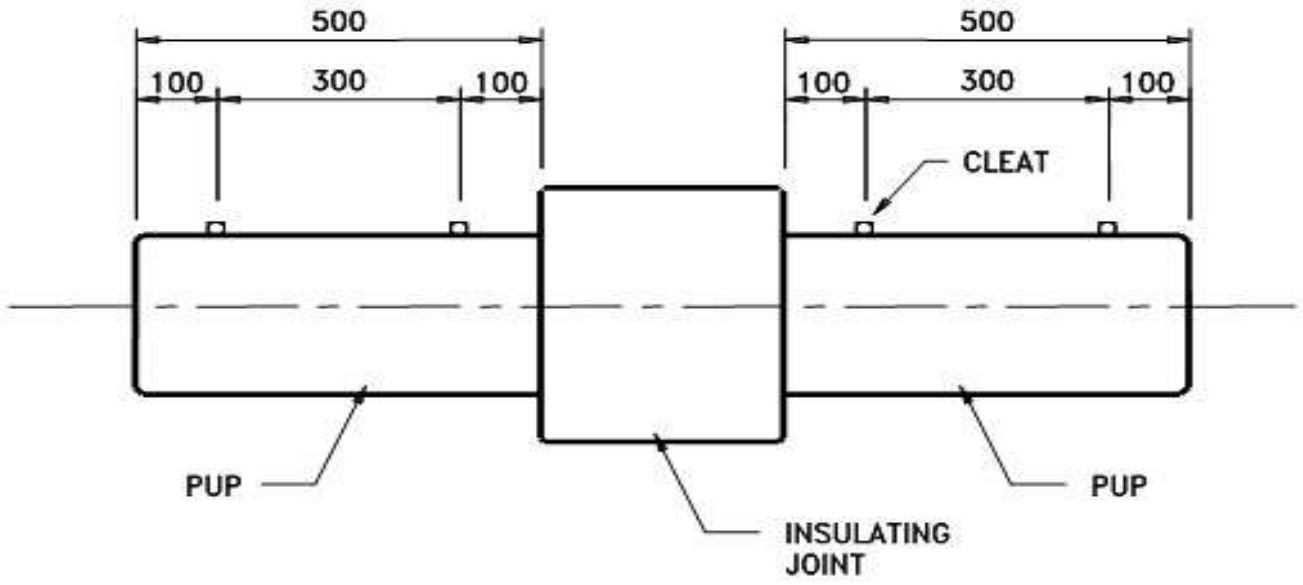


FIG. 4.1

5.0 INSPECTION AND TESTS

The Manufacturer shall ensure all equipment used for testing and inspection purposes is calibrated and certified accordingly. The Manufacturer shall record all inspection and testing activity on the appropriate inspection certificate. The following minimum inspection and testing shall be carried out prior to painting, marking and shipment of insulating joints.

5.1 TESTING OF MATERIALS

Chemical composition and mechanical tests including yield strength, ultimate tensile strength, impact test, elongation and hardness shall be carried out for each heat of steel used as per the applicable standard as referred to in this specification.

5.2 VISUAL INSPECTION AND DIMENSIONAL CHECK

All insulating joints shall be visually inspected for visible surface defects and compliance with related documents. The Internal The internal and external surfaces shall be free from any strikes, gouges and other detrimental defects Bevels at butt weld ends shall show a smooth contour. All dimensions shall be checked for conformance with approved drawings.

5.3 NON-DESTRUCTIVE EXAMINATION

As a minimum all NDT shall be performed in accordance with ASME Section V and examination according to ASME Section VIII or as defined herein.

a. Full length of all pressure containing butt welds, including welds that have been repaired, shall be examined 100% by radiography. Acceptance limits shall be as per API 1104

b. Any other weld that, in Purchaser's opinion, cannot be radiographed shall be inspected by ultrasonic or magnetic particle methods. Acceptance criteria shall be as per ASME Section VIII Appendix 12 and Appendix 6 respectively. Root pass of joint closure weld shall be examined by magnetic particle inspection method.

c. All forging shall be wet magnetic particle inspected on 100 % of forged surface. Method of inspection and acceptance shall comply MSS-SP-53.

d. All finished weld ends shall be 100% ultrasonically tested for lamination type defects for a distance of 50 mm from the ends. Any lamination larger than 6.35 mm shall not be acceptable.

e. All fillet welds shall be non-destructively examined as follows:

Fillet thickness < 6 mm	:	100% by magnetic particle inspection, acceptance criteria as per ASME Sec VIII Appendix 6.
Fillet Thickness ≥ 6 mm	:	100% by Ultrasonic Testing, acceptance criteria as per ASME Sec VIII Appendix 12 respectively.

f. All NDT shall result shall documented and be available for Purchasers review.

5.4 HYDROSTATIC TEST

A hydrostatic test shall be carried out on each insulating joint complete in all respects. The test pressure as indicated in data sheets shall be held for a period of 15 min and the assembly visually inspected for leaks. Any pressure changes must correspond with temperature changes otherwise the test will not be acceptable. Test records to be maintained accordingly by Manufacturer.

After hydrostatic test, insulating joints 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 will be accepted.

5.5 DIELECTRIC TEST

Insulation resistance of each insulating joint shall be at least 25 Mega Ohms, when checked with 500-1000 V DC.

In addition, prior to and after hydro testing, each insulating joint shall be tested for dielectric integrity at 5000 V AC, 50 Hz for one minute and the leakage current before and after the hydrostatic test shall be equal. Testing time, voltage and leakage shall be recorded and certified.

No repair shall be permitted to the insulating joints failed in the above-mentioned tests.

Company reserves the right to perform stage wise inspection and witness tests as indicated in clause 5 at Manufacturer's Works prior to shipment. Manufacturer shall give reasonable notice of time and shall provide without charge reasonable access and facilities required for inspection by the Company's Inspector. 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.

6.0 PAINTING

SURFACE PREPARATION

Surface preparation for all coated surfaces according standard SSPC-SP-10 by shot blasting

PAINTING

Exterior surfaces of all insulating joints shall be painted with a non-conducting epoxy, three layer paint coating system. The internal lining shall be of a two-pack (solvent free) non-conducting epoxy compound (cold or hot curing).

The internal coating shall be suitable for the service and design conditions indicated in data sheets, and shall neither be damaged by or cause damage to pipeline pigs including inspection and scraper pigs.

The internal and external coating/lining shall be cut back by 75mm from the weld-edge. Coating system and procedure shall be approved by Purchaser prior to manufacture.

7.0 MARKING

All insulating joints shall be fitted with a stainless-steel name plate with following markings die stamped or raised letters in metric units:

- Manufacturer's Name.
- Suitable for _____Inch Nominal Diameter Pipeline.
- End Thickness in mm.
- Material.
- Design Pressure / Hydrostatic Test Pressure.
- ANSI Class Rating.
- Tag No.
- Year of Manufacture.

8.0 TEST CERTIFICATES

Manufacturer shall submit following certificates to Company's inspector:

- Test certificates relevant to the chemical analysis and mechanical properties of the materials used for construction of insulating joint as per this specification and relevant standards.
- Test reports on non-destructive testing.
- Test certificates for hydrostatic and air tests.
- Test certificate for electrical tests.

9.0 PACKING & SHIPPING

All butt weld ends shall be suitably protected to avoid any damage during transit by means of metallic or high impact plastic bevel protectors; and all assemblies shall be cleaned from inside of all foreign materials, grease, rust etc. prior to packing. Prior to shipment, parts and equipment which have bare metallic surfaces shall be protected with a rust preventative which will provide protection at temperatures up to 50^{o}C. Sealing surfaces and moving parts to have a graphite grease coating applied.

The Manufacturer shall supply packing and shipping procedure with the tender. All Insulation joints shall be packed and prepared for shipment/transport in accordance with the procedures included in the

Request for Quotation (RFQ) documentation, subsequently approved by the Purchaser.

Only those insulating joints, which have been inspected and certified by Company's Inspector, shall be shipped.

10.0 DOCUMENTATION

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

10.1 At the time of bidding, Bidder shall submit the following documents:

- Reference list of similar supplies including all relevant details viz. Project, Year of supply, Client, Location, Size, Rating and Service for the last seven years.

10.2 After placement of order, the Manufacturer shall submit the following drawings, documents and specifications for company's review and information:

- General arrangement drawings of flow tees with overall dimensions and cross-sectional drawing including relevant calculations for pressure containing parts.

10.3 All documents shall be in English Language.

INDRAPRASTHA GAS LIMITED

INSPECTION AND TEST PLAN
FOR
INSULATING JOINTS
IGL – ITP – PP – 2006

ABBREVIATIONS:			
CE	Carbon Equivalent	PO	Purchase Order
DFT	Dry Film Thickness	PQR	Procedure Qualification Record
DPT	Dye Penetrant Testing	PR	Purchase Requisition
HT	Heat Treatment	RT	Radiography Testing
IC	Inspection Certificate	TC	Test Certificate
ITP	Inspection and Test Plan	TPI or TPIA	Third Party Inspection Agency
MPT/MT	Magnetic Particle Testing	UT	Ultrasonic Testing
MTC	Material Test Certificate	VDR	Vendor Data Requirement
NDT	Non-Destructive Testing	WPQ	Welders Performance Qualification
PMI	Positive Material Identification	WPS	Welding Procedure Specification

LEGENDS:
H - Hold (Do not proceed without approval)
W - Witness (Give due notice, work may proceed after scheduled date)
P – Perform
R – Review
RW - Random Witness [As specified or 10% (min.1 no. of each size and type of Bulk items)]

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Insulating Joints.

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 VENDOR	VENDOR	TPIA
1.0	**Procedure**						
1.1	Hydrostatic Test, NDT and other procedures	Documented Procedures	100%	Procedure Documents	-	H	R
1.2	WPS/ PQR /WPQ	Documented procedures	100%	Procedure Documents	-	H	R-Existing W-New
2.0	**Material Inspection**						

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
2.1	1) Forging 2) Pup Piece	Chemical / Mechanical Properties, NDT, HT and other requirement as per purchase specification.	100%	MTC & Inspection Record	H	W	W
2.2	Gasket, Insulating Ring, Filling Material, etc.	As per material spec./code	100%	MTC & Inspection Record	H	H	R
3.0	**In Process Inspection**						
3.1	Welding	Welding Parameters, NDT (as applicable)	100%	NDT Records/RT films	-	W	R
4.0	**Final Inspection**						
4.1	Hydro Testing, Air Leak test, Vacuum test (As applicable)	Leak Check	100%	Test Report	-	H	H

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
4.2	Visual and Dimension Check	Visual and Dimension Check	100%	Inspection Report	-	H	RW
4.3	Dielectric Test	Insulating Resistance	100%	Inspection Report	-	W	W
5.0	**Painting**						
5.1	Final painting (as applicable)	Paint Scheme, Visual & Paint thickness check	100%	Inspection Report	-	H	R
6.0	**Documentation & IC**						
6.1	Stamping and review of inspection documents, issue of IC	Review of documents for compliance as per PR.	100%	IC	-	-	H

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
7.0	**Review of final documentation**	Compilation of documents as per VDR attached with PR records for submission to customer	100%	Dossier/Completion Certificate (EN 10204 Type 3.2)	-	H	H

NOTES (As applicable):

1. Items shall be EN 10204 Type 3.2 Certified.
2. ITP shall be submitted including but not limited to the item/activity covered above. Any item/activity identified and required for the completeness shall also be covered in the ITP submitted by the manufacturers.

	CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI, UP, HARYANA & RAJASTHAN				
		Tender Number		IGL/ET2/CP/CP18455	
		Total Sheets		11	
Document No	18455	000	PP	MR	2002

INDRAPRASTHA GAS LIMITED

CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI, UP, HARYANA & RAJASTHAN

MATERIAL REQUISITION FOR FLANGES & FITTINGS

ABBREVIATION

MT	Metric Tonne
DFT	Dry Film Thickness
EN	European Norm
ASME	American Society of Mechanical Engineers
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
MSS	Manufacturers Standardization Society
WPHY	High Yield strength of Wrought Pipe
WNRF	Weld Neck Raised Flange
PSV	Pressure Safety Valve
Pr.	Pressure
Conn.	Connection
SS	Stainless Steel
NPTF	National Pipe Thread Female

CONTENTS

1. INTRODUCTION

INDRAPRASTHA GAS LTD. (IGL) plans to augment the PNG Network. It supplies natural gas to domestic & commercial consumers in the city of Delhi, Uttar Pradesh, Haryana and Rajasthan.

IGL is now inviting tenders on Domestic Competitive Bidding basis for procurement of Carbon Steel Fittings, Flanges, Insulating Joints & Other Misc. Items for this project. The present document covers the technical specifications for the enquiry.

2. PURPOSE

This document is to define the scope of supply, which shall cover Design, engineering, manufacture, inspection, testing at manufacturer's works, packing, transportation/ shipping, Handling, delivery of Insulating Joints, as per this material requisition, including supply of documentation/ drawings as per the enclosed specifications and other codes and standards enclosed or referred for City Gas Distribution project in NCT of Delhi, NCR, Haryana, Uttar Pradesh and Rajasthan.

3. DOCUMENT PRECEDENCE

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

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

a. MR

b. Project Specifications

c. Basic Documents

d. Codes and Standards

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

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

4. SCOPE OF SUPPLY

Sl. No.	DESCRIPTION	QTY	REMARKS
1.1	Flanges & Fittings	As per Bill of Material Clause 5.0 of this document	
1.2	Painting and Coating	1 LOT	As per specification
1.3	Inspection and Testing	1 LOT	As per specification
1.4	Inspection and Test Plan	1 LOT	To be submitted by vendor
1.5	Certification accordance with EN10204, 3.2 certificates.	1 LOT	As per specification
1.6	Vendor Documentation	1 LOT	As per specification
1.7	Marking, Packaging & Transportation	1 LOT	As per specification
1.8	Preparation for Shipment	1 LOT	As per specification
1.9	Delivery Point	Delivery location is at site/ Client designated store	
1.10	Delivery Schedule	Delivery Schedule as defined in the Tender	

5. BILL OF MATERIAL

Design, engineering, manufacture, procurement of materials and bought out components, assembly at shop, inspection, testing at manufacturer's works, packing, transportation/ shipping, delivery of Fittings & Flanges as per this material requisition, including supply of documentation/ drawings as per the enclosed specifications and other codes and standards enclosed or referred.

Group A: Flanges

SUMMARY OF FLANGES							
SR. NO.	SIZE & SPEC	SCH/ THK	DIMENSION STD	MATERIAL	DESCRIPTION	QTY	REMARKS
WNRF FLANGE							
1.01	2" (30HC)	-	ASME B16.5	ASTM A 105 (Charpy)	300#, RF/125AARH	1500	-

SUMMARY OF FLANGES							
SR. NO.	**SIZE & SPEC**	**SCH/ THK**	**DIMENSION STD**	**MATERIAL**	**DESCRIPTION**	**QTY**	**REMARKS**
1.02	4" (30HC)	-	ASME B16.5	ASTM A 105 (Charpy)	300#, RF/125AARH	1500	-
1.03	6" (30HC)	-	ASME B16.5	ASTM A 105 (Charpy)	300#, RF/125AARH	10	-
BLIND FLANGE							
1.04	2" (30HC)	-	ASME B16.5	ASTM A105 (Charpy)	300#, RF/125AARH	300	-
1.05	4" (30HC)	-	ASME B16.5	ASTM A105 (Charpy)	300#, RF/125AARH	150	-

Group B: Fittings

SUMMARY OF FITTINGS							
SR. NO.	**SIZE & SPEC**	**SCH/ THK**	**DIMENSION STD**	**MATERIAL**	**DESCRIPTION**	**QTY**	**REMARKS**
ELBOWS							
2.01	2" x 45°	SCH 80	ASME B16.9	ASTM A234 Gr. WPB (Charpy)	BW, 1.5D	500	-
2.02	2" x 90°	SCH 80	ASME B16.9	ASTM A234 Gr. WPB (Charpy)	BW, 1.5D	100	-
2.03	4" x 45°	6.4	ASME B16.9	ASTM A234 Gr. WPB (Charpy)	BW, 3D	150	-
2.04	4" x 90°	6.4	ASME B16.9	ASTM A234 Gr. WPB (Charpy)	BW, 1.5D	250	-

2.05	4" x 90°	6.4	ASME B16.9	ASTM A234 Gr. WPB (Charpy)	BW, 3D	1000	-

SR. NO.	SIZE & SPEC	SCH/ THK	DIMENSION STD	MATERIAL	DESCRIPTION	QTY	REMARKS
UNEQUAL TEE							
2.06	8" X 4"	6.4 x 6.4	ASME B16.9	API 5L, Gr. X52 or ASTM A234 Gr. WPB (Charpy)	300#, BW	20	-
2.07	8" X 6"	6.4 x 6.4	ASME B16.9	API 5L, Gr. X52 or ASTM A860 WPHY 52	300#, BW	5	-
2.08	12" X 4"	6.4 x 6.4	ASME B16.9	API 5L, Gr. X60 or ASTM A860 WPHY 60	300#, BW	10	-
EQUAL TEE							
2.09	2"	SCH 80	ASME B16.9	ASTM A234 Gr. WPB (Charpy)	BW	50	-
2.10	4"	6.4	ASME B16.9	ASTM A234 Gr. WPB (Charpy)	BW	50	-
2.11	12"	9.5	ASME B16.9	API 5L, Gr. X60 or ASTM A860 WPHY 60	BW	10	-
REDUCER							
2.12	4" X 2"	6.4 X SCH 80	ASME B 16.9	ASTM A234, GR. WPB	Concentric, BW	50	-
2.13	6" X 4"	6.4 X 6.4	ASME B 16.9	ASTM A234, GR. WPB	Concentric, BW	20	-

SUMMARY OF FITTINGS							
SR. NO.	**SIZE & SPEC**	**SCH/ THK**	**DIMENSION STD**	**MATERIAL**	**DESCRIPTION**	**QTY**	**REMARKS**
2.14	8″ X 4″	6.4 X 6.4	ASME B 16.9	API 5L, Gr. X52 or ASTM A860 WPHY 52	Concentric, BW	30	-
2.15	8″ X 6″	6.4 X 6.4	ASME B 16.9	API 5L, Gr. X52 or ASTM A860 WPHY 52	Concentric, BW	20	-
2.16	12″ X 6″	6.4 X 6.4	ASME B 16.9	API 5L, Gr. X60 or ASTM A860 WPHY 52	Concentric, BW	20	-
END CAPS							
2.17	4″	6.4MM	ASME B 16.9	ASTM A234, WPB	-	50	-
2.18	6″	6.4MM	ASME B 16.9	ASTM A234, WPB	-	30	-
2.19	8″	6.4MM	ASME B 16.9	API 5L, Gr. X52 or ASTM A860 WPHY 52	-	40	-
WELDOLET							
2.20	4″ X ½″	-	MSS SP-97	ASTM A105 (Charpy)	300#, BW	150	-
2.21	8″ X 2″	-	MSS SP-97	ASTM A105 (Charpy)	300#, BW	20	-

- 30HC = 300# (Refer PMS)
- 15HC = 150# (Refer PMS)
- Manufacture to ensure that all welding end, thickness of Flanges, Fittings and Flow Tee shall meet the connecting pipe thickness. For connecting pipe thickness enclosed PMS (Piping Material Specification) shall be referred.

6.0 NOTES FOR FLANGES & FITTINGS:

6.1 All material is to be used in Natural gas Services.

6.2 Design Data for the Project:

Pipeline Service	:	Natural Gas
Max Design Temp (Above Ground)	:	65°C
Max Design Temp (Under Ground)	:	60°C
Min Design Temp	:	(-)29°C for CS/ (-)45°C for LTCS

6.3 Manufacturer shall ensure that the wall thickness (W.T.) of Flanges & Fittings shall be adequate to sustain design pressure and selected W.T. shall be suitable for welding with W.T. of connected pipeline/piping.

6.4 Manufactures must possess the record of successful proof test, in accordance with the provision of ASME B 16.9/ MSS SP-75/ MSS SP-97 as applicable. Also successful proof test records shall be submitted at the time of bidding for qualifying the entire range of fittings being offered.

6.5 Fittings such as tees, elbows and reducers shall be seamless type for sizes up to DN 300 mm (12") and shall be either welded or seamless type for sizes above DN 300 mm (12"). Fitting shall conform to ASME B16.9/ MSS SP 75 for sizes DN 50 mm (2") and above and ASME B16.11 for sizes DN 15mm (1½") &below.

6.6 All welded fittings shall be subjected to heat treatment. All fittings (except weldolets) shall comply with the requirements of MSS SP-75/ ASME B16.9. Welded pipes used for fittings shall be SAWL (Longitudinally Seam Submerged Arc Welded) type only.

6.7 Fittings such as Weldolets, Sockolets, Nippolets, etc. shall be manufactured in accordance with MSS SP-97.

6.8 Certification shall be EN 10204 type 3.2.

6.9 All welds shall be made by welders and welding procedures qualified in accordance with the provision of ASME Section IX. The procedure qualification shall include impact test, hardness test and guided bend test.

6.10 For all Flanges & Fittings Charpy V-notch test shall be conducted for each heat treatment lot and for each heat of steel used. Charpy V-notch test shall be conducted at -29°C for CS & -45°C for LTCS in accordance with the impact test provisions of ASTM A 370 for flanges and MSS SP-75 for all fittings. Results of Charpy V-notch test shall be recorded.

6.11 The average absorbed impact energy values of three full-sized specimens shall be 27 joules. The minimum impact energy value of any one specimen of the three specimens analyzed as above shall not be less than 22 Joules.

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

6.13 Flanges & fittings shall be delivered at Client designated store. All transportation, handling, delivery shall be in bidder's scope.

6.14 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.

6.15 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).

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

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

6.18 Quantity may vary by ± 25 %. The final quantity will be issued to successful bidder.

7.0 LIST OF ATTACHMENTS

7.1 Standard Specification for Seamless (SMLS) Line Pipe (Onshore), Doc. No. IGL-SS-PP-2036

7.2 Standard Specification for Seamless fittings & flanges (size up to DN 400 mm -16"), Doc. No. IGL-SS-PP-2024

7.3 Standard Specification for Painting, Doc. No. IGL-SS-PP-2502

7.4 ITP for Flanges and Spectacle Blinds, Doc. No. IGL-ITP-PP-2003

7.5 ITP for Forged, Seamless & Welded Fittings (16" NB & Below), Doc. No. IGL-ITP-PP-2005

7.6 Piping Material Specification

7.7 Compliance Statement, Doc. No. IGL-SD-CS-001

7.8 Deviation Sheet, Doc. No.IGL-SD-DS-001

7.9 Instruction to Bidder, Doc. No.IGL-SD-ITB-001

7.10 Check List, Doc. No. IGL-SD-CK-001

7.11 List of Spares, Doc. No.IGL-SD-LS-001

7.12 Reference List, Doc. No. IGL-SD-RL-001

7.13 Vendor Drawing Document Schedule, Doc. No. IGL-SD-VS-001

7.14 Drawings & Documents, Doc. No.IGL-SD-DD-001

7.15 Standard Specification for Quality Management System Requirement from Vendors, Doc. No.IGL-SS-PP-2044

7.16 Standard Specification for Documents Required from Suppliers, Doc. No.IGL-SS-PP-2043

INDRAPRASTHA GAS LIMITED

STANDARD SPECIFICATION FOR

SEAMLESS FITTINGS AND FLANGES {SIZE UPTO DN 400MM (16")}

IGL-SS-PP-2024

ABBREVIATIONS:

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
API	American Petroleum Institute
BHN	Brinell hardness number
HAZ	Heat Affected Zone
MSS-SP	Manufacturers Standardization Society - Standard Practice
RTJ	Ring Type Joint
SSPC	Steel Structures Painting Council
CE	Carbon Equivalent
LTCS	Low Temperature Carbon Steel
LPG	Liquefied Petroleum Gas

CONTENTS

1.0 SCOPE

This Technical specification specifies the minimum requirements for the design, manufacture and supply of following carbon steel flanges (such as welding neck flanges, blind flanges, spectacle blinds, spacers and blind etc.) and seamless fittings (such as tees, elbows, reducers, caps, outlets etc.) size DN up to 400 mm (16") to be installed in onshore pipeline systems handling non-sour hydrocarbons in liquid or gaseous phase including Liquefied Petroleum Gas (LPG) and Natural Gas.

2.0 REFERENCE DOCUMENTS

Reference has been made in this specification to the latest edition (edition enforce at the time of issue of enquiry unless specified otherwise) of the following Codes, Standards and Specification.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

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 Fitting.

B16.9 : Factory made Wrought Butt Weld Fittings.

B 16.11 : Forged Steel Fittings, Socket welding and Threaded.

B 16.48 : Steel Line Blanks.

Section VIII : Boiler and Pressure Vessel Code - Rules for Construction of Pressure Vessels.

Section IX : Welding and Brazing Qualifications.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A370 : Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

MANUFACTURERS STANDARDIZATION SOCIETY (MSS)

SP-25 : Standard Marking System for Valves, Fittings, Flanges and Unions.

SP-97 : Forged Carbon Steel Branch Outlet Fittings-Socket Welding, Threaded and Butt Welding Ends

In case of conflict between various requirements of this specification and the requirements of above referred Codes and Standards, more stringent requirement shall apply unless otherwise agreed by Purchaser.

3.0 MATERIALS

The Material of flanges & fittings shall be as indicated in purchase requisition. In addition, the material shall also meet the requirements specified hereinafter.

3.1 The Carbon Steel used for the manufacture of flanges and fittings shall be fully killed.

3.2 The carbon equivalent (CE) shall not exceeding 0.45, based on check analysis calculated in accordance with following.

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

3.3 For flanges and fittings specified to be used for gas service or LPG service, Charpy V-notch test shall be conducted on each heat of steel. Unless specified otherwise, the Charpy V-notch test shall be conducted at 0^0 C in accordance with the impact test provisions of ASTM A 370 for flanges and MSS-SP-75 for all fittings.

The average absorbed impact energy values of three full-sized specimens shall be 27 joules. The minimum impact energy value of any one specimen of the three specimens analyzed as above shall not be less than 22 Joules.

When Low Temperature Carbon Steel (LTCS) materials are specified for flanges and fittings in Purchase Requisition, the Charpy V-notch test requirements of applicable material standard shall be complied with.

3.4 For flanges and fittings specified to be used for Gas service or LPG service, Hardness test shall be carried out as per ASTM A 370 for each heat of steel used. A full thickness cross section shall be taken for this purpose and the maximum hardness of base metal, Weld metal and heat affected zone shall not exceed 248 HV_{10}.

3.5 In case of RTJ (Ring Type Joint) flanges, the groove hardness shall be minimum 140 BHN. Ring Joint flanges shall have octagonal section of Ring joint.

4.0 DESIGN AND MANUFACTURE

4.1 Flanges such as weld neck flanges and blind flanges shall conform to the requirements of ASME B 16.5.

4.2 Spectacle blind and spacer & blind shall conform to the requirements of ASME B 16.48.

4.3 Fittings such as tees, elbows, reducers, etc. shall be seamless type and shall conform to ASME B 16.9 for sizes DN 50mm (2") to DN 400mm (16") (both sizes included) and ASME B 16.11 for sizes DN 15mm (1½") & below.

4.4 Fittings such as weldolets, sockolets, nippolets, etc. shall be manufactured in accordance with MSS-SP-97.

4.5 Repair by Welding on flanges and fitting is not permitted.

4.6 All butt weld ends shall be bevelled as per ASME B 16.5/ ASME B 16.9/ MSS-SP-97, as applicable

4.7 Type, face and finish of flanges shall be as specified in purchase requisition. The interpretation of range of face finish shall be as follows:

Serrated Finish/125 AARH	:	Serration with 125 to 250µ in AARH.
63 AARH	:	32 to 63µ in AARH.

4.8 Flanges and fittings manufactured from bar stock are not acceptable.

5.0 INSPECTION AND TESTS

The Manufacture shall perform all inspections and tests in accordance with the requirements of this specification and the relevant codes, at his works, prior to shipment. Such inspection and testing shall include, but not be limited to, the following:

5.1 TESTING OF MATERIALS

Chemical composition and mechanical tests including yield strength, ultimate tensile strength, impact test, elongation and hardness shall be carried out for each heat of steel used as per the applicable standard as referred to in this specification.

5.2 VISUAL INSPECTION AND DIMENSIONAL CHECK

All flanges and fittings shall be visually inspected. The internal and external surface of the flanges and fittings shall be free from any strikes, gauges and other detrimental defects.

Dimensional checks shall be carried out on finished products as per ASME B 16.5 for flanges, ASME B 16.48 for spacers and blinds and ASME B 16.9/MSS-SP-97 as applicable for fittings and as per this specification.

5.3 NON-DESTRUCTIVE EXAMINATION

All finished wrought weld ends subject to welding in field, shall be 100% tested for lamination type defects by ultrasonic test. Any lamination larger than 6.35 mm shall not be acceptable.

5.4 The Purchaser reserves the right to perform stage wise inspection and witness tests as indicated above, at the Manufacturer's works, prior to shipment. The Manufacturer shall give reasonable notice of date and time for such inspection and shall provide 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 confirm Or further investigate a suspected fault. All costs incurred shall be for 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 Performance of the materials concerned. 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.

6.0 PAINTING

Once all inspection and test have been carried out all external surface shall be thoroughly cleaned to remove grease, dust & rust. Standard mill coating shall be applied on external surface to protect against corrosion during transmit and storage. The coating shall be removable type in field.

7.0 MARKING

All Flanges & fittings shall be stamped with the requirements of applicable dimensional manufacturing standard. The marking shall also include following:

- PO Number.
- Item Code.

8.0 TEST CERTIFICATES

Manufacture who intends bidding for fittings must possess the records of a successful proof test, in accordance with the provision of ASME 16.9/MSS-SP-75, as applicable.

Manufacturer shall furnish the following certificates:

- Test certificates relevant to the chemical analysis and mechanical properties, including hardness of the materials used for manufacture of flanges and fittings in accordance with the requirement of relevant standards and this specification.
- Test reports on radiography, ultrasonic and magnetic particle examination.
- Certificates for each fitting stating that it is capable of withstanding without leakage a test pressure, which results in a hoop stress equivalent to 100% of the specified minimum yield strength for the pipe with which the fitting is to be attached without impairment of serviceability.

9.0 PACKING & SHIPPING

Ends of all fittings and weld neck flanges shall be suitable protected to avoid any damage during transit. Metallic or high impact plastic bevel protected shall be provided for flanges and fittings. Flanges face shall be suitably protected to avoid any damage during transit.

10.0 DOCUMENTATION

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

INDRAPRASTHA GAS LIMITED

INSPECTION AND TEST PLAN
FOR
FORGED, SEAMLESS & WELDED FITTINGS (16” NB & BELOW)
IGL – ITP – PP – 2005

ABBREVIATIONS:			
CE	Carbon Equivalent	PMI	Positive Material Identification
DCN	Dispatch Clearance Note	PO	Purchase Order
DFT	Dry Film Thickness	PQR	Procedure Qualification Record
DPT	Dye Penetrant Testing	PR	Purchase Requisition
HT	Heat Treatment	RT	Radiography Testing
IC	Inspection Certificate	TC	Test Certificate
IR	Inspection Report	TPI or TPIA	Third Party Inspection Agency
IRC	Inspection Release Certificate	UT	Ultrasonic Testing
ITP	Inspection and Test Plan	VDR	Vendor Data Requirement
MPT/MT	Magnetic Particle Testing	WPQ	Welders Performance Qualification
MTC	Material Test Certificate	WPS	Welding Procedure Specification
NDT	Non-Destructive Testing		

LEGENDS:
H- Hold (Do not proceed without approval)
W-Witness (Give due notice, work may proceed after scheduled date)
P-Perform
R-Review
RW-Random Witness [As specified or 10% (min. 1 no. of each size and type of Bulk item)]

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Forged, Seamless & Welded Fittings.

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 VENDOR	VENDOR	TPIA
1.0	**Procedure**						
1.1	Heat Treatment / NDT	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
2.0	**Material Inspection**						
2.1	Raw Material Identification (Billets, Rounds, Pipes, Coil, Plates, etc.)	Chemical and Mechanical Properties, Size & Steel making practice etc	100%	Mill test certificate, Vendor's Inspection Report	-	H	R

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
3.0	**In Process Inspection**						
3.1	Welding	Welding Parameters as per WPS / PQR	100%	Inspection Reports	-	H	-
3.2	Heat Treatment	Stress Relieving, Normalising, Tempering, Solution Annealing, Stabilization Heat Treatment etc. as applicable	100%	HT chart	-	H	R
3.3	RT For Fittings As Applicable	Weld defects	PR / Purchase Specification	RT films & Reports	-	H	R (RT film review)
3.4	Identification of Test Samples	Product Chemical, Mechanical, Impact, Hardness and other test as applicable	One/Heat/Lot	Test Reports	-	H	H

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
3.5	Product Analysis	Chemical Composition	PR/ Purchase Specification	Test Reports	-	H	R
3.6	Destructive Testing	Mechanical, Impact, Hardness and Other test as applicable	One/Heat/Lot	Test Reports	-	H	H
3.7	MPT/LPT	Surface & Internal Imperfections	PR/ Purchase Specification	NDT Reports	-	H	R
4.0	**Final Inspection**						
4.1	Visual and Dimensional Inspection (VDI)	Surface finish, Dimensions, Marking etc	100%	Inspection report	-	H	RW
4.2	PMI Check	Chemical Check	As Per Spec./Code	Inspection report	-	H	RW

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
4.3	Final Stamping	Stamping of accepted Items	100%	Inspection report	-	H	H
5.0	**Painting**						
5.1	Rust Preventive Coating & Colour Coding	Visual Inspection & Colour Coding	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%	Vendor TC & IC	-	H	H
7.0	**Final Documentation and Submission of Reports**	Compilation of IR/IRC/DCN/MTC/DRGS. /VDR	100%	Compliance Certificate (Note-1)	-	H	-

NOTES (As applicable):

1. If the certification is specified as EN 10204 Type 3.1 in Datasheet / Material Requisition, then '**W**' may be replaced with '**R**' with Material Traceability.

2. ITP shall be submitted including but not limited to the item/activity covered above. Any item/activity identified and required for the completeness shall also be covered in the ITP submitted by the manufacturers.

INDRAPRASTHA GAS LIMITED

INSPECTION AND TEST PLAN
FOR
FLANGES & SPECTACLE BLINDS

IGL – ITP – PP – 2003

ABBREVIATIONS:			
CE	Carbon Equivalent	NDT	Non-Destructive Testing
DCN	Dispatch Clearance Note	PO	Purchase Order
HT	Heat Treatment	PR	Purchase Requisition
IC	Inspection Certificate	RT	Radiography Testing
IR	Inspection Report	TC	Test Certificate
IRC	Inspection Release Certificate	TPI or TPIA	Third Party Inspection Agency
ITP	Inspection and Test Plan	UT	Ultrasonic Testing
MPT/MT	Magnetic Particle Testing	VDR	Vendor Data Requirement
MTC	Material Test Certificate		
LEGENDS:			
H - Hold (Do not proceed without approval)			
W - Witness (Give due notice, work may proceed after scheduled date)			
P - Perform			
R - Review			
RW - Random Witness [As specified or 10% (min.1 no. of each size and type of Bulk items)]			

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Flanges, Spectacle Blinds & Drip Rings.

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 VENDOR	VENDOR	TPIA
1.0	**Procedure**						
1.1	Heat Treatment, NDT and Other Procedures	Documented Procedures	100%	Procedure Documents	-	H	R
2.0	**Material Inspection**						
2.1.	Raw Material Inspection	Chemical, Mechanical, Properties	100%	Test Certificates	-	H	R
3.0	**In Process Inspection**						

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
3.1	Heat Treatment	Stress Relieving, Normalising, Tempering, Solution Annealing, Stabilization Heat Treatment etc. as applicable	100%	HT Chart	-	H	R
3.2	Identification of Test Samples	Product Chemical, Mechanical, Impact and Other test as applicable	One/Heat/Lot	Test Report	-	H	H
3.4	Product Analysis (As applicable)	Chemical Composition	As per PR/Purchase Specification	Test Reports	-	H	R
3.5	Destructive Testing	Mechanical, Impact and Other test as applicable	One/Heat/Lot	Test Reports	-	H	H
3.6	MPI	Surface & Internal Imperfections	As per PR/Purchase Specification	NDT Reports	-	H	R
4.0	**Final Inspection**						
4.1	Final Inspection	1. Visual 2 Dimensions 3. Hardness 4. Marking etc	100%	Inspection Report	-	H	W

	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
4.2	PMI Check	Chemical	As per Spec.	Inspection Report	-	H	RW
4.3	Final Stamping	Stamping Of Accepted Flanges & Spectacle Blinds	Stamping of Valves which are witnessed by TPIA.	Inspection Report	-	H	H
5.0	**Painting**						
5.1	Rust Preventive Coating & Colour Coding	Visual & Colour Coding as applicable	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%	Vendor TC & IC	-	H	H
7.0	**Final Documentation & Submission of Reports**	Compilation of IR/IRC/DCN/MTC/DRGS. /VDR	100%	Compliance Certificate (Note-1)	-	H	-

NOTES (As applicable):

1. If the certification is specified as EN 10204 Type 3.1 in Datasheet / Material Requisition, then '**W**' may be replaced with '**R**' with Material Traceability.
2. ITP shall be submitted including but not limited to the item/activity covered above. Any item/activity identified and required for the completeness shall also be covered in the ITP submitted by the manufacturers.

INDRAPRASTHA GAS LIMITED

CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI, UP, HARYANA & RAJASTHAN

MATERIAL REQUISITION FOR VALVES

CONTENTS

1.0 INTRODUCTION

INDRAPRASTHA GAS LTD. (IGL) plans to augment the PNG Network. It supplies natural gas to domestic & commercial consumers in the city of Delhi, Uttar Pradesh, Haryana and Rajasthan.
IGL is now inviting tenders on Domestic Competitive Bidding basis for procurement of Carbon Steel Fittings, Flanges, Insulating Joints, Valves & Other Misc. Items for this project.
The present document covers the technical specifications for the enquiry.

2.0 PURPOSE

This document is to define the scope of supply, which shall cover Design, engineering, manufacture, inspection, testing at manufacturer's works, packing, transportation/ shipping, Handling, delivery of Valves, as per this material requisition, including supply of documentation/ drawings as per the enclosed specifications and other codes and standards enclosed or referred for City Gas Distribution project in NCT of Delhi, NCR, Haryana, Uttar Pradesh and Rajasthan.

3.0 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. Data Sheets
b. Material Requisition (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.)

4.0 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.

Part A: Ball Valves

S. No.	Size	Rating	Bore	Ends	Data Sheet No.	Qty.	Remarks
2.01	12″	300#	FB	BW	18455-000-PP-DS-2002A	40	AG-CS
2.02	12″	300#	FB	RF	18455-000-PP-DS-2002A	5	AG-CS
2.03	8″	300#	FB	BW	18455-019-PP-DS-2002A	170	AG-CS
2.04	8″	300#	FB	RF	18455-019-PP-DS-2002A	5	AG-CS
2.05	6″	300#	FB	BW	18455-019-PP-DS-2002A	30	AG-CS
2.06	6″	300#	FB	RF	18455-019-PP-DS-2002A	5	AG-CS
2.07	4″	300#	FB	BW	18455-019-PP-DS-2002A	300	AG-CS
2.08	4″	300#	FB	RF	18455-019-PP-DS-2002A	450	AG-CS
2.09	2″	300#	FB	BW	18455-019-PP-DS-2002A	100	AG-CS
2.10	2″	300#	FB	BW	18455-019-PP-DS-2002A	60	UG-CS
2.11	2″	300#	FB	RF	18455-019-PP-DS-2002A	500	AG-CS

Part B: Globe Valve

S. No.	Size	Rating	Bore	Ends	Data Sheet No.	Qty.	Remarks
3.01	4″	300#	FB	RF	18455-019-PP-DS-2002B	50	AG-CS
3.02	2″	300#	FB	RF	18455-019-PP-DS-2002B	100	AG-CS

HC = Meant Carbon steel for High Temperature services.

BW = Butt welded, FB = Full Bore, AG = Above Ground, UG = Underground,

RF = Raised Face

Welding end, thickness of valves shall be as per the connecting pipe thickness.

5.0 NOTES

1. All valves (including all components) shall be designed and suitable for NG.
2. Design Data for the Project:
   - Pipeline Service : NG
   - Max Design Temp (Above Ground) : 65^{o}C
   - Max Design Temp (Under Ground) : 60^{O}c

- Design Pressure : 49 kg/cm²
- Min Design Temp : (-)29°C for CS/ (-)45°C for LTCS

3. Vendor shall submit Ball Valve body calculation based on design conditions and manufacturing requirements and submit necessary to company for approval.
4. The valves cover shall be bolted design, screwed connections are not acceptable;
5. Bidder shall submit Torque table along with the bid for actuated valves, if any.
6. All applicable field instruments such as pressure transmitters, pressure gauge etc. as applicable shall be under scope of supply.
7. 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 for CS/ (-) 45° C for LTCS with the impact test provisions of ASTM A 370.
8. Certification shall be EN-10204, type 3.2.
9. Globe Valve shall be designed as per BS 1873.
10. All Valves shall be fire safe.
11. Vendor shall Design Valve body and other pressure containing parts as per ASME Sec VIII Div-1, minimum wall thickness shall not be less than ASME B16.34.
12. 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.
13. Bidder shall quote separately spares for 2-year normal operation. List of spares quoted shall be furnished as per attached formats.
14. 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.
15. Delivery of Valves shall be at Client's designated storage yard and shall be in the Bidder's scope.
16. Bidder shall furnish quotation only in case he can supply material strictly as per this MR and specification/ data sheets forming part of MR.
17. 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).
18. 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.
19. Bidder must submit all documents/ drawings/ calculations as specified in relevant specification along with his offer and after award of order.

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

6.0 LIST OF ATTACHMENTS

1. Data Sheet - Ball Valve; Doc. No. 18455-019-PP-DS-2002A
2. Data Sheet - Globe Valve; Doc. No. 18455-019-PP-DS-2002B.
3. ITP – Ball Valve; Doc. No. IGL-ITP-PP-2007.
4. ITP – Globe, Gate, Check Valves; Doc. No. IGL-ITP-PP-2008.
5. Specification – Ball Valves; Doc. No. IGL-SS-PP-2004.
6. Specification – Assorted Valves; Doc. No. IGL-SS-PP-2504.
7. Standard specification for Painting; Doc. No.- IGL-SS-PP-2502
8. Standard Specification for Documents Required from Suppliers, Doc. No. IGL-SS -PP-2043.
9. Standard Specification for Quality Management System Requirement from Vendors, Doc No. IGL-SS-PP-2044.
10. Check List; Doc. No. IGL-SD-CK-001.
11. Compliance Statement; Doc. No.IGL-SD-CS-001.
12. Deviation Sheet; Doc. No. IGL-SD-DS-001.
13. Drawing & Document; Doc. No. IGL-SD-DD-001.
14. Instruction to Bidders; Doc. No. IGL-SD-ITB-001.
15. List of Spares; Doc. No. IGL-SD-LS-001.
16. Reference List; Doc. No. IGL-SD-RL-001.
17. Vendor Drawing Document Schedule; Doc. No. IGL-SD-VS-001.

	CLIENT : INDRAPRASTHA GAS LIMITED	TENDER NO : IGL/ET2/CP/CP18455
	PROJECT : CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI, UP, HARYANA & RAJASTHAN	DOC. NO.: 18455-000-PP-DS-2002A
	DATA SHEET OF FE/BW, ABOVEGROUND, MANUAL BALL VALVE DN 50 TO DN 300 (NPS 2" to NPS 12"), RATING 300# , PIPING CLASS - 30HC, SPLIT /WELDED BODY DESIGN	No. of Pages : 02 — Revision: C1 (08.01.2024)

Location	-	MR No.	18455-000-PP-MR-2003
SR.NO	#	P.O No.	#

1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requisition (MR) Item No: 1.01, 1.02, 1.03, 1.04, 1.05, 1.06 & 1.07**	
3		Company's Specification No.		**IGL-SS-PP-2004**	
4		Category		-	
5		Pipeline Line No		**Not Required**	
6		Class		**30 HC**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 300 (NPS 12")**	
8		Type of Valve		**Trunion Mounted, Double Block and Bleed, Antistatic, Vent Drain/ Flush Connection with Anti Blowout Stem, Split Body Design/ Fully Welded Body Design as specified in MR, Tight Shut Off (As Applicable)**	
9		Type of Port (Full/ Reduced)		**Refer Material Requisition (Doc. No- 18455-000-PP-MR-2003)**	
10		Design Temperature (° C)	Maximum	**65**	
11			Minimum	**-29**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**AboveGround**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**Refer Material Requistion (Doc. No- 18455-000-PP-MR-2003)**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends (As applicable)**	
17		Design Standards		**API 6D**	
18		End Connection Standard		**ANSI B16.5 for Flanged Ends (As applicable)/ ANSI 16.25 for Butt Welded Ends (As applicable)**	
19		ASME Class		**300#**	
20		Stem Extension Requirement		**Not Applicable**	
21		Length of Stem Extension		**Not Applicable**	
22		Orientation of Stem		**Perpendicular to Valve axis**	
23		Type of Valve Operator		**DN ≤ 100 mm (4") - Wrench / Lever - Pull Force 350N max. DN ≥ 150 mm (6") - Gear Operated**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**Refer Material Requistion (Doc. No- 18455-000-PP-MR-2003)**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Note-16) (Integrally welded to the BW valve on each side)		**Required for Welded End Valves, as per Ball Valve Specification**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness (Note-16)		**As per Piping Material Specification**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm²)		**49 kg/cm²**	
30		Hydrostatic Test Pressure (kg/cm²) & Time		**Body : 73.5 kg/cm² & Test Duration as per API 6D**	**Seat : 54 kg/cm² & Test Duration as per API 6D**
31		Pneumatic Test Pressure (kg/cm²) & Time		**7.0 kg/cm² & Test Duration as per API 6D**	
32		Charpy Impact Test (° C)		**Yes (at -29 °C)**	
33		Fire Safe Design (Note-24)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per API 6D Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-21)		**As per specification (Suitable for Highly Corrosive Environment) Note-21**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (° C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**Size 2" to 12"**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**300#**	
53		Piping Class		**30HC**	
54		Orientation of Pipe		**Suitable for all orientation**	

	CLIENT : INDRAPRASTHA GAS LIMITED	**TENDER NO : IGL/ET2/CP/CP18455**
	PROJECT : **CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI, UP, HARYANA & RAJASTHAN**	**DOC. NO.: 18455-000-PP-DS-2002A**
	DATA SHEET OF FE/BW, ABOVEGROUND, MANUAL BALL VALVE DN 50 TO DN 300 (NPS 2" to NPS 12"), RATING 300# , PIPING CLASS - 30HC, SPLIT /WELDED BODY DESIGN	**No. of Pages : 02** **Revision** C1 08.01.2024

Location	-	**MR No.**	**18455-000-PP-MR-2003**
SR.NO	#	**P.O No.**	#

55	**VALVE MATERIAL**	**Part Description**	**Material Specified**	**Material Offered (By Bidder)**
56		Body	**ASTM A216 GR. WCC/ASTM 105**	
57		Ball (Single Piece, Solid Construction)	**SS-304 / SS-316 (Solid) OR (ASTM A105/ ASTM A216 Gr. WCC) + 75 micron ENP**	
58		Seat Rings (No Casting)	**(AISI 4140 +75 micron ENP)/ AISI 410/ SS 304/ SS 316**	
59		Seat Seal	**Primary Devlon V/ PEEK/ Viton with Secondary Metal to Metal**	
60		Stem (No Casting)	**(AISI 4140 +75 micron ENP)/ AISI 410 / SS 304 / SS 316**	
61		Trunion	**ASTM A216 GR. WCC/ASTM 105**	
62		Stem Seal	**VITON/ PTFE**	
63		Body Seal	**VITON/ PTFE**	
64		Gland	**13% Cr. Steel/ SS 316 / SS 304**	
65		Stud Bolts/Nut	**ASTM A 193 Gr. B7/ ASTM A 194 Gr. 2H**	
66		Handle / Lever / Hand Wheel	**Carbon Steel**	

67	**DATA TO BE PROVIDE BY VENDOR (If Applicable)**	Valve Model No.		*
68		Flow Coefficient, Kv (Cubic Meters per Hour)		*
69		Valve Cavity Volume(CC)	Open position	*
70			Closed position	*
71		Operator Manufacturer / Model No.		*
72		Break-away Torque Under Max. Diff Pressure(Nm)		*
73		Running Torque (Open - Close/Close - Open) (Nm)		*

74	**NOTES**	**NOTES:**
75		1. Bidder to submit Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
76		2. This Data Sheet shall be read in conjunction with Piping Material Specification, valve Specification & other Tender Documents.
77		3. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
78		4. Manufacturer shall have valid API 6D license to use API monogram.
79		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
80		6. 100.0 % Valve castings shall undergo Radiographic Examination.
81		7. Valves shall have support foot & lifting lugs as per valve Specification.
82		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
83		9. Wrench operated valves shall be supplied with wrench.
84		10. The Charpy Impact temperature shall be -29°C as specified in data sheet and it shall superceded the Specification (IGL-SS-PP-2004) requirement at 0°C
85		11. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
86		12. 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 manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
87		13. 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
88		14. 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.
89		15. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24" and 450 for valve size above 24".
90		16. Adequacy for Length of pup piece/ Nipple shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment.These nipples shall be welded to the valve body by the manufacturer before fitting the packings, seats & seals.
91		17. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25
92		18. 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.
93		19. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
94		20. Stem extension length shall be finalized during drawing approval stage after award of order.
95		21. For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy(Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
96		22. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed". Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.
97		23. All Elastomereric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
98		24. Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.
99		25. Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.Vendor to guarantee the suitability of seat/ seal material for the given service condition
100		26. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.

	CLIENT : INDRAPRASTHA GAS LIMITED		TENDER NO : IGL/ET2/CP/CP18455
	PROJECT : CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI, UP, HARYANA & RAJASTHAN		DOC. NO.: 18455-000-PP-DS-2002B
	DATA SHEET OF FE, ABOVEGROUND, GLOBE VALVE DN 50 TO DN 200 (NPS 2" TO NPS 8"), RATING 300# , PIPING CLASS - 30HC	No. of Pages : 02	Revision: C1 / 08.01.2024

Location		-	MR No.	18455-000-PP-MR-2003
SR.NO		#	P.O No.	#
1	GENERAL	Valve Manufacturer		
2		Tag Numbers / Material Requisition Item No.	**Refer Material Requisition (MR) Item No: 2.01 & 2.02**	
3		Company's Specification No.	**IGL-SS-PP-2504**	
4		Category	**-**	
5		Pipeline Line No	**Not Required**	
6		Class	**30HC**	
7	DESIGN AND TEST REQUIREMENTS	Size	**DN 50 (NPS 2") to DN 200 (NPS 8")**	
8		Type of Valve	**Rising Stem**	
9		Type of Port (Full / Reduced)	**Not Applicable**	
10		Design Temperature (° C) – Maximum	**65**	
11		Design Temperature (° C) – Minimum	**-29**	
12		Corrosion Allowance (mm)	**1.5**	
13		Installation (Aboveground/Underground)	**Aboveground**	
14		Service	**Natural Gas (NG)**	
15		End Connection	**Refer Material Requistion (Doc. No- 18455-000-PP-MR-2003)**	
16		Flange Face Finish	**RF/125AARH for Flanged Ends (As applicable)**	
17		Design Standards	**BS 1873**	
18		End Connection Standard	**ANSI B16.5 for Flanged Ends (As applicable)**	
19		ASME Class	**300#**	
20		Stem Extension Requirement	**Not Applicable**	
21		Length of Stem Extension	**Not Applicable**	
22		Orientation of Stem	**Not Applicable**	
23		Type of Valve Operator	**As per Standard Specification**	
24		Valve Actuator Operating Time	**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)	**Refer Material Requistion (Doc. No- 18455-000-PP-MR-2003)**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Note-16) (Integrally welded to the BW valve on each side)	**Not Applicable**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness (Note-16)	**Not Applicable**	
28		Operator Specification No.	**Not Applicable**	
29		Valve Design Pressure (kg/cm²)	**49 (kg/cm²)**	
30		Hydrostatic Test Pressure (kg/cm²) & Time	**Body :73.5 (kg/cm²) barg & Test Duration as per code**	**Seat : 54 (kg/cm²) & Test Duration as per code**
31		Pneumatic Test Pressure (kg/cm²) & Time	**7.0 (kg/cm²) & Test Duration as per code**	
32		Charpy Impact Test (° C)	**Yes (at -29 °C)**	
33		Fire Safe Design (Note-24)	**API 6FA / ISO10497**	
34		Anti Static Testing Requirement	**As per BS-1873 Latest Edition**	
35		Hardness Test	**248 HV10 max**	
36		Painting (Note-17)	**As per specification (Suitable for Highly Corrosive Environment)**	
37		Operator Data Sheet No.	**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)	**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)	**Not Applicable**	
40		Temperature (Min/Nor/Max) (° C)	**Not Applicable**	
41		Max Shutoff DP (barg)	**Not Applicable**	
42		Viscosity (cP)	**Not Applicable**	
43		Density (Kg/m^3)	**Not Applicable**	
44		Mol . Wt	**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)	**Not Applicable**	
46		Compressibility (Z)	**Not Applicable**	
47		Ambient Temperature	**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)	**Size 2" to 8"**	
49		Thickness (mm) / Schedule	**As per Piping Material Specification**	
50		Pipe Material	**As per Piping Material Specification**	
51		Design Code	**ASME B31.8**	
52		ASME Rating	**300#**	
53		Piping Class	**30HC**	
54		Orientation of Pipe	**Suitable for all orientation**	

	CLIENT : INDRAPRASTHA GAS LIMITED	**TENDER NO : IGL/ET2/CP/CP18455**
	PROJECT : **CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI, UP, HARYANA & RAJASTHAN**	**DOC. NO.: 18455-000-PP-DS-2002B**
	DATA SHEET OF FE, ABOVEGROUND, GLOBE VALVE **DN 50 TO DN 200 (NPS 2" TO NPS 8"), RATING 300# , PIPING CLASS - 30HC**	**No. of Pages : 02** — **Revision** C1 / 08.01.2024

Location	-	**MR No.**	**18455-000-PP-MR-2003**
SR.NO	#	**P.O No.**	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	VALVE MATERIAL			
56		Body	**ASTM A216 GR. WCC/ASTM 105**	
57		Bonnet	**ASTM A216 GR. WCC/ASTM 105**	
58		Trim	**STELLITED-6**	
59		Disc & Seat Ring	**STELLITED-6**	
60		Stem	**13% Cr. Steel (No Casting)**	
61		Gland/ Stem Packing	**Graphited Asbestos with Sacrificial Corrosion Inhibitor & Inconel Wire Reinforcement**	
62		Body Stud	**ASTM A 193 Gr. B7**	
63		Body Nut	**ASTM A 194 Gr. 2H**	
66		Handle / Lever / Hand Wheel	**Carbon Steel**	

67	DATA TO BE PROVIDE BY VENDOR (if Applicable)	Valve Model No.		*
68		Flow Coefficient, Kv (Cubic Meters per Hour)		*
69		Valve Cavity Volume(CC)	Open position	*
70			Closed position	*
71		Operator Manufacturer / Model No.		*
72		Break-away Torque Under Max. Diff Pressure(Nm)		*
73		Running Torque (Open - Close/Close - Open) (Nm)		*

74	NOTES	**NOTES:**
75		1. This Data Sheet shall be read in conjunction with Tender Documents & Specifications.
76		2. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
77		3. All tests shall be carried out as per BS 1873 & BSEN 12266 part-1.
78		4. Gland packing assembly shall permit repair of gland packing under full line pressure.
79		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
80		6. 100.0 % Valve castings shall undergo Radiographic Examination.
81		7. Valves shall have support foot & lifting lugs as per valve Specification.
82		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
83		9. Wrench operated valves shall be supplied with wrench.
84		10. The Charpy Impact temperature shall be -29°C as specified in data sheet and it shall superceded the Specification (IGL-SS-PP-2004) requirement at 0°C
85		11. Design of Welded Valves shall be such that during field welding operation, the soft or plastic components of valve are not liable to be damages.
86		12. Gasket Material Graphite Shall Be Provided With Corrosion Inhibitor.
87		13. Valve wall thickness shall be as per ANSI B16.34.
88		14 .For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy (Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
89		15. Stem extension length shall be finalized during drawing approval stage after award of order.
90		16. For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy(Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
91		17. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.

INDRAPRASTHA GAS LTD.

STANDARD SPECIFICATION
FOR
PIPELINE BALL VALVES

IGL-SS-PP-2004

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

CONTENTS

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 ASME 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, latest edition (edition in force at the time of issue of enquiry), Specification for Pipeline and Piping 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 in force 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 and Slurries.
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 of 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)

SSPC-VIS-I	:	Steel Structures Painting Council Visual Standard- Guide and Reference Photographs for Steel Surfaces prepared by Dry Abrasive Blast Cleaning.

2.6 In case of conflict between the requirements of this specification, API 6D and the Codes, Standards and Specifications referred 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 shall be subjected to approval by Company. In addition, the material shall also meet the requirement specified hereinafter.

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

Non-metallic parts of the valves (including 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, fine grain practice.

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

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

3.4 Charpy V-Notch Test Requirements

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

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

For Carbon Steel, alloy steel & Stainless Steel (except Austenitic Grades) Materials, The impact test temperature shall be 0 °C or minimum design temperature indicated in valve

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

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

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

3.5 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/Low temperature 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 ASME Boiler & Pressure Vessel Code, Section VIII, Div 1 shall be used to design the valve body. Allowable stress requirements shall comply the provisions of above code. 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/ Material requisition.

4.3 Valve Body

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

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

4.4 Ball

Ball shall be of single piece, solid type construction.

4.5 Valve Bore Configuration

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

Full Opening Valve

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 of full bore butt-welded & flanged valves shall be in line with Connecting pipe as stated in valve data sheet or Valve MR, however in any case it shall not be less than the minimum required shown in Client Ball Valve specification & API 6D.

Reduced Opening Valve

The bore size of reduced bore valve shall correspond to that of a full-bore valve of smaller nominal diameter as indicated in Table- 4.5 below. For sizes of a particular rating not covered in API 6D, the bore size of the reduced bore valve shall be as per manufacturer`s Standard.

TABLE – 4.5

Nominal Valve Size	Nominal Valve Size for Reduced Bore	Nominal Valve Size	Nominal Valve Size for Reduced Bore
DN mm (NPS inches)	DN mm (NPS inches)	DNmm (NPSinches)	DNmm (NPS inches)
50 (2)	40 (1.5)	600 (24)	500 (20)

80 (3)	50 (2)	650 (26)	550 (22)
100 (4)	80 (3)	700 (28)	600 (24)
150 (6)	100 (4)	750 (30)	600 (24)
200 (8)	150 (6)	800 (32)	650 (26)
250 (10)	200 (8)	850 (34)	700 (28)
300 (12)	250 (10)	900 (36)	750 (30)
350 (14)	250(10)	950 (38)	800 (32)
400 (16)	300 (12)	1000 (40)	850 (34)
450 (18)	350 (14)	1050 (42)	900 (36)
500 (20)	400 (16)	1200 (48)	1050 (42)
550 (22)	450 (18)		

4.6 Seat Design

The valves shall either be a soft seated valve or metal seated valve or with primary metal-to metal contact and secondary soft seats or seat design shall be as indicated in valve data sheet.

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

For valves with primary metal to metal contact and secondary soft seats, O-rings or other seals if used for drip tight sealing shall be encased in a suitable groove in such a manner that it cannot be removed from seat ring and there is no extrusion during opening or closing operation of valve at maximum differential pressure corresponding to valve class rating. The seat rings shall be so designed as to ensure sealing at low as well as high differential pressures.

4.7 Valves shall be designed to withstand a sustained internal vacuum of at least 1 (one) 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 block valve and an internal non-return valve. Valve design shall have a provision to replace the sealant injection fitting under full line pressure. Location and arrangement of sealant points shall be as per Fig 4.9.

4.10 Vent & Drain

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.

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. The design of support foot shall be such that it shall take minimum double the weight of the valve assembly.

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

4.14 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"), 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.

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

For soft seated valves with Butt welded end, valves shall be provided with pup pieces on

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

4.15 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. For actuated valves, additionally mechanical means of position indicator shall be provided.

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. In case of below Ground LTCS valves, Stem extension material shall be equivalent to stem material.

c. Vent and drain connections and sealant injection lines shall be terminated adjacent to the valve operator by means of suitable piping anchored to the valve body. The pipe used shall be API 5L Gr. B/ ASTM A 106 Gr. B, with Sch 160 for carbon steel valves and ASTM A 333 Gr 6, with Sch 160 for Low temperature carbon steel valves or the material shall be as specified in valve data sheet. The material of fittings for Carbon Steel valve shall be ASTM A105/ ASTM A234 Gr. WPB and material for the fittings for low temperature carbon steel valves shall be ASTM A 350 Gr LF2 Cl 1 or the material shall be as specified in valve data sheet. The fittings and valve end shall be Socket welded ANSI class 6000# as per ASME B 16.11 (For piping class up to 600#) and BW end (For Piping Class 900#).

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

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

f. 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. The length of wrench shall not be longer than twice the face to face or end to end dimension of the valve. Each wrench operated valve shall be supplied with wrench. Valve design shall be such that damage due to malfunctioning of the operator or its controls will only occur in the operator gear train or power cylinder and that damaged parts can be replaced without the valve cover being removed.

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

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

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

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

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

4.21 WELDING

All welds shall be made by welders and welding procedures qualified in accordance with the provisions of ASME Section IX. The procedure qualification shall also include impact test and hardness test when required as per Clause 3.4 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. Heat treatment and radiography shall be repeated after the weld repair.

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

4.24 Wherever specified for the part of valve in valve data sheet, minimum thickness of stelliting shall be 1.6mm

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

4.26 Soft-seated valves shall have antistatic device.

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	≤ DN 600 mm (24")	Nil
	≥ DN 650 mm (26")	100%

ANSI 300 # Class	≤ DN 400 mm (16") ≥ DN 450 mm (18")	Nil 100%
ANSI 600 # Class and above	All sizes	100%

Radiography shall be performed after the final heat treatment also.

All castings shall be wet magnetic particle inspected 100% of the internal surfaces. Method and acceptance shall, comply with ASME 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 , 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 for both Shell & seat Test. 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 I, Para I.9 Type II) shall be carried

out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.

5.11 Valves shall be subjected to Operational Torque Test as per API 6D (Annex I, Para I.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 Anti-Static testing for soft seated valves in accordance with L.5 of API 6D.

5.16 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 SA-2 ½ / SSPC-SP10. For Coastal area, painting shall be suitable for industrial marine environment. For the valves to be installed underground, when indicated in Valve Data Sheet, the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy with a minimum dry film thickness of 1000 microns or
1.5 mm thick polyurethane coating.

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 name plate shall appear on all required documentation in accordance with EN 10204 3.2.

8.6 Name Plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25

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

8.8 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

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

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

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

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

c. Copy of valid API 6D Certificate.

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

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

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

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

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

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

10.3 Within 30 days from the approval date, Manufacturer shall submit to Company the approved drawings, documents and specifications as listed in clause 10.2 above.

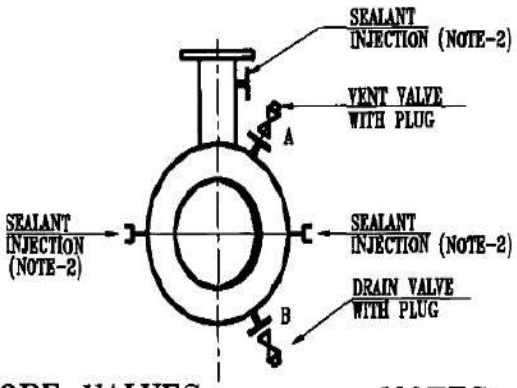
10.4 Prior to shipment, Manufacturer shall submit to Company following:

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

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

10.5 All documents shall be in English language only.

ABOVE GROUND INSTALLATION



FULL BORE VALVES

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

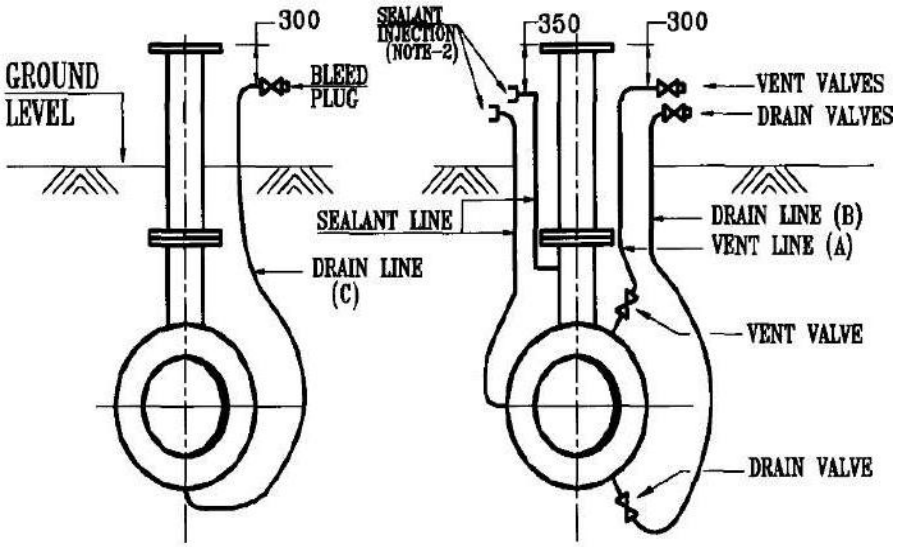
REDUCED BORE VALVES

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

NOTES:-

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

UNDERGROUND INSTALLATION



FULL BORE (FB) VALVES

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

REDUCED BORE (RB) VALVES

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

NOTES:-

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

2 SEALANT POINTS SHALL BE PROVIDED FOR FULL BORE VALVES OF NOMINAL VALVE SIZE 200 mm (8") & ABOVE AND REDUCED BORE VALVES OF NOMINAL VALVE SIZE, DN 250 mm (10") AND ABOVE ONLY. SEALANT LINES SHALL HAVE PROVISION TO REPLACE THE SEALANT INJECTION FITTING UNDER FULL LINE PRESSURE. SEALANT LINES SHALL HAVE BLOCK VALVE & INTERNAL NON RETURN VALVE.

3 ALL VENT/DRAIN CONNECTION IN BURIED SECTION SHALL BE OF WELDED CONSTRUCTION. ALL PIPING INCLUDING VALVE ENDS IN BURIED PORTIONS OF VENT & DRAIN SHALL BE WELDED TYPE.

FIGURE-4.9

INDRAPRASTHA GAS LTD.

STANDARD SPECIFICATION FOR ASSORTED VALVES

IGL – SS – PP - 2504

ABBREVIATIONS:

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

CONTENTS

1. GENERAL

1.1 Vendor shall supply valves in accordance with the valve specification sheets along with auxiliaries, if any, such as gear operator, bypasses, drains, locking arrangements etc. wherever specified in the specification sheets, subject notes and other enclosures to the material requisition (MR).

1.2 Vendor shall quote in strict accordance with the valve data/ specification sheets, subject technical notes and all other enclosures to the MR. For all valves, no deviations whatsoever shall be accepted.

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

2. DOCUMENTATION

2.1 For all valves, vendor shall submit the following documents with the offer:

2.1.1 Manufacturers complete descriptive and illustrative catalogue/ literature.

2.1.2 Detailed dimensioned cross section drawing with parts/ material lists, weight etc.

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

2.1.4 One copy of the valve specification sheets signed as "Accepted" by the manufacturer. Deviations, if any shall be marked as applicable on the valve specification sheet.

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

2.1.6 On failure to submit documents as specified in clauses 2.2.1 to 2.2.6 above, the offer is likely to be rejected.

2.2 The following documents shall be submitted in soft and hard copy after placement of the order.

2.2.1 For all valves to manufacturers' standard specified in MR/valve specification sheet, detailed dimensioned cross section drawing with parts, materials, weight, etc. shall be submitted for records/information/ review.

2.2.2 Test report shall be supplied for all mandatory tests as per the applicable code. Test reports shall also be furnished for any supplementary tests as specified in clauses 3.15.

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

2.3 Catalogues/Drawings (6 sets) shall be submitted in hard copies (6 sets) and soft copies (2 CDs/DVDs) along with delivery for Purchaser's record for all categories/ types of valves.

3. DESIGN AND CONSTRUCTION

3.1 Valve shall be designed, manufactured, tested, inspected and marked as per the manufacturing standards, design codes and standards indicated in the respective valve specification sheets. Any conflict between the requisition, enclosures, specification

sheets and referred standards/ codes shall be brought to the notice of the purchaser for clarifications and resolution, before proceeding with the manufacture. The purchaser's decision shall be final and binding to the vendor. The drawings submitted for review shall not include any deviations except as communicated in writing in Deviation permits. The Drawings shall be reviewed only for design and construction features.

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

Stock Finish	:	1000 p. in AARH max.
125 AARH	:	Serrations with 125 to 250 p in AARH
63 AARH	:	32 to 63 p. in AARH

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

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

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

3.4 For flanged valves with ring joint flanges the hardness shall be as follows:

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

3.5 Following requirements for check valves shall be met over and above the valve specification sheet requirements:

3.5.1 Unless specified otherwise in the data sheet all check valves 3" & above (except in 900#, 1500# & 2500# rating) shall have a drain boss at location "G" (Refer Fig.No.1 of ASME B16.34) where pocket is formed in valve body. A tapped drain hole with plug shall be provided as per ASME B 16.34. Threads shall be as per ASME B 1.20.1 (Taper) NPT.

3.5.2 For heavy check valves, provisions shall be available for lifting by way of lugs, eye bolts and other such standard devices.

3.6 If an overlay weld-deposit is used for the body seat ring seating surface, the corrosion resistance of the seat ring base material shall be at least equal to the corrosion resistance of the material of the shell.

3.7 Following valve bypass requirements shall be met:

3.7.1 By-pass requirement for Gate valves shall be as follows unless otherwise mentioned.

ASME 150 Class	On sizes 26" and above
ASME 300 Class	On sizes 16" and above
ASME 600 Class	On sizes 6" and above
ASME 900 Class	On sizes 4" and above
ASME 1500 Class	On sizes 4" and above
ASME 2500 Class	On sizes 3" and above

3.7.2 The by-pass piping arrangement shall be such that clearance between main valve body and bypass assembly shall be the minimum possible for layout reasons. Vendor shall follow the sketch enclosed in this Specification No. SS-PI-012_A1.

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

On main valve <= 4"	:	1/2"
On main valve 6" to 8"	:	3/4"
On main valve 10" & above	:	1"

By-pass piping shall be of same metallurgy as main valve. The by-pass piping, fittings and valve tag numbers shall be as specified in Piping Material Specification (PMS).

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

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

3.10 Stem shall be forged or machined from forged / rolled bar. No casting is permitted. However, integral stem of cast material is acceptable for Plug valves.

3.11 Stelliting/ hardfacing by deposition shall be minimum 1.6 mm.

3.12 Renewable seat rings shall be seal welded for valves of size 3" and above to prevent loosening in service.

3.13 For Low Temperature & Cryogenic valve requirements, refer Specification. No. SS-PI-012_A2 unless otherwise specified.

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

3.14.1 ASTM A262 Practice 'B' with acceptance criteria of '60 mils/year (max.)' for all

materials forged, rolled, wrought and casting.

Or

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

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

3.14.3 For the IGC test as described in Clauses 3.15.1 & 3.15.2, two sets of samples shall be drawn from each solution annealing lot. One set shall correspond to the highest Carbon content and the other to the highest pressure rating. When testing is conducted as per practice `E', of the microscopic structure shall be submitted for record.

3.15 All types of 321 or 347 stainless steel valves shall be in a stabilized heat treated condition. Stabilizing heat treatment shall be carried out subsequent to the normal solution annealing. Soaking temperature and holding time for stabilizing heat treatment shall be 900°C and 4 hours respectively.

3.16 Spiral wound bonnet gaskets are to be provided with inner/ outer ring except when encapsulated gaskets type body-bonnet joints are employed. Outer ring may be avoided case of non-circular spiral wound gasket used in 150# valve provided the outermost layer of spiral touches the bolts ascertaining the centering.

3.17 All Stainless Steel Castings shall be solution heat treated.

3.18 Only normalized and tempered material shall be used in the following specifications:

Castings	:	A217 Gr.WC1, A217 Gr.WC4, A217 Gr.WC5, A217 Gr.WC6, A217 Gr.WC9, A217 Gr.C5, A217 Gr.C12
Forgings	:	A182 Gr.F11 C1.2, A182 Gr.F12 C1.2

3.19 Ball / Plug / Butterfly Valves

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

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

3.19.3 Soft-seated ball, plug & butterfly valves shall be supplied with antistatic devices.

3.19.4 BW / SW end ball valves shall have pipe nipple/ pup piece welded to each end of the valve. As specified in valve datasheets nipples/ pup piece are to be welded prior to assembling Teflon seats / seals. Specifications of the nipples shall be as indicated in the MR.

3.19.5 The face-to-face dimensions of all ball valves shall be same as those of gate valves of the corresponding ANSI class (except 10" onwards in Class 150 where the face-to-face dimensions shall be as per API 6D long patterns).

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

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

150#	8" & below 10" & above	Floating ball Trunnion mounted
300#	4" & below 6" & above	Floating ball Trunnion mounted
600# & above	1.5" & below 2" & above	Floating ball Trunnion mounted

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

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

3.21 Ends of flanged valves of 22" size shall match corresponding flanges to MSS-SP44 unless otherwise specified.

3.22 Yoke material shall be same as bonnet material where maximum temperature specified is more than 427°C.

4. OPERATION

4.1 Gear operation shall be provided as under:

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

For sizes lower than these ranges, hand wheel / lever / wrench shall be provided. For pressure balance plug valves manufacturer's recommendation shall be acceptable provided the requirements specified in clause 4.6 are met.

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

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

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

4.5 Ball, plug and butterfly valves, shall have "Open" position indicators with limit stops.

4.6 Hand wheel diameter shall not exceed 750mm and lever length shall not exceed 500mm on either side. Effort to operate shall not exceed 35 Kg at hand wheel periphery. However, failing to meet the above requirements, vendor shall offer gear operated valve and quote as per clause 4.3.

5. INSPECTION AND TESTING

5.1 Every valve shall be subjected to all the mandatory tests and checks called in the respective codes/ data sheet by any third party as approved by the purchaser. For IBR valves refer clause 7.0.

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

5.3 Though the extent of inspection shall be as under, exact extent withhold points shall be decided by company/ company representative and recorded in the form of inspection plan. In case of third party inspection, the inspection plan shall be approved by the purchaser.

Forged Valves:

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

Cast Steel Valves:

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

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

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

6. RADIOGRAPHY OF CAST VALVES

6.1 Valve castings shall undergo radiographic examination as specified below.

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

* No radiography is required for valves of size 26" and above in cooling water service.

**For sizes 24" & below in 150# and 16" & below in 300#, radiography percentage if specifically mentioned in individual valve material spec sheet shall govern.

Radiography specified as random 10% or 20% etc. in the respective valve data sheet implies 10% or 20% etc. of number of valves ordered against each item number with a minimum of one valve against each item.

6.2 Radiography procedure, areas of casting to be radiographed shall be as per ASME B 16.34 and acceptance criteria shall be as per ASME B 16.34 Annexure-B. However for areas of casting to be radiographed for types of valves not covered in ASME B 16.34, vendor shall radiograph castings in line with ASME B 16.34.

6.3 For random radiography wherever specified in individual data sheets, the sampling shall be per size of the quantity ordered for each foundry.

6.4 Radiography wherever specified in the data sheets or as per clause 6.1 shall be done by X-ray / Gamma-ray to get the required sensitivity.

7. IBR CERTIFICATION

7.1 For valves described "IBR", valves shall be in accordance with the latest IBR (Indian Boiler Regulation) including the requirements specified in the specification.

7.2 For SW / BW end carbon steel valves under IBR, the chemical composition shall conform to the following:

Carbon (Max) : **0.25%**

Others (S, P, Mn) : **As per IBR**

7.3 Valves coming under the purview of "IBR"(Indian Boiler Regulations) shall each be individually accompanied by IBR certificate original in Form III-C duly approved by IBR authority / local authority empowered by the Central Boiler Board of India. Photocopy

of original certificate duly attested by the local boiler inspector where the supplier is located is the minimum requirement for acceptance.

7.4 All "IBR" valves shall be painted red in body-bonnet / body-cover joint.

8. MARKING

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

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

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

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

9. DESPATCH

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

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

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

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

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

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

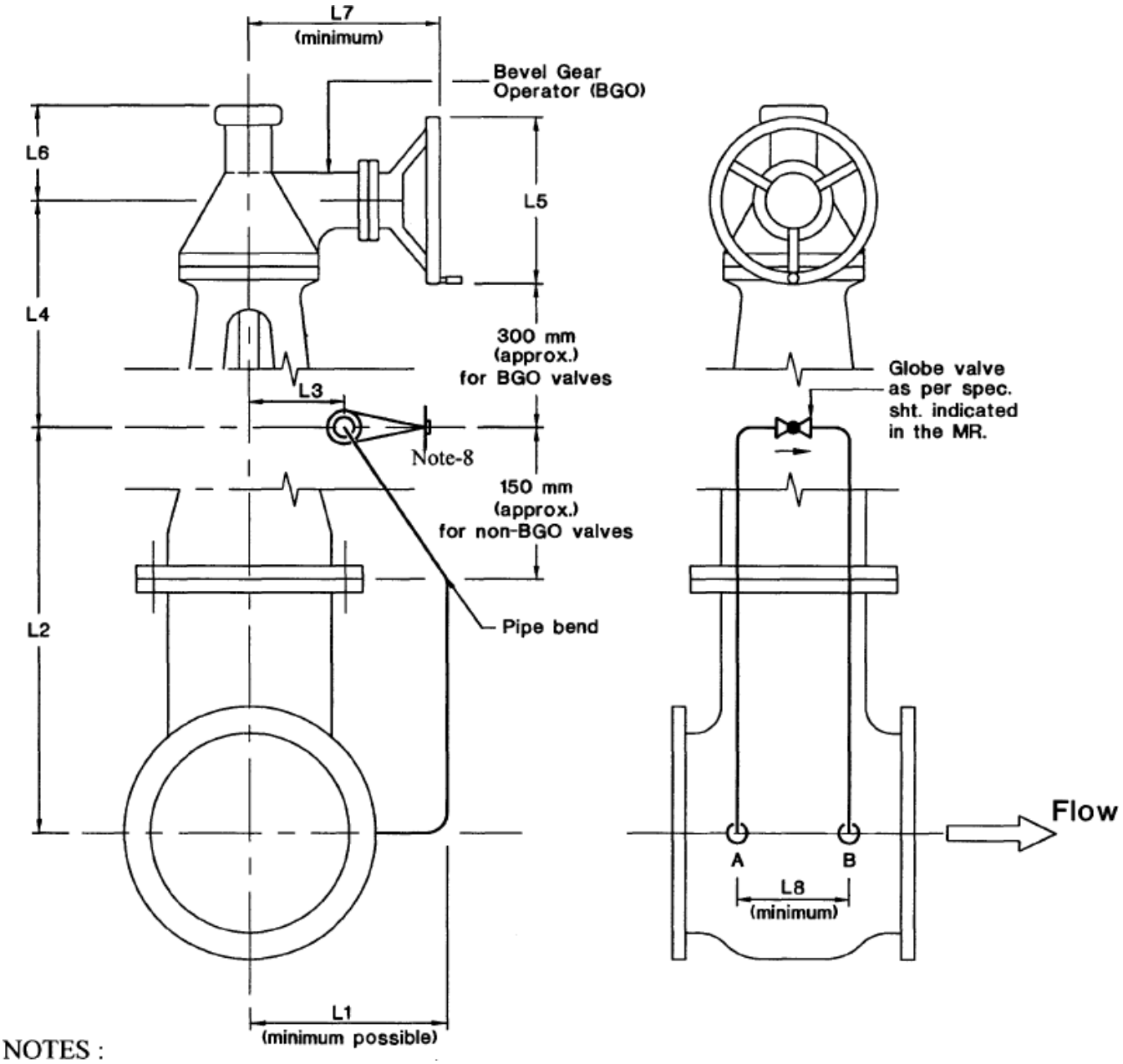
9.6 End protectors to be used on beveled end shall be securely and tightly attached.

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

10. ATTACHMENTS

SS-PI-012_A1	:	Bypass Piping Arrangement
SS-PI-012_A2	:	Special Requirements for Low Temperature and Cryogenic Valves

BYPASS PIPING ARRANGEMENT
(SS-PI-012-A1)



NOTES :

1. The orientation & location of hand wheel of bevel gear operator & the bypass arrangement shall be strictly as per this sketch.
2. The bypass connection ends shall be socket welded up to 600# and butt welded for 900#and above rating.
3. The bypass arrangement shall be properly clamped to & supported by the body of the main valve.
4. Basic design of bypass shall be to MSS-SP-45.
5. Material of bypass pipe & 90° elbows shall be same or equivalent to the body material.
6. Sketch is applicable for both BGO & NON-BGO Valves.

7. Vendor shall furnish dimensions L1 to L8.

8. Stem shall not be horizontal in the case of CRYO Valves

SPECIAL REQUIREMENTS FOR LOW TEMPERATURE & CRYOGENIC VALVES (SS-PI-012-A2)

11. SCOPE

All valves of Low Temperature Carbon Steel (LTCS) and all grades of austenitic (CRYO) materials are categorized as cryogenic valves. All these valves shall have extended bonnet as per BS 6364 except check valves.

Following qualification criteria shall be met by the valve vendors to quote valves for cryogenic services:

12. QUALIFICATION CRITERIA

I. Both cryogenic test (clause 2.1) and reference list (clause 2.2) together shall be for vendor qualification and vendor shall furnish the same, along with his offer.

II. Vendors who do not have cryogenic test reports and reference list covering valves of all materials and ratings required by MR, should confirm / furnish the following for consideration of their offer:

a. Evidence of having conducted successfully at least one cryogenic test as per BS 6364. Test certificate shall be furnished with the offer.

b. Vendor shall confirm to conduct cryogenic test per clauses 2.1 & 2.3 for the remaining valves not later than 12 weeks from the date of purchase order.

c. Vendor shall also furnish reference list for valves supplied for non-cryo service if reference list referred in 2.2.1 does not cover all the sizes of MR.

Offers of vendors who do not comply with above requirements would be rejected.

12.1 Cryogenic Test

Vendors to furnish copies of cryogenic test certificate for tests conducted as per given below:

12.1.1 Test shall be as per BS 6364.

12.1.2 Test temperature, unless specifically called for otherwise in the individual MR, shall be
-45°C for LTCS and -196°C for all grades of austenitic stainless steel.

12.1.3 Tests carried out on a particular size of one type of valve, pressure rating and material shall qualify all sizes equal to and below the test valve size for the same type, pressure rating and material. In case of austenitic SS any one grade would qualify for all other grades of austenitic SS.

12.1.4 Tests should have been witnessed and certified by approved third party inspection agencies.

12.1.5 Cryogenic test need not be conducted for every order. Test conducted previously and witnessed by inspection agencies listed above shall be considered acceptable and need not be repeated.

12.2 Reference List

Vendor shall furnish reference list for valves supplied for cryogenic service indicating the name of client, year of supply, size, material, pressure rating, type of valve and quantity.

12.3 Post Order Testing Procedure

12.3.1 Before conducting post order testing, vendor shall submit the following for approval:

a. Test procedure (as per BS 6364).

b. Cross-section drawing of the valve with material of construction.

c. Schematic of test rig (as per BS 6364) with complete details.

12.3.2 Test has to be conducted irrespective of the service on largest size for each type of valve and for each material and class rating. Vendor shall offer one, two or three valves for selection of test valve by inspector depending upon whether quantity of largest valve in the order is one, two or three and more than three respectively.

In the event of failure of the test valve to meet the specification requirements, the vendor shall conduct test on two more valves. These two valves which pass test successfully, are of lower size, then the qualification will be valid only to sizes upto which test has been conducted successfully.

12.3.3 In case of non-conductance of cryogenic test(s) within 12 weeks or failure in the test(s) conducted after receipt of order, the owner reserves the right to invoke any of the of the purchase order including cancellation of the purchase order at the risk and cost of vendor.

13. Bonnet extension, wherever specified in the valve sheet to BS 6364 shall be for "non cold box application" unless otherwise specified in the MR. Even if not called for in valve sheet, valves indicated as "LT" or "CRYO" shall be supplied with bonnet extension.

14. Bonnet and Gland extension joints shall be of butt welded/integrally cast construction.

15. Repair welding procedure for austenitic stainless steel valves in "CRYO" service shall have to be qualified for impact test as per ASME B31.3. Minimum acceptable impact energy shall be 20 J or lateral expansion of 0.38 mm at temperature of -196°C.

16. Wherever impact test of SS studs / nuts is called for in the data sheet, the impact value shall be 27 J at the intended service temperature specified in the data sheets.

INDRAPRASTHA GAS LTD.

INSPECTION AND TEST PLAN FOR BALL VALVE

IGL – ITP – PP – 2007

ABBREVIATIONS:			
CE	Carbon Equivalent	NDT	Non-Destructive Testing
DCN	Dispatch Clearance Note	PO	Purchase Order
DFT	Dry Film Thickness	PQR	Procedure Qualification Record
DPT	Dye Penetrant Testing	PR	Purchase Requisition
HT	Heat Treatment	RT	Radiography Testing
ITP	Inspection and Test Plan	TC	Test Certificate
IC	Inspection Certificate	TPI or TPIA	Third Party Inspection Agency
IGC	Inter Granular Corrosion	UT	Ultrasonic Testing
IR	Inspection Report	VDR	Vendor Data Requirement
IRC	Inspection Release Certificate	WPQ	Welders Performance Qualification
MPT / MT	Magnetic Particle Testing	WPS	Welding Procedure Specification
MTC	Material Test Certificate		

LEGENDS:
H - Hold (Do not proceed without approval)
W – Witness (Give due notice, work may proceed after scheduled date)
P - Perform
R - Review
RW - Random Witness [As specified or 10% (min.1 no. of each size and type of Bulk items)]

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 VENDOR	VENDOR	TPIA
1.0	**PROCEDURES**							
1.1	Hydrostatic Test, NDT and Other Procedures	Documented Procedures	100%		Procedure Documents	-	H	R
1.2	WPS,PQR & WPQ	Welding Parameters & Qualification Record	100%		WPS ,PQR & WPQ	-	H	W- New R- Existing
1.3	Pre-Qualification Tests	Fire safe, Cryogenic & Other Test as applicable	As per PR/Purchase Specification		Acceptance Report	-	H	H (If new)
2.0	**RAW MATERIAL**							
2.1	Forging / Casting: 1) Body 2) End Piece 3) Ball 4) Seat Ring 5) Pup Piece (as applicable)	Visual & Dimension	100%	Material & Technical Specification	Inspection Report	H	H	-
		Chemical: Chemical Analysis IGC (For SS component)	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
		Mechanical: Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	W (Note-1)

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS / METHOD OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT & ACCEPTENCE CRITERIA	FORMAT OF RECORD	SCOPE OF INSPECTION		
						SUB VENDOR	VENDOR	TPIA
		Impact Test (@ - 29°C): for CS Impact Test (@ - 45°C): for LTCS	All Heats	Material & Technical Specification / ASME B 16.34	Test Report	H	R	W (Note-1)
		Non-Destructive Examination (NDT): Radiography (100% Critical Area)	100%	Material & Technical Specification /ASME B 16.34	RT Report	H	R (RT-Film review)	R (RT-Film review)
		Non-Destructive Examination (NDT): Magnetic Particle Examination (100% exterior & accessible interior)	100%	Material & Technical Specification /ASME B 16.34	MPI Report	H	R	R
		ENP (For Ball): Visual, Thickness & Hardness	100%	25 microns (min) & 50 HRC (min)	Vendor Test Certificate	H	R	R
3.0	**INCOMING / BOF ITEMS**							
3.1	Stem	Chemical: Chemical Analysis	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
		Mechanical: Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
3.2	Fasteners	Chemical: Chemical Analysis	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
		Mechanical: Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
		Impact Test (@ - 29°C): for CS Impact Test (@ - 45°C): for LTCS	All Heats	Material & Technical Specification /ASME B 16.34	Test Report	H	R	R
3.3	Gaskets, Gear units, Gland, Packings, etc.	Physical / Chemical Properties	100%	Material & Technical Specification	Test Certificates& Lab Report	H	R	R

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS / METHOD OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT & ACCEPTENCE CRITERIA	FORMAT OF RECORD	SCOPE OF INSPECTION		
						SUB VENDOR	VENDOR	TPIA
4.0	**MACHINED COMPONENTS**							
4.1	Body, Connector, Ball & Seat Ring	Surface examination & Dimension Inspection: Visual & Measurement	100%	Manufacturer's Drawing	Inspection Reports	100%	R	R
5.0	**IN-PROCESS**							
5.1	Body & Connector joint welding	Non-Destructive Examination (NDT): Magnetic Particle Examination (MPI)	100%	ASME Sec VIII - Appendix V & VI	MPI Report	100%	R	R
5.2	Valve & Pup Piece Bevel Ends joint welding	Non-Destructive Examination (NDT): Radiography (100% on weld joint)	100%	ASME B16.34	RT Report	100%	R (RT-Film review)	R (RT-Film review)
6.0	**FINAL INSPECTION**							
6.1	Finished Valve Assembly: Pressure Test & Final Inspection	Shell Test: Hydrostatic	100%	Testing Procedure as per Code	Test Record	-	H	RW
6.2		Seat Test: Hydrostatic				-	H	RW
6.3		Seat Test: Pneumatic				-	H	RW
6.4		Functional Test - Actuated Valve @ Atm. Pressure & Max. Diff. Pressure: Operation- Open / Close				-	H	RW
6.5		Double Block & Bleed: Hydrostatic				-	H	RW
6.6		Final Inspection: Visual, Dimension, TC Verification, Special Requirements & Marking as per sale order	100%	Approved GA Drawing (if applicable)	Test Report	-	H	RW
6.7		Anti-Static Test	100%	API 6D & Technical Specification	Test Record	-	H	RW

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS / METHOD OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT & ACCEPTENCE CRITERIA	FORMAT OF RECORD	SCOPE OF INSPECTION		
						SUB VENDOR	VENDOR	TPIA
6.8		Fire Safe Test	100%	API-6FA / ISO-10497	Fire safe type test report	-	H	R
6.9	Final Stamping	Stamping Of Accepted Valves	Stamping of Valves which are witnessed by IGL/TPIA	As per Tender Specification	Inspection Report	-	H	H
6.10	Strip Test	Component integrity, PMI of BOM	One per size per rating	-	Test report	H	H	H
7.0	**PAINTING & PACKING**	Surface examination & DFT Inspection: Visual & Measurement	100%	As per Tender Specification	Painting Record	-	H	R
8.0	**DOCUMENTATION & INSPECTION CERTIFICATE(IC)**	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	As per Tender Specification	Vendor TC & IC	-	H	H
9.0	**FINAL DOCUMENTATION & SUBMISSION OF REPORTS**	Compilation of IR/IRC/DCN/MTC/DRGS./VDR	100%	EN 10204 type 3.2/3.1 certification as specified in valve datasheet (Note-1)	Compliance Certificate	-	H	-

NOTES (As applicable):

1. If the certification is specified as EN 10204 Type 3.1 in Data sheet / Material Requisition, then '**W**' may be replaced with '**R**' with Material Traceability.

2. ITP shall be submitted including but not limited to the item/activity covered above. Any item/activity identified and required for the completeness shall also be covered in the ITP submitted by the manufacturers.

INDRAPRASTHA GAS LTD.

INSPECTION AND TEST PLAN
FOR
GATE/GLOBE/CHECK VALVES

IGL –ITP –PP –2008

ABBREVIATIONS:			
CE	Carbon Equivalent	NDT	Non-Destructive Testing
DCN	Dispatch Clearance Note	PO	Purchase Order
DFT	Dry Film Thickness	PQR	Procedure Qualification Record
DPT	Dye Penetrant Testing	PR	Purchase Requisition
HT	Heat Treatment	RT	Radiography Testing
IC	Inspection Certificate	TC	Test Certificate
IR	Inspection Report	TPI or TPIA	Third Party Inspection Agency
IRC	Inspection Release Certificate	UT	Ultrasonic Testing
ITP	Inspection and Test Plan	VDR	Vendor Data Requirement
MPT/MT	Magnetic Particle Testing	WPQ	Welders Performance Qualification
MTC	Material Test Certificate	WPS	Welding Procedure Specification

LEGENDS:
H - Hold (Do not proceed without approval)
W - Witness (Give due notice, work may proceed after scheduled date)
P - Perform
R - Review
RW - Random Witness [As specified or 10% (min.1 no. of each size and type of Bulk items)]

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 VENDOR	VENDOR	TPIA
1.0	**Procedure**						
1.1	Hydrostatic Test, 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

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
2.0	**Material Inspection**						
2.1	Castings & Forgings (Body, Bonnet, Disc, Stem, Body ring)	Chemical, Mechanical, Heat Treatment, NDT & Other Properties as applicable	100%	Test Certificates	H	R	W (Note-1)
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 (RT-Film review)	R (RT-Film review) (Note-1)
2.4	Bars for Trim material	Chemical Analysis	Each Heat	Test Certificates& Lab Report	H	R	R
2.5	Gaskets, Gear units, Fasteners, Gland, Packings, etc.	Physical / Chemical Properties	100%	Test Certificates& Lab Report	H	R	R

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
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	R
3.2	Machining of components	Visual / Dimension	100%	Inspection Reports	-	H	-
4.0	**Final Inspection**						
4.1	Hydrostatic / Pneumatic Test	Hydrostatic Test – Shell Pneumatic Test – Seat & Back Seat	As per PR / Purchase Specification	Test Report	-	H	RW
4.2	Visual / Dimension	Surface & Dimension Check	100%	Test Report	-	H	RW
4.3	Final Stamping	Stamping Of Accepted Valves	Stamping of Valves which are witnessed by TPIA.	Inspection Report	-	H	H

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
4.4	Strip Test	Component integrity, PMI of BOM	One per size per rating	Test report	H	H	H
5.0	**Painting**						
5.1	Painting and Colour coding as applicable	Visual / DFT Check	100%	Inspection Report	-	H	R
6.0	**Documentation & IC**						
6.1	Documentation & Inspection Certificate (IC)	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	Vendor TC & IC	-	H	H
7.0	**Final Documentation & Submission of Reports**	Compilation of IR/IRC/DCN/MTC/DRGS. /VDR	100%	Compliance Certificate (Note-1)	-	H	-

NOTES (As applicable):

1. If the certification is specified as EN 10204 Type 3.1 in Data sheet / Material Requisition, then '**W**' may be replaced with '**R**' with Material Traceability.

2. ITP shall be submitted including but not limited to the item/activity covered above. Any item/activity identified and required for the completeness shall also be covered in the ITP submitted by the manufacturers.

INDRAPRASTHA GAS LIMITED

CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI, UTTAR PRADESH, HARYANA & RAJASTHAN

MATERIAL REQUISITION FOR SPLIT TEE

TABLE OF CONTENTS

1.0 INTRODUCTION

INDRAPRASTHA GAS LTD. (IGL) plans to augment the PNG Network. It supplies natural gas to domestic & commercial consumers in the city of Delhi, Uttar Pradesh, Haryana and Rajasthan.

IGL is now inviting tenders on Domestic Competitive Bidding basis for procurement of Carbon Steel Fittings, Flanges, Insulating Joints, Valves & Other Misc. Items for this project.

The present document covers the technical specifications for the enquiry.

2.0 PURPOSE

This document is to define the scope of supply, which shall cover Design, engineering, manufacture, inspection, testing at manufacturer's works, packing, transportation/ shipping, Handling, delivery of Split Tee, as per this material requisition, including supply of documentation/ drawings as per the enclosed specifications and other codes and standards enclosed or referred for City Gas Distribution project in NCT of Delhi, NCR, Haryana, Uttar Pradesh and Rajasthan.

3.0 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. Data Sheets (DS)
b. Material Requisition (MR)
c. 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.)

4.0 SCOPE OF SUPPLY

Design, procurement of materials and bought out components, manufacture, assembly at shop, inspection, testing at manufacturer's works, packing, delivery of Split Tee (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.

S.no	Description of Split Tee	Qty. (No.)
1.01	8" x 4", 300#, Reduced Branch, Full Encirclement Type, Butt Welded End	5
1.02	8" x 6", 300#, Reduced Branch, Full Encirclement Type, Butt Welded End	3

1.03	12" x 4", 300#, Reduced Branch, Full Encirclement Type, Butt Welded End	6
1.04	12" x 6", 300#, Reduced Branch, Full Encirclement Type, Butt Welded End	3

5.0 NOTES

1. All split tee shall be used for NG services. Accordingly, all necessary tests as per tender specification shall be applicable.
2. Bidders may be either split tee & stopple tee manufacturer or may procure the same from any other reputed Split Tee and Stopple Tee manufacturer. However, in any case, successful bidder has to submit the Past Track Record (PTR) of split tee and stopple tee manufacturer for approval.
3. Bidder must submit duly filled up and signed data sheets, compliance statement, check list etc. along with his offer. In the absence of this information, Purchaser reserves the right to reject bidder's offer without any reference to bidder in this regard.
4. Design Data for the Project are:
   - Pipeline Service : NG
   - Max Design Temp (Above Ground) : 65°C
   - Min Design Temp : (-)29°C for CS/ (-)45°C for LTCS
5. All materials shall be, Charpy V-notch tested for each heat of steel. Test shall confirm to the provisions of ASTM A-370 and at temp of (-)29°C for CS/ (-)45°C for LTCS.
6. Certification shall be EN-10204, type 3.2.
7. Vendor shall check all calculations of split tee based on design conditions and manufacturing requirements and submit necessary documents to company for approval. Vendor must submit all documents for review within 07days after the placement of PO/LOA by IGL
8. Vendor shall furnish the allowable forces and moments for the axial, lateral and transverse (i.e. x, y and z directions) along with Bending and transverse forces for review.
9. Delivery of split tee shall be at Client's designated storage yard and shall be in the 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. Bidder must submit all documents for review within 07days after the placement of PO/LOA by IGL.

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

6.0 LIST OF ATTACHMENTS

1. Data Sheet for Split Tee Doc. No. 18455-000-PP-DS-2002
2. ITP for Split Tee. IGL-ITP-PP-2023
3. Specification for Split Tee Doc No. IGL-SS-PP-2041
4. Painting Specification Doc. No. IGL-SS-PP-2502
5. Check List, Doc. No. IGL-SD-CK-001.
6. Compliance Statement, Doc. No. IGL-SD-CS-001.
7. Deviation Sheet, Doc. No. IGL-SD-DS-001.
8. Drawing & Document, Doc. No. IGL-SD-DD-001.
9. Instruction to Bidders, Doc. No. IGL-SD-ITB-001.
10. List of Spares, Doc. No. IGL-SD-LS-001.
11. Reference List, Doc. No. IGL-SD-RL-001.
12. Vendor Drawing Document Schedule, Doc. No. IGL-SD-VS-001.

INDRAPRASTHA GAS LIMITED

CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI, UTTAR PRADESH, HARYANA & RAJASTHAN

DATA SHEET FOR SPLIT TEE

S. No.	DESIGN DATA FOR SPLIT TEE (8" x 4", 8" x 6", 12" x 4" & 12" x 6" (300#))	
1	Type of Fitting	8" x 4", 8" x 6", 12" x 4" & 12" x 6" Split Tee,Reduced Branch, Full Encirclement Type, Butt Welded End.
2	ANSI Rating	300#
3	Quantity	As per M.R.
4	Pipeline Design Code	ASME B31.8
4.1	Reference Codes & Standards	ASME B16.9, MSS-SP-75 & B16.25 ASME SECTION-VIII, DIV-I
5	Design Pressure	49 kg/cm^2
6	Design Temperature (°C)	(-) 29 to 65°C
7	Corrosion Allowance (mm)	1.5
8	Design Factor	0.5
9	Butt Weld Ends	Beveled as per MSS-SP-75/ B16.25
10	PWHT	In accordance with code requirement (*)
11	Test Pressure	Min 1.5 x Specified Design Pressure. Strength test to be carried out after the fitting being welded to the pipeline without buckling the mother pipe. Please check the buckling calculation as per ASME SEC VIII div.1 that mother pipe will withstand test pressure.
12	Existing (Run) Pipeline Details (on which hot tapping to be carried out)	**Outside Dia** / **Thickness** / **Material** 8" / 6.4 mm / API 5L X52, HFW/SMLS 12" / 6.4 mm / API 5L X60, HFW/SMLS
13	Connecting Branch Pipeline Details	N.A.
14	Type of Valve to be used on Split Tee	Ball valve, Full Bore
15	Product handled	Natural Gas
16	Sleeve, OD (mm)	(*)
17	Sleeve, thickness (mm)	(*)
18	Sleeve, Length (mm)	(*)
19	Branch, Thickness (mm)	(*)
20	Fitting Height (Center line to run pipe to flange top) (mm)	Shall be suitable for making Hot Tapping using tapping machine.
21	Weight of Split Tee (Kg)	(*)
22	Hardness Test	248 HV10 max.
23	Charpy Impact Test @ Temperature	Required @ (-)29°C

MATERIAL REQUIREMENT			
S. No.	**Part Description**	**Specified Material**	**Offered Material By Bidder**
1	Full Encirclement sleeves – Top Portion	ASTM A860 WPHY-42/ Parent Pipe Material or Equivalent	(*)
2	Full Encirclement sleeves – Bottom Portion	ASTM A860 WPHY-42/ Parent Pipe Material or Equivalent	(*)
3	Branch	ASTM A860 WPHY-42/ Parent Pipe Material or Equivalent	(*)

Notes:

1. Design calculation for CLIENT/ PMC approval & Data/ Dimensions as marked (*) shall be provided by Vendor/ Manufacturer.
2. Split Tee shall be manufactured, tested, and supplied in compliance with Job Specification, Doc. No. IGL-SS-PL-2041.
3. Fitting thickness shall be calculated based on pressure corresponding to ANSI 300# and considering design code B16.5, design factor and corrosion allowance indicated above. Calculation in this respect shall be submitted by vendor for review/ approval of purchaser/ consultant.
4. Requirement of impact test and hardness shall be in compliance with Codes & Standards.
5. Vendor shall submit Inspection & Test Plan for approval within two weeks from the date of issuance of LOI/ FOA.
6. Material of Construction (MOC) of Split Tee shall be such that post-weld heat treatment/ stress relieving are not required after welding of Split Tee on pipeline.
7. Flow through Lock-O-Ring assembly shall allow full flow into branch line and shall allow pigs to cross the branch opening smooth & unobstructed in the main pipeline.
8. Manufacturer shall possess the records of a successful proof test, in accordance with the provisions of ASME B16.9/ MSS-SP-75. These records shall be submitted at the time of bidding.
9. Material test reports shall be as per EN 10204, type 3.2.

INDRAPRASTHA GAS LTD.

STANDARD SPECIFICATION
FOR
SPLIT TEE

IGL-SS-PP-2041

CONTENTS

1.0 SCOPE

This specification covers the basic requirements for the design, manufacture and supply of carbon steel split tees as hot tap material to be installed in pipeline system for handling hydrocarbons in liquid or gaseous phase.

2.0 REFERENCE DOCUMENTS

2.1 Reference has also been made in this specification to the latest edition of the following codes, standards and specifications:

a) ASME B 31.4: Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia and Alcohols.

b) ASME B 31.8: Gas Transmission and Distribution Piping System

c) ASME B 16.9: Factory made wrought steel butt-welding fittings.

d) ASME B 16.25: But Welding Ends

e) ASME Sec. VIII: Boiler & Pressure Vessels Code-Rules for the construction of Pressure vessels.

f) ASME Sec. IX : Boiler & Pressure Vessel Code-Welding & Brazing Qualifications.

g) ASTM A 370: Mechanical Testing of Steel Products

h) MSS-SP-53 : Quality Standard for Steel Castings and Forgings for Valves, Flanges and fittings and other Piping components and - Magnetic Particle Examination Method.

i) MSS-SP-75: Specification for High Test Wrought Butt Welding Fittings

j) API 1104: Specification for Welding Pipeline and Related Facilities

k) SSPC-VIS-1: Steel Structures Painting Council

2.2 In case of conflict between the requirements of this specification and any code, Standard and Specification referred in Clause 2.1 above. Order of precedence shall be as follows:

- Data Sheets
- This Specification
- Other Referred Codes & Standards
- Manufacturer's Standard.

3.0 MANUFACTURER'S QUALIFICATION

Manufacturer who intends bidding for fittings must possess the records of a successful proof test, in accordance with the provisions of ASME B16.9/ MSS-SP-75. These records shall be submitted at the time of bidding when specified in data sheet.

4.0 MATERIALS

4.1 The basic materials required for manufacturing of split tees have been indicated in the data sheet. Other additional materials required for manufacturing split tees shall be as per manufacturer's standard suitable for the service conditions indicated in data sheet and shallbe subjected to approval by Purchaser.

4.2 Fully killed Carbon steel shall be used in the manufacture of split tees.

4.3 Each heat of steel used for the manufacture of pressure containing parts of the flow tees shall have carbon equivalent (CE) not greater than 0.45 calculated from the check analysis in accordance with the following formula.

$$CE = C + Mn/6 + (Cr+Mo+V)/5 + (Ni +Cu)/15$$

Carbon content on check analysis shall not exceed 0.22%.

4.4 When specified in Data sheet, Charpy V-notch test shall be conducted for each heat of steel used in manufacture of split tee. Test shall conform to the provisions of ASTM A-370 and at a temperature of 0°C. The Charpy impact test specimen shall be taken in the direction of principal grain flow and notched perpendicular to the original surface of the plate or forging. The average impact energy values of three full sized specimens shall be 27 joules, unless indicated otherwise in the data sheets:

Minimum impact energy value of any one specimen of the three specimens analyzed shall not be less than 80% of the average impact energy specified. No specimen shall exhibit less than 80% shear.

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

4.5 When specified in the data sheet, hardness test shall be carried out as per ASTM A 370 for each heat of steel used. A full thickness cross section shall be taken for this purpose and the maximum hardness of base metal, weld metal and HAZ of all pressure containing parts shall not exceed 248 HV10, unless otherwise specified.

5.0 DESIGN AND CONSTRUCTION REQUIREMENTS

5.1 Split tees shall be designed and manufactured in accordance with the provisions of codes and standards referred in Section 2.0 of this specification. Design factor and corrosion allowance indicated in data sheet shall be taken into account for design of split-tees.

5.2 Split tees shall meet following requirements as minimum:

a) Sleeves shall be designed to meet pressure & reinforce requirements of ASME Codes.

b) Fittings shall be manufactured with controlled carbon equivalent for its welding in harsh outside environments.

c) Split tee shall be of full branch or reducing branch & meet the requirement for fittings with hot tap machine.

5.3 Butt weld ends shall be beveled as per MSS-SP-75/ B16.25.

5.4 Split tees shall be manufactured by hot drawn, full branch/ reduced branch opening, snug-fitting sleeve or fabricated full size nipple, branch outlet welded to snug-fittings sleeve.

5.5 All welds shall be made by welders and welding procedures qualified in accordance with ASME Section-IX. The welding procedure qualification test shall include charpy impact test and hardness test and shall meet the requirements of clause 4.4 and 4.5 of this specification respectively.

5.6 Repair by welding on parent metal is not allowed. Repair of welds shall be carried out only after specific approval by Purchaser's Representative for each repair. The repair welding shallbe carried out by the welders and welding procedures duly qualified as per ASME Section-IX and records for each repair shall be maintained.

6.0 INSPECTION AND TESTS

6.1 The manufacturer shall perform all inspections 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:

6.1.1 All split tees shall be visually inspected.

6.1.2 Dimensional checks shall be carried out as per the approved drawing.

6.1.3 Chemical composition and Mechanical properties shall be checked as per MSSSP-75 and this specification for each heat of steel used.

6.1.4 Non destructive examination of individual split tees shall be performed as given below:

a) 100% inspection by radiography shall be carried out on all pressure containing welds on fittings. Acceptance limits shall be as per API 1104.

b) Welds which in Purchaser's Representative's opinion cannot be inspected by radiographic methods shall be checked by ultrasonic or magnetic particle methods. Acceptance criteria shall be as per ASME Section VIII Appendix-12 and Appendix-6 respectively.

c) All finished weld ends shall be 100% ultrasonically tested for lamination type defects for a distance of 50mm from the end. Any lamination larger than 6.35mm shall not be acceptable.

d) All forgings shall be wet magnetic particle examined on 100% of the forged surfaces.

Method and acceptance shall comply with MSS-SP-53.

6.2 Purchaser's Representative shall also perform stage wise inspection and witness tests as indicated in clause 6.1 at manufacturer's works prior to shipment. Manufacturer shall give reasonable notice of time and shall provide without charge reasonable access and facilities required for inspection, to the Purchaser's Representative.

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

7.0 TEST CERTIFICATES

7.1 Manufacturer shall submit following certificates to Purchaser's Representative:

a) Test certificates relevant to the chemical analysis and mechanical properties of the materials used for construction as per this specification and relevant standards.

b) Test reports on radiographic and ultrasonic inspection and wet magnetic particle examination.

c) Certificates for each split tee stating that it is capable of withstanding without leakage for a test duration of 15 minutes and test pressure which results in a hoop stress equivalent to 95% of the specified minimum yield strength.

d) Test reports on heat treatment carried out.

8.0 PAINTING, MARKING AND SHIPMENT

8.1 Split tees entire surface shall be thoroughly cleaned, freed from rust and grease and applied with sufficient coats of corrosion resistant paint, after all the required tests have been performed and accepted by Purchaser's Representative. The surface preparation shall be carried out by shot blasting to SP 6 in accordance with "Steel Structures Painting Council - Visual Standard -SSPC-VIS-1"

8.2 Manufacturer shall indicate the type & recommended coats of corrosion resistant paint used, in the drawing submitted for approval.

8.3 Split tees shall be marked with indelible paint with the following data:

a) Manufacturer's Name

b) Nominal diameter in mm D1 x D2

c) End thickness in mm T1 x T2

e) Material

8.4 Split tees shall be suitably protected to avoid any damage during transit. Metallic or high impact plastic bevel protectors shall be provided for weld ends.

9.0 WARRANTY

Purchaser will be reimbursed by Manufacturer for any Split tee furnished to this specification which fails under field hydrostatic testing and if such failure or non-performance is caused by a defect in the Split tees which is outside the acceptance limits of this specification. The reimbursement cost shall include cost of Split tee, labor and equipment rental for finding, excavating, cutting, and installation of replaced Split tee in position.

10.0 DOCUMENTATION

10.1 At the time of bidding, bidder shall submit the following documents: -

a) General arrangement drawing of split tees with overall dimensions and Cross sectional drawings.

b) Reference list of previous supplies of split tees of similar specification

c) With relevant details viz Project, Year of supply, Client, size, Rating and service for the last five years.

d) Clause wise list of deviation from this specification, if any.

e) Records of successful proof test for tees qualifying the range of sizes Quoted.

f) Brief description of the manufacturing, heat treatment and quality control facilities of the manufacturer's work.

g) Quality Assurance Plan (QAP) enclosed with this tender duly signed, stamped and accepted.

10.2 Within two weeks of placement of order, the manufacturer shall submit four copies, of but not limited to, the following drawings, documents and specifications for approval.

a) Fabrication drawings and relevant calculations for pressure containing parts.
b) Calculation for fittings thickness.
c) Method of manufacture, welding procedure and heat treatment details.
d) Quality control Manual.

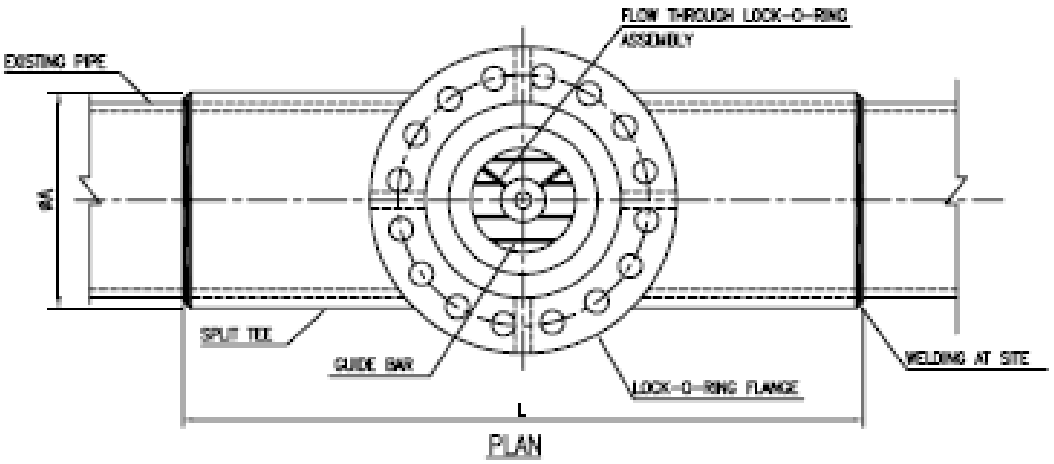
Once the approval has been given by Purchaser, any change in design, material method of manufacture shall be notified to Purchaser whose approval in writing of all changes shall be obtained before the Split tees are manufactured.

10.3 Within four weeks from the approval date Manufacturer shall submit one reproducible and six copies of the approved drawings, documents and specification as stated in clause 10.3 of this specification.

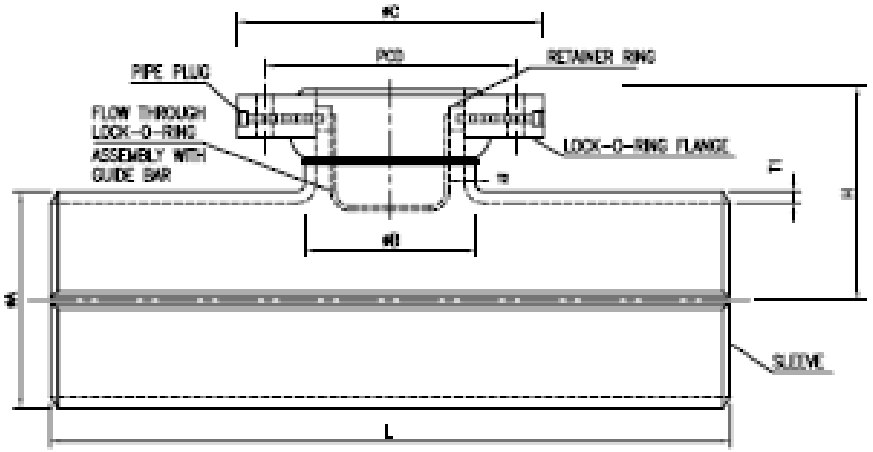
10.4 Prior to shipment, Manufacturer shall submit one reproducible and six copies of test certificates as listed in clause 7.0 of this specification.

10.5 All documents shall be in English Language.

Attachment



PLAN



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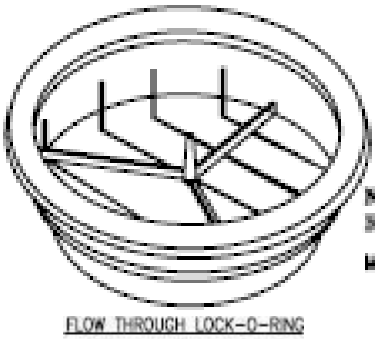


FLOW THROUGH LOCK-O-RING
ASSEMBLY WITH GUIDE BAR

INDRAPRASTHA GAS LTD.

INSPECTION AND TEST PLAN
FOR
SPLIT TEE
IGL – ITP – PP – 2023

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Split Tee.

2.0 REFERENCE DOCUMENTS:

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

3.0 INSPECTION AND TEST REQUIREMENTS:

SL. No.	OPERATION	CHARACTERISTICS	QUANTUM OF CHECK	REFERENCE DOCUMENT	FORM OF RECORD	TYPE OF CHECK	SCOPE OF INSPECTION		
							VENDOR	TPIA	PMC
1.0	**RAW MATERIAL**								
1.1	SLEEVES & FLANGES Chemical / Physical / Impact test (@ -29°C)	Verification of size marking & correlation with mill TC	100%	Applicable codes & approved drawing	Mill TC or check test reports, if any	Visual, dimensions, verification of marking with MTC & check test, if any All material requires 302 certification as per BS EN 10204.	R	W	R
2.0	**IN PROCESS**								
2.1	Sleeve to Flange set up	Verification of form, shape, size and thickness.	100%	As per ANSI, ASME codes, approved drawings. & applicable spec	Stage Inspection Report	Visual, dimensions, verification of profile & dimension	R	W	R
3.0	**WELDING**								
3.1	WPS/ PQR / WPQ	Approved WPS / PQR / WPQ	100%	ASME SEC IV / IX	WPS / PQR / WPQ	Witnessing welding & testing	P	W	R
3.2	Heat Treatment	Normalising, quenching, tempering	100%	Applicable codes & approved drawing	HT Records	Visual & review Certification as per EN 3.2	P	W	R

3.3	Machining	Verification of size	100%	Applicable codes & approved drawing	Internal Inspection	Visual & dimension	P	W	R
3.4	Cleaning & Finishing	Mechanical de-scaling	100%	Applicable codes & approved drawing	-	Visual	P	W	R
3.5	Marking	Material Spec., Heat No., Lot No., Size Vendors monogram	100%	Applicable codes & approved drawing	-	Visual	P	R	R
4.0	**DESTRUCTIVE TESTING**								
4.1	Impact Test a) Parent material b) weld metal c) HAZ	Mechanical Strength	100%	ASTM A 370, Client Spec & Approved drawing	Laboratory report	Witness / Scrutiny of reports	P	W	R
4.2	Micro Test & Hardness a) Parent material b) weld metal c) HAZ	Mechanical Strength	100%	ASTM A 370, Client Spec & Approved drawing	Laboratory report	Witness / Scrutiny of reports	P	W	R
5.0	**NON - DESTRUCTIVE TESTING**								
5.1	Butt Weld UT shall be carried out at bevel ends up to 50 mm. MPT shall be carried out at welds.	Review of 100% Radiography, UT & MPT testing	100%	API 1104	Radiograph report and radiographs UT / MPT Reports	Review of radiograph and Visual	P	R & W (100%) W	R
5.2	Fillet Weld	DPT, MPT	100%	API 1104	DPT / MPT Reports	Visual	P	W	R
6.0	**HYDROTEST**	1.5 x Design Pressure	100%	Client Spec	Hydro test report & Graph	Witnessing Hydro Test	P	W	R
6.1	Leak Test Inspection	7 bar/ 15 minutes	100%	Applicable code	Test Report	Visual	P	W	R

7.0	**FINAL INSPECTION**								
7.1	Completeness, Dimension, Workmanship & Finish	Checking for dimensions, surface finish, marking, stamping	100%	Approved Drawings	Final offer list and other relevant documents	Visual and Dimensions	P	R	R
7.2	Final Painting, Field Joint Coating& Quality Doc.	Checking for colour code, dimensions, surface finish, marking	100%	Approved Drawings	Final offer list and other relevant documents	Verification	P	R	R
7.3	Packing List & Dispatching	Packing suitably to avoid transit Damages marking each carton, for proper identification.	100%	Client PO & Spec	LR, Invoice, Challan / despatch file etc.	Verification	P	R	R
ABBREVIATION: V: VISUAL, R: REVIEW, P: PERFORM, N: NORMALISING, D: DIMENSION, LR: LABORATORY REPORT, W: WITNESS, H: HOLD, TPIA: THIRD PARTY INSPECTION AGENCY, IRN: INSPECTION RELEASE NOTE									

NOTES:

1. Calibration Measuring & Testing Instruments shall be used with valid calibration certificate; such calibration certificate shall be produced at the time of inspection.
2. Material and type shall be as per tender Specifications / Data Sheet.
3. TPIA to issue 3.2 Certificate, as per EN 10204 SPEC.
4. Supplementary Conditions: If any, as per PO shall be fulfilled.
5. For Split Tee QAP/ ITP along with GAD & Mechanical Design Calculation shall be submitted for Client approval.
6. Strength / leak test shall be performed at site as per approved Hot Tap Procedure.
7. For all materials grain size shall be 8 or finer as per ASTM E-112.
8. Start & stop temperature of the heat treatment chart shall be signed by the TPIA along with power failure log.

INDRAPRASTHA GAS LIMITED

CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI, UTTAR PRADESH, HARYANA & RAJASTHAN

MATERIAL REQUISITION FOR Y - STRAINER

TABLE OF CONTENTS

1.0 INTRODUCTION

INDRAPRASTHA GAS LTD. (IGL) plans to augment the PNG Network. It supplies natural gas to domestic & commercial consumers in the city of Delhi, Uttar Pradesh, Haryana and Rajasthan.

IGL is now inviting tenders on Domestic Competitive Bidding basis for procurement of Y-Strainer, Carbon Steel Fittings, Flanges, and Insulating Joints & Other Misc. Items for this project.

The present document covers the technical specifications for the enquiry.

2.0 PURPOSE

This document is to define the scope of supply, which shall cover Design, engineering, manufacture, inspection, testing at manufacturer's works, packing, transportation/ shipping, Handling, delivery of Y-strainer, as per this material requisition, including supply of documentation/ drawings as per the enclosed specifications and other codes and standards enclosed or referred for City Gas Distribution project in NCT of Delhi, NCR, Haryana, Uttar Pradesh and Rajasthan.

3.0 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. Data Sheets (DS)
b. Material Requisition (MR)
c. 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.)

4.0 SCOPE OF SUPPLY

Design, procurement of materials and bought out components, manufacture, assembly at shop, inspection, testing at manufacturer's works, packing, delivery of Y-strainer (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.

Description of Strainer	Qty. (No.)
4"(Inlet)×4"(outlet), 300#, Y-strainer with filter & Drain plug	70

5.0 TECHNICAL NOTES

1. All Y-strainer shall be used for NG services. Accordingly, all necessary tests as per Data sheet, inspection test plan & tender specification shall be applicable.
2. Bidders may be Y-strainer manufacturer or may procure the same from any other reputed Y- strainer manufacturer. However, in any case, successful bidder has to submit the Past Track Record (PTR) of split tee and stopple tee manufacturer for approval.
3. Bidder must submit duly filled up and signed data sheets, compliance statement, check list strainer calculations, GA drawing & Material schedule list etc. along with his offer. In the absence of this information, Purchaser reserves the right to reject bidder's offer without any reference to bidder in this regard.
4. Design Data for the Project are:
   - Pipeline Service : NG
   - Max Design Temp (Above Ground) : 65°C
   - Min Design Temp : (-)29°C for CS/ (-)45°C for LTCS
5. Y-strainer with its larger body & sizable strainer elements it shall provide with excellent open area ration that is typically two & half times larger than corresponding pipelines.
6. Vendor shall give provision of differential pressure Gauge taps and ¼ '' NPT Plugs are standard only on sizes of strainer.
7. Face to face values have a tolerance of ±0.06 in (±2.0 mm) for sizes 10" and lower and a tolerance of ±0.12 in (±3.0 mm) for sizes 12" and larger.
8. Bidder to calculate standard screen calculation based on fluid media & open area % which shall review details during detail engineering.
9. Bidder shall refer detail engineering & Pressure-temperature rating of Y-strainer from reference code ASME/ANSI B16.5.
10. Certification shall be EN-10204, type 3.2.
11. Vendor shall check all calculations of Y-strainer based on design conditions and manufacturing requirements and submit necessary documents to company for approval.
12. Vendor shall furnish the allowable forces and moments for the axial, lateral and transverse (i.e. x, y and z directions) along with Bending and transverse forces for review.
13. Vender shall furnish the all torque required for flanges, fasteners & fasteners class for review.
14. Delivery of Y-strainer shall be at Client's designated storage yard and shall be in the Bidder's scope.
15. All CS body y-strainer are epoxy painted to resist rust & corrosion and for details refer Data sheet & painting specifications.

16. Strainer are individually, hydrostatically tested at 1.5 × 100°F rating round off next higher 25 psi.
17. Bidder shall furnish quotation only in case he can supply material strictly as per this MR and specification/ data sheets forming part of MR.
18. 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).
19. 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.
20. Bidder must submit all documents/ drawings/ calculations as specified in relevant specification along with his offer and after award of order. Bidder must submit all documents for review within 07days after the placement of PO/LOA by IGL.
21. Purchaser's inspector reserves the right to perform stage wise inspection and witness tests, as indicated in specification for 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.

6.0 LIST OF ATTACHMENTS

1. Data Sheet for Y-strainer Doc. No. 18455/0/ME/DS/3001
2. ITP for Y-strainer Doc. No. IGL-ITP-ME-3001
3. Painting Specification Doc. No. IGL-SS-PP-2502
4. List of Recommended TPIA.
5. Check List, Doc. No. IGL-SD-CK-001.
6. Compliance Statement, Doc. No. IGL-SD-CS-001.
7. Deviation Sheet, Doc. No. IGL-SD-DS-001.
8. Drawing & Document, Doc. No. IGL-SD-DD-001.
9. Instruction to Bidders, Doc. No. IGL-SD-ITB-001.
10. List of Spares, Doc. No. IGL-SD-LS-001.
11. Reference List, Doc. No. IGL-SD-RL-001.
12. Vendor Drawing Document Schedule, Doc. No. IGL-SD-VS-001.

INDRAPRASTHA GAS LIMITED

CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI, UTTAR PRADESH, HARYANA & RAJASTHAN

DATA SHEET FOR Y - STRAINER

CLIENT:	INDRAPRASTHA GAS LIMITED
PROJECT NO:	18455
DOCUMENT TITLE :	MECHANICAL DATA SHEET FOR Y-STRAINER (PNG PIPELINE)
DOCUMENT NO:	18455/0/ME/DS/3001

UNIT : Y-strainer — **TAG No.** : XXXXX

EQUPMENT NAME : XXXX — **QUANTITY** : XXXXX

SERVICE : NATURAL GAS — **P&ID REFERENCE** : XXXXX

PDS REF. XXXXX — **OPERATION** : CONTINUOUS / INTERMITTENT

OPERATING & GENERAL CONDITIONS

Y - TYPE STRAINER / ORIENTATION	~	Horizontal / vertical (if any space constraints)
QUANTITY / TAG NO. / PHILOSOPHY	Nos.	As per Bill of Quantity
SERVICE FLUID	~	Natural gas
LIQUID TO BE REMOVED	~	Particulate matters+ Iron sulphides + pipe scales + Solid contaminates
TYPE OF Y-STRAINER	~	Y-Type strainer with drain Plug
SPECIFIC GRAVITY OF NATURAL GAS @ STP	~	0.62
COMPRESSABILITY FACTOR	~	0.8983
DENSITY @ P,T…	kg/m3	38.259
DESIGN CODE	~	ASME B31.3 & ASME B31.1
STANDARD PRESSURE & TEMPERATURE	Bar(a) / ℃	1.013 / 15.56℃
OPERATING PRESSURE	Kg/cm2 g	49.96
DESIGN PRESSURE	Kg/cm2 g	75.0
DESIGN TEMPERATURE (MIN. / MAX.)	℃	~29 to 65 ℃
OPERATING TEMPERATURE (MIN. / MAX.)	℃	15 ~ 44 ℃
END CONNECTION	~	RF Flange 4" (300 #)
COVER FLANGE	~	BLIND FLANGE WITH DRAIN
STRAINER ELEMENT SIZE	mm2	#
MESH OPEN AREA	%	#
MESH HOLES PER SQUARE INCH(HPSI)	~	#
MESH HOLES DIA.	mm	#
INLET & OUTLET SIZE OF Y-STRAINER	Inch	4" Inlet & 4" Outlet
DRAIN CONNECTION (BLOW OFF PLUG)	~	1-1/2" NPT(F) with Plug
ALLOWABLE PRESSURE DROP (CLEAN / 50 % CLOGGED OR DIRTY)	Kg/cm2 g	0.1 / 0.25
MESH FILTERATION EFFICIENCY	%	Up to 5 Microns
ANSI PRESSURE CLASS	PSI	300 #

DESIGN CONSIDERATION

DESIGN STANDARD	ASME B16.4, B16.9, B16.11, B16.20, B18.2.1, B18.2.2,ASME B31.3 & B31.1	DESIGN PRESSURE	75.0 kg/cm2
ANSI PRESSURE RATINGS	300 #	DESIGN TEMPERATURE	~29 to 65℃
NO.OF HOLE PER SQUARE INCH(HPSI)	#	FLOW CO-EFFICIENT (C_V)	260
END CONNECTION	ANSI B 16.5 300# RF	SHELL WALL THICKNESS	ANSI B16.34
HYDROSTATIC TEST PRESSURE	1.3 × Design Pressure	VISUAL & DIMESIONAL EXAMINATION TEST	MSS-SP-55/API 1104

MATERIAL OF CONSTRUCTION

ITEM DESCRIPTION	MATERIAL GRADE	ITEM DESCRIPTION	MATERIAL GRADE
BODY & FLANGE	ASTM A 216 Gr.WCB	EXTERNAL GASKETS	SS-316 SPIRAL WOUND, TEFLON OR GRAPHOIL FILLED, 4.5MM THK., CS OUTER RING
COVER FLANGE	ASTM A105	STRAINER ELEMENTS	5 MICRONS (GLASS FIBER/SS316)
STUD BOLTS & NUTS	ASTM A193-B7 / ASTM A194 2H (HOT DIP GALVANISED)	INTERNAL GASKETS/ O-RING IF ANY	#(VENDOR SHALL SPECIFY SUITABLE FOR NATURAL GAS APPLICATION)

DIMESNIONS & OTHER DETAILS

FACE TO FACE DISTANCE(INCLUDE RAISED FACE)	#	APPROX. ASSEMBLY WEIGHT	#
MESH SCREEN REMOVAL LENGTH	#	ORDERING CODE	#
STRAINER CENTRE LINE TO BOTTOM DISTANCE	#	PAINT GRADE / COLOR	RAL (#) / BLACK
STRAINER CAPCITY FOR NATURAL GAS @ HPSI	#	SPARE	1 Nos. Strainer Mesh screen & 1 Nos. gasket & 1 nos. Drain Plugfor Each Y-strainer
DIAMETER OF PERFORATION	#	THK. OF SIEVE SHEETS	#

NOTES

 # MARK INDICATES THAT VENDOR SHALL PROVIDE THE DATA DURING DETAIL ENGINEERING & FINAL APPROVAL PROCESS

1. VENDOR TO CONFIRM THE PRESSURE DROP AT CLEAN & AT 50% CLOGGEED CONDITION.
2. UNLESS OTHERWISE STATED, ALL TESTS WILL BE WITNESSED BY THE PURCHASER/CONTROL AUTHORITY.
3. VENDOR TO PROVIDE PRELIMINARY DRAWINGS ALONG WITH STRAINER ELEMENT REMOVABLE SPARE DETAILS & WEIGHT OF STRAINER.
4. ARROW SHOULD BE SHOWN ON Y-STRAINER FOR FLOW DIRECTION
5. INSPECTION & TESTING TO BE DONE AS PER API 598.
6. VENDOR TO PROVIDE Y-STRAINER CALCULATION SHEET INCLUDING PRESSURE DROP, MESH OPEN AREA, PERFORATED OPEN AREA & FREE STRAINING AREA CALCULATION DURING DETAIL ENGINEERING
7. ALL FLANGE BOLT HOLES SHALL BE OFF CENTERED & EQUISPACED TO PRINCIPAL AXIS.

INDRAPRASTHA GAS LTD.

INSPECTION AND TEST PLAN
FOR
Y- STRAINER

IGL-ITP-ME-3001

ABBREVIATIONS:			
CE	Carbon Equivalent	NPSH	Net Positive Suction Head
DFT	Dry Film Thickness's	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

LEGENDS:
H - Hold (Do not proceed without approval)
W - Witness (Give due notice, work may proceed after scheduled date)
P - Perform
R - Review
RW - Random Witness [As specified or 10% (min.1 no. of each size and type of Bulk items)]

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Y-STRAINER

2.0 REFERENCE DOCUMENTS:

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

2.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	TPIA
1.0	**Procedures**						
1.1	Hydrostatic Test, Heat Treatment, NDT and other Procedures	Documented Procedures	100%	Procedure Documents	~	H	R
1.2	WPS, PQR & WPQ	Documented Procedures	100%	Procedure Documents	~	H	W- New R- Existing
2.0	Material Inspection (Raw Material / Bought Out Items)						
2.1	Flanges, Body cover, Cap end, Perforated Sheet, Mesh, Gaskets, fasteners etc.	Chemical, Physical and other properties as per purchase specification	100%	Mill Test Certificates	H	H	R
2.2	Hydro Test	Complete assembly for integrity of castings	100%	As per Data & Manufacturer Test procedure	H	H	W

2.3	Check of General appearance / cleanliness and overall dimensions	Visual & dimensional	100%	As per Manufacturer drawings & data	H	H	W

SL. NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	TPIA
3.0	Strainer Material Identifications & Markings	Visual	100 %	As per Manufacturer drawings & data	H	H	W
4.0	Strainer Heat treatment Record Review	Review of documents	100 %	As per Manufacturer procedure & data	H	H	R
5.0	Strainer ferrite & Alloy verification check	Review of documents	100 %	As per Manufacturer procedure & data	H	H	R
6.0	Non-destructive testing Casted Components	RT, UT, MT, PT when as applicable	100%	NDT Report	~	W	R
		Hardness Test (as applicable)	100%	Test Report	~	W	R
		HT (as applicable)	100%	HT Graph & record	~	W	R
		Test coupon, if applicable	100%	Test Report	~	W	W

		Visual & Dimensional Inspection (Min. Thickness, Profile, Ovality etc.)	100%	Test Report	~	H	W
7.0	Strainer surface preparation prior to painting, coating, lining	Visual	100%	DFT report & paint procedure	~	H	W

SL. NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	TPIA
8.0	Strainer final visual inspection (including Painting (color & thickness), coating, preservation, lining, picking, nameplate, tagging, marking, and Aux items like spare parts, bolts, etc.)	Visual	100%	Approved Data sheet, DFT report & paint procedure	~	H	W
9.0	Documentation & IC						
10.0	Documentation & Inspection Certificate (IC)	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	Manufacturer TC & IC	~	H	H
11.0	Final Document submission	Compilation of Inspection reports, drawings,etc. as per VDR / PR	100%	Final data folder / Completene	~	H	H

				ss certificate			

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 item]),R - Review,
W - Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable):

1. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also beapplicable (unless otherwise agreed upon).
2. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in /Job Specification /Approved Documents.

Name / Sign / Stamp	Name / Sign / Stamp	Name / Sign / Stamp
Prepared By (Vendor's QC Dept.)	Checked By (Vendor's QC HOD)	Approved By (Client/PMC)

INDRAPRASTHA GAS LTD.

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

IGL-PP-SS-2036

CONTENTS

1. SCOPE

This specification establishes the minimum requirements for the manufacture of seamless steel line pipe for onshore service in accordance with the requirements of API (American Petroleum Institute) Specification 5L, Forty-Fifth Edition, 2012 and makes restrictive amendments to API Specification 5L. Unless modified and/or deleted by this specification, the requirements of API Specification 5L shall remain applicable.

The sections, paragraphs and annexes contained herein have the same numbering as that of API Spec 5L in order to facilitate reference. Additional requirements, which are not specified in API Spec 5L, have also been numbered and marked as "(New)".

The coverage by this specification is limited to line pipe to be used in onshore pipelines transporting non-sour hydrocarbons in liquid or gaseous phase. The product specification level for line pipe to be supplied as per this specification shall be "PSL 2".

The Manufacturer shall have a valid license to use API Monogram in accordance with the requirements of Specification 5L, Forty-Fifth Edition, 2012 for line pipe as Product Specification Level PSL 2.

1.1 Pipe Size

This Specification shall be applied to line pipe of size 4.5” OD thru 16" OD (both sizes included).

2. NORMATIVE REFERENCES

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

ASTM

ASTM E112: Standard Test Methods for Determining Average Grain size

3. PIPE GRADE, STEEL GRADE AND DELIVERY CONDITION

- PIPE GRADE AND STEEL GRADE
    - Line pipe supplied to this specification shall conform to Product Specification Level 2 (PSL2) as given in Table 1 of this specification and consists of an alpha or alphanumeric designation that identifies the strength level of the pipe. The steel name (designating a steel grade), linked to the chemical composition of the steel, additionally includes a suffix that consists of a single letter (N or Q) that identifies the delivery condition as per Table 3 of this specification.

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

Table 1- Pipe grades, steel grades and acceptable delivery conditions

PSL	Delivery Condition	Pipe grade! steel grade [a,b]
PSL -2	Normalized	BN, X42N, X46N, X52N
	Quenched and tempered	BQ, X42Q, X46Q, X52Q, X56Q, X60Q, X65Q & X70Q
a Deleted b The suffix (N or Q) for PSL 2 grades belongs to steel grade		

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

4 MANUFACTURING

4.1 PROCESS OF MANUFACTURE

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

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

Table 3 - Acceptable manufacturing routes for PSL 2 pipe

Type of Pipe	Starting Material	Pipe forming	Pipe heat treatment	Delivery condition
SMLS	Ingots, Bloom or billet	Normalising forming	None	N
		Hot forming	Normalising or Quenched & Tempered	N or Q
		Hot forming and cold finishing		N or Q

4.2 STARTING MATERIAL

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

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

4.3 COLD SIZING AND COLD EXPANSION

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

4.4 JOINTERS

4.4.1 Jointers on pipes are not permitted.

5 ACCEPTANCE CRITERIA

5.1 CHEMICAL COMPOSITION

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

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

Table 5 - Chemical composition for pipe

Element	Mass fraction based upon heat and product analyses (%)	
C [b]	0.16	max.
Si	0.15 [m(new)]	min.
	0.40	max. (For Grade B to X46)
	0.45	max. (For Grade X52 to X70)
Mn [b]	1.20	max. (For Grade B to X42)
	1.40	max. (For Grade X46 to X70) for delivery condition N
	1.50	max. (For Grade X46 to X 56) for delivery condition Q
	1.60	max. (For Grade X60 to X70) for delivery condition Q
P	0.020	max.
S	0.010	max.
V	c	(For Grade B)
	0.05	max. (For Grade X42 to X52)
	0.07[g]	max. (For Grade X56)
	0.08[g]	max. (For Grade X60 to X70)
Nb	c	(For Grade B)
	0.05[g]	max. (For Grade X42 to X70)
Ti	0.04[g]	max. (For Grade B to X60)
	0.06[g]	max. (For Grade X65 & X70)
Al [n (new)]	0.07	max.
Cr	0.20	
Mo	0.10	
Cu [o (new)]	0.35	
Ni [o (new)]	0.20	
N [n (new)]	0.012	
B	0.0005	

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

CE_{Pcm} ≤ 0.20 %

CE_{IIW} ≤ 0.40 %

Boron content shall be considered in CE_{Pcm} formula even if it is less than 0.0005%.

b Deleted

c Nb + V ≤ 0.06%

d Deleted

e Deleted

f Deleted

g Nb + V + Ti ≤0.15%

h Deleted.

I Deleted

j Deleted
k Deleted
l Deleted
(New) m Minimum for Si is not applicable for Al killed steel.
(New) n Al/N shall be minimum 2 (not applicable to titanium-killed steel or titanium-treated steel).
(New) o Cu + Ni ≤0.40%

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

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

5.2 TENSILE PROPERTIES

5.2.1 The finished pipe (after all heat treatment & sizing operations) shall conform to the requirements of Table 7 of API Spec 5L and as modified herein.

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

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

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

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

5.3 CVN IMPACT TEST FOR PSL 2 PIPE

5.4.1 GENERAL

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

5.4.2 Pipe body tests

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

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

Table 8 - CVN absorbed energy requirements

for pipe body of PSL 2 pipe

Pipe Grade	Full-size CVN absorbed energy (KvT) [a.b] [J]	
	Average	Minimum
B	40	33
X42	40	33
X46	40	33
X52	40	33
X56	40	33
X60	42	35
X65	45	38
X70	50	40

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

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

5.5 SURFACE CONDITIONS, IMPERFECTIONS AND DEFECTS

5.5.1 General

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

5.5.2 Laminations

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

5.5.3 Geometric deviations

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

a) 2 mm for types of dents and not encroaching upon the minimum specified wall thickness

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

5.5.4 Hard Spots

Any hard spot larger than 50 mm (2.0 in) in any direction and hardness greater than 248HV 10 shall be classified as defect and treated in accordance with clause C.3 of API Spec 5L.

5.5.5 Other surface imperfection

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

5.5.5.1 Imperfections that have a depth ≤ 0.05 t and do not encroach on the minimum specified wall thickness shall be classified as acceptable imperfections and shall be treated in accordance with Clause C.1 of this specification.

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

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

5.6 DIMENSIONS, MASS AND TOLERANCES

5.6.1 Tolerances for diameter, wall thickness, length and straightness

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

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

Table 10 - Tolerances for diameter and out-of-roundness

Specified outside Diameter (D) mm (inch)	Diameter tolerances [d]		Out-of-roundness	
	Pipe except the end [a]	Pipe end [a,b,c]	Pipe except the end [a]	Pipe end [a,b,c]
114.3 (4 1/2) ≤ D ≤ 168.3 (6.625)	± 0.0075 D	-0.4 mm to + 1.6mm	0.020D	2.0mm
168.3 (6.625) < D ≤ 273.1 (10.750)		±0.005 D, but maximum of ± 1.6mm		2.0mm
273.1 (10.750) < D ≤ 406.4 (16)				3.0mm

a. The pipe end includes a length of 100 mm at each of the pipe extremities.
b. Deleted
c. The diameter tolerance and out-of-roundness tolerance shall apply on inside diameter. The inside diameter, based on circumferential measurement, shall be calculated as ID = (D – 2t).
d. For determining compliance to the diameter tolerances, the pipe diameter is defined as the circumference of the pipe in any circumferential plane divided by Pi (π).
e(new). Out-of-roundness tolerances apply to maximum and minimum diameters as measured with bar gage, caliper, or device measuring actual, maximum and minimum diameters.

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

Table 11 of API Spec 5L stands replaced by Table 11 of this specification.

Table 11- Tolerances for wall thickness

Wall thickness (mm)	Tolerances c, d (mm)
t < 10.0	+0.225 t -0.05 t

10.0 ≤ t < 25.0	+0.20 t -0.05 t
t ≥ 25.0	+5.00 -1.25
a Deleted b Deleted c The + ve tolerance for wall thickness does not apply to the weld area. d See 9.13.2 of API Spec 5L and as modified herein for additional restrictions.	

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

5.6.1.4 The tolerances for straightness shall be as follows:

A) The total deviation from a straight line over the entire pipe length shall not exceed 12 mm, as shown in Figure I of API Spec 5L.
B) The local deviation from straight line in 1.0 m (3.0 ft) portion at each pipe end shall be ≤ 3.0 mm (0.120 in), as shown in Figure 2 of API Spec 5L.

5.7 FINISH OF PIPE ENDS

5.7.1 Plain ends

5.7.1.1

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

5.7.1.2

(New) Bevel Protectors

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

6 INSPECTION

6.4 TYPES OF INSPECTION AND INSPECTION DOCUMENTS

10.1.3 Inspection documents for PSL 2 pipes

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

6.5 SPECIFIC INSPECTION

6.5.1 Inspection frequency

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

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

Table 18 - Inspection frequency of pipe

Sl. no.	Type of inspection	Frequency of inspection
1	Heat analysis [a]	One analysis per heat of steel
2	Product analysis [b]	Two pipes per lot (maximum 100 pipes) per heat
3	Tensile testing of the pipe body	Two pipes per lot (maximum 100 pipes) per heat
4	CVN impact testing of the pipe body	Once per test unit of not more than 100 pipes
5	Vickers hardness testing of Pipe body	Once per test unit of not more than 50 pipes
6	Hydrostatic testing	Each pipe
7	Visual inspection	Each pipe
8	Pipe diameter and out-of-roundness for pipe [d]	Each pipe
9	Wall thickness measurement [d]	Each pipe
10	Straightness [d]	At least 3 times per operating shift (12 hours maximum)
11	Other dimensional testing	Random testing, with the details left to the discretion of the manufacturer
12	Weighing of pipe	Each pipe shall be measured and recorded
13	Non-destructive inspection	In accordance with Annex E of API Spec 5L and as modified herein
14	Length	Each length of pipe shall be measured and recorded

a. Where the steel mill is not a part of an integrated pipe mill, heat analysis shall be reported by the Manufacturer prior to start of pipe production.
b. Pipes selected shall be such that one at the beginning of the heat and one at the end of the heat are also represented.
c. Deleted.
d. Measurement shall be recorded at least 3 times per operating shift (12 hrs maximum).
e. "Test unit" is as defined in clause 4.62 of API Spec 5L.

6.5.2 Samples and test pieces for product analysis

Samples shall be taken, and test pieces prepared, in accordance with ISO 14284 or ASTM E1806. Samples used for product analysis shall be taken from finished pipes only.

6.5.3 Samples and test pieces for mechanical tests

6.5.3.1 General

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

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

Table 20 - Number, orientation and location of test pieces per sample for mechanical tests

Sample Location	Type of test	Number, Orientation and location of test pieces per sample [a]
Pipe body	Tensile	1L, 1T[b]
	CVN	3T
	Hardness	1T

a See figure 5 (b) of API Spec 5L for an explanation of the symbols used to designate orientation and location.

b The transverse tensile tests shall be carried out on pipes of D ≥ 219.1 mm.

6.5.3.2 Test pieces for the tensile test

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

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

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

6.5.3.3 Test pieces for the CVN impact test

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

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

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

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

6.5.3.4 Samples for hardness tests

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

6.5.4 Test methods

6.5.4.1 CVN impact test

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

6.5.4.2 Hardness test

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

Vickers hardness tests shall be carried out in accordance with ISO 6507-1. The resulting Vickers hardness value at any point shall not exceed 248 HV_{10}. Hardness test locations shall be as shown in Figure 10.2.4.8.1 of this specification.

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

6.5.4.3 Hydrostatic test

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

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

The pressure gauge used for hydrostatic testing shall have a minimum range of 1.5 times and maximum range of 4 times the test pressure. The test-pressure measuring device shall be calibrated by means of a dead-weight tester only. The test configuration shall permit bleeding of trapped air prior to pressurization of the pipe.
The test pressure for all sizes and grades of pipe shall be such that hoop stress (fibre stress) generated is at least 95% of SMYS, computed based on the Equation (6) indicated in clause of API Spec 5L. Table 26 of API Spec 5L stands deleted.

6.5.5 Visual inspection

Each pipe shall be visually examined for entire external surface and internal surface to the extent feasible and shall be free of defects in finished condition. Visual examination shall be carried out in a sufficiently illuminated area; minimum 1000 1x. If required additional lights shall be used to obtain good contrast and relief effect between imperfections and backgrounds.

6.5.6 Dimensional testing

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

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

6.5.7 Non-destructive inspection

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

6.5.8 Reprocessing

This clause of API Spec 5L stands cancelled.

6.5.9 Retesting

Recheck analyses

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

7 MARKING

7.1 GENERAL

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

7.1.2(New) Marking shall also include Purchase Order number, item number, pipe number and heat number.

7.2 Pipe markings

7.2.1 k) (New). Actual length in metres and actual pipe weight in kg shall be marked

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

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

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

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

8 COATINGS AND THREAD PROTECTORS

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

9 RETENTION OF RECORDS

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

10 PRODUCTION REPORT

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

- Pipe number
- Heat number from which pipe is produced
- Pipe length and weight
- Pipe grade

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

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

- Certified reports of dimensional inspection, surface imperfections & defects.
- Data on test failures, rejected heats/lots, etc.
- Information on production and shipping
- All other reports and results required as per this specification.

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

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

11 INSPECTION OF FIELD TESTS & WARRANTY

(New) Purchaser shall be reimbursed by Manufacturer for any pipe furnished on this order that fails under field hydrostatic test if such failure is caused by a material/ manufacturing defect in the pipe. The reimbursement cost shall include pipe, labour and equipment rental for finding, excavating, cutting out and installation of replaced pipe in position. The field hydrostatic test pressure will not exceed that value which will cause a calculated hoop stress equivalent to 95 percent of specified minimum yield strength.

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

Annex B

Manufacturing Procedure Qualification for PSL 2 Pipe

B.1 INTRODUCTION

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

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

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

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

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

B.3 CHARACTERISTICS OF THE MANUFACTURING PROCEDURE SPECIFICATION

Before pipe production commences, Manufacturing Procedure Specification (MPS) for manufacturing of pipes and Statistical process control charts shall be prepared by pipe manufacturer and submitted for approval of the Purchaser.

B.5 MANUFACTURING PROCEDURE QUALIFICATION TESTS (MPQT)

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

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

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

a. **Visual Examination**

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

b. **Ultrasonic Examination**

The weld seam of all pipes shall be examined ultrasonically by automatic ultrasonic equipment.

c. **Mechanical Properties**

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

The following tests shall be conducted:

i. Tensile test

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

- Two (2) transverse test pieces for pipe of D ≥ 219.1 mm (8.625 inch):

- Two (2) longitudinal test pieces

ii. CVN impact testing

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

iii. Hardness test

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

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

Annex C

Treatment of surface imperfections and defects

C.1 TREATMENT OF SURFACE IMPERFECTIONS

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

C.2 TREATMENT OF DRESSABLE SURFACE DEFECTS

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

Annex E

Non-destructive inspection for other than sour service or offshore service

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

E.1 QUALIFICATION OF PERSONNEL

E.1.1 All personnel performing NOT activities shall be qualified in the technique applied, in accordance with latest edition of ISO 9712, ISO 11484 or ASNT No. ASNT-TC-IA or equivalent

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

Inspector Qualification

Acceptable qualification for NOT inspectors shall be as specified below:

(i) For UT

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

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

(ii) For all other NDT methods

Evaluation of indications: Level II & Level III inspector

E.3 METHODS OF INSPECTION

E.3.1 General

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

E.3.3 Pipe End Inspection - Welded Pipe

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

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

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

E.5 ULTRASONIC AND ELECTROMAGNETIC INSPECTION

E.5.1 Equipment

E.5.1.1 In addition to the API Spec 5L requirements, all automatic ultrasonic equipment shall have an alarm device, which continuously monitors the effectiveness of the coupling. The equipment for the automatic inspection shall allow the localization of both longitudinal and transverse defects corresponding to the signals exceeding the acceptance limits of the reference standard. The equipment shall be fitted with a paint spray or automatic marking device and alarm device for areas giving unacceptable ultrasonic indications. All ultrasonic testing equipment shall be provided with recording device.

E.5.2. Ultrasonic and electromagnetic inspection reference standards

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

E.5.2.3 Reference standards

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

Examination Type	Seamless
Lamination Detection	FBH (6.4mm)
Surface defect detection	Notch N5
Defect detection of body and pipe ends	Notch N5

Flat Bottomed Holes (FBH) for lamination detection shall have 6.4 mm (1/4inch) diameter and depth 0.5 t, where 't' is the specified wall thickness.

E.5.3 Instrument standardization

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

- Once at the beginning of each operating shift (12 hours maximum).
- Once in between of each operating shift i.e, 3 hrs to 4 hrs after the first
- Every time there is change in probes or working condition of the UT machine.
- Every time the running of the system gives rise to doubts on its efficiency.
- If during the calibration verification, it is found that notches or holes of the reference standard are not revealed or if the signals caused by notches and holes of the calibration samples do not switch on the automatic alarm or marking and selection device, all pipes already checked from the previous verification shall be re-inspected at manufacturer's cost.

E.5.5 Acceptance limits

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

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

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

b) Greater than or equal to 5000 mm^2 in area.

E.5.6 Disposition of defects found by ultrasonic and electromagnetic inspection

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

E.5.8 LAMINAR IMPERFECTIONS IN THE PIPE BODY

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

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

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

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

E.5.9 Suspect pipe

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

E.7 RESIDUAL MAGNETISM

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

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

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

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

E.10 DISPOSITION OF PIPES CONTAINING DEFECTS

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

E.11 SUPPLEMENTARY NON-DESTRUCTIVE INSPECTION

(New)

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

E.11.2(new) Pipe shall be full-body inspected using the flux leakage method in accordance with ISO 10893-3 acceptance level F2 for the surface testing of the pipes for longitudinal and transverse imperfections.

Annex Q (New)

Purchaser Inspection

Q.1 INSPECTION NOTICE

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

Q.2 PLANT ACCESS

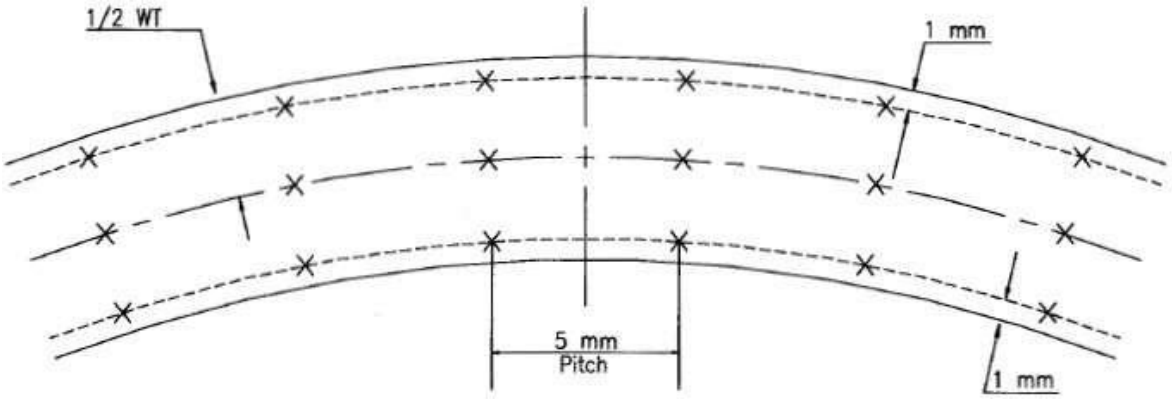
The inspector representing the purchaser shall have unrestricted access, at all times while work of the contract of the purchaser is being performed, to all parts of the manufacturer's works that will concern the manufacture of the pipe ordered. The manufacturer shall afford the inspector all reasonable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

Q.3 COMPLIANCE

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

Q.4 REJECTION

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



Notes:

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

FIGURE: 10.2.4.8.1

LOCATIONS FOR HARDNESS MEASUREMENT

INDRAPRASTHA GAS LTD.

STANDARD SPECIFICATION

FOR

HIGH FREQUENCY WELDED LINE PIPE

IGL – SS – PP – 2008

CONTENTS

1. SCOPE

1.1 Coverage

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

The sections, paragraphs and annexes contained herein have the same numbering as that of API Spec 5L in order to facilitate reference. Additional requirements, which are not specified in API Spec 5L, have also been numbered and marked as "(New)".

The coverage by this specification is limited to line pipe to be used in onshore pipelines transporting non-sour hydrocarbons in liquid or gaseous phase. The product specification level for line pipe to be supplied as per this specification shall be "PSL 2".

1.2 Application of The API Monogram

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

1.3 (New) Pipe Size

This Specification shall be applied to line pipe of size 4.5" (114.3 mm) OD thru 20" (508.0 mm) OD (both sizes included).

2. NORMATIVE REFERENCES

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

ASTM E112-12: Standard Test Methods for Determining Average Grain size

6. PIPE GRADE, STEEL GRADE AND DELIVERY CONDITION

6.1 Pipe Grade and Steel Grade

6.1.2 Line pipe supplied to this specification shall conform to Product Specification Level 2 (PSL2) as given in Table 1 of this specification and consists of an alpha or alphanumeric designation that identifies the strength level of the pipe. The steel name (designating a steel grade), linked to the chemical composition of the steel, additionally includes a suffix that consists of a single letter (M) that identifies the delivery condition as per Table 3 of this specification.

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

Table 1- Pipe grades, steel grades and acceptable delivery conditions

PSL	Delivery Condition	Pipe grade/ steel grade [a, b].
PSL -2	Thermomechanical rolled	BM, X42M, X46M, X52M, X56M, X60M, X65M & X70M
a Deleted b The suffix (M) for PSL 2 grades belongs to steel grade		

6.2 **Delivery condition**

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

8 MANUFACTURING

8.1 Process of Manufacture

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

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

Table 3 - Acceptable manufacturing routes for PSL 2 pipe

Type of Pipe	Starting Material	Pipe forming	Pipe Heat treatment	Delivery condition
HFW	Thermomechanical-rolled coil	Cold forming	Heat treating [a] of weld area only	M
a See clause 8.8 of this specification for applicable heat treatment				

High frequency electric welding shall be performed with a minimum welding current frequency of 200 kHz. The welding system shall have an integrated control in which following data as a minimum shall be monitored:

- Welding Temperature
- Welding speed
- Current and Voltage

Abutting edges of the coil shall be milled or machined immediately before welding. The width of the coil shall be continuously monitored.

8.3 **Starting Material**

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

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

8.8 **Treatment of Weld Seams In EW And LW Pipes**

8.8.2 **LW pipe and PSL 2 HFW pipe**

The weld seam and the entire Heat Affected Zone (HAZ) shall be heat treated so as to simulate a normalizing heat treatment in order to control the grain structure so that no untampered martensite remains in the weld seam and the HAZ, and the mechanical properties of heat treated zone approximate that of the parent metal.

Heat treatment temperature of the weld seam and the entire HAZ shall be continuously measured and recorded.

8.9 **Cold Sizing and Cold Expansion**

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

8.11 **Jointers**

8.11.1 Jointers on pipes are not permitted.

9 ACCEPTANCE CRITERIA

9.2 CHEMICAL COMPOSITION

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

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

Table 5 - Chemical composition for pipe

Element	Mass fraction based upon heat and product analyses (%)	
C [b]	0.16	max. (For Grade BM to X56M)
	0.12[f]	max. (For Grade X60M to X70M)
Si	0.15 [m(new)]	min.
	0.45	max.
Mn [b]	1.20	max. (For Grade BM to X46M)
	1.40	max. (For Grade X52M & X56M)
	1.60	max. (For Grade X60M & X65M)
	1.70	max. (For Grade X70M)
P	0.020	max.
S	0.015	max.
V	0.05	max. (For Grade BM to X46M)
	[d]	max. (For Grade X52M to X70M)
Nb	0.05	max. (For Grade BM to X46M)
	[d]	max. (For Grade X52M to X70M)
Ti	0.04	max. (For Grade BM to X46M)
	[d]	max. (For Grade X52M to X70M)
Al [n (new)]	0.02 [o(new)]	min.
	0.07	max.
Cr	0.20	max.
Mo	0.10	max. (For Grade BM to X65M)
	0.20	max. (For Grade X70M)
Cu	0.35	max.
Ni	0.20	max.
N [n (new)]	0.012	max.
B	0.0005	max.
a Based upon product analysis as per clause 9.2.4 and 9.2.5 of API Spec 5L, the CE_{Pcm}		

limits apply if C =< 0.12% and CE_{IIW} limits apply if C > 0.12%. For pipes of all grades, sizes and wall thicknesses, Carbon Equivalent shall comply with the following limits:

CE_{Pcm} =< 0.20 %

CE_{IIW} =< 0.40%

Boron content shall be considered in CE_{Pcm} formula even if it is less than 0.0005%.

b Deleted

c Deleted

d Nb + V + Ti = < 0.15%

e Deleted

f Deleted

g Deleted

h Deleted.

I Deleted

j Deleted

k Deleted

l Deleted

(New)m : Minimum for Si is not applicable for AI killed steel.

(New)n : AI/N shall be minimum 2 (not applicable to titanium-killed steel or titanium-treated steel).

(New)o : Applicable for AI killed steel.

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

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

9.3 **TENSILE PROPERTIES**

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

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

API Spec 5L Grade	Permissible in excess of SMYS, MPa (psi)
Up to and including X46 M	131 (19,000)
X52M to X60M	125 (18,000)
X65M to X70M	120 (17,400)

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

The tensile strength of the weld (after heat treatment of the weld seam) shall be equal to or higher than the specified minimum tensile strength of the base metal.

The minimum elongation of base metal shall be determined in accordance with the formula given in foot note (f) of Table 7 of API Spec 5L, however, minimum elongation in no case shall be less than 20%.

9.6 **Flattening Test**

Acceptance criteria for flattening tests shall be as follows:

a) For HFW pipe of grade ≥ X60 and t ≥ 12.7 mm, there shall be no opening of the weld before the distance between the plates is less than 66% of the original outside diameter. For all other combinations of pipe grade and specified wall thickness, there shall be no cracks or breaks in either weld or parent metal before the distance between the plates is less than 50% of the original outside diameter. Dye penetrant testing shall be used to positively confirm the presence of crack, break or opening.

b) For HFW pipe with a D / t> 10, there shall be no cracks or breaks other than in the weld before the distance between the plates is less than 33% of the original outside diameter.

c) For all pipes, there shall be no evidence of lamination or burnt metal during the entire test before opposite walls of the pipe meet.

Note: The weld extends to a distance of 13 mm on each side of the weld line. The original outside diameter is the specified outside diameter.

9.8 **Cvn Impact Test For PSL 2 Pipe**

9.8.1 **General**

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

9.8.2 **Pipe body tests**

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

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

Table 8 - CVN absorbed energy requirements

for pipe body, weld and HAZ of PSL 2 pipe

Pipe Grade	Full-size CVN absorbed energy (KvT) [a,b] [J]	
	Average	Minimum
BM	40	32
X42M	40	32
X46M	40	32
X52M	40	32
X56M	40	32
X60M	42	34
X65M	45	36
X70M	50	40
a. The required KvL (longitudinal direction test pieces) values shall be 50% higher than the required KvT values. b. Testing shall be performed at a test temperature of 0° C (32°F) or at a lower temperature as specified in the Purchase Order /Material Requisition/Data sheets..		

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

9.8.3 **Pipe weld and HAZ tests**

The average (set of three test pieces) absorbed energy value (Kv1) for each pipe weld and HAZ test shall be as specified in Table 8 of this specification, based upon full-size test pieces at a test temperature of 0°C (32°F) or at a lower test temperature as specified in the Purchase Order/ Material Requisition/Data sheets

9.10 **Surface Conditions, Imperfections and Defects**

9.10.1 **General**

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

9.10.3 **Arc burns**

9.10.3.2 Arc bums shall be treated in accordance with clause C.3 b) or c) of API Spec 5L. As a reference method for confirming the existence of an arc bum, the area shall be buffed with wire brush or sanding disc and etched with 10% solution of ammonium per sulfate or a 5% solution of nital.

However, arc bums can be considered for acceptance, in case the same is re-crystallized by seam heat treatment. In such case, the Manufacturer shall demonstrate the re- crystallization to Purchaser by taking a sample as per clause 10.2.3.8 (New) of this specification.

9.10.4 **Laminations**

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

9.10.5 **Geometric deviations**

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

a) 3.2 mm for cold-formed dents with sharp-bottom gouges and not encroaching upon the specified minimum wall thickness

b) 6.4 mm for other dents

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

d) Any dent on weld and heat affected zone (HAZ).

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

9.10.6 **Hard Spots**

Any hard spot larger than 50 mm (2.0 in) in any direction and hardness greater than 248HV_{10} shall be classified as defect and treated in accordance with clause C.3 b) or C.3 c) of API Spec 5L.

9.10.7 **Other surface imperfection**

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

a) Imperfections that have a depth =< 0.05 t and do not encroach on the minimum specified wall thickness shall be classified as acceptable imperfections and shall be treated in accordance with Clause C.1 of this specification.

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

c) Imperfections that encroach on the minimum specified wall thickness shall be classified as defects and treated in accordance with clause C.3 b) or c) of API Spec 5L.

9.11 **Dimensions, Mass and Tolerances**

9.11.3 **Tolerances for diameter, wall thickness, length and straightness**

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

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

Table 10 - Tolerances for diameter and out-of-roundness

Specified outside Diameter (D) mm (inch)	Diameter tolerances [d]		Out-of-roundness [e (new)]	
	Pipe except the end [a]	Pipe end [a,c]	Pipe except the end [a]	Pipe end [a,c]
D ≤168.3 (6 5/8)	± 0.0075 D	-0.4 mm to + 1.6mm	0.020D	0.015 D up to a maximum of2.0mm
168.3 (6 5/8) < D ≤ 273.1 (10 3/4)	± 0.0075 D	±0.005 D	0.020D	2.0mm
D > 273.1 (10 3/4)	± 0.0075 D up to a maximum of ±3.0mm	± 1.6mm	0.020D	3.0mm

a The pipe end includes a length of 100 mm at each of the pipe extremities.
b Deleted
c The diameter tolerance and out-of-roundness tolerance shall apply on inside diameter. The inside diameter, based on circumferential measurement, shall be calculated as ID = (D – 2t).
d For determining compliance to the diameter tolerances, the pipe diameter is defined as the circumference of the pipe in any circumferential plane divided by Pi (π).
e (New) Out-of-roundness tolerances apply to maximum and minimum diameters as measured with bar gage, caliper, or device measuring actual, maximum and minimum diameters.

9.11.3.2 In addition to API requirements, the wall thickness of each pipe shall be checked along the circumference at both ends and at the mid location of pipe body at 12 0' clock, 3 0' clock, 6

0' clock and 9 0' clock positions. The tolerances for wall thickness shall be as given in Table 11 of this specification.

Table 11 of API Spec 5L stands replaced by Table 11 of this specification.

Table 11- Tolerances for wall thickness

Wall thickness (mm)	Tolerances c, d (mm)
t < 15.0 mm	+0.20 t -0.0t
t ≥ 15.0 mm	+3.0 mm -0.0 mm
a Deleted b Deleted c The + ve tolerance for wall thickness does not apply to the weld area. d See 9.13.2 of API Spec 5L and as modified herein for additional restrictions.	

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

9.11.3.4 The tolerances for straightness shall be as follows:

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

b) The local deviation from straight line, as depicted in Figure 2 of API Spec 5L, in 1.0 m (3.0 ft) portion at each pipe end shall be ≤ 3.0 mm (0.120 in),

9.12 **Finish of Pipe Ends**

9.12.5 **Plain ends**

9.12.5.6

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

9.12.5.7

(New) **Bevel Protectors**

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

9.16

(New) **Reverse Bend Test**

All pipes shall meet the minimum acceptance criteria for Reverse Bend Test as follows:

A specimen which fractures completely prior to the engagement of mandrel and specimen as specified in clause 10.2.4.9 (New) of this specification, or which reveals cracks or ruptures in the weld or heat affected zone longer than 4 mm shall be rejected. Cracks less than 6 mm long at the edges of the specimen shall not be cause for rejection. Dye penetrant testing shall be used to positively confirm cracks or openings.

10 INSPECTION

10.1 Types of Inspection and Inspection Documents

10.1.3 Inspection documents for PSL 2 pipes

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

10.2 **Specific Inspection**

10.2.1 **Inspection frequency**

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

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

Table 18 - Inspection frequency of pipe

Sl. no.	Type of inspection	Frequency of inspection
1	Heat analysis [a]	One analysis per heat of steel
2	Product analysis [b]	Two pipes per lot (maximum 100 pipes) per heat
3	Tensile testing of the pipe body	Two pipes per test unit of not more than 100 pipes per heat
4	Tensile testing of the longitudinal weld seam of pipe [c]	Two pipes per test unit of not more 100 pipes per heat
5	CVN impact testing of the pipe body	Once per test unit of not more than 50 pipes
6	CVN impact testing of the weld and HAZ of pipe	Once per test unit of not more than 50 pipes
7	Flattening test of pipe	As shown in Figure 6 a) of API Spec 5L
8	Reverse Bend Test (New)	Same as Figure 6 a) of API Spec 5L
9	Hardness testing	Any hard spot exceeding 50 mm (2.0 in) in any direction

10	Hydrostatic testing	Each pipe
11	Weighing of pipe	Each pipe shall be measured and recorded
12	Wall thickness measurement [d]	Each pipe
13	Pipe diameter and out-of roundness [d]	Each pipe
14	Length	Each length of pipe shall be measured and recorded
15	Straightness [d]	Each pipe
16	Tolerances for the weld seam [d] a) Radial offset of coil edges b) Height of flash and c) Depth of groove after trimming of inside flash	Each pipe
17	Visual inspection	Each pipe
18	Metallographic testing (including Vicker's hardness test) of the longitudinal seam weld of pipe as defined in clause 10.2.5 of this specification	At least one finished pipe from each lot of 50 pipes per heat or at least once per operating shift (12 hrs max.) whichever is occurring more frequently and whenever changes of grade, diameter or wall thickness are made and whenever significant excursions from operating heat treatment conditions are encountered and at the beginning of the production of each combination of specified outside diameter and specified wall thickness.
19	Other dimensional testing	Random testing, with the details left to the discretion of the manufacturer
20	Non-destructive inspection	In accordance with Annex E of API Spec 5L and as modified herein

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

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

c Pipe produced by each welding machine shall be tested at least once per week.

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

e "Test unit" is as defined in clause 3.1.60 of API Spec 5L.

10.2.2 **Samples and test pieces for product analysis**

Samples shall be taken, and test pieces prepared, in accordance with ISO 14284 or ASTM E1806. Samples used for product analysis shall be taken from finished pipes only.

Samples for product analysis from coil may be used provided the traceability of samples is guaranteed.

10.2.3 **Samples and test pieces for mechanical tests**

10.2.3.1 General

In addition to API Spec 5L requirements, samples and test pieces for various types of tests shall be taken from Figure 5 b) and Figure 6 a) of API Spec 5L and Figure 10.2.4.9.1 & 10.2.5.3 of this specification, whichever is applicable, and as given in Table 20 of this specification.

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

Sample Location	**Type of test**	**Number, Orientation and location of test pieces per sample [a]**	
		Specified outside diameter, D mm (in)	
		< 219.1 mm (8.625 in)	≥219.1 mm (8.625 in)
Pipe body	Tensile	1 L90	1T180
	CVN	3T90	3T90
Seam Weld	Tensile	---	IW[b]
	CVN	3W and 3HAZ	3W and 3HAZ
	Hardness	1W (As shown in figure 10.2.5.3 of this specification)	
Pipe body and weld	Flattening	As shown in figure 6 a) of API Spec 5L	
	Reverse Bend	As shown in figure 10.2.4.9.1 of this specification	

a See figure 5 (b) of API Spec 5L for an explanation of the symbols used to designate orientation and location.

b Test specimen shall be tested for ultimate tensile strength only.

10.2.3.2 Test pieces for the tensile test

Rectangular test pieces, representing the full wall thickness of the pipe, shall be taken in accordance with ASTM A370 and as shown in Figure 5 b) of API Spec 5L.

Longitudinal tensile tests for pipe body with specified outside diameter, D < 219.1 mm (8.625 inch) shall be carried out on a strip specimen representing full wall thickness of the pipe prepared according to ASTM A370.

Transverse tensile test for pipe body with specified outside diameter, D ≥ 219.1 mm (8.625 inch) shall be carried out on flattened rectangular test pieces.

For tensile test piece, both inside and outside flash of weld in excess of pipe wall thickness shall be removed from the test piece either by grinding or machining.

10.2.3.3 **Test pieces for the CVN impact test**

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

The test pieces shall be prepared in accordance with ASTM A370. Non-flattened test pieces shall be used. The axis of the notch shall be perpendicular to the pipe surface.

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

Lower pipe sizes wherein preparation of transverse sub-sized specimen is not possible, CVN impact testing shall be carried out on longitudinal test specimen [see Note 'a' of Table 8 of this specification].

10.2.3.7 **Test pieces for flattening test**

The test pieces shall be prepared in accordance with ISO 8492. The length of each test piece shall be >= 60 mm.

Minor surface imperfections may be removed by grinding.

10.2.3.8 **Test pieces for Macro graphic and metallographic tests**

(New) Test piece for metallographic testing shall be taken transverse to the longitudinal weld seam as indicated in Figure 10.2.5.3 of this specification. The test piece shall be suitably ground, polished and etched to reveal the macro-structure.

10.2.3.9 **Test pieces for Reverse bend test**

(New) Ring specimen of width between 100 mm to 115 mm shall be taken from the pipe. Reverse bend test shall be carried out as per clause 10.2.4.9 (New) of this specification.

10.2.4 **Test methods**

10.2.4.3 CVN impact test

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

10.2.4.7 **Flattening test**

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

The flattening test shall be carried out in accordance with ISO 8492.

10.2.4.9 **Reverse bend test**

(New) The mandrel shall be plunged into the test piece prepared in accordance with clause 10.2.3.9 (New) of this specification, with the weld in contact with the mandrel, to such a depth that the angle of engagement between mandrel and specimen reaches 60° as shown in figure 10.2.4.9.1 of this specification. If the combination of diameter & wall thickness of pipe and radius of mandrel is such that the angle of engagement cannot reach 60°, then the mandrel shall be plunged into the specimen until opposite walls of the specimen meet.

Selection of Mandrel

The reverse bend test shall be carried out with a mandrel, whose radius (R), or width (A) shall be calculated for any combination of diameter, wall thickness and grade with the following formula:

$$A = 2R = \frac{1.4\,(D-t)\,t}{e\,(D-2t) - 1.4t} - t$$

Where,

D - Specified outside diameter of pipe, mm

t - Specified wall thickness of pipe, mm

1.4 - Peaking factor

e - Strain

Minimum value of 'e' shall be as per Table 23 of API Spec 5L reproduced as below:

Table 23 — Strain Values for Guided-bend Test

Pipe grade	Strain value *'e'*
Gr. B	0.1375
X42	0.1375
X46	0.1325
X52	0.1250
X56	0.1175
X60	0.1125
X65	0.1100
X70	0.1025

10.2.5 **Macro graphic and metallographic tests**

10.2.5.3 The test piece shall be visually examined using a minimum 40X magnification to provide evidence that heat treatment of weld zone is adequate and there is no untempered martensite or detrimental oxides from the welding process present along the weld seam. The metallographic examination shall be documented on micrographs (at 10X to 20X magnification). In case imperfections or defects are observed, it will become a cause for re-evaluation of welding parameters and heat treatment as deemed necessary by Purchaser's Representative.

Vickers hardness tests shall be carried out on each test piece taken for metallographic examination in accordance with ISO 6507-1, at locations indicated in Fig. 10.2.5.3 of this specification. Indentation in the HAZ shall start as close to the fusion line as possible. The resulting Vickers hardness value at any point shall not exceed $248HV_{10}$. The maximum difference in hardness between the base metal and any reading taken on the weld or heat affected zone shall be less than $80HV_{10}$. Modalities of retest shall be in accordance with clause 10.2.12.7 of API Spec 5L.

10.2.6 **Hydrostatic test**

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

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

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

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

10.2.7 **Visual inspection**

10.2.7.1 Each pipe shall be visually examined for entire external surface and internal surface to the extent feasible and shall be free of defects in finished condition. Visual examination shall be carried out in a sufficiently illuminated area; minimum 1000 1x. If required additional lights shall be used to obtain good contrast and relief effect between imperfections and backgrounds.

10.2.8 **Dimensional testing**

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

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

10.2.10 **Non-destructive inspection**

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

10.2.11 **Reprocessing**

This clause of API Spec 5L stands cancelled.

10.2.12 **Retesting**

10.2.12.1 Recheck analyses

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

10.2.12.9 **Reverse bend retests**

(New) Reverse bend retest provisions shall be same as specified for flattening retests in clause 10.2.12.3 of API Spec 5L.

11 MARKING

11.1 General

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

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

11.2 Pipe markings

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

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

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

11.2.8 A colour code band shall be marked on inside surface of finished pipe for identification of pipes of same diameter but different wall thickness, as indicated in the Purchase Order. The colour code band shall be 50 mm wide and shall be marked at a distance of 150 mm from the pipe ends.

12 COATINGS AND THREAD PROTECTORS

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

Bevels shall be free of any coating.

13 RETENTION OF RECORDS

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

15 PRODUCTION REPORT

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

- Pipe number

- Heat number from which pipe is produced
- Pipe length and weight
- Pipe grade

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

- All test certificates as per clause 10.1.3 of API Spec 5L and as modified herein.
- Records of qualification of welders and procedures for repair welding.
- Certified reports of dimensional inspection, surface imperfections & defects.
- Data on test failures, rejected heats/lots, etc.
- All other reports and results required as per this specification.

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

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

16 INSPECTION OF FIELD TESTS & WARRANTY

(New) Purchaser shall be reimbursed by Manufacturer for any pipe furnished on this order that fails under field hydrostatic test if such failure is caused by a material/ manufacturing defect in the pipe. The reimbursement cost shall include pipe, labour and equipment rental for finding, excavating, cutting out and installation of replaced pipe in position. The field hydrostatic test pressure will not exceed that value which will cause a calculated hoop stress equivalent to 95 percent of specified minimum yield strength.

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

Annex B

Manufacturing Procedure Qualification for PSL 2 Pipe

B.1 INTRODUCTION

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

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

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

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

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

B.3 CHARACTERISTICS OF THE MANUFACTURING PROCEDURE SPECIFICATION

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

B.5 MANUFACTURING PROCEDURE QUALIFICATION TESTS (MPQT)

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

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

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

a. **Visual Examination**

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

b. **Ultrasonic Examination**

The weld seam of all pipes shall be examined ultrasonically by automatic ultrasonic equipment.

c. **Mechanical Properties**

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

The following tests shall be conducted:

i. Flattening test

Two (2) flattening test pieces shall be extracted; one test piece shall be tested with weld at 0° and other at 90°.

ii. Tensile test

Tensile tests shall be conducted on:

For pipe with specified outside diameter, D < 219.1 mm (8.625 inch):

- Two (2) longitudinal test pieces from base metal

For pipe with specified outside diameter, D ≥ 219.1 mm (8.625 inch):

- Two (2) transverse test pieces from base metal

- Two (2) transverse test pieces from the longitudinal weld seam

iii. Metallographic tests

Six (6) weld cross-section test pieces, three (3) from each end of pipe weld seam shall be taken for metallographic examination. Two of these shall be tested for hardness at room temperature after etching, one from each pipe

iv. CVN impact testing

CVN impact test shall be performed on test pieces extracted as follows:

- Four sets of three (3) transverse test pieces each from base metal

- One set of three (3) transverse test pieces with weld in middle

- One set of three (3) transverse test pieces with HAZ in middle

The minimum average (set of three test pieces) absorbed energy value (KvT) at the test temperature specified in clause 9.8 and Table 8 of this specification shall be complied with for test pieces extracted from base metal, weld and HAZ.

v. Fracture toughness testing

Four (4) sets of CVN base metal test pieces shall be tested at - 40°C, - 10°C, 0°C and + 20° C for shear area and absorbed energy to produce full transition curve. The minimum average (set of three test pieces) shear fracture area at the test temperature specified in clause 9.8 of this specification shall be complied with. For other temperatures, the value shall be for information only.

Annex C

Treatment of surface imperfections and defects

C.1 TREATMENT OF SURFACE IMPERFECTIONS

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

C.2 TREATMENT OF DRESSABLE SURFACE DEFECTS

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

Annex E

Non-destructive inspection for Pipe

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

E.1 QUALIFICATION OF PERSONNEL

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

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

Inspector Qualification

Acceptable qualification for NDT inspectors shall be as specified below:

(i) For UT

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

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

(ii) For all other NDT methods

Evaluation of indications Level II & Level III inspector

E.3 METHODS OF INSPECTION

E.3.1 **General**

E.3.1.1 The electric weld of the pipe shall be inspected by ultrasonic methods (Refer Table E.1 of API Spec 5L) for full length (100%) for the entire thickness, using automatic ultrasonic equipment in accordance with clause E.5 of API Spec 5L and as modified in this specification.

E.3.1.3 Location of NDT equipment in the manufacturer's facility shall be such that final inspection of weld seam of pipe shall be performed after hydrostatic testing.

E.3.2 **Pipe End Inspection - Welded Pipe**

E.3.2.1 Pipe ends including weld at the pipe ends not covered by automatic ultrasonic equipment shall be inspected by manual ultrasonic equipment with same sensitivity and capability as

automatic equipment, or, such non-inspected pipe end shall be cut-off. Records in accordance with E.5.4 of API Spec 5L shall be maintained.

E.3.2.3 Ultrasonic inspection in accordance with the method described in ISO 10893-8 shall be used to verify that the SO mm (2.0 in) wide zone at each pipe end is free of any laminar imperfections in the circumferential direction.

E.3.2.4(New) Bevel face of each pipe end shall be magnetic particle inspected for the detection of laminar imperfections in accordance with ISO 10893-5

E.5 **ULTRASONIC AND ELECTROMAGNETIC INSPECTION**

E.5.1.1 In addition to the API Spec 5L requirements, all automatic ultrasonic equipment shall have an alarm device, which continuously monitors the effectiveness of the coupling. The equipment for the automatic inspection shall allow the localization of both longitudinal and transverse defects corresponding to the signals exceeding the acceptance limits of the reference standard. The equipment shall be fitted with a paint spray or automatic marking device and alarm device for areas giving unacceptable ultrasonic indications. All ultrasonic testing equipment shall be provided with recording device. In addition, an automatic weld tracking system shall be provided for correct positioning of the probes with respect to weld centre.

E.5.2. **Ultrasonic and electromagnetic inspection reference standards**

E.5.2.1 The reference standard (calibration pipe) shall have the same specified diameter and wall thickness as specified for the production pipe being inspected.

E.5.2.2 Reference standards shall be of sufficient length to permit calibration of ultrasonic inspection equipment at the speed to be used in normal production.

The reference standard (calibration pipe) shall also be of the same material, type and have the same surface finish and heat treatment as the pipe being inspected.

E.5.2.3 **Reference standards**

E.5.2.3.1 **Reference standards for pipe weld UT:**

(New) Reference standard shall contain as reference indicators i.e. machined notches as given in

Table E.7 of this specification

Table E.7 of API Spec 5L stands replaced by Table E.7 of this specification.

Table E.7 — Reference Indicators

Item	Reference indicators		
	Number of notches and orientation [a]		Notch Type [b]
	OD	ID	
Weld Seam	1L	1L	N10
a The symbol indicates the orientation of the notch i.e. L = Longitudinal. Reference indicators shall be located as per Figure E.I of this specification. b Dimensions of Notch type N10 shall be 0.1 t x 50 mm x 1 mm (Depth x maximum Length			

x maximum width), where, 't' is the specified wall thickness. The depth tolerance is ± 15% of the specified notch depth or ± 0.05 mm, whichever is greater.

E.5.2.3.2 Reference standards for coil/ pipe body UT:

(New) Reference standard for the ultrasonic inspection of coil or pipe body (except the coil edges/pipe ends) shall contain continuous machined notch of following dimension:

a) width, w : 8 mm, with a tolerance +0.8/ - 0.0 mm

b) depth, d : 0.25 1< d < 0.5 t, where 't' is the specified wall thickness

Reference standard for the ultrasonic inspection of coil edges (area adjoining weld seam)/ pipe ends shall have 6.4 mm (1/4 inch) diameter FBH of a depth 0.5 t, where 't' is the specified wall thickness.

E.5.3 **Instrument standardization**

E.5.3.2 The instrument shall be calibrated with appropriate reference standard (refer E.5.2 of API Spec 5L and as modified herein) at following intervals:

- Once at the beginning of each operating shift (12 hours maximum).
- Once in between of each operating shift i.e, 3 hrs to 4 hrs after the first
- Every time there is change in probes or working condition of the UT machine.
- Every time the running of the system gives rise to doubts on its efficiency.

If during the above calibration verification, it is found that the equipment has not functioned satisfactorily in the opinion of the Purchaser's Representative, all the pipes or coils already inspected after the previous verification shall be inspected again at Manufacturer's cost.

E.5.5 **Acceptance Limits**

E.5.5.2 For ultrasonic inspection of pipe/coil, any imperfection that produces an imperfection greater than the acceptable limits shall be treated as following:

a) Locations showing indications above the acceptance limits during automatic ultrasonic inspection may be re-examined by manual ultrasonic method. If no defects are located during re-examination, the original findings may be ignored. Additional scanning may be requested by Purchaser's Representative to check questionable areas.

E.5.6 **Disposition of defects found by Ultrasonic and electromagnetic inspection**

Disposition of any imperfection in pipe/coil that produces an indication greater than the acceptable limits as specified in Table E.9 (New) of this specification shall be classified as defect and shall be given disposition as specified in (e) or (f) of E.10 of API Spec 5L.

E.7 **RESIDUAL MAGNETISM**

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

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

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

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

E.8 **LAMINAR IMPERFECTIONS IN THE PIPE BODY OF EW, SAW AND COW PIPE**

E.8.1 The coil, except the longitudinal coil edges (area adjoining weld seam), shall be ultrasonically tested for laminations using an oscillating or straight running pattern of probes in accordance with ISO 10893-9 amended as follows:

The distance between adjacent scanning tracks shall be sufficiently small to ensure detection of minimum allowed imperfection size. The minimum coverage during automatic ultrasonic inspection shall be ≥ 20 % of the coil surface uniformly spread over the area.

Acceptance limit for laminar imperfection in the coil, except the longitudinal edges, shall be as per Table E.9 (New) of this specification. Disposition of defects shall be as per clause E.5.6 of this specification.

Table 3 of lSO 10893-9 stands replaced by Table E.9 (New) of this specification.

E.9 **LAMIMAR IMPERFECTIONS ALONG THE STRIP/ PLATE EDGES OR PIPE WELD SEAM OF EW, SAW AND COW PIPES**

The longitudinal edges of the coil (area adjoining weld seam) shall be 100% ultrasonically inspected in accordance with ISO 10893-9 amended as follows:

UT shall be performed over 25 mm wide zone along each side of the trimmed longitudinal edges of the coil.

Acceptance limit for laminar imperfection in the longitudinal edges of the coil shall be as per Table E.9 (New) of this specification. Disposition of defects shall be as per clause E.5.6 of this specification.

Table 2 of ISO 10893-9 stands replaced by Table E.9 (New) of this specification.

Table E.9 - Acceptance criteria for laminar imperfection in coil/ pipe body (New)

Location	Maximum individual imperfection		Minimum imperfection size considered			Maximum population density[a]
	Area mm^2	Length[b] mm	Area mm^2	Length[b] mm	Width[c] mm	
Coil, except the longitudinal edges	1000	100[d]	300	35	8	10 (per 1.0 m x 1.0m)
Longitudinal edges of the	500	40	----	20	--	4

coil						(per 1.0 m length)

a Number of imperfections of size smaller than the maximum imperfection size and greater than the minimum imperfection size.

b Length is the dimension at right angles to the scan track.

c Width is the dimension parallel to the scan track.

d Any planar imperfection which is not parallel to the coil surface is not acceptable.

e For an imperfection to be larger than the minimum imperfection size, the minimum area, minimum length and minimum width given for the coil/ pipe body, all have to be exceeded.

E.10 **DISPOSITION OF PIPES CONTAINING DEFECTS**

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

E.11 **ROTARY ULTRASONIC INSPECTION OF PIPE (ALTERNATIVE METHOD)**

(New) As an alternative, full pipe may be ultrasonically inspected after welding of longitudinal seam by rotary ultrasonic testing method (pipe in rotating condition) in accordance with ISO 10893-8 amended as follows:

The coverage area during ultrasonic inspection shall be 100 % of the pipe body including weld seam, sides of the weld seam and pipe ends.

The reference standard for the weld seam as per clause E.5.2.3.1 and Table E.7 of this specification shall be used for the rotary ultrasonic testing.

If the manufacturer opts for rotary ultrasonic testing of full pipe in accordance with this clause, then, the requirement for ultrasonic inspection as per clause E.3.1.1, E.3.2.3, E.8 and E.9 of API Spec 5L and as modified herein shall not be applicable.

Annex G

PSL 2 Pipe with Resistance to Ductile Fracture Propagation

G.1 INTRODUCTION

G.1.1 This annex specifies additional provision that apply for pipes ordered as per this specification.

G.2 ADDITIONAL INFORMATION TO BE SUPPLIED BY THE PURCHASER

G.2.1 CVN minimum average absorbed energy value (based on full-sized test pieces) for each test as per G.3.2 shall be as per table G of this specification for BM, weld and HAZ.

Table G.1, G.2 & G.3 of API specification 5L stands replaced by Table G of this specification.

Table G-CVN Absorbed Energy Requirements for Pipe Body, Weld and HAZ of PSL2 Pipe.

Pipe Grade	Full size CVN Absorbed Energy (K_vT)[a.b {J}]	
	Average	Minimum
BM	40	32
X42M	40	32
X46M	40	32
X52M	40	32
X56M	40	32
X60M	42	34
X65M	45	36
X70M	50	40

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

Annex Q (New)

Purchaser Inspection

Q.1 **INSPECTION NOTICE**

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

Q.2 **PLANT ACCESS**

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

Q.3 **COMPLIANCE**

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

Q.4 **REJECTION**

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

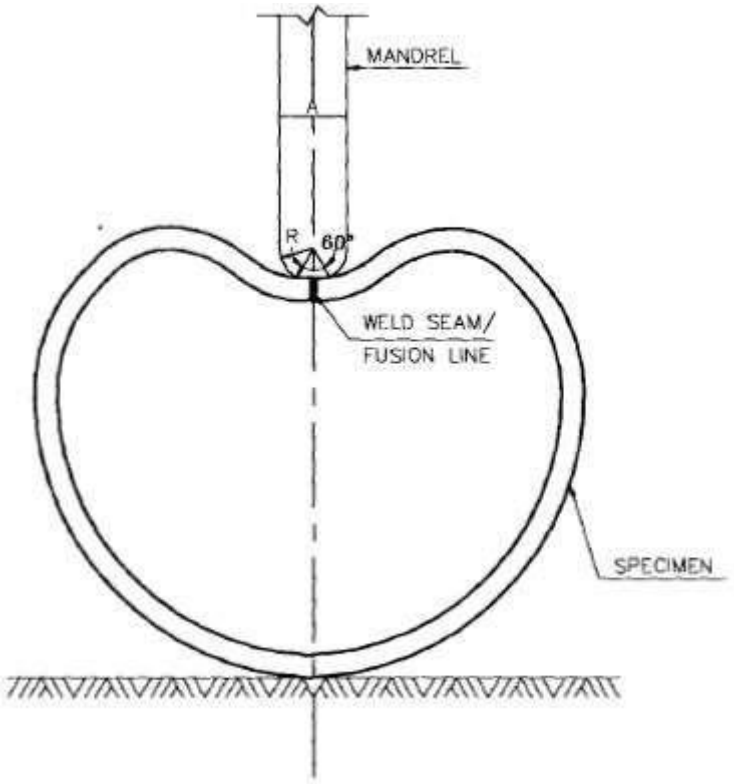


FIGURE: 10.2.4.9.1

REVERSE BEND TEST

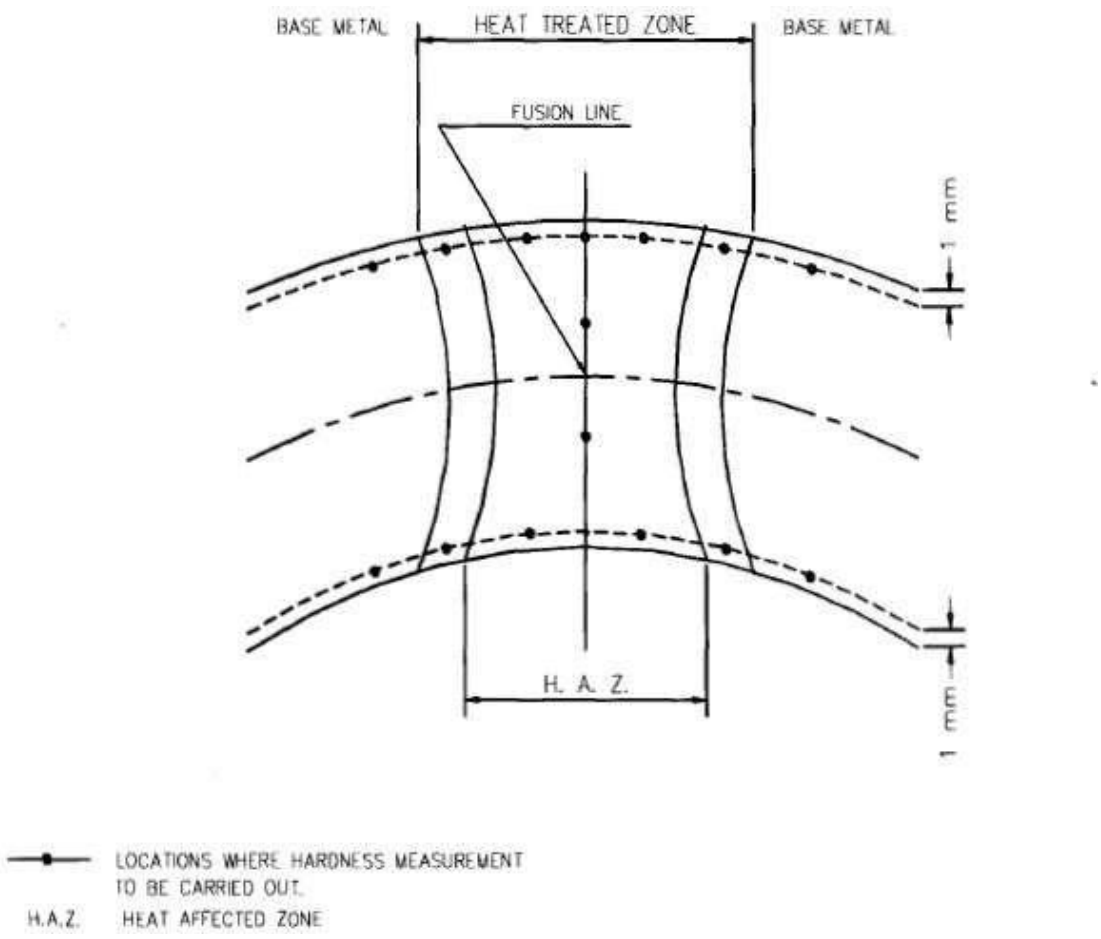
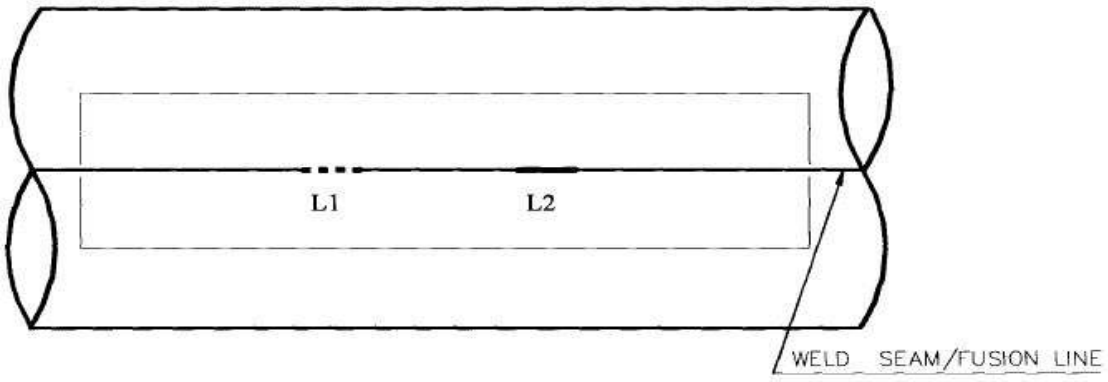


FIGURE: 10.2.5.3

METALLOGRAPHIC SPECIMEN AND LOCATIONS FOR HARDNESS MEASUREMENT



L1 - Longitudinal inside notch (N10) at weld line
L2 - Longitudinal outside notch (N10) at weld line

FIGURE: E.1

REFERENCE STANDARD FOR UT OF LONGITUDINAL WELD SEAM

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TECHINCAL NOTES FOR BOLTS AND NUTS

IGL-SS-PP-2510

CONTENTS

1.0 GENERAL

1.1 The process of manufacture, heat treatment, chemical & mechanical requirements and marking for all stud bolts, m/c bolts, jack screws & nuts shall be in accordance with the codes/standards and specifications given in the requisition. The applicable identification symbol in accordance with the material specification shall be stamped on each bolt and nut. Supplier shall strictly comply with MRIPR stipulations and no deviation shall be permitted.

1.2 Testing

1.2.1. Test reports shall be supplied for all mandatory tests as per the relevant material specifications.

1.2.2. Material test certificate shall also be furnished. (Heat Analysis, Product Analysis and Mechanical Requirement)

1.2.3. Stress Rupture Test as detailed in ASTM A453 shall be carried out for all ASTM A453 bolting material irrespective of the temperature.

1.2.4. Refer Specification no IGL-PL-ITP-0012 for 'Inspection & Test Plan for Bolting Material'.

1.3 All bolting shall be as per ASME B 18.2.1 for studs, M/c bolts and jackscrews and ASME B 18.2.2 for nuts.

1.4 Threads shall be unified (UNC for up to 1" dia and 8UN for> 1" dia) as per ASME B1.1 with class 2A fit for studs, M/c bolts and jackscrews and class 2B fit for nuts.

1.5 Stud bolts shall be threaded full length with two heavy hexagonal nuts unless otherwise specified. Length tolerance shall be in accordance with the requirement of Table D2 of Annexure-D of ASME B 16.5.

1.6 The nuts shall be double chamfered, semi-finished, heavy hexagonal type and shall be made by the hot forged process and stamped as per respective material specification.

1.7 Heads of jackscrews and m/c bolts shall be heavy hexagonal type. Jackscrew end shall be rounded.

1.8 Each size of studs & m/c bolts with nuts and jackscrews shall be supplied in separate containers marked with size and material specifications. 'CRYO' shall be marked additionally in case 'CRYO' is specified in the requisition.

1.9 All items shall be inspected and approved (stage-wise) by IGL.

1.10 The heat treatment for stud bolts & nuts shall be as per code unless mentioned otherwise.

1.11 All austenitic stainless steel bolts, nuts, screws shall be supplied in solution annealed condition unless specified otherwise in the material specification.

1.12 Any additional requirements specified in the requisition shall be fully complied with.

1.13 Stud bolts, nuts & jackscrews shall be impact tested wherever specified in the material specification and also where the material specification is indicated as "CRYO". For S.S. nuts and bolts minimum impact energy absorption shall be 27 Joules and test temperature shall be -196DC unless mentioned otherwise. For other materials impact energy and test shall be as per respective code.

1.14 Bolts/nuts of material of construction B7M/2HM shall be 100% Hardness tested as per supplementary requirement S3 of ASTM A193.

1.15 When specified as galvanized, the studs, M/C bolts and nuts shall be 'hot dip zinc coated' in accordance with requirements of 'class C' of' ASTM A 153'. As an alternative, electro- galvanizing as per IS 1573, 'Service Grade Number 2' is also acceptable.

1.16 All Stud Bolts of Bolt diameter size 1" and above shall be provided with three nuts irrespective of whatever has been specified elsewhere in the MR.

1.17 Bolting shall be protected by non-corrosive oil or grease before dispatch to prevent rusting.

1.18 For stud bolt diameters not covered in ASTM A320, mechanical properties shall match the values specified for the matching grades and stud bolt diameters in ASTM A 193.

1.19 In cases where the lengths of Stud/Machine bolts specified in the MR are not multiples of 0.25", the length supplied shall be equal to the specified length rounded up to the next higher 0.25".

1.20 All Specialties mentioned in item description like "IBR", "L T", "H2", etc. other than **"CRYO" & "NACE**" shall be ignored.

2.0 ACCEPTABLE DEVIATIONS

2.1 Nuts' to ASTM A194Gr.7 are acceptable in place of ASTM A194Gr 4.

2.2 Stud Bolts to ASTM A453 Gr.660 C1.B are acceptable in lieu of ASTM A453 Gr.660C1.A and vice versa

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TECHINCAL NOTES FOR GASKETS

IGL-SS-PP-2511

Abbreviations:

AARH	Average Arithmetic Root Height
BHN	Brinnel Hardness Number
CS	Carbon Steel
MR	Material Requisition
PMI	Positive Material Identification
RTJ	Ring Type Joint

CONTENTS

1.0 GENERAL

1.1 All gaskets shall conform to the codes/standards and specifications given in the requisition. Supplier shall strictly comply with MR/PR stipulations and no deviations shall be permitted.

1.2 Process of manufacture, dimensions and tolerances not specified in requisition shall be in accordance with the requirements of the manufacturer's standards.

1.3 Testing

1.3.1. Test reports shall be supplied for all mandatory tests for gaskets as per the standards specified in the requisition.

1.3.2. Chemical composition and hardness of RTJ gaskets shall also be furnished in the form of test reports on samples.

1.3.3. For Spiral wound material following shall be furnished:

a. Manufacturer's test certificate for filler material and spiral material as per the relevant material specifications.

b. Manufacturer's test certificate for raw materials and tests for compressibility! seal- ability & recovery as per the relevant material specifications.

1.3.4. Refer Specification no IGL-PL-ITP-0013 for 'Inspection & Test Plan for Gaskets'.

1.4 Full face gaskets shall have bolt holes punched out.

1.5 Filler material for spiral wound gaskets shall not have any colour or dye.

1.6 All spiral wound gaskets shall be supplied with Outer ring. Material of the outer ring shall be CS unless otherwise specified in the MR.

1.7 For spiral wound gaskets, material of Inner Compression ring shall be same as Spiral Strip material. Inner rings shall be provided for all Spiral Wound Gaskets.

1.8 Hardness of metallic RTJ gaskets shall not exceed the values specified below unless otherwise specified in MR:

Ring Gasket Material	**Maximum Hardness (BHN)**
Soft Iron	90
Carbon steel	120
5 Cr. $^{1}/_{2}$ Mo	130
Type 304, 316, 321, 347	140
Type 304L, 316L	120
Inconel UNS N06625	200
Incoloy UNS N08825	190
Duplex SS UNS N032205, N031803	230

1.3.5. Face finish of metallic RTJ gaskets shall be 32 to 63 AARH.

1.3.6. Gaskets of different types and sizes shall be placed in separate shipping containers and each container clearly marked with the size, rating, material specification and item code.

1.3.7. All items shall be inspected and approved by IGL.

1.3.8. Any additional requirements specified in the requisition, shall be fully complied with.

1.3.9. Non-metallic ring gaskets as per ASME B 16.21 shall match flanges to ASME B 16.5 upto 24" and to ASME B 16.47B above 24" unless specified otherwise.

1.3.10. Spiral wound gasket as per ASME B 16.20 shall match flanges to ASME B 16.5 upto 24" and to ASME B 16.47B above 24" unless specifically mentioned otherwise.

1.3.11. The following abbreviations have been used in the Material Requisition for Spiral Wound Gaskets:

(I)	:	Inner Ring
(O)	:	Outer Ring
GRAFJL	:	Grafoil Filler

1.3.12. Specialties mentioned in item description like "IBR", "LT", "HICI", "H2", etc. shall be ignored.

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STANDARD SPECIFICATION FOR PAINTING

IGL – SS – PP - 2502

CONTENTS

1.0 GENERAL

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

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

1.2 SCOPE

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

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

1.2.3 Extent of Work

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1.2.4 Documents

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

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

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

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

2.0 CODES & STANDARDS

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

IS: 5 Colors for ready mixed paints and enamels.

RAL DUTCH International Standard for colour shade (Dutch Standard)

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

IS: 161 Heat resistant paints.

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

IS: 2379 Color code for identification of pipelines.

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

3.0 CONDITIONS OF DELIVERY

Packaging

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

4.0 COMPOSITION OF THE PAINT PRODUCTS USED

a) Quality

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

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

b) Quality control - Sampling

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

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

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

5.0 IDENTIFICATION

Every recipient will bear the following information:

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

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

Leaving the site after work

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

The restoration work includes among other things:

- The removal of abrasives.
- The removal of the different protective coverings.

- The Contractor will make the required repairs to any damage after refitting the supports.

- The removal of paint and cleaning of the stains on the floor.

6.0 SURFACE PREPARATION STANDARDS

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

1. Swedish Standard Institution- SIS-05 5900-1967/ISO 8501-1

2. Steel Structures Painting Council, U.S.A. (Surface Preparation Specifications (SSPC-SP)

3. British Standards Institution (Surface Finish of Blast-cleaned for Painting) BS-4232.

4. National Association of Corrosion Engineers. U.S.A. (NACE).

5. IS-1477-1971 (Part-1) - Code of Practice for Painting of Ferrous metals in Buildings. (Part 1, Pre-treatment)

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

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

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

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

7.0 PREPARATION OF THE SURFACES

7.1 General Specifications

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

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

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

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

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

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

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

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

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

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

7.2 Air blast cleaning with abrasive

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

- Clear the steel surface of oil and/or grease;
- Ensure that each flange collar (section where the sealing is applied) is properly screened off against the blasting and the subsequent works;
- Check that no blasting grains can act into the pipes during this process. Any openings not sealed off must be screened off;

- Where there are valves, regulators and other devices, the manufacturer's identification plate will be dismantled so that all surfaces can be treated. The plate will then be put back again.
- Screen off all non-metal structures such as rubber where there is a filter;
- With valves, operators and other devices, care should be taken to ensure that no metal filings or paint get into the apparatus:
- The OWNER reserves the right to carry out part or all of these works himself.

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

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

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

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

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

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

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

7.3 Mechanical or Power tool cleaning

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

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

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

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

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

7.4 Manual or Hand tool cleaning

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

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

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

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

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

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

a) Galvanized surface

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

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

b) Metallized surfaces treated with an impregnation layer

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

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

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

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

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

7.7 Preparation of concrete or cement plaster surfaces

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

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

7.8 Use of solvents

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

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

7.9 Condition of the metal after stripping

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

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

7.10 Removing coating from surface pipelines

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

TABLE-1 (FOR CLAUSE 7.0)
SURFACE PREPARATION STANDARDS

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

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

8.0 METALLISATION

8.1 Applying the metallization

Metallization must be carried out in accordance with ISO 2063,

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

- The metallizing is always carried out on dry parts in good weather conditions (maximum relative humidity 80 %);
- For metallization, a wire composed of 85 % zinc and 15 % aluminum with a minimum guaranteed degree of purity of 99.5 % is used (subject to other specifications). The application thereof is always carried out in accordance with the conditions of the manufacturer and may at all times be submitted to the OWNER's representative.
- The sealant should be applied maximum 3 hours alter metallization.
- The sealant must be thinned and applied as per the present specifications. A visual inspection whereby the sealant completely covers the metallization will suffice here.
- When evaluating the metallization, a negative deviation from the minimum coating thickness, to 80 µ for 20% of the measurements will be permitted.

9.0 COATING PROCEDURE AND APPLICATION

9.1 Conditions for carrying out paintwork

Painting may not be carried out in unsuitable conditions.

All preparatory work and painting may only he carried out in dry weather and at a minimum temperature of 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.

10.0 PAINT MATERIAL

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

a) Primer (P-1)

Red oxide Zinc Chromate Primer

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

b) Primer (P-2)

High build chlorinated rubber zinc phosphate primer

Type and Composition	Single pack, Air Drying Chlorinated rubber medium Plasticized with unsaponifiable plasticiser pigmented with zinc phosphate
Volume solids	35 - 40% (min)
DFT	30 - 40 microns/coat (min)
Covering capacity	7 - 8 M^2/Lit/Coat

c) Primer (P-3)

High build zinc phosphate primer

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

d) Primer (P-4)

Etch Primer / Wash Primer

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

e) Primer (P-5)

Epoxy Zinc Chromate Primer

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

f) Primer (P-6)

Epoxy Zinc Phosphate Primer

Type and Composition	Two packs, Polyamide cured Epoxy resin medium pigmented with zinc phosphate.
Volume solids	40% (min)
DFT	35 - 50 microns/coat (min)
Covering capacity	11 - 12 M^2/lit/coat

g) Primer (P-7)

Epoxy high build M10 Paint (Intermediate Coat)

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

h) Primer (P-8)

Epoxy Red Oxide zinc phosphate primer

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

i) Primer (P-9)

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

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

j) Finish Coats (F-1)

Synthetic Enamel

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

k) Finish coat (F-2)

Acrylic Polyurethane paint

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

l) Finish Coat (F-3)

Chlorinated Rubber Paint

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

m) Finish Coat (F-4)

High build chlorinated rubber M10 paint.

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

n) Finish coat (F-5)

Chemical Resistant Phenolic based Enamel

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

o) Finish Coat (F-6)

Epoxy High Building Coating

Type and Composition	Two pack. Polyamide-amine cured epoxy resin medium suitably pigmented.
Volume solids	60 - 65% (min)
DFT	100 microns/coat (min)
Covering capacity	6.0 - 6.5 M^2/lit/coat

p) Finish Coat (F-7)

High build Coal Tar Epoxy

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

q) Finish Coat (F-8)

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

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

r) Finish Coat (F-9)

Inorganic Zinc Silicate coating

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

s) Finish coat (F-10)

High build Black

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

t) Finish Coat (F-11)

Heat Resistant Aluminium Paint Suitable up to 250°C.

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

u) Finish Coat (F-12)

Heat Resistant Silicon Paint suitable up to 400º C.

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

v) Finish Coat (F-13)

Synthetic Rubber Based Aluminium Paint Suitable up to 1508C.

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

Notes:

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

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

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

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

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

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

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

MANUFACTURERS

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

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

STORAGE

All paints and painting material shall be stored only in rooms to be provided by contractor and approved by OWNER/ OWNER 's Representative for the purpose. 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

12.0 COLOR CODE FOR PIPING:

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

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

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

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

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

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

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

COLOR CODE:

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

Table 12.1 Colour Coding Scheme for Pipes and Equipment

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

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

IDENTIFICATION SIGN

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

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

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

a) Color Bands

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

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

IDENTIFICATION OF EQUIPMENT

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

INSPECTION AND TESTING

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

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

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

Any defect noticed during the various stages of inspection shall be rectified by the contractor to the entire satisfaction of OWNER/ OWNER's Representative before proceeding further. Irrespective of the inspection, repair and approval at intermediate stages of work. Contractor shall be responsible for making good any defects found during final inspection/guarantee period/defect liability period as defined in general condition of contract. Dry film thickness (DFT) shall be checked and recorded after application of each coat and extra coat of paint should be applied to make-up the DFT specified without any extra cost to OWNER.

PRIMER APPLICATION

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

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

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

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

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

18.0 PAINT SYSTEMS

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

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

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

TABLE 18.1: LIST OF PRIMERS & FINISH PAINTS

PRIMERS	
P-1	Red oxide Zinc chromate Primer
P-2	Chlorinated rubber zinc Phosphate Primer
P-3	High build Zinc phosphate Primer
P-4	Etch Primer/Wash Primer
P-5	Epoxy Zinc Chromate Primer
P-6	Two component Epoxy Zinc Phosphate Primer cured with polyamine hardener
P-8	Epoxy red oxide zinc phosphate primer
FINISH COATS / PAINTS	
F-1	Synthetic Enamel
F-2	Two component Acrylic – Polyurethane finish paint
F-3	Chlorinated Rubber finish paint
F-5	Chemical resistant phenolic based enamel
F-6	High Build Epoxy finish coating cured with **polyamide** hardener
F-7	High build Coal Tar Epoxy coating cured with **polyamine** hardener
F-8	Self priming surface Tolerant High Build epoxy coating. cured with **polyamine** hardener
F-9	Two component Inorganic Zinc Silicate coating
F-10	High build Reinforced bituminous composition phenol based resin.
F-11	Heat resistant synthetic medium based Aluminium paint suitable for 250 deg C
F-12	Two component Heat resistant Silicone Aluminium paint. suitable for 400 deg C
F-13	Synthetic based aluminium Paint suitable for 150 deg C

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

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

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

SI. No.	Temp. Range	Surface preparation	Primer	Finish Coat	Total DFT	Remarks
1	-14 to 80	SSPC-SP-10	Two coats P-6, 35 microns / coat (min.)	One coats F- 6, 100 microns coat (min.) and one coats F- 2 40 microns coat (min.)	210	Paint application at ambient temp.
2	81 to 250	SSPC-SP-10	-	Three coats F-11, 20 Microns / coat (min.)	60	Paint application at ambient temp. and curing at 250°C for 4 hours
3	81 to 400	SSPC-SP-10	-	Three coats F-12, 20 Microns / coat (min.)	60	Paint application at ambient temp. and curing at 250°C for 4 hours

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

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

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

SI. No.	Temp. Range	Surface Preparation	Primer	Finish Coat	Total DFT	Remarks
External side of un-insulated underground storage tanks:						
1	-40 to 80	SSPC-SP-10	1 coat of F-9 @ 65-75µ DFT/ coat	3 coats of F-7 @ 100µ DFT/coat (3x100=300)	365-375	

18.2 Precautions to be taken

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

18.3 Method of application

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

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

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

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

18.4 Application of the coating

Application of the paint will be carried out in accordance with best practice in order to obtain a homogeneous and continuous layer. The OWNER or the Approved Supervisory body demands that painting of a layer will only be started after acceptance by them of the surface preparation or of the previous layer of paint.

The layers of paint must have a uniform thickness. They must he spread in such a way that all concave parts are dried out and that the surface is completely covered and has a

glossy appearance without leaving brush marks and without exhibiting bubbles, foam, wrinkles, drips, craters, skins or gums that arise from weathered paint,

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

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

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

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

18.5 Transporting treated items

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

19.0 GROUND-LEVEL TRANSITION POINT

19.1 Polyester protection system

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

1) The primer of system 01.

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

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

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

20.0 USE OF SCAFFOLDING

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

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

21.0 QUALITY CONTROLS AND GUARANTEE

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

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

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

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

21.2 Reference Surfaces

At the start of the works. The OWNER or the approved supervisory body will indicate a few surfaces that the Contractor will prepare and cover in accordance with the recognized method of operation under the inspection and to the satisfaction of all parties; the OWNER or his representative, the approved supervisory body, the contractor and possibly the paint manufacturer. These reference surfaces will serve as a point of comparison for the good adhesion of the paint on the installations as a whole. The parties will together

work out a system for the identification of these surfaces in order to be able to monitor the conditions of the coatings over time. If the paintwork on a section of the installations is in a worse condition than the reference surfaces, the Contractor may be obliged to treat these parts again.

21.3 Measures to be taken in the event of a dispute

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

- The Swedish standards ISO 8501-1 1988 SS 05.5900 concerning the degree of cleanliness of the areas derusted by blasting, by machine or by hand.

- The wet film thickness of the paint will be measured in accordance with ISO 2808 or ASTM DI 212;

- The dry layer thickness of the film will be measured electronically, will complete statistical information. in accordance will, ISO 2808 or ASTM D 1186.

- The thickness of each layer will be measured in accordance with ISO 2808. ASTM 4138 or DIN 50986.

- Adhesion tests will be carried out in accordance with ISO 2409. ASTM 3359 or DIN 53151.

- Traction tests will he carried out in conformity with ISO 4624 or ASTM D 4541.

- The rugosity will be measured electronically in accordance with DIN 4768;

- The non-porosity will be measured with a test tension depending on the type of coating, the layer thickness and after consultation with the Paint manufacturer.

- Any defects in the paint film may be inspected visually by means of a magnifying glass or microscope. If necessary a photographic report may be drawn up in accordance with ASTM Standard D 4121-82.

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

21.4 Guarantee

a) General Principles

The Contractor declares that he is aware of:

- The maximum operating temperature of the surfaces to be covered.
- The maximum permitted degree of humidity of the bearing surface.

- The properties of the environment to which the surfaces to be covered are: subject.

b) Summary of the Guarantee.

The contractor fully guarantees the following without reservation:

- The observance of all stipulations of the specifications for paintwork regarding, among other things:
  - The preparation of the surfaces.
  - The thickness of each layer.
  - The total thickness of the covering.
- The uniformity of the materials used.
- The repair of all defects before delivery of the works.

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

INDRAPRASTHA GAS LTD.

STANDARD SPECIFICATION
FOR
QUALITY MANAGEMENT SYSTEM
REQUIREMENT FROM VENDORS

IGL – SS – PP - 2044

Abbreviations:

CV	:	Curriculum Vitae
ISO	:	International Organization for Standardization
MR	:	Material Requisition
PO	:	Purchase Order
PR	:	Purchase Requisition
QA	:	Quality Assurance
QMS	:	Quality Management System

CONTENTS

1.0 SCOPE

This specification establishes the Quality Management System requirements to be met by BIDDER for following purpose:

- QMS requirements to be met by suppliers/contractors after award of work/ during contract execution.

2.0 DEFINITIONS

2.1 Bidder

For the purpose of this specification, the word "BIDDER" means the person(s), firm, company or organization who is under the process of being contracted by Owner for delivery of some products (including service). The word is considered synonymous to supplier, contractor or vendor.

2.2 Project Quality Plan

Document tailored from Standard Quality Management System Manual of BIDDER, specifying how the quality requirements of the project will be met.

2.3 Owner

Owner means the owner of the project for which services / products are being purchased and includes their representatives, successors and assignees.

3.0 REFERENCE DOCUMENTS

IGL-SS-PP-2043 Standard Specification for Documentation Requirements from Suppliers

4.0 QUALITY MANAGEMENT SYSTEM — GENERAL

Unless otherwise agreed with PMC / Owner, the BIDDER proposed quality system shall fully satisfy all relevant requirements of ISO 9001 "Quality Management Systems - Requirements." Evidence of compliance shall be current certificate of quality system registration to ISO 9001 or a recent compliance audit recommending registration from a certification agency. The quality system shall provide the planned and systematic control of all quality related activities for execution of contract. Implementation of the system shall be in accordance with BIDDER'S Quality Manual and PROJECT specific Quality Plan.

5.0 QUALITY SYSTEM REQUIREMENTS

5.1 BIDDER shall prepare and submit for review / record, Project Quality Plan / Quality Assurance Plan for contracted scope / job. The BIDDER'S Quality Plan shall address all of the applicable elements of ISO 9001, identify responsible parties within BIDDER'S organization, for the implementation / control of each area, reference the applicable procedures used to control / assure each area, and verify the documents produced for

each area. The Project Quality Plan shall necessarily define control or make reference to the relevant procedures, for design and engineering, purchase, documentation, record control, bid evaluation, inspection, production/manufacturing, preservation, packaging and storage, quality control at construction site, pre-commissioning, commissioning and handing over (as applicable) in line with contract requirement and scope of work.

5.2 BIDDER shall identify all specified or implied statutory and regulatory requirements and communicate the same to all concerned in his organization and his sub contractor's organization for compliance.

5.3 BIDDER shall deploy competent and trained personnel for various activities for fulfilment of PO / contract. BIDDER shall arrange adequate infrastructure and work environment to ensure that the specification and quality of the deliverable are maintained.

5.4 BIDDER shall do the quality planning for all activities involved in delivery of order.
The quality planning shall cover as minimum the following:

- Resources
- Product / deliverable characteristics to be controlled.
- Process characteristics to ensure the identified product characteristics are realized
- Identification of any measurement requirements, acceptance criteria
- Records to be generated
- Need for any documented procedure

The quality planning shall result into the quality assurance plan, inspection and test plans (ITPs) and job procedures for the project activities in the scope of bidder.

These documents shall be submitted to PMC/Owner for review/approval, before commencement of work.

5.5 Requirements for sub-contracting / purchasing of services specified in contract / tender shall be adhered to. In general, all outsourced items will be from approved vendors of OWNER. Wherever requirements are not specified, or approved sub vendors do not exist, the sub-contractor shall establish and maintain a system for purchasing / sub-contracting to ensure that purchased product / service conforms to specified requirements. Criteria for selection of sub-contractor, evaluation, re-evaluation, maintenance of purchasing data and verification of purchased product (subcontractor services), constitute important components of this requirement.

5.6 BIDDER shall plan and carry production and service provision under controlled conditions. Controlled conditions shall include, as applicable the availability of information that describes the characteristics of the product the availability of work instructions the use of suitable equipment the availability and use of monitoring and measuring devices the implementation of monitoring and measurement the implementation of release, delivery and post-delivery activities.

5.7 BIDDER shall validate any processes for production and service provision where resulting output cannot be verified by subsequent monitoring and measurement. This includes any process where deficiencies become apparent only after the product is in use or service has been delivered.

5.8 BIDDER shall establish a system for identification and traceability of product /deliverable throughout product realization. Product status with respect to inspection and testing requirements shall be identified.

5.9 BIDDER shall identify, verify, protect and safeguard PMC / Owner property (material / document) provided for use or incorporation into the product. If any OWNER/ PMC property is lost, damaged or otherwise found to be unsuitable for use, this shall be reported to the OWNER/ PMC.

5.10 BIDDER shall ensure the conformity of product / deliverable during internal processing and delivery to the intended destination. Requirements mentioned in the tender shall be adhered to.

5.11 BIDDER shall establish system to ensure that inspection and testing activities are carried out in line with requirements. Where necessary, measuring equipment's shall be calibrated at specified frequency, against national or international measurement standards; where no such standard exists, the basis used for calibration shall be recorded. The measuring equipment's shall be protected from damage during handling, maintenance and storage.

5.12 BIDDER shall ensure effective monitoring, using suitable methods, of the processes involved in production and other related processes for delivery of the scope of contract.

5.13 BIDDER shall monitor and measure the characteristics of the product/deliverable to verify that product requirement has been met. The inspection (stage as well as final) by BIDDER and OWNER / Owner personnel shall be carried out strictly as per the ITPs forming part of the contract. Product release or service delivery shall not proceed until the planned arrangements have been satisfactorily completed, unless otherwise approved by relevant authority and where applicable by Owner / PMC.

5.14 BIDDER shall establish and maintain a documented procedure to ensure that the product which does not conform to requirements is identified and controlled to prevent its unintended use or delivery.

5.15 All non-conformities (NCs) / deficiencies found by the BIDDER'S inspection /surveillance staff shall be duly recorded, including their disposal action shall be recorded and resolved suitably. Effective corrective and preventive action shall be implemented by the BIDDER so that similar NCs including deficiencies do not recur.

5.16 All deficiencies noticed and reported by PMC / OWNER shall be analysed by the BIDDER and appropriate corrective and preventive actions shall be implemented. BIDDER shall intimate PMC / OWNER of all such corrective and preventive action implemented by him.

5.17 BIDDER should follow the standards, specifications and approved drawings. Concessions/Deviations shall be allowed only in case of unavoidable circumstances. In such situations Concession/deviation request must be made by the BIDDER through online system of OWNER/ PMCs eDMS.

5.18 BIDDER shall have documented procedure for control of documents.

5.19 All project records shall be carefully kept, maintained and protected for any damage or loss until the project completion, then handed over to PMC / Owner as per contract requirement (IGL-SS-PL-0047 Specification for Documentation Requirements from Suppliers), or disposed as per relevant project procedure.

6.0 AUDITS

BIDDER shall plan and carry out the QMS audit for the job. Quality audit programme shall cover design, procurement, construction management and commissioning as applicable including activities carried out by sub-vendors and sub-contractors. This shall be additional to the certification body surveillance audits carried out under BIDDER'S own ISO 9001 certification scheme.

The audit programmes and audit reports shall be available with bidder for scrutiny by PMC / OWNER. PMC or OWNER representative reserves the right to attend, as a witness, any audit conducted during the execution of the WORKS.

In addition to above OWNER, PMC and third party appointed by PMC/Owner may also perform Quality and Technical compliance audits. BIDDER shall provide assistance and access to their systems and sub-contractor / vendor systems as required for this purpose. Any deficiencies noted shall be immediately rectified by BIDDER.

7.0 DOCUMENTATION REQUIREMENTS

BIDDER shall submit following QMS documents immediately after award of work (Within one week) for record / review by PMC/ Owner.

- Organization chart (for complete organization structure and for the project)
- Project Quality Plan/Quality Assurance Plan
- Job specific Inspection Test Plans, if not attached with PR
- Job Procedures
- Inspection/Test Formats

In addition to above QMS documents, following documentation shall be maintained by the BIDDER for submission to PMC / Owner on demand at any point of time during execution of the project.

- Quality Manual
- Certificate of approval for compliance to ISO: 9001 standards
- Procedure for Control of Non-conforming Product

- Procedure for Control of Documents
- Sample audit report of the QMS internal and external audits conducted during last one year
- Customer satisfaction reports from at least 2 customers, during the last one year
- Project QMS audit report
- Technical audit reports for the project
- Corrective action report on the audits

Documents as specified above are minimum requirements. BIDDER shall submit any other document/data required for completion of the job as per PMC/Owner instructions.

INDRAPRASTHA GAS LTD.

STANDARD SPECIFICATION

FOR

DOCUMENTATION

REQUIREMENTS FROM

SUPPLIERS

IGL – SS – PP - 2043

Abbreviations:

DCI	:	Document Control Index
edms	:	Electronic Document Management System
FOA	:	Fax of Acceptance
HOD	:	Head of Division / Department
IC	:	Inspection Certificate
IRN	:	Inspection Release Note
ITP	:	Inspection and Test Plan
LOA	:	Letter of Acceptance
MOU	:	Memorandum of Understanding
MR	:	Material Requisition
PO	:	Purchase Order
PR	:	Purchase Requisition
PVC	:	Polyvinyl Chloride
QMS	:	Quality Management System
TPIA	:	Third Party Inspection Agency
URL	:	Universal Resource Locator

CONTENTS

1.0 SCOPE

This specification establishes the Documentation Requirements from Suppliers. All documents/data against the PO / PR / MR shall be developed and submitted to OWNER by the suppliers for review / records, in line with this specification.

2.0 DEFINITIONS

2.1 Supplier

For the purpose of this specification, the word "SUPPLIER" means the person(s), firm, company or organization who is under the process of being contracted by OWNER for delivery of some products (including service). The word is considered synonymous to bidder, contractor or vendor.

2.2 Owner

Owner means the owner of the project for which services / products are being purchased and includes their representatives, successors and assignees.

3.0 REFERENCE DOCUMENTS

IGL-SS-PP-2044 Standard Specification for Quality Management System Requirements from Vendors

4.0 DOCUMENTATION REQUIREMENTS

4.1 Documents/Data to be Submitted by the Supplier

4.1.1 The Supplier shall submit the documents and data against the PO/PR/MR as per the list given in respective PO/PR/MR.

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

4.1.3 Unless otherwise specified, submission of documents for Review/Records shall commence as follows from the date of Fax of Intent / Letter of Intent/ Fax of Acceptance (FOA)/ Letter of Acceptance (LOA):

QMS - 1 week

Drawing/Document Control Index - 2 weeks

Other Documents/Drawings - As per approved Drawing/Document Control Index/Schedule

4.1.4 Documents as specified in PO/PR/MR are minimum requirements. Supplier shall submit any other document/data required for completion of the job as per OWNERs instructions.

4.2 Style and Formatting

4.2.1 All Documents shall be in ENGLISH language and in M.K.S System of units.

4.2.2 Before forwarding the drawings and documents, contractor shall ensure that the following information are properly mentioned in each drawing:

Purchase Requisition Number

Name of Equipment / Package

Equipment / Package Tag No.

Name of Project

Client

Drawing / Document Title

Drawing / Document No.

Drawing / Document Revision No. and Date

4.3 Review and Approval of Documents by Supplier

4.3.1 The Drawing/Documents shall be reviewed, checked, approved and duly signed/stamped by supplier before submission. Revision number shall be changed during submission of the revised supplier documents and all revisions shall be highlighted by clouds. Whenever the supplier requires any sub-supplier drawings to be reviewed by OWNER, the same shall be submitted by the supplier after duly reviewed, approved and stamped by the supplier. Direct submission of sub-supplier's drawings without contractor's approval shall not be entertained.

4.4 Document Category

4.4.1 Review Category

Following review codes shall be used for review of supplier Drawings/Documents:

Review Code A	-	No comments. Proceed with manufacture/ fabrication as per the document.
Review Code B	-	Proceed with manufacture/fabrication as per commented document. Revised document required.
Review Code C	-	Document does not conform to basic requirements as marked. Resubmit for review
Review Code D	-	Document Rejected
Review Code F	-	For information
R	-	Document is retained for Records. Proceed with manufacture/fabrication.
V	-	Void

4.5 Methodology for Submission of Documents to PMC/Owner

4.5.1 Document Control Index (DCI)

Supplier shall create and submit Document Control Index (DCI) for review based on PO/PR/MR along with schedule date of submission of each drawing/document on OWNERs eDMS. The DCI shall be specific with regard to drawing/document no. and the exact title. Proper sequencing of the drawings/documents should be ensured in scheduled date of submission on of the job as per OWNER.

4.5.2 Submission of Drawings/Documents

Drawings/documents and data shall be uploaded on the eDMS Portal as per DCI

4.5.3 Statutory Approvals

Wherever approval by any statutory body is required to be taken by Supplier, the Supplier shall submit copy of approval by the authority to PMC/OWNER.

4.5.4 Details of Contact Persons of Supplier

After placement of order supplier shall assign a Project Manager for that order. The details are to be filled online through the portal. The details include e-mail address, mailing address, telephone nos., fax nos. and name of Project Manager. All the system generated emails pertaining to that order shall be sent to the assigned Project Manager.

4.5.5 Schedule and Progress Reporting

Supplier shall submit monthly progress report and updated procurement, engineering and manufacturing status (schedule vs. actual) every month, beginning within 2 weeks from FOA/LOA . In case of exigencies, PMC/Owner can ask for report submission as required on weekly/fortnightly/adhoc basis depending upon supply status and supplier shall furnish such reports promptly without any price implication. Format for progress report shall be submitted by the Supplier during kick off meeting or within one week of receiving FOA/LOA, whichever is earlier.

4.5.6 Quality Assurance Plan/Inspection and Test Plan

Inspection and test plans (ITP) attached if any, to the MR/PR are to be followed.

However for cases wherein ITPs have not been attached with MR/PR, Supplier shall submit within one week of receiving FOA/LOA, the Quality Assurance Plan for manufacturing, covering quality control of critical bought out items/materials, inspection& testing at various stages of production, quality control records and site assembly &testing as may be applicable to the specific order and obtain approval from OWNER /PMC/ third party inspection agency, as applicable.

For Package equipment contracts, the supplier shall prepare a list of items/ equipment's and their inspection categorization plan for all items included in the scope of supply immediately after receipt of order and obtains approval for the same from OWNER. The

items shall be categorized into different categories depending upon their criticality for the scope of inspection of TPIA and/or OWNER/ OWNER appointed PMC.

4.5.7 Inspection Release Note (IRN)/ Inspection Certificate (IC)

IRN/ IC shall be issued by PMC Inspector/ third party inspection agency on the basis of successful inspection, review of certificates as per specifications & agreed quality plan (as applicable) and only after all the drawings/documents as per DCI are submitted and are accepted under review code-A or code R. Supplier shall ensure that necessary documents/manufacturing and test certificates are made available to PMC/TPIA as and when desired.

Note: Non fulfilling above requirement shall result into appropriate penalty or withholding of payment as per conditions of PO/PR/MR.

Transportation Plan for Over Dimensional Consignments (ODC), if any, shall be submitted within 2 weeks of receiving FOA/LOA, for approval. Consignment with parameters greater than following shall be considered as over dimensional.

Dimensions: 4 meters width x 4 meters height x 20 meters length

Weight: 32 MT

4.6 Final Documentation

4.6.1 As Built Drawings

Shop changes made by Supplier after approval of drawings under `Code A' by OWNER/OWNER appointed PMC and deviations granted through online system , if any, shall be marked in hard copies of drawings which shall then be stamped 'As-built' by the supplier. These 'As-built' drawings shall be reviewed and stamped by PMC Inspector/TPIA also. Supplier shall prepare scanned images files of all marked — up 'As — built drawings. Simultaneously Supplier shall incorporate the shop changes in the native soft files of the drawings also.

4.6.2 As Built Final Documents

As built final documents shall be submitted as listed in PO/PR/MR.

4.6.3 Packing/Presentation of Final Documents

Final Documents shall be legible photocopies in A4, A3 size only. Drawings will be inserted in plastic pockets (both sides transparent, sheet thickness minimum 0.1 mm) with an extra strip of 12 mm wide for punching so that drawings are well placed.

Final Documentation shall be bound in Hard board Plastic folder(s) of size 265 mm x 315 mm (101 /2 inch x 12 1 /2 inch) and shall not be more that 75 mm thick. It may be of several volumes and each volume shall have a volume number, index of volumes and index of contents of that particular volume. Where number of volumes are more, 90mm thickness can be used. Each volume shall have top PVC sheet of minimum 0.15mm thick duly fixed and pressed on folder cover and will have 2 lever clips. In case of imported items documents, 4 lever clips shall also be accepted. All four corners of folders shall be properly metal clamped. Indexing of contents with page numbering must be incorporated by supplier. Spiral/Spico bound documents shall not be acceptable. As mentioned above,

books should be in hard board plastic folders with sheets punched and having 2/4 lever clips arrangement.

Each volume shall contain on cover a Title Block indicating package Equipment Tag No. & Name, PO/Purchase Requisition No., Name of Project and Name of Customer. Each volume will have hard front cover and a reinforced spine to fit thickness of book. These spines will also have the title printed on them. Title shall include also volume number (say 11 of 15) etc.

4.6.4 Submission of Soft Copies

Supplier shall submit to OWNER, the scanned images files as well as the native files of

Drawings / documents, along with proper index.

In addition to hard copies, Supplier shall submit electronic file (CD-ROM) covering soft

copies of all the final drawings and documents, all text documents prepared on computer, scanned images of all important documents (not available as soft files), all relevant catalogues, manuals available as soft files (editable copies of drawings/text documents, while for catalogues/manuals/proprietary information and data, PDF files can be furnished).

All the above documents shall also be uploaded on the OWNERs eDMS portal.

4.6.5 Completeness of Final Documentation

Supplier shall get the completeness of final documentation verified by PMC appointed TPIA and attach the Format for Completeness of Final Documentation Format duly signed by OWNER/ OWNER appointed PMC/ Inspector or TPIA as applicable to the document folder.

ANNEUXRE-1

COMPLETENESS OF FINAL DOCUMENTATION

Name of Supplier/Contractor :

Customer :

Project :

OWNER's Job No. :

Purchase Order No./

Contract No. :

Purchase Requisition No./

Tender No. : Rev. No. :

Name of the Work/

Equipment :

Tag. No. :

Supplier's/ Contractor's

Works Order No. :

Certified that the Engineering Documents/ Manufacturing & Test Certificates submitted by the supplier is complete in accordance with the Vendor Data Requirements of Purchase Requisition.

Signature :..... Signature:.....

Date :..... Date:.....

Name :..... Name:.....

Designation :..... Designation:.....

Department :..... Department:.....

Supplier/Contractor **OWNER/PMC/TPIA**

INDRAPRASTHA GAS LTD.

STANDARD SPECIFICATION
FOR
THIRD PARTY INSPECTION AGENCY (TPIA)

IGL – SS – PP - 2031

ABBREVIATIONS:

TPIA	THIRD PARTY INSPECTION AGENCY
QA	Quality Assurance
QC	Quality Control
LOI	Letter of Indent
QAP	Quality Assurance Procedure
ISS	International Standard Space
UPS	Uninterruptible Power Supply

CONTENTS

1.0 INTRODUCTION

The objective is to specify the role of Third-Party Inspection Agency (TPIA) appointed by Contractor for supply items and appointed by Owner for construction work.

The Contractor will appoint an independent approved Third-Party Inspection Agency (TPIA) whose role shall be to witness, review and certify all quality related issues for supply of material. The TPIA shall ensure that all quality related requirements during manufacturing are strictly followed as per Owner/Owner's representative specifications and approved documents. Owner shall appoint its TPIA for witness, review and certification of all the construction activities.

This Standard Specification also indicates general quality control requirements for various activities pertaining to Gas Pipeline Projects and the extent of TPIA involvement as indicated in tender shall be binding on the contractor.

2.0 SCOPE OF WORK

2.1 Role of TPIA for Supply Items

TPIA, as appointed by the Contractor from Owner's approved list, shall witness, review and certify all quality related activities for supply of material for Mechanical, Civil, Electrical and Instrumentation system. The extent of TPIA involvement as a minimum is indicated in the various Quality Control Sheets attached with the tender document and shall be as per final approved QA/QC procedures or as per codes and standards, wherever applicable.

2.2 Role of Owner / Owner's Representative for Supply Items

For supply items, Owner / Owner's Representative reserves the right to carryout independent inspection / audit of the plant during manufacturing. The extent of inspection shall be at the discretion of Owner / Owner's Representative. All costs related to the same (excluding travel expenses) shall be borne by Contractor

2.3 Role of TPIA for Construction Activity

TPIA, as appointed and paid by Owner will be involved in all inspection, witness & certify construction work. The extent of TPIA involvement will be shown in the various Quality control sheets prepared by Contractor and approved by Owner/ Owner's representative.

Prior to commencement of any activity pertaining to construction at site, Owner/Owner's representatives shall get the documents reviewed by the TPIA.

2.4 The various Hold points' involvement as mentioned in various QC sheets is indicative minimum. However, actual involvement shall be decided by Owner/Owner's Representative during review of documents, and Contractor shall be bound by the same. Contractor shall also submit the calibration certificates of all the equipment/instruments, which are part of manufacturing/Inspection & testing for TPIA review TPIA shall also be responsible to check /witness the

necessary calibration of such equipment/Instruments during visit to contractor's works.

3.0 ROLE OF CONTRACTOR

Contractor shall have to carry out all necessary inspections and testing which are indicated in approved documents and shall have to provide all necessary latest tools & tackles, measuring instruments and facilities, which are required by the TPIA/Owner /Owner's representatives and all necessary assistance to carryout inspection/testing at contractor's cost. Owner/Owner's representative shall have a right to inspect any activity.

4.0 CO-ORDINATION WITH TPIA

Contractor on award of the Contract/LOI shall submit the detail procurement and construction schedules within fifteen (15) days to Owner/Owner's representative for their approval. The detail item wise Manufacturing schedule indicating dates and location of manufacturer works shall be submitted by the Contractor within One (1) week from the date of issue of their internal Indent /Purchase order to sub vendor.

Contractor shall inform in writing minimum One (1) week in advance to inform the Owner/Owner's representative for Inspection Notice/Call. All coordination among Owner/Owner's representative/TPIA and Contractor's/ Vendor's works shall be the responsibility of Contractor. In case the Contractor fails to honour its inspection calls/notice, contractor has to reimburse all costs incurred by the Owner/Owner representative at actual.

Inspection of site construction activities shall be coordinated on daily basis and adequate notice shall be given to Owner/Owner's representative to mobilize TPIA, this shall be as per site conditions and requirements.

5.0 INVOLVEMENT OF TPIA

5.1 The Minimum requirements are indicated in the Quality Control Tables attached in tender document.

5.2 Civil

All procured items required for execution activities for civil works should satisfy the following conditions:

- It should be of reputed make having proven record of being successfully used in similar works earlier and as per approval by Owner / Owner's Representative.
- All materials shall be of standard quality and shall be procured from renowned sources / manufacturers approved by Owner/ Owner's representative.
- All tests of the materials as specified by the relevant codes should be carried out by the contractor in an approved laboratory and the test reports should be

duly authenticated by the laboratory and should be submitted to TPIA for his approval. If so desired by Owner/ Owner's representative, tests shall be conducted in his presence or in presence of his authorized nominee.

- Quality and acceptance of materials not covered under general technical specifications shall be governed by relevant codes.
- The Contractor shall submit manufacturer's test reports on quality and suitability of any material procured from them and their recommendations on storages/ application/ workmanship etc. for the intended use. Submission of manufacturer's test reports does not restrict Owner/ representative from asking fresh test results from an approved laboratory of the actual materials supplied even from an approved manufacturer.
- Contractor shall furnish the QAP for all supply and construction works.

5.3 Electrical

All procured items for required execution activities for electrical works should satisfy the following conditions:

- Contractor shall furnish the QAP for Panels, Cables, UPS etc. for Owner's review.
- QA Plan will commence at the instigation of the requisition and follow through to equipment acceptance thus ensuring total conformity to the specifications.
- Type test certificates of similar equipment shall be provided.
- Routine tests shall be carried out on the panels, Cables, UPS, Flame proof equipment and other items as per ISS.
- Owner/Owner's Representative reserve the right to witness routine acceptance tests at the manufacturer works as indicated in QAP & ISS.
- Owner/Owner's Representative will witness the routine tests on Panels, UPS at the manufacturer works prior to despatch, to prove compliance with specifications.
- Owner/Owner's Representative shall carry out the inspection of the erection of equipment and witness the testing & commissioning of the equipment at site and approve the test certificates.

5.4 Instrumentation

All procured items for required execution activities for Instrumentation works should satisfy the following conditions:

- Contractor shall furnish the quality assurance procedure for field instruments and cables for review of Owner/ Owner's representative.
- QAP will commence at the instigation of the requisition and follows through to

equipment acceptance. Thus, ensuring total conformity to the specifications.

- Type test certificates of similar equipment shall be provided.
- Owner/Owner's Representative shall carryout the inspection of erection of the equipment and witness the testing and commissioning and approve the certificates.

	PIPING SPECIFICATION	SPECIFICATION NO 3C1
		SHEET 1 OF 6
		REV 0

BASIC PIPING SPECIFICATION DATAS		MAXIMUM DESIGN CONDITIONS			
		TEMPERATURE ° C		PRESSURE bar g	
PRIMARY FLANGE RATING	300#-RF	NG	0 to 45	NG	49.00
		AG	60	AG	49.00
BASIC MATERIAL	CARBON STEEL				
CORROSION ALLOWACE	1.5 mm				
X-RAYS	100%				
SIZE RANGE	1/2"-12"				
CODE	ANSI B 31.8				

FLUIDS

NG : NATURAL GAS

AG : ACTUATING GAS

REV	DESCRIPTION	DATE	AUTHOR	CHECKER	APPROVED
0	FIRST ISSUE	30.08.2022	SR	DG	HK

			PIPING SPECIFICATIONS				SPECIFICATION NO 3C1 SHEET 2 OF 6 REV 0
ITEM	**SHORT CODE**	**SIZE FROM - THRU**	**END CONNECTION**	**RATING AND/OR SCH.**	**DIMENSION STANDARD**	**MATERIAL**	**REMARKS**
PIPES	**P**	1/2" - 2"	BE-ANSI B16-25	6.4 mm	ANSI B36-10	ASTM A 106 Gr. B	SEAMLESS
		4"	BE-ANSI B16-25	6.4 mm	API 5L	API 5L Gr. B	HFW / SEAMLESS
		6"	BE-ANSI B16-25	6.4 mm	API 5L	API 5L Gr. B	HFW / SEAMLESS
		8"	BE-ANSI B16-25	6.4 mm	API 5L	API 5L X 52	HFW / SEAMLESS
		12"	BE-ANSI B16-25	6.4 mm	API 5L	API 5L X 60	HFW / SEAMLESS
ELBOWS 90 LR	**E**	1/2"- 6"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
		8"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 52 or ASTM A860 WPHY 52	SEAMLESS
		12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 60 or ASTM A860 WPHY 60	
ELBOWS 45 LR	**E45**	1/2"- 6"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
		8"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 52 or ASTM A860 WPHY 52	SEAMLESS
		12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 60 or ASTM A860 WPHY 60	
ELBOWS 30 LR	**E30**	1/2"- 6"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
		8"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 52 or ASTM A860 WPHY 52	SEAMLESS
		12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 60 or ASTM A860 WPHY 60	
ELBOWS 22.5 LR	**E22.5**	1/2"- 6"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
		8"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 52 or ASTM A860 WPHY 52	SEAMLESS
		12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 60 or ASTM A860 WPHY 60	
ELBOWS 15 LR	**E15**	1/2"- 6"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
		8"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 52 or ASTM A860 WPHY 52	SEAMLESS
		12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 60 or ASTM A860 WPHY 60	
REDUCERS CONCENTRIC	**RC**	1/2"- 6"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
		8"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 52 or ASTM A860 WPHY 52	SEAMLESS
		12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 60 or ASTM A860 WPHY 60	
REDUCERS ECCENTRIC	**RE**	1/2"- 6"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
		8"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 52 or ASTM A860 WPHY 52	SEAMLESS
		12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 60 or ASTM A860 WPHY 60	
TEES EQUAL	**T**	1/2"- 6"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
		8"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 52 or ASTM A860 WPHY 52	SEAMLESS
		12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 60 or ASTM A860 WPHY 60	
TEES RED	**TR**	1/2"- 6"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
		8"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 52 or ASTM A860 WPHY 52	SEAMLESS
		12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 60 or ASTM A860 WPHY 60	
WELDOLETS	**WEL**	3/4"-12"	BW - ANSI B16-25	SEE PIPE	MANUFACTURER	ASTM A 105	SEAMLESS
CAPS	**C**	1/2"- 6"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
		8"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 52 or ASTM A860 WPHY 52	SEAMLESS
		12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	API 5L X 60 or ASTM A860 WPHY 60	
NIPPLES	**NBEP**	1/2" - 1.1/2"	BOTH ENDS PLAIN	SEE PIPE	ANSI B36-10	ASTM A 106 Gr. B	SEAMLESS-LG=100mm
	NOET	1/2" - 1.1/2"	ONE END THRD-MNPT	SEE PIPE	ANSI B36-10	ASTM A 106 Gr. B	SEAMLESS-LG=100mm
	NBET	1/2" - 1.1/2"	BOTH ENDS THRD-MNPT	SEE PIPE	ANSI B36-10	ASTM A 106 Gr. B	SEAMLESS-LG=100mm
FULL CPLNGS THRD	**CF**	1/2" - 1.1/2"	FNPT ANSI B1-20-1	3000#	ANSI B16-11	ASTM A 105	SEAMLESS
CAPS THRD	**C2**	1/2" - 1.1/2"	FNPT ANSI B1-20-1	3000#	ANSI B16-11	ASTM A 105	SEAMLESS
PLUGS THRD	**PL**	1/2" - 1.1/2"	MNPT ANSI B1-20-1	3000#	ANSI B16-11	ASTM A 105	SEAMLESS

PIPING SPECIFICATIONS

SPECIFICATION NO 3C1
SHEET 3 OF 6
REV 0

ITEM	SHORT CODE	SIZE FROM-THRU	END CONNECTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS
WN FLANGES	F	1/2"-6"		300# RF	ANSI B16-5	ASTM A 105	Always to be welded on 3C1 pipe
		8"				ASTM A 694 F 52	
		12"				ASTM A 694 F 60	
ORIFICE FLANGES	FO	1" - 6"		300# RF	ANSI B16-36	ASTM A 105	COMPLETE WITH GASKET BOLTS, NUTS JACK-SCREWS AND PLUGS
		8"				ASTM A 694 F 52	
		12"				ASTM A 694 F 60	
BLIND FLANGES	FB	1" - 6"		300# RF	ANSI B16-5	ASTM A 105	
		8"				ASTM A 694 F 52	
		12"				ASTM A 694 F 60	
DRIP RINGS	DR	1" - 6"		300# RF	ANSI B16-36	ASTM A 105	3/4" FNPT OUTLET CONNECTION
		8"				ASTM A 694 F 52	
		12"				ASTM A 694 F 60	
SPECTACLE BLINDS	SB	1" - 6"		300# RF	ANSI B16-5	ASTM A 515 GR 70	
		8"				ASTM A 694 F 52	
		12"				ASTM A 694 F 60	
RESTRICTION ORIFICES	RO	1" - 6"		300# RF	ANSI B16-5	ASTM A240 GR 304	
		8"				ASTM A 694 F 52	
		12"				ASTM A 694 F 60	
MONOLITHIC	IJ	2"-6"	BW - ANSI B16-2	300#	ANSI B16-5	PIPE PUPS:Same as pipe Material Forged Ring - ASTM A 105	REFER DATA SHEET
INSULATING		8"	BW - ANSI B16-2	300#	ANSI B16-5	PIPE PUPS:API 5L X 52 Forged Ring - ASTM A 694 F52	REFER DATA SHEET
JOINTS		12"	BW - ANSI B16-2	300#	API 5L	PIPE PUPS:API 5L X 60 Forged Ring - ASTM A 694 F60	REFER DATA SHEET
STUD BOLTS	B	1/2" - 12"		300# RF	ANSI B18.2.1 ANSI B18.2.2	ASTM A 193 B 7 HEXAGONAL NUTS ASTM A194 GR 2H	
GASKETS SPIRAL WOUND	G	1/2"-12"		300# RF	API 601 MSS SP 44	WINDING ANSI 304 FILLING PURE GRAPHITE CENTERING RING CS	4.5 mm THK

			PIPING SPECIFICATIONS				SPECIFICATION NO 3C1 SHEET 4 OF 6 REV 0
ITEM	SHORT CODE	SIZE FROM-THRU	END CONNECTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS
BALL VALVES	VBA	1/2" - 11/2"	FLGD RF:ANSI B16-5	600#	ANSI B16-10	BODY: ASTM A 105 BALL: SS 316	FULL BORE WRENCH OPERATED. FIRE SAFE
		2"- 4"	FLGD RF:ANSI B16-5 or BW :ANSI B16.25	300#	ANSI B16-10	BODY: ASTM A 216 WCB BALL: ASTM A 216 WCB / A 234 WPB / A 395 with ENP (75 microns)	FULL BORE / REDUCED BORE AS IN INDICATED DATA SHEET DOUBLE BLOCK & BLEED WRENCH OPERATED. FIRE SAFE
		6"- 8"	FLGD RF:ANSI B16-5 or BW :ANSI B16.25	300#	ANSI B16-10	BODY: ASTM A 216 WCB BALL: ASTM A 216 WCB / A 234 WPB / A 395 with ENP (75 microns)	FULL BORE / REDUCED BORE AS IN INDICATED DATA SHEET DOUBLE BLOCK & BLEED GEAR OPERATED. FIRE SAFE
		12"	BW :ANSI B16.25	300#	ANSI B16-10	BODY: ASTM A 105 BALL: ASTM A 105	FULL BORE / REDUCED BORE AS IN INDICATED DATA SHEET DOUBLE BLOCK & BLEED GAS OVER OIL ACTUATED VALVE FIRE SAFE
GLOBE VALVES	VGL	1/2"-1 1/2"	FLGD RF:ANSI B16-5	600#	ANSI B16-10	BODY: ASTM A 105 TRIM: ASTM A182 F6	HANDWHEEL FIRE SAFE
		2" - 12"	FLGD RF:ANSI B16-5	300#	ANSI B16-10	BODY: ASTM A 216 WCB TRIM: ASTM A 216 WCB	HANDWHEEL FIRE SAFE
SWING CHECK VALVES	VCH	1/2" - 11/2"	FLGD RF:ANSI B16-5	600#	ANSI B16-10	BODY: ASTM A 105 TRIM: ASTM A182 F6	HORIZONTAL INSTALLATION VERTICAL INSTALLATION FLOW UPWARDS
		2"-12"	FLGD RF:ANSI B16-5	300#	ANSI B16-10	BODY: ASTM A 216 WCB TRIM: ASTM A 216 WCB	HORIZONTAL INSTALLATION VERTICAL INSTALLATION FLOW UPWARDS

REDUCERS CHART

SMALL SIZE

LARGE SIZE

LARGE SIZE \ SMALL SIZE	1/2"	3/4"	1"	1.1/2"	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	28"	30"	32"	36"
1/2"																				
3/4"	X																			
1"	X	X																		
1.1/2"	X	X	X																	
2"		X	X	X																
3"				X	X															
4"				X	X	X														
6"						X	X													
8"							X	X												
10"							X	X	X											
12"								X	X	X										
14"								X	X	X	X									
16"									X	X	X	X								
18"										X	X	X	X							
20"																				
24"																				
28"																				
30"																				
32"																				
36"																				
42"																				

LEGEND

X :CONCENTRIC AND ECCENTRIC REDUCERS-BW

BRANCH CHART

BRANCH SIZE

HEADER SIZE	1/2"	3/4"	1"	1.1/2"	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	28"	30"	32"	36"
1/2"	T																			
3/4"	TR	T																		
1"	TR	TR	T																	
1.1/2"	W	TR	TR	T																
2"	W	W	TR	TR	T															
3"	W	W	W	TR	TR	T														
4"	W	W	W	W	TR	TR	T													
6"	W	W	W	W	W	TR	TR	T												
8"	W	W	W	W	W	BW	TR	TR	T											
10"	W	W	W	W	W	BW	BW	TR	TR	T										
12"	W	W	W	W	W	BW	BW	BW	TR	TR	T									
14"	W	W	W	W	W	BW	BW	BW	BW	TR	TR	T								
16"	W	W	W	W	W	BW	BW	BW	BW	BW	TR	TR	T							
18"	W	W	W	W	W	BW	BW	BW	BW	BW	BW	TR	TR	T						
20"																				
24"																				
28"																				
30"																				
32"																				
36"																				

LEGEND

T : TEE EQUAL-BW

TR : REDUCING TEE-BW

W : WELDOLET- BW

BW : BRANCH WELD-CHECK IF REINFORCING PLATE IS NECESSARY ACCORDING ANSI B 31.8

	LIST OF AUTHORIZED THIRD PARTY INSPECTION AGENCY (TPIA)	DOC. NO.- IGL-C&P-TPIA-001

SL. NO.	NAME OF TPIA
1	Det Norske Veritas (DNV)
2	Germanischer Lloyd Industrial Services GmbH
3	Bureau Veritas (India) Pvt. Ltd.
4	Moody International (India) Pvt. Ltd. (Industry Services Division)
5	SGS India Pvt. Ltd.
6	Certification Engineer International Limited (CEIL)
7	TÜV SÜD South Asia Pvt. Ltd.
8	ABS Industrial Verification (India) Pvt. Ltd.
9	Lloyd Register of Industrial Services
10	IRCLASS Systems and Solutions Private Limited
11	Tata Projects Limited
12	International Certification Services Pvt. Ltd.
13	TUV India Pvt. Ltd., Industrial Services Division
14	Intertek India Pvt. Ltd. (Industry Services Division)
15	Quality Austria Central Asia Pvt. Ltd.

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	IGL-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)

INFORMATION/ DOCUMENTS / DRAWINGS TO BE SUBMITTED BY SUCCESSFUL BIDDER

Successful Bidder shall submit four copies unless noted otherwise, each of the following:

1. Inspection & test reports for all mandatory tests as per the applicable code as well as test reports for any supplementary tests, in nicely bound volumes.

2. Filled in Quality Assurance Plan (QAP) for Purchaser's/ Consultant's approval. These QAPs shall be submitted in two copies within 15 days from LOI/ FOI.

3. Detailed completion schedule activity wise (Bar Chart), within one week of placement of order.

Note : All drawings, instructions, catalogues, etc., shall be in English language and all dimensions shall be metric units.

INSTRUCTION TO BIDDERS

1. Bidder to note that no correspondence shall be entered into or entertained after the bid submission.

2. Bidder shall furnish quotation only in case he can supply material strictly as per this Material Requisition and specification/data sheet forming part of Material Requisition.

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

4. Bidder must submit all documents as listed in checklist with his offer.

5. Supplier must note that stage wise inspection for complete fabrication, testing including the raw material inspected to be carried out.

6. Vendors for bought out items to be restricted to the approved vendor list attached with bid document. Approval of additional vendor if required, for all critical bought out items shall be obtained by the supplier from the purchaser before placement of order. Credentials/PTR of the additional vendor proposed to be submitted by supplier for review and approval of Purchaser/ Purchaser's representative

LIST OF SPARES

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

REFERENCE LIST						
S. No.	**Project**	**Year of Supply**	**Client, Address and Contact No.**	**Email**	**Size and Rating / thk**	**Service**

Bidder's Signature with stamp

	VENDOR DRAWINGS DOCUMENT SCHEDULE	**IGL-SD-VS-001**

VENDOR DRAWINGS

DOCUMENT SCHEDULE

	Vendor Drawing/ Document Submission Schedule	Status:
		Date:

Client	Project		Vendor Name	
Item Description	PO No.		Address	
	Date		Contact Person:	Fax:
IGL Department		Contact Person (IGL)	Phone:	Email:

S. No.	Equipment/ Item No.	Drg./ Doc. Nomenclature	Vendor Drg./ Doc. No.	Vendor Drg./ Doc. Title	Category Review (R) / Records	Scheduled date of 1st submission (Rev.0)	Form Electronic / Print	Remarks