

# **SECTION-VI**

## **PARTICULAR JOB SPECIFICATION**

# **PARTICULAR JOB SPECIFICATION**

## **SCOPE OF WORK**



**LAYING & CONSTRUCTION OF STEEL GAS PIPELINE AND TERMINALS  
ALONG WITH ASSOCIATED FACILITIES FOR  
SECTION- SECTION-10 & 11 UNDER  
NORTH EAST GAS GRID PHASE III OF IGGL**



**CONTENTS**

<b><u>SL.NO.</u></b>	<b><u>DESCRIPTION</u></b>
1.0	INTRODUCTION
2.0	WORK TENDERED
3.0	SCOPE OF WORK
4.0	SCOPE OF SUPPLY
5.0	INDICATIVE CONSTRUCTION MILESTONE
6.0	SCOPE OF WORK & SCOPE OF SUPPLY FOR OTHER DISCIPLINES
7.0	OTHER CONDITIONS OF BID
8.0	AS BUILT DOCUMENTS
9.0	DOCUMENTS TO BE SUBMITTED AT THE TIME OF BIDDING
9.1.1	DOCUMENTS, SPECIFICATION, STANDARDS AND DRAWINGS AND ADDITIONAL CLAUSES
10.0	APPENDIX-I – INDICATIVE CONSTRUCTION MILESTONE
11.0	APPENDIX-II – DATA SHEETS FOR MECHANICAL ITEMS ETC.
12.0	APPENDIX-III –QAPs AND ITPs FOR BOUGHT OUT ITEMS
13.0	APPENDIX-IV – SCHEMATIC ROUTE DIAGRAM
14.0	APPENDIX-V – VIDEOGRAPHY SURVEY
15.0	APPENDIX-VI – THIRD PARTY INSPECTION AGENCY
16.0	APPENDIX-VII – AIR SURVEILLANCE
17.0	APPENDIX-VIII – LIST OF CROSSINGS INDICATING PROPOSED CROSSING METHODOLOGY
18.0	APPENDIX-IX – LIST OF APPROVED PARTIES FOR BOUGHT OUT ITEMS
19.0	APPENDIX-X – MINIMUM NO. OF CONSTRUCTION EQUIPMENT TO BE



**LAYING & CONSTRUCTION OF STEEL GAS PIPELINE AND TERMINALS  
ALONG WITH ASSOCIATED FACILITIES FOR  
SECTION--10 & 11 UNDER  
NORTH EAST GAS GRID PHASE III OF IGGL**



**DEPLOYED DURING RE-MOBILISATION**

20.0 APPENDIX-XI– MINIMUM NO. OF SKILLED MANPOWER TO BE DEPLOYED  
DURING RE-MOBILISATION

21.0 APPENDIX-XII– SCHEDULE OF DOCUMENT SUBMISSION

22.0 APPENDIX-XIII– STANDARD OPERATING PROCEDURE

23.0 APPENDIX-XIV– INSPECTION CATEGORIZATION PLAN

- ◆ Annexure-I : Temporary Cathodic Protection Works
- ◆ Annexure-II : Corrosion Monitoring System Works
- ◆ Annexure-III : Civil, Architecture & Structural Works
- ◆ Annexure-IV : Instrumentation Works
- ◆ Annexure-V : Telecommunication Works
- ◆ Annexure-VI : Fire Protection Works
- ◆ Annexure-VII : Electrical Works
- ◆ Annexure-VIII : Pipeline Information Management System (PIMS)



ENERGISING QUALITY

**PROJECT NUMBER: C221052**



**SCOPE OF WORK  
(PIPELINE LAYING & PIPING WORK  
FOR PART D1 & D2)**

TOTAL SHEETS

52

**DOCUMENT NO**

C221052

00

PP

SOW

2002


**INDRADHANUSH GAS GRID LIMITED**

**NORTH EAST GAS GRID PHASE-III OF IGGL**


C1	09-12-2022	ISSUED FOR BID	RZ	MC	HK
<b>REV</b>	<b>DATE</b>	<b>DESCRIPTION</b>	<b>PREP</b>	<b>CHK</b>	<b>APPR</b>

**TABLE OF CONTENTS**

1.0	PURPOSE.....	5
2.0	DEFINITIONS .....	5
3.0	INTRODUCTION .....	5
4.0	WORK TENDERED .....	7
4.1	The details of proposed work are as under: .....	7
5.0	SCOPE OF WORK.....	10
5.2	Associated Works for Pipeline Construction .....	18
5.3	Piping Works at Despatch Terminal, Receiving Terminal, IP Station, Tap- off Points, Injection points and Sectionalizing Valve Stations. ....	19
5.4	Temporary Cathodic Protection Works.....	22
5.5	Corrosion Monitoring System Works .....	22
5.6	Civil, Architecture& Structural Works.....	22
5.7	Instrumentation Works .....	22
5.8	Telecommunication Works.....	22
5.9	Electrical Works .....	23
5.10	Fire Protection Works .....	23
6.0	SCOPE OF SUPPLY.....	23
7.0	INDICATIVE CONSTRUCTION MILESTONE.....	31
8.0	SCOPE OF WORK AND SCOPE OF SUPPLY FOR OTHER DISCIPLINES.....	31
9.0	OTHER CONDITIONS OF BID .....	31
9.1	Basis of Work .....	31
9.1.1	All piping/ pipeline works shall be carried out as per following: .....	31
9.2	Topographic Survey .....	32
9.3	Alignment Sheets and Station Drawings .....	32
9.4	Description of pipeline Route .....	33
9.4.1	Route Description.....	33
9.5	Soil Investigation and Soil Resistivity survey .....	33
9.6	Pipeline ROU.....	33

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 2 of 52	

9.7	Pipeline Passing Through City Area And Along NH/ SH.....	34
9.7.1	RESTRICTION OF ROU .....	34
9.7.2	PARTICULAR INSTRUCTIONS .....	35
9.7.3	PREPARATION OF CONSTRUCTION SITE.....	36
9.7.4	WORKING STRIP .....	36
9.7.5	REDUCING THE WORKING STRIP .....	36
9.7.6	REVERSE OF THE WORKING STRIP .....	36
9.7.7	EXCAVATIONS (UNDERGROUND OBSTACLES) .....	36
9.7.8	REINFORCED CONCRETE SLABS AS MECHANICAL PROTECTION FOR THE PIPE	36
9.7.9	MARKERS.....	36
9.7.10	DIRECTIONAL MARKERS .....	37
9.7.11	EXCAVATED MATERIALS .....	37
9.7.12	SIGNALLING, FENCING & LIGHTING .....	38
9.7.13	BARRICADING .....	38
9.8	Site Visit.....	38
9.9	Line Pipes & Coatings .....	39
9.9.1	Taking Over of Pipes .....	39
9.9.2	Repair of Coatings .....	39
9.10	Statutory Permissions .....	39
9.11	Controlled Blasting's.....	39
9.12	Environmental Restrictions .....	40
9.13	Pipeline through Seismic Areas.....	40
9.14	Pipeline Burial.....	41
9.15	Crossings.....	42
9.16	Pipeline in Forest Area .....	45
9.17	Installation of Conduits for Optical Fibre Cable at Crossings.....	45
9.18	CATHODIC PROTECTION WORKS .....	45
9.19	HYDROSTATIC TESTING .....	45
9.20	Direction of Construction.....	47

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 3 of 52	

9.21	Leak Detection.....	47
9.22	Magnetic Cleaning, Caliper Pigging.....	47
9.23	Pre-Commissioning and Commissioning assistance of Pipeline.....	48
9.24	Commissioning .....	48
9.25	Priorities.....	48
9.26	Terminal Piping Works .....	48
9.27	Working in Areas of Existing Facilities .....	49
9.28	Contractor Responsibilities.....	49
9.29	Technical Requirements.....	49
10.0	AS BUILT DOCUMENTS.....	50
11.0	DOCUMENTS TO BE SUBMITTED AT TIME OF BIDDING .....	50
12.0	DOCUMENTS, SPECIFICATION, STANDARDS AND DRAWINGS AND ADDITIONAL CLAUSE .....	51

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 4 of 52	



## 1.0 PURPOSE

This document is for the detailed Scope of work (SOW) and shall be read in conjunction with particular Job specifications, technical specifications, Schedule of rates (SOR) & Various parts of bidding documents meant for the execution of the proposed 12-inch Natural gas Pipeline for **PART-D1 & PART-D2 under Section-11** of **Siliguri – Gangtok Pipeline Section** of North East Gas Grid Phase-III of IGGL.

**DIMAPUR-KOHIMA-IMPHAL (DIPL) Section-10** is not part of this Tender, same is to be executed by others.

The whole SILIGURI-GANGTOK PIPELINE SECTION (SECTION-11) is divided in to following parts for Laying Purpose, **PART-C, PART D1 & PART-D2 and PART-E.**

**PART-C and PART- E** to be executed by Others.

Scope of work specified in this document is applicable for **PART-D1 & PART-D2** only.

## 2.0 DEFINITIONS


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

PROJECT	North East Gas Grid Phase-III OF IGGL
OWNER	Indradhanush Gas Grid Limited (IGGL)
CONSULTANT	VCS Quality Services Private Limited (VCSQSPL) the party to act for and on behalf of OWNER for the EPMC Services.
MANUFACTURER	The party, which manufactures and supplies equipment and services to the OWNER or to Contractor
SOW	Scope of Work (Pipeline Laying & Piping Works)

## 3.0 INTRODUCTION

The Hydrocarbon vision 2030 for North East India (vision document), released by MoP&NG proposes detailed plan for Natural gas infrastructure development in North-East. The states covered in the vision document include Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura.

-M/s Indradhanush Gas Grid Limited (IGGL), a Joint Venture of IOCL, ONGC, GAIL, OIL and NRL, is in the process of implementing the North East Gas Grid (NEGG) with a vision to connect all the eight (08) northeastern state capitals and major consumption centers in the region. The NEGG will be connected to National gas grid at Guwahati through Barauni-Guwahati pipeline (already under execution by M/s GAIL).

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 5 of 52	

M/s IGGL intends to lay pipeline along with terminal works for 11 which consist of 12" NB x 186 Km (approx.) in section-11 mainline. Main line taken from Siliguri DT to Gangtok RT in Section-11.

The brief scope of work includes supply of materials (other than free issue), pipeline laying work including but not limited to Construction Management, HSE & Quality Management, Survey, ROU management, clearing of ROU, grading, stringing, bending, welding (Manual), trenching, joint coating, lowering, crossings, crossings by HDD (wherever specified), Tie-ins, NDT and destructive testing, backfilling, laying of pipeline along-with OFC & HDPE ducts, TCP works, site restoration, hydro-testing, dewatering, swabbing, drying, nitrogen purging (as applicable), pre-commissioning, commissioning and Gas-in of pipeline including construction / installation of related facilities like scraper launching / receiving facilities and all piping works at dispatch / receiving terminals, I.P. Stations and piping works at Sectionalizing valve stations, Tap-off station & Injection points, etc. including associated Mechanical, Cathodic protection, Corrosion monitoring works, Electrical works, Telecom works, Firefighting works, Instrumentation, Civil works (including boundary wall and building works), Architectural and Structural works at all stations, and Pipeline Information Management system. The scope of work has been divided into the following parts:


PROJECT TITLE: -SILIGURI-GANGTOK PIPELINE SECTION (SECTION-11)		
REF. SCHEMATIC DRAWING NO: -C221052-SGPL-PP-SCM-2001		
PART NO	SPREAD NO.	SCOPE OF WORK
<b>PART-D1</b> (Length 44.2 km)	SPREAD-2B (Length 44.2 km)	Pipeline laying from <b>Ch. 59+800</b> Km to <b>Ch. 104+000</b> Km including associated works (Mechanical, Piping & Including Terminal works as per scope matrix) & One (01) SV stations.
<b>PART-D2</b> (Length 46.3 km)	SPREAD-2C (Length 46.3 km)	Pipeline laying from <b>Ch. 104+000</b> km to <b>Ch. 150+300</b> Km. Intermediate Pigging Station (IP station) Lava, West Bengal at <b>Ch. 128+000</b> Km including associated works (Mechanical, Piping & Terminal works) at Two (02) SV stations.

Note: Chainage shown above are tentative and for reference purpose only, there may be change in Chainage shown as per site condition during execution.

The schematic of pipeline networks (**Drawing No: C221052-SGPL-PP-SCM-2001**) is Enclosed as **Appendix-IV**.

This document covers details of work tendered, scope of work, scope of supply and other requirements pertaining to pipeline and associated facilities. All works and clauses of this document shall be applicable to all sections/parts unless specifically mentioned otherwise.

Details of associated Civil, Architecture, Structural, Mechanical, Piping, Instrumentation, Cathodic Protection, Corrosion Monitoring Works, Telecom Works, Electrical Works, Fire protection, water supply and Pipeline Information Management System (PIMS) works etc.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	Document No.	Rev
		C221052-00-PP-SOW-2002	C1
		Page 6 of 52	

are covered elsewhere in the Bid document.

## 4.0 WORK TENDERED


Work tendered as a part of this Bid document consists of supply of materials as required, laying/ installation, testing, pre-commissioning of pipeline, drying, preservation and commissioning. The work includes installation of pipeline and related piping works at dispatch terminals, receiving terminals, intermediate pigging stations, sectionalizing valve stations and all associated mechanical, civil, architectural, structural, cathodic protection, corrosion monitoring system, electrical, instrumentation, telecom works, firefighting works, water supply works at Stations along the route etc.

### 4.1 The details of proposed work are as under:

#### 4.1.1 PART-D1 (Pipeline Spread-2B): SGPL Pipeline Section-10

**Spread-2B: Pipeline works after Sectionalizing Valve Station (SV/SGPL/03), start point at Ch. 59.800 Km to Ch. 104.000 Km Towards Lava IP station including one (01) SV station.**

- Pipeline works from Ch. 59.800 Km towards Lava up to Ch. 104.000 Km including installation of all valves, fittings, flow tee etc. and associated Piping works and SV stations at (SV/SGPL/04) 01 Nos. For details, refer schematic route diagram of the pipeline network attached with the Bid Document.
- Laying of approx. 44.2 Km long, 12" (323.9 mm) O.D., 7.14/8.38 W.T., API 5L Gr. X-70 PSL-2, coated main pipeline from Ch. 59.800 Km to Ch. 104.000 km Approx.
- Entire works including installation of flow tee, all valves, equipment's, fittings, other facilities and all associated mechanical, civil (pavement & supports works), instrumentation, telecom, structural, and all other terminal works i.e. all architectural, fire protection system, water supply, civil (Boundary wall, approach road, Plot development & Building works), electrical works etc. for complete SV stations at (SV/SGPL/04)
- Installation of 01 (One) nos. of Sectionalizing valve stations including all associated Mechanical, civil (including supports, Boundary wall, approach road, Plot development & Building works), architectural, structural, corrosion monitoring system, electrical, instrumentation, telecom, fire-fighting, water supply works etc. at SV stations.
- Installation of Pipeline at crossings of roads, rails, utilities, underground pipelines, water crossings (rivers, canals, drains, field channels and nalas), ponds etc.
- Installation of Pipeline by Horizontal Directional Drilling (HDD) method, wherever required.
- Installation of pipeline by machine moling, wherever required.
- All works related to hydro-testing, dewatering, swabbing, drying and tie-in with adjoining pipeline/ terminal piping sections/parts including tie-in with the HDD sections.
- Carrying out magnetic cleaning & EGP.


 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 7 of 52	

- Pre-commissioning of the pipeline section and associated facilities.
- Commissioning assistance (as applicable) and Commissioning.
- Idle time preservation of pipeline including supply of nitrogen, if required.
- All works related to HDPE duct laying and optical Fibre cable (OFC) blowing.
- All works related to Pipeline Information Management System (PIMS).
- Making all necessary arrangements to prevent rolling down of removed earth while grading and ROU clearance in hill side and steep slope areas. Stabilization of side hill faces to prevent landslides.
- Making necessary arrangements to prevent rolling down of pipes in steep slopes.
- Supply and installation of slope breaker as per specifications and drawings in steep slope areas, wherever required;
- Supply and Installation of trench breakers with 1:4 ratio of cement and sand in bags for slopes, stabilization of soil, stabilization of trench, wherever required and as directed by Owner / Owner's Representative.
- Excavation of National Highway /State Highway/others Road during laying of Pipeline and restoration of same to original condition on completion of the work to the satisfaction of Concern Authority

## 4.1.2 **PART-D2 (Pipeline Spread-2C): SGPL Pipeline Section**

### **Spread-2C: Pipeline from Ch. 104.000 Km to State Border between West Bengal & Sikkim at Ch. 150.300 Km including Lava IP station and Two (02) SV stations.**

- Pipeline works from Ch. 104.000 Km to Ch. 149.4 km including Lava IP station at Ch. 128.000 Km including installation of scrapper traps, all valves, fittings, insulating joints, flow tee etc. and associated Piping works at IP station (IP/SGPL/01), and SV stations from SV/SGPL/05 to SV/SGPL/06 - 02 Nos. For details, refer schematic route diagram of the pipeline network attached with the Bid Document.
- Laying of approx. 46.3 Km long, 12" (323.9 mm) O.D., 7.14/8.38 W.T., API 5L Gr. X-70 PSL-2, coated main pipeline from Ch. 104.000 Km to Ch. 150.300 km Approx.
- Entire works of IP Station at Ch. 128.000 Km including installation of scrapper traps, insulating joints, flow tee, all valves, equipment's, fittings, all piping works and other facilities and all associated mechanical, civil (pavement, supports works & building works), structural, architectural, corrosion monitoring system, electrical, instrumentation, telecom, firefighting, water supply works etc.
- Installation of 02 (Two) nos. of Sectionalizing valve stations including all associated Mechanical, civil (including supports, Boundary wall, approach road, Plot development & Building works), architectural, structural, corrosion monitoring system, electrical, instrumentation, telecom, fire-fighting, water supply works etc. at SV stations.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 8 of 52	


- Installation of Pipeline at crossings of roads, rails, utilities, underground pipelines, water crossings (rivers, canals, drains, field channels and nalas), ponds etc.
- Installation of Pipeline by Horizontal Directional Drilling (HDD) method, wherever required.
- Installation of pipeline by machine moling, wherever required.
- All works related to hydro-testing, dewatering, swabbing, drying and tie-in with adjoining pipeline/ terminal piping sections/parts including tie-in with the HDD sections.
- Carrying out magnetic cleaning & EGP.
- Pre-commissioning of the pipeline section and associated facilities.
- Commissioning assistance (as applicable) and Commissioning.
- Idle time preservation of pipeline including supply of nitrogen, if required.
- All works related to HDPE duct laying and optical Fibre cable (OFC) blowing.
- All works related to Pipeline Information Management System (PIMS).
- Making all necessary arrangements to prevent rolling down of removed earth while grading and ROU clearance in hill side and steep slope areas. Stabilisation of side hill faces to prevent landslides.
- Making necessary arrangements to prevent rolling down of pipes in steep slopes.
- Supply and installation of slope breaker as per specifications and drawings in steep slope areas, wherever required;
- Supply and Installation of trench breakers with 1:4 ratio of cement and sand in bags for slopes, stabilization of soil, stabilization of trench, wherever required and as directed by Owner / Owner's Representative.
- Excavation of National Highway /State Highway/others Road during laying of Pipeline and restoration of same to original condition on completion of the work to the satisfaction of Concern Authority

## 4.2

### CONSTRUCTION FRONTS:

The Construction fronts shall be mobilized for as indicated below:

PARTS	SPREAD	MINIMUM OPENING REQUIREMENT
<b>PART-D1 (SGPL)</b>	<b>2B</b> (Ch.59.800 km) to (Ch. 104.000 km)	Minimum two opening in each spread.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 9 of 52	

PARTS	SPREAD	MINIMUM OPENING REQUIREMENT
<b>PART-D2</b> <b>(SGPL)</b>	<b>2C</b> (Ch.104.000 km) to (Ch. 150.300 km)	Minimum two opening in each spread.

Fully equipped (as per SCC), maintained and functional fronts (as mentioned above) are required to be mobilized by the Contractor to complete installation of facilities covered under each section/part as a minimum. All the construction fronts shall work simultaneously. In addition, contractor shall deploy separate crews for rail, road, water crossings and restricted areas. Contractor shall also mobilize separate teams for mechanical works at Dispatch Terminal, IP Stations, Receiving station, SV Stations.

- 4.3 Successful Bidder is required to submit detailed methodology for working in rainy season before start of the work.
- 4.4 Contractor shall adopt suitable method of construction/ execution of work for restricted ROU/ Common ROU and deploy adequate equipment & manpower etc. as required. CONTRACTOR shall provide complete details of manpower, equipment etc. to be deployed. Contractor shall mobilize and provide all equipment, manpower (skilled and unskilled), consumables and other resources and separate crew etc. for each front as required for the execution of the complete job defined herein.
- 4.5 For execution of the pipeline work in the narrow ROU space in forest areas, the CONTRACTOR shall consider the special requirements/ measures and shall deploy adequate amount of manpower and equipment for performing the work.
- 4.6 Mechanical, civil, architecture, structural, temporary cathodic protection, corrosion monitoring system, electrical, instrumentation, telecom works, water supply works, and fire protection works for the respective sections/parts shall be carried out as per relevant particular job specification provided elsewhere in the Bid document.

## 5.0 SCOPE OF WORK


The Contractor's Scope of work for the pipeline shall consist of, but shall not be limited to, supply (as required), fabrication, installation, testing, swabbing, drying, EGP, pre-commissioning and commissioning of the proposed pipeline system including terminal piping works and hook-up works at terminals along with all associated mechanical, civil, architectural, structural, corrosion monitoring system, electrical, instrumentation, telecom, firefighting works, Pipeline Information Management System works etc. All such works that are not indicated here below but are otherwise required to complete the work in all respects shall form part of Contractor's Scope of Work.

The scope indicated below shall be read in conjunction with Schedule of Rates as applicable, drawings, standards, specifications and other documents forming part of the Contract document.

The detailed scope of work pertaining to cross country pipeline shall be in general but not limited to the following:

### 5.1 Main Pipeline

- 5.1.1 "Receiving and Taking-over" of COMPANY supplied externally/ Internally corrosion- coated


 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR</b> <b>(PIPELINE LAYING &amp; PIPING WORKS FOR</b> <b>PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 10 of 52	



and bare line pipes of all thicknesses at Company's designated storage yard in presence of Company's representative. Transportation including loading, unloading, handling, stacking, hauling and stringing of pipes from Company's storage yards to Contractor's worksite(s)/ workshop(s)/ pipeline Right-Of-Use (ROU), including arranging all pipe trailers, cranes, arranging all necessary intermediate storage area(s) required thereof till the complete pipeline system is permanently installed.


COMPANY shall set up storage yards for coated and bare line pipes near pipeline ROU as defined subsequently in this document. The exact location of Company's storage yards shall be intimated to the CONTRACTOR at the time of award. In addition, COMPANY shall set up stores for all items other than line pipes as defined in scope of supply.

- 5.1.2 Carrying out inspection of COMPANY supplied line pipes and pipe corrosion coating at the time of receiving and taking-over for all defect etc. in the presence of Company's representative.
- 5.1.3 Carrying out repairs (including supply of all materials) of line pipe and pipe coating not attributable to COMPANY which will include repair of all defects/damages occurring during transportation and/ or handling after receiving and taking over.
- 5.1.4 For pipes were cutting out involves more than 25mm from pipe ends, ultrasonic inspection shall be carried out at pipe ends for line pipe and including supply of all equipment's. Contractor shall take prior approval from Company for the agency engaged for carrying out ultrasonic inspection.
- 5.1.5 Loading, unloading, handling, stacking, storing and transportation to workshop/ work site of all materials (other than bare and corrosion coated line pipes) that may be used for the construction of pipeline system either supplied by COMPANY at their designated storage yard/ store and/ or by CONTRACTOR as the case may be. All Company supplied materials (other than line pipe) shall be issued to Contractor from Company's designated store.
- 5.1.6 Preparation of bevel end and coating edge of line pipes for welding.
- 5.1.7 Contractor shall incorporate the crossing details in the as-built alignment sheet after completion of work.
- 5.1.8 Carrying out all additional topographic and/ or geotechnical survey as required for local detours, detours at crossing locations during execution.
- 5.1.9 Geo-technical investigation and hydrological survey of all major water body crossings are being carried out by the Company and the same shall be provided to the contractors during execution of the contract. However, contractor shall verify the authenticity of the data provided during execution and if required, additional geo-technical investigation & hydrological survey shall be carried out by the contractors for HDD crossings without any cost and time implication. Geo-technical & topographical survey for all plots shall be carried out by the respective contractor during execution of the contract.
- 5.1.10 Carrying out thorough internal cleaning of all pipes to remove debris, shots, grits etc. to the satisfaction of Engineer-in-charge.
- 5.1.11 Mobilizing and providing all equipment's, manpower (skilled and unskilled), consumables

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 11 of 52	

and other resources etc., as required for the execution of complete work and thereafter demobilizing the same upon completion of work.

- 5.1.12 Obtaining all necessary approvals and work permits from concerned authorities having jurisdiction, as applicable for performing the work including shifting/ relocation and restoration of telephone/ electrical poles and underground pipes and other utilities etc., as required by local authorities and as directed by COMPANY. Contractor shall also obtain all necessary approvals and work permits from concerned authorities having jurisdiction for crossing underground utilities/ pipelines wherever encountered along the pipeline route.
- 5.1.13 Cutting/ uprooting of trees within ROU, counting the number and type of trees to be cut (before cutting) during pipeline laying works in presence of DFO/ concerned authorities keeping record thereof and handing over the cut trees as directed by concerned authorities/ COMPANY.
- 5.1.14 The Pipeline corridor shall be kept as narrow as possible at all times. The pipeline shall be fully buried. Wherever possible vegetation along the center line of the pipe shall be uprooted carefully, with soil and roots intact, so that it can be used in the reinstatement. During the excavation of the pipeline, trench top soil and subsoil material shall be kept separate and backfilled in the same order where possible imported backfill material shall be avoided and a selective backfill method used. The Trench shall be opened and closed as quickly as possible. Safe exit routes/ramps from the trench shall be provided for wildlife if a trench is left open overnight. The Pipeline shall not alter the drainage characteristic of the land. Clay Stopper bungs will be used as required.
- 5.1.15 Staking, clearing, grading of Right of Use (ROU) as required, trenching to all depths in all types of soils including soft and hard rock, including blasting, controlled blasting, chiseling, or otherwise cutting etc. to a width to also accommodate the OFC/ cable conduit as per relevant standards, drawings, specifications etc., stringing, aligning, bending, welding, NDT by AUT/X-ray, field weld joint coating including supply of all materials, protective coating of long radius bends and buried fittings/ valves including supply of materials, providing sand/ soft soil padding, rock shield in the trench wherever required including supply of sand/ soft soil, laying and lowering of the pipeline including locating existing pipeline using pipe locator, wherever applicable and maintaining the specified minimum spacing from existing pipeline(s), back filling including supply of select backfill material where required, carrying out rail, road, river, canal, drain, utility and submerged minor and major water course crossings including installation of carrier pipe inside casing pipe at cased crossings wherever required, providing two component epoxy coating on inner surface of casing pipe wherever required by statutory authority, bank stabilization of water course crossings as required, arranging all additional temporary land/ area required for construction purposes. Supply and installation of anti-buoyancy measures viz. continuous concrete coating, geo-textile gravel filled bags, saddle weight, extra cover, select backfill etc. on pipeline, installation of supports wherever required, tie- in/ hook-up with pipeline/ piping installed by others including cutting of temporary test headers, if any, re-beveling, NDT, fit-up, welding, radiography etc.; clean-up, ROU restoration, pigging, flushing, gauging, hydrostatic testing with the quantity of corrosion inhibitor as required, dewatering with the addition of approved chemicals to neutralize the effect of inhibitor added during hydro test at required dosage, swabbing, drying, pre-commissioning and commissioning of pipeline including supply of all materials such as required type and quantity of pigs, manpower, equipment, consumables and carrying out all associated works as per relevant specifications, standards and approved drawings enclosed with the Contract document.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 12 of 52	



5.1.16 All welding and NDT shall be carried out as per welding specification and as per welding specification charts enclosed in the bid document.

5.1.17 Welding Techniques & NDT

Sl. No.	Description	Welding Technique	NDT
1	12" x 7.14/8.38 mm, API 5L Gr. X70	Manual	X-Ray

Notes:

- a) Pipeline welding may be carried out as mentioned above.
- b) Contractor to note that NDT of first 100 joints performed by each machine (if applicable) for weld joints welded by automatic welding, shall also be re-verified/rechecked by radiography. On successful acceptance of the same, shall be allowed to be performed on remaining joints. Methodology and frequency of re-calibration shall be finalized at the time of execution.

5.1.18 Welding of all tie-in joints including tie-in joints and bends on either side of major river/ canal/ road/ rail crossings/ other facilities as required including adjoining pipeline spreads, cutting of test header, re-beveling and tie-in with adjacent pipeline segments.

5.1.19 Carrying out welding including cutting, edge preparation (inclusive of grinding the edges of pipe, fittings, flanges, etc. to match with the matching edges of different thickness wherever required), fit-up, bending, pre heating wherever required, NDT including radiography and other non-destructive tests as specified. NDT requirements for process and other piping shall be in accordance with relevant specifications enclosed with the Bid document.

5.1.20 Transportation of bare pipes, fabrication, supply, installation and coating of LR Bend as per requirement of pipeline route.


5.1.21 Bare pipe for LR Bends shall be free issue to the contractor at the pipe manufacturer premise.

5.1.22 "Receiving and taking-over", handling, loading, transportation and unloading of Owner supplied bare line pipes from the line pipe manufacturer premise to Bend manufacturer and transportation and unloading of Bends from manufacturer to work sites is in the scope of contractor.

5.1.23 Field weld joints coating and corrosion coating of Long Radius (LR) bends and pup pieces of sectionalizing valves by Heat Shrink Sleeve. 100% solid high build epoxy (minimum 500 micron thk.) shall be applied for underground piping & valves.


5.1.24 Installation of all in-line insulating joints, valves, appurtenances, online instruments etc.

5.1.25 Providing slope breakers in steep slope areas including supply of all materials, wherever required. Contractor shall carry out slope breaker survey and slope breaker shall be installed (before backfilling) as per standard after approval of Engineer-In- charge. Supply and installation of slope breaker as per specification and drawing in slightly undulating areas


 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 13 of 52	

(having slope 6° to < 20°); slope stabilization as per specification and drawing in highly undulating areas (having slope ≥ 20°)

- 5.1.26 Sand/soft soil padding of minimum 150 mm thickness around pipe wherever required in areas where trenching has been done in rock or gravel or hard soil including supply of sand/soft soil. The pipeline trench shall not be filled with gravel and large stones or boulders. Supply and installation of rock-shield in addition to 150 mm of sand/soft soil padding around the pipe in rocky areas. The rock shield shall be of minimum 6 mm thick polyethylene mat as per COMPANY specifications. Contractor shall furnish all details of proposed rock shield to be used, for COMPANY's approval.
- 5.1.27 Providing engineered select backfill consisting of loosely compacted cohesion less soil like sand (for the areas prone to seismic activity) including supply of cohesion less soil like sand for a distance of 1 km on either side, as per job standards. The pipeline shall be surrounded by at least 0.6 m of select backfill. Extra digging of trench shall be carried out to comply with above requirement.
- 5.1.28 The list of crossings indicating crossing methodology is enclosed as APPENDIX VIII. However mentioned crossing methodology for respective crossing may vary depending upon site conditions during time of execution. In case of such situation, IGGL/PMC has reserve right to inform contractor about revised crossing methodology to be adopted. The payment will be regulated based on the actual crossing methodology executed as per relevant SOR item.
- 5.1.29 Carrying out National highway /State Highway, Expressway, railways and major road crossings by conventional/ boring/ Jacking/ HDD method (Refer Appendix – VIII- List of Crossings indicating Proposed Methodology).
- 5.1.30 Supply & Installation of 168 mm (6") CS conduit for OFC cable/ HDPE for all crossings with HDPE sub ducted in CS conduit (with proper end-sealing and arrangement of wire/etc for pulling OFC).
- 5.1.31 Supply and Installation of warning mesh over entire pipeline as per relevant specification. Warning mesh shall be laid 300 mm above the top of pipeline.
- 5.1.32 Qualifying Procedure for cold field bending of pipes, Making and handling of cold field bends at site as per the specification, as required for laying of pipelines and crossings is in the scope of contractor.
- 5.1.33 Providing all necessary barricading material, safety signboards, warning lights etc to safeguard the pipeline against accidents during construction of line in city area.
- 5.1.34 Localized purging/ inertisation including supply of nitrogen during hook up with existing Pipeline/ piping at existing terminal, if any.
- 5.1.35 Loading, unloading, handing over and transportation of all surplus COMPANY supplied free issue materials including line pipe to COMPANY designated stores and stacking of the same. Stacking of surplus pipe & other material shall be inclusive of supplying of sand bags etc.
- 5.1.36 Transportation of long radius bends for installation in terminals/ other areas to work.


 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 14 of 52	

- 5.1.37 Return of surplus material/ bends etc. to storage yard/ work site/ Company's store shall be in Contractor's scope. LR bends shall be installed only at the locations shown in alignment sheets and approach drawings.
- 5.1.38 Carrying out cleaning, flushing, swabbing (as applicable), dewatering, testing and pre-commissioning of pipeline and associated facilities at Dispatch Station, Intermediate Pigging Station, Sectionalizing Valve Stations & Receiving terminal up to the respective battery limits. Locating all major and minor leaks during hydro-testing, if any.
- 5.1.39 Repair of leaks/ burst, not attributable to Contractor, occurring in Company supplied material, shall be carried out by the contractor and the Contractor shall be compensated as per provisions of the contract. However, Contractor shall carry out repair of defects attributable to Contractor at no extra cost to Company. Contractor shall submit a report for failure to Company.
- 5.1.40 Carrying out magnetic cleaning (pigging with the help of magnetic pig to remove steel debris), electronic geometric pigging (caliper pigging) for each pipeline section/part including supply of all types of pigs, pig locating and tracking device, spares, consumables, manpower etc. as per specification enclosed with bid/ contract document.
- 5.1.41 Carrying out repair of all defects found during electronic geometric pigging including locating, digging, cutting, welding, NDT etc.
- 5.1.42 Commissioning of pipeline & associated facilities providing all equipment's, manpower, machinery, consumables including required number of pigs and assistance as required during commissioning of pipeline system and associated facilities viz. Dispatch Terminal, Intermediate pigging station, Sectionalizing Valve Stations and Receiving Terminal up to the respective battery limits.
- 5.1.43 Pipeline Information Management System is to be implemented by laying Contractor as per the scope detailed in particular job specification enclosed as Annexure-VIII and SOR enclosed elsewhere with the tender document. As a minimum the documents to be uploaded in PIMS system shall include but not be limited to the following:
- Daily and Monthly Progress Report
  - All approved working procedures
  - Approved Welding Procedure Specification (WPS) / Procedure Qualification Record (PQR).
  - Approved Alignment Sheets / Crossing Sheets
  - HSE Reports
  - Material Reconciliation Report
  - Status report of contractor bought out items including relevant documents (QAP, TC, etc.)
  - Data for Preparation of Pipe Book
  - Technical documents of bought out items (MDS, QAP, QA, Inspection Report, etc.)
  - All As-Built Documents
- 5.1.44 Final clean-up and restoration of ROU and other conveniences like temporary approach roads/ temporary works, barren land, road, rail, canals, water crossings, cultivable land etc.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 15 of 52	


to original condition as per specification and drawings to the entire satisfaction of COMPANY and/ or authorities having jurisdiction over the same, including disposal of surplus construction materials to Company's designated stock yard(s) or as directed by Engineer-in-charge. CONTRACTOR shall restore stones laid to mark the boundaries of adjoining fields to original conditions. Contractor shall arrange necessary clearance from all concerned authorities/ land owners to the effect that ROU has been restored back to the original condition.

- 5.1.45 Disposal of surplus excavated soil from trench outside ROU.
- 5.1.46 Idle time preservation by filling Nitrogen at a positive pressure of 2 bar (g) as per specification, if required including supply of Nitrogen.
- 5.1.47 Preparation of as-built drawings, pipe-books, documents, photographs and project records as per specification and instructions of the COMPANY including furnishing of all Test Certificates/ Inspection Reports for all materials used for permanent installation. Taking over Crossing details from HDD agency (in case of separate agency) and compilation of all as-built drawings, project records, pipe book etc. shall be in laying contractor's scope of work.
- 5.1.48 Taking over surplus bare and coated pipe from coating contractor at storage yard after completion of work, loading, unloading, transportation and handing over of all surplus Company supplied free issue material including short length of pipes to Company's designated Storage yard as directed by Engineer-in-charge.
- 5.1.49 In case any activity though not specifically covered in schedule of rates description but same is covered under scope of work/ Specification / drawings, it is understood that the contractor shall do such performance & provisions so mentioned without any time & cost implication.
- 5.1.50 Any other works not specifically listed herein but are required to be carried out to complete entire work related to pipelines and the associated facilities.
- 5.1.51 Installation of casing pipes (by open cut/jacking/ boring/ any other trenchless technique) assembly, including supply of all materials, casing insulators and end seals, vents and drains etc. complete, at cased crossings.
- 5.1.52 Supply of HDPE duct for laying of OFC at crossings.
- 5.1.53 Providing loosely compacted cohesion less soil like sand, murrum, silty sand for specified distance in seismic prone areas.
- 5.1.54 Crossings of rivers/streams/canals by Open Cut:
- 5.1.55 Pre-construction surveys, preparation of detailed construction method statement and calculations for Company's approval.
- 5.1.56 Geo-technical investigations, if required.
- 5.1.57 Site preparation, arranging required land for setting up of string fabrication yard and

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 16 of 52	

obtaining necessary permissions from concerned authorities.

- 5.1.58 Preparation of pipeline Launch way, continuous concrete coating of pipes, repair of damages to corrosion and concrete coating, string preparation, field welding, NDT including radiography, pretest of completed strings, corrosion and concrete coating of field joints, trenching, laying at approved depth, backfilling including supply of select backfill material (where required), stabilization of banks, post installation hydro test, capping, providing and installing of markers, etc.
- 5.1.59 Installation of HDPE conduit, laying of OFC inside the conduit. Contractor shall install pipeline and HDPE conduit together in river crossings and HDPE conduit shall be strapped using corrosion resistance straps to the main pipeline in the top quadrant. Stability of the combined installation shall be ensured.
- 5.1.60 HDD works shall be carried out in accordance with specification enclosed with bid package. For directionally drilled crossing, following shall be performed:
- a) Carrying out all surveys and collection of data, as may be required for the design and construction of the crossings.
  - b) Carrying out all engineering, design calculations and preparing all construction drawings for laying of pipeline and optical Fibre cable inside steel pipe as per requirements for installation of river crossings by HDD method.
  - b) All construction activities required for installation of the crossings viz. site preparation, preparation of pipe string, repair of damages to corrosion coating, field welding, NDT including radiography, pretest of completed string, corrosion coating of field joints, holiday testing of complete pipe string, drilling in all types of soil including gravel, boulders and disintegrated and hard rock, installation of pipeline, post installation hydro-testing of the crossing section, capping, providing and installing markers at crossings.
  - d) Field joint coating shall be carried out by using approved sleeves.
  - e) Supply of duct of flexible HDPE/plastic corrugated tubing for laying of OFC cable, preparation of steel conduit string and corrosion coating of weld joints.
  - f) Installation of pipeline and 6" NB steel conduit for OFC (together in a single drilled hole or separately in two independent drilled holes).
  - g) Tie-in with main pipeline after successful installation of pipeline at river crossing.
  - h) Testing and jointing of OFC at either ends with OFC in main pipeline trench.
  - i) Contractor shall dispose bentonite slurry safely as per technical specification and environmental requirements as applicable.
- 5.1.61 Clean-up and restoration of ROU and other conveniences like road, rail, canals, cultivable


 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 17 of 52	

land, water facilities, irrigation facilities, boundary wall/fence etc. to original condition as per specification and drawings to the entire satisfaction of Company and/or Authorities having jurisdiction over the same, including disposal of surplus excavated soil and other construction materials to a location identified by Contractor approved by local authority without causing any disturbance to environment and to the entire satisfaction of Company.

- 5.1.62 Contractor shall arrange necessary clearance from the concerned authorities/ land owners to the effect that ROU/ ROW has been restored back to original condition. Contractor shall carry out joint survey with representative of Competent Authority (CA) and will obtain clearance in writing from CA that ROU has been restored to original condition. Necessary clearance from statutory authority / NOC for restoring the ROU to original condition shall be in Contractor's scope. Necessary proof of restoration i.e. through photographs and video recordings will have to be submitted by the contractor where ever NOC is not available.
- 5.1.63 Carrying out corrosion coating of long radius bends by heat shrink sleeve as per specification enclosed with tender document.
- 5.1.64 Tie-in with the pipeline at rail, road, river and other crossings including cutting of test headers as required and tie-in with terminal piping & with existing facilities as applicable.
- 5.1.65 At all pipeline tie-in locations, the trench shall be excavated further wherever possible and permanently lubricated HDPE duct shall be laid away (approx. 1 meter) from the pipeline to avoid damage to the HDPE conduit and to the pipeline.
- 5.1.66 Preparation of video films with audio commentary covering all aspects of pipeline construction annotated as required, conversion of the same to video CD/DVD ROM format and USB, submitting three (3) sets of the same.
- 5.1.67 All incidental and associated works and any other works not specifically listed herein but are required to be carried out to complete entire work related to pipelines and the associated facilities and making the entire pipeline system ready for operation.

## 5.2 Associated Works for Pipeline Construction

- 5.2.1 Installation of casing pipes (by open cut/ jacking/ boring) assembly, including transportation of casing pipe from company store and supply of all materials, viz. casing insulators and end seals, vents and drains etc. complete, at cased crossings. In case, coated casing pipe is supplied as free issue material, then the contractor shall remove coating before installation.
- 5.2.2 Cased crossings shall be installed at locations as per instructions of Engineer in- charge. The number of crossings indicated in alignment sheets is subject to change based on engineering, construction and statutory requirements or the requirements of the authority having jurisdiction over a utility crossing.
- 5.2.3 Supply and installation of all types of pipeline markers including their painting suitable for highly corrosive environment as per specification and all associated civil works.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 18 of 52	



5.2.4 Tie-in/ hook-up of pipeline at Dispatch / Receipt Terminal / IP Station/ SV Stations/ Injection Points and existing facilities, if any, is in the scope of Contractor.

**5.3 Piping Works at Dispatch Terminal, Receiving Terminal, IP Station, Tap- off Points, Injection points and Sectionalizing Valve Stations.**

Facilities to be installed at various terminals (Dispatch & Receiving), IP Stations and sectionalizing Valve (SV) Stations, as a part of overall pipeline system are shown in respective Piping & Instrumentation diagrams (P&IDs) enclosed.

**a. Dispatch & Receiving Terminals /IP Stations/Tap- off Points/ Injection Points/SV Stations**

Preliminary Plot plans and P&ID for the terminals/ stations are enclosed with this Bid. These drawings are indicative only and are enclosed to enable the Contractor to understand the nature of work involved. Issued for Construction (IFC) piping General Arrangement Drawings (GADs) shall be progressively furnished to the Contractor, at an appropriate time at project execution stage.


Contractor shall carry out all works strictly in accordance with the Issued for Construction (IFC) drawings and reference specifications/ standards, documents, data sheets etc. enclosed with this Bid document and instructions of Company/ Engineer- in-Charge and other provisions of Bid document.

The Contractor's Scope of Work for the work tendered shall consist of, but not be limited to, supply (as indicated in Scope of Supply), installation, testing, pre-commissioning and commissioning of terminal piping complete, with all associated mechanical, civil, architectural, structural, corrosion monitoring system, electrical, instrumentation, telecom, firefighting, water supply works etc. as applicable including all such works which though specifically not indicated here but will otherwise be required to complete the work in all respects.

The scope indicated below shall be read in conjunction with Schedule of Rates as applicable, drawings, standards, specifications and other documents forming part of the Contract document.


5.3.1 "Receiving and Taking over" as defined in specifications of all Company supplied materials including equipment from the Company's designated place(s) of issue defined elsewhere, transportation including loading, unloading, handling from Company's designated place(s) of issue to Contractor's own stock yard(s)/ work site(s)/ workshop(s), including arranging all necessary intermediate storage area(s) thereof till the materials are installed in permanent installation.

5.3.2 Procurement and supply of all materials, equipment's that are included in the scope of supply of Contractor, transportation of all materials from manufacturer's works including loading, unloading, handling, storing and transportation to work site(s)/work shop(s) including arranging all necessary intermediate storage area (s) thereof, as

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 19 of 52	


required.

- 5.3.3 Fabrication, erection, testing of all above-ground/ buried piping system including installation of scrapper trap etc. consisting of pipes, valves (manual and actuated), flanges, fittings, flow tees, pig signalers, insulating joint etc.; carrying out all applicable works associated with buried pipeline within the Terminal/ Intermediate pigging station/ SV station boundary wall/ fence (wherever applicable), carrying out welding, NDT including radiography; weld repairs/ retesting, cleaning/ flushing hydro testing, dewatering, functional testing, cutting of mainline and beveling (if required), excavation in all types of soil for installation of piping and pipe supports, pre-commissioning, providing commissioning assistance (wherever required) and commissioning including supply of all materials and manpower that are required during pre-commissioning and commissioning and all associated works.
- 5.3.4 Installation of Sectionalizing Valve stations in all terrains/ soils including all above ground/ underground piping at all elevations and depths including all civil works, viz. filling and compaction of valve station areas, excavation of pits, gravel filling, construction of supports, foundations, construction of access road to installation from nearest metaled road, installation of all valves and valve actuators and all fittings/ piping works.
- 5.3.5 Preparation of isometrics and/or fabrication drawings required for the purpose of fabrication during execution of work.
- 5.3.6 Obtaining all necessary approvals and work permits from concerned local authorities having jurisdiction including hot work permit as applicable for performing the work in existing terminal facilities. Arranging of adequate fire-fighting equipment viz. fire brigade, fire extinguisher, shielding from existing facilities, oxygen mask etc. for carrying out the work safely to the satisfaction of COMPANY.
- 5.3.7 Carrying out welding including cutting, edge preparation (inclusive of grinding the edges of pipe, fittings, flanges, etc. to match with the matching edges of different thickness wherever required), fit-up, bending, pre heating wherever required, NDT including radiography and other non-destructive tests specified. NDT requirements for process and other piping shall be in accordance with relevant specifications enclosed with the Contract document.
- 5.3.8 Installation of all types of valves (manual/ actuated), all types of inline/ online instruments such as PSVs (other than those covered separately), safety valves, tapping for thermowells, sample connections, pressure gauges, corrosion monitoring system etc. for all sizes and ratings including fixing of gaskets, bolts, studs and nuts of all sizes, ratings and materials.
- 5.3.9 Installation of all in-line and on-line instruments including Skin Temperature measurement assemblies.
- 5.3.10 All works for corrosion monitoring system (CMS) system as described in relevant document enclosed elsewhere with Bid document.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 20 of 52	



- 5.3.11 All associated civil works, viz. levelling, filling and compaction of station areas as required, necessary stone pitching at the sides of earth fill (if required), excavation of pits, gravel filling, paving as required, access road to installation from nearest metaled road, etc.
- 5.3.12 All associated structural and mechanical works including supply of all materials required, unless covered separately elsewhere in the Bid document, including construction of foundations (PCC/ RCC works) for equipment's and pipe supports and sleepers, fabrication and erection of supporting structural elements for piping such as shoes, clamps, anchors, guides, insert plates, brackets, structural column, valve operating platforms, pipe crossovers etc. Contractor shall provide grating as per details currently included in the tender document or as per details furnished subsequently.
- 5.3.13 Supply of bolts, nuts, gaskets, washers, U bolts, clamps, clips, gaskets for supports for all piping works.
- 5.3.14 Supply, fabrication and erection of supporting structural elements for piping such as shoes, clamps, anchors, guides, insert plates, brackets, structural column etc.
- 5.3.15 All associated structural, instrumentation, telecom, mechanical and civil works including supply of all material required, covered separately elsewhere in the Bid document.
- 5.3.16 Hook-up of piping with equipment's and vessels and hook-up of all piping at the battery limit with the pipeline/ piping including cutting of temporary test header, re- beveling, NDT, fit-up, welding, radiography etc. including interface/ coordination as required with other Contractor(s)/Agencies.
- 5.3.17 Painting of above ground piping (including supply of materials), structural steel elements, for pipe supports, all equipment's and all related miscellaneous items as required and as directed by Engineer-in-charge. Paint shall be suitable for highly corrosive environment in accordance with specification. Wherever touch up/ repair of primer is required, high build epoxy zinc phosphate primer shall be used.
- 5.3.18 Protective coating of 100% solid high build epoxy minimum 500 micron thk. for all underground piping, valves, fittings, etc.
- 5.3.19 Corrosion protection coating of all field weld joints for buried piping of all sizes including supply of all materials.
- 5.3.20 Cleaning (card board blasting), Hydro testing, dewatering and drying of piping system of all sizes as per specifications enclosed.
- 5.3.21 Final clean up and restoration of site, facilities etc. as per the requirement of COMPANY/ Engineer-in-Charge including filling (wherever required) and grading of areas around stations for avoiding any local flooding of area.
- 5.3.22 Transportation and stacking of all surplus COMPANY supplied free issue material to Company's designated store after completion of works or as directed by Engineer-in-Charge.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 21 of 52	

- 5.3.23 Preparation of as-built drawings, documents and project records as per instructions of Engineer-in-Charge.
- 5.3.24 Preparation of detailed procedures for fabrication, installation, testing, pre-commissioning and commissioning. Such procedures shall be submitted to COMPANY/ Engineer-in-Charge for review and approval.
- 5.3.25 Obtaining all statutory clearances, approvals, permissions and hot work permit for the works as required.
- 5.3.26 Fabrication and erection of piping supports and change of existing support/additional supports installed by others as directed by Engineer-in charge.
- 5.3.27 Idle time preservation of mainline and terminal piping by nitrogen gas with positive pressure 2 bar (g) for specified period.
- 5.3.28 Any other works not specifically listed herein but required for completion of the works in all respects.
- 5.3.29 All construction works shall be carried out as per "Issued for Construction" drawings, procedures, specifications and applicable codes and standards. Any changes at site shall also need prior approval from the COMPANY and revision of drawings.

## 5.4 **Temporary Cathodic Protection Works**

Temporary Cathodic Protection works shall be carried out as per the scope detailed in particular job specification enclosed as **Annexure-I and SOR** enclosed elsewhere with the tender.

## 5.5 **Corrosion Monitoring System Works**

Corrosion Monitoring System works shall be carried out as per the scope detailed in particular job specification enclosed as **Annexure-II and SOR** enclosed elsewhere with the tender.

## 5.6 **Civil, Architecture & Structural Works**


Civil, Architecture & Structural works shall be carried out as per the scope detailed in particular job specification enclosed as **Annexure-III and SOR** enclosed elsewhere with the tender.

## 5.7 **Instrumentation Works**

Instrumentation works shall be carried out as per the scope detailed in particular job specification enclosed as **Annexure-IV and SOR** enclosed elsewhere with the tender.

## 5.8 **Telecommunication Works**

Telecommunication works shall be carried out as per the scope detailed in particular job specification enclosed as **Annexure-V and SOR** enclosed elsewhere with the tender.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 22 of 52	

**5.9 Electrical Works**

Electrical works shall be carried out as per the scope detailed in particular job specification enclosed as **Annexure-VI and SOR** enclosed elsewhere with the tender.

**5.10 Fire Protection Works**

Fire Protection works shall be carried out as per the scope detailed in particular job specification enclosed as **Annexure-VII and SOR** enclosed elsewhere with the tender.

**6.0 SCOPE OF SUPPLY**


**6.1 Materials to be supplied by COMPANY as Free Issue**

Company shall supply the following Pipeline/ Terminal piping materials required for permanent installation to the Contractor at an appropriate time during the execution stage as free issue materials:

**Line Pipes:**

Entire required quantity of coated line pipes of all thickness shall be supplied by Company. Line pipes (coated) shall be made available to the Contractor at designated storage yards. Transportation of the line pipe from designated storage yards in to work site shall be in the scope of the CONTRACTOR. Further the CONTRACTOR has to ensure safe storage.

- a.** Bare Line Pipes API 5L Gr. X-70 of 12"x 9.53 mm shall be used for above ground piping in front of scrapper trap by the respective part Contractor. This bare pipe shall be free issue to the contractor at manufacturer premise.
- b.** The quantities of coated and bare line pipes indicated in the bid document are approximate and may vary. The exact quantity shall be intimated to the Contractor after award of work.
- c.** Contractor to note that quantities of line pipe indicated in the bid document includes contingency/ extra length over and above the actual requirements. Surplus pipes shall be taken over by the Installation contractor from the coating contractor at storage yard after completion of Installation works. It is the responsibility of installation contractor to return surplus pipes to the COMPANY designated storage yard as per instructions of Engineer In-Charge after completion of installation works.
- d.** Receiving and taking over of bare and coated line pipes at Storage yard including its inspection. All trucks / trailers for transportation of line pipes from storage yards to site/ ROU/ Contractor's storage Yard shall be supplied by contractor. The coating contractor shall load the coated/bare line pipes onto the truck/trailers supplied by contractor.
- e.** Contractor shall note that the dump yard/ storage yard chainages indicated in the bid document are approximate and may vary based on the availability of land and NH/ SH/ Rail approach. The exact location of Pipe Storage Yards shall be intimated to the Contractor at the time of award. Contractor shall be responsible for performing all

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 23 of 52	

works as per scope of work at the finally selected storage yard location by the COMPANY at no extra time / cost to the COMPANY.

- f.** Contractor shall note that Chainage indicated for SVs are approximate and may vary  $\pm 10\%$  along the pipeline chainage, based on the availability of land and NH/ SH/ Rail approach. The exact location of SV stations shall be intimated to the Contractor at the time of award. Contractor shall be responsible for performing all works as per scope of work at the finally selected SV locations by the COMPANY at no extra time/ cost to the COMPANY.
- g.** Transportation of pipes and other free issue material from place of issue is in Contractor's scope. Contractor shall note that the prices indicated in the Schedule of Rates shall be inclusive of taking the delivery and transportation of line pipes and other material from the above storage yard/ stockyard to work place(s).
- h.** Bevel Protectors of the line pipes shall be the property of the pipeline installation Contractor. He has to collect and dispose off the bevel protectors. Contractor shall quote accordingly.
- i.** The Storage yard shall be managed by coating contractor under a separate contract. The coating contractor shall load the coated/ bare line pipes onto the trailers supplied by Installation Contractor.


## Other Terminal Piping Materials

- Company shall supply the following materials to be installed as a part of Terminal piping as free issue:
- All types of valves (ball, plug, globe etc.) of size 4" and above. Wherever required, actuators shall be supplied along with valves.
- The Company shall make above free issue materials available at the IGGL store locations as indicated **SCC**.
- Contractor shall arrange all trucks/ trailers, cranes etc. for transportation of above materials including loading at Company store, unloading at contractor's storage yard/ work site, arrangement of cranes, handling etc.
- Contractor shall return all surplus material to company designated storage yard as decided by Engineer- In- charge.

### 6.1.1

## Conditions for COMPANY Supplied Material

- i.** The Contractor shall be responsible for taking over of the material and subsequent handling, hauling, transportation to the actual work site(s)/fabrication yard(s) and storage & safe keeping of the materials. Contractor shall arrange all equipment/ cranes etc. for loading of these materials on their truck/trailers for transportation except line pipe.
- ii.** The Contractor shall inspect all COMPANY supplied free issue materials at the time of

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 24 of 52	


taking over from the COMPANY and defects noticed, if any, shall be brought to the notice of COMPANY/ COMPANY representative and jointly recorded. Once the material has been taken over by the Contractor, all the responsibility for safe keeping of the materials shall rest with the Contractor.

- iii. Every month the Contractor shall submit to the COMPANY an account for the material issued to the Contractor in the Performa prescribed by Engineer-in- Charge.
- iv. On completion of the works, Contractor shall submit a "Material Appropriation Statement" for all materials supplied by the COMPANY as free issue materials.
- v. The scrap allowances shall be permissible as per the provision of Bid document. The percentage allowance shall be accounted on the basis of actual consumption as incorporated in the work.
- vi. All unused and scraps material shall be the property of the COMPANY and shall be returned by Contractor to COMPANY at COMPANY's designated storage point(s) including transportation of the same from Contractor's stock yard(s)/worksite(s)/work shop(s) to the COMPANY's designated storage point(s). Contractor shall be responsible for the proper measurements of the unused/ scrap materials to be returned to the COMPANY.


## 6.2 Materials to be supplied by CONTRACTOR

The procurement and supply, in sequence and at appropriate time and place, including inspection and expediting, of all materials and consumables required for completion of the work as defined in this bid document except the materials specifically listed under para 6.1 above as COMPANY free issue material, shall be entirely the CONTRACTOR's responsibility and the item rates quoted for the execution of the WORK shall be inclusive of supply of all these materials. All materials supplied by the CONTRACTOR shall be strictly in accordance with the requirements of relevant COMPANY material specifications enclosed with the Contract document. All equipment's, materials, components etc. shall be new and specifically purchased for this job from Company approved vendors, duly inspected by third party inspection agency (shall be 3.2 certified-refer APPENDIX-VI – Third Party Inspection Agency) along with manufacturing certificate for relevant pressure containing equipment/ materials/ parts/ components etc. For other contractor supplied equipment/ materials/ parts/ components, contractor has to submit test certificate as per technical specification/ applicable codes/ approved QAP (as applicable) before supply. As a minimum, the materials to be supplied by CONTRACTOR may include but shall not be limited to the following

- i. Scrapper traps including handling devices, Jib Crane, Trolley, pig signalers, quick opening closure and pressure safety valves.
- ii. Insulating Joints
- iii. Flow tees
- iv. Quick Opening End Closures of all sizes for blow down lines.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 25 of 52	


- v. Fittings of all types, all size, all Rating such as elbows, tees, reducers, weldolet, sockolet etc.
- vi. Flanges/ Blind Flanges/ Spectacle Blinds/ Spacers & Blinds. All assorted pipes
- vii. Valves of all types (ball, plug, globe etc.), all rating of size below 4" shall be in Contractor scope.
- viii. All equipment's & consumables such as welding electrodes, oxygen, acetylene, inert gases, all types of welding electrodes, filler wires, solder wires, brazing rods, flux etc. for welding/ cutting and soldering purposes.
- ix. All materials for all types of pipeline markers including cement, sand, reinforcements, structural steel etc. and paint conforming to normal corrosive environment as per specification enclosed with the bid documents.
- x. Casing insulators and end seals and materials for casing vents and drains as per drawings.
- xi. All materials required for continuous concrete coating/ gravel filled geo- textile bags/ saddle weight for providing negative buoyancy to the pipeline wherever required. Contractor shall take prior approval of COMPANY and furnish all details including design calculations in case of use of purpose built geo-textile bags. For river crossings, only continuous concrete coating shall be provided for negative buoyancy.
- xii. Supply of warning mesh as per the technical specification/ EN:12613 standard (latest edition).
  - The material of warning mesh shall be of virgin quality polyethylene (PE) / polypropylene (PP) as per EN:12613 (latest edition).
  - It shall have UV-resistant, non- biodegradable, non-hazardous and non-toxic properties. If warning mesh is made from PE material, then, the same shall have anti-rodent properties in addition to above properties.
  - Warning mesh shall have golden yellow color and printed text shall be in red color and of non-deletable type with high abrasion resistance.
  - All test shall be conducted and accepted as per requirement of EN:12613 (latest edition) unless otherwise mentioned in approved QAP.
  - Handling including loading and unloading, packaging, transportation, laying shall be carried out as per manufacturer's / supplier's guidelines so that material at all stages upto laying shall be in safe and sound condition.
  - Printer matter and their layout shall be approved by PMC/owner before supply.
  - Print matter shall be printed in English and Local language alternatively at every 1 m distance. Manufacturer's name, year of manufacturing and batch/lot number

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 26 of 52	



shall appear at every running meter of warning mesh strip

- In case warning mesh is supplied in more than 500 mm width, a sample of width 500 mm from the same lot/batch of material shall be tested as per requirement of EN:12613. The sample drawn should have same production parameters (except width) as of higher width section.
  - Contractor has to submit the QAP of warning mesh for approval before commencement of production. Inspection of material will be done at vendor's works by owner/PMC representatives. Any test failed during inspection for the referred lot/batch, the total lot/batch will be rejected.
  - Print matter text/ font size will be of letter height 15 mm and thickness of letter line 2 mm. However, vendor to ensure that print matter text size shall be legible when viewed from the range of minimum 5 m distance without magnification.
  - If center width of the mesh is not sufficient to accommodate the requirement mentioned above, in that case the vendor may put separate PE Centre band/strip to accommodate the below mentioned requirements.
    - a) PE center band/strip shall be golden yellow color and made from virgin quality, high density polyethylene, center band/strip thickness shall be of minimum 0.1 mm thick and shall have UV-resistant, non-biodegradable, non-hazardous, non-toxic and anti-rodent properties.
    - b) PE center band /strip width shall be 100 mm for warning mesh width upto 550mm and 150 mm width of PE center bend shall be kept for warning mesh width more than 550mm
    - c) PE center band/strip shall be pasted on center of the warning mesh in such a manner, so that after paste inherent material properties of warning mesh shall not be compromised. Further peel strength of the used adhesive material shall be sufficient enough so that PE center band/strip shall not peel off during handling, transportation, storage, laying in trench and in wet environment/condition either at above ground or underground condition. Manufacturer/Supplier shall give declaration/ compliance statement regarding the used adhesive for paste purpose of PE centers band/strip.
  - The warning mesh shall be supplied in single part of 600 mm width for 12" Pipeline.
- xiii.** Supply of all materials for installation of wind-shock and safety signboard at different stations.
- xiv.** All materials and consumables required for external corrosion coating and concrete coating (where required) of field weld joints.
- xv.** All materials required for field joint coating, corrosion coating of LR bends, pup pieces of sectionalizing valves and repair of damaged corrosion coating of line pipe. Contractor shall confirm that proposed field joint coating material is suitable for type of terrain encountered along pipeline route. Contractor shall take prior approval from COMPANY for field joint coating material to be used.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 27 of 52	


The cut back length shall be 150 mm + 20 (-0) mm.

- xvi.** All material, equipment & consumables for HDD works including approved sleeve.
- xvii.** All materials required for sand/ soft soil padding around pipeline and optical Fibre cable, select backfill of approved quality, slope breakers, bank stabilization of water crossings etc.
- xviii.** For rocky areas, rock shield shall be provided in addition to sand/ soft soil padding. Rock shield shall be of high density extruded polyethylene mesh with following properties:

Thickness	ASTM D-1777	6 mm (minimum)
Compressive Strength	ASTM D-1621	250 PSI
Impact Resistance	ASTM G-14	100 in-lb


Contractor shall obtain prior approval from Engineer-in-charge for rock shield material & its application procedure.

- xix.** All materials including consumables, nitrogen etc. required for hook-up with existing facilities and equipment's.
- xx.** Mobilizing and providing all necessary barricading material, safety signboards, warning lights etc. to safeguard the pipeline against accidents during construction of line in city area.
- xxi.** All safety tools, tackles, devices, apparatus, equipment etc. including ladders and scaffolding complete as required.
- xxii.** All stud bolts, nuts, jack screws, all type of gaskets (metallic spiral wound gaskets) in required quantities to be used for permanent installation into the system for all sizes and ratings of flanges and flanged valves, equipment etc., including nuts, bolts, gaskets, washers, U bolts, clamps, clips etc. for pipe/equipment supports. All materials for supports shall be in contractor's account.
- xxiii.** All types of coating and painting materials including primer and paints suitable for normal corrosive environment for painting above ground piping and 100% solid high build epoxy (minimum 500 micron Thk.) for underground piping/ valves, etc.
- xxiv.** All pipes, fittings, flanges, blind flanges, gaskets, nuts, bolts, clamps, strainers, equipment/ consumable, metallic blinds, temporary gaskets as required for filling, pressurizing, hydrostatic testing and dewatering, swabbing etc. including test headers for pigging and hydro-testing.
- xxv.** All materials such as cohesion less soil/ sand required for installation of pipeline in seismic active zones.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 28 of 52	



- xxvi.** All materials, equipment's, consumables etc. required for magnetic cleaning and caliper pigging of pipeline.
- xxvii.** All materials required for civil, structural and general civil works including structural steel, cement, reinforcement, concreting, grouting etc. in facilities like despatch terminal, IP Station, SV stations, injection points and receiving terminal including all types of equipment and material required for excavation/ construction of pits for equipment and instrument installations and steel/ structural steel materials of all types.
- xxviii.** All materials required for repair/ restoration of pavements, roads, bunds, walls, other structures affected/ damaged by Contractor's construction activities. Materials shall be equivalent/ superior to those used for original construction of the facility.
- xxix.** All equipment and consumables required for hydrostatic testing like pumps, pressure and temperature gauges, test water and corrosion inhibitors for test water for hydrostatic testing.
- xxx.** Supply of insulators, end seals etc. in case of cased crossings; supply of 6" NB CS conduit. CS conduit of 168 mm dia. for OFC shall also be used in open cut river crossing by strapping with concrete coated line pipe.
- xxxi.** All materials, consumables and equipment required for welding and for all types of tests and NDT such as radiography, ultrasonic testing, magnetic particle, dye penetrate examination etc. including radiography film, X-ray/ gamma ray machines, developing equipment and consumables, Ultrasonic equipment's etc.
- xxxii.** All safety tools, tackles, devices, apparatus, equipment etc. including ladders and scaffolding complete as required.
- xxxiii.** Steel materials such as structural steels, reinforcement steels and steel for all types of supports, foundations, ladders, platforms, etc.
- xxxiv.** All steel materials such as structural steel, reinforcement steel, shims, wedges, packing plates (machined wherever required), pipes, nuts & bolts, washers, U-bolts, anchor bolts, clamps, clips, pipe saddles/ shoes etc. as required for the fabrication of structural supports and supports basements/ foundations, platforms etc. Pipes supplied by COMPANY shall not be used for fabrication of supports and support saddles etc.
- xxxv.** All materials for corrosion protection of buried piping, pipe fittings, valves, casing pipes, etc.
- xxxvi.** All materials and equipment's related to blasting of rock/ controlled blasting for excavating trench, grading of ROU, pipeline & pipe laying/ installation and other works.
- xxxvii.** All materials for surface type temperature element.


 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 29 of 52	

- xxxviii.** Mobilizing Pipe/ cable locator for locating existing pipelines/ cables.
- xxxix.** All types of corrosion measuring instruments e.g. corrosion coupons, corrosion probes etc. wherever required as per specification.
- xl.** Sand ridges (sand, polyethylene sheets etc.) and other materials for stacking of surplus pipes at Company's designated storage yard.
- xli.** Corrosion inhibitor, oxygen scavengers and bactericides for water used for hydrostatic testing including water for testing.
- xlii.** Required quantities of nitrogen for idle time preservation and pre- commissioning of Pipeline and associated facilities, if required.
- xliii.** Supply of Assorted pipes.
- xliv.** All pigs for cleaning, gauging, filling, dewatering, swabbing, drying, pre-commissioning and commissioning of the pipeline.
- xlv.** All materials i.e. fittings, flanges, valves, blind flange etc. required for isolation and nitrogen purging for pipe section, manpower, equipment, pigs, consumables, nitrogen required for carrying out commissioning of pipeline along with necessary piping and instrumentation connection for monitoring flow rate, pressure, temperature etc. providing temporary facilities for venting/ flaring along with necessary piping, valves and instrumentation etc. shall be in contractor's scope.
- xlvi.** All other materials not specified above but required for successful completion of the entire work whether temporary or permanent in nature.

The item rates quoted for the execution of the work shall be inclusive of supply of all materials mentioned above unless specifically covered otherwise under schedule of rates. The quantities indicated in schedule of rates under Contractor's scope of supply are approximate. Contractor shall carryout MTO of all materials required based on IFC general arrangement drawings, P&IDs and firm up the actual requirement of materials. All escalation/ extra materials procured by Contractor for contingencies shall be Contractor's property and no payments shall be made for such materials. Payment shall be made for actual materials installed by the Contractor as a part of permanent installation.

In case, any item is covered in scope of work but is not present in Schedule of Rates (SOR), it will be assumed that bidder has included cost implication of those items in their total price.

**Material covered under supply of material by the contractor for SV stations for SGPL Section is required to be handed over to client / other contractor/s at Damdim and Lava in West Bengal and Marming at Sikkim. Similarly for supply of material by the contractor for SV stations for DIPL Section is required to be handed over to client / other contractor/s at Dimapur and Zakhma in Nagaland and Senapati in Manipur as per**

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 30 of 52	

respective schedule of rates

## 6.3 STORAGE OF MATERIALS

- 6.3.1 All materials shall be preserved against deterioration and corrosion due to poor or improper storage while under the custody of the Contractor.
- 6.3.2 All materials shall be duly protected by the CONTRACTOR at his own cost with the appropriate preservatives like primer, lacquer coating, grease etc. and shall be covered with suitable material to prevent them from direct exposure to sun, rain, wind and dust.
- 6.3.3 Whenever applicable, pipes shall be stacked according to the identification marks and stacks shall be arranged on sleepers/ sand pads at least 300 mm above ground.
- 6.3.4 The CONTRACTOR shall check that valves, fittings, specials etc. are not subjected to corrosion from hydrostatic test water remaining in the packing. 4.3.5 Any such condition when detected should be brought to the notice of Engineer-in-Charge and remedial measures taken as directed.
- 6.3.5 All machined surfaces shall be properly greased and should be maintained and protected from damages.
- 6.3.6 Openings of equipment, machinery, valves etc. shall be kept blocked/ covered with blinds to prevent entry of foreign matter.
- 6.3.7 As far as possible materials shall be transported to the site of erection only just prior to the actual erection and shall not be left lying around indefinitely on ground but kept on packing/ sleepers etc. to maintain the minimum distance from the ground as specified and/ or as per directions of Engineer-in-Charge.

## 7.0 INDICATIVE CONSTRUCTION MILESTONE

Contractor shall adhere to meet the indicative construction milestones enclosed as **Appendix-I to Particular Job Specification**. Contractor shall be responsible for close monitoring and completion of indicative construction milestone.

## 8.0 SCOPE OF WORK AND SCOPE OF SUPPLY FOR OTHER DISCIPLINES


Detailed scope of work and scope of supply covered in this document given above is pertaining to pipeline laying and associated pipeline terminal/ station piping works only. Detailed scope of work related to civil, architectural, structural, Cathodic protection, corrosion monitoring system, electrical, instrumentation, telecom, firefighting and water supply works are covered in separate documents in detail and the same are enclosed elsewhere with the Bid document. All these documents shall be read in conjunction with this document and shall form an integral part of the overall Scope of work of the Contractor(s).

## 9.0 OTHER CONDITIONS OF BID

### 9.1 Basis of Work

#### 9.1.1 All piping/ pipeline works shall be carried out as per following:

- a) Piping and Instrumentation Diagram (P & IDs) and line schedule.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 31 of 52	

- b) Approved for construction Piping General Arrangement Drawings (GADs).
- c) Approved for construction Alignment sheets/ crossing drawings.
- d) Piping Material Specifications.
- e) Specifications
- f) Piping support standards/ drawings and support index.
- g) Any other drawings/ sketches prepared by Company and/ or by the Contractor and approved by the Company

## 9.2 **Topographic Survey**

The alignment sheets including plan and ground profile details, details of various crossings are enclosed along with the bid document for contractor's reference and information only.

It shall be the Contractor's responsibility to verify the pipeline routes. Wherein Contractor's opinion the survey and investigation data is not found to be sufficient in detail, it shall be the responsibility of the Contractor to collect/ arrange and provide such topographic surveys.

Further, successful contractor(s) after award of work shall immediately carry out topographic survey and geotechnical investigation of all crossings other than those provided by the company in the pipeline route and prepare crossing drawing for each crossing. The drawing shall be submitted for Company's approval. IFC alignment sheet shall be issued based on the input of above crossing drawings.

The formats for crossing drawing to be used are enclosed with the bids. Contractor shall also incorporate the crossing details in the as built alignment sheet after completion of work.


Contractor shall also perform any additional topographic surveys and geotechnical investigations that may be required for local detours or at crossings or at any other location during execution of the project without any extra cost to the COMPANY. Pipeline alignment shall be marked on village maps by CONTRACTOR wherever detouring is beyond existing ROU. CONTRACTOR shall be deemed to have considered such eventualities while formulating his bid.

## 9.3 **Alignment Sheets and Station Drawings**

Surveyor Alignment Sheets and crossing drawings are included in the Bid package. The details of class location, crossings details are separately enclosed. These drawings/ details are indicative only and are furnished to enable to estimate the quantum of work and to quote a firm price for the work.

Final drawings marked "Issued for Construction (IFC)" shall be furnished by COMPANY to CONTRACTOR at project execution stage after submission of crossing drawings by the Contractor as per mentioned elsewhere in the bid.

Typical station drawings are also included in the Bid package. These drawings are marked as "Tender Purpose Only".

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 32 of 52	

The IFC (Issued for Construction) drawings issued during project execution stage may vary from the drawings included in the Bid Package. CONTRACTOR shall carry out all works in accordance with these IFC drawings at no extra cost to the COMPANY.

## 9.4 Description of pipeline Route

### 9.4.1 Route Description

1. PART-D1: Spread-2B (12" x 44.2 Km (approx.) trunk line originates from Ch. 59.800 km up to Ch. 104.000 km. with 1 SV stations
2. PART-D2: Spread-2C (12" x 46.3 Km (approx.) trunk line originates from Ch. 104.000 km towards and up to State border between West Bengal & Sikkim at Ch. 150.3km with 2 SV stations (SV/SGPL/05) & (SV/SGPL/06) and 1 IP station (IP/SGPL/01)

For details refer Pipeline Network Schematic Diagram No. **C221052-SGPL-PP-SCM-2001** attached as **Appendix-IV**.

3. For detailed list of crossings, refer **Appendix-VIII**– List of Crossings. (Vol-IV of IV)


The number of crossings and features along the pipeline route described above are approximate. CONTRACTOR shall not be entitled for any compensation in terms of time and cost in case of variation in the above. Contractor shall verify the above data and carry out pipeline installation works without any extra cost & time to COMPANY.

## 9.5 Soil Investigation and Soil Resistivity survey

COMPANY has carried out soil investigation (visual classification/ stratification) and resistivity survey along the entire pipeline route. Data collected from such surveys is enclosed with the bid package to the extent available. Such data is issued to CONTRACTOR for his reference purpose only. It shall be Contractor's responsibility to verify the data and satisfy himself with regard to accuracy and utility of data. CONTRACTOR shall carry out any additional soil data/ investigation required for installation. CONTRACTOR shall not be entitled for any compensation in terms of time or cost in case of any variation in actual site conditions from the data furnished in the bid package. It shall be Contractor's responsibility to familiarize himself with sub-soil conditions along the pipeline route and workout the lengths of pipeline to be laid in different subsoil conditions including the quantum of rock excavation that would be necessary. Unit rates quoted shall also be inclusive of all rock excavation. No extra compensation shall be payable to CONTRACTOR for any rock excavation whatsoever.

## 9.6 Pipeline ROU

Contractor shall carry out construction work within the width of pipeline ROU as made available to them with no time and cost implication to the Company. The Contractor shall arrange any additional ROU requirement for construction purposes. It shall be Contractor's responsibility to make arrangement for any additional land required for fabrication, construction, storage and all other work areas. In certain restricted areas such as private holdings, congested and plantation areas etc. ROU may be restricted

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 33 of 52	


to a width of 3-5 meters. In forest areas only 10 m ROU will be made available to the contractor. Contractor shall propose suitable execution methodology and time schedule for construction/ execution of work at areas of restricted ROU and deploy adequate equipment& manpower etc. as required. Contractor shall also arrange additional land during installation of Pipeline by HDD. Damages, if any, to existing pipeline and facilities shall be Contractor's account. Wherever the detouring is carried out beyond ROU during pipeline installation, the detoured pipeline alignment shall be marked on village maps by the pipeline installation Contractor.

## 9.7 Pipeline Passing Through City Area and Along NH/ SH

In case the pipeline passes through city areas, it will be laid generally in the carriage way. Wherever it is not possible to lay the pipe line on the carriage way for any reason whatsoever, the pipeline will be laid on service road / footpath. It will be the responsibility of the Contractor to identify all the underground utilities after surveying the area along the gas pipeline route and lay the pipeline with clear distance of 20 cm from other existing utilities like cable, water pipeline etc. In case of hydrocarbon pipeline the clear distance shall be 50 cm.

### 9.7.1 RESTRICTION OF ROU

- In congested urban/industrial areas where the exact location of the existing services (aboveground as well underground) is not known, the contractor shall contact the concerned authorities to get the permission to cross the existing utility including approval of the final alignment of the pipeline before commencement of work. Contractor shall obtain the Digging Permit from the respective authority. In addition to this acquisition of NOC from the respective utilities' companies will be also in the scope of the contractor.
- In many areas due to pipeline being laid in ROW of NH/ SH areas and due to several underground obstacles encountered during construction, mechanical trenching may not be possible. In such cases Contractor shall perform the work by manual means without any Cost as well as time implications.
- The contractor shall finalize the alignment of pipeline by making the trial pits at regular intervals in order to ensure the location of existing underground utilities.
- In urban/ Industrial areas where there are numerous underground utilities, the cover of 1.0m /1.5 m may not be sufficient; Contractor will not raise any compensation for any such necessary deepening. Due to deepening of trench, it may be required that shoring of trench may be required to avoid collapse of the same along the road. The same shall be done by the contractor without any cost implications.
- Due to restriction by statutory authorities, the Contractor may not be allowed to work during monsoon season. Thus for such areas the contractor shall plan his work accordingly and submit his schedule to relevant authorities without any time as well as Cost implication.
- In city areas where, due to restrictions by the statutory authorities, the movement of heavy machinery is not allowed, the laying /Construction activities shall have to be carried out manually. Only tyre mounted equipment such as Hydra/ JCB etc. will be

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 34 of 52	




permitted with consent of the concerned authorities.

- The authorities may impose stringent conditions for laying the pipeline in certain areas like limited length of working section, night work shift only etc. Thus, the contractor must submit his working methodology to relevant authorities in order to obtain the necessary permission for laying the pipeline prior to commencement of work.
- Due to non-mobilization of the heavy machinery and due to underground utilities, the welding of long pipe string above ground and lowering may not be possible, therefore welding may need to be carried out in the trench by making bell holes for individual pipe or small sections of pipe.
- To comply with the agreed work schedule, the contractor may work in shift or extended hours.
- The Contractor shall be deemed to have taken into consideration all variations as mentioned above at the time of formulating his bid and no extra compensation either by way of time or cost shall be admissible.

## 9.7.2

### PARTICULAR INSTRUCTIONS

- In Principle all statutory permissions from all concerned shall be obtained by IGGL. However, all activities related to liaison, co-ordination etc. with all authorities needed to achieve the work as per schedule will be under Contractor's scope including taking work permit/ Digging Permit before commencement of work. Contractor shall also inform and seek necessary permission from the local traffic police before commencement of trenching work.
- For access route to the working strip, the Contractor will be responsible to negotiate with the relevant owner, tenant or authorities. Any deemed compensation will be borne by the Contractor.
- The contractor shall be responsible for overall entire quality control activities for the present project.
- Contractor proponent shall have to take prior approval of concerned Government agencies while carrying out blasting wherever required.
- Contractor proponent shall have to take preserve top soil dug and shall be restored to original condition on completion of the work.
- Owner shall obtain permission from the Forest department. However, required assistance to get the permission from the respective authorities, necessary liaison, co-ordination etc., with the authorities needed to achieve the work as per schedule including taking work is in the Contractor's scope.
- While carrying out the laying activities any damage to other utilities to be repaired by the contractor to the full satisfaction of the utility agency. Any claim arises out of damage of other utilities shall be borne by the contractor.
- Contractor proponent shall construct the pipeline and other infrastructure and adopt safety measures as per the standards & specification laid down by the concerned

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 35 of 52	

agencies from time to time.

- Contractor proponent is required to comply with the manufacturing, Storage and import of Hazardous Chemicals Rules -1989 framed under the Environment (protection) Act 1986.
- On completion of all temporary work structures, surplus materials and wastes shall be suitably disposed of.
- Similarly, any additional conditions issued by statutory authorities will also have to be complied with by the contractor without any cost implications.

## 9.7.3 **PREPARATION OF CONSTRUCTION SITE**

The overall duration of the works at every point of the pipeline route, from the opening of the working area to lowering of pipeline and trench backfilling shall not exceed the permit condition of relevant authority.

## 9.7.4 **WORKING STRIP**

No ROU exist for the city portion line along the authority land. Working strip may be available along the road side for the construction site. Contractor should deploy suitable equipment and adopt his working methodology accordingly.

## 9.7.5 **REDUCING THE WORKING STRIP**

Contractor shall not be compensated for any reduction in the width of working strip.

## 9.7.6 **REVERSE OF THE WORKING STRIP**

No fencing of any kind along the pipe route is essential to be provided. However, it remains the responsibility of the Contractor to barricade the area of open trenches so that no untoward accident takes place.

## 9.7.7 **EXCAVATIONS (UNDERGROUND OBSTACLES)**


In congested area or if deemed necessary by Owner's Engineer or concerned authorities where numerous utilities may be encountered the contractor should carry out the excavation manually without entitlement of any compensation.

## 9.7.8 **REINFORCED CONCRETE SLABS AS MECHANICAL PROTECTION FOR THE PIPE**

Crossing of utilities will be done by invariably going below the utilities maintaining a clear gap of minimum 20 cm except hydrocarbon pipelines. From hydrocarbon pipelines, clear gap of minimum 50 cm shall be maintained. If due to site constraint it is not possible to lay the pipeline as per the above cover requirement, Contractor shall initiate the proposal for approval of Deviation and obtain written permission from EIC.

## 9.7.9 **MARKERS**

Pipeline Warning Markers shall be installed at each and every Kilometer. Apart from this, additional warning markers shall also be installed at each side of highways (NH/SH), major district roads (MDR), all metalled roads, railway crossings, water body

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 36 of 52	



crossings, any other major crossings and at entrance to stations.

For urban Agglomeration (UAs) / Towns having a population of 1 lakh or more, the warning marker shall be installed at least at every 50 meters and if required additional markers shall be installed where there is possibility of damage or interference.

Pipeline Warning Sign shall in general be installed at

- National and State Highway Crossings (2 Nos.)
- Other Road Crossings (1 No.)
- Railway Crossings (2 Nos.)
- Minor Water Crossings (less than 15m width) (1 No.)
- Minor Water Crossings (above 15m width) (2 Nos.)
- Major Water Crossings (2 Nos.)
- Valve Station (1 No.)
- And at any other location as shown in the approved drawings and as directed by the COMPANY.

Pipeline Warning Sign shall identify the existence of the pipeline

**Aerial markers** shall in general be installed along the pipeline at every kilometer's interval and at places specified by COMPANY. The aerial kilometer marker having the warning details can also be treated as warning marker.

**Kilometer markers** shall in general be installed at every one (1) kilometer interval along the pipeline route and in place of every fifth kilometer marker, aerial marker shall be provided. The Aerial/ Kilometer Markers having the warning details can also be treated as Warning Marker.


**Right-of-Way/ boundary markers** shall be installed at every 250 meters interval along the entire pipeline route. These shall be installed on either side of the pipeline alignment to define the ROW boundary limits. These shall also be installed at pipeline turning points to maintain the continuity of the ROW limits. In urban agglomerates (UAs)/ towns having a population of 1 lakh or more, pipeline route marker shall be installed at least at every 25 meters.

## 9.7.10 DIRECTIONAL MARKERS

Direction markers shall be installed to identify the significant turning points of the pipeline during aerial traverse. One direction marker shall be installed at each turning point. In addition, direction markers shall also be installed along the pipeline alignment at 150 m upstream and downstream of turning points.

## 9.7.11 EXCAVATED MATERIALS

- The excavated material shall be placed in such a way as to avoid any inconvenience to property owners, or interference to the circulation of pedestrians or vehicles as well as to the operation of near-by installations. The excavated material shall be piled up in such a way that they enable the watering of the trees. No excavated material shall be piled up in the road crossings. It may be insisted upon by the authority to remove all the excavated materials immediately after

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 37 of 52	

trenching.

- To prevent the excavated stone and earth from falling into the trench, a strip 20cm shall be left clear between the edge of the trench and the bottom of the pile of excavated earth. This width may be increased, according to the nature of the ground and the atmospheric conditions.
- Wherever necessary, the contractor is required to remove the excavated material from the site and to be kept at a dump yard until the trench is to be back filled and to be brought back to the site for backfilling.
- When the excavated material is judged by the Engineer to be unsuitable for re-use, the Contractor shall remove it from the site as the digging of the trench proceeds and shall supply in its place suitable material approved by the Engineer-In-Charge.
- Contractor is required to arrange the steel plates (preferably 1.5 meters wide x 20mm Thk.) to place on the excavated trench for smooth movement of traffic.

## 9.7.12 **SIGNALLING, FENCING & LIGHTING**


- Each site shall be provided with an identification board mentioning the reason for the work and the names of the Company, the Contractor and the Consulting Engineer, as stipulated in the special specifications.
- At both ends of the trench, the Contractor shall install 2 traffic and warning signs, and Display board one immediately close to the trench and the other ahead, as required by the Engineer-In-Charge.
- The Contractor shall install lights and warning lights around all working areas, in accordance with the special specifications. The voltage shall conform to the safety regulations in force.
- The Contractor shall install barricading and lighting of all trial-holes, trench sections and other excavations.
- The Contractor shall provide watchmen wherever deemed necessary for the safety of the public and of the workers, in particular as regards working sites, on site material stockage, temporary dumping yards, etc.

## 9.7.13 **BARRICADING**

- The contractor shall provide the barricades of size 2m wide X 1.5m high of wooden/plastic/steel with necessary supports along the open trenches to protect/caution the public about the digging work without any cost to owner. The barricades shall be painted as per the requirement of authority with the owner's/Consultants/Contractor's details, job being carried out, cautions, inconvenience captions, etc. also needs to be provided.

## 9.8 **Site Visit**

Bidders are advised to make site visits to familiarize themselves with all the salient features of subsoil, terrain and available infrastructure along the pipeline route. Contractor shall be deemed to have considered all constraints and eventualities on

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 38 of 52	

account of site conditions along pipeline route while formulating his bid. Contractor shall not be eligible for any compensation in terms of cost and/ or time, on account of site conditions along pipeline route varying to any extent from whatever described in the Bid Package and the drawings furnished along with the Package.

## 9.9 **Line Pipes & Coatings**

### 9.9.1 **Taking Over of Pipes**

COMPANY shall supply bare, externally corrosion coated with 3-layer polyethylene coating and internally epoxy coated line pipes. Contractor shall receive and take over the pipes progressively as per construction requirements at designated place of issue in presence of Company's representative. At the time of taking-over, Contractor shall perform inspection of pipes and pipe coating for all defects in the presence of Company's Representative. COMPANY shall be liable for repair defects and damage to pipe coating noticed at the time of taking over. However, installation Contractor shall repair all defects to pipe and pipe coating occurring after taking over including those during transportation and handling. Rebuffing for dents (in bevels) less than 1 mm in depth shall be carried out by Contractor ahead of welding in the field at no extra cost to COMPANY. Contractor shall take-over the entire quantity of bare and coated line pipe from storage yard after completion of installation works. Return of surplus line pipe material to Company's designated storage yard is in installation Contractor's scope including loading, transportation, unloading, handling, stacking of pipes at storage yard and getting the pipes inspected to Company's representative at storage yard.

### 9.9.2 **Repair of Coatings**


CONTRACTOR using suitable material compatible with parent coating system shall carry out any repairs to 3-layer polyethylene coating. The coating repair material and procedure for application shall be submitted to COMPANY for approval prior to start of construction.

## 9.10 **Statutory Permissions**

The COMPANY shall obtain a general permission from the various authorities having jurisdiction over the area as necessary for construction of the pipeline. CONTRACTOR shall obtain the necessary permits like work permit/ excavation permit/ trench opening permit etc. for all works from the authorities having jurisdiction before the actual execution of various phases of the works and all stipulations/ conditions/ recommendations of the said authorities shall be strictly complied with at no extra cost to COMPANY. CONTRACTOR shall also obtain all necessary permissions from the concerned authorities for installation of pipeline at railways, roads, water crossings and at places where blasting is required. COMPANY may, however, assist CONTRACTOR in obtaining such permissions, wherever required, by issuing recommendation letters etc. In case of damage to other utilities/ infrastructure, Contractor shall be responsible and the required compensation as per the directions of concerned authorities/ COMPANY shall be paid by the Contractor. After completion of work, Contractor shall obtain a certificate from the concerned authorities that the job has been completed as per their requirement and the area/ land has been restored to their satisfaction.

## 9.11 **Controlled Blasting's**

In case blasting is required for making of trench for laying pipeline, it shall be

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 39 of 52	

responsibility of the contractor to ensure safety of pipeline while carrying out blasting operations. The controlled blasting procedure shall be subject to approval of Company.

## 9.12 Environmental Restrictions


The following measures shall be adopted during pipeline construction in order to minimize the impact of pipeline construction activities on the environment.

- 9.12.1 While working in plantation areas, Contractor shall take due care to minimize the damage of trees. The number of trees felled shall be restricted to minimum based on working requirement for pipeline installation. In the paddy field area, Contractor shall exercise maximum care not to damage the crop outside the ROU. The compensation of damage of crop outside ROU, if any, shall be to Contractor's account. Damage to any obstruction, temporary/ permanent structure, boundary walls etc. within ROU shall be repaired, restored and shall be to Contractor's account.
- 9.12.2 During ROU clearance, the vegetation shall be cut off at ground level leaving the roots intact to the extent possible. Only stumps and roots directly over the trench shall be removed for pipeline installation.
- 9.12.3 Intake and discharge of water required/ used for line flushing and testing should not cause unacceptable environmental disturbance. During dewatering process, proper drainage arrangement shall be made to discharge the hydro-test water to avoid flooding of the nearby area.
- 9.12.4 As far as possible, the contractor shall ensure that river and stream crossings are done during dry season to avoid disturbance of breeding grounds and soil erosion. The riverbed, embankments and dykes shall be restored adequately after installation of crossings.
- 9.12.5 The contractor shall exercise adequate care while working, in order to avoid damage to forests and wildlife.

## 9.13 Pipeline through Seismic Areas

The requirements specific to safety of pipeline against seismic activity:

- a. Backfill for pipeline trench at locations where the pipeline crosses the faults should be provided with loosely compacted (unit weight  $< 1.8 \text{ t/m}^3$ ) cohesion less soil for a distance of 1 km on both side of such crossings. The angle of friction of cohesion less soil to be used for backfilling should not be more than  $25^\circ$ . In case the dugout soil of the trench is clayey in nature (undrained shear strength greater than  $0.5 \text{ T/m}^2$ ), the local soil shall be replaced by engineered (cohesion less) backfill as mentioned in previous paragraph. Otherwise, the same dugout soil can be used as backfill. The recommended backfill shall be at least 600 mm thick all around the pipeline. Extra digging of trench shall be carried out to provide 600 mm cohesion less soil all around the pipeline.
- b. If the fault crossing zone, the pipeline is in rocky terrain, the following recommendation is made. When the pipeline is to be laid on a rocky terrain, the stones/ boulder/ rock dugout from the trench should be crushed such that maximum size of stone/ boulders is limited to 20 mm. The crushed stone should

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 40 of 52	

be mixed with locally available soil, before using as backfill. Alternatively, 150 mm sand padding shall be provided all around the pipeline before crushed boulders/ stones are placed over the sand padding. In this case the size of boulders can be increased up to 100 mm.


- c. A minimum gap of 100 m shall be maintained between two successive bends of the underground pipeline where the deflection angle is more than 45°. Rerouting shall be carried out in consultation with Company incase minimum gap could not be maintained.

## 9.14 Pipeline Burial

The pipeline shall be buried normally at a depth of 1.2 meter except **river/ rail/ road/ canal/ water crossings/ paddy** fields where cover shall be as given below or as per the requirements of statutory/ local authorities whichever is more stringent. Increased wall thickness (as indicated in alignment sheets) and cover shall be provided at critical locations and at crossings.

The pipeline, in general shall be laid underground with minimum cover as given below.

Sl. No.	Location	Installation Methodology	Minimum Cover (m) (Ref Note)
1.0	Industrial, commercial residential area, Barren area	Open Cut	1.2 (Normal terrain) 1.0 (Rocky terrain)
2.0	Cultivated & agricultural areas	Open Cut	1.2 (Note-2)
3.0	Drainage ditches at roadways and railways	As applicable	1.2
4.0	Minor water crossings/ Unlined - canal/ drain/ nala/ ditches (Below Bed of Crossing)	Open Cut	1.5
		Boring -Cased	
		HDD	2.5
5.0	Lined Canal/drain/nalas (Below Bed of Crossing)	Boring -Cased	1.5
		HDD	2.5
6.0	Major River Crossing (Below Scour Depth)	Open Cut	2.5 (Normal terrain) 1.5 (Rocky strata)


 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 41 of 52	

Sl. No.	Location	Installation Methodology	Minimum Cover (m) (Ref Note)
	(Note 3 & 4)	HDD	2.5
7.0	River with rocky bed (Note-4)	Open Cut	1.5
8.0	Area under influence of tides		1.5
9.0	Road crossings (Cased/uncased)	Open Cut	1.2
		Boring -Cased	1.5
		HDD	4.0 (NH & EH) 2.5 (Other Roads)
10.0	Railway Crossings	(Boring-Cased)	1.7
		(HDD)	7.0
11.0	Parallel Encroachment of Pipeline on Roads & Railways	Open Cut	1.5 (Railway) 1.5 (Road– Soft Strata) 1.2 (Road – Rocky Strata)
12.0	Marshy land, Swamps	Open Cut	1.5
13.0	Pipeline in Station Approach	Open Cut	1.5
14.0	Pipeline in SV Station	Open Cut	1.5
15.0	Areas of Brick Kiln	Open Cut	1.5 (below predicted excavation level or from the current level, whichever is more)
16.0	Seismic Zone	Open Cut	1.5

In case, any private dwelling, industrial building or place of public assembly falls within 15m of pipeline, additional cover of minimum 300 mm shall be provided over and above the cover indicated in the above table. Additional soil covers other than specified above shall be provided at locations indicated by statutory/ local authorities as per agreements between COMPANY and authorities.

### 9.15 Crossings

For all rails, road, canal, river & other water crossings, Contractor shall liaison with relevant authorities and intimate them well in advance about the schedule and methodology of crossing. It shall be obligatory on the part of the laying Contractor to ensure that Authorized Representative of the authority under whose jurisdiction the crossing falls should be made available at site by the Contractor at the time of making

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 42 of 52	



crossing. After completion of works and complete restoration of ROW, Contractor shall provide NOC from the relevant official pertaining to complete restoration to their satisfaction and certification in respect of no other damage caused to their property outside the earmarked ROW.

## 9.15.1 Railway Crossings


**In case of permission by Boring:** Pipeline at railway crossings shall be provided with a casing pipe. The casing pipe shall be three nominal pipe sizes larger than carrier (unless advised otherwise by concerned authorities) and shall be installed by boring/ jacking/ HDD/ ramming. Internal of Casing pipe shall be coated with two- component epoxy coating wherever required by statutory authorities. It should be noted that the extent of casing pipe generally specified by Railways is 14.0 m beyond centerline of the outermost tracks on either side or 0.6 meter beyond the ROU/ROW limits of Railways on either side, whichever is more. Carrier pipe shall be electrically insulated from the casing pipe and casing ends shall be sealed using durable, electrically non-conducting materials. The crossing drawing shall be subject to approval of concerned Railway Authorities prior to implementation. The railway crossing shall comply with the requirements of API 1102 and Indian Railways regulations. The crossing angle shall be as close to 90° as possible. Cover of casing pipe for railway crossings shall be minimum 1.7 m wherever railway track is on embankment. Care shall be taken to isolate the pipeline crossing installation from aerial electrical wires and shall be suitably insulated from underground conduits carrying electrical wires. The casing pipe shall be provided with minimum 50 mm diameter vent pipe. Casing vent pipe shall be at least 1.2 m away vertically from aerial electrical wires and shall be suitably insulated from underground conduits carrying electrical wires on railway land. Casing pipe should be so placed and oriented so as to prevent any leakage inside railway boundary except through the vent pipes. The casing pipes shall be installed with even bearing throughout the length

**In case of permission by HDD:** If railway authority grants permission for crossing of railway by HDD method, pipeline shall be laid at least 7 m below the ground level throughout the railway land width embankment and also at least 7m below formation level in cutting throughout land width.

Further, as per railway Guideline on Pipeline Crossing under Railway track, in case of pipelines carrying gas, Railway operations should be considered equivalent to Location Class 4 for design of carrier pipe thickness. Design factor of 0.4 shall be used for calculating wall thickness of carrier pipes within railway land and up to a distance of risk radius outside the railway boundary (ROU/ROW) on either side.

## 9.15.2 Road Crossings

- i. The method of crossing of roads such as open cut/ trench-less shall be firmed up by CONTRACTOR in consultation with concerned authorities and COMPANY. The CONTRACTOR shall also take due care to identify and take due precautions so as not to disturb or damage the utilities like cables, water lines and other structures.
- ii. After laying the pipeline in a road crossing by open cut method, the CONTRACTOR shall completely restore the road to its original condition.
- iii. While laying the pipeline in road crossings by open cut method the CONTRACTOR

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 43 of 52	



should ensure that the traffic is not stopped during the execution of work. This may be done by cutting half of the road at a time so as to enable the traffic to pass on the remaining half of the road. Alternatively, the CONTRACTOR can provide diversion roads to maintain the flow of traffic. For NH crossings, traffic of both sides shall not be disturbed.


- iv. The CONTRACTOR shall provide proper caution boards during daytime and danger lights during night time when the cutting operation of the road is going on.
- v. For cased crossings, the pipeline should be taken through the casing pipe, the top of which should be at least 1.2 meters below the road top as specified or as per the requirements of the local authorities, whichever is higher. Casing pipe shall extend min. 600 mm beyond Road ROU/ROW on either side. The casing pipe shall be installed by trenchless method like boring/ jacking/ HDD. The casing pipe shall be three nominal pipe sizes larger than carrier pipe. The crossing angle shall be as close to 90° as possible. Casing insulators and end seals shall be provided to ensure electrical isolation of carrier pipe and casing pipe.
- vi. For National Highways/ state highways, crossing shall not be too near the existing structure on the NH maintaining a minimum distance of 15 meters or as specified by Highway Authority.
- vii. The National Highway crust shall be built to the same strength as the existing crust on either side of the trench or to thickness and specification stipulated by Highway Authority. Care shall be taken to avoid the formation of a dip at the trench.

## 9.15.3 Canal/Drain/Minor water Crossings

- i. Canal and other water crossings shall be carried out by open cut/ trench-less technology method. CONTRACTOR shall firm the method of crossing in consultation with concerned authorities and COMPANY.
- ii. HDD method shall be adopted for river/water/ canal crossings that are specifically mentioned in this document or decided at site by Engineer-in- charge. These crossings shall be installed and paid separately as per schedule of rates.
- iii. No damage should be caused to any irrigation sources, while laying the pipeline through canal crossings.
- iv. The flood banks of the River/ Canal should be brought to the original condition, if they are damaged by the laying of the pipeline. Stabilization of banks shall be carried out as per requirements of concerned authorities.
- v. The detailed construction methodology/ plan and time etc. shall have to be finalized by CONTRACTOR in consultation with concerned authorities having jurisdiction over canals/ rivers. COMPANY shall provide assistance by providing introductory letters.

## 9.15.4 Existing Pipeline Crossings

The specific requirements of Owner / operator of existing pipeline shall generally be followed. The minimum clearance between the lines shall be 500 mm below existing pipeline unless specified otherwise.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 44 of 52	

**9.16 Pipeline in Forest Area**

- a.** Contractor shall restrict the pipeline laying activities within the ROU acquired. No additional land in forest area shall be used. Contractor shall clear only the minimum width required for laying of pipeline. Number of trees/ plants felled shall be kept a minimum based on construction requirements. ROU width in forest area is 10 m. or less.
- b.** Full care shall be taken to ensure that no damage is caused to the adjoining forest area while carrying out the work. However, in case of any damage, Contractor shall be liable to pay suitable compensation as per requirements of Forest Department.

**9.17 Installation of Conduits for Optical Fibre Cable at Crossings**

At all crossing locations (viz., rail, road, canal and minor water course crossings) the optical Fibre cable shall be installed inside a HDPE Telecom Duct to be installed by the CONTRACTOR.

At all such crossings where the carrier pipe is installed by open-cut of the facility crossed, HDPE conduit shall be installed along with the pipeline for installation of the Optical Fibre Cable. At river crossings where anti buoyancy measures are provided for the carrier pipe, HDPE conduit shall be placed inside a CS casing pipe and shall be strapped to the mainline at 5m interval using high strength PE straps. Net specific gravity of pipe in empty condition should not be less than 1.2. In any case, OFC conduit shall not be installed in casing of carrier pipe.

**9.18 CATHODIC PROTECTION WORKS**

Temporary Cathodic Protection (TCP) of respective pipeline sections/parts shall be in the scope of the CONTRACTOR. However Permanent Cathodic protection works (PCP) will be carried out by different agency under different contract while the pipeline laying works are going on. For details of Temporary Cathodic Protection works, refer the enclosed **Annexure – I: Temporary Cathodic Protection Works**.


**9.19 HYDROSTATIC TESTING**

**9.19.1 Pipelines**

Hydrostatic testing of mainline shall exclude valves at terminals, SVs and facilities that are to be installed as a part of the scrapper stations. Temporary test headers. shall be provided and the mainline shall be hydrostatically tested between the temporary test headers only. The highest point of the test section shall be subjected to the minimum test pressure as specified below. The minimum hydrostatic test pressure in the pipeline during testing shall be as follows:

**A. 1.5 times Design Pressure**

The maximum hydrostatic pressure shall not however exceed the pressure required to produce hoop stress equal to 95% of SMYS of pipe material based on the minimum wall thickness in the test section. The test duration shall be 24 hrs. Hydro test shall be done with corrosion inhibitor, wherever required. Mainline valves shall be installed

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 45 of 52	

after successful completion of hydrostatic pressure testing. Station piping to be tested hydrostatically for minimum 6 hours at pressure of 1.5 times Design Pressure.

The pipeline string of HDD crossing shall be pre-tested for min. 6 hours and post-installation testing for min. 24 hours at 1.5 times the design pressure.

The pipeline string of 500 m. and above shall be hydro-tested (post- installation) as per mainline hydrotesting procedure.

Control and instrumentation piping, actuators to be tested by Dry air or nitrogen at pressure of 1.1 x MOP (design pressure), test time- soaping time.

Subsequent to separate hydro testing of pipeline and associated facilities, the Contractor shall carry out tie-in/ hook up. Pipes/ prefabricated assembly used for such tie-in shall be pre-tested to a test pressure specified for the pipeline. The Contractor at no extra cost shall provide all materials required for the fabrication of the test headers to Company. After successful completion of hydrostatic testing, the Contractor shall de water the pipeline as per the directions of Engineer-in-charge.

For HDD, Pre-hydrotest, post-hydrotest and pipeline final hydrotest, contractor has to arrange soft water in view of alkalinity/ Salinity in the river water.

## 9.19.2 **Dewatering & Swabbing**

It is envisaged that dewatering and swabbing operations shall be carried out as a part of pre-commissioning activities. Contractor shall take up dewatering of pipeline after hydrostatic testing only when Contractor is ready for swabbing operations. Till such time Contractor is ready to start pre-commissioning activities, the pipeline/ section of pipeline after hydrostatic testing shall be left filled with inhibited water. In case, if contractor proposes to dewater any test section for any reason depending upon site conditions (e.g., using test water for adjoining section due to nonavailability of water), the Contractor shall swab such sections as per applicable requirements of Contract and fill the section with nitrogen at a pressure of 2 bar (g) with residual content of oxygen less than 1% v/v at no extra cost to the company. In no case shall the pipeline be kept empty i.e., without nitrogen filling.


Transfer of test water from one test section to another section may be considered, however dosing additional quantity of corrosion inhibitor shall be done.

Disposal of water (hydro testing) shall be done by Contractor after seeking necessary permission from concerned authority/ land owner so that no liability on this account comes on COMPANY.

## 9.19.3 **Corrosion Inhibitor (Wherever applicable)**

The products to be used for corrosion inhibition of the water used for hydro testing and their dosage shall be as specified in Hydro test specification.

Contractor (not the inhibitor manufacturer) shall get the inhibitor tested for corrosion inhibition and microbiological control efficiency from competent Govt/ PSU Laboratory. The test report shall be submitted to COMPANY for approval prior to undertaking

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 46 of 52	

hydro testing works. The dosage as recommended by COMPANY shall only be adopted. Necessary records for dosing of inhibitor should be maintained by the laying Contractor and such records should be handed over to COMPANY.

#### 9.19.4 **Terminal Facilities**

Piping facilities between the insulating joint and hook up point/ battery limit, sectionalizing valve stations and all above ground facilities installed by Contractor shall be hydrostatically tested to a test pressure equivalent to **1.5 times design pressure** as per "Flushing and Testing of Piping System" enclosed with the Contract document. All valves in the piping network being hydro tested shall be kept in the crack open position. Holding time shall be minimum **six hours**.

#### 9.19.5 **Preservation**

The **positive pressure shall be maintained at 2 bar (g)** in the pipeline during preservation. The necessary arrangements like valves, fittings, manpower etc. shall be kept for maintenance of pressure in the pipeline during idle time.

#### 9.20 **Direction of Construction**

The direction of construction shall be in the direction of flow, unless specified otherwise. In case the contractor proposes to carry out construction in direction opposite to direction of flow, the contractor may do so at no extra time and cost to Company and subject to Company Approval.

#### 9.21 **Leak Detection**

CONTRACTOR shall submit a detailed procedure for leak detection during hydro test. Such method of detection shall consume minimum possible time to complete the hydro test activity within contractual completion schedules. This procedure needs approval of the Engineer-in-charge.


All works for locating and repair of major leak/ burst attributable to COMPANY (occurred during hydrostatic testing) including necessary repairing/ replacing/ cutting and removing out defective pipe length as defined in the specification and shall be payable as per relevant items of schedule of rates.

All works for locating and repair of minor leak attributable to COMPANY (occurred during hydrostatic testing) which require sectionalizing of pipeline shall be payable as per relevant items of schedule of rates.

Contractor shall carry out repairing/ replacing of defective pipe length including cutting and removing of defective pipes, pre testing of replacement pipe for 24 hours and welding into main line, NDT of the welds, coating of the weld joints, clean up, re-testing of pipeline including providing all equipment's, manpower & consumables.

#### 9.22 **Magnetic Cleaning, Caliper Pigging**

The individual contractor shall carry out magnetic cleaning and caliper pigging of the pipeline system being installed by him. Contractor shall engage a specialized agency that have previously carried out such operations (magnetic cleaning and caliper

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 47 of 52	

pigging) and shall develop procedures, supervise and monitor the entire operations, coordinate with other Contractor(s) as required. Rectification of defects observed during caliper pig run, shall be carried out by individual section/part contractor including digging, cutting, replacement, repair, welding, NDT etc.

## 9.23 **Pre-Commissioning and Commissioning assistance of Pipeline**

Pipeline Contractor shall be responsible for pre-commissioning and commissioning assistance of the pipeline system being installed by him. The above shall include P&ID checks (with respect to requirement of design/ operation/ safety and interlocks of latest revision of P&IDs), flushing, tightness test, de-watering, as required and supply of consumables required during pre-commissioning and commissioning assistance. Contractor shall supply manpower, materials, equipment including consumables along with necessary piping and instrumentation connections for monitoring flow rate, pressure, temperature etc. temporary venting along with necessary piping, valves and instrumentation as well as consumables.

## 9.24 **Commissioning**

Contractors shall mobilize all equipment, consumables and manpower for carrying out pigging, drying, inertization and commissioning activities.

Whenever required, contractors shall provide commissioning assistance to other section/part contractor.

Contractors shall engage a specialized team/ agency who have previously carried out such operations and shall develop procedures, supervise and monitor the entire operations, coordinate with other Contractor(s) as required till the time commissioning operations are completed. Contractor shall mobilize all equipment, materials, consumables including pigs, nitrogen and manpower etc. for commissioning activities. All necessary piping connection as required shall be carried out.


Commissioning activities shall be carried out as per applicable specifications enclosed with Contract.

## 9.25 **Priorities**

COMPANY may, at its sole option, assign priority of construction to any part of the total pipeline or terminal works. Contractor shall comply with such priority of execution without any time and cost implication to the COMPANY.

## 9.26 **Terminal Piping Works**

The construction work shall be carried out based on Issued for Construction (IFC) drawings issued to Contractor at the time of construction. The final IFC drawings issued during execution stage may vary to some extent from the drawings included in the Bid Package. CONTRACTOR shall carry out all works in accordance with the IFC drawings and reference specifications/ documents with the Contract at no extra cost to the COMPANY.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 48 of 52	

The piping fabrication, erection, welding, flushing and hydro testing and painting works shall be carried out as per standard piping specifications enclosed with Contract. The hydro test duration shall be minimum 6 hours.

## 9.27 **Working in Areas of Existing Facilities**

For pipeline installation work within existing terminal facilities which are under operation, Contractor shall obtain all necessary permissions for working in/ around the facility including hot work permit as applicable and shall be fully responsible for the safety of the existing facilities/ areas during all phases of work and shall fully abide by and comply with the restrictions and conditions of COMPANY/ concerned authorities imposed on Contractor from time to time. Providing all safety appliances, gas detectors required during execution of the work, arranging of adequate firefighting equipment viz. fire brigade, fire extinguisher, shielding from existing facilities, oxygen mask etc. for carrying out the work safely to the satisfaction of COMPANY shall be done by the Contractor.

Contractor may be permitted to work for limited hours in such places. For working on Sundays/ Holidays, the required permission may be obtained well in advance. During any emergency, work shall be suspended till further permission is obtained by Contractor. Idle period in case of interruption shall not be compensated to Contractor.

The structure/ electric poles/ telegraph poles existing in the vicinity of proposed pipeline shall be properly taken care so that the stability of structure is not affected during construction.

## 9.28 **Contractor Responsibilities**


Appraisal and taking cognizance of site-conditions, pipeline route, Central Government/state Govt. rules and regulations/ bye-laws, applicable Indian Standards and Codes, authorities having jurisdiction over the work site(s), environmental and pollution rules and regulations including conditions/ stipulations laid down by the concerned authorities etc. The CONTRACTOR is deemed to have recognized any restrictive features and constraints of the site(s), pipeline route and/ or specific requirements of the work and made due allowance for it in the work to be performed by him. Furnishing and mobilizing at site(s) of all construction equipment, manpower, tools and tackles, construction fronts, fully equipped and fully manned with other required support facilities etc.

An onsite – offsite emergency plan shall be prepared and submitted to Disaster Management Authorities under intimation to respective state authorities.

## 9.29 **Technical Requirements**

The technical requirements for the pipeline laying as well as terminal works as defined herein shall be read in conjunction with Schedule of Rates, specifications, standards, drawings and other applicable documents enclosed with the Bid document. All piping/pipeline works shall be carried out as per following:

**a)** Piping and Instrumentation Diagram (P&IDs) and line schedule.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 49 of 52	



- b)** Approved for construction Piping General Arrangement Drawing (GADs).
- c)** Approved for construction Alignment sheets/crossing drawings.
- d)** Piping Material Specifications.
- e)** Specifications.
- f)** Piping support standards/drawings and support index.

## **10.0 AS BUILT DOCUMENTS**


Contractor shall prepare all documents as per the requirements indicated in Specification for Documentation for Pipeline Construction enclosed with the Contract document. In addition to the hard copy, three copies of final documents shall also be submitted in electronic media i.e., CD ROM/ DVD ROM diskettes and USB drive. Software used for the presentation of these documents shall be as follows: Type of document Software

- a) Reports MS Office (Word / Excel)
- b) Drawings AutoCAD

For the purpose of preparation of as-built drawings, Contractor shall update the "Issued for Construction" drawings provided by the Company. For drawings where electronic copies are available for IFC drawings, Contractor shall provide as built drawings in electronic form as well as in hard copies. Where only hard copies are available for IFC drawings, Contractor shall prepare and submit as built drawings in hard copies.

## **11.0 DOCUMENTS TO BE SUBMITTED AT TIME OF BIDDING**

No technical documents are required to be submitted at the time of bidding. Bidder is advised to comply with all requirements of Bid document without any deviation. Company reserves the right to reject any bid with deviation without making any reference to the Bidder.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 50 of 52	



**12.0 DOCUMENTS, SPECIFICATION, STANDARDS AND DRAWINGS AND ADDITIONAL CLAUSE**


- 12.1 Owner shall furnish piping and Instrumentation diagrams (P & I D), preliminary plot plan along with the tender. Owner shall also supply design & engineering drawings and construction drawings including general arrangement drawings for piping, mechanical & instrumentation systems and other related/ required systems, at appropriate times and as requisitioned by contractor in his time schedule.
- 12.2 Contractor shall prepare isometric drawings & bill of materials and submit the same for Owner/ Consultant's approval/ record. Contractor shall prepare drawing for utilities line as required as per SOR and submit the same for Owner/ Consultant's approval/ record.
- 12.3 No construction small or big shall be carried out without proper construction drawings duly approved by Owner's Engineers at Delhi or site office or Owner's representative duly authorized to do so. For Mainline, route survey alignment sheets and crossing survey details shall be furnished along with bid by Owner. However, detail-crossing drawings with crossing methodology shall be submitted by Contractor for prior approval. Any additional survey and data required to complete above should be done by Contractor without any extra cost.
- 12.4 After completion of construction & commissioning of Terminal, Contractor shall incorporate all the correction in drawings, prepare and issue the drawings "As-built drawings" as listed below to Owner as final submission of drawings. For Mainline pipeline alignment sheet, all X-ing details, all CP drawings, pipe book etc. and for Terminals P&ID, layout drg., piping GAD, Isometric, all electrical & instrumentation drg, all civil drawings. For final submission only 4 sets of documents plus the original transparencies shall be handed over by Contractor. Any construction done by Contractor without duly approved drawings shall be wholly at his risk and cost. Contractor shall also submit soft copy of pipe book in excel along with hard copy. Soft copy of all as-built drawings shall be also submitted in AutoCAD. Videography/ photograph of all major activities/ milestone achieved shall also be arranged and submitted by the Contractor. For details of documentation to be submitted for mainline and terminal refer enclosed specification for documentation for Standard Specification for pipeline construction No. VPC-SS-PP-2001 enclosed elsewhere with the tender.

**12.5 Specifications**

The work shall be carried out by CONTRACTOR strictly in accordance with the specifications enclosed in **Volumes II & III** of this document.

**12.6 ADDITIONAL CLAUSES**

- 12.6.1 Contractor to note that the minimum requirements of inspection and testing of the bought-out items shall be governed by attached QAP with the tender document. However, contractor shall submit their QAP in line with the requirement specified in attached QAP for Owner's/ PMC's approval.
- 12.6.2 Contractor to note that all the documents/drawings submitted by them as a part of bid shall be considered only to assess Bidder's technical capability and shall in no way absolve them from complying with all the requirements of the Tender. All works to be performed by the Bidder shall be strictly in accordance with tender conditions.
- 12.6.3 Contractor shall submit duly signed & stamped hard copies of all required documents/ drawings/ data sheets etc to VCS for their review & approval as per terms & condition of tender documents. The date of receipt of these documents/ drawings/ data sheets etc at VCS shall be deemed as the date of submission. If any documents/ drawings/ data sheets etc require re-submission due to any error/ deficiency noticed during review/

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 51 of 52	

approval stage, in that event the additional time required by the contractor to get the revised document/ drawing reviewed/approved by VCS shall be solely to contractor's account and in no case, contractor shall be entitled for any time or cost benefit.

12.6.4 The drawings/documents/ data sheets etc shall be reviewed, checked, approved and duly signed/stamped by successful contractor before submission. Revision number shall be changed and revisions shall be highlighted by clouds during submission of revised documents/drawings/data sheets by the successful contractor. Whenever the successful contractor require any sub-supplier drawings to be reviewed/approved by VCS, the same shall be submitted by the contractor after review/ approval and stamped by the Contractor. Direct submission of the sub-supplier's drawings/documents/data sheets etc without contractor's approval shall not be entertained.


12.6.5 Review/Approval of the contractor's submitted drawings/ documents/ data sheets etc by VCS would be only to review the compatibility with basic design and concepts including mainline work procedure and in no way absolve the successful contractor of his responsibility/contractual obligation to comply with tender requirements, applicable codes, specifications and statutory rules/regulations. Any error/deficiency noticed during any stage of manufacturing/execution/installation shall be promptly corrected by the contractor without any extra cost or time, whether or not comments on the same were received from VCS during the drawing review stage.

12.6.6 Contractor shall make & maintain their own suitable sized Storage yard/ area (covered as well as open space) to store Free Issue Materials (FIM) in proper manner. Contractor shall also maintain the FIM in good condition during entire storage period by using all type of servicing/overhauling such as cleaning, greasing, protecting from rusting/ pitting etc.

Storage Yard/ Area shall have proper motorable approach, adequate indoor & outdoor area lighting, potable & service water, proper rack & wooden sleeper etc. for staking/ storing the material, availability of material handling equipment of adequate capacity etc.

Owner/PMC's Site In-charge shall visit & inspect the Contractor's Storage Yard/ Area and upon his concurrence only, the FIM shall be stored by the Contractor at the particular Storage Yard/ Area. Delay in issuance of FIM due to non-acceptance of Contractor's Storage Yard/(i.e mainly because of non-compliance of the minimum condition as mentioned above for Storage Yard/ Area) shall not be attributable to Owner/PMC.

12.6.7 During construction, Owner / PMC, on their discretion, have reserve right to take samples for any bought-out item received at site and test the same in a NABL approved or equivalent laboratory even if the lot has already been inspected and cleared by PMC / Owner for use in construction. The cost for such testing shall be borne by the Contractor. In case of failure of the samples, the lot shall be rejected and the same shall be replaced by the Contractor without any additional cost to Owner.

 ENERGISING QUALITY	<b>SCOPE OF WORK (SOW) FOR (PIPELINE LAYING &amp; PIPING WORKS FOR PART D1 &amp; D2)</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-SOW-2002	C1
		Page 52 of 52	



**PROJECT NUMBER: C221052**



**Pipeline & Piping Design Basis**

Total Sheets

54

**Document No.**

C221052

00

PP

DB

2001

# **INDRADHANUSH GAS GRID LIMITED**

## **NORTH EAST GAS GRID PHASE-III OF IGGL**

D1	12.05.2022	Issued for Engineering	CL	MC	HK
C1	30.03.2022	Issued for Client Review	SR	MC	HK
<b>REV</b>	<b>DATE</b>	<b>DESCRIPTION</b>	<b>PREP</b>	<b>CHKD</b>	<b>APPR</b>

## ABBREVIATION

ASME	American Society of Mechanical Engineers
BS	British Standards
API	American Petroleum Institute
ASTM	American Society for Testing & Materials
OISD	Oil Industry Safety Directorate
HDD	Horizontal Direction Drilling
NDT	Non-Destructive Testing
DFT	Dry Film Thickness
NB	Nominal Bore
HFW	High Frequency Welded
ROU	Right of Use
ROW	Right of Way
PNGRB	Petroleum & Natural Gas Regulatory Board
IGGL	Indradhanush Gas Grid Limited

## CONTENTS

1.	DEFINITION .....	4
2.	INTRODUCTION .....	4
3.	PROJECT BRIEF .....	4
4.	SCOPE .....	5
5.	DESIGN CODES AND STANDARDS.....	6
6.	DESCRIPTION & LOCATION OF FACILITIES .....	10
6.1	DIMAPUR-KOHIMA-IMPHAL PIPELINE SECTION .....	10
	PIPELINE SCHEMATIC (DIMAPUR-KOHIMA-IMPHAL PIPELINE SECTION).....	12
6.2	SILIGURI-GANGTOK PIPELINE SECTION .....	13
	PIPELINE SCHEMATIC (SILIGURI-GANGTOK PIPELINE SECTION).....	15
7.	PIPELINE ROUTE DETAILS: .....	16
8.	DESIGN DATA .....	17
9.	PIPELINE DESIGN .....	20
10.	PRE-COMMISSIONING AND COMMISSIONING .....	44
11.	GENERAL.....	44
12.	PIPING DESIGN BASIS .....	45
12.1	GENERAL.....	45
12.3	PIPES.....	46
12.4	FITTINGS .....	47
12.5	FLANGES .....	47
12.6	GASKET AND BOLTS .....	47
12.7	VALVES .....	47
12.8	VENTS AND DRAINS .....	49
12.9	SITE AND ENVIRONMENTAL DATA.....	49
12.10	BATTERY LIMITS.....	49
12.11	PIPING LAYOUT DESIGN GUIDES .....	49
13.	GUIDELINES-PREPARATION OF PIPING DRAWINGS .....	53
14.	PROCESS .....	53
15.	ELECTRICAL .....	54
16.	INSTRUMENTATION & TELECOMMUNICATION.....	54
17.	CIVIL .....	54
18.	QUALITY CONTROL .....	54

## 1. DEFINITION

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

PROJECT	PMC Services for North East Gas Grid Phase-III OF IGGL.
CLIENT/OWNER	Indradhanush Gas Grid Limited (IGGL)
CONSULTANT	VCS Quality Services Private Limited (VCSQSPL) the party to act for and on behalf of the OWNER for the Engineering Services
VENDOR / MANUFACTURER	Party, which manufactures and supplies equipment and services to the OWNER or to CONTRACTOR

## 2. INTRODUCTION

VCS Quality Services Pvt. Ltd. (VCS) has been appointed as a PMC (Project Management Consultant) by IGGL for **"PMC Services for North East Gas Grid Phase-III of IGGL."**

Indradhanush Gas Grid Limited (IGGL), a joint venture (JV) of IOCL, ONGC, GAIL, OIL and NRL has been entrusted with the responsibility to execute cross country natural gas pipeline connecting all states of the North East and Sikkim. The natural gas pipeline grid in North East would connect Guwahati to capital cities / major cities of North East states like Itanagar, Dimapur, Kohima, Imphal, Aizawl, Agartala, Shillong, Silchar, Gangtok and Numaligarh. The grid would be connected with upcoming Barauni-Guwahati natural gas pipeline as a part of Urja- Ganga scheme. The grid would also connect to sustainable and viable indigenous gas sources in North-East.

The pipeline grid has been designed with flexibility for gas injection in either direction

## 3. PROJECT BRIEF

Salient details of the tentative pipeline sections under VCS's scope of work are as under:

### A) Siliguri – Gangtok Pipeline (dia. 12") – tentative length is 186 Kms.

The pipeline in this section originates from a tap off point on Barauni-Guwahati pipeline at Siliguri and traverses through plain agricultural land and forest land for initial 50 odd kilometers which includes the crossing of Teesta River. Thereafter, the pipeline traverses through hilly terrain along the new highway under construction up to Lava, which is approximately at Ch.108.000 km of this pipeline section and thereafter follows the route of NH-717A up to near Ranipool area. The total area traversed by this pipeline section thus comes out to be approximately 186 km.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	Document No.	Rev
		C221052-00-PP-DB-2001	D1
		Page 4 of 54	

## B) Dimapur – Kohima-Imphal Pipeline (dia. 12”) – tentative length is 199 Kms

The proposed pipeline route traverses through plain agricultural land and forest land for initial 5 odd kilometers and then enters the ghats/hilly terrain and traverses through it till Senapati town which is approximately at Ch.155.000 km of this pipeline section (en route taking the under-construction Kohima Bypass Road) and then runs through more or less plain area till Sekmai. The total area traversed by this pipeline section thus comes out to be approximately 199 km.

Summary of various stations envisaged in the proposed Phase-III of Gas Grid Development of Natural Gas Pipeline in North-East are as under

### **SILIGURI – GANGTOK PIPELINE (SGPL)**

Sr. No	Type of Station	Nos.	Location
1	Dispatch Terminal (DT / SGPL)	1	Siliguri ( West Bengal)
2	Intermediate Pigging Station (IP/SGPL/01)	1	Tentatively at Lava ( West Bengal)
3	Receipt Terminal (RT/SGPL) with/ without Tap off	1	Gangtok (Sikkim)
4	Sectionalizing Valves (SV/SGPL/01 to SV/SGPL/08) with Tap off	8	Along the Siliguri-Gangtok route

### **DIMAPUR – KOHIMA- IMPHAL PIPELINE (DIPL)**

Sr. No	Type of Station	Nos.	Location
1	Dispatch Terminal (DT/DIPL)	1	Dimapur ( Nagaland)
2	Intermediate Pigging Station (IP/DIPL/01))	1	Tentatively at Tadubi ( Manipur)
3	Receipt Terminal (RT/DIPL) with Tap off	1	Sekmai, Imphal (Manipur)
4	Sectionalizing Valves (SV/DIPL/01 to SV/DIPL/10) with Tap off	10	Along the Dimapur-Kohima-Imphal route

## 4. SCOPE

This document covers the guidelines for basic design & detailed engineering of 12” Diameter Natural gas Pipeline and associated facilities for **Dimapur-Kohima-Imphal**



and **Siliguri-Gangtok Pipeline Section** covered under this project as defined briefly herein below.

This document alone shall not form basis for engineering by the contractor. Contractor shall carryout engineering activities based on other documents enclosed with the bid package.

Pipeline from Dimapur Dispatch/IP Station to Imphal (Receipt Station) and its associated facilities designed as per ASME B31.8 and Pipeline from Siliguri Dispatch Station to Gangtok (Receipt Station) and its associated facilities designed as per ASME B31.8

In addition to requirement stipulated in ASME B 31.8, this document shall refer to requirements stated in OISD 226, and PNGRB T4S (Aa applicable for Natural gas) for Pipeline for followings.

- Piggable 12" pipeline from dispatch/IP station at Dimapur (Nagaland) to Receipt terminal at IOCL Bottling Plant in Imphal (Manipur), Pipeline length 199 Km approx.
- Piggable 12" pipeline from dispatch station at Siliguri (West Bengal) to Receipt terminal at Ranipool (Gangtok, Sikkim) Pipeline length 186 Km approx.
- Addition of new equipment i.e., Pig Launcher, CP Station, Facility or provision Check Metering, Pressure reduction (if required) at proposed Dispatch Station and addition of Pig receiving arrangement, SCADA & Management Information System (MIS) for leak detection,
- Hook up with existing facilities and Associated piping, instrumentation, telecom, civil and structural work at Dispatch and Receipt terminal.

## 5. DESIGN CODES AND STANDARDS

The Basic Laws, Codes, Rules and Standards that are mandatory by law in India shall be applied. Pipelines and associated facilities envisaged shall be designed and engineered primarily in accordance with the provisions of latest edition of Code ASME B 31.8, PNGRB (Technical Standards & Specifications including Safety Standards for Natural Gas Pipelines) Regulations, 2009 (T4S) and its Amendments till date and OISD 226. Due attention shall also be paid to, but not limited to, Laws, Codes & Rules as mandatory under the legislation of India.

In addition to codes and standard mentioned above, the latest edition of below listed codes and standard shall also be used for design of pipelines & facilities. The listing including but not limited to followings:

ASME STANDARDS	
ASME B 31.3	Process Piping
ASME B16.34	Valves- flanged, threaded and butt-welding end

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	Document No.	Rev
		C221052-00-PP-DB-2001	D1
		Page 6 of 54	

ASME B16.25	Butt welding ends
ASME B16.5	Pipe flanges and flanged fittings
ASME B16.9	Factory-made wrought steel butt welding fittings
ASME B16.10	Face to face and end to end dimensions of valves
ASME B16.11	Forge Fitting socket Welding and Threading
ASME B16.20	Metallic Gaskets for Pipe Flanges-Ring-Joint, Spiral-Would, and Jacketed
ASME B16.49	Factory-Made, Wrought steel, Butt welding induction bend for Transportation and distribution systems
ASME B36.10	Welded and seamless wrought steel pipe
<b>OISD STANDARDS</b>	
OISD STD -114	Hazardous chemical and their handling
OISD STD -115	Guidelines on Fire Fighting, Equipment and Appliances in Petroleum Industry
OISD STD-117	Fire Protection facilities for Petroleum Depots, terminals, Pipeline Installation and Lube oil Installations
OISD STD -130	Inspection of Pipes valves and Fittings
OISD STD-138	Inspection of Cross-Country Pipelines-Onshore
OISD STD-188	Corrosion Monitoring of offshore and Onshore Pipelines
OISD STD-226	Natural Gas Transmission Pipelines and City Gas Distribution Networks
<b>PNGRB</b>	
PNGRBT4S	Petroleum & Natural Gas Regulatory Board
<b>API STANDARDS</b>	
API 5L	Specification for Line Pipe
API RP 1102	Steel Pipelines Crossings Railroads and Highways
API 1104	Standard for Welding of Pipelines and Related Facilities
API RP 5L1	Recommended Practice for Transportation of Line Pipe by Road and railways
API RP 5LW	Recommended Practice for Transportation of Line Pipe on Barges and marine vessels

API RP 1110	Recommended Practice for the Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids, or Carbon Dioxide
API 6D	Specification for valves
API 6FA	Specification for fire test for valves
API 6H	Specification for end closures, connectors and swivels.
API 607	Fire test for soft-seated quarter turn valves
<b>DN/EN STANDARDS</b>	
EN 10204	Metallic products: types of inspection documents
DIN 30670	Polyethylene coatings for steel pipes and fittings
<b>ASTM STANDARDS</b>	
ASTM A 53	Pipe, steel, black and hot-dipped zinc coated welded and seamless
ASTM A 105/A 105 M	Carbon steel Forgings for piping components
ASTM A 106	Seamless carbon steel pipe for high temperature service
ASTM A 193/A 193 M	Alloy steel and stainless-steel bolting materials for high temperature
ASTM A 194/A 194 M	Carbon and alloy steel nuts for bolts for high temperature service
ASTM A 234/A 234 M	Piping, fittings of wrought carbon steel and alloy steel for moderate and elevated temperatures
ASTM A 320/A 320 M	Alloy steel bolting materials for low temperature service
ASTM A 333/A333 M	Seamless and welded steel pipe for low temperature. Service
ASTM A 350/A 350 M	Forgings, carbon and low alloy steel, requiring notch toughness testing for piping components
ASTM A 352/A 352 M	Steel casting, Ferritic and Martensitic, for pressure containing parts,
ASTM A 370	Mechanical testing of steel products
ASTM A 381	Metal-arc-welded steel pipe for use with high-pressure transmission

ASTM A 420/A 420 M	Piping fittings of wrought carbon steel and alloy steel for low temperature service
ASTM A 694/A 694 M	Forgings, carbon and alloy steel, for pipe flanges, fittings, valves and parts for high-pressure transmission service
ASTM A 707/A 707 M	Flanges, forged, carbon and alloy steel for low temperature service
ASTM E 112	Standard methods for determining the average grain size
ASTM A 487	Steel castings for suitable pressure service
<b>ASME Boiler and Pressure Vessel Codes</b>	
Section-II, Part-A	Ferrous Material Specification
Section-II, Part-C	Specification for Welding Rods, Electrodes and Filler metals.
Section-V	Non-Destructive Examination
Section-VIII Div -1	Boiler & Pressure vessel Code
Section-IX	Qualification Procedure for Welding & Brazing Procedures, Welders, Brazers and Welding Operations
<b>MSS SP -Manufacturers Standardization Society of the valves and Fitting Industry</b>	
MSS SP-6	Standard Finishes for Contact Faces of Pipes Flanges and Connecting End Flanges of Valves and Fittings
MSS SP-44	Steel Pipeline Flanges
MSS SP-75	Specification for High test Wrought Butt Welding Fittings
MSS SP-97	Integrally Reinforcement Forged Branch outlet fittings -Socket Welding Threaded and Butt-welding ends
<b>NFPA STANDARDS</b>	
NFPA 58	Liquefied Petroleum Gas Code
NFPA 12	Standards on Carbon Dioxide Extinguishing System
<b>OTHERS</b>	
Petroleum Rules	Chapter III, Transport of Petroleum Chapter V, Transport by Pipelines

BS-105 & it's Amendment	Guidelines on Pipeline Crossings Under Railway Track
-------------------------	--

In case of conflict between the requirements of ASME B 31.8/ OISD-226/ PNGRB and other codes/ Standards referred above, requirement of ASME B 31.8/ / PNGRB shall govern. In case of conflict between requirements of ASME B 31.8/ OISD-226/PNGRB and this document, the most stringent requirements shall govern.

## **6. DESCRIPTION & LOCATION OF FACILITIES**

### **6.1 Dimapur-Kohima-Imphal Pipeline Section**

Pipeline of 12" km to be laid along with the facilities required inside Dispatch Station (Dimapur), Intermediate Pigging Station (IPS), SV stations & Receipt terminal (Bottling Plant, Manipur) under this project shall consist of broadly the following.

#### **1) Dispatch Terminal at Dimapur (Nagaland)**

- Permanent Pig Launcher Facility, all kinds of Pigging including intelligent pigging. The Dimapur Plot shall be an Intermediate Pigging Station (IPS, it has a pig receiver (By other) for Jorhat-Dimapur Pipeline (by others)
- Facility or provision for Metering, Gas Over Oil Actuated valves (GOOV)
- CP station.
- Hook up with existing or Proposed system.
- Associated Piping, Valves, Fitting, Cold Blow Down System, Instrumentation, telecom, civil and structural works.

#### **2) Pipeline**

- 12" X 199 Km approx. mainline (API 5L X-70, PSL2) for transportation of Natural gas, originate from Dispatch Station (Dimapur, Nagaland) & Terminate at Imphal Receipt Station (Manipur)
- 1 no's of Optical Fiber Cable for 12" Pipeline shall be placed inside 1 no's of 40 mm dedicated PLB-HDPE duct and shall be laid along with the Pipeline along the entire route from Dispatch Station to Receipt Station.

#### **3) Intermediate Pigging Station (IPS) at Tadubi, Manipur**

- Permanent Pig Receiver Facility, all kinds of Pigging including intelligent pigging for Dimapur to IPS pipeline section.
- Permanent Pig Launcher Facility, all kinds of Pigging including intelligent pigging for IPS to Bottling Plant (Manipur) pipeline section.
- SCADA terminal & Management Information System (MIS) for leak detection.
- Check Metering facilities.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 10 of 54	

- Associated Piping, Valves, Fitting, Cold Blow Down System, Instrumentation, telecom, civil and structural works.

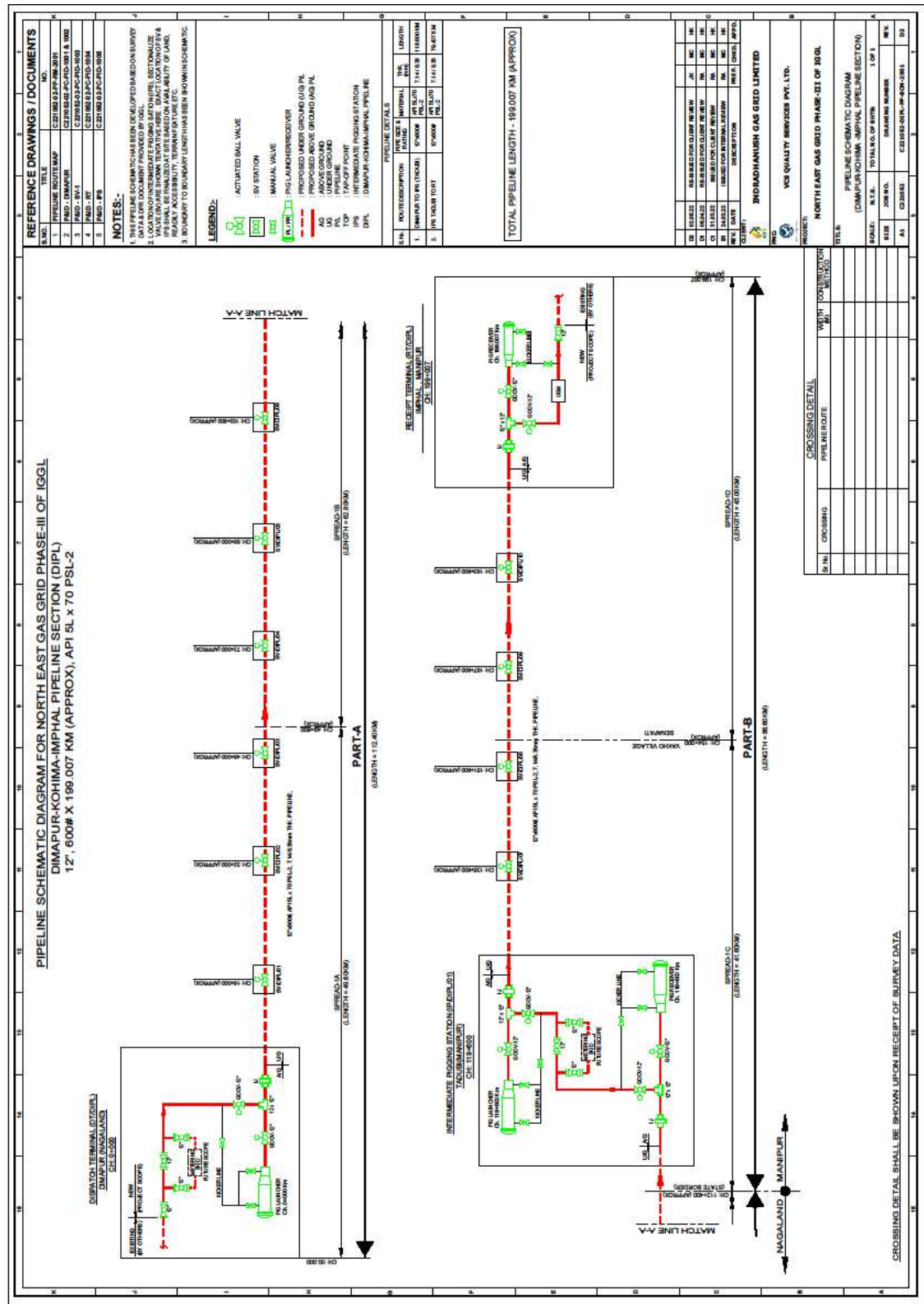
**4) Receipt station at Imphal (Manipur)**

- Permanent Pig Receiver Facility, all kinds of Pigging including intelligent pigging.
- SCADA terminal & Management Information System (MIS) for leak detection.
- Check Metering facilities.
- Hook up with existing system.
- Associated Piping, Valves, Fitting, Cold Blow Down System, Instrumentation, telecom, civil and structural works.

**5) Sectionalize valve station along the Pipeline Route**

- Sectionalize valve along with Associated Piping, Valves, Fitting, Cold Blow Down System, Instrumentation, telecom, civil and structural works. There will be 10 no's of SV proposed along the pipeline route

### Pipeline Schematic (Dimapur-Kohima-Imphal Pipeline Section)





## **6.2 Siliguri-Gangtok Pipeline Section**

Pipeline of 12" km to be laid along with the facilities required inside Dispatch Station (Siliguri, West Bengal), Intermediate Pigging Station (IPS), SV stations & Receipt terminal (Ranipool, Gangtok-Sikkim) under this project shall consist of broadly the following.

### **1) Dispatch Terminal at Siliguri (West Bengal) (1 Nos)**

- Permanent Pig Launcher Facility, all kinds of Pigging including intelligent pigging.
- Facility or provision for Check Metering, Gas Over Oil Actuated valves (GOOV)
- CP station.
- Hook up with existing or Proposed system.
- Associated Piping, Valves, Fitting, Cold Blow Down System, Instrumentation, telecom, civil and structural works.

### **2) Pipeline**

- 12" X 186 Km approx. mainline (API 5L X-70, PSL2) for transportation of Natural gas, originate from Dispatch Station (Siliguri, West Bengal) & terminate at Receipt Station (Ranipool, Gangtok-Sikkim). The proposed pipeline shall be tap-off from Barauni-Guwahati Pipeline (BGPL)
- 1 no's of Optical Fiber Cable for 12" Pipeline shall be placed inside 1 no's of 40 mm dedicated PLB-HDPE duct and shall be laid along with the Pipeline along the entire route from Dispatch Station to Receipt Station.

### **3) Intermediate Pigging Station (IPS) at Lava.**

- Permanent Pig Receiver Facility, all kinds of Pigging including intelligent pigging for Siliguri to IPS pipeline section.
- Permanent Pig Launcher Facility, all kinds of Pigging including intelligent pigging for IPS to Receipt station (Gangtok) pipeline section.
- SCADA terminal & Management Information System (MIS) for leak detection.
- Check Metering facilities.
- Associated Piping, Valves, Fitting, Cold Blow Down System, Instrumentation, telecom, civil and structural works.

### **4) Receipt station at Ranipool (Gangtok, Sikkim)**

- Permanent Pig Receiver Facility, all kinds of Pigging including intelligent pigging.
- SCADA terminal & Management Information System (MIS) for leak detection.

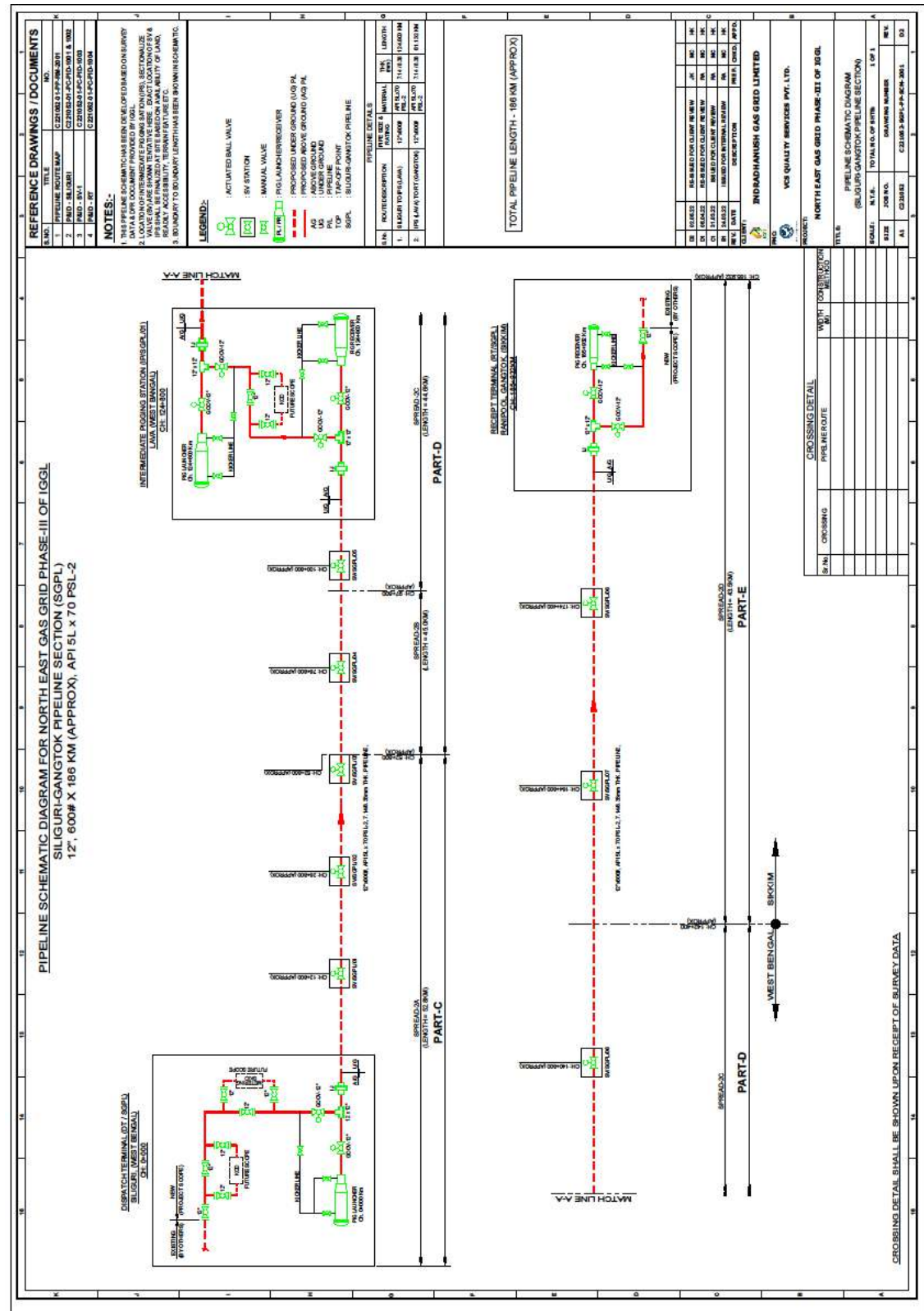
 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 13 of 54	

- Check Metering facilities.
- Hook up with existing system.
- Associated Piping, Valves, Fitting, Cold Blow Down System, Instrumentation, telecom, civil and structural works.

## 5) Sectionalize valve station along the Pipeline Route

- Sectionalize valve along with Associated Piping, Valves, Fitting, Cold Blow Down System, Instrumentation, telecom, civil and structural works. There will be 8 no's of SV along the pipeline route.

## Pipeline Schematic (Siliguri-Gangtok Pipeline Section)



## 7. PIPELINE ROUTE DETAILS:

Both of the proposed 12" pipelines originate from Station and terminate at Receipt Station as described above.

Salient features of the surveyed pipeline route as per pipeline schematic (Doc no. C221052-01-PL-SCM-2001 & C221052-02-PL-SCM-2001).

### 7.1 Pipeline Route Crossing Detail

SALIENT FEATURES OF THE PIPELINE ROUTE		
Description	Dimapur-Kohima-Imphal Pipeline Section	Siliguri-Gangtok Pipeline Section
Size, OD (inch)/(mm)	12" (323.8)	12" (323.8)
Length (km) Approx.	199 Km	186 Km
National Highway (Nos)	Note-1	119 nos
State Highway (Nos)	Note-1	Nil
River (Nos)	Note-1	11 nos.
Railway's crossings (Nos)	Note-1	4 nos
Nala (Nos)	Note-1	Note-1
Canal (Nos)		3
Drain (Nos)	Note-1	71 nos
Field Channel	Note-1	Note-1
Minor Roads (Nos)	Note-1	148
U/G Pipeline (Nos.)	Note-1	Note-1
Power Line Crossing	Note-1	2 nos
Seismic Fault Line	Note-1	Note-1
Forest	Note-1	Note-1

SALIENT FEATURES OF THE PIPELINE ROUTE		
Description	Dimapur-Kohima-Imphal Pipeline Section	Siliguri-Gangtok Pipeline Section
Wildlife Sanctuary	Note-1	Note-1

Note-1: Crossing detail will be updated upon receipt of survey data from Surveyor. For detail Survey Report shall be referred.

## 7.2 Route

### 7.2.1 Dimapur-Kohima-Imphal Pipeline Section

The proposed route traverses through plain area for approximately 5 km. After that hilly terrain is encountered. The hills are of folding/ rolling type with steep slopes of more than 75° angle and deep gorges in between. It is not feasible to lay cross-country pipeline across such hilly terrain. The only feasible route is to lay the pipeline in the corridor of NH-39. Along one side of the highway, there are high rise hill ranges and deep valleys on the other side. There is very little space between road and hill range on one side and also between road and valley/gorge on the other side. Gradient of the highway is observed within 8° throughout the length. Highway widening/ 4 laning work is going on in this section. NHIDCL has planned to construct alternate road for bypassing Kohima city. The alternate route for bypassing Kohima city has been taken into consideration of Pipeline route. The length of this alternate route is approximate 44km.

The pipeline can be laid under the shoulder of the highway on Valley side after its widening on hill side for which permission will have to be obtained from National Highway Infrastructure Development Corporation Limited (NHIDCL).

The Approximate Length of pipeline is 199km

### 7.2.2 Siliguri-Gangtok Pipeline Section

The pipeline in this section originates from a tap off point on Barauni-Guwahati pipeline at Siliguri and traverses through agriculture fields, tea plantations and forest area in plain/flat terrain in the northern direction for initial 30 km upto Sevoke. After that hilly terrain is encountered. The hills are of folding/ rolling type with steep slopes of more than 75° angle and deep gorges in between.

Length of the pipeline route along this section is around 185 km

## 8. DESIGN DATA

Pipeline and its associated facilities to be installed as part of this project shall be designed and engineered in accordance with the codes/ standards referred in this document except as modified in this document.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	Document No.	Rev
		C221052-00-PP-DB-2001	D1
		Page 17 of 54	

## 8.1 Pipeline Design Data

Description	Dimapur-Kohima-Imphal Pipeline Section	Siliguri-Gangtok Pipeline Section
	Value	Value
Pipeline Start Point	Dispatch Station at Dimapur (Ch. 0+000 km), Nagaland	Dispatch Station at Siliguri (Tap off from SV-13 of Barauni Guwahati Pipeline-BGPL) (Ch. 0+000 km), West Bengal
Pipeline Termination Point	Receipt Station at Sekmai Gas Bottling Plant, Imphal (Manipur) (Ch. 199 km Approx. ),	Receipt Station at Ranipool, Gangtok (Sikkim) (Ch. 186 km Approx. ),
Design code	ASME B 31.8, PNGRB T4S Regulation (Natural Gas) & OISD 226	ASME B 31.8, PNGRB T4S Regulation (Natural Gas) & OISD 226
Pipeline Operating Life, years	25	25
Pipeline Design Life, years	35	35
Transported Medium	Natural Gas	Natural Gas
Design Pressure (kg/cm <sup>2</sup> g)	92	92
Design Temperature, °C	-29 to +65	-29 to +65
Pipeline Rating	600#	600#
Main line (Inch)/ (mm)	12" (323.8)	12" (323.8)
Material of Construction	Carbon Steel	Carbon Steel
Pipeline Material	API 5L X-70, PSL2	API 5L X-70, PSL2

Corrosion Allowance, mm	0.5	0.5
Line Pipe Process of Manufacture	High Frequency Welded (HFW)/Seamless (SMLS)	High Frequency Welded (HFW)/Seamless (SMLS)
Pipeline Wall thickness (mm)	<b><u>For Pipeline</u></b> <ul style="list-style-type: none"> <li>7.14 mm (For D.F 0.5, Location Class-3)</li> <li>8.38 mm (For D.F 0.4, Location Class-4)</li> </ul>	<b><u>For Pipeline</u></b> <ul style="list-style-type: none"> <li>7.14 mm (For D.F 0.5, Location Class-3)</li> <li>8.38 mm (For D.F 0.4, Location Class-4)</li> </ul>
	<b><u>For Induction Bend</u></b> 9.53 mm (for All location Classes and all Design factor)	<b><u>For Induction Bend</u></b> <ul style="list-style-type: none"> <li>9.53 mm (for All location Classes and all Design factor)</li> </ul>
Each Pipeline Length (km) Approx.	199 Km Approx.	186 Km Approx.
External Corrosion Coating/Thickness	3LPE/ 3.1mm	3LPE/ 3.1mm
Internal Coating	Liquid Epoxy 100 µm	Liquid Epoxy 100 µm
Pipeline Roughness	15 Micron (For Internal Coated Pipes) 40 Micron (For Without Internal Coated Pipes)	15 Micron (For Internal Coated Pipes) 40 Micron (For Without Internal Coated Pipes)
Field Joint Coating	Heat Shrinkable Sleeve	Heat Shrinkable Sleeve
Cathodic Protection	Yes	Yes
Construction	Under Ground	Under Ground
Piggability	Piggable	Piggable
Design Factor/Location Class	Refer Clause 8.3 of this document	Refer Clause 8.3 of this document



Minimum field Hydrotest Pressure	1.5 x Design Pressure i.e., 138 Kg/Cm2g for Location Class 3 & Class-4	1.5 x Design Pressure i.e., 138 Kg/Cm2g for Location Class 3 & Class-4
Max Field Hydrotest Pressure	The maximum test pressure normally shall not exceed the mill test pressure or pressure required to produce a hoop stress equal to 95 percent of SMYS of the pipe material based on minimum wall thickness in the test section whichever is more	The maximum test pressure normally shall not exceed the mill test pressure or pressure required to produce a hoop stress equal to 95 percent of SMYS of the pipe material based on minimum wall thickness in the test section whichever is more
Hydrotest Duration	The test pressure shall be maintained for a period of 24 hours after temperature stabilization & stabilization of surges from pressurizing operation.	The test pressure shall be maintained for a period of 24 hours after temperature stabilization & stabilization of surges from pressurizing operation.

## 9. PIPELINE DESIGN

### 9.1 General

Both Pipeline shall be designed and engineered in accordance with the standards/ codes referred in section 4.0 of this document.

The mainline Material shall be API 5L X-70, PSL-2 for 12" size for both pipeline

A corrosion allowance of 0.5 mm is selected for all Carbon steel mainline.

### 9.2 Pipeline

- Pipeline shall be designed in accordance with requirements of ASME B 31.8 & PNGRB T4S guidelines (Natural Gas) & OISD-226. The pipeline shall withstand all installation, testing and operating condition/ loads. All necessary calculations shall be carried out to verify structural integrity and stability of the pipeline for the combined effect of pressure, temperature, bending (elastic), soil/ pipe interaction, external loads and other environmental parameters as applicable during all phases of work from installation to operation.
- Pipe wall thickness less than 6.4 mm shall not be used for mainline pipe. Selected thickness shall also be checked to ensure that D/t ratio does not exceed 100. This shall ensure pipe is not damaged during handling/ transportation. Selected wall

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 20 of 54	

thickness shall also be check for longitudinal/ combined stress. Limiting maximum stress values shall be in line with allowable values as mentioned in ASME B 31.8, PNGRB, OISD-226

- Allowable stress limit shall be as per ASME B 31.8. Such calculations shall include, but are not limited to following:
  - Buoyancy control and stability analysis for pipeline section to be installed in areas subjected to flooding/ submergence. Unless specified, specific gravity of installation in such area shall be at least 1.1.
  - Crossing analysis at crossing of rail and highway etc.
  - Crossing analysis of rivers by HDD (if applicable).
  - Pipeline expansion and its effect on station piping (above ground/ below ground).
  - Stress analysis of Pipeline.
- Mainline shall be suitable for pigging facilities designed for handling all types of pigs including intelligent pigs.

### 9.3 Design factor

The design factors for the carrier pipeline for **Dimapur-Kohima-Imphal Pipeline Section & Siliguri-Gangtok Pipeline Section** shall be as per ASME B31.8, PNGRB (T4S) Regulations (Natural Gas) & OISD-226 except as modified in below table. The table below is not intended to define or restrict the methodology of pipeline installation for the crossings.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 21 of 54	

Design Factor for Steel Pipeline Construction			
Sl. No.	Pipeline/ Crossing	Location Class	
		3	4
1.	Pipeline (Note - a)	0.5	0.4
2.	All types of crossings (HDD) other than Railway	0.5	0.4
3.	River/ Stream/ Creek Crossings (Open Cut)	0.5	0.4
4.	Nala/ Drain (Boring-Cased)	0.5	0.4
5.	Nala/ Drain/ Canal (Unlined) (Width < 30 m) (Open Cut)	0.5	0.4
6.	Nala/ Drain/ Canal (Unlined) (Width ≥ 30 m)	0.5	0.4
7.	Canal (Lined/ Unlined) (Boring-Cased)	0.5	0.4
8.	Railway Crossings (Boring-Cased/HDD)	0.4	0.4
9.	Road Crossings (Boring-Cased)	0.5	0.4
10.	Road Crossings (Open Cut)	0.5	0.4
11.	Parallel Encroachment of Pipeline on Roads	0.5	0.4
12.	Above Ground Pipeline (Note - c)	0.5	0.4
13.	Pipeline in Station Approach (Note - c)	0.5	0.4
<b>Note:</b> <ol style="list-style-type: none"> <li>Design factors indicated above are minimum requirement. More stringent Design factor shall be applicable if required by statutory authorities.</li> <li>Design factor 0.5 &amp; 0.4 shall be applicable for above ground pipeline sections as per respective location class. Design factor 0.5 &amp; 0.4 shall also be applicable for the buried pipeline from above ground/ buried transition up to 100 m length of the buried pipeline as per respective location class.</li> <li>Higher thickness shall be used if required to control stresses or for stability during installation and operation.</li> <li>Pipeline crossing through high consequence area in location class-3 shall be designed as per design factor 0.4.</li> </ol>			



## 9.4 Line Pipe Material & Wall thickness

- Line pipe material for both Pipeline section shall be of API 5L X-70 PSL 2. Minimum testing and inspection requirement shall be according to Company specification and API 5L Latest editions.
- The process of manufacture for mainline pipe shall be High Frequency Electric Welded/Seamless
- Pipe wall thickness calculations shall be carried out in compliance with ASME B 31.8 & PNGRB T4S (Natural Gas), OISD STD-226 and a corrosion allowance of as specified above shall be added to the calculated pipe thickness. In addition, the selected thickness shall also be checked to ensure that the diameter/thickness (D/t) ratio does not exceed 100, to avoid damages to pipe during handling and transportation.
- Line Pipe shall be suitable for Specified product service.

Line pipe Wall Thickness (Minimum) for 12"				
Sl. No.	Material	Location Class	Design Factor	Selected Wall Thickness (mm)
1.	API 5L X-70, PSL-2, HFW/SMLS	3	0.5	7.14
2.		4	0.4	8.38

*The above minimum wall thicknesses for design factors 0.5 & 0.4 are based on Design pressure  $P = 92 \text{ kg cm}^2 \text{ (g)}$  and  $CA = 0.5 \text{ mm}$ .*

- These are minimum wall thicknesses for line pipe to be used in mainline. No negative tolerances on line pipe wall thickness are allowed.
- Line pipe wall thicknesses and corresponding design factors shall be as per clause no. 7.1 & 8.3.
- The finished/ final thickness & material grade of 6D induction bends shall not be less than the minimum wall thickness & material grade of the connected line

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	Document No.	Rev
		C221052-00-PP-DB-2001	D1
		Page 23 of 54	

pipe as indicated in this table. Accordingly, minimum mother line pipe wall thickness required for fabrication of induction bends considering bend thinning as per Data sheet/ specification of bend shall be calculated.

### **9.5 Pipeline Stress Analysis**

All Pipelines shall be checked for structural integrity taking into account the anticipated stress conditions in the pipeline during installations, hydrostatic testing and operation. As a minimum the following analysis/ checks shall be performed.

- Pipeline crossing analysis;
- Pipeline stress analysis/ Pipeline flexibility and tie-in analysis/ Stress at bends, for pipelines operating at temperature higher than ambient.
  - The stress analysis of pipeline system shall be performed using CAESAR-II software.
  - The analysis shall model as per soil conditions and the following loads and load combinations as a minimum, be considered.
- Internal pressure;
- Dead loads from the self-weight of the pipeline, weight of transport fluids, coating and appurtenances;
- Functional loads (effect of pressure, temperature and thermal resistance);
- Environmental loads;
- Hydrotest loads;

The system flexibility and anchoring requirements of buried pipelines shall be determined considering the maximum temperature difference between operation and installation. Flexibility and end expansion calculation shall be carried out to ensure that stresses in the pipeline system, restraining loads and deflections are within allowable limits and that any transfer of movement to the above ground section can be accommodated by the above ground piping arrangement.

Buried pipe analysis shall use soil friction, soil stiffness and backfill density. The computer model shall accurately reflect the geometry of the pipeline system.

The pipeline will be adequately supported to prevent excessive expansion and undue loads on connected equipment.

### **9.6 Pipeline Seismic Analysis (If applicable)**

Seismic analysis shall be carried out for the pipeline for various Seismic Hazards (listed below) as per the applicable codes/standards/guidelines (such as B31.8, GSDMA

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 24 of 54	

guidelines, ALA 2005, ALA Guidelines, etc.). The following modes of failure shall be studied as applicable:

- Wave propagation (PGA shall be considered based on any measured data along the pipeline route (if available), subjected to a minimum as per Zone V of IS 1893).
- Fault movement analysis shall be based on anticipated fault displacement.
- Buoyancy due to Liquefaction
- Permanent ground displacement

In case the pipeline does not qualify for the above failure modes, mitigation measures such as increase in wall thickness/ grade/ select (cohesion-less) back-fill etc. shall be specified to ensure safety and integrity of the pipeline system.

## 9.7 Pipeline Bends

In order to accommodate changes in vertical and horizontal alignment in piggable section of pipeline, elastic bends/ cold field bends/ hot formed long radius bends shall be used. Miter bends shall not be used for change in direction. Minimum bend radius shall be as follows:

Minimum Bend Radius			
Pipeline Details	Elastic Bend Radius, m	Cold Field Bend Radius	LR Bend Radius
12" , API 5L X-70, PSL2	250	R=21D	R=6D

### Cold Field Bends

- All bending of the pipe required for horizontal and vertical alignment changes which cannot be achieved by elastic bend, will be completed using an approved cold bending machine. The degrees of bend and their location will have to be initially determined by an accurate survey conducted by the laying Contractor's/ Bending Engineer prior to commencing of pipeline welding activity. The degrees and type of bend will then be marked on the outside of the pipe. The skilled bending machine operator, with the use of precision instruments, will verify the degree of each bend made and also check for wrinkles or excessive out of roundness.

- The completed cold bends will be transported from the Pipe Coating storage yard and then transported by the laying Contractor to their predetermined locations along the pipeline route in sequence with the pipe stringing operation.

## **Induction Bends**

- Hot Induction bends shall be used at the station inlet and outlet of stations and at the entry/ exit points of the crossings where the approach and departure angles are such that use of cold field bends is not possible.
- Horizontal induction bends shall be utilized as required to maintain the ROU boundary and in critical areas where field bending is not possible. Vertical bends are to be defined to minimize excavation and facilitate difficult crossing profiles.
- Higher/ Positive wall thickness pipes shall be used for bends, at crossings, in HDD locations, in particular sections etc. All induction bends shall comply with internal pipeline tolerances to allow for passage of instrument pigs.
- Bend radius of  $R=6D$  minimum (D: pipe outside diameter) shall be used.
- Use of miter bend shall not be permitted
- Corrosion resistant coating shall be provided on the pipeline up to a minimum length of 500 mm after it comes aboveground/ before it gets buried underground at terminals and scraper stations.

## **9.8 Pipeline Valves**

- All pipeline mainline valves including launcher & receiver valves shall be full bore ball valves of appropriate pressure-temperature rating and shall conform to API 6D. The ball valves shall be of double-block and bleed design to ensure safety of operations downstream of the valve when isolated. Valve shall be Top Entry/ Side entry type as specified in Valve data sheets.
- Ball & check valves provided shall meet the minimum design requirement of API 6D and API 6FA/ API 607 for fire safe design. Globe valve shall meet the minimum design requirement of BS 1873. Valves testing shall meet minimum requirement as per API 6D/ API 598/ BS 6755 (as applicable).
- Pressure temperature rating of valves shall be according to ASME B 16.34.
- The ASME Boiler and Pressure Vessel code, Section VIII, Division 1 shall be used to design the valve body. Allowable stress requirements shall meet the provisions of ASME B 31.8. In addition, corrosion allowance indicated in valve data sheet

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 26 of 54	



shall be considered in valve design. However, minimum wall thickness shall not be less than the minimum requirements of ASME B 16.34.

- All the main line valves shall be suitable for applications as a requirement specific to the purpose which the valve is intended to be used. Major testing like Hydrostatic & pneumatic test of valve shall be witnessed by Owner or its Authorized representatives in fully closed/ open condition and passing/ leakage shall be checked.
- Valve end shall be either BW end as per ANSI B16.25 or flange connection as per ANSI B16.5/ ANSI B 16.47B (as defined in P & ID).
- Valve with split body/ fully welded shall be used for above ground as shown in Valve Data sheet.
- All mainline & underground valves shall be fully welded body construction with ball entry type as side/ top as specified in valve Data sheet. In order to minimize potential leak sources, mainline valve and first isolation valve on branch shall be with butt-weld ends. All mainline valves shall be full-bore valves to allow smooth passage of cleaning and intelligent pigs.
- All Ball valves shall have bore type as shown in P&IDs.
- All valves of 2" and above shall be trunnion mounted.
- Valves shall have provision for drain connection, vent connection and sealant injection system for seat & stem seal. Valves shall have double seating arrangement. Valve seat shall be as defined in valve data sheet.
- Pup piece of equivalent grade material of connecting pipe may be provided with valve in order to match ID of connecting pipe with valve as defined in data sheet.
- All Under Ground valve shall have the wheel/actuator installed at the operational height without any need of structural platform. The selection of extended stem length of underground valve shall be such that the centerline of wheel or center of actuator is at approximately 1.0 m above the finished ground level considering ease of operation.
- Under Ground Valve Surface shall be provided with 100% solid epoxy coating 1000 micron thick (powercrete R95) as corrosion protection coating.

## 9.9 Isolation Valve at boundary limit (if Applicable)

- Station Isolation Valve (SIV) shall be provided at entry and exit location of pipeline at station/ boundary limit as shown in P&IDs.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 27 of 54	

## 9.10 Insulating joints

- Insulating joints shall be provided to electrically isolate the buried pipeline from above ground pipeline. Insulating joints shall be monolithic type and shall allow smooth passage of pigs. Insulating joints shall be installed in above ground portion of the pipeline, immediately after the buried/ aboveground transition as shown in P&IDs. Design of Insulating joint shall be in accordance with ASME Section VIII Div.I.
- The Insulating joint shall be in accordance with the Project specifications and shall preferably be installed in a horizontal position and shall be capable of withstanding mechanical loads resulting from the adjacent pipe work configuration. Isolation joints shall be designed to withstand the maximum allowable design conditions of the pipeline including bending and torsion requirements.
- Wherever pressure/ temperature transmitters are used on cathodically protective pipeline the same shall be electrically isolated by providing insulating joints/ flanges.

## 9.11 Permanent Scraper Traps

- Scraper traps shall be provided at the Dispatch & Receiving terminals. The scraper traps shall be capable of handling intelligent pigs and other cleaning pigs. The launching and receiving barrels shall be designed in accordance with the requirements of PNRGB T4S, ASME B 31.8, ASME Section VIII, Div.1 as specified in Scraper Traps data sheets and its quick open-end closure (QOEC) shall be designed according to ASME Section VIII, Div.1.
- Barrel shall be provided with Quick opening End Closure arrangement. The Quick opening End Closure (QOEC) shall be provided with locking arrangement which shall be closed only when the vessel is completely depressurized. A davit / hinge arrangement shall be provided for easy closing and opening of the QOEC.
- The QOEC shall be designed in accordance with ASME Section VIII, Division I, UG-35. The QOEC shall be Band Lock / Clamp ring type. T-bolt type closure and threaded type quick opening closures are not permitted.
- The QOEC shall be suitable to hand-operate by one operator with simple standard tools like wrenches, etc and shall not require any special tools for opening. QOECs of 24" and above sizes shall be fitted with worm gear arrangement for opening of the closure.
- Two-Safety bleeder locking device shall be provided in QOEC.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 28 of 54	

- Traps shall be accessible by walkway/ road for movement of equipment, pigs etc. Scraper stations shall be provided with access road from the nearest metaled road.
- Scraper traps shall be provided with adequate launching, retraction and handling facilities for cleaning and instrumented pigs (trolley and basket) to facilitate handling of instrumented pigs, cleaning and displacement pigs.
- Equipment/ valves requiring periodical maintenance shall be supported in such a way that the valves and equipment can be removed with a minimum temporary pipe supports.
- The diameter of barrel of the launcher cum receiver shall be three nominal sizes larger than the pipeline nominal size. Center line elevation of scraper trap shall be at suitable height from grade level. Suitable arrangements shall be provided for handling & lifting of pigs.
- Pig traps shall be provided with auxiliary connection like QOEC, Pig signaler, kicker connection, vent, drain, PSV/ TSV connection etc. Pig trap shall be provided with safety locking device to avoid accidental opening under pressure. Further, door of pig trap shall be mechanically interlocked with mainline valve to avoid opening when valves are in open state.
- Flanges of minor barrel and kicker connection shall be capable of withstanding the loads (such as forces, moment and torque etc.) resulting from unrestrained pipeline/ interconnecting piping.
- As far as possible, pipeline expansion & contraction shall be absorbed by allowing the scraper traps to move on supports by providing sliding supports. Installation of anchor block in the underground pipeline is not permitted. If required adequate length of trench in approaches to stations shall be provided with a select backfill to ensure flexibility.

## 9.12 Pig Signallers

- Pig signalers shall be installed as a minimum at the following locations:
- Pig signalers shall be located at the Pig launcher & Pig Receiver and one on mainline, on downstream/ upstream of flow tee as indicated in P&ID diagram.
- As indicated on P&IDs, Pig signaler shall be bi-directional non-intrusive type (On Pipeline), Intrusive (On Pig Traps), suitable for maintenance with pipeline under operating pressure and capable to communicate with SCADA system.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 29 of 54	

## 9.13 Flow Tee

- The Branch Connection on mainline, with greater than 40% of the mainline diameter will be provided with flow tee to allow smooth passage of pigs. The design of Flow tee shall be as per ASME B 31.8 and material of flow tee shall be compatible with Mainline Material.

## 9.14 Pipeline flanges and Fittings

- Flanges shall conform to ASME B 16.5/ ASME B 16.47/ MSS SP 44 or equivalent. Butt welded fittings shall conform to ASME B16.9/ MSS-SP-75 as applicable. Material of construction for flanges and fittings shall be carbon steel suitable for the service conditions and shall be compatible with the line pipe material.

## 9.15 External corrosion coating

### Buried Pipeline

- Pipeline to be installed below ground shall be protected against external corrosion by a combination of high integrity externally applied coatings and permanent impressed Cathodic protection system. Externally applied coating shall be three-layer side extruded polyethylene coating in Compliance with Company`s 3LPE coating specification enclosed with bid documents.
- In addition to external anti-corrosion coating, buried pipeline, valves and fittings shall be provided with Temporary Cathodic Protection (TCP) during construction phase and an Impressed Current Cathodic Protection (ICCP) system for the design life of pipeline.

### Field Joints, bends and inline/ online buried appurtenances

- Heat Shrink sleeves compatible with mainline 3LPE coating shall be used for field joints and induction bends.
- Heat Shrink sleeves with min. thickness equal to the corresponding pipe coating thickness, shall be used for field joint coating on pipeline girth welds. Field joint coating material shall be approved by Company.
- However, for HDD (if any) Joint Coating fiber glass reinforced heat shrinkable sleeve shall be used in line in with Company approval.
- 100% Solid High build epoxy of minimum 1000-micron dry film thickness shall be used for coating of buried valves, fittings and other buried Piping.
- Casing pipes/ MS tube for HDPE duct shall have external coating as per relevant specification.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 30 of 54	

## 9.16 Painting

### Above Ground Pipes & Structure

- All above ground pipes and structures shall be painted to prevent atmospheric corrosion. Painting of above ground pipes and structures shall be as per painting specification provided suitably for mention temperature application as per company specification enclosed with the bid document. Painting shall be suitable for normal corrosive environment/corrosive environment, as applicable, as defined in Painting Specification for all stations and terminals.

## 9.17 Pipeline Burial

- Pipeline burial depth shall be appropriate for the route, surface use of land, terrain features and external loads imposed. In areas likely to have an increased risk of impact damage or third-party interference the pipeline shall be buried with a minimum depth of cover as given below.
- The pipeline shall be buried normally at a depth of 1.2 meter below natural ground level except river/ rail/ road/ canal/waterways/ sandunes/ salt pit crossing where minimum cover shall be as given below or as per the requirements of statutory/local authorities whichever is more stringent. Increased cover shall be provided at critical locations and crossings.

Sl. No.	Location	Installation Methodology	Minimum Cover (m) (Ref Note)
1.0	Industrial, commercial residential area, Barren area	Open Cut	1.2 (Normal terrain) 1.0 (Rocky terrain)
2.0	Cultivated & agricultural areas	Open Cut	1.2 (Note-2)
3.0	Drainage ditches at roadways and railways	As applicable	1.2
4.0	Minor water crossings/ Unlined - canal/ drain/ nala/ ditches	Open Cut	1.5
		Boring -Cased	

Sl. No.	Location	Installation Methodology	Minimum Cover (m) (Ref Note)
	(Below Bed of Crossing)	HDD	2.5
5.0	Lined Canal/drain/nalas (Below Bed of Crossing)	Boring -Cased	1.5
		HDD	2.5
6.0	Major River Crossing (Below Scour Depth) (Note 3 & 4)	Open Cut	2.5 (Normal terrain) 1.5 (Rocky strata)
		HDD	2.5
7.0	River with rocky bed (Note-4)	Open Cut	1.5
8.0	Area under influence of tides		1.5
9.0	Road crossings (Cased/uncased)	Open Cut	1.2
		Boring -Cased	1.5
		HDD	4.0 (NH & EH) 2.5 (Other Roads)
10.0	Railway Crossings	(Boring-Cased)	1.7
		(HDD)	7.0
11.0	Parallel Encroachment of Pipeline on Roads & Railways	Open Cut	1.5 (Railway) 1.5 (Road- Soft Strata) 1.2 (Road – Rocky Strata)
12.0	Marshy land, Swamps	Open Cut	1.5
13.0	Pipeline in Station Approach	Open Cut	1.5
14.0	Pipeline in SV Station	Open Cut	1.5
15.0	Areas of Brick Kiln	Open Cut	1.5 (below predicted excavation level or from the current level, whichever is more)
16.0	Seismic Zone	Open Cut	1.5

1. The above-mentioned minimum cover requirements shall be valid for all class locations.
2. Pipeline in cultivated & agricultural areas may require deeper burial to avoid damage from deep ploughing; this possibility shall be accounted for.
3. For river or watercourses that are prone to scour and/ or erosion, the specified cover shall be provided below the predicted lowest bed profile after scouring or erosion expected during the life time of the pipeline.
4. Stream & Creek crossings shall also be having the minimum requirements of pipeline cover similar to that specified for rivers.
5. Minimum depth of cover shall be measured from the top of the top most pipe coating (3LPE OR CCW) to the top of undisturbed surface of the soil, or top of graded working strip, whichever is lower. Fill material in working strip shall not be considered to add to the depth of cover. The top of Boring-cased crossing shall be measured from the top of the casing.
6. Cover shall be measured from the top of road or top of rail, as the case may be.
7. In case HDD methodology has been adopted for locations where other modes of installation such as Open Cut/ Boring have been specified above, the depth of pipeline cover shall be decided on case-to-case basis, however, the same shall be minimum 2.5 m.
8. Soft soil/ sand padding of minimum 150 mm thickness to be provided around the pipe in rocky areas. Rock Shield are to be used for backfilling in rocky area.
9. For pipeline trench in Sand Dunes area, a 250 mm thick layer of Gravels shall be provided for the entire trench width, at a depth of 750 mm from the ground.
10. All water crossings done by open cut method shall be provided with anti- buoyancy measures. Anti-buoyancy measure for River, Stream & Creek shall be Continuous Concrete Coating only. Anti-buoyancy measure for other water body crossings including marshy areas shall be Continuous Concrete Coating or Gravel filled Geo-textile bags.
12. Final Installation methodology shall be as specified in AFC drawings & and as directed by EIC based on site conditions

Additional soil covers other than specified above shall be provided at locations indicated by statutory/ local authorities or in areas likely to have an increased risk of impact damage or third-party interference as per agreements between COMPANY

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 33 of 54	



and authorities. In case, any private dwelling, industrial building or place of public assembly falls within 15m of pipeline, additional cover of minimum 300mm shall be provided over and above the cover indicated in the above table. Any stringent requirement prevailing in Bangladesh shall be complied.

#### **9.18 Pipeline in common ROW/ROU**

The location of a new buried pipeline, when running parallel to an existing buried pipeline, should be at a minimum clear distance of 5.0 meters from the existing underground pipeline when heavy conventional construction equipment is expected to be utilized. This distance may be reduced after careful assessment of construction methodologies so that it does not result in unsafe conditions during construction. In any case the minimum clear distance shall not be less than 3.0 meters.

#### **9.19 ROW/ROU**

The Pipeline route have variable ROU width. At some of the locations along the pipeline route where limited/ restricted ROU shall made available, Contractor shall perform all the pipeline installation works in the available ROU.

#### **9.20 Pipeline in Common Trench**

When laying more than one new pipeline in the same trench, a minimum clear horizontal separation distance of 500 mm shall be maintained. Typical Drawing shall be referred.

#### **9.21 Backfilling**

- In normal cross-country areas, the pipeline trench shall be backfilled with excavated soil. Select rockfill/ slope breakers shall be provided in the trench in steep areas (slope generally 10% and more) to prevent erosion. In case of rivers/ water bodies prone to scour and erosion, the safety cover shall be provided below the predicted scour level. In addition to the cover, anti-buoyancy measures (concrete coating) shall be provided at river crossings/ marshy areas.
- Contractor shall keep top 150 mm of excavated top soft soil (free of gravels) aside, which shall be back filled in the end as top layer.
- Select backfill shall be provided at approaches to terminal up to transition point (below ground/above ground) inside terminal.
- In rocky/ pebbles, marram areas, the trench bottom shall have sand/soft soil padding of 150 mm. After laying of pipeline, sand/soft soil padding shall be placed around and on top of the pipe so that thickness of compacted padding on top of pipe corrosion coating shall be at least 150 mm.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 34 of 54	

- Disposal of debris and surplus material to designated disposal areas or designated place(s), as the case may be and as directed by Engineer-in-charge shall be carried out.

## **9.22 Marshy Areas/ Areas Prone to Flooding (Anti-Buoyancy Measures)**

Wherever marshy areas/areas prone to flooding are encountered along the pipeline route, pipeline shall be provided with anti-buoyancy measures viz. continuous concrete coating/ Geotextile gravel filled bags. Unless specified otherwise in AFC drawings, Specific gravity of pipeline under empty/ installation conditions shall be minimum 1.1.

- Certain buoyancy mitigation measures shall be provided in areas prone to flooding and/or where potential to floatation exists which will be indicated on design drawings.

Generally, the following buoyancy control measures should be considered for design:

- Continuous Concrete weight coating.
- Geotextile fabric weights.
- Net negative buoyancy of installation relative to water shall be minimum 1.1. Continuous concrete weight coating shall be provided during installation at locations prone to flooding or water body crossings (other than lined canal) where potential of scour of backfill exists.
- At locations known to be subject to inundation but risk of scour does not exist, other buoyancy control methods may be used in place of continuous concrete coating. Potential solutions that may be considered include extra cover, select backfill materials and gravel filled geotextile bags etc.

## **9.23 Crossings**

- All major crossing shall have 1 no. 6" Steel casing pipe to accommodate. HDPE ducts & OFC cable.

### **9.23.1 Water Body Crossing**

- All water crossing shall be installed by open cut or may be crossed by Horizontal Directional Drilling (HDD)/ Micro Tunneling method. Wherever there is an evidence of bank erosion, the banks shall be protected by gravel and boulders filled with embankment mattresses of galvanized iron wire to be laid over the backfilled, compacted and graded banks.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 35 of 54	

- Crossings should be located in a comparatively straight reach of the water body, where the banks are stable, minimum evidence of erosion of bed, sufficient area for construction is available. Angle of crossing should be as close to 90° as possible. For major canals / rivers courses, the angle of crossing should be as close to 90 degrees as possible.
- River crossings installed by open-cut bottom pull method may necessitate additional weight coating to hold the pipeline in place during installation and operation.
- Special considerations shall be required for submerged crossings which are characterized by their perennial nature, meandering course, steep and potentially erodible banks, potentially scouring bed, large erodible flood plain and wide water course (high water mark to high water mark) both during the design and installation of such crossings.
- The requirement shall be finalized at site based on permission available and as advised by Engineer In-Charge.

## 9.23.2 Railway Crossing

### Crossing by Boring, Casing

- Railway crossing shall comply with the requirements of API RP 1102 and guidelines of Indian Railway Authorities & RDSO. The casing pipe shall be minimum three nominal pipe sizes larger than carrier pipe (unless advised otherwise by concerned authorities) and shall be installed by boring/jacking. Carrier pipe shall be electrically insulated from the casing pipe and casing ends shall be sealed using durable, electrically non- conducting materials.
- The crossing angle shall be as close to 90° as possible but in no case less than 85 degrees to the centre line of the railway line. Casing Pipe material shall be as per API 5L GR B/ ASTM 106 Gr B and wall thickness shall be as per RDSO & Railway code BS – 105 & its addendum and API 1102.
- It should be noted that the extent of casing pipe generally specified by Railways is 14.0 m beyond centerline of the outermost tracks on either side or 0.6 meter beyond the ROU limits of Railways on either side, whichever is more.
- Care shall be taken to isolate the pipeline crossing installation from aerial electrical wires and shall be suitably insulated from underground conduits carrying electrical wires.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 36 of 54	

- Casing pipe should be so placed and oriented so as to prevent any leakage inside railway boundary except through the vent pipes.
- The casing pipes shall be installed with even bearing throughout the length.
- Internal of Casing pipe shall be coated with two component epoxy coating wherever required by statutory authorities.
- The crossing drawing shall be subject to approval of concerned Railway Authorities prior to implementation

### **In case of permission by HDD**

- If railway authority grants permission for crossing of railway by HDD method, pipeline shall be laid at least 7 m below the ground level throughout the railway land width embankment and also at least 7m below formation level in cutting throughout land width.
- Further, as per railway Guideline on Pipeline Crossing under Railway track, in case of pipelines carrying gas, Railway operations should be considered equivalent to Location Class 4 for design of carrier pipe thickness. Design factor of 0.4 shall be used for calculating wall thickness of carrier pipes within railway land and up to a distance of risk radius outside the railway boundary (ROU/ROW) on either side.

### **9.23.3 Road Crossing**

- Road crossing shall comply with the requirements of API RP 1102 and the requirements of the concerned road authorities. Unless otherwise required by concerned Authorities, casing pipe shall not be used.
- The method of crossing of roads such as open cut/ trench-less shall be firmed up in consultation with concerned authorities and COMPANY
- All road crossings shall have a minimum cover as per clause 8.1.6 or as per requirement of local/ statutory authorities, whichever is more.
- All National Highways/ State Highways shall be with trenchless (Cased/ HDD) method. Casing shall be installed by jacking & boring method.
- The method of crossing of roads such as open cut / trenchless (Cased/ HDD) method shall be firmed up by Contractor in consultation with concerned authorities and COMPANY.
- However, at national highway road crossings pipeline shall be provided with casing pipe, which shall extend min. 600 mm beyond Road ROW on either side. Casing

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 37 of 54	

pipe shall be installed extending equally in either side of the National Highway crossing.

- The casing pipe shall be installed by trenchless method like boring/ jacking/ Micro Tunelling. Provision of casing at locations other than national highways shall be decided based on type of road crossing and as per requirements of local authorities if necessary. The casing pipe shall be three nominal pipe sizes larger than carrier pipe.
- The crossing angle shall be as close to 90° as possible but in no case less than 80 degrees to the centre line of the road/highway. Casing insulators and end seals shall be provided to ensure electrical isolation of carrier pipe and casing pipe. Casing Pipe material shall be as per API 5L GR B/ / ASTM 106 Gr B and wall thickness shall be as per API 1102.

## 9.23.4 Open Cut Crossing

- Pipeline at minor crossing like nalas, minor roads, brick road, which have very less Human/ vehicle etc. Movement and will not affect public and others should go for Open cut crossing. The crossing angle shall be as close to 90° as possible but in no case less than 60 degrees to the center line of the road.
- Wall thickness for uncase road shall be verified in accordance with API 1102.
- Statutory approval shall be obtained from the road /canal/ water authorities for the above crossing prior to implementation.

## 9.23.5 Existing Pipeline Crossing & Other Utility Crossing

- The specific requirements of Owner/ operator of existing pipeline shall generally be followed. The minimum clearance between the lines shall be 500 mm unless specified otherwise.
- In case any existing pipeline needs to be crossed, the new pipeline shall be laid at least 500 mm below such existing pipeline and a physical barrier in the form of concrete slab shall be provided. The existing pipeline shall be properly supported during and after the construction activities.
- In case any existing cable needs to be crossed, the new pipeline shall be laid at least 500 mm below such existing cable and a physical barrier in the form of concrete slab shall be provided.
- Concrete slab of shall be provided 300mm above the new Pipeline or below in case new Pipeline is laid above existing utilities. In both the cases, the cover over Pipeline shall not anyway less the requirements.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 38 of 54	

### **9.23.6 High Tension (HT- 11KV and above) Line Crossing**

- Apart from the safety measures during construction a concrete slab (75 mm Thk or as specified on Slab Concrete typical drawing, whichever is more) shall also be provided 300 mm above the top of buried pipeline to safeguard against any adverse effects. The length of this slab shall extend 3 meters on either side of the HT line crossing.
- A minimum separation of 3.0 meter or as specified in Typical drawing, stringent separation among these should be maintained between pipeline and transmission tower footings.
- The specific requirements of Owner/ operator of existing pipeline/ utility shall also be followed.

### **9.24 Pipeline in Forest area**

- Contractor shall restrict the pipeline laying activities within the ROU acquired. No additional land in forest area shall be used. Contractor shall clear only the minimum width required for laying of pipeline. Number of trees/ plants felled shall be kept a minimum based on construction requirements. ROU width in forest area is 10 m. or less
- Full care shall be taken to ensure that no damage is caused to the adjoining forest area while carrying out the work. However, in case of any damage, Contractor shall be liable to pay suitable compensation as per requirements of Forest Department.

### **9.25 Minimum Size Tapping/ Branch Connection**

- Minimum size of any tapping from the pipeline shall be 2" NB and shall be provided with an isolation valve at a minimum distance from the pipeline.

### **9.26 Pipeline Markers**

#### **• Kilometer Markers**

Kilometer Markers shall be located, in general, at every one kilometer. Each kilometer post (KP) shall be fitted with two warning plates. One warning plate shall be inscribed with text in English and the other with text in local language. Markers shall indicate cumulative distance in kilometers from the reference station, as directed by OWNER.

#### **• Pipeline Warning Sign**

Warning signs shall be placed at crossings as follows:

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 39 of 54	

- National and State Highway, on both sides of crossings.
- Metaled/WBM Roads, on one side of crossing.
- Railways, on both sides of crossing.
- Minor Waterways/canals, on one side of crossing.
- Rivers and major water ways/ Canals, on both sides of crossing.
- Buried Foreign Pipeline/ Utility Crossing, on one side of crossing.
- Valve Station, on one side of valve.
- And or any other location as shown in the approved drawings and as directed by the OWNER.

Each post shall be fitted with two number warning plates. One warning plate shall be inscribed with text in English and the other with text in local language.

Where warning sign is within 200 m of KP point, the same shall be provided with KP post with warning plate indicating crossing chain-age.

Pipeline warning sign shall identify the existence of the pipeline and display the name of the OWNER, with an emergency telephone number.

## 9.27 Pipeline Warning Tape

- In order to enhance pipeline safety against third party accidents a plastic warning tape shall be installed all along the pipelines. The warning tape shall be installed 300 mm above the pipeline top before completing the backfilling operation. The tape shall be white color with red letters and the description of the tape shall be in language as specified in typical drawing. Pipeline warning tape shall cover pipeline as well as OFC.

## 9.28 Corrosion protection and Corrosion Probe.

- The Pipeline shall be protected against Corrosion to ensure its continued safe operation. Permanent cathodic protection shall be provided for entire pipeline system considering minimum service life. During Construction, temporary cathodic Protection shall be provided. Pipeline shall be provided with Corrosion probe and corrosion coupons for continuous online monitoring of Pipeline health.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 40 of 54	



## 9.29 Pipeline Leak Detection System

It is important that any leak from pipelines be detected as early as possible to minimize environmental impact and production loss. The Pipeline leak detection for longer lengths becomes necessary from environmental regulations, safety and economics point of view. Leak Detection System shall be provided for new pipeline and integrated with RTU/ SCADA system through OFC communication & will monitor the real time leak detection for this new pipeline.

## 9.30 Sectionalizing Valve Stations

Sectionalizing valve station shall be provided along pipeline route for isolating sections of pipeline as per requirement of PNGRB T4S, OISD-226 and ASME B31.8.

- Limiting the hazard and damage from accidental discharge from pipeline system.
- Facilitating maintenance of pipeline system and
- Complying with the requirements of applicable codes.

The location of sectionalizing valves shall be as per the requirements of applicable codes taking consideration of terrain features, requirement of safety and operation etc. Sectionalizing valve on the main pipeline shall be ball valves of full-bore type, to allow smooth passage of cleaning and intelligent pigs.

Spacing between mainline valves / sectionalizing valve in various Location Classes shall not exceed values given below.

Location Class	Maximum Distance in km
1	32
2	24
3	16
4	8

Valves installed in scraper stations and pipeline sectionalizing valve stations shall be gas actuated/ hand operated and with butt welding ends or as specified in P&IDs. Sectionalizing shall be installed buried and provided with a stem extension in such a way that the center line of rim of the hand wheel on a horizontal shaft or center of actuator is at approximately 1.0 m above the finished ground level. Valve surface shall be provided with corrosion protection coating. Valve body vent and drain lines shall be extended and terminated above ground. All Sectionalizing Valves in mainline and other buried valves in SV stations shall have fully-welded body design.

The valve stations shall be located at a readily accessible location such as near road and shall be provided with an access road from the nearest all weather metalled road at interval distances mentioned in the table above based on predominant location class along the pipeline. Valve spacing adjustments should not exceed 10% of the applicable distance listed above. The facilities within valve station shall be secured by a chain link fence/ boundary wall enclosure with gate. The location of valve station shall be clear of overhead power lines.

The provisions of remote operated feature shall be as per the operation and control philosophy to be adopted for the project. At locations, where valve stations are combined with CP the safe distance and statutory clearance as per standard shall be followed.

Cold blow down facility shall be provided at all SVs for evacuation of pipeline sections upstream & downstream of SV in case of any emergency. Cold blow down piping size shall be at least  $1/3^{\text{rd}}$  of sectionalizing valve size. Tap-offs with isolation valve and blind for customer connectivity shall be considered from SV stations. Tap-off shall be taken from upstream of SV. Also, tap off of size greater than  $1/3^{\text{rd}}$  of SV shall be taken from main line and tap-off of size up to  $1/3^{\text{rd}}$  of SV shall be taken from blow down piping of the SV.

## 9.31 Welding

- Welding shall be carried out in accordance with API 1104, Standard Specification for Welding and applicable welding charts. All pipeline butt welds shall be 100 per cent radiographed.
- NDT requirements for all process and utility piping shall be as per applicable specifications.
- Inspection and testing requirement as a minimum of API 1104 latest edition shall strictly be complied. WPS/PQR shall be established as per API 1104.
- Automatic welding may be employed for rapid construction of pipeline. Automatic UT is mandatory in case of automatic welding.

## 9.32 Hydrostatic Testing

- After installation, the entire pipeline system shall be hydrostatically tested with inhibited water as per applicable specification. The water shall be tested, as applicable prior to using for hydro testing. Mainline valves shall be installed after successful completion of pipeline hydro testing.
- The minimum test pressure at any point along the pipeline shall be as 1.25 x Design Pressure i.e., 115 Kg/Cm<sup>2</sup>g) for location Class 1 & 2 and 1.5 x Design Pressure i.e., 138 Kg/Cm<sup>2</sup>g) for location Class 3 & 4 as per table of clause 7.1 of this document in the test section.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 42 of 54	

- The maximum test pressure normally shall not exceed the mill test pressure or pressure required to produce a hoop stress equal to 95 percent of SMYS of the pipe material based on minimum wall thickness in the test section whichever is more.
- The test duration shall be minimum 24 hours. Hydrostatic testing of terminals shall be carried out separately.
- Line pipe used for all cased crossings, HDD crossings shall be pressure tested at 1.25 x Design Pressure i.e., 115 Kg/Cm<sup>2</sup>g) for location Class 1 & 2 and 1.5 x Design Pressure i.e., 138 Kg/Cm<sup>2</sup>g) for location Class 3 & 4 before and after installation for a period of at least four (4) hours. Such section shall be retested along with completed pipeline sections.
- API-1110 shall be used for guidance for the hydrostatic test.
- Pressure variations during testing shall be acceptable, if caused by factors other than leakage, like temperature variations. Maximum unaccounted pressure variation shall not exceed 0.3 bar. Pipelines not meeting the requirements shall be repaired and retested in accordance with the requirements of OISD-226.

Preliminary hydrostatic test pressure calculation shall be prepared in accordance with ASME B 31.8, PNGRB T4S, OISD 226 and will be submitted for Client approval.

### 9.33 Dewatering and Swabbing

- Dewatering, swabbing and pre commissioning operations shall be carried out after hydro testing and prior to commissioning of the pipeline as per project specification.
- Swabbing shall be carried out prior to installation of sectionalizing valves.
- After swabbing, the pipeline shall be dried and commissioned in accordance with the Project specifications.

### 9.34 Geometric Survey

Survey to establish pipeline geometry using Electronic Geometric Pigs (EGP) shall be conducted after completion and acceptance of following pipeline activities:

- Gauging
- Pressure Testing
- Cleaning and swabbing
- Installation of Mainline/ Sectionalizing Valve stations

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 43 of 54	

- All tie-ins

If the pipeline commissioning after pressure testing is anticipated to be delayed beyond six (6) months, suitable preservation technique shall be adopted to prevent corrosion during such period. Pipeline shall be preserved using adequate quantity of corrosion inhibitors.

### **9.35 Restoration**

- Pipeline ROU and other crossings restoration shall be performed by the construction contractor in accordance with design details.

## **10. PRE-COMMISSIONING AND COMMISSIONING**

### **Pre-Commissioning:**

#### **Pipeline**

The pre-commissioning activities includes Air cleaning, mechanical resistance test, leak test, cleaning, swabbing, survey, drying (Pre & Final) activity, magnetic cleaning, connecting the stations, OFC & HDPE testing and final acceptance dossier (As built document) and all other relevant activities with Civil, Electrical and Instrumentation & telecom.

The pre-commissioning activities shall include all activities which are not under commissioning scope. The pre-drying includes runs of high density foam pigs till water content is acceptable by Owner/ Engineer.

### **Commissioning:**

No commissioning activity may start if all Pre-Commissioning works are completed and all punch points under category are not attended.

Depending on the procedure followed for the pipeline commissioning i.e., vacuum cleaning or Nitrogen purging the detailed procedure shall be worked out considering safety aspects. Commissioning shall be carried out as per Commissioning procedure/ Specification.

## **11. GENERAL**

For Engineering, procurement and construction the requirements given in standard specifications to be followed.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 44 of 54	

## **12. PIPING DESIGN BASIS**

### **12.1 GENERAL**

- A. The design basis gives the minimum basic requirement for piping design to be carried out. This shall be read in conjunction with the specifications attached elsewhere in the bid.
- B. All design calculation for pressure requirements, vibrations, thermal expansions / flexibility considering seismic factors etc. Shall be made in accordance with code requirements and submitted to the owner for approval.
- C. All piping shall be designed for combined effects of pressure, weight and temperature during operating conditions without over stressing the piping, valves or equipment. All piping shall be adequately supported, guided or anchored so as to prevent undue vibration, deflection or loads on connected equipment such as filters, meters etc
- D. All station piping systems shall be designed as per the requirements of OISD 226 and utility piping (if required) to be provided at these locations shall be designed in accordance with the provisions of ASME B 31.8.
- E. All piping material shall be tested as prescribed in the piping specifications and standard codes and practices and certificates of conformance shall be furnished for review and approval by owner.
- F. All piping material and components i.e. Pipes, fittings, valves, flanges, gaskets and bolting etc. shall be as per the piping specifications.
- G. Piping general arrangement drawing / isometric / support drawings etc. shall be prepared using good engineering practice as per the guidelines furnished in the piping specifications.
- H. Thermal insulation and insulation for personnel protection shall be provided wherever required as per the P&ID and general specifications attached with the bid.
- I. Threaded piping connections are not permitted.
- J. Pipe wall thickness shall be calculated against each size of each piping class as per relevant codes.
- K. Transition piece shall be provided between different grades of pipes welding if shown in P&ID and as per standard engineering practice.
- L. All pipe, valves and fittings shall be new and unused and shall have legible mill code as to type and grade of material.
- M. In the event of conflict the following order of priority shall be generally govern, however the contractor shall inform the owner in writing and receive written clarification from the owner.
  - a) Piping design criteria/basis
  - b) P&ID diagrams
  - c) Piping material specification (PMS)

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 45 of 54	

- d) IFC drawings
- e) Specialty item specification
- f) General specification
- g) Codes and standards

## 12.2 Piping specifications

The piping material specification shall be governed by the design conditions of pressure, temperature, corrosion allowance and compatibility with contained media.

When two lines that operates at different pressure – temperature conditions are connected; the valve segregating the two lines shall be rated for more severe service condition.

Pipe wall thickness shall be calculated in accordance with ASME B 31.8. Corrosion allowance shall be as indicated in piping material specification.

## 12.3 PIPES

- Piping shall be designed to meet the design code of ASME B 31.8 & OISD 226
- The main piping system parameters to be considered is as follows:

Piping Design Parameters	
Description	Value
Products	NG
Design Pressure (kg/cm <sup>2</sup> g)	150# Class (19 kg/cm <sup>2</sup> g), 300# Class (49 kg/cm <sup>2</sup> g), 600# Class (92 kg/cm <sup>2</sup> g)
Max. Design Temperature for CS, °C	-29 to +65.0
Max. Design Temperature for LTCS, °C	-45 to +65.0
Design Life, years	35
Corrosion Allowance- Piping , mm	1.5
Corrosion Allowance- Equipment, mm	3.2

- Suitable allowance for occasional loads like seismic effect on the piping to be considered while calculating the wall thickness as per the relevant code applicable.
- No negative tolerance on thickness should be considered.
- Corrosion allowance should be considered based on the gas specification.

- Branch line shall be low temperature seamless pipes of equivalent grade to match with pressure and temperature rating.
- Transition piece has to be maintained between two different grade and thickness of line pipes.
- The minimum diameter used shall be ½". The pipes having nominal diameters ¼", 3/8", 1 ¼", 2 ½", 5", 7" shall not be used. If vessel has connections at these diameters the piping from the vessels shall be increased to the next largest diameter. Pipe size of 18" and above shall be welded type.
- All pipes 2" and below shall also be as per PMS

## **12.4 FITTINGS**

### **Fittings up to 1 ½" diameter**

- Generally the fittings up to 1 ½" diameter shall be socket welding type made of forged steel.
- Malleable cast iron fittings are not allowed.

### **Fittings of 2" or more in diameter**

- Generally the fittings used for piping 2" or larger in diameter shall be made of the Butt Welding ends.
- Elbow shall have radius  $R = 1.5D$ .
- Fittings up to 16" size shall be seamless and 18" & beyond shall be welded.

### **Branch connections (General)**

- Branch connections shall be as per PMS (Piping Material Specification).
- All fittings 2" and below size shall be as per PMS

## **12.5 FLANGES**

- Welding neck flanges shall be generally used for sizes 2" and more.
- Socket welding shall be used for sizes less than or equal to 1 ½" as per piping class.
- The dimensions of flanges shall comply with ANSI B 16.5 for diameter up to 24".

## **12.6 GASKET AND BOLTS**

- The types to be used shall be as per piping material specification.

## **12.7 VALVES**

Application of various types of valves shall be as follows:

### **Valve Type**

Globe

Ball

Check

### **Typical Application**

Throttling

On/off, Isolation (on main line)

Uni-directional flow

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 47 of 54	



All valves shall comply with the requirements of API 6D/ relevant PMS. In order to minimize potential leak sources, valves used in mainline shall be with butt-weld ends. Valve installed within the terminal to isolate the mainline/ pipeline shall also be provided with butt welding ends. However terminal valves shall be flanged ends. Flanges may be used where frequent access or removal of equipment is required.

- All main line valves shall be double block and bleed type, double piston effect for low temperature application.
- For underground services, fully welded valves shall be used and for above ground services flanged type valves shall be used in station piping.
- Stem extensions where specified in the requisition shall be to the proven vendor standard. The stem extensions height to be decided by the engineering consultant which shall be normal operating height up to chest level from the finished ground level.
- The first isolation valves from the mainline shall be welded end ball valve.
- All isolation valves shall be equipped with spectacle blind at downstream of the valve.
- Valves shall be Top entry or Side entry as per valve data sheet.
- All SV valves on main line shall be operated by remote SCADA system.
- The face-to-face dimensions of valves shall be based on ANSI 16.10.
- Hand wheel made of aluminum alloy are not allowed.
- All soft-seated valves shall be fire safe as per API 607(latest edition) or API 6FA (latest edition).
- Ball valves shall be floating ball type / trunnion mounted type as per following:

RATING	SIZE	TYPE
150#, 300# , 600#	1.5" and below	Floating Ball
	2" and above	Trunnion mounted

- Generally valves up to 1-½" diameter shall have socket welding ends.
- Valves 2" or more in diameter shall be flanged, unless otherwise specified.
- Branch connection details: Branch connections shall be in accordance with piping material specification attached elsewhere in the bid.
- Installation and mounting of instruments shall be as per fabrication and installation specification.

- Underground valves/ pipes shall be coated with solid epoxy 1000 microns/ Powercrete R95.

## **12.8 VENTS AND DRAINS**

- The venting arrangements in station should be ball and globe combination.
- Hydrostatic test vent connections shall be in accordance with piping material specification. Vents are not required on lines, which are pneumatically tested and may be omitted on alloy piping and on lines handling corrosive commodities. Vent size shall be not less than ¾".
- Piping and equipment shall be sufficiently drained at all low points to remove all liquid from the system. Drain shall be valve fitted and shall not be less than ¾".

## **12.9 SITE AND ENVIRONMENTAL DATA**

The site and environmental data attached elsewhere in the bid shall be referred for this purpose.

## **12.10 BATTERY LIMITS**

Battery limits for the stations shall be as per the drawings attached in the bid.

## **12.11 PIPING LAYOUT DESIGN GUIDES**

### **A. LAYOUT**

- All piping shall be routed in an orderly manner and grouped in banks wherever possible to provide an economical layout and have the minimum number of fittings consistent with ease of support and with the proper provision for expansion and flexibility and ease of maintenance.
- Where possible piping shall be grouped and run on sleepers for ease of supporting.
- Piping to be arranged for ease of inspection and servicing. Maintenance areas are to be kept clear of piping as far as possible. Piping shall be designed so that vessel connections and other pertinent components can be isolated for safe maintenance.
- Piping or equipment requiring occasional cleaning or maintenance shall be provided with break flanges for dismantling.
- All components requiring operation or maintenance, where practical shall be located where they can be operated or serviced conveniently. Access shall be provided to such components if they are located out of reach from platform.
- The piping arrangement shall provide for isolation by operation of valves or other components to accomplish safe isolation.
- Small instrument tubing and piping shall be adequately supported and protected from damage by impact.
- Bypass spools in piping shall be designed to permit the removal of the components bypassed without removing isolating block valves. A drain valve shall be provided to drain liquids between isolating valves.
- Connections from the header for air, nitrogen, fuel gas will be from the top and liquids to be either from the side or bottom.

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 49 of 54	

- Control valves, relief valves shall be accessible from equipment or ground levels and grouped at main operating levels if possible. Valve stems should not be positioned below a horizontal centerline.
- Bracing and supports for pressure relief valve risers shall be designed to prevent vibrations during operation and to permit independent removal of pressure relief valve from piping systems.
- Pockets in lines including dead legs shall be avoided at all times.
- In the event this is not possible, all gas traps shall have accessible plugged vents and liquid traps shall have accessible plugged valve drains.
- Circumferential butt welds shall be separated by the maximum possible distance. For piping of sizes 4" and above shall be no less than 100mm apart or 5x W.T. whichever is greater. For piping 3" and below, minimum spacing shall be one pipe diameter.
- Bolt holes on fabricated piping items shall straddle the vertical and North / South center lines unless otherwise specified on the piping drawing.
- Changes in pressure rating in piping system shall be made at valves, a valve separating two different pressure rated systems shall carry the rating of higher-pressure system.
- Branching for instrument gas or air systems shall have block valves at the primary header.
- Control Valves shall be installed with the actuator in a vertical upward position. Manifold arrangements shall consider access, clearance, maintenance and removal of control valve without removing of stop valves. Control valve manifold shall preferably be located within view of associated instruments.
- The clearance between two pipes shall be the minimum of flanges to pipe distance plus 25 mm, or insulated flange to pipe insulation plus 25mm, in case where the two pipes are insulated, with the flanges staggered. Consideration shall be given to the expansion / contraction in spacing of pipes.
- The minimum clearance between hand wheels on valve manifolds shall be 75mm.
- Minimum clearance for personnel access ways shall be as follows:
  - Overhead clearance : 2.2 m
  - Horizontal clearance : 0.750 m
- All allocated areas for safety access, service, maintenance and operation shall be kept clear of piping or any other obstructions.
- Block valves in pipe work connected to equipment shall be installed as close to the equipment as practical.
- Locked open (or closed) valves should have a stainless-steel tag shall be attached to the stem, bearing the following:

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 50 of 54	

**B. SPECTACLE BLINDS**

- Spectacle blinds shall be provided as per the requirements shown in P&IDs.
- Spectacle blinds assembly shall be provided with jackscrews. All heavy flanges 12" NPS and above shall be provided with jackscrew holes for easy removal of flanges.

**C. VENTS AND DRAINS**

- Valve vents and drains (bleeds) shall be in accordance with process requirements as shown on the piping and instrument diagrams. They shall generally be provided at control valve sets, level controller and gauge glass hook-ups and where liquid / gas can be trapped between isolating valves.
- For pressure testing, all piping low points shall be drained by a valves connection and in general, all high points shall be vented by plugged, capped or flanged connection in accordance with the piping specification.

**D. PIPING FLEXIBILITY/STRESS ANALYSIS**

- All piping shall be designed for thermal expansion under start up, operating and shut down conditions without over stressing the piping, valves or equipment. Provisions for expansion shall normally be made with bends and offsets.
- All piping shall be adequately supported, guided or anchored so as to prevent undue vibration, deflection or loads on connected equipment's. Equipment's/ valves requiring periodical maintenance shall be supported in such a way that the valves and equipment can be removed with minimum temporary pipe supports.

**E. PIPING MATERIAL SPECIFICATION**

All procurement of materials shall be as per (PMS) and specifications indicated in PMS.

**F. UTILITY REQUIREMENTS**

Utilities like Power, Water etc. shall be provided up to a certain point by the purchaser, the further distribution has to be taken care by the contractor.

**G. CLEARANCE AND ACCESSIBILITY**

All equipment, structure, platform, piping and its support shall be arranged to provide the following minimum clearance:

**Overhead Clearance (Vertical)**

- Maintenance passageways and walkways : 2200mm
- Clearance between bottom of pipe and top of grade level : 300mm
- Horizontal Clearance : 750 mm

**H. EXITS**

The piping arrangement shall be such that, so as to facilitate easy exit in case of emergency.

**I. PLATFORMS. LADDERS AND STAIRWAYS**

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 51 of 54	

- Platforms, ladders and stairways shall be minimized consistent with access and safety requirements.
- Elevated stations requiring attention for operation and/or maintenance shall be supplied with a permanently fixed ladder and/or platform. Maintenance platforms shall be provided for all pressure vessels and other relief valves over 2000 mm above ground level. Access is not required to equipment nozzles where flanges are provided only for initial assembly of the piping.
- Gauges, instrumentation, cable trays and small-bore piping shall not interfere with access to area.
- Access and permanent maintenance facilities shall be provided for all plant and equipment subject to regular maintenance.
- On racks and pipe ways, consideration shall be given to space allocation for future piping.

## **J. EQUIPMENT**

- Equipment Fixing (General)
- Permanently fixed equipment shall be supported on the ground / civil structure as applicable.
- Platforms and Access
- Elevation of platform to be established for access to instruments, valves and manway as per good engineering practices if required.
- Run piping at a common BOP elevation for ease of supporting.
- Minimum dimension from grade level to be 500 mm BOP or insulation.

## **K. INSTRUMENTS**

### **i. Pressure Instruments**

Local pressure indicators shall be visible from platform or permanent ladder. Gauge glasses shall be accessible from a platform, or a ladder.

### **ii. Temperature Instruments**

Temperature elements or thermo wells shall be accessible from grade level, platforms or permanent ladder.

### **iii. Control Valves**

- Control valves shall generally be installed in a horizontal line and the actuator in a vertical position. Variations shall be approved by the design Engineer.
- Control valves shall be easily accessible from the grade or permanent platform and be conveniently located for ease of operation, maintenance and removal.

### **iv. Safety valves**

Safety relief valves shall be installed vertically and as close as possible to the equipment or piping to be protected. If for installation reasons (e.g. accessibility) the inlet connection length of safety valves has to be larger than usual, the pressure drop

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 52 of 54	

in the related section of pipe must be checked. Inlet and outlet lines to relief valves shall have full bore lock open ball valves.

### **13. GUIDELINES-PREPARATION OF PIPING DRAWINGS**

#### **A. TITLE BLOCKS**

- At least following information shall be reflected in the TITLE BLOCK.
- The title of document, including the contract name.
- The document serial number including the contract number.
- The date and revision number of documents.
- The purpose of issue of document with the signature / initials of the persons, who drafted, checked and approved the document.

#### **B. REVISIONS**

Revisions shall be clearly identified on all documents / drawings and modified portions shall be clouded in case of drawings and outlined ( $\Delta$  shown with Revision) in case of documents.

#### **C. LIST OF DRAWINGS**

All documents shall be listed. From the list it should be possible to keep track of various issues and revisions of the documents. The list shall be regularly updated to reflect the latest revisions based on project requirements.

#### **D. SCALES**

- Equipment Layouts - 1:50, 1:75
- Piping plans / Support plans - 1:50
- The metric system shall be used for all drawings.
- True north and plant north to be shown. Nozzle with size, rating, orientation, to be marked on equipment layout for installation of equipment,
- The piping plan shall provide all information required for installation of piping. Sectional views and details to be drafted. Line marking shall be as per P&ID.
- Pipe support shall be marked on piping plans and support drawings shall be furnished separately for OWNER's review / information. The support arrangement shall be as per the Pipe Support Standards attached elsewhere in the bid.
- Piping arrangement inside Vendor's skid not required to be shown on piping GAD's.
- Piping up to 12" NB diameter shall be shown by single lines. Piping 14" NB or more shall be shown by double lines. All piping lines shall be identified as shown in P&ID. The direction of flow and any insulation and tracing shall be indicated.

### **14. PROCESS**

For Process part Refer Process Design Basis Refer Doc No C221052-00-PP-DB-1001 and P&IDs

 Energising Quality	PIPELINE & PIPING DESIGN BASIS	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DB-2001	D1
		Page 53 of 54	

**15. ELECTRICAL**

For Electrical refer Electrical Design Basis Refer Doc No C221052-00-EL-DB-4001

**16. INSTRUMENTATION & TELECOMMUNICATION**

Refer Instrumentation Design Basis Refer Doc No C221052-00-IN-DB-5001

**17. CIVIL**

Refer Instrumentation Design Basis Refer Doc No C221052-00-CS-DB-6001

**18. QUALITY CONTROL**

All the pressure retaining components shall be procured under strictly as per the purchase requirement and quality control procedure duly approved by owner/owner's representative. The stage inspection shall be witnessed by TPIA appointed by supplier/contractors, who will issue the 3.2 certificate as per EN 10204.

Owner / Owner's representative shall witness all the final inspection of the critical components such as Line pipes, valves, skid, vessels, pumps etc. as per the prescribed and approved Quality Assurance Plan.





## NORTH EAST GAS GRID PHASE-III OF IGGL



### PIPING MATERIAL SPECIFICATION

CLIENT  
JOB NO

C221052

TOTAL  
SHEETS

31

DOCUMENT NO

C221052

00

PP

PMS

2001

## INDRADHANUSH GAS GRID LIMITED

### PIPING MATERIAL SPECIFICATION

D2	01.06.2022	RE-ISSUED FOR BID	RS	AK	MC
D1	18.05.2022	ISSUED FOR BID	SR	AK	MC
REV	DATE	DESCRIPTION	PREP	CHK	APPR

---

## **TABLE OF CONTENTS**

1.0 SCOPE A .....	3
2.0 CODES AND STANDARDS .....	3
3.0 MATERIAL SPECIFICATION .....	3
4.0 CLASS DESIGNATION CODE .....	3
5.0 PIPELINE .....	3
6.0 PIPING .....	4
7.0 FITTINGS .....	4
8.0 BENDS .....	4
9.0 FLANGES .....	4
10.0 GASKETS .....	5
11.0 BOLTING & THREADS .....	5
12.0 THREAD SEALANT .....	5
13.0 VALVES .....	5
14.0 QUICK OPENING END CLOSURE .....	6
15.0 HYDROTESTING VENTS AND DRAINS .....	6
16.0 PIPELINE SPECIATLITY ITEMS .....	6

## **1.0 SCOPE**

This specification covers the requirements of various piping materials used in piping/ pipeline system handling natural gas/ Re-gasified Liquid Natural Gas (RLNG) and associated utilities in the pipeline.

## **2.0 CODES AND STANDARDS**

- 2.1 Pipeline and terminal facilities envisaged as a part of this project shall be designed and engineered primarily in accordance with the provision of ASME B 31.8 – Gas Transmission & Distribution Piping System – Latest edition and OISD Standard 226- Natural Gas Transmission Pipeline and City Gas Distribution Networks.
- 2.2 All codes standards and specifications referred herein shall be the latest edition of such documents.
- 2.3 For sake of brevity, the initials of the society to which the codes are referred are omitted in the specification, for example, B16.5 is a code referring to ANSI/ASME, A 105 is a code referring to ASTM.
- 2.4 In addition, VCS specifications for various piping and pipeline materials shall also be applicable.

## **3.0 MATERIAL SPECIFICATION**

Piping materials specifications are classified for the general purpose of selection of material for the class of services. The maximum design pressure and design temperature together with the fluid in line governs the selection of material specifications. Deviation of materials from class specifications may occur due to specific design condition. These deviations are permissible if they are equal or better than the individual class requirements.

## **4.0 CLASS DESIGNATION CODE**

The piping class designation shall generally consist of three digits numbering system made up of letter, number and letter e.g. A1A, B1A, D1A, etc as follows:

First letter indicates ANSI class rating e.g.,

- |   |   |           |
|---|---|-----------|
| A | - | Class150  |
| B | - | Class 300 |
| D | - | Class 600 |

The middle number indicates differences in the specification within the same rating and material.

The last letter indicates type of material e.g.

A- Carbon Steel

## **5.0 PIPELINE**

The material for line pipe shall be as per the requirements of specification as indicated in Table-1.

## **6.0 PIPING**

- 6.1 Carbon steel pipe shall be made by open hearth, electric furnace or basic oxygen process only. The steel used shall be fully killed and made with fine grain structure. The grade and wall thickness of various sizes of pipes shall be as per piping material specification for the applicable class.
- 6.2 Pipe dimensions shall be in accordance with ANSI B 36.10 for carbon steel pipes and ANSI B 36.19 for stainless steel pipes.
- 6.3 All pipe threads shall conform to American Standard taper as per ANSI B 1.20.1 NPT, unless otherwise specified.
- 6.4 For butt weld end, bevel shall be in accordance with ANSI B 16.25/ API 5L as applicable.

## **7.0 FITTINGS**

- 7.1 Fully killed carbon steel shall be used in the manufacture of fittings.
- 7.2 Threaded joints, if used, shall conform to American Standard taper as per ANSI 1.20.1 NPT.
- 7.3 Dimensions of socket welded/screwed fittings shall conform to ASME B 16.11.
- 7.4 Dimensions of butt welded carbon steel fittings shall be as per ASME B 16.9/ MSS-SP-75, as applicable.
- 7.5 Bore of socket welded fittings shall suit outside diameter (OD) of pipe and its thickness.
- 7.6 Butt welding ends shall conform to ANSI B 16.25/ API 5L. In case of difference in thickness of matching ends, requirements of ASME B 31.8 shall apply.
- 7.7 Integrally reinforced forged branch fittings such as Sockolet, Thredolet, Weldolet, Nippolet etc. shall be as per MSS-SP-97. Fittings not covered in ASME B16.9 and MSS-SP-97 shall conform to manufacturer's standard.
- 7.8 Fittings thickness tolerances shall match pipe thickness tolerance.

## **8.0 BENDS**

- 8.1 Unless otherwise specified for process piping, elbow of radius  $R = 1.5 D$  shall only be used.
- 8.2 The radius of cold field bends shall not be less than 30 times the nominal diameter for pipes upto nominal diameter of 16" and shall not be less than 40 times the nominal diameter for pipes of nominal diameter of 18" and above. Limited use of long radius bends ( $R = 6D$ ) may be permitted for reason of space constraints.

## **9.0 FLANGES**

- 9.1 Flange rating shall be same as ANSI B 16.5/ MSS-SP-44/ B 16.47 series A as specified.
- 9.2 Dimensions of flanges shall be in accordance with ANSI B16.5/ B16.47 Series A, as applicable.
- 9.3 Neck of weld neck (WN) flanges shall suit pipe bore and thickness.
- 9.4 Bore of socket welded (SW) flanges shall suit pipe O.D. and its thickness.
- 9.5 Threads for screwed flanges, if used, shall conform to American Standard taper as per ANSI B 1.20.1 NPT.

- 9.6 Sizes for blind flanges shall be indicated by nominal pipe size and schedule.
- 9.7 Carbon steel flanges faces shall have smooth finish as indicated in the material specification. Flanges faces shall have smooth finish to 125-250 micro inches AARH as per MSS-SP-6.
- 9.8 Butt welding ends of WN flanges shall conform to ANSI B 16.25.
- 9.9 Spectacle blind/spacer & blinds shall be in accordance with ASME B 16.48/ manufacturer's standard. Spectacle blind shall be used for sizes up to 8" NB and spacer & blind for 10" & above shall be used.
- 9.10 Two jack screws 180° apart shall be provided for all spectacle blind assemblies. The jack screws shall be as per VCS's standard.

## **10.0 GASKETS**

- 10.1 Spiral wound metallic gasket shall conform to B 16.20 and API 601 shall be provided with graphite filler. All spiral wound gaskets shall be provided with stainless steel centering ring.

## **11.0 BOLTING & THREADS**

- 11.1 Nuts for stud bolts shall be American Standard Hexagon Heavy Series and double chamfered.
- 11.2 Dimension and tolerances for stud bolts and nuts shall be as per ANSI B 18.2.1 and 18.2.2 with full threading to ANSI B 1.1 Class 2A thread for bolts and Class 2B for nuts. Diameter and length of stud bolts shall be as per ASME B 16.5/ASME B16.47 with full threading.
- 11.3 Threads for nuts shall be as per ANSI B 1.1 as follows,
- |                                   |   |        |
|-----------------------------------|---|--------|
| Nuts for stud bolts dia ¼" to 1"  | : | UNC-2B |
| Nuts for stud bolts dia 1⅛" to ¾" | : | 8UN-2B |
- 11.4 Threads for stud bolts shall be as per ANSI B 1.1, as follows:
- |                          |   |        |
|--------------------------|---|--------|
| Stud bolts dia ¼" to 1"  | : | UNC-2A |
| Stud bolts dia 1⅛" to ¾" | : | 8UN-2A |
- 11.5 Heads of jack screws shall be heavy hexagonal type. Jack screw end shall be rounded. Stud bolts shall be fully threaded with two hexagonal nuts.

## **12.0 THREAD SEALANT**

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

## **13.0 VALVES**

- 13.1 Valve ends shall be as per piping material specifications (Appendices).
- 13.2 Flange dimensions and face finish of flanged end valves shall conform to clause 9.0 of this specification.
- 13.3 Butt welding ends of Butt Welded valves shall conform to ANSI B 16.25.
- 13.4 Face to face and end to end dimensions shall conform to applicable standards.
- 13.5 Buried valves on mainline shall be provided with stem extension, sealant, vent/drain & shall have butt welded ends.
- 13.6 Sectionalizing Valves (Block valves) installed on the main pipeline shall be Ball valves

with butt welded ends and shall be full bore to allow smooth passage of cleaning pigs as well as intelligent pigs.

- 13.7 Unless specified otherwise valves shall confirm to the following standards:

**Screwed/ Socket welded/ Flanged end valves (1½" and below)**

Ball Valves	:	BS 5351 (latest)
Plug Valves	:	BS 5351 (latest)
Globe Valves	:	BS 5351 (latest)
Gate Valves	:	API 602 (latest)

**Flanged/ Butt weld end valves (2" and above)**

Ball Valves	:	API 6D
Plug Valves	:	API 6D
Check Valves	:	API 6D
Globe Valves	:	BS 1873
Gate Valves	:	API 6D

- 13.8 Manual Valve operators shall be as indicated below, unless specified otherwise in the P&ID.

**a) Gate Valves**

For ANSI class 150 and 300	Hand wheel operated for size ≤ 12" NB. Gear operated for size ≥ 14" NB.
For ANSI class 600	Hand wheel operated for size ≤ 10" NB. Gear operated for size ≥ 12" NB.

**b) Ball and Plug Valves**

For ANSI class 150, 300, 600 and 900 - Wrench operated for size ≤ 4" NB.  
Gear operated for size ≥ 6" NB.

**c) Actuated Valves** – Actuated valves shall be as per P & ID.

**14.0 QUICK OPENING END CLOSURE**

Quick opening end closure to be installed on scraper traps shall be equipped with safety locking devices in compliance with section VIII, division 1, UG-35.2 of ASME Boiler and Pressure Vessel code.

**15.0 HYDROTESTING VENTS AND DRAINS**

High point vents and low point drains required for the purpose of hydro testing shall be of size 3/4" and consist of sockolet, plug/ ball valve for vent, globe/ ball valve for drain, flange & blind flange.

**16.0 PIPELINE SPECIALTY ITEMS**

Pipeline specialty items viz. scraper traps, flow tees, insulating joints, LR bends, QOEC for venting shall be as per respective data sheets, specifications and project specific drawing showing mainline & terminal materials.

**TABLE-1**

**PIPE WALL THICKNESS DETAILS FOR MAINLINE/ SPURLINE**

<b>Sl. No.</b>	<b>Pipe Material Description</b>	<b>Size (NB)</b>	<b>Thickness (mm)</b>	<b>Length</b>
1	API 5L Gr. X-70, PSL-2	12"	7.14	As per SOR Quantity
2	API 5L Gr. X-70, PSL-2	12"	8.38	As per SOR Quantity
3	API 5L Gr. X-70, PSL-2	12"	9.537	As per SOR Quantity

**TABLE-2**

**INDEX OF PIPING MATERIAL SPECIFICATIONS**

<b>Class</b>	<b>Service</b>	<b>C.A. (mm)</b>	<b>Basic material</b>	<b>Design Code</b>	<b>Enclosed as</b>
D1A	Natural Gas	1.5	ASTM A 106 Gr. B/ API 5L Gr. B	ASME B31.8	Appendix-I
D4A	RLNG	1.5	ASTM A 333 Gr. 6	ASME B31.8	Appendix-II
B1A	Natural Gas	1.5	ASTM A 106 Gr. B/ API 5L Gr. B	ASME B31.8	Appendix-III
B4A	RLNG	1.5	ASTM A 333 Gr. 6	ASME B31.8	Appendix-IV
A1A	Natural Gas	1.5	ASTM A 106 Gr. B/ API 5L Gr. B	ASME B31.8	Appendix-V
A4A	RLNG	1.5	ASTM A 333 Gr. 6	ASME B31.8	Appendix-VI



## **APPENDIX - I**

<b>ANSI CLASS</b>	:	<b>600# (D1A)</b>
BASE MATERIAL	:	Carbon Steel (Material Group 1.1)
CORROSION ALLOWANCE	:	1.5 MM
SPECIAL REQUIREMENT	:	Non IBR

## **TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq.cm g) RATINGS**

<b>TEMP</b>	-29	38	50	100	150	200	250
<b>PRESS</b>	104.14	104.14	102.2	95.04	91.97	89.35	85.07

## **SERVICE**

Natural Gas, Utilities (water, inst. air, plant air, nitrogen gas, carbon dioxide)

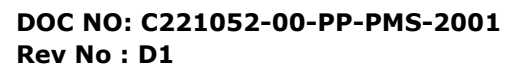
## **NOTES**

1. All vents and drains shall be provided with plug valve unless mentioned otherwise in P&IDs.
2. Fittings shall be of seamless construction up to 16" and shall be of welded construction 18" and above.
3. Wall thickness for line pipe used in various sections shall be as per Table-1 of PMS.
4. Ball valve to be used in mainline shall have butt welded ends except for the valves used for hot tapping which shall be one side butt welded and other side flanged.
5. Procurement of materials shall be as per detailed relevant specifications.
6. Design pressure and temp. for pipeline and related facilities are 92 kg/cm<sup>2</sup>g & (-29° to +65° C) respectively.
7. Pressure-temperature ratings indicated are for flanges only in accordance with ANSI B 16.5.
8. For valves, steel pipe and associated steel components of 2" and larger notch toughness properties shall be as specified in relevant specifications/ codes, VCS's standard technical specifications and data sheets etc.
9. At stations, branch connections shall be as per branch connection table below.
10. All Butt welds shall be 100% radiographed.
11. 100% of socket weld shall be subjected MPI/ DPT.

12. Pressure-Temperature rating of valve body shall be as per API 6D.
13. Pipeline design code – ASME B 31.8 & OISD 226.
14. For pipeline specialty items (scraper trap, flow tee, IJ, LR Bends etc.) and their material descriptions refer data sheet of respective items.

### **STATION PIPING MATERIAL SPECIFICATIONS**

ITEM	SIZE	DESCRIPTION
Maintenance joints	ALL	Flanged, to be kept minimum
Pipe joints	1.5" & BELOW	Socket Weld
	2.0" & ABOVE	Butt welded
Drains	ON LINES $\leq 1.5"$	Refer std. SD-PI-019
	ON LINES $\geq 2.0"$	As per P&ID or 0.75". Refer std. SD-PI-018
Vents	ON LINES $\leq 1.5"$	Refer std. SD-PI-019
	ON LINES $\geq 2.0"$	As per P&ID or 0.75". Refer std. SD-PI-018
Temp. Connection	1.5"	Flanged, installation as per std. SD-PI-014 & 015, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. SD-PI-011, 012 & 013





## PIPING MATERIAL SPECIFICATION

PIPELINE/ PIPING DESIGN CODE		ASME B 31.8/ OISD 226									DESIGN FACTOR – 0.5									
ITEM	NOMINAL DIAMETER (INCHES)	0.50	0.75	1.00	1.50	2.00	3.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	24.0	28.0	30.0	
PIPE	WALL THICKNESS (MM/SCH)	S160	S180	S80	S80	S80	XS	XS	XS	14.3	XS	S60	14.3	17.5	S60	S60	19.1	22.2	23.8	
	MATERIAL	ASTM A 106 GR.B				ASTM A 106 GR.B (CHARPY)				API 5L GR.B PSL2		API 5L GR.X-52 PSL2								
	DIMENSION STD.	B 36.10									API 5L									
	METHOD OF MAUFACTURE, ENDS	SEAMLESS PE				SEAMLESS BE									BE SAW					
FLANGE	MATERIAL AND GRADE	ASTM A 105				ASTM A 105 (CHARPY)					ASTM A 694 GR. F-52 (CHARPY)									
	TYPE, FLANGE FACING	SW. RF 125 AARH				WN. THICKNESS TO MATCH PIPE THICKNESS, RF 125AARH														
	DIMENSION STD.	B 16.5																	B 16.47 A	
BLIND FLANGE	MATERIAL AND GRADE	ASTM A 105				ASTM A 105 (CHARPY)														
	FLANGE FACING	RF 125 AARH																		
	DIMENSION STD.	B 16.5																	B 16.47 A	
BLANK	MATERIAL AND GRADE	ASTM A 105				ASTM A 105 (CHARPY)									ASTM A 516 GR. 70					
	FLANGE FACING	RF 125 AARH																		
	DIMENSION STD.	B 16.48													MNF’ STD					
	TYPE	FIG. 8 FLANGE										SPACER & BLIND								
BOLTING	STUD BOLTS (FULLY THREADED)	A 193 GR B7, B-18.2																		
	NUTS (HEAVY HEXAGONAL)	A 194 GR 2H, B-18.2																		
GASKET	TYPE, MATERIAL AND DMN STD.	SPIRAL 600#, SP. WND SS316+GRAPHITE FILLED, B-16.20-ANSI B16.5																		
ELBOW-90 ELBOW-45	MATERIAL	ASTM A 105				ASTM A 234 GR.WPB (CHARPY)					MSS-SP-75 GR. WPHY-52									
	END DETAIL	SW,6000#		SW,3000#		BW, 1.5D														
	DIMENSION STD.	B-16.11				B-16.9					MSS-SP-75									
T-EQUAL T-RED	MATERIAL	ASTM A 105				ASTM A 234 GR.WPB (CHARPY)					MSS-SP-75 GR. WPHY-52									
	END DETAIL	SW,6000#		SW,3000#		BW														
	DIMENSION STD.	B-16.11				B-16.9					MSS-SP-75									
CAP	MATERIAL	ASTM A 105				ASTM A 234 GR.WPB (CHARPY)					MSS-SP-75 GR. WPHY-52									
	END DETAIL	SCRF6000		SCRF3000		BW, THICKNESS TO MATCH PIPE THICKNESS														
	DIMENSION STD.	B-16.11				B-16.9					MSS-SP-75									
FITTING	MATERIAL	ASTM A 105				ASTM A 234 GR.WPB (CHARPY)					MSS-SP-75 GR. WPHY-52									
	END DETAIL	SW,6000#		SW,3000#		BW, THICKNESS TO MATCH PIPE THICKNESS														
	DIMENSION STD.	B-16.11				B-16.9					MSS-SP-75									
	TYPE	COUPLING FULL, HALF LH. RED.				RED. CON. RED. ECC.														
O’LET	MATERIAL	ASTM A 105				ASTM A 105 (CHARPY)					ASTM A 694 GR.F-52 (CHARPY)									
	END DETAIL	SW,6000#		SW,3000#		BW					BW									
	DIMENSION STD.	MSS-SP97				MSS-SP97					MSS-SP97									
	TYPE	SOCKOLET				WELDOLET					WELDOLET									

**APPENDIX-II**

**ANSI CLASS** : **600# (D4A) LOW TEMP SERVICE**  
**BASE MATERIAL** : Carbon Steel (Material Group 1.3)  
**CORROSION ALLOWANCE** : 1.5 MM  
**SPECIAL REQUIREMENT** : Non IBR

**TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq.cm g) RATINGS**

<b>TEMP</b>	-45	38	50	100	150	200
<b>PRESS</b>	97.89	97.89	96.77	92.48	89.63	87.02

**SERVICE**

RLNG

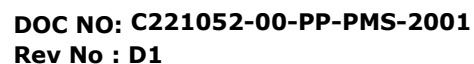
**NOTES**

1. All vents and drains shall be provided with plug valve unless mentioned otherwise in P&IDs.
2. Fittings shall be of seamless construction up to 16" and shall be of welded construction 18" and above.
3. Wall thickness for line pipe used in various sections shall be as per Table-1 of PMS.
4. Ball valve to be used in mainline shall have butt welded ends except for the valves used for hot tapping which shall be one side butt welded and other side flanged.
5. Procurement of materials shall be as per detailed relevant specifications.
6. Design pressure and temp. for pipeline and related facilities are 92 kg/cm<sup>2</sup>g & (-45° to +65° C) respectively.
7. Pressure-temperature ratings indicated are for flanges only in accordance with ANSI B 16.5.
8. For valves, steel pipe and associated steel components of 2" and larger notch toughness properties shall be as specified in relevant specifications/ codes, VCS's standard technical specifications and data sheets etc.
9. At stations, branch connections shall be as per branch connection table below.
10. All Butt welds shall be 100% radiographed.
11. 100% of socket weld shall be subjected MPI/ DPT.

12. Pressure-Temperature rating of valve body shall be as per API 6D.
13. Pipeline design code – ASME B 31.8 & OISD 226.
14. For pipeline specialty items (scraper trap, flow tee, IJ, LR Bends etc.) and their material descriptions refer data sheet of respective items.

## **STATION PIPING MATERIAL SPECIFICATIONS**

ITEM	SIZE	DESCRIPTION
Maintenance joints	ALL	Flanged, to be kept minimum
Pipe joints	1.5" & BELOW	Socket Weld
	2.0" & ABOVE	Butt welded
Drains	ON LINES $\leq 1.5"$	Refer std. SD-PI-019
	ON LINES $\geq 2.0"$	As per P&ID or 0.75". Refer std. SD-PI-018
Vents	ON LINES $\leq 1.5"$	Refer std. SD-PI-019
	ON LINES $\geq 2.0"$	As per P&ID or 0.75". Refer std. SD-PI-018
Temp. Connection	1.5"	Flanged, installation as per std. SD-PI-014 & 015, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. SD-PI-011, 012 & 013



## Page 14 of 31





## PIPING MATERIAL SPECIFICATION

PIPELINE/ PIPING DESIGN CODE		ASME B 31.8/ OISD 226									DESIGN FACTOR – 0.5										
ITEM	NOMINAL DIAMETER (INCHES)	0.50	0.75	1.00	1.50	2.00	3.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0			
PIPE	WALL THICKNESS (MM/SCH)	S160	S160	XS	XS	XS	STD	XS	XS	XS	XS	19.0	20.6	22.2	25.4	22.2	25.4	26.3			
	MATERIAL	ASTM A333 GR.6																			
	DIMENSION STD.	B 36.10																			
	METHOD OF MAUFACTURE, ENDS	SEAMLESS PE					SEAMLESS BE									BE SAW					
FLANGE	MATERIAL AND GRADE	ASTM A 350 GR. LF2, CL-I																			
	TYPE, FLANGE FACING	SW. RF 125 AARH					WN. THICKNESS TO MATCH PIPE THICKNESS, RF 125AARH														
	DIMENSION STD.	B 16.5																			
BLIND FLANGE	MATERIAL AND GRADE	ASTM A 350 GR. LF2, CL-I																			
	FLANGE FACING	RF 125 AARH																			
	DIMENSION STD.	B 16.5																			
BLANK	MATERIAL AND GRADE	ASTM A 350 GR. LF2, CL-I																			
	FLANGE FACING	FF 125 AARH																			
	DIMENSION STD.	B 16.48																			
	TYPE	FIG. 8 FLANGE										SPACER & BLIND									
BOLTING	STUD BOLTS (FULLY THREADED)	A 320 GR L7, B-18.2																			
	NUTS (HEAVY HEXAGONAL)	A 194 GR 4, B-18.2																			
GASKET	TYPE, MATERIAL AND DMN STD.	SPIRAL, SP. WND SS316+GRAPHITE FILLED, B-16.20-ANSI B16.5																			
ELBOW-90 ELBOW-45	MATERIAL	ASTM A350 GR.LF2					ASTM A 420 GR. WPL6									ASTM A 420 GR. WPL6.W					
	END DETAIL	SW,6000#			SW,3000#		BW, 1.5D														
	DIMENSION STD.	B-16.11					B-16.9														
T-EQUAL T-RED	MATERIAL	ASTM A350 GR.LF2					ASTM A 420 GR. WPL6									ASTM A 420 GR. WPL6.W					
	END DETAIL	SW,6000#			SW,3000#		BW														
	DIMENSION STD.	B-16.11					B-16.9														
CAP & PLUG (UPTO 1.5")	MATERIAL	ASTM A350 GR.LF2					ASTM A 420 GR. WPL6									ASTM A 420 GR. WPL6.W					
	END DETAIL	SCRF6000			SCRF3000		BW, THICKNESS TO MATCH PIPE THICKNESS														
	DIMENSION STD.	B-16.11					B-16.9														
FITTING	MATERIAL	ASTM A350 GR.LF2					ASTM A 420 GR. WPL6									ASTM A 420 GR. WPL6.W					
	END DETAIL	SW-6000			SW-3000		BW, THICKNESS TO MATCH PIPE THICKNESS														
	DIMENSION STD.	B-16.11					B-16.9														
	TYPE	COUPLING FULL, HALF LH., RED.					RED. CON. RED. ECC.														
O'LET	MATERIAL	ASTM A350 GR.LF2																			
	END DETAIL	SW,6000#			SW,3000#		BW														
	DIMENSION STD.	MSS-SP97					MSS-SP97														
	TYPE	SOCKOLET					WELDOLET														

**APPENDIX-III**

<b>ANSI CLASS</b>	:	<b>300# (B1A)</b>
<b>BASE MATERIAL</b>	:	Carbon Steel (Material Group 1.1)
<b>CORROSION ALLOWANCE</b>	:	1.5 MM
<b>SPECIAL REQUIREMENT</b>	:	Non IBR

**TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq.cm g) RATINGS**

<b>TEMP</b>	-29	38	50	100	150	200
<b>PRESS</b>	52.1	52.1	51.10	47.52	45.98	44.60

**SERVICE**

Natural Gas, Utilities (water, inst. air, plant air, nitrogen gas, carbon dioxide)

**NOTES**

1. All vents and drains shall be provided with plug valve unless mentioned otherwise in P&IDs.
2. Fittings shall be of seamless construction up to 16" and shall be of welded construction 18" and above.
3. Wall thickness for line pipe used in various sections shall be as per Table-1 of PMS.
4. Ball valve to be used in mainline shall have butt welded ends except for the valves used for hot tapping which shall be one side butt welded and other side flanged.
5. Procurement of materials shall be as per detailed relevant specifications.
6. Design pressure and temp. for pipeline and related facilities are 49 kg/cm<sup>2</sup>g & (-29° to +65° C) respectively.
7. Pressure-temperature ratings indicated are for flanges only in accordance with ANSI B 16.5.
8. For valves, steel pipe and associated steel components of 2" and larger notch toughness properties shall be as specified in relevant specifications/ codes, VCS's standard technical specifications and data sheets etc.
9. At stations, branch connections shall be as per branch connection table below.
10. All Butt welds shall be 100% radiographed.
11. 100% of socket weld shall be subjected MPI/ DPT.



12. Pressure-Temperature rating of valve body shall be as per API 6D.
13. Pipeline design code – ASME B 31.8 & OISD 226.
14. For pipeline specialty items (scraper trap, flow tee, IJ, LR Bends etc.) and their material descriptions refer data sheet of respective items.

### **STATION PIPING MATERIAL SPECIFICATIONS**

<b>ITEM</b>	<b>SIZE</b>	<b>DESCRIPTION</b>
Maintenance joints	ALL	Flanged, to be kept minimum
Pipe joints	1.5" & BELOW	Socket Weld
	2.0" & ABOVE	Butt welded
Drains	ON LINES $\leq 1.5"$	Refer std. SD-PI-019
	ON LINES $\geq 2.0"$	As per P&ID or 0.75". Refer std. SD-PI-018
Vents	ON LINES $\leq 1.5"$	Refer std. SD-PI-019
	ON LINES $\geq 2.0"$	As per P&ID or 0.75". Refer std. SD-PI-018
Temp. Connection	1.5"	Flanged, installation as per std. SD-PI-014 & 015, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. SD-PI-011, 012 & 013



**DOC NO: C221052-00-PP-PMS-2001**  
**Rev No : D1**

## BRANCH TABLE

T												
	T											
		T										
			T									
				T								
					T							
						T						
							T					
								T				
									T			
										T		
											T	
												T

0.5	0.75	1	1.5	2	3	4	6	8	10	12	14
-----	------	---	-----	---	---	---	---	---	----	----	----

14
12
10
8
6
4
3
2
1.5
1
0.75
0.5

BRANCH PIPE

## RUN PIPE

### CODE DESCRIPTION

T	TEES
W	WELDOLETS
S	SOCKOLETS



## PIPING MATERIAL SPECIFICATION

PIPELINE/ PIPING DESIGN CODE		ASME B 31.8/ OISD226									DESIGN FACTOR – 0.5						
ITEM	NOMINAL DIAMETER (INCHES)	0.50	0.75	1.00	1.50	2.00	3.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	
PIPE	WALL THICKNESS (MM/SCH)	S160	S160	XS	XS	XS	STD	S40	S40	7.9	STD	S40	S40	S40	S40	15.9	
	MATERIAL	ASTM A 106 GR.B				ASTM A 106 GR.B (CHARPY)				API 5L GR.B PSL2							
	DIMENSION STD.	B 36.10								API 5L							
	METHOD OF MAUFACTURE, ENDS	SEAMLESS PE				SEAMLESS BE								BE SAW			
FLANGE	MATERIAL AND GRADE	ASTM A 105				ASTM A 105 (CHARPY)											
	TYPE, FLANGE FACING	SW. RF 125 AARH				WN. THICKNESS TO MATCH PIPE THICKNESS, RF 125AARH											
	DIMENSION STD.	B 16.5															
BLIND FLANGE	MATERIAL AND GRADE	ASTM A 105				ASTM A 105 (CHARPY)											
	FLANGE FACING	RF 125 AARH															
	DIMENSION STD.	B 16.5															
BLANK	MATERIAL AND GRADE	ASTM A 105				ASTM A 105 (CHARPY)											
	FLANGE FACING	FF 125 AARH															
	DIMENSION STD.	B 16.48															
	TYPE	FIG. 8 FLANGE										SPACER & BLIND					
BOLTING	STUD BOLTS (FULLY THREADED)	A 193 GR B7, B-18.2															
	NUTS (HEAVY HEXAGONAL)	A 194 GR 2H, B-18.2															
GASKET	TYPE, MATERIAL AND DMN STD.	SPIRAL 300#, SP. WND SS316+GRAPHITE FILLED, B-16.20-ANSI B16.5															
ELBOW-90 ELBOW-45	MATERIAL	ASTM A 105				ASTM A 234 GR.WPB (CHARPY)											
	END DETAIL	SW,6000#		SW,3000#		BW, 1.5D											
	DIMENSION STD.	B-16.11				B-16.9											
T-EQUAL T-RED	MATERIAL	ASTM A 105				ASTM A 234 GR.WPB (CHARPY)											
	END DETAIL	SW,6000#		SW,3000#		BW, THICKNESS TO MATCH PIPE THICKNESS											
	DIMENSION STD.	B-16.11				B-16.9											
CAP	MATERIAL	ASTM A 105				ASTM A 234 GR.WPB (CHARPY)											
	END DETAIL	SCRF6000		SCRF3000		BW, THICKNESS TO MATCH PIPE THICKNESS											
	DIMENSION STD.	B-16.11				B-16.9											
FITTING	MATERIAL	ASTM A 105				ASTM A 234 GR.WPB (CHARPY)											
	END DETAIL	SW,6000#		SW,3000#		BW, THICKNESS TO MATCH PIPE THICKNESS											
	DIMENSION STD.	B-16.11				B-16.9											
	TYPE	COUPLING FULL, HALF LH., RED.				RED. CON. RED. ECC.											
O’LET	MATERIAL	ASTM A 105				ASTM A 105 (CHARPY)											
	END DETAIL	SW,6000#		SW,3000#		BW											
	DIMENSION STD.	MSS-SP97				MSS-SP97											
	TYPE	SOCKOLET				WELDOLET											

**APPENDIX-IV**

**ANSI CLASS** : **300# (B4A) LOW TEMP SERVICE**  
**BASE MATERIAL** : Carbon Steel (Material Group 1.3)  
**CORROSION ALLOWANCE** : 1.5 MM  
**SPECIAL REQUIREMENT** : Non IBR

**TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq.cm g) RATINGS**

TEMP	-45	38	50	80	100	120	120	150
PRESS	48.95	48.95	48.44	46.72	46.19	45.54	45.54	44.76

**SERVICE**

RLNG

**NOTES**

1. All vents and drains shall be provided with plug valve unless mentioned otherwise in P&IDs.
2. Fittings shall be of seamless construction up to 16" and shall be of welded construction 18" and above.
3. Wall thickness for line pipe used in various sections shall be as per Table-1 of PMS.
4. Ball valve to be used in mainline shall have butt welded ends except for the valves used for hot tapping which shall be one side butt welded and other side flanged.
5. Procurement of materials shall be as per detailed relevant specifications.
6. Design pressure and temp. for pipeline and related facilities are 49 kg/cm<sup>2</sup>g & (-45° to +65° C) respectively.
7. Pressure-temperature ratings indicated are for flanges only in accordance with ANSI B 16.5.
8. For valves, steel pipe and associated steel components of 2" and larger notch toughness properties shall be as specified in relevant specifications/ codes, VCS's standard technical specifications and data sheets etc.
9. At stations, branch connections shall be as per branch connection table below.
10. All Butt welds shall be 100% radiographed.
11. 100% of socket weld shall be subjected MPI/ DPT.



12. Pressure-Temperature rating of valve body shall be as per API 6D.
13. Pipeline design code – ASME B 31.8 & OISD 226.
14. For pipeline specialty items (scraper trap, flow tee, IJ, LR Bends etc.) and their material descriptions refer data sheet of respective items.

**STATION PIPING MATERIAL SPECIFICATIONS**

ITEM	SIZE	DESCRIPTION
Maintenance joints	ALL	Flanged, to be kept minimum
Pipe joints	1.5" & BELOW	Socket Weld
	2.0" & ABOVE	Butt welded
Drains	ON LINES $\leq 1.5"$	Refer std. SD-PI-019
	ON LINES $\geq 2.0"$	As per P&ID or 0.75". Refer std. SD-PI-018
Vents	ON LINES $\leq 1.5"$	Refer std. SD-PI-019
	ON LINES $\geq 2.0"$	As per P&ID or 0.75". Refer std. SD-PI-018
Temp. Connection	1.5"	Flanged, installation as per std. SD-PI-014 & 015, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. SD-PI-011, 012 & 013



## BRANCH TABLE

[illegible]

## RUN PIPE

### CODE DESCRIPTION

T	TEES
W	WELDOLETS
S	SOCKOLETS



# PIPING MATERIAL SPECIFICATION

PIPELINE/ PIPING DESIGN CODE		ASME B 31.8/ OISD226									DESIGN FACTOR – 0.5							
ITEM	NOMINAL DIAMETER (INCHES)	0.50	0.75	1.00	1.50	2.00	3.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0
PIPE	WALL THICKNESS (MM/SCH)	S160	S160	XS	XS	XS	STD	STD	STD	STD	STD	S40	S40	S30	S30	S30	S30	S30
	MATERIAL	ASTM A333 GR.6																
	DIMENSION STD.	B 36.10																
	METHOD OF MAUFACTURE, ENDS	SEAMLESS PE					SEAMLESS BE								BE SAW			
FLANGE	MATERIAL AND GRADE	ASTM A 350 GR. LF2, CL-I																
	TYPE, FLANGE FACING	SW. RF 125 AARH					WN. THICKNESS TO MATCH PIPE THICKNESS, RF 125AARH											
	DIMENSION STD.	B 16.5																
BLIND FLANGE	MATERIAL AND GRADE	ASTM A 350 GR. LF2, CL-I																
	FLANGE FACING	RF 125 AARH																
	DIMENSION STD.	B 16.5																
BLANK	MATERIAL AND GRADE	ASTM A 350 GR. LF2, CL-I																
	FLANGE FACING	FF 125 AARH																
	DIMENSION STD.	B 16.48																
	TYPE	FIG. 8 FLANGE										SPACER & BLIND						
BOLTING	STUD BOLTS (FULLY THREADED)	A 320 GR L7, B-18.2																
	NUTS (HEAVY HEXAGONAL)	A 194 GR 4, B-18.2																
GASKET	TYPE, MATERIAL AND DMN STD.	SPIRAL, SP. WND SS316+GRAPHITE FILLED, B-16.20-ANSI B16.5																
ELBOW-90 ELBOW-45	MATERIAL	ASTM A350 GR.LF2					ASTM A 420 GR. WPL6								ASTM A 420 GR. WPL6.W			
	END DETAIL	SW,6000#			SW,3000#		BW, 1.5D											
	DIMENSION STD.	B-16.11					B-16.9											
T-EQUAL T-RED	MATERIAL	ASTM A350 GR.LF2					ASTM A 420 GR. WPL6								ASTM A 420 GR. WPL6.W			
	END DETAIL	SW,6000#			SW,3000#		BW											
	DIMENSION STD.	B-16.11					B-16.9											
CAP & PLUG (UPTO 1.5")	MATERIAL	ASTM A350 GR.LF2					ASTM A 420 GR. WPL6								ASTM A 420 GR. WPL6.W			
	END DETAIL	SCRF6000			SCRF3000		BW, THICKNESS TO MATCH PIPE THICKNESS											
	DIMENSION STD.	B-16.11					B-16.9											
FITTING	MATERIAL	ASTM A350 GR.LF2					ASTM A 420 GR. WPL6								ASTM A 420 GR. WPL6.W			
	END DETAIL	SW-6000			SW-3000		BW, THICKNESS TO MATCH PIPE THICKNESS											
	DIMENSION STD.	B-16.11					B-16.9											
	TYPE	COUPLING FULL, HALF LH., RED.					RED. CON. RED. ECC.											
O’LET	MATERIAL	ASTM A350 GR.LF2																
	END DETAIL	SW,6000#			SW,3000#		BW											
	DIMENSION STD.	MSS-SP97					MSS-SP97											
	TYPE	SOCKOLET					WELDOLET											

**APPENDIX-V**

<b>ANSI CLASS</b>	:	<b>150# (A1A)</b>
<b>BASE MATERIAL</b>	:	Carbon Steel (Material Group 1.1)
<b>CORROSION ALLOWANCE</b>	:	1.5 MM
<b>SPECIAL REQUIREMENT</b>	:	Non IBR

**TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq.cm g) RATINGS**

<b>TEMP</b>	-29	38	50	100	150	200
<b>PRESS</b>	19.98	19.98	19.57	18.05	16.11	14.07

**SERVICE**

Natural Gas, Utilities (water, inst. air, plant air, nitrogen gas, carbon dioxide)

**NOTES**

1. All vents and drains shall be provided with plug valve unless mentioned otherwise in P&IDs.
2. Fittings shall be of seamless construction up to 16" and shall be of welded construction 18" and above.
3. Wall thickness for line pipe used in various sections shall be as per Table-1 of PMS.
4. Ball valve to be used in mainline shall have butt welded ends except for the valves used for hot tapping which shall be one side butt welded and other side flanged.
5. Procurement of materials shall be as per detailed relevant specifications.
6. Design pressure and temp. for pipeline and related facilities are 19 kg/cm<sup>2</sup>g & (-29° to +65° C) respectively.
7. Pressure-temperature ratings indicated are for flanges only in accordance with ANSI B 16.5.
8. For valves, steel pipe and associated steel components of 2" and larger notch toughness properties shall be as specified in relevant specifications/ codes, VCS's standard technical specifications and data sheets etc.
9. At stations, branch connections shall be as per branch connection table below.
10. All Butt welds shall be 100% radiographed.
11. 100% of socket weld shall be subjected MPI/ DPT.



12. Pressure-Temperature rating of valve body shall be as per API 6D.
13. Pipeline design code – ASME B 31.8 & OISD 226.
14. For pipeline specialty items (scraper trap, flow tee, IJ, LR Bends etc.) and their material descriptions refer data sheet of respective items.

**STATION PIPING MATERIAL SPECIFICATIONS**

ITEM	SIZE	DESCRIPTION
Maintenance joints	ALL	Flanged, to be kept minimum
Pipe joints	1.5" & BELOW	Socket Weld
	2.0" & ABOVE	Butt welded
Drains	ON LINES $\leq 1.5"$	Refer std. SD-PI-019
	ON LINES $\geq 2.0"$	As per P&ID or 0.75". Refer std. SD-PI-018
Vents	ON LINES $\leq 1.5"$	Refer std. SD-PI-019
	ON LINES $\geq 2.0"$	As per P&ID or 0.75". Refer std. SD-PI-018
Temp. Connection	1.5"	Flanged, installation as per std. SD-PI-014 & 015, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. SD-PI-011, 012 & 013



**DOC NO: C221052-00-PP-PMS-2001**  
**Rev No : D1**

## BRANCH TABLE

T												
	T											
		T										
			T									
				T								
					T							
						T						
							T					
								T				
									T			
										T		
											T	
												T

0.5
0.75
1
1.5
2
3
4
6
8
10
12
14

0.5
0.75
1
1.5
2
3
4
6
8
10
12
14

**RUN PIPE**

### CODE DESCRIPTION

T	TEES
W	WELDOLETS
S	SOCKOLETS

PIPELINE/ PIPING DESIGN CODE		ASME B 31.8/ OISD 226									DESIGN FACTOR – 0.5									
ITEM	NOMINAL DIAMETER (INCHES)	0.50	0.75	1.00	1.50	2.00	3.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0		
PIPE	WALL THICKNESS (MM/SCH)	S160	S160	XS	XS	XS	STD	STD	STD	S20	S20	S20	S10	S10	S10	7.1	7.9	8.7		
	MATERIAL	ASTM A 106 GR.B				ASTM A 106 GR.B (CHARPY)				API 5L GR.B PSL2										
	DIMENSION STD.	B 36.10								API 5L										
	METHOD OF MAUFACTURE, ENDS	SEAMLESS PE				SEAMLESS BE								BE SAW						
FLANGE	MATERIAL AND GRADE	ASTM A 105				ASTM A 105 (CHARPY)														
	TYPE, FLANGE FACING	SW. RF 125 AARH				WN. THICKNESS TO MATCH PIPE THICKNESS, RF 125AARH														
	DIMENSION STD.	B 16.5																		
BLIND FLANGE	MATERIAL AND GRADE	ASTM A 105				ASTM A 105 (CHARPY)														
	FLANGE FACING	RF 125 AARH																		
	DIMENSION STD.	B 16.5																		
BLANK	MATERIAL AND GRADE	ASTM A 105				ASTM A 105 (CHARPY)														
	FLANGE FACING	FF 125 AARH																		
	DIMENSION STD.	B 16.48																		
	TYPE	FIG. 8 FLANGE										SPACER & BLIND								
BOLTING	STUD BOLTS (FULLY THREADED)	A 193 GR B7, B-18.2																		
	NUTS (HEAVY HEXAGONAL)	A 194 GR 2H, B-18.2																		
GASKET	TYPE, MATERIAL AND DMN STD.	SP. WND SS316+GRAPHITE FILLED, B-16.20-ANSI B16.5																		
ELBOW-90 ELBOW-45	MATERIAL	ASTM A 105				ASTM A 234 GR.WPB (CHARPY)								ASTM A 234 GR.WPB-W (CHARPY)						
	END DETAIL	SW,6000#		SW,3000#		BW, 1.5D														
	DIMENSION STD.	B-16.11				B-16.9														
T-EQUAL T-RED	MATERIAL	ASTM A 105				ASTM A 234 GR.WPB (CHARPY)								ASTM A 234 GR.WPB-W (CHARPY)						
	END DETAIL	SW,6000#		SW,3000#		BW, THICKNESS TO MATCH PIPE THICKNESS														
	DIMENSION STD.	B-16.11				B-16.9														
CAP	MATERIAL	ASTM A 105				ASTM A 234 GR.WPB (CHARPY)														
	END DETAIL	SCRF6000		SCRF3000		BW, THICKNESS TO MATCH PIPE THICKNESS														
	DIMENSION STD.	B-16.11				B-16.9														
FITTING	MATERIAL	ASTM A 105				ASTM A 234 GR.WPB (CHARPY)								ASTM A 234 GR.WPB-W (CHARPY)						
	END DETAIL	SW,6000#		SW,3000#		BW, THICKNESS TO MATCH PIPE THICKNESS														
	DIMENSION STD.	B-16.11				B-16.9														
	TYPE	COUPLING FULL, HALF LH., RED.				RED. CON. RED. ECC.														
O'LET	MATERIAL	ASTM A 105				ASTM A 105 (CHARPY)														
	END DETAIL	SW,6000#		SW,3000#		BW														
	DIMENSION STD.	MSS-SP97				MSS-SP97														
	TYPE	SOCKOLET				WELDOLET														

## **APPENDIX-VI**

**ANSI CLASS** : **150# (A4A)**  
**BASE MATERIAL** : Carbon Steel (Material Group 1.1)  
**CORROSION ALLOWANCE** : 1.5 MM  
**SPECIAL REQUIREMENT** : Non IBR

## **TEMPERATURE (Deg. C) AND PRESSURE (Kg/Sq.cm g) RATINGS**

TEMP	-45	38	50	100	150
PRESS	18.76	18.76	18.55	17.74	16.11

## **SERVICE**

RLNG

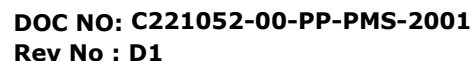
## **NOTES**

1. All vents and drains shall be provided with plug valve unless mentioned otherwise in P&IDs.
2. Fittings shall be of seamless construction up to 16" and shall be of welded construction 18" and above.
3. Wall thickness for line pipe used in various sections shall be as per Table-1 of PMS.
4. Ball valve to be used in mainline shall have butt welded ends except for the valves used for hot tapping which shall be one side butt welded and other side flanged.
5. Procurement of materials shall be as per detailed relevant specifications.
6. Design pressure and temp. for pipeline and related facilities are 19 kg/cm<sup>2</sup>g & (-45° to +65° C) respectively.
7. Pressure-temperature ratings indicated are for flanges only in accordance with ANSI B 16.5.
8. For valves, steel pipe and associated steel components of 2" and larger notch toughness properties shall be as specified in relevant specifications/ codes, VCS's standard technical specifications and data sheets etc.
9. At stations, branch connections shall be as per branch connection table below.
10. All Butt welds shall be 100% radiographed.
11. 100% of socket weld shall be subjected MPI/ DPT.

12. Pressure-Temperature rating of valve body shall be as per API 6D.
13. Pipeline design code – ASME B 31.8 & OISD 226.
14. For pipeline specialty items (scraper trap, flow tee, IJ, LR Bends etc.) and their material descriptions refer data sheet of respective items.

**STATION PIPING MATERIAL SPECIFICATIONS**

ITEM	SIZE	DESCRIPTION
Maintenance joints	ALL	Flanged, to be kept minimum
Pipe joints	1.5" & BELOW	Socket Weld
	2.0" & ABOVE	Butt welded
Drains	ON LINES $\leq 1.5"$	Refer std. SD-PI-019
	ON LINES $\geq 2.0"$	As per P&ID or 0.75". Refer std. SD-PI-018
Vents	ON LINES $\leq 1.5"$	Refer std. SD-PI-019
	ON LINES $\geq 2.0"$	As per P&ID or 0.75". Refer std. SD-PI-018
Temp. Connection	1.5"	Flanged, installation as per std. SD-PI-014 & 015, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. SD-PI-011, 012 & 013





PIPELINE/ PIPING DESIGN CODE		ASME B 31.8/ OISD226										DESIGN FACTOR – 0.5			
ITEM	NOMINAL DIAMETER (INCHES)	0.50	0.75	1.00	1.50	2.00	3.00	4.00	6.00	8.00	10.0	12.0	14.0		
PIPE	WALL THICKNESS (MM/SCH)	S160	S160	XS	XS	XS	STD	STD	STD	STD	STD	STD	STD		
	MATERIAL	ASTM A 333 GR.6													
	DIMENSION STD.	B 36.10													
	METHOD OF MAUFACTURE, ENDS	SEAMLESS PE					SEAMLESS BE								
FLANGE	MATERIAL AND GRADE	ASTM A 350 GR. LF2, CL-I													
	TYPE, FLANGE FACING	SW. RF 125 AARH					WN. THICKNESS TO MATCH PIPE THICKNESS, RF 125AARH								
	DIMENSION STD.	B 16.5													
BLIND FLANGE	MATERIAL AND GRADE	ASTM A 350 GR. LF2, CL-I													
	FLANGE FACING	RF 125 AARH													
	DIMENSION STD.	B 16.5													
BLANK	MATERIAL AND GRADE	ASTM A 350 GR. LF2, CL-I													
	FLANGE FACING	FF 125 AARH													
	DIMENSION STD.	B 16.48													
	TYPE	FIG. 8 FLANGE										SPACER & BLIND			
BOLTING	STUD BOLTS (FULLY THREADED)	A 320 GR L7, B-18.2													
	NUTS (HEAVY HEXAGONAL)	A 194 GR 4, B-18.2													
GASKET	TYPE, MATERIAL AND DMN STD.	SPIRAL, SP. WND SS316+GRAPHITE FILLED, B-16.20-ANSI B16.5													
ELBOW-90 ELBOW-45	MATERIAL	ASTM A 350 GR.LF2					ASTM A 420 GR. WPL6								
	END DETAIL	SW,6000#		SW,3000#		BW, 1.5D									
	DIMENSION STD.	B-16.11					B-16.9								
T-EQUAL T-RED	MATERIAL	ASTM A 350 GR.LF2					ASTM A 420 GR. WPL6								
	END DETAIL	SW,6000#		SW,3000#		BW									
	DIMENSION STD.	B-16.11					B-16.9								
CAP	MATERIAL	ASTM A 350 GR.LF2					ASTM A 420 GR. WPL6								
	END DETAIL	SCRF6000		SCRF3000		BW, THICKNESS TO MATCH PIPE THICKNESS									
	DIMENSION STD.	B-16.11					B-16.9								
FITTING	MATERIAL	ASTM A 350 GR.LF2					ASTM A 420 GR. WPL6								
	END DETAIL	SW,6000#		SW,3000#		BW, THICKNESS TO MATCH PIPE THICKNESS									
	DIMENSION STD.	B-16.11					B-16.9								
	TYPE	COUPLING FULL, HALF LH., RED.					RED. CON. RED. ECC.								
O’LET	MATERIAL	ASTM A 350 GR.LF2					ASTM A 350 GR.LF2								
	END DETAIL	SW,6000#		SW,3000#		BW									
	DIMENSION STD.	MSS-SP97					MSS-SP97								
	TYPE	SOCKOLET					WELDOLET								

## **10.0 INDICATIVE CONSTRUCTION MILESTONE**

**(Appendix-I to Particular Job Specification  
of Work)**



**LAYING AND CONSTRUCTION OF STEEL GAS PIPELINE AND TERMINALS ALONG WITH ASSOCIATED FACILITIES FOR  
PARTS D1 & D2 OF  
NORTH EAST GAS GRID PHASE-III OF IGGL**



**INDICATIVE CONSTRUCTION MILESTONE FOR PIPELINE LAYING, TERMINALS & ASSOCIATED WORKS**

Sl. No.	ACTIVITY DESCRIPTION	DURATION (In Months)	1	2	3	4	5	6	7	8	9
	<b>AWARD OF CONTRACT</b>										
1	Mobilization	0.5									
2	TAKING / HANDING OVER OF ROU (DATE OF ROU PUNCHNAMA/ HANDING OVER OF PERMISSIONS), CLEARING AND GRADING										
3	LIFTING OF COATED PIPES FROM COATING YARD AND STRINGING										
4	FIT UP, WELDING, NDT										
5	JOINT COATING, TRENCHING, LOWERING AND BACKFILLING										
6	TIE-IN, INCLUDING CROSSING, HYDROTESTING AND DE-WATERING (MAINLINE)										
7	COMPLETE CIVIL WORK (INCLUDING STRUCTURAL & ARCHITECTURAL WORKS) FOR ALL SV STATION, CIVIL WORKS PERTAINING TO PROCESS AREA OF DT/RT/IP										
8	INSTRUMENTATION, ELECTRICAL, TELECOM AND FIRE PROTECTION WORKS										
9	SCRAPPER TRAP INSTALLATION, MECHANICAL WORKS, SWABBING, EGP, SV INSTALLATION, GOLDEN TIE-IN RESTORATION AND PRE-COMMISSIONING										
10	DRYING AND COMMISSIONING										



Note

1. The schedule of station work e.g. mechanical, civil (including structural & architectural), electrical, telecom, instrumentation and fire protection systemworks shall be in line with the schedule indicated above meeting the schedule requirement for mechanical completion and commissioning as mentioned in bid document.
2. testing shall include testing and commissioning of all associated works.

Part	Part D1	Part D2			
Asking Rate (Km/month)	8	8			

## **11.0 DATA SHEETS FOR MECHANICAL ITEMS ETC**

**(Appendix-II to Particular Job Specification  
of Work)**

		<b>NORTH EAST GRID PHASE-III OF IGGL</b>					
CLIENT		INDRADHANUSH GAS GRID LIMITED					
PMC		VCS QUALITY SERVICES PVT. LTD.					
<b>DATA SHEET : BALL VALVE (MORE THAN OR EQUAL TO 2.0 INCH) BUTT WELDED</b>							
<b>GENERAL SPECIFICATION</b>							
Process Fluid	NG	ANSI Pressure Rating		600#			
Design Temperature	(-)29°C to 65°C	Design Pressure		92 barg			
Size, Inch (DN)	More than or equal to 2" (50)						
Valve Type	Full Bore, Trunnion Mounted, Fully welded or Two/ Three Piece Bolted Valve body construction						
End Connection Type	Butt Welded	Design Standard		API 6D			
Face Finish	Not Applicable	Locking Arrangement		As per P&ID			
<b>VALVE DESIGN CONDITIONS</b>							
Corrosion Allowance	1.5 mm	Design Factor		0.5			
Installation	Above Ground	Stem Ext Length (mm)		Not Applicable			
<b>VALVE OPERATION</b>							
Actuation Type	Not Applicable	Type of Actuator		Not Applicable			
<b>PUP PIECE DETAILS</b>							
N/A							
<b>VALVE MATERIAL SPECIFICATION</b>							
PART DESCRIPTION	MATERIAL SPECIFIED			MATERIAL OFFERED (Equivalent or Higher)			
Body	ASTM A216 Gr. WCB/ ASTM A105						
Ball	(ASTM A216 Gr. WCB/ ASTM A105 + 75 microns ENP Coating/ AISI 410						
Body Seat Rings (No Casting)	AISI 4140 + 75 micron ENP coating/ AISI 410						
Seat Seal	VITON/ DEVLON						
Stem (No casting)	AISI 4140 + 75 micron ENP coating/ AISI 410						
Stem Seals	VITON/ PTFE						
Stud Bolts/ Nuts	ASTM A193 Gr. B7/ A194 Gr. 2H						
<b>TESTING REQUIREMENT</b>							
Hydrostatic Test Pressure & Time	Body: 157 kg/cm <sup>2</sup> & as per API 6D			Seat: 114 kg/cm <sup>2</sup> & as per API 6D			
Pneumatic Test Pressure & Time	5.6 -7 kg/cm <sup>2</sup> & as per API 6D						
Hardness Test	248 HV10 max.						
Charpy Impact Test @ Temperature	Yes (at -29°C)						
Anti-Static Testing Requirement	As per standard API 6D (Latest Ed.)						
Fire Safe Test	API 607 / API 6FA						
DOCUMENT NO.							
C221052-00-PP-DS-2008							
	D2	16.12.2022	SR	AK	MC	ISSUED FOR BID	
SHEET NO.	1 OF 2	REV	DATE	PRPD	CHKD	APVD	REMARKS



### NORTH EAST GRID PHASE-III OF IGGL



CLIENT

INDRADHANUSH GAS GRID LIMITED

---

PMC

VCS QUALITY SERVICES PVT. LTD.

**DATA SHEET : BALL VALVE (MORE THAN OR EQUAL TO 2.0 INCH) BUTT WELDED**



**Valve Painting Specification :**

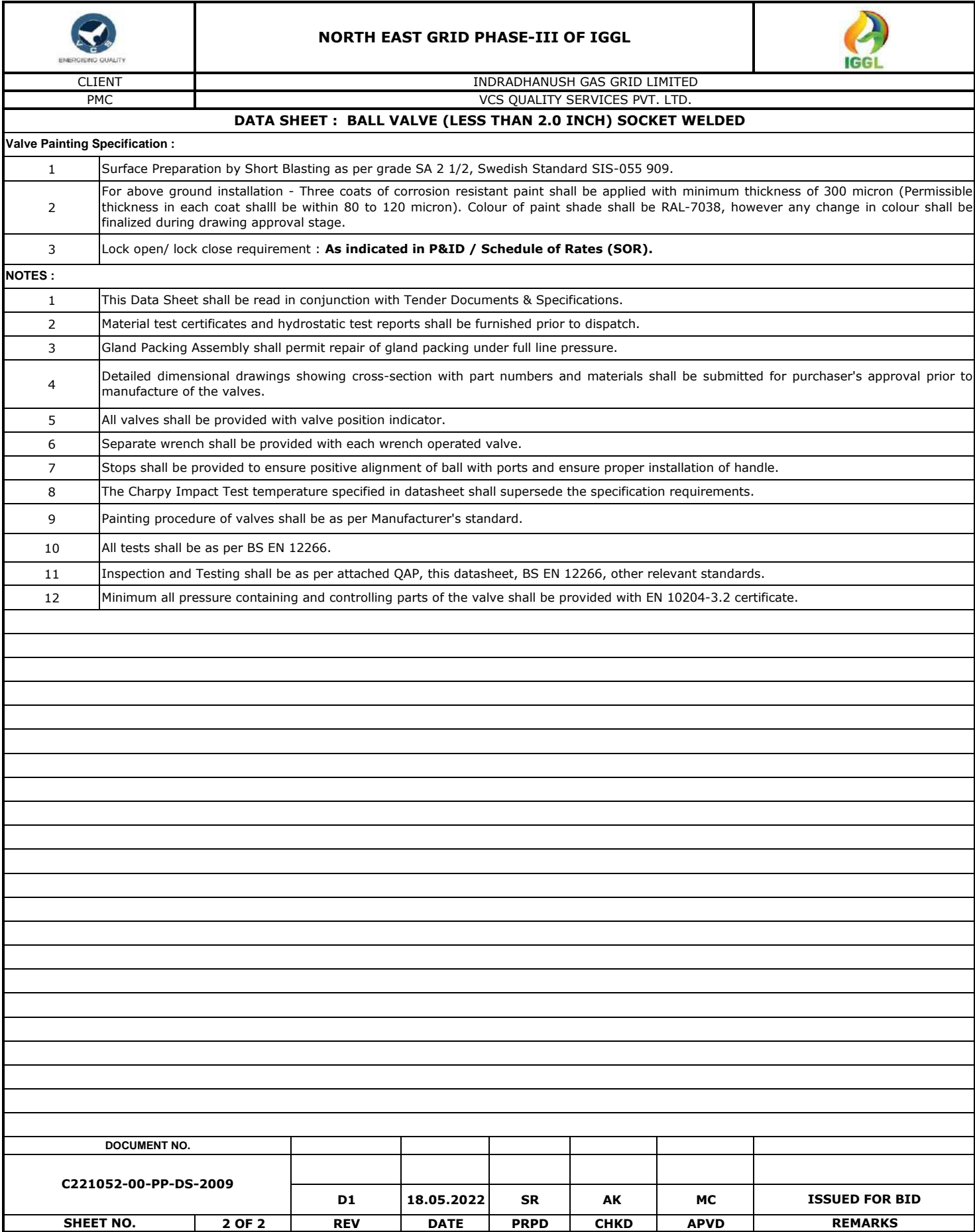
1	Surface Preparation by Short Blasting as per grade SA 2 1/2, Swedish Standard SIS-055 909.
2	For above ground installation - Three coats of corrosion resistant paint shall be applied with minimum thickness of 300 micron (Permissible thickness in each coat shall be within 80 to 120 micron). Colour of paint shade shall be RAL-7038, however any change in colour shall be finalized during drawing approval stage.
3	Lock open/ lock close requirement : <b>As indicated in P&amp;ID / Schedule of Rates (SOR).</b>

**NOTES :**



1	This Data Sheet shall be read in conjunction with Tender Documents & Specifications.
2	Material test certificates and hydrostatic test reports shall be furnished prior to dispatch.
3	Stops shall be provided to ensure positive alignment of ball with ports and ensure proper installation of handle.
4	Short pattern valves (as per API 6D or otherwise) are not permitted. Only long pattern valves are to be supplied.
5	The Charpy Impact Test temperature specified in datasheet shall supersede the specification requirements.
6	Compressed asbestos fibre (CAF) shall not be used for body sealing/ gasket materials.
7	For welding end, the out of roundness (i.e., difference between maximum and minimum ID at pipe end) shall not be more than 0.5% of pipe OD.
8	Inspection and Testing shall be done as per attached QAP, this data sheet, VCS's T.S., API 6D and other relevant standards.
9	Material for body shall have a guaranteed minimum yield strength of 35000 psi. In case the same cannot be guaranteed, valves shall be provided with a 500 mm pup piece (integrally welded to the valve on each side) with strength equivalent to that of the connecting pipe N.A.
10	Valves shall be inspected and approved by purchaser before dispatch.
11	Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.
12	100% Valve casting shall undergo Radiographic Examination.

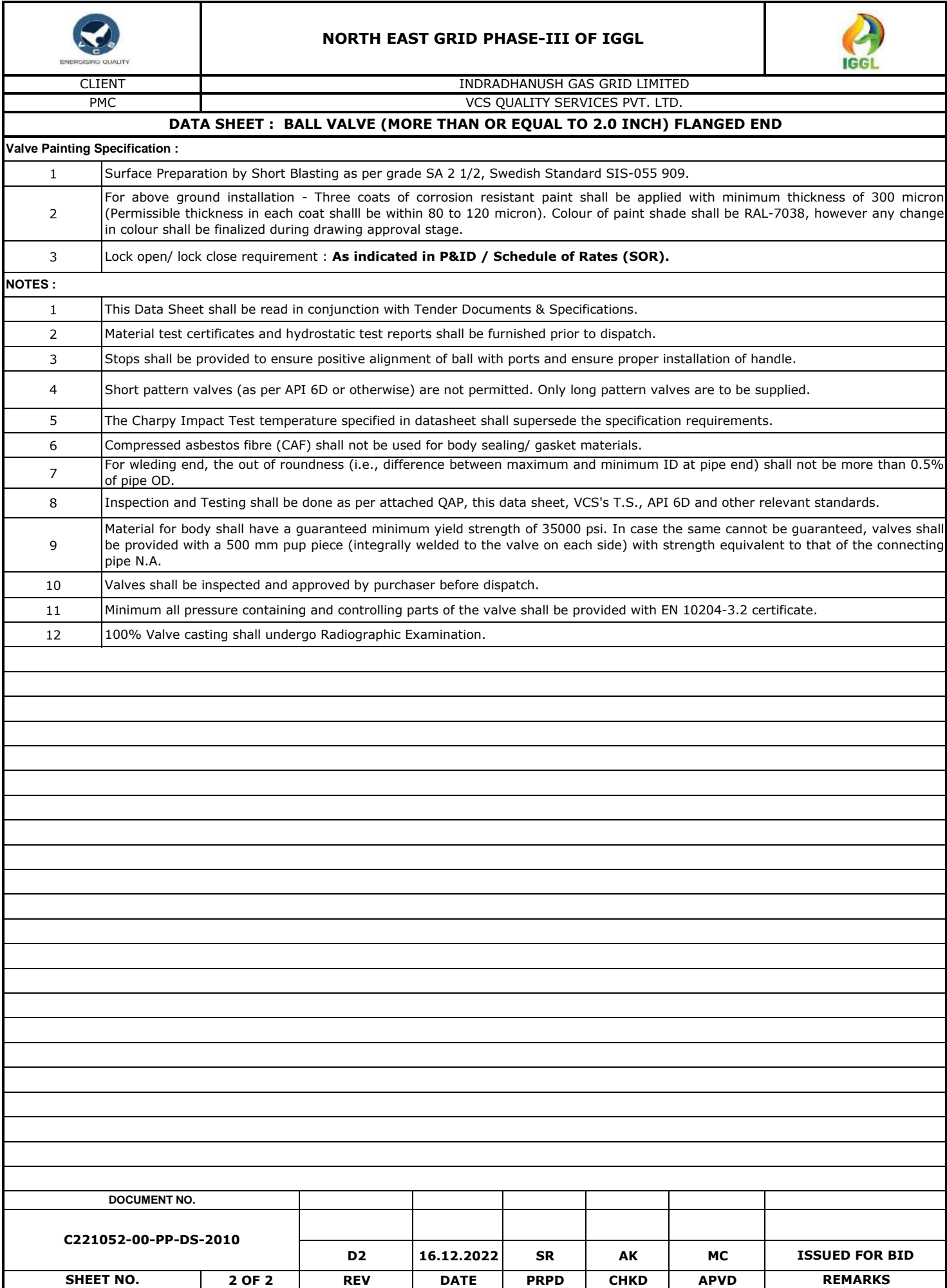
DOCUMENT NO.							
C221052-00-PP-DS-2008							
		D1	18.05.2022	SR	AK	MC	ISSUED FOR BID
SHEET NO.	2 OF 2	REV	DATE	PRPD	CHKD	APVD	REMARKS



		<b>NORTH EAST GRID PHASE-III OF IGGL</b>					
CLIENT		INDRADHANUSH GAS GRID LIMITED					
PMC		VCS QUALITY SERVICES PVT. LTD.					
<b>DATA SHEET : BALL VALVE (LESS THAN 2.0 INCH) SOCKET WELDED</b>							
<b>GENERAL SPECIFICATION</b>							
Process Fluid	NG	ANSI Pressure Rating		800#			
Design Temperature	(-)29°C to 65°C	Design Pressure		92 barg			
Size, Inch (DN)	Less than 2" (50)						
Valve Type	Full Bore, Floating Ball						
End Connection Type	Socket Welded	Design Standard		BS EN ISO 17292			
Face Finish	Not Applicable	Locking Arrangement		As per P&ID			
<b>VALVE DESIGN CONDITIONS</b>							
Corrosion Allowance	1.5 mm	Design Factor		0.5			
Installation	Above Ground	Stem Ext Length (mm)		Not Applicable			
<b>VALVE OPERATION</b>							
Actuation Type	Not Applicable	Type of Actuator		Not Applicable			
<b>PUP PIECE DETAILS</b>							
100mm extension pups in ASTM A106 Gr.B, Sch 160 (for 3/4") and Sch XS (for 1 1/2")							
<b>VALVE MATERIAL SPECIFICATION</b>							
PART DESCRIPTION	MATERIAL SPECIFIED			MATERIAL OFFERED (Equivalent or Higher)			
Body	ASTM A105						
Ball	13% Cr Steel						
Body Seat	RPTFE/ DELRIN						
Gland	13% Cr Steel						
Stem (No Casting)	13% Cr Steel						
Body Seal	Grafoil						
Stem Seal	Grafoil						
Body Studs/ Nuts	ASTM A193 Gr. B7/ A194 Gr. 2H						
<b>TESTING REQUIREMENT</b>							
Hydrostatic Test Pressure & Time	Body: 210 kg/cm <sup>2</sup> & as per BS EN ISO 17292			Seat: 155 kg/cm <sup>2</sup> & as per BS EN ISO 17292			
Pneumatic Test Pressure & Time	5.6 -7 kg/cm <sup>2</sup> & as per BS EN ISO 17292						
Hardness Test	248 HV10 max.						
Charpy Impact Test @ Temperature	Yes (at -29°C)						
Anti-Static Testing Requirement	As per BS EN ISO 17292						
Fire Safe Test	API 607 / API 6FA						
DOCUMENT NO.							
C221052-00-PP-DS-2009							
	D1	18.05.2022	SR	AK	MC	ISSUED FOR BID	
SHEET NO.	1 OF 2	REV	DATE	PRPD	CHKD	APVD	REMARKS







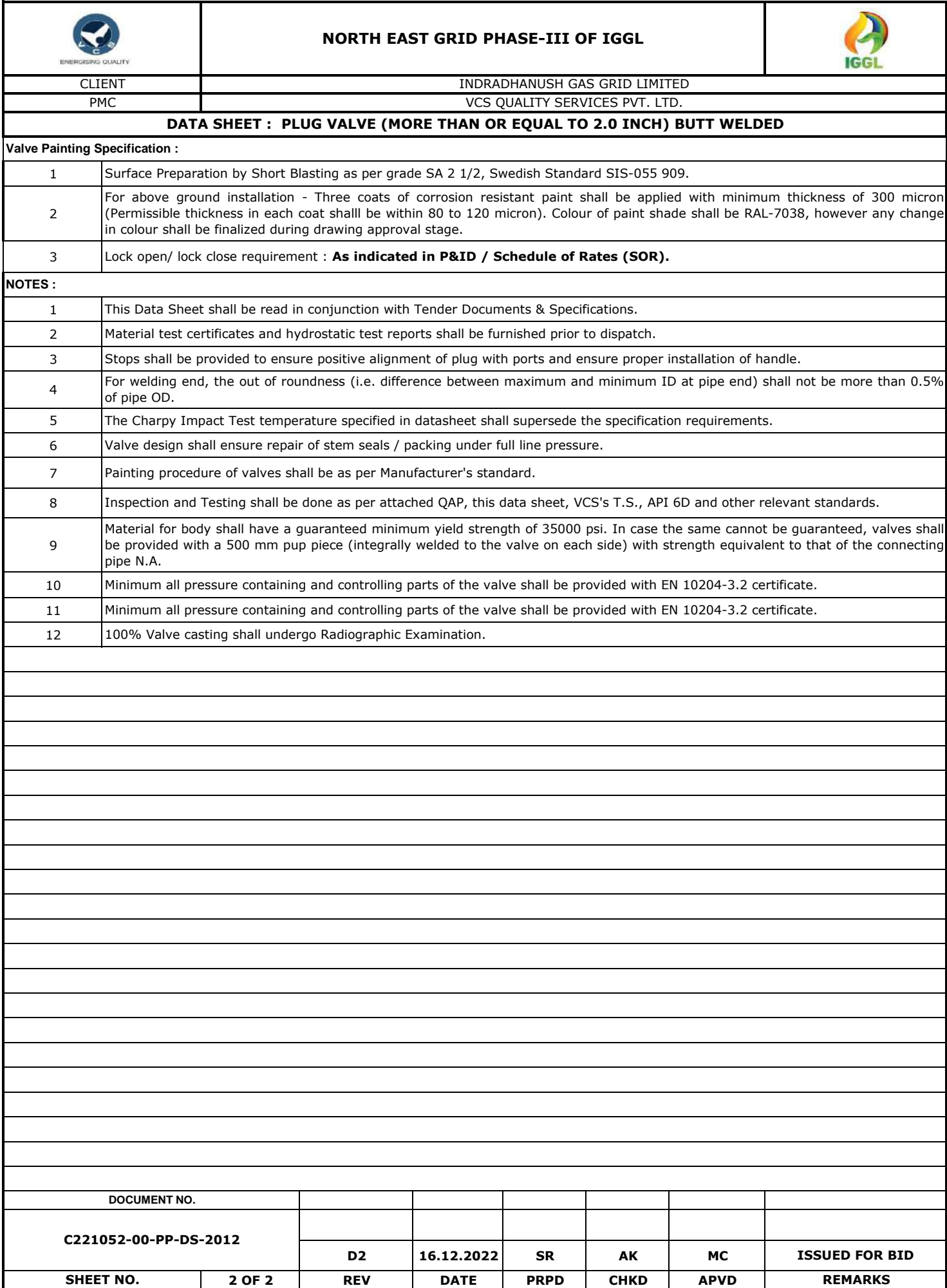
		<b>NORTH EAST GRID PHASE-III OF IGGL</b>					
CLIENT		INDRADHANUSH GAS GRID LIMITED					
PMC		VCS QUALITY SERVICES PVT. LTD.					
<b>DATA SHEET : BALL VALVE (MORE THAN OR EQUAL TO 2.0 INCH) FLANGED END</b>							
<b>GENERAL SPECIFICATION</b>							
Process Fluid	NG	ANSI Pressure Rating		600#			
Design Temperature	(-)29°C to 65°C	Design Pressure		92 barg			
Size, Inch (DN)	More than or equal to 2" (50)						
Valve Type	Full Bore, Trunnion Mounted, Fully Welded or Two/ Three Piece Bolted Body Type						
End Connection Type	Flanged Welded	Design Standard		API 6D			
Face Finish	Raised Face (Smooth [125 to 200 microinches AARH])	Locking Arrangement		As per P&ID			
<b>VALVE DESIGN CONDITIONS</b>							
Corrosion Allowance	1.5 mm	Design Factor		0.5			
Installation	Above Ground	Stem Ext Length (mm)		Not Applicable			
<b>VALVE OPERATION</b>							
Actuation Type	Not Applicable	Type of Actuator		Not Applicable			
<b>PUP PIECE DETAILS</b>							
N/A							
<b>VALVE MATERIAL SPECIFICATION</b>							
PART DESCRIPTION	MATERIAL SPECIFIED			MATERIAL OFFERED (Equivalent or Higher)			
Body	ASTM A216 Gr. WCB/ ASTM A105N						
Ball	(ASTM A216 Gr. WCB/ ASTM A105N) + 75 microns ENP Coating/ AISI 410						
Body Seat Rings (No Casting)	AISI 4140 + 75 micron ENP coating/ AISI 410						
Seat Seal	VITON/ DEVLON						
Stem (No Casting)	AISI 4140 + 75 micron ENP coating/ AISI 410						
Stem Seals	VITON/ PTFE						
Stud Bolts/ Nuts	ASTM A193 Gr. B7/ A194 Gr. 2H						
<b>TESTING REQUIREMENT</b>							
Hydrostatic Test Pressure & Time	Body: 157 kg/cm <sup>2</sup> & as per API 6D			Seat: 114 kg/cm <sup>2</sup> & as per API 6D			
Pneumatic Test Pressure & Time	5.6 -7 kg/cm <sup>2</sup> & as per API 6D						
Hardness Test	248 HV10 max.						
Charpy Impact Test @ Temperature	Yes (at -29°C)						
Anti-Static Testing Requirement	As per standard API 6D (Latest Ed.)						
Fire Safe Test	Type test as per API 607 for floating ball valve Type test as per API 6FA for trunnion mounted ball valve						
DOCUMENT NO.							
C221052-00-PP-DS-2010							
	D2	16.12.2022	SR	AK	MC	ISSUED FOR BID	
SHEET NO.	1 OF 2	REV	DATE	PRPD	CHKD	APVD	REMARKS





		<b>NORTH EAST GRID PHASE-III OF IGGL</b>					
CLIENT		INDRADHANUSH GAS GRID LIMITED					
PMC		VCS QUALITY SERVICES PVT. LTD.					
<b>DATA SHEET : PLUG VALVE (LESS THAN 2.0 INCH) SOCKET WELDED</b>							
<b>GENERAL SPECIFICATION</b>							
Process Fluid	NG	ANSI Pressure Rating	800#				
Design Temperature	(-)29°C to 65°C	Design Pressure	92 barg				
Size, Inch (DN)	Less than 3/4" (20)						
Valve Type	Regular Pattern						
End Connection Type	Socket Welded	Design Standard	BS 5353				
Face Finish	Not Applicable	Locking Arrangement	As per P&ID				
<b>VALVE DESIGN CONDITIONS</b>							
Corrosion Allowance	1.5 mm	Design Factor	0.5				
Installation	Above Ground	Stem Ext Length (mm)	Not Applicable				
<b>VALVE OPERATION</b>							
Actuation Type	Not Applicable	Type of Actuator	Not Applicable				
<b>PUP PIECE DETAILS</b>							
100mm extension pups in ASTM A106 Gr.B, Sch 160 at both ends							
<b>VALVE MATERIAL SPECIFICATION</b>							
PART DESCRIPTION	MATERIAL SPECIFIED			MATERIAL OFFERED (Equivalent or Higher)			
Body	ASTM A105						
Plug (Lubricated)	ASTM A105 + 75 microns ENP						
Stem (No Casting)	(AISI 4140 + 75 microns ENP Coating)/ AISI 410						
Stem Seal	GRAFOIL/ PTFE V-RINGS + GRAFOIL						
Gland	ASTM A 105						
Gland Packing	Graphite/ PTFE						
Gasket	N.A						
Body Studs/ Nuts	ASTM A193 Gr. B7/ A194 Gr. 2H						
Lubricant Screw	Manufacturer's Standard						
<b>TESTING REQUIREMENT</b>							
Hydrostatic Test Pressure & Time	Body: 210 kg/cm <sup>2</sup> & 2 Minutes			Seat: 155 kg/cm <sup>2</sup> & 2 Minutes			
Pneumatic Test Pressure & Time	5.6 -7 kg/cm <sup>2</sup> & 15 Minutes						
Hardness Test	248 HV10 max.						
Charpy Impact Test @ Temperature	Yes (at -29°C)						
Fire Safe Test	API 607 / API 6FA						
DOCUMENT NO.							
C221052-00-PP-DS-2011							
	D1	18.05.2022	SR	AK	MC	ISSUED FOR BID	
SHEET NO.	1 OF 2	REV	DATE	PRPD	CHKD	APVD	REMARKS

[illegible]

		<b>NORTH EAST GRID PHASE-III OF IGGL</b>					
CLIENT		INDRADHANUSH GAS GRID LIMITED					
PMC		VCS QUALITY SERVICES PVT. LTD.					
<b>DATA SHEET : PLUG VALVE (MORE THAN OR EQUAL TO 2.0 INCH) BUTT WELDED</b>							
<b>GENERAL SPECIFICATION</b>							
Process Fluid	NG	ANSI Pressure Rating		600#			
Design Temperature	(-)29°C to 65°C	Design Pressure		92 barg			
Size, Inch (DN)	More than or equal to 2" (50)						
Valve Type	Regular Pattern						
End Connection Type	Butt Welded	Design Standard		API 6D			
Face Finish	Not Applicable	Locking Arrangement		As per P&ID			
<b>VALVE DESIGN CONDITIONS</b>							
Corrosion Allowance	1.5 mm	Design Factor		0.5			
Installation	Above Ground	Stem Ext Length (mm)		Not Applicable			
<b>VALVE OPERATION</b>							
Actuation Type	Not Applicable	Type of Actuator		Not Applicable			
<b>PUP PIECE DETAILS</b>							
N/A							
<b>VALVE MATERIAL SPECIFICATION</b>							
PART DESCRIPTION	MATERIAL SPECIFIED			MATERIAL OFFERED (Equivalent or Higher)			
Body	ASTM A216 Gr. WCB/ ASTM A105N						
Plug (Lubricated)	(ASTM A216 Gr. WCB/ ASTM A105N) + 75 microns ENP Coating						
Cover	ASTM A216 Gr. WCB/ A234 Gr. WPB						
Stem (No Casting)	(AISI 4140 + 75 microns ENP Coating)/ AISI 410						
Stem Seal	PTFE/ Graphite						
Stud Bolts/ Nuts	ASTM A193 Gr. B7/ A194 Gr. 2H						
<b>TESTING REQUIREMENT</b>							
Hydrostatic Test Pressure & Time	Body: 157 kg/cm <sup>2</sup> & as per API 6D			Seat: 114 kg/cm <sup>2</sup> & as per API 6D			
Pneumatic Test Pressure & Time	5.6 -7 kg/cm <sup>2</sup> & as per API 6D						
Hardness Test	248 HV10 max.						
Charpy Impact Test @ Temperature	Yes (at -29°C)						
Fire Safe Test	API 607 / API 6FA						
DOCUMENT NO.							
C221052-00-PP-DS-2012							
	D2	16.12.2022	SR	AK	MC	ISSUED FOR BID	
SHEET NO.	1 OF 2	REV	DATE	PRPD	CHKD	APVD	REMARKS



		<b>NORTH EAST GRID PHASE-III OF IGGL</b>					
CLIENT		INDRADHANUSH GAS GRID LIMITED					
PMC		VCS QUALITY SERVICES PVT. LTD.					
<b>DATA SHEET : PLUG VALVE (MORE THAN OR EQUAL TO 2.0 INCH) FLANGED END</b>							
<b>GENERAL SPECIFICATION</b>							
Process Fluid	NG	ANSI Pressure Rating		600#			
Design Temperature	(-)29°C to 65°C	Design Pressure		92 barg			
Size, Inch (DN)	More than or equal to 2" (50)						
Valve Type	Regular Pattern						
End Connection Type	Flanged Welded	Design Standard		API 6D			
Face Finish	Raised Face (Smooth [125 to 200 microinches AARH])	Locking Arrangement		As per P&ID			
<b>VALVE DESIGN CONDITIONS</b>							
Corrosion Allowance	1.5 mm	Design Factor		0.5			
Installation	Above Ground	Stem Ext Length (mm)		Not Applicable			
<b>VALVE OPERATION</b>							
Actuation Type	Not Applicable	Type of Actuator		Not Applicable			
<b>PUP PIECE DETAILS</b>							
N/A							
<b>VALVE MATERIAL SPECIFICATION</b>							
PART DESCRIPTION	MATERIAL SPECIFIED			MATERIAL OFFERED (Equivalent or Higher)			
Body	ASTM A216 Gr. WCB/ ASTM A105N						
Plug (Lubricated)	(ASTM A216 Gr. WCB/ ASTM A105N) + 75 microns ENP Coating						
Cover	ASTM A216 Gr. WCB/ A234 Gr. WPB						
Stem (No Casting)	(AISI 4140 + 75 microns ENP Coating)/ AISI 410						
Stem Seal	PTFE/ Graphite						
Stud Bolts/ Nuts	ASTM A193 Gr. B7/ A194 Gr. 2H						
<b>TESTING REQUIREMENT</b>							
Hydrostatic Test Pressure & Time	Body: 157 kg/cm <sup>2</sup> & as per API 6D			Seat: 114 kg/cm <sup>2</sup> & as per API 6D			
Pneumatic Test Pressure & Time	5.6 -7 kg/cm <sup>2</sup> & as per API 6D						
Hardness Test	248 HV10 max.						
Charpy Impact Test @ Temperature	Yes (at -29°C)						
Fire Safe Test	API 607 / BS EN: 10497						
DOCUMENT NO.							
C221052-00-PP-DS-2013							
	D2	16.12.2022	SR	AK	MC	ISSUED FOR BID	
SHEET NO.	1 OF 2	REV	DATE	PRPD	CHKD	APVD	REMARKS



### NORTH EAST GRID PHASE-III OF IGGL



CLIENT

INDRADHANUSH GAS GRID LIMITED

---

PMC

VCS QUALITY SERVICES PVT. LTD.

**DATA SHEET : PLUG VALVE (MORE THAN OR EQUAL TO 2.0 INCH) FLANGED END**

**Valve Painting Specification :**



1	Surface Preparation by Short Blasting as per grade SA 2 1/2, Swedish Standard SIS-055 909.
2	For above ground installation - Three coats of corrosion resistant paint shall be applied with minimum thickness of 300 micron (Permissible thickness in each coat shall be within 80 to 120 micron). Colour of paint shade shall be RAL-7038, however any change in colour shall be finalized during drawing approval stage.
3	Lock open/ lock close requirement : <b>As indicated in P&amp;ID / Schedule of Rates (SOR).</b>

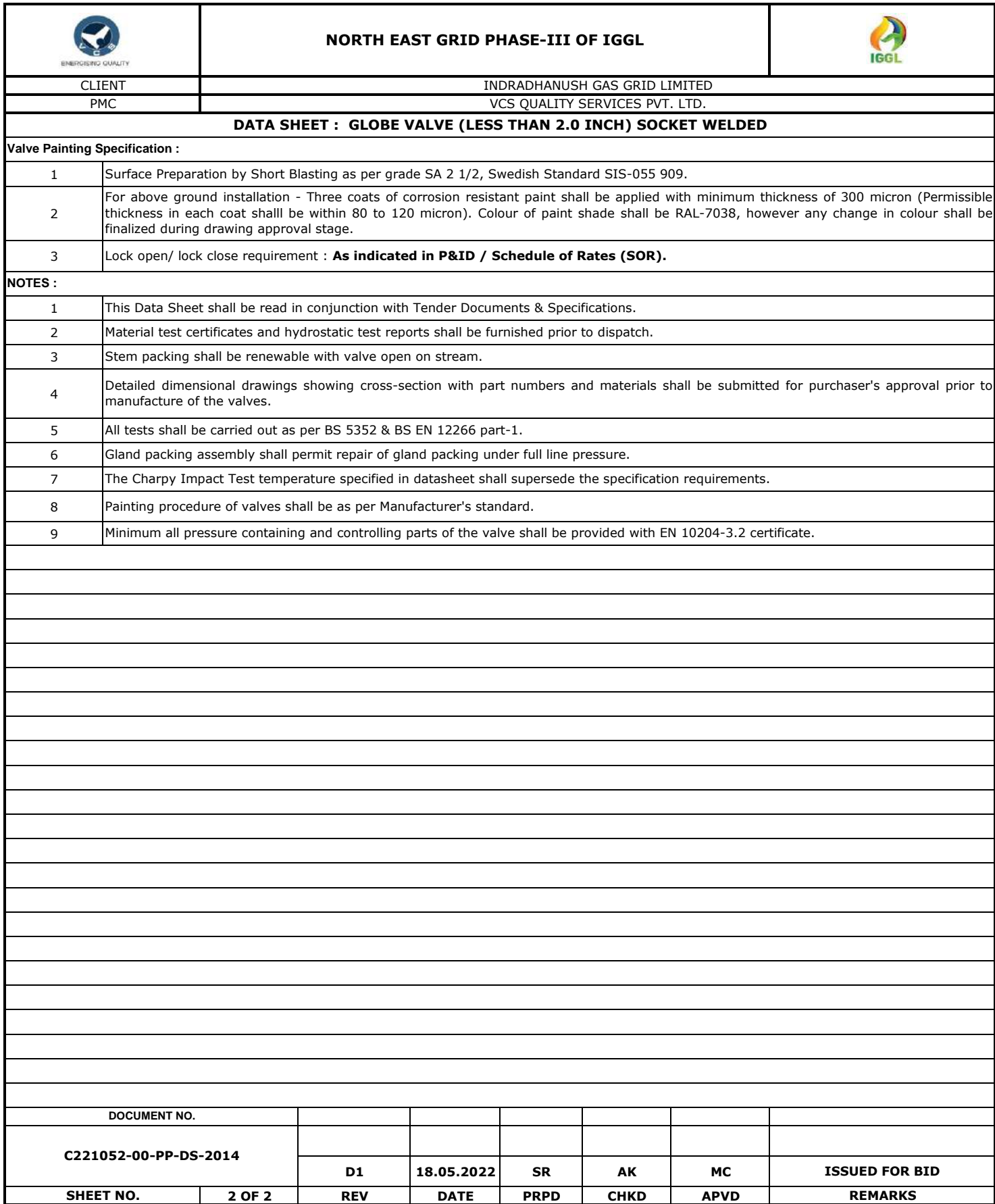
**NOTES :**



1	This Data Sheet shall be read in conjunction with Tender Documents & Specifications.
2	Material test certificates and hydrostatic test reports shall be furnished prior to dispatch.
3	Stops shall be provided to ensure positive alignment of plug with ports and ensure proper installation of handle.
4	For welding end, the out of roundness (i.e. difference between maximum and minimum ID at pipe end) shall not be more than 0.5% of pipe OD.
5	The Charpy Impact Test temperature specified in datasheet shall supersede the specification requirements.
6	Valve design shall ensure repair of stem seals / packing under full line pressure.
7	Painting procedure of valves shall be as per Manufacturer's standard.
8	Inspection and Testing shall be done as per attached QAP, this data sheet, VCS's T.S., API 6D and other relevant standards.
9	Material for body shall have a guaranteed minimum yield strength of 35000 psi. In case the same cannot be guaranteed, valves shall be provided with a 500 mm pup piece (integrally welded to the valve on each side) with strength equivalent to that of the connecting pipe N.A.
10	Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.
11	Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.
12	100% Valve casting shall undergo Radiographic Examination.

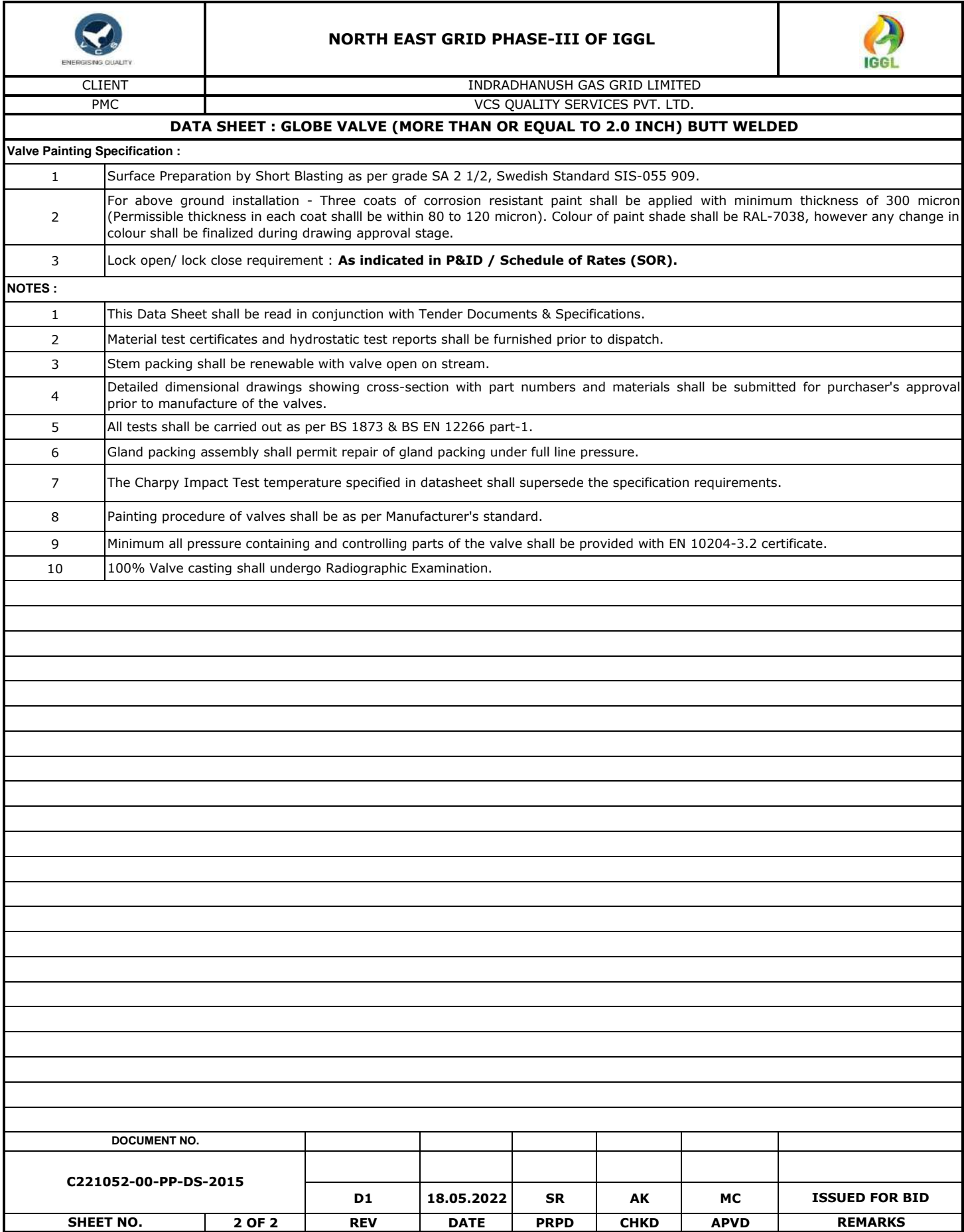
DOCUMENT NO.							
C221052-00-PP-DS-2013							
		D2	16.12.2022	SR	AK	MC	ISSUED FOR BID
SHEET NO.	2 OF 2	REV	DATE	PRPD	CHKD	APVD	REMARKS





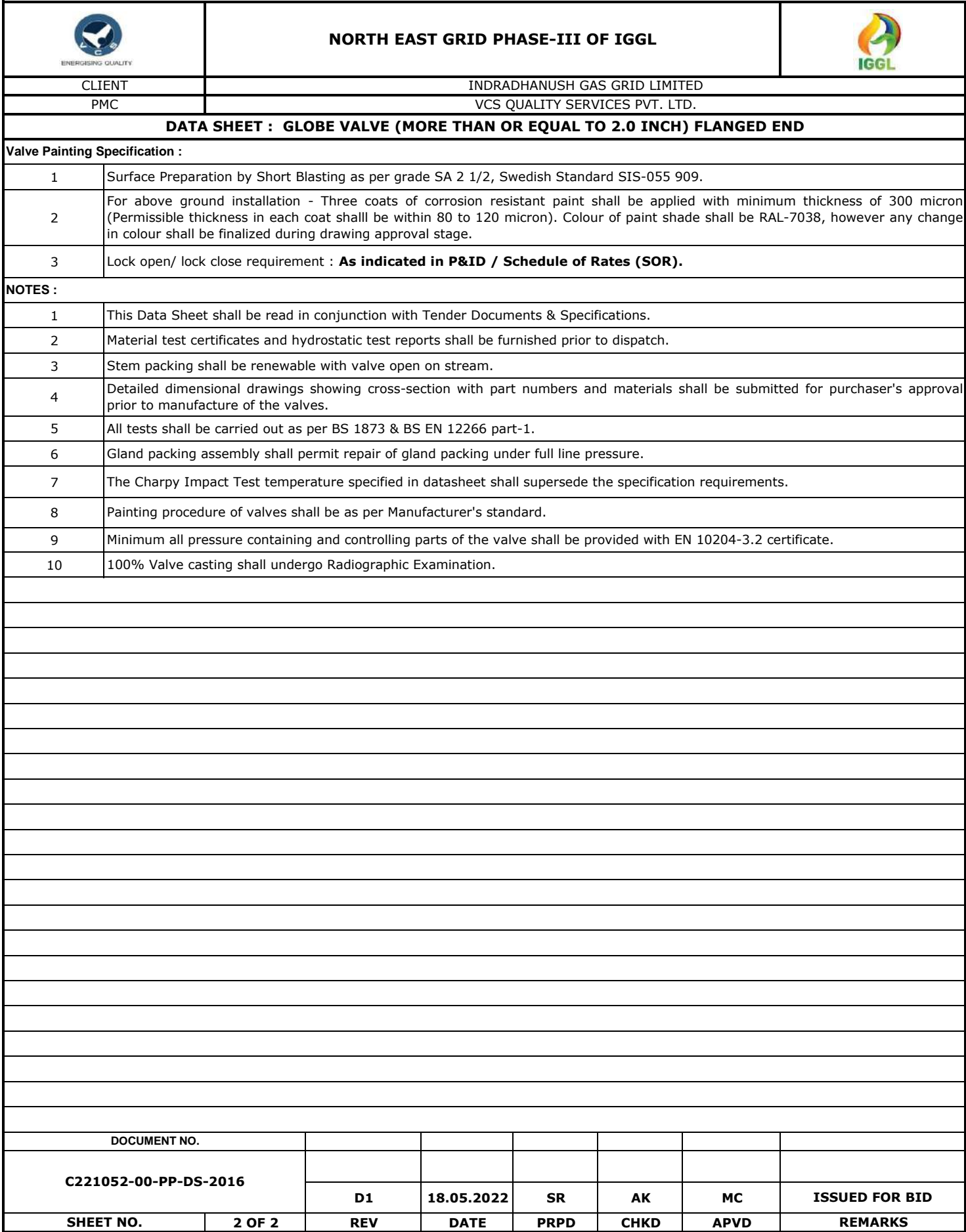
		<b>NORTH EAST GRID PHASE-III OF IGGL</b>					
CLIENT		INDRADHANUSH GAS GRID LIMITED					
PMC		VCS QUALITY SERVICES PVT. LTD.					
<b>DATA SHEET : GLOBE VALVE (LESS THAN 2.0 INCH) SOCKET WELDED</b>							
<b>GENERAL SPECIFICATION</b>							
Process Fluid	NG	ANSI Pressure Rating		800#			
Design Temperature	(-)29°C to 65°C	Design Pressure		92 barg			
Size, Inch (DN)	Less than 2" (50)						
Valve Type	Rising Stem						
End Connection Type	Socket Welded	Design Standard		BS 5352			
Face Finish	Not Applicable	Locking Arrangement		As per P&ID			
<b>VALVE DESIGN CONDITIONS</b>							
Corrosion Allowance	1.5 mm	Design Factor		0.5			
Installation	Above Ground	Stem Ext Length (mm)		Not Applicable			
<b>VALVE OPERATION</b>							
Actuation Type	Not Applicable	Type of Actuator		Not Applicable			
<b>PUP PIECE DETAILS</b>							
100mm extension pups in ASTM A106 Gr.B, Sch 160 (for 3/4") and Sch XS (for 1 1/2")							
<b>VALVE MATERIAL SPECIFICATION</b>							
PART DESCRIPTION	MATERIAL SPECIFIED			MATERIAL OFFERED (Equivalent or Higher)			
Body	ASTM A105						
Bonnet (Bolted)	ASTM A105						
Disc (Loose Plug/ Ball Type)	SS316 + Stellite						
Stem (Rising)	13% Cr Steel (No Casting)						
Body Seat Ring	SS316 + Stellite						
Stem Packing (Renewable with valve open on stream)	Corrosion inhibited die formed flexible graphite with braided anti extrusion rings						
Hand Wheel (Rising)	Malleable Iron/ Cast Steel/ Fab. Steel						
Bonnet Gasket	Spiral Wound SS316 + Grafoil						
Body Studs/ Nuts	ASTM A193 Gr. B7/ A194 Gr. 2H						
<b>TESTING REQUIREMENT</b>							
Hydrostatic Test Pressure & Time	Body: 210 kg/cm <sup>2</sup> & as per BS 5352			Seat: 155 kg/cm <sup>2</sup> & as per BS 5352			
Pneumatic Test Pressure & Time	5.6 -7 kg/cm <sup>2</sup> & as per BS 5352						
Hardness Test	248 HV10 max.						
Charpy Impact Test @ Temperature	Yes (at -29°C)						
Fire Safe Test	API 607 / ISO10497						
DOCUMENT NO.							
C221052-00-PP-DS-2014							
	D1	18.05.2022	SR	AK	MC	ISSUED FOR BID	
SHEET NO.	1 OF 2	REV	DATE	PRPD	CHKD	APVD	REMARKS



		<b>NORTH EAST GRID PHASE-III OF IGGL</b>					
CLIENT		INDRADHANUSH GAS GRID LIMITED					
PMC		VCS QUALITY SERVICES PVT. LTD.					
<b>DATA SHEET : GLOBE VALVE (MORE THAN OR EQUAL TO 2.0 INCH) BUTT WELDED</b>							
<b>GENERAL SPECIFICATION</b>							
Process Fluid	NG	ANSI Pressure Rating		600#			
Design Temperature	(-)29°C to 65°C	Design Pressure		92 barg			
Size, Inch (DN)	More than or equal to 2" (50)						
Valve Type	Rising Stem						
End Connection Type	Butt Welded	Design Standard		BS 1873			
Face Finish	Not Applicable	Locking Arrangement		As per P&ID			
<b>VALVE DESIGN CONDITIONS</b>							
Corrosion Allowance	1.5 mm	Design Factor		0.5			
Installation	Above Ground	Stem Ext Length (mm)		Not Applicable			
<b>VALVE OPERATION</b>							
Actuation Type	Not Applicable	Type of Actuator		Not Applicable			
<b>PUP PIECE DETAILS</b>							
N/A							
<b>VALVE MATERIAL SPECIFICATION</b>							
PART DESCRIPTION	MATERIAL SPECIFIED			MATERIAL OFFERED (Equivalent or Higher)			
Body	ASTM A216 Gr. WCB						
Bonnet (Bolted)	ASTM A216 Gr. WCB						
Disc (Loose Plug/ Ball Type)	(ASTM A216 Gr. WCB + 13% Cr Steel Facing)/ 13% Cr Steel (Stellited)						
Stem (Rising)	13% Cr Steel (No Casting)						
Body Seat Ring	ASTM A216 Gr. WCB + 13% Cr Steel (Stellited)						
Stem Packing (Renewable with valve open on stream)	Corrosion inhibited die formed flexible graphite with braided anti extrusion rings						
Hand Wheel (Rising)	Malleable Iron/ Cast Steel/ Fab. Steel						
Bonnet Gasket	Spiral Wound SS316 + Grafoil						
Body Studs/ Nuts	ASTM A193 Gr. B7/ A194 Gr. 2H						
<b>TESTING REQUIREMENT</b>							
Hydrostatic Test Pressure & Time	Body: 157 kg/cm <sup>2</sup> & as per BS 1873			Seat: 114 kg/cm <sup>2</sup> & as per BS 1873			
Pneumatic Test Pressure & Time	5.6 -7 kg/cm <sup>2</sup> & as per BS 1873						
Hardness Test	248 HV10 max.						
Charpy Impact Test @ Temperature	Yes (at -29°C)						
Fire Safe Test	API 607 / API 6FA						
DOCUMENT NO.							
C221052-00-PP-DS-2015							
	D1	18.05.2022	SR	AK	MC	ISSUED FOR BID	
SHEET NO.	1 OF 2	REV	DATE	PRPD	CHKD	APVD	REMARKS



		<b>NORTH EAST GRID PHASE-III OF IGGL</b>					
CLIENT		INDRADHANUSH GAS GRID LIMITED					
PMC		VCS QUALITY SERVICES PVT. LTD.					
<b>DATA SHEET : GLOBE VALVE (MORE THAN OR EQUAL TO 2.0 INCH) FLANGED END</b>							
<b>GENERAL SPECIFICATION</b>							
Process Fluid	NG	ANSI Pressure Rating		600#			
Design Temperature	(-)29°C to 65°C	Design Pressure		92 barg			
Size, Inch (DN)	More than or equal to 2" (50)						
Valve Type	Rising Stem						
End Connection Type	Flanged Welded	Design Standard		BS 1873			
Face Finish	Raised Face (Smooth [125 to 200 microinches AARH])	Locking Arrangement		As per P&ID			
<b>VALVE DESIGN CONDITIONS</b>							
Corrosion Allowance	1.5 mm	Design Factor		0.5			
Installation	Above Ground	Stem Ext Length (mm)		Not Applicable			
<b>VALVE OPERATION</b>							
Actuation Type	Not Applicable	Type of Actuator		Not Applicable			
<b>PUP PIECE DETAILS</b>							
N/A							
<b>VALVE MATERIAL SPECIFICATION</b>							
PART DESCRIPTION	MATERIAL SPECIFIED			MATERIAL OFFERED (Equivalent or Higher)			
Body	ASTM A216 Gr. WCB						
Bonnet (Bolted)	ASTM A216 Gr. WCB						
Disc (Loose Plug/ Ball Type)	(ASTM A216 Gr. WCB + 13% Cr Steel Facing)/ 13% Cr Steel (Stellited)						
Stem (Rising)	13% Cr Steel (No Casting)						
Body Seat Ring	ASTM A216 Gr. WCB + 13% Cr Steel (Stellited)						
Stem Packing (Renewable with valve open on stream)	Corrosion inhibited die formed flexible graphite with braided anti extrusion rings						
Hand Wheel (Rising)	Malleable Iron/ Cast Steel/ Fab. Steel						
Bonnet Gasket	Spiral Wound SS316 + Grafoil						
Body Studs/ Nuts	ASTM A193 Gr. B7/ A194 Gr. 2H						
<b>TESTING REQUIREMENT</b>							
Hydrostatic Test Pressure & Time	Body: 157 kg/cm <sup>2</sup> & as per BS 1873			Seat: 114 kg/cm <sup>2</sup> & as per BS 1873			
Pneumatic Test Pressure & Time	5.6 -7 kg/cm <sup>2</sup> & as per BS 1873						
Hardness Test	248 HV10 max.						
Charpy Impact Test @ Temperature	Yes (at -29°C)						
Fire Safe Test	API 607 / API 6FA						
DOCUMENT NO.							
C221052-00-PP-DS-2016							
	D1	18.05.2022	SR	AK	MC	ISSUED FOR BID	
SHEET NO.	1 OF 2	REV	DATE	PRPD	CHKD	APVD	REMARKS





Energising Quality

## NORTH EAST GAS GRID PHASE-III OF IGGL



### DATA SHEET – INSULATING JOINT

Client Job Number

C221052

Total Sheets

07

DOCUMENT NO

C221052

00

PP

DS

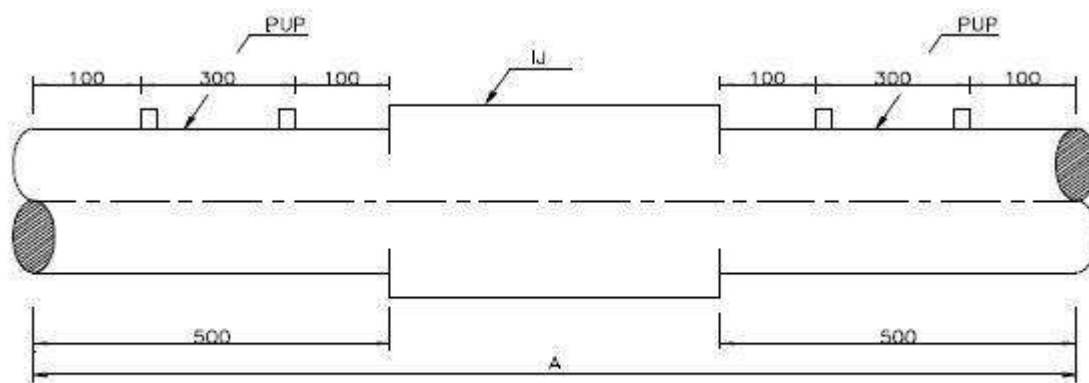
2001

# INDRADHANUSH GAS GRID LIMITED (IGGL)

## NORTH EAST GAS GRID PHASE-III OF IGGL

### DATA SHEET FOR INSULATING JOINT

D2	03-06-2022	RE-ISSUED FOR BID	RS	AK	MC
D1	18-05-2022	ISSUED FOR BID	AK	AK	MC
REV	DATE	DESCRIPTION	PREP	CHK	APPR



A = OVERALL LENGTH OF IJ TO BE CONFIRMED BY MANUFACTURER.

\*NOTE: The length of the pup piece will vary as per pipe diameter.

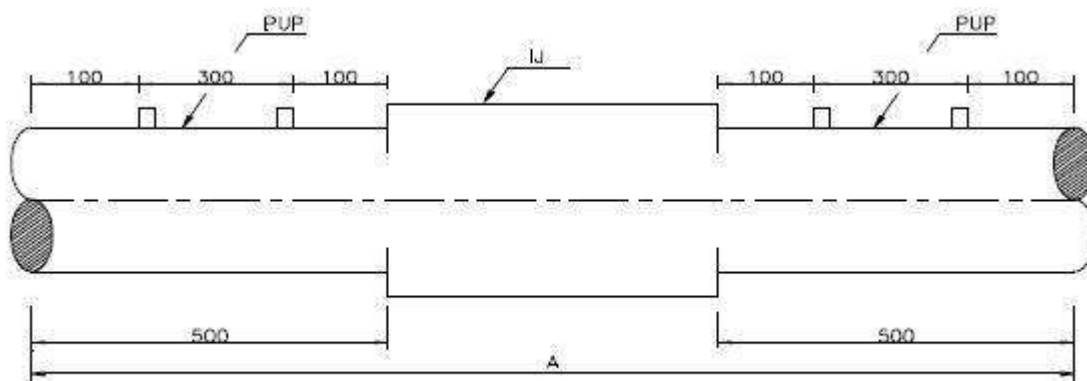
Insulating Joint Manufacturer	-
IJ Specification No.	VPC-SS-PP-2029
<b>DESIGN DATA FOR INSULATING JOINT FOR CS LINE</b>	
Service, Design Life	NG, 35 yrs.
Size (OD), mm (inch)	323.8 (12")
Design Pressure	92 Kg/cm <sup>2</sup> g
ASME Rating / Design Factor	600# / 0.5
Design Temperature (°C)	-29 to 65.0
Corrosion Allowance (mm)	1.5
Hydrostatic Test Pressure	138 Kg/cm <sup>2</sup> 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		ASTM A694 Gr. F70 (CHARPY)	
Pups		API 5L GR. X-70 PSL2	
Insulation		As per specification	
ATTACHED PIPE SPECIFICATION			
S. No.	Outside Diameter, OD mm (inch)	Wall Thickness, (mm)/ Schedule	Material
1.	323.8 (12")	9.53	API 5L GR. X-70 PSL2

## Notes:

1. The internal diameter of Insulating Joint shall be uniform throughout the entire length and shall not be less than specified internal diameter of connecting Pipeline.
2. Insulating joint shall comply the requirement of Project Specification VPC-SS-PL-2029.
3. Insulation material shall be minimum 20 mm thick and shall comply with Section 5, NACE RP 0286.
4. Holiday detection shall be performed using a detector equipped with a straight brush and set at a voltage of at least 2.5kV.
5. For the welding end, the out of roundness and tolerance on internal diameter at pipe ends shall be same as diameter tolerance for the pipe ends indicated in line Pipe Specification & API 5L.
6. Insulating Joint shall be suitable for all type of pigging operation including intelligent pigging.
7. Insulating Joint shall be monolithic boltless.
8. Vendor to ensure that all material specified herein/ offered is suitable for specified fluid type & design & operating Condition.
9. All applicable test (Impact, hardness, Chemical, mechanical etc) shall also be carried out on pup piece.
10. Overall isolating joint's length shall be such that the heat generated by field welding is not detrimental to the insulating, filler materials, and internal/external coating.
11. Vendor shall furnish the allowable forces & moments for the axial, lateral & transverse (i.e., X, Y & Z) directions
12. Manufacturing shall not commence until materials, dimension (including the calculation sheet), drawings, manufacturing process and welding procedure qualification selected by the Manufacturer are approved by COMPANY.
13. Manufacturer shall ensure that the wall thickness (W.T.) of all parts of insulating joint shall be adequate to sustain design pressure and selected W.T. shall be suitable for welding with W.T. of connected pipeline.



A = OVERALL LENGTH OF IJ TO BE CONFIRMED BY MANUFACTURER.

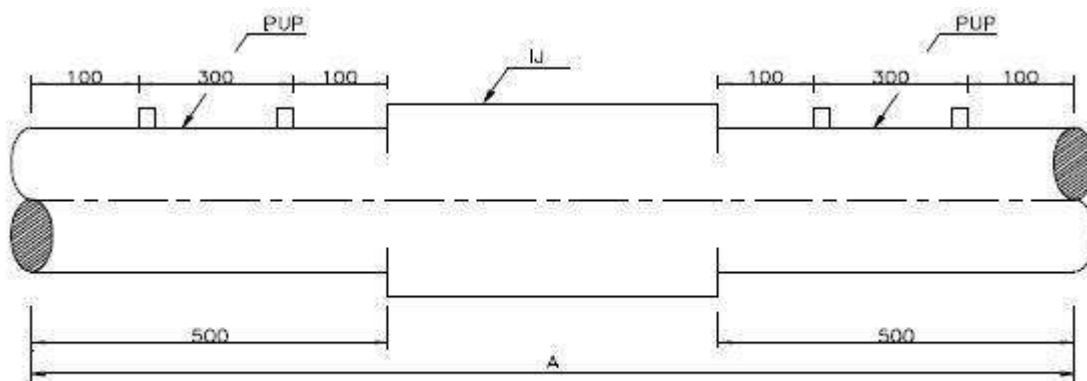
\*NOTE: The length of the pup piece will vary as per pipe diameter.

Insulating Joint Manufacturer	-
IJ Specification No.	VPC-SS-PP-2029
<b>DESIGN DATA FOR INSULATING JOINT FOR CS LINE</b>	
Service, Design Life	NG, 35 yrs.
Size (OD), mm (inch)	219.1 (8")
Design Pressure	92 Kg/cm <sup>2</sup> g
ASME Rating / Design Factor	600# / 0.5
Design Temperature (°C)	-29 to 65.0
Corrosion Allowance (mm)	1.5
Hydrostatic Test Pressure	138 Kg/cm <sup>2</sup> 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		ASTM A 105 (CHARPY)	
Pups		API 5L GR. B PSL2	
Insulation		As per specification	
ATTACHED PIPE SPECIFICATION			
S. No.	Outside Diameter, OD mm (inch)	Wall Thickness, (mm)/ Schedule	Material
1.	219.1 (8")	14.3	API 5L GR. B PSL2

### **Notes:**

1. The internal diameter of Insulating Joint shall be uniform throughout the entire length and shall not be less than specified internal diameter of connecting Pipeline.
2. Insulating joint shall comply the requirement of Project Specification VPC-SS-PL-2029.
3. Insulation material shall be minimum 20 mm thick and shall comply with Section 5, NACE RP 0286.
4. Holiday detection shall be performed using a detector equipped with a straight brush and set at a voltage of at least 2.5kV.
5. For the welding end, the out of roundness and tolerance on internal diameter at pipe ends shall be same as diameter tolerance for the pipe ends indicated in line Pipe Specification & API 5L.
6. Insulating Joint shall be suitable for all type of pigging operation including intelligent pigging.
7. Insulating Joint shall be monolithic boltless.
8. Vendor to ensure that all material specified herein/ offered is suitable for specified fluid type & design & operating Condition.
9. All applicable test (Impact, hardness, Chemical, mechanical etc) shall also be carried out on pup piece.
10. Overall isolating joint's length shall be such that the heat generated by field welding is not detrimental to the insulating, filler materials, and internal/external coating.
11. Vendor shall furnish the allowable forces & moments for the axial, lateral & transverse (i.e., X, Y & Z) directions
12. Manufacturing shall not commence until materials, dimension (including the calculation sheet), drawings, manufacturing process and welding procedure qualification selected by the Manufacturer are approved by COMPANY.
13. Manufacturer shall ensure that the wall thickness (W.T.) of all parts of insulating joint shall be adequate to sustain design pressure and selected W.T. shall be suitable for welding with W.T. of connected pipeline.



A = OVERALL LENGTH OF IJ TO BE CONFIRMED BY MANUFACTURER.

\*NOTE: The length of the pup piece will vary as per pipe diameter.

Insulating Joint Manufacturer	-
IJ Specification No.	VPC-SS-PP-2029
<b>DESIGN DATA FOR INSULATING JOINT FOR CS LINE</b>	
Service, Design Life	NG, 35 yrs.
Size (OD), mm (inch)	114.3 (4")
Design Pressure	92 Kg/cm <sup>2</sup> g
ASME Rating / Design Factor	600# / 0.5
Design Temperature (°C)	-29 to 65.0
Corrosion Allowance (mm)	1.5
Hydrostatic Test Pressure	138 Kg/cm <sup>2</sup> 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		ASTM A 105 (CHARPY)	
Pups		ASTM A 106 Gr. B (CHARPY)	
Insulation		As per specification	
ATTACHED PIPE SPECIFICATION			
S. No.	Outside Diameter, OD mm (inch)	Wall Thickness, (mm)/ Schedule	Material
1.	114.3 (4")	8.56, XS	ASTM A 106 Gr. B (CHARPY)

### Notes:

1. The internal diameter of Insulating Joint shall be uniform throughout the entire length and shall not be less than specified internal diameter of connecting Pipeline.
2. Insulating joint shall comply the requirement of Project Specification VPC-SS-PL-2029.
3. Insulation material shall be minimum 20 mm thick and shall comply with Section 5, NACE RP 0286.
4. Holiday detection shall be performed using a detector equipped with a straight brush and set at a voltage of at least 2.5kV.
5. For the welding end, the out of roundness and tolerance on internal diameter at pipe ends shall be same as diameter tolerance for the pipe ends indicated in line Pipe Specification & API 5L.
6. Insulating Joint shall be suitable for all type of pigging operation including intelligent pigging.
7. Insulating Joint shall be monolithic boltless.
8. Vendor to ensure that all material specified herein/ offered is suitable for specified fluid type & design & operating Condition.
9. All applicable test (Impact, hardness, Chemical, mechanical etc) shall also be carried out on pup piece.
10. Overall isolating joint's length shall be such that the heat generated by field welding is not detrimental to the insulating, filler materials, and internal/external coating.
11. Vendor shall furnish the allowable forces & moments for the axial, lateral & transverse (i.e., X, Y & Z) directions
12. Manufacturing shall not commence until materials, dimension (including the calculation sheet), drawings, manufacturing process and welding procedure qualification selected by the Manufacturer are approved by COMPANY.
13. Manufacturer shall ensure that the wall thickness (W.T.) of all parts of insulating joint shall be adequate to sustain design pressure and selected W.T. shall be suitable for welding with W.T. of connected pipeline.



Energising Quality

## NORTH EAST GAS GRID PHASE-III OF IGGL



### DATA SHEET BI-DIRECTIONAL SCRAPER LAUNCHER / RECEIVER

Total Sheets

06

DOCUMENT NO.

C221052

00

PP

DS

2002

## INDRADHANUSH GAS GRID LIMITED (IGGL)

### NORTH EAST GAS GRID PHASE-III OF IGGL

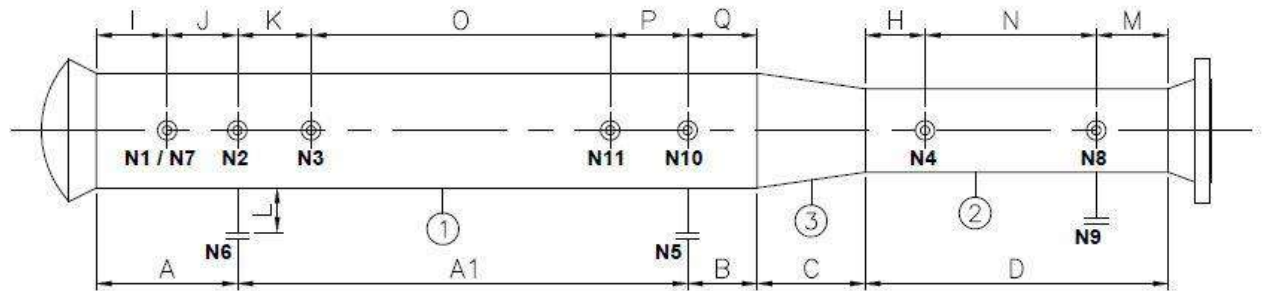
### DATA SHEET FOR BI-DIRECTIONAL SCRAPER LAUNCHER / RECEIVER

D1	18.05.2022	ISSUED FOR BID	AK	AK	MC
REV	DATE	DESCRIPTION	PREP	CHK	APPR

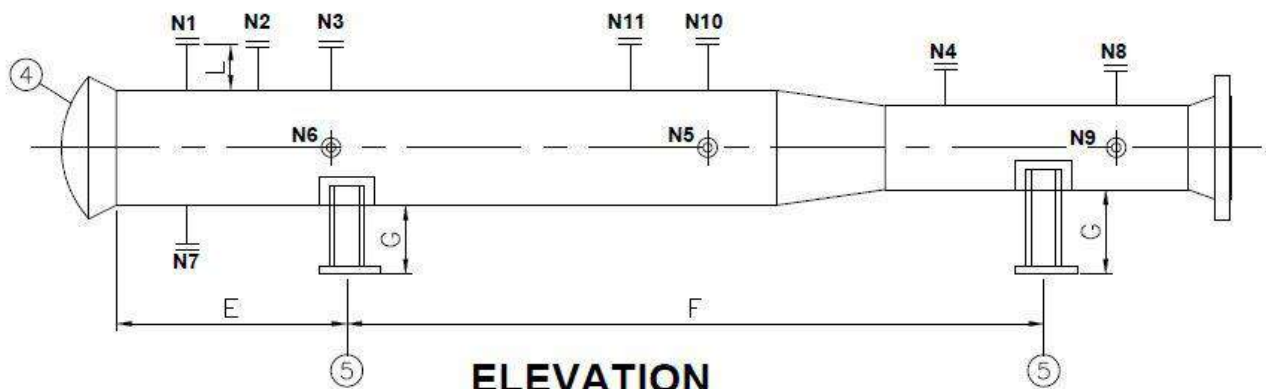
BI – DIRECTIONAL SCRAPER LAUNCHER/ RECEIVER DETAILS (18” x 12”)			
GENERAL PARAMETERS			
Scraper Trap Manufacturer		-----	
Scraper Trap Specification No.		VPC-SS-PP-2011	
Type of Scraper Trap		Bi-directional, Scraper Launcher/ Receiver suitable for Intelligent pig	
Design Pressure (kg/cm <sup>2</sup> g)		92	
Design Temperature (°C) (min. to max.)		-29 to 65	
Pipeline Design Code		ASME B31.8/OISD STD-226	
Design Code -Scraper Trap & QOEC		ASME B31.8 & ASME Section VIII, Division I	
Corrosion Allowance, mm		3	
Design Factor		0.5	
ANSI Rating		600#	
Design Life		35 years	
Tag No. (s)		As per P&ID	
Charpy Impact Test		-29°C	
Hardness		The maximum hardness of base metal, weld metal & HAZ of all the pressure containing parts shall not exceed 248 HV10.	
Other tests		As per Specification	
PIPELINE DETAILS			
Pipeline Nominal Diameter, mm (inch)	323.8 (12”)	Thickness, mm	9.53
Pipeline Material	API 5L GR. X-70 PSL2	Fluid Service	Natural Gas

Part No.	Description	Item	Ends/Type	Material (Equiv. /Sup.)	SIZE(N B)
1	Body	Major Barrel (Pipe)	BW, QOEC, Welded	API 5L GR. X-70 PSL2	18"
2	Body	Minor Barrel (Pipe)	Flanged WNRF,	API 5L GR. X-70 PSL2	12"
3	Reducer	Concentric	BW, Welded	MSS SP - 75 WPHY-70	18" X 12"
4	End Closure	Forged	Quick Opening	ASTM A 694 Gr. F70 (CHARPY)	18" / 600#
5	Supports	Plate	Welded	ASTM A 36	As required
N11	Vent	Weldolet /pipe/ Flange	BW/SMLS/Flanged, WNRF	A 106 Gr. B (CHARPY)/ ASTM A 105 (CHARPY)	2"
N2	PSV conn.	Weldolet /pipe/ Flange	Flanged, WNRF	A 106 Gr. B (CHARPY)/ ASTM A 105 (CHARPY)	2"
N1, N3 & N4	Pr. gauge conn./Pr. indicator	Weldolet /pipe/ Flange	Flanged, WNRF	A 106 Gr. B/ ASTM A 105	2"
N5	Bypass conn./ Kicker conn.	Weldolet /pipe/ Flange	Flanged, WNRF	A 106 Gr. B (CHARPY)/ ASTM A 105 (CHARPY)	4"
N6	Kicker conn.	Weldolet /pipe/ Flange	Flanged, WNRF	A 106 Gr. B (CHARPY)/ ASTM A 105 (CHARPY)	4"
N7	Drain conn.	Weldolet /pipe/ Flange	Flanged, WNRF	A 106 Gr. B (CHARPY)/ ASTM A 105 (CHARPY)	4"
N8 (XXI)	Pig Signaler (Non Intrusive Type)	As per Pig Signaler Data Sheet No. C221052-00-PP-DS-2003			
N9	Pressure Balancing conn.	Weldolet /pipe/ Flange	Flanged, WNRF	A 106 Gr. B (CHARPY)/ ASTM A 105 (CHARPY)	2"
N10	Purge Connection	Weldolet /pipe/ Flange	Flanged, WNRF	A 106 Gr. B (CHARPY)/ ASTM A 105 (CHARPY)F60(CHARPY)	2"





**PLAN**



**ELEVATION**

DIMENSION DETAILS			
Marking	Dimension (mm)	Marking	Dimension (mm)
A + A1 + B	4300 (Note - 3)	I	300 (Note - 3)
		J	300 (Note - 3)
		K	300 (Note - 3)
C	381 (Note - 3)	L	250 (Note-3)
D	4300 (Note - 3)	M	300 (Note - 3)
E	900 (Note - 3)	N	3700 (Note - 3)
F	7521 (Note - 3)	O	2800 (Note - 3)
G	1028 (Note - 3)	P	300 (Note - 3)
H	300 (Note - 3)	Q	300 (Note - 3)

## Legend:

BW – Butt Welded, WNR – WELD NECK RAISED FACE, SW – Socket welded, LSAW-Longitudinal Seam Submerged Arc Welded

## Notes:

1. The scraper traps are bi-directional and all its components intend to be used in service specified above. All requirements as specified shall be applicable for above fluid service.
2. Nozzles numbers, nozzle orientation & naming of all the nozzles are indicative only and shall be confirmed & approved by Company during manufacturer's drawing approval stage. Vendor to note that all Nozzle numbering shall be as per P&IDs.
3. The dimensions shown in above table are suggestive/Indicative only. The Manufacturer shall check and provide dimensions suitable for accommodating latest online inspection tool and by considering other technical criteria. Final dimensions shall be approved by Company.
4. For all Nozzle (N1 to N11), Vendor to check / Suggest requirement of Pipe between Weldolet and Flange.
5. Charpy and hardness test shall be carried out as per specification no. VPC-SS-PP-2011. Impact test temperature shall be as specified in Data sheet & MR
6. Manufacturer shall check thickness of the scraper based on pipeline design conditions and manufacturing requirements, and submit necessary calculations to Company for approval.
7. Hydrotest of scraper trap shall be hydrotested at 1.5 times of design pressure.
8. Flanges welded on Scraper trap shall be WNR type & shall have smooth face finish to 125 AARH suitable for 600#. Flanged end, if specified shall have flanges as per ASME B16.5
9. Vendor to furnish the allowable nozzle forces and moments in the axial, lateral and transmission direction.
10. All the support shall be sliding type with slotted bolt holes to accommodate axial movement
11. Heat treatment, normalizing requirement of all carbon steel fittings/flanges shall be in accordance with relevant standard. All carbon steel fittings and flanges shall be finish forged i.e., forged to be the required shape. Machined fittings and flanges are not acceptable. Machining is permitted for weld end preparation and flange face finish preparation.
12. All Weldolets shall be as per MSS-SP-97 & all Nippolets shall be as per Manufacturer's Standard. Stub-in or pipe to pipe connection shall not use for making branch connections.
13. End closure gasket shall be self-energized type.
14. End closure shall be designed with ASME Section VIII Division I.
15. Circumferential weld on scraper trap body and neck shall not be permitted.
16. Butt weld end, if specified shall have ends prepared as per ASME B16.25. However, end preparation for butt welding end having unequal thickness with respect to connecting pipe shall be as per ASME B 31.8 as applicable.
17. The thickness of concentric reducer shall match with the adjoining body/neck.
18. Scraper traps & its fittings including QOEC shall be externally painted/ coated as per Painting Specification for highly corrosive environment.

 Energising Quality	<b>DATA SHEET</b> <b>BI-DIRECTIONAL SCRAPER</b> <b>LAUNCHER/RECEIVER</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DS-2002	D1
		Page 5 of 6	



## NORTH EAST GAS GRID PHASE-III OF IGGL

19. Supply of Pig handling system with insertion retraction facility for insert/pulling the SS tray/pigs to suit scraper trap is in contractor scope.
20. Supply of jib crane to suit the pig handling for scraper trap is in contractor scope.
21. Pig handling system shall be suitable for inserting and retracting of all types of instrumented/intelligent pigs from the trap.
22. Pig handling system, pushing rod mechanism & trolley shall be of dismantled type.
23. Jib crane with 360-degree swing arm shall be supplied with duly certified load test details.

 Energising Quality	<b>DATA SHEET BI-DIRECTIONAL SCRAPER LAUNCHER/RECEIVER</b>	<b>Document No.</b>	<b>Rev</b>
		C221052-00-PP-DS-2002	D1
		Page 6 of 6	



PROJECT NUMBER : C221052



Energising Quality

PROCESS DATASHEET FOR PIG LAUNCHER

Client Job  
Number

C221052

Total Sheets

3

Document no.

C221052

DIPL

PC

DS

1002

**Indradhanush Gas Grid Limited**

**North East Gas Grid Phase - III of IGGL**

C1	30.05.22	Issued for Client Review	KT	AD	SKP
REV	DATE	DESCRIPTION	PREP	CHKD	APPR



**CLIENT : Indradhanush Gas Grid Limited**

**JOB. NO. C211052**

**PROJECT :North East Gas Grid Phase - III of IGGL**

**C221052-DIPL-PC-DS-1002**

**PROCESS DATASHEET FOR PIG LAUNCHER**

**Sht 2 of 3**

**Rev**

**C1**

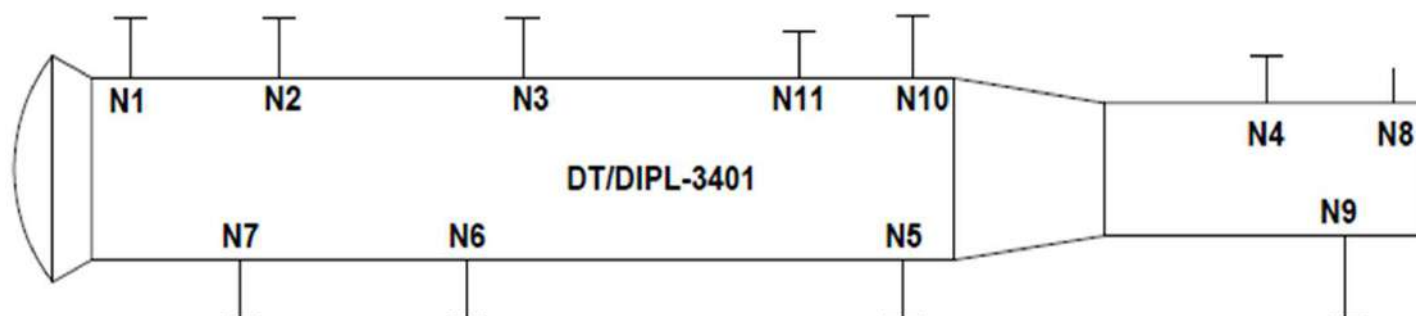
**Remarks**

		Unit		Remarks
1	Tag No.	-	DT/DIPL-3401	
2	Quantity	-	One	
3	P&ID No.	-	C221052-DIPL-PC-PID-1001	
4	Service	-	Launcher	
5	Fluid handled	-	Natural Gas	
6	Type	-	Concentric, Bi directional	
7	Design Code	-	ASME B31.8/ ASME Sec VIII, Div I	
8	Size (Minor / Major)	inch / inch	18" x 12"	
9	Closure type	-	QOEC	
10	Operating Temperature (Min./Max.)	°C	25 / 50	
11	Operating Pressure	kg/cm2g	37	
12	Design Temperature	°C	-29 / 65	
13	Design Pressure	kg/cm2g	92	
14	Material of construction	-	Carbon Steel	
15	Corrosion allowance	mm	3	
16	Performance specification	-	Note-2	

**17 Appurtenances Nozzle**

Nozzle Description	No	Nozzle Size	Pipe Class	Pipe Rating
PG-3402 Connection	N1	2"	D1A	600
PSV-3401 Connection (Note-3)	N2	2"	D1A	600
PT-3401 Connection	N3	2"	D1A	600
PG-3403 Conection	N4	2"	D1A	600
Kicker Line	N5	4"	D1A	600
Kicker Line	N6	4"	D1A	600
Drain from Major barrel	N7	4"	D1A	600
Pig Signaller XXS-3401	N8	2"	D1A	600
Balance line	N9	2"	D1A	600
Purge Vent SP-3401	N10	2"	D1A	600
Vent to ATM	N11	2"	D1A	600

**Sketch**



**Notes :**

1. Pig trap door opening mechanism to be constructed such that the door can not be opened unless the pig trap is fully depressurised/drained.
2. Shall be suitable for launching of intelligent pigs in 12" NB pipeline.
3. PSV-3401 connection nozzle size is under hold. Shall be finalised post receipt of PSV size by vendor.

**Hold:**

1. To be conformed by client



**CLIENT : Indradhanush Gas Grid Limited**

**JOB. NO. C211052**

**PROJECT :North East Gas Grid Phase - III of IGGL**

**C221052-DIPL-PC-DS-1002**

**PROCESS DATASHEET FOR PIG LAUNCHER**

**Sht 3 of 3**

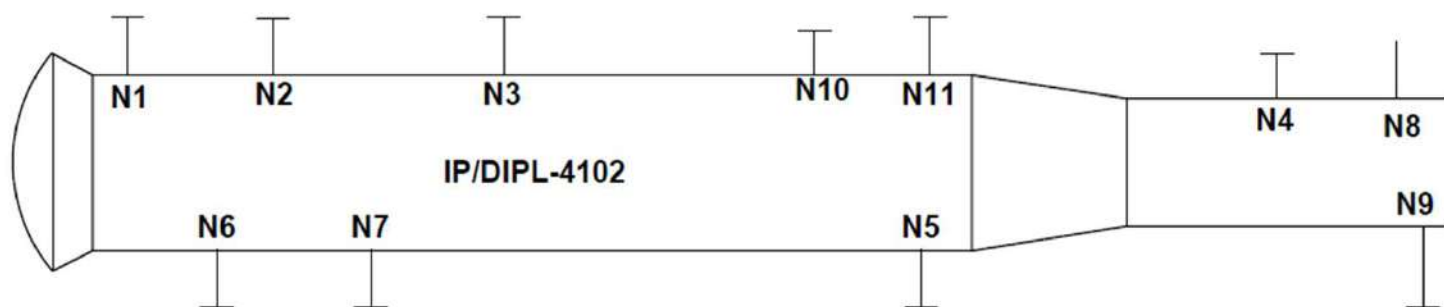
**Rev**

**C1**

	Unit	Remarks
1 Tag No.	-	IP/DIPL-4102
2 Quantity	-	One
3 P&ID No.	-	C221052-DIPL-PC-PID-1008
4 Service	-	Launcher
5 Fluid handled	-	Natural Gas
6 Type	-	Concentric, Bi directional
7 Design Code	-	ASME B31.8 / ASME Sec VIII, Div I
8 Size (Minor / Major)	inch / inch	18" x 12"
9 Closure type	-	QOEC
10 Operating Temperature (Min./Max.)	°C	25 / 50
11 Operating Pressure	kg/cm2g	37
12 Design Temperature	°C	-29 / 65
13 Design Pressure	kg/cm2g	92
14 Material of construction	-	Carbon Steel
15 Corrosion allowance	mm	3
16 Performance specification	-	Note-2

Appurtenances Nozzle				
Nozzle Description	No	Nozzle Size	Pipe Class	Pipe Rating
PG-4111 Connection	N1	2"	D1A	600
PSV-4102 Connection (Note-3)	N2	2"	D1A	600
PT-4142 Connection	N3	2"	D1A	600
PG-4112 Conection	N4	2"	D1A	600
Kicker Line	N5	4"	D1A	600
Kicker Line	N6	4"	D1A	600
Drain from Major barrel	N7	4"	D1A	600
Pig Signaller XXS-4104	N8	2"	D1A	600
Balance line	N9	2"	D1A	600
Vent to ATM	N10	2"	D1A	600
Purge Vent SP-4102	N11	2"	D1A	600

#### Sketch



#### Notes :

1. Pig trap door opening mechanism to be constructed such that the door can not be opened unless the pig trap is fully depressurised/drained.
2. Shall be suitable for launching of intelligent pigs in 12" NB pipeline.
3. PSV-4102 connection nozzle size is under hold. Shall be finalised post receipt of PSV size by vendor.

#### Hold:

1. To be conform by client



PROJECT NUMBER : C221052



Energising Quality

PROCESS DATASHEET FOR PIG RECEIVER

Client Job  
Number

C221052

Total Sheets

3

Document no.

C221052

DIPL

PC

DS

1003

**Indradhanush Gas Grid Limited**

**North East Gas Grid Phase - III of IGGL**

C1	30.05.22	Issued for Client Review	KT	AD	SKP
REV	DATE	DESCRIPTION	PREP	CHKD	APPR



**CLIENT : Indradhanush Gas Grid Limited**

**JOB. NO. C211052**

**PROJECT :North East Gas Grid Phase - III of IGGL**

**C221052-DIPL-PC-DS-1003**

**PROCESS DATASHEET FOR PIG RECIEVER**

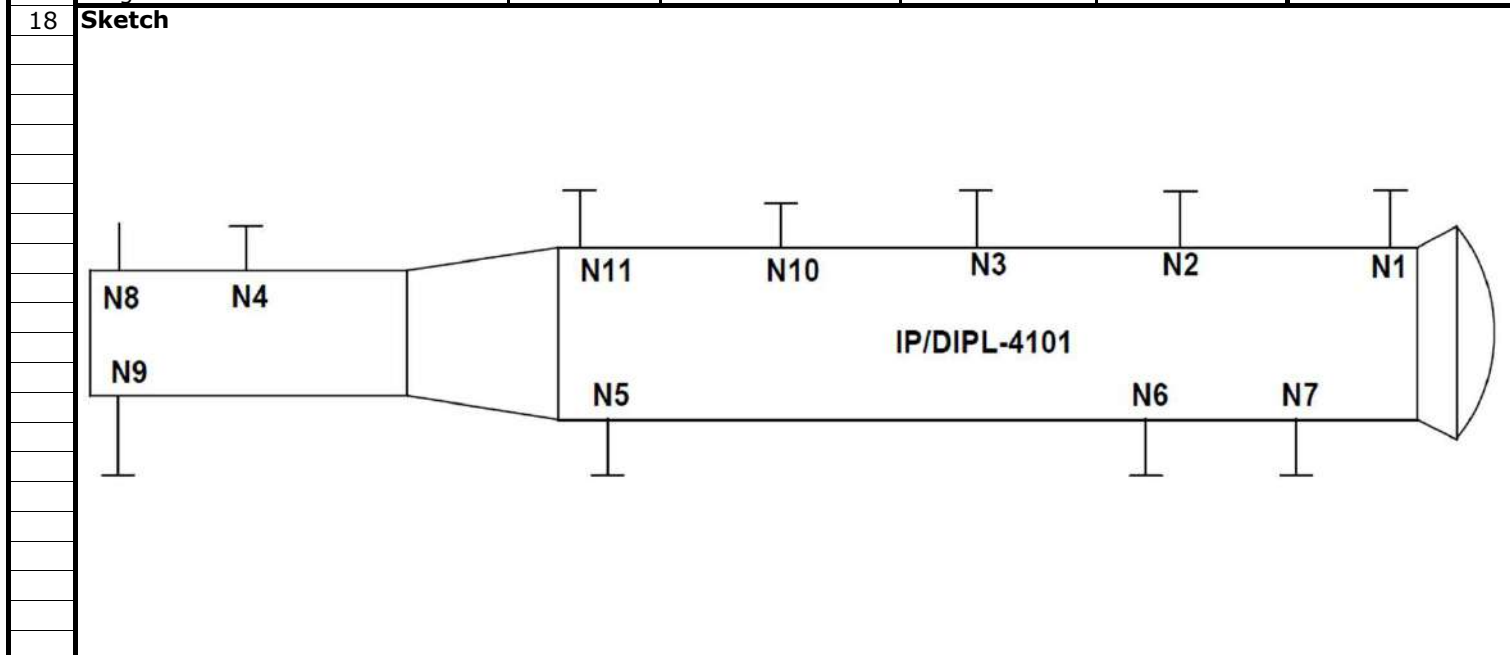
**Sht 2 of 3**

**Rev**

**C1**

	Unit	Remarks
1 Tag No.	-	IP/DIPL-4101
2 Quantity	-	One
3 P&ID No.	-	C221052-DIPL-PC-PID-1008
4 Service	-	Receiver
5 Fluid handled	-	Natural Gas
6 Type	-	Cocentric, Bi directional
7 Design Code	-	ASME B31.8 / ASME Sec VIII, Div I
8 Size (Minor / Major)	inch / inch	18" x 12"
9 Closure type	-	QOEC
10 Operating Temperature	°C	25 / 50
11 Operating Pressure	kg/cm2g	37
12 Design Temperature	°C	-29 / 65
13 Design Pressure	kg/cm2g	92
14 Material of construction	-	Carbon Steel
15 Corrosion allowance	mm	3
16 Performance specification	-	Note-2

17	<b>Appurtenances Nozzle</b>				
	<b>Nozzle Description</b>	<b>No</b>	<b>Nozzle Size</b>	<b>Pipe Class</b>	<b>Pipe Rating</b>
	PG-4102 Connection	N1	2"	D1A	600
	PSV-4101 Connection (Note-3)	N2	2"	D1A	600
	PT-4101 Connection	N3	2"	D1A	600
	PG-4101 Conection	N4	2"	D1A	600
	Kicker Line	N5	4"	D1A	600
	Kicker Line	N6	4"	D1A	600
	Drain from Major barrel	N7	4"	D1A	600
	Pig Signaller XXS-4102	N8	2"	D1A	600
	Balance line	N9	2"	D1A	600
	Vent to atm	N10	2"	D1A	600
	Purge Vent	N11	2"	D1A	600



**Notes :**

1. Pig trap door opening mechanism to be constructed such that the door can not be opened unless the pig trap is fully depressurised/drained.
2. Shall be suitable for launching of intelligent pigs in 12" NB P/L.
3. PSV-4602 connnection nozzle size is under hold. Shall be finalised post receipt of PSV size by vendor.

**Hold:**

1. To be confirm by client





**CLIENT : Indradhanush Gas Grid Limited**

**JOB. NO. C211052**

**PROJECT :North East Gas Grid Phase - III of IGGL**

**C221052-02-PC-DS-1003**

**PROCESS DATASHEET FOR PIG RECIEVER**

**Sht 3 of 3**

**Rev**

**C1**

	Unit			Remarks	
1	Tag No.	-	RT/DIPL-4601		
2	Quantity	-	One		
3	P&ID No.	-	C221052-DIPL-PC-PID-1013		
4	Service	-	Receiver		
5	Fluid handled	-	Natural Gas		
6	Type	-	Cocentric, Bi directional		
7	Design Code	-	ASME B31.8 / ASME Sec VIII, Div I		
8	Size (Minor / Major)	inch / inch	18" x 12"		
9	Closure type	-	QOEC		
10	Operating Temperature	°C	25 / 50		
11	Operating Pressure	kg/cm2g	37		
12	Design Temperature	°C	-29 / 65		
13	Design Pressure	kg/cm2g	92		
14	Material of construction	-	Carbon Steel		
15	Corrosion allowance	mm	3		
16	Performance specification	-	Note-2		
17	<b>Appurtenances Nozzle</b>				
	<b>Nozzle Description</b>	<b>No</b>	<b>Nozzle Size</b>	<b>Pipe Class</b>	<b>Pipe Rating</b>
	PG-4602 Connection	N1	2"	D1A	600
	PSV-4602 Connection (Note-3)	N2	2"	D1A	600
	PT-4601 Connection	N3	2"	D1A	600
	PG-4606 Conection	N4	2"	D1A	600
	Kicker Line	N5	4"	D1A	600
	Kicker Line	N6	4"	D1A	600
	Drain from Major barrel	N7	4"	D1A	600
	Pig Signaller XXS-4604	N8	2"	D1A	600
	Balance line	N9	2"	D1A	600
	Vent to atm	N10	2"	D1A	600
	Purge Vent	N11	2"	D1A	600
18	<b>Sketch</b>				
	<b>Notes :</b>				
	1. Pig trap door opening mechanism to be constructed such that the door can not be opened unless the pig trap is fully depressurised/drained.				
	2. Shall be suitable for launching of intelligent pigs in 12" NB P/L.				
	3. PSV-4602 connection nozzle size is under hold. Shall be finalised post receipt of PSV size by vendor.				
	<b>Hold:</b>				
	1. To be confirm by client				



PROJECT NUMBER : C221052



Energising Quality

PROCESS DATASHEET FOR PIG LAUNCHER

Client Job  
Number

C221052

Total Sheets

3

Document no.

C221052

SGPL

PC

DS

1002

**Indradhanush Gas Grid Limited**

**North East Gas Grid Phase - III of IGGL**

C1	31.05.22	Issued for Client Review	KT	AD	SKP
REV	DATE	DESCRIPTION	PREP	CHKD	APPR



**CLIENT : Indradhanush Gas Grid Limited**

**JOB. NO. C211052**

**PROJECT :North East Gas Grid Phase - III of IGGL**

**C221052-SGPL-PC-DS-1002**

**PROCESS DATASHEET FOR PIG LAUNCHER**

**Sht 2 of 3**

**Rev**

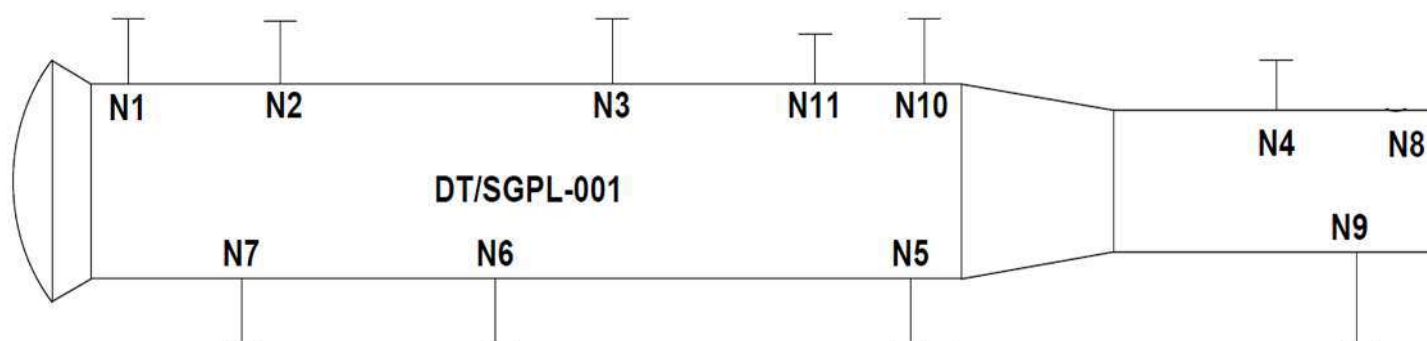
**C1**

**Remarks**

	Unit		
1 Tag No.	-	DT/SGPL-1001	
2 Quantity	-	One	
3 P&ID No.	-	C221052-SGPL-PC-PID-1001	
4 Service	-	Launcher	
5 Fluid handled	-	Natural Gas	
6 Type	-	Concentric, Bi directional	
7 Design Code	-	ASME B31.8/ ASME Sec VIII, Div I	
8 Size (Minor / Major)	inch / inch	18" x 12"	
9 Closure type	-	QOEC	
10 Operating Temperature (Min/ Max)	°C	25 / 50	
11 Operating Pressure	kg/cm2g	30	
12 Design Temperature	°C	-29 / 65	
13 Design Pressure	kg/cm2g	92	
14 Material of construction	-	Carbon Steel	
15 Corrosion allowance	mm	3	
16 Performance specification	-	Note-2	

Appurtenances Nozzle				
Nozzle Description	No	Nozzle Size	Pipe Class	Pipe Rating
PG-1009 Connection	N1	2"	D1A	600
PSV-1001 Connection (Note-3)	N2	2"	D1A	600
PIT-1001 Connection	N3	2"	D1A	600
PG-1010 Connection	N4	2"	D1A	600
Kicker Line	N5	4"	D1A	600
Kicker Line	N6	4"	D1A	600
Drain from Major barrel	N7	4"	D1A	600
Pig Signaller XXS-1001	N8	2"	D1A	600
Balance line	N9	2"	D1A	600
Purge Vent SP-101	N10	2"	D1A	600
Vent to ATM	N11	2"	D1A	600

#### Sketch



#### Notes :

1. Pig trap door opening mechanism to be constructed such that the door can not be opened unless the pig trap is fully depressurised/drained.
2. Shall be suitable for launching of intelligent pigs in 12" NB Pipeline.
3. PSV-1001 connection nozzle size is under hold. Shall be finalised post receipt of PSV size by vendor.

#### Hold:

1. To be conformed by client



**CLIENT : Indradhanush Gas Grid Limited**

**JOB. NO. C211052**

**PROJECT :North East Gas Grid Phase - III of IGGL**

**C221052-SGPL-PC-DS-1002**

**PROCESS DATASHEET FOR PIG LAUNCHER**

**Sht 3 of 3**

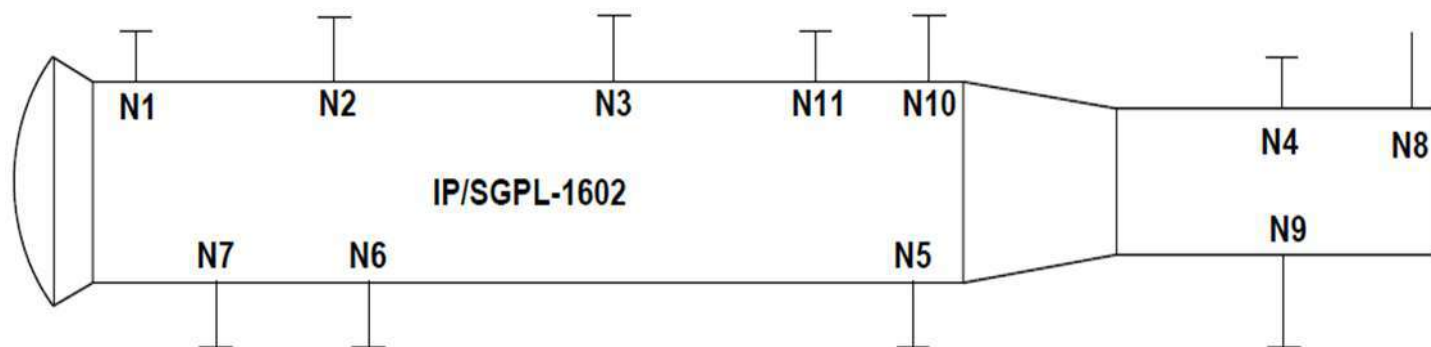
**Rev**

**C1**

	Unit	Remarks
1 Tag No.	-	IP/SGPL-1602
2 Quantity	-	One
3 P&ID No.	-	C221052-SGPL-PC-PID-1007
4 Service	-	Launcher
5 Fluid handled	-	Natural Gas
6 Type	-	Concentric, Bi directional
7 Design Code	-	ASME B31.8 / ASME Sec VIII, Div I
8 Size (Minor / Major)	inch / inch	18" x 12"
9 Closure type	-	QOEC
10 Operating Temperature (Min/ Max)	°C	25 / 50
11 Operating Pressure	kg/cm2g	30
12 Design Temperature	°C	-29 / 65
13 Design Pressure	kg/cm2g	92
14 Material of construction	-	Carbon Steel
15 Corrosion allowance	mm	3
16 Performance specification	-	Note-2

Appurtenances Nozzle				
Nozzle Description	No	Nozzle Size	Pipe Class	Pipe Rating
PG-1604 Connection	N1	2"	D1A	600
PSV-1602 Connection (Note-3)	N2	2"	D1A	600
PIT-1602 Connection	N3	2"	D1A	600
PG-1606 Conection	N4	2"	D1A	600
Kicker Line	N5	4"	D1A	600
Kicker Line	N6	4"	D1A	600
Drain from Major barrel	N7	4"	D1A	600
Pig Signaller XXS-1603	N8	2"	D1A	600
Balance line	N9	2"	D1A	600
Purge Vent SP-162	N10	2"	D1A	600
Vent to ATM	N11	2"	D1A	600

#### Sketch



#### Notes :

1. Pig trap door opening mechanism to be constructed such that the door can not be opened unless the pig trap is fully depressurised/drained.
2. Shall be suitable for launching of intelligent pigs in 12" NB Pipeline.
3. PSV-1602 connection nozzle size is under hold. Shall be finalised post receipt of PSV size by vendor.

#### Hold:

1. To be conform by client



PROJECT NUMBER : C221052



Energising Quality

PROCESS DATASHEET FOR PIG RECEIVER

Client Job  
Number

C221052

Total Sheets

3

Document no.

C221052

SGPL

PC

DS

1003

# Indradhanush Gas Grid Limited

## North East Gas Grid Phase - III of IGGL

C1	31.05.22	Issued for Client Review	KT	AD	SKP
REV	DATE	DESCRIPTION	PREP	CHKD	APPR



**CLIENT : Indradhanush Gas Grid Limited**

**JOB. NO. C211052**

**PROJECT :North East Gas Grid Phase - III of IGGL**

**C221052-SGPL-PC-DS-1003**

**PROCESS DATASHEET FOR PIG RECIEVER**

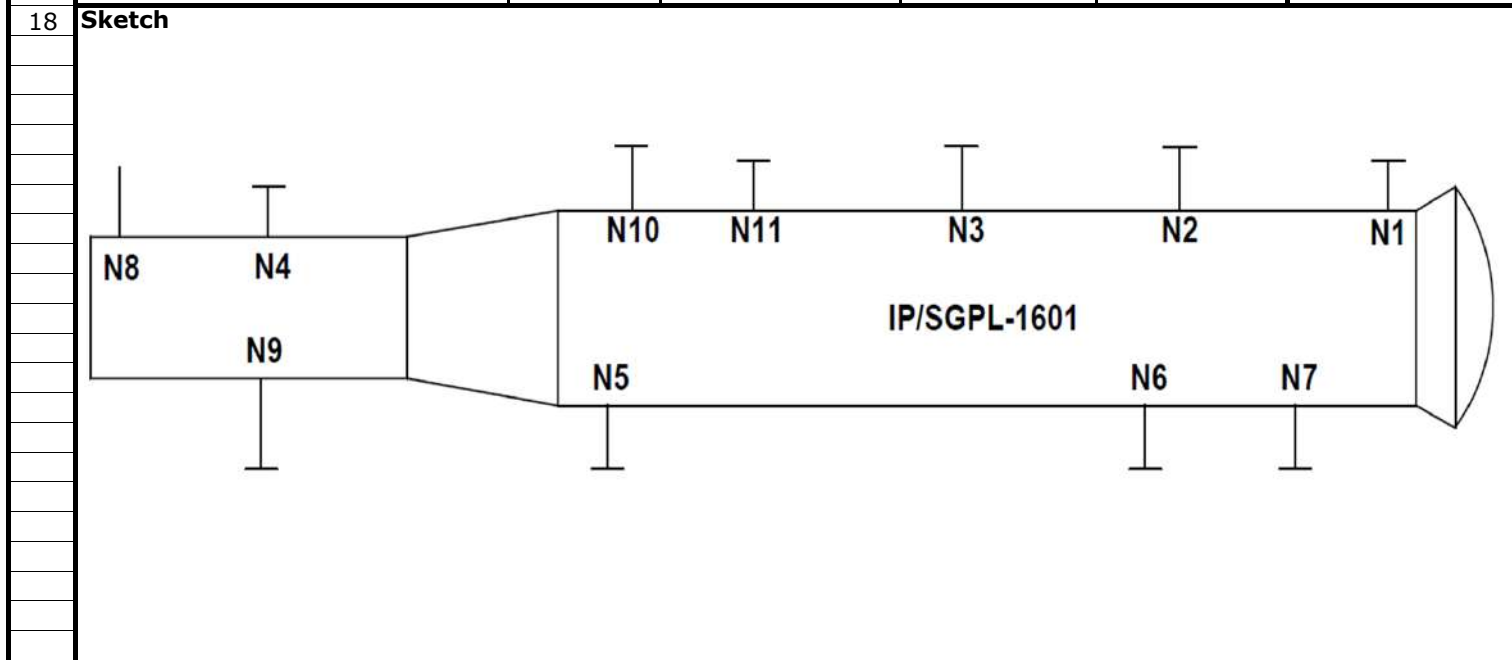
**Sht 2 of 3**

**Rev**

**C1**

	Unit	Remarks
1 Tag No.	-	IP/SGPL-1601
2 Quantity	-	One
3 P&ID No.	-	C221052-SGPL-PC-PID-1007
4 Service	-	Receiver
5 Fluid handled	-	Natural Gas
6 Type	-	Cocentric, Bi directional
7 Design Code	-	ASME B31.8 / ASME Sec VIII, Div I
8 Size (Minor / Major)	inch / inch	18" x 12"
9 Closure type	-	QOEC
10 Operating Temperature (Min/ Max)	°C	25 / 50
11 Operating Pressure	kg/cm2g	30
12 Design Temperature	°C	-29 / 65
13 Design Pressure	kg/cm2g	92
14 Material of construction	-	Carbon Steel
15 Corrosion allowance	mm	3
16 Performance specification	-	Note-2

Appurtenances Nozzle					
Nozzle Description	No	Nozzle Size	Pipe Class	Pipe Rating	
PG-1603 Connection	N1	2"	D1A	600	
PSV-1601 Connection (Note-3)	N2	2"	D1A	600	
PT-1601 Connection	N3	2"	D1A	600	
PG-1601 Conection	N4	2"	D1A	600	
Kicker Line	N5	4"	D1A	600	
Kicker Line	N6	4"	D1A	600	
Drain from Major barrel	N7	4"	D1A	600	
Pig Signaller XXS-1602	N8	2"	D1A	600	
Balance line	N9	2"	D1A	600	
Purge Vent SP-161	N10	2"	D1A	600	
Vent to ATM	N11	2"	D1A	600	



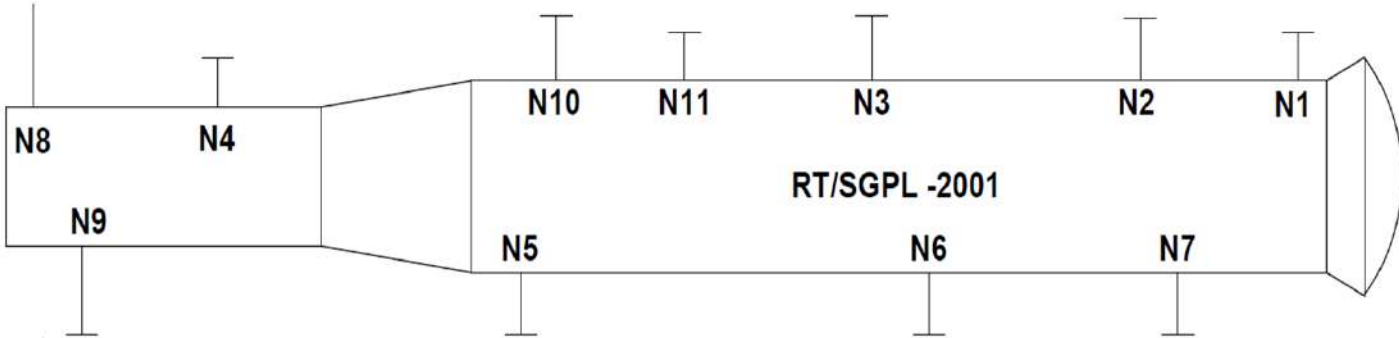


**Notes :**

1. Pig trap door opening mechanism to be constructed such that the door can not be opened unless the pig trap is fully depressurised/drained.
2. Shall be suitable for launching of intelligent pigs in 12" NB Pipeline.
3. PSV-1601 connection nozzle size is under hold. Shall be finalised post receipt of PSV size by vendor.

**Hold:**

1. To be confirm by client

  Energising Quality		<b>CLIENT : Indradhanush Gas Grid Limited</b>		<b>JOB. NO. C211052</b>	
		<b>PROJECT :North East Gas Grid Phase - III of IGGL</b>		<b>C221052-SGPL-PC-DS-1003</b>	
		<b>PROCESS DATASHEET FOR PIG RECIEVER</b>		<b>Sht 3 of 3</b>	
				<b>Rev</b>	
				<b>C1</b>	
		<b>Unit</b>		<b>Remarks</b>	
1	Tag No.	-	RT/SGPL-2001		
2	Quantity	-	One		
3	P&ID No.	-	C221052-SGPL-PC-PID-1011		
4	Service	-	Receiver		
5	Fluid handled	-	Natural Gas		
6	Type	-	Cocentric, Bi directional		
7	Design Code	-	ASME B31.8 / ASME Sec VIII, Div I		
8	Size (Minor / Major)	inch / inch	18" x 12"		
9	Closure type	-	QOEC		
10	Operating Temperature (Min/ Max)	°C	25 / 50		
11	Operating Pressure	kg/cm2g	30		
12	Design Temperature	°C	-29 / 65		
13	Design Pressure	kg/cm2g	92		
14	Material of construction	-	Carbon Steel		
15	Corrosion allowance	mm	3		
16	Performance specification	-	Note-2		
17	<b>Appurtenances Nozzle</b>				
	<b>Nozzle Description</b>	<b>No</b>	<b>Nozzle Size</b>	<b>Pipe Class</b>	<b>Pipe Rating</b>
	PG-2003 Connection	N1	2"	D1A	600
	PSV-2001 Connection (Note-3)	N2	2"	D1A	600
	PT-2001 Connection	N3	2"	D1A	600
	PG-2001 Conection	N4	2"	D1A	600
	Kicker Line	N5	4"	D1A	600
	Kicker Line	N6	4"	D1A	600
	Drain from Major barrel	N7	4"	D1A	600
	Pig Signaller XXS-2002	N8	2"	D1A	600
	Balance line	N9	2"	D1A	600
	Purge Vent SP-201	N10	2"	D1A	600
	Vent to ATM	N11	2"	D1A	600
18	<b>Sketch</b>				
					
	<b>Notes :</b>				
	1. Pig trap door opening mechanism to be constructed such that the door can not be opened unless the pig trap is fully depressurised/drained.				
	2. Shall be suitable for launching of intelligent pigs in 12" NB Pipeline.				
	3. PSV-2001 connection nozzle size is under hold. Shall be finalised post receipt of PSV size by vendor.				
	<b>Hold:</b>				
	1. To be confirm by client				



Energising Quality

## NORTH EAST GAS GRID PHASE-III OF IGGL



<b>DATA SHEET – NON-INTRUSIVE TYPE PIG SIGNALLER</b>			<b>Client Job Number</b>		C221052
			<b>Total Sheets</b>		04
<b>DOCUMENT NO</b>	C221052	00	PP	DS	2003

# INDRADHANUSH GAS GRID LIMITED (IGGL)

## NORTH EAST GAS GRID PHASE-III OF IGGL

### DATA SHEET FOR NON-INTRUSIVE TYPE PIG SIGNALLER

D1	18-05-2022	ISSUED FOR BID	AK	AK	MC
<b>REV</b>	<b>DATE</b>	<b>DESCRIPTION</b>	<b>PREP</b>	<b>CHK</b>	<b>APPR</b>



Pig Signaller Make & Model	Vendor to specify
Pig Signaller Tag Nos.	To be finalised during detail engineering
<b>General</b>	
Service	Natural Gas
Area Classification	Zone 1, Gr. IIA, IIB, T3 as per IEC 60079 (Line size: 12" & Minor barrel: 12")
Pig Detection	At Passage
<b>Sensing Element</b>	
Type	Intelligent, Non-intrusive, Clamp On, Bidirectional measurement.
Process Data	Please refer process data sheet (Note-10) and P&ID.
Sensor Element	Ultrasonic Sensor
Sensor repeatability	1% Minimum
Detection	Passive acoustics based (Ultrasonic type)
Connection	Universal Clamp-on type
Self-testing capability	Particle & Pig detection required (Note-9)
Detection Speed	(Vendor to Advice)
Signal Output	2 No. Potential free contact (DPDT) (2NO +2 NC) (24 VDC 2A)
Housing	Hermetically sealed SS316
<b>Terminal Box/Enclosure/Junction Box</b>	
Body Material	SS316 as a minimum.
Degree of Protection	Explosion proof with IP65 as per IEC 60529, PESO approved
Power Supply	24V DC feed externally
Signal Interface	To Control Panel for pig detection through potential free contacts.
Cable Entry	One nos. power ½" NPTF & 3 Nos. Signal ½" NPTF. Cable glands shall be Double compression type with PVC shroud, explosion proof and PESO Approved.
Cables	Vendor to provide sensor cable between sensor & termination box. Vendor to consider a length of 5 meters between sensor & termination box. All cables shall be terminated in terminal strips. Flying leads shall not be provided. Separate terminal strips to be considered for power & signals.
Earthing	Shall be provided as per IEC 60364.
Local Indicator	Required Green LED for Power Available Red LED for Pig detection




	Amber for Sensor Fault EExe, IIA, IIB, T3(visible from min 5m) & IP-65 certificate
Local Reset Button	Required (Mushroom head) with cover.
Terminal Box Mounting	Station mounted, vendor to provide suitable mounting brackets & accessories.
	The Manufacturer shall perform all inspections and tests as per the requirements of this specification and the relevant

<b>INSPECTION AND TESTS</b>	<p>Codes, standards and specifications, prior to shipment at his Works. Such inspections and tests shall be, but not limited to, the following:</p> <p>All pig signallers shall be visually inspected. The internal and external surfaces shall be free from any strikes, gouges and other detrimental defects. The surfaces shall be thoroughly cleaned and free from dirt, rust and scales.</p> <p>Testing and assembly procedure shall be detailed by Manufacturer and implemented during the work. Welding Inspection and testing shall be performed before any coating or painting is applied.</p>
<b>SPARES AND ACCESSORIES</b>	<p>Manufacturer shall furnish list of recommended spares and accessories for pig signallers required during start-up and commissioning and supply of such spares shall be included in the price quoted by Manufacturer.</p> <p>Manufacturer shall furnish list of recommended spares and accessories required for two years of normal operation and maintenance of pig signallers and price for such spares shall be quoted separately.</p> <p>Manufacturer shall provide special tools required for operation and maintenance as a part of supply, this includes but not limited to Any type of communicator/ cables/ connectors for configurations; Any Special tools required for maintenance like special type of Allen Key etc.</p>

- Reference has been made in this specification to the latest edition (edition enforce at the time of issue of enquiry) of the following codes, standards and specifications.
- The Pig Signaller shall be capable of detecting all type of pigging devices as indicated below:

Pig Material	Carbon Steel, Steel and Plastic
Pig Length	Need to follow current industry practice to accommodate all types of tools
Pig Diameter (OD)	90% - 100% of Pipeline ID
Pig Velocity (max.)	6 m/s

- The Pig Signaller shall be clamped to the external surface of the pipe or the scraper trap's major & minor barrel through which the pig passes
- Documentation (Hard copies / soft copies etc.) to be submitted by Manufacturer is summarized below.  
Manufacturer shall submit the following documents (in English only):

 ENERGISING QUALITY	<b>DATA SHEET – NON-INTRUSIVE TYPE PIG SIGNALLER</b>	<b>Document No.</b>	<b>Rev.</b>
		C221052-00-PP-DS-2003	D1
		Page 3 of 4	

- a) General arrangement drawings with overall dimensions and cross-sectional drawings.
  - b) Power consumption details.
  - c) Sectional arrangement drawings showing all parts with reference numbers and material specification including mounting details of pig signallers on the pipeline.
  - d) Cable connection details and cable specification.
  - e) Test Certificates.
  - f) Manual for installation, erection instructions, maintenance and operation instructions.
  - g) Manufacturer shall provide standard installation drawing for mounting of sensor on pipe, which should indicate the welding details of the support brackets to the pipe as a minimum
5. Pig signaller data, storage capacity shall be up to 60 days of measurement data.
  6. In built battery-required (2nos),1W+1spare, with a minimum lifetime of 1 year.
  7. Vendor to provide all necessary accessories for installation of pig signaller.
  8. Spectrum analysis using associated software-required.
  9. The Pig signaller/detector sensor is mounted in hermetically sealed SS316 housing and to be clamped to the external surface of the pipe or the launcher's/ receiver minor chamber through which pig is passing.
  10. For process datasheet, kindly refer P&ID.



# NORTH EAST GAS GRID PHASE-III OF IGGL



## DATA SHEET – FLOW TEE

CLIENT JOB NO

C221052

TOTAL SHEETS

06

DOCUMENT NO

C221052

00

PP

DS

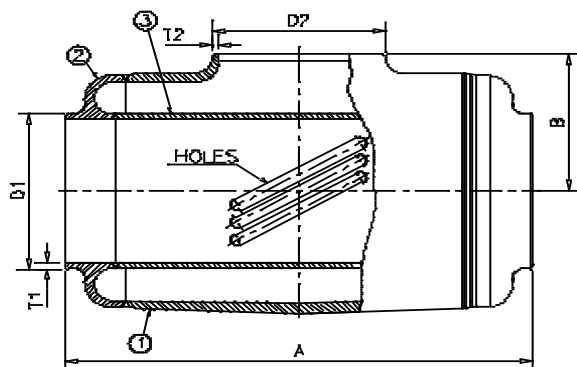
2004

# INDRADHANUSH GAS GRID LIMITED

North East Gas Grid Phase-III of IGGL

## DATA SHEET – FLOW TEE

REV	DATE	DESCRIPTION	PREP	CHK	APPR
D1	18-05-2022	RE-ISSUED FOR BID	RS	AK	MC
D1	18-05-2022	ISSUED FOR BID	SR	AK	MC



## DESIGN DATA

Flow Tee Specification no.	VPC-SS-PP-2007
Service	NG
Design Pressure (kg/cm <sup>2</sup> )	92
Design Temperature (°C)	-29 to 65.0
Corrosion Allowance (mm)	1.5
Design Factor (F)	0.5
Hydrostatic Test Pressure (kg/cm <sup>2</sup> )	138
Suitability of Flow Tee	For all types of pigs/ Intelligent Pigs
Flow Direction	Bi-directional
Charpy Test (Tees, End Piece)	Required, as per specification & ASTM-A370
Hardness Test	Required, as per specification & ASTM-A370

## FLOW TEE MATERIAL (EQUIVALENT OR SUPERIOR)

Part No.	Description	Material of Construction	
		Specified	Offered
1	Tee	MSS-SP-75 Gr. WPHY 70	
2	End Pieces	ASTM A694 Gr. F-70	
3	Internal Sleeve	API 5L Gr. X-70 PSL2	



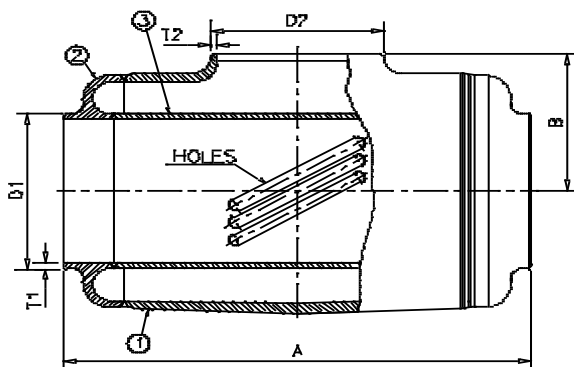
## CONNECTING PIPE DETAILS

Run Pipe Details				Branch Pipe Details		
S. No.	Outside Diameter, D1 (mm)	Thickness/Schedule	Material	Outside Diameter, D2 (mm)	Thickness/Schedule	Material
1.	323.8	9.53 mm	API 5L Gr. X-70, PSL-2	323.8	14.3 mm/ S60	API 5L Gr. X-52, PSL-2

### Notes:

1. Manufacturer to indicate dimensions A, B, T1 and T2 marked in the Sketch above.
2. Coating /Painting of Flow tee shall be for Coastal & Marine Environment as specified in painting spec.
3. Holes/ Slots in the sleeve shall be arranged at 45° to the centre line of Flow Tee. Manufacturer to furnish details of the holes/slots in the internal sleeve. The area of the hole shall be minimum 1.1 to 1.5 times the area of the branch pipe. Relevant Calculation to this extent shall be furnished by manufacturer.
4. For the welding end, the out of roundness and tolerance on internal diameter at pipe ends shall be same as diameter tolerance for the pipe ends indicated in Line Pipe Specification & API 5L.
5. The thickness of end pieces & tee of flow tee shall match with the thickness of the run pipe and branch pipe.
6. Straight welding end shall be at least L1 =50 mm.
7. The Impact test temperature specified in data sheet shall superseded the temperature specified in Flow tee Specification.
8. All buried flow tees shall be coated with 100% solid high build epoxy (minimum 1000-micron thk) or 1.5 mm thick polyurethane coating. The end ring shall remain bare and the coating shall terminate 150mm to 200mm before the bevel end of the branch end.
9. Ends of flow tees shall be suitably protected to avoid any damage during transit. Metallic or high impact plastic bevel protectors shall be provided for weld ends of flow tees.
10. Applicable standard test:
  - a) Charpy test.
  - b) Hardness test.
  - c) Non-destructive test.
  - d) Air leak test @5Kg/cm<sup>2</sup> for 10 min with zero leakage.
  - e) Fatigue test @5Kg/cm<sup>2</sup> for 10 min. No pressure drop/leakage.
11. Manufacturer shall ensure that the wall thickness (W.T) of all parts of flow tee shall be adequate to sustain design pressure and the thickness of run size ends (T1) and Branch size end (T2) of flow tee shall be same as connecting run pipe and branch pipe W.T as indicated above.





## DESIGN DATA

Flow Tee Specification no.	VPC-SS-PP-2007
Service	NG
Design Pressure (kg/cm <sup>2</sup> )	92
Design Temperature (°C)	-29 to 65.0
Corrosion Allowance (mm)	1.5
Design Factor (F)	0.5
Hydrostatic Test Pressure (kg/cm <sup>2</sup> )	138
Suitability of Flow Tee	For all types of pigs/ Intelligent Pigs
Flow Direction	Bi-directional
Charpy Test (Tees, End Piece)	Required, as per specification & ASTM-A370
Hardness Test	Required, as per specification & ASTM-A370

## FLOW TEE MATERIAL (EQUIVALENT OR SUPERIOR)

Part No.	Description	Material of Construction	
		Specified	Offered
1	Tee	MSS-SP-75 Gr. WPHY 70	
2	End Pieces	ASTM A694 Gr. F-70	
3	Internal Sleeve	API 5L Gr. X-70 PSL2	



## CONNECTING PIPE DETAILS

Run Pipe Details				Branch Pipe Details		
S. No.	Outside Diameter, D1 (mm)	Thickness/ Schedule	Material	Outside Diameter, D2 (mm)	Thickness/ Schedule	Material
1.	323.8	8.38 mm for location class-4 (Note-12) 7.14 mm for location class-3 (Note-12)	API 5L Gr. X-70, PSL-2	219.1	14.3	API 5L GR.B PSL2
2.	323.8	8.38 mm for location class-4 (Note-12) 7.14 mm for location class-3 (Note-12)	API 5L Gr. X-70, PSL-2	168.3	XS	ASTM A 106 Gr. B (Charpy)

### Notes:

1. Manufacturer to indicate dimensions A, B, T1 and T2 marked in the Sketch above.
2. Coating /Painting of Flow tee shall be for Coastal & Marine Environment as specified in painting spec.
3. Holes/ Slots in the sleeve shall be arranged at 45° to the centre line of Flow Tee. Manufacturer to furnish details of the holes/slots in the internal sleeve. The area of the hole shall be minimum 1.1 to 1.5 times the area of the branch pipe. Relevant Calculation to this extent shall be furnished by manufacturer.
4. For the welding end, the out of roundness and tolerance on internal diameter at pipe ends shall be same as diameter tolerance for the pipe ends indicated in Line Pipe Specification & API 5L.
5. The thickness of end pieces & tee of flow tee shall match with the thickness of the run pipe and branch pipe.
6. Straight welding end shall be at least L1 =50 mm.
7. The Impact test temperature specified in data sheet shall superseded the temperature specified in Flow tee Specification.
8. All buried flow tees shall be coated with 100% solid high build epoxy (minimum 1000-micron thk) or 1.5 mm thick polyurethane coating. The end ring shall remain bare and the coating shall terminate 150mm to 200mm before the bevel end of the branch end.





9. Ends of flow tees shall be suitably protected to avoid any damage during transit. Metallic or high impact plastic bevel protectors shall be provided for weld ends of flow tees.
10. Applicable standard test:
  - f) Charpy test.
  - g) Hardness test.
  - h) Non-destructive test.
  - i) Air leak test @5Kg/cm<sup>2</sup> for 10 min with zero leakage.
  - j) Fatigue test @5Kg/cm<sup>2</sup> for 10 min. No pressure drop/leakage.
11. Manufacturer shall ensure that the wall thickness (W.T) of all parts of flow tee shall be adequate to sustain design pressure and the thickness of run size ends (T1) and Branch size end (T2) of flow tee shall be same as connecting run pipe and branch pipe W.T as indicated above.
12. Location class will be confirmed to the successful bidders only and shall be shared later.



Energising Quality

## NORTH EAST GAS GRID PHASE-III OF IGGL



**Datasheet For Hot Induction Bend**

Total Sheets

03

**Document No**

C221052

00

PP

DS

2005

# INDRADHANUSH GAS GRID LIMITED (IGGL)

## North East Gas Grid Phase-III of IGGL


### DATA SHEET FOR HOT INDUCTION BEND

D1	19.05.2022	Issued For Bid	SR	AK	MC
REV	DATE	DESCRIPTION	PREP	CHKD	APPR

	30.	Tangent Length(mm) "TL"		Either side 500mm or Pipe outside diameter whichever is more.
	31.	Weld Seam Position		±5° from the Neutral Axis
	32.	Maximum Thinning (%)		8
<b>Inspection, Testing &amp; Marking</b>	33.	Visual Inspection		As per Spec: VCS-SS-PP-2009
	34.	Dimension & Tolerance	General	As per Spec: VCS-SS-PP-2009
			Out of Roundness – Ends	As per Spec: VCS-SS-PP-2008
			Bend angle	± 0.5°
			Bend Radius	± 1%
	35.	CVN Impact Test		At -29°
	36.	Minimum Mill Hydrotest Pressure		Test Pressure that shall result in Hoop Stress Corresponding to of 95% SMYS of Pipe Material.
	37.	Procedure Qualification		On 90° bend, as per Spec: VCS-SS-PP-2009
	38.	Thickness Measurement of Bend		As per Spec: VCS-SS-PP-2009
	39.	Gauging Requirement		As per Spec: VCS-SS-PP-2009
<b>Coating</b>	40.	Hardness		As per Spec: VCS-SS-PP-2009
	41.	Certification		BS EN 10204 Type 3.2
	42.	External Coating		As per Spec: VCS-SS-PP-2009

## NOTES:

1. Bend shall be corrosive coated for transportation and storage.
2. Bends shall be supplied with end caps to prevent internal bevel damage during transport and to prevent internal corrosion during storage under exposed conditions.
3. Bend angle and bend quantity shall be as given in the Material Requisition for Induction.
4. Testing of chemical, mechanical properties and NDE to be done as per specification.
5. Anti-corrosive paint as per manufacturer standard to be provided.
6. Inspection shall be as per Inspection & Test plan (ITP).

General	1.	Project Title	North East Gas Grid Phase-III of IGGL	
	2.	Project No.	C221052	
	3.	Item / Type	Factory made Pipeline Induction Bend – Butt Welded ends	
	4.	Pipeline	Natural Gas Pipeline	
	5.	Installation / Location	Onshore – Buried	
Design Data	6.	Design Code	ASME B31.8/ ASME B16.49	
	7.	Design Specifications	Project Spec: VCS-SS-PP-2009	
	8.	Design Factor	0.4	
	9.	Line Size (inch)/(mm) "D"	NPS 12 / 323.85	
	10.	Corrosion Allowance (mm)	0.5	
	11.	Min. Design Life (Years)	35	
	12.	Operational Requirement	Shall be suitable for smooth Pigging operation in either direction	
	13.	Environmental Data	Onshore application	
	14.	End Finish	Bevelled As per Spec VCS-SS-PP-2009/ API 5L & Line pipe Specification	
	15.	End Protection	Metallic or high impact plastic bevel protector (As per Spec VCS-SS-PP-2009)	
Process Data	16.	Transported Medium	NG	
	17.	Design Pressure (kg/cm <sup>2</sup> g)/ASME Class	92	
	18.	Max. / Min. Design Temp. of Pipe (°C)	65 ° / -29 °	
Connected Pipeline Data	19.	Pipeline Material & Grade	Carbon Steel API 5L X-70, PSL-2	
	20.	Type of Pipe	SMLS/HFW	
	21.	Nominal Wall Thickness (mm)	9.53	
Mother Pipe for Bend	22.	Mother Pipe Material & Grade	Carbon Steel API 5L X-70, PSL-2	
	23.	Type of Pipe	HFW	
	24.	Nominal Wall Thickness(mm)	9.53	
Hot Induction Bend Data	25.	Manufacturing method	High Frequency continuous Induction heating and forming	
	26.	Bend Procedure Qualification	As per Spec: VCS-SS-PP-2009	
	27.	Production Bending	As per Spec: VCS-SS-PP-2009	
	28.	Bend Angle (Degree)	15° to 90°	
	29.	Bending Radius (mm) "6D"	1942.8	
 ENERGISING QUALITY	Data Sheet for Hot Induction Bend		Document No.	Rev
			C221052-00-PP-DS-2005	D1
			Page 2 of 3	