

1.0 DEFINITION

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

PROJECT	PMC Services for North East Gas Grid Phase-III OF IGGL.
OWNER	Indradhanush Gas Grid Limited
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 .

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).

M/s IGGL intends to lay pipeline along with terminal works for section-10 & 11 which consist of 12" NB x 199.007 Km (approx.) in section-10 and 12" NB x 186 Km (approx.) in section-11 mainline. Main line taken from Siliguri DT to Gangtok RT in Section-11. Similarly in section-10 12" Main line taken from T point Jorhat to Dimapur DT to Sekmai gas Bottling plant RT Via IP station at Tadubi (Manipur).

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,

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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
PART-D1 (Length 44.2 km)	SPREAD-2B (Length 44.2 km)	Pipeline laying from Ch. 59+800 Km to Ch. 104+000 Km including associated works (Mechanical, Piping & Including Terminal works as per scope matrix) & One (01) SV stations.
PART-D2 (Length 46.3 km)	SPREAD-2C (Length 46.3 km)	Pipeline laying from Ch. 104+000 km to Ch. 150+300 Km. Intermediate Pigging Station (IP station) Lava, West Bengal at Ch. 128+000 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.

2.0 PROJECT BRIEF

Summary of various stations envisaged in the proposed North East Gas Grid Phase-III of IGGL are as under:

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A) SILIGURI – GANGTOK PIPELINE (SGPL)

Sr No	Type of Station	Nos.	Location
1	Dispatch Terminal (DT / SGPL)	0	-----
2	Intermediate Pigging Station (IP/SGPL/01)	1	Tentatively at Lava
3	Receipt Terminal (RT/SGPL) with/ without Tap off	0	-----
4	Sectionalizing Valves with/without Tap off	3	Along the Siliguri-Gangtok route

3.0 PIPELINE SIZE, LENGTH AND DESIGN CONDITIONS

Detail of the pipeline is given below:

A. SILIGURI GANGTOK PIPELINE

Spread	Approx. Length	DT/RT	SV	IP
Spread 2B	44.2 KM	0	1	0
Spread 2C	46.3 KM	0	2	1

3.1 Multi Products Pipeline Details

- A) Design Pressure: 92kg/Cm²
- B) Design Temperature; -29° TO +65°C
- C) Pipeline Size: - 12" (90.5 km) Approx.
- D) Pipeline Material: - API 5L Gr. X 70 PSL 2
- E) Pipeline Wall Thickness; -7.14mm / 8.38 mm
- F) Pipeline Total Length (APPROX.): - 90.5 Km (Approx.)
- G) Pipeline Corrosion Coating; - 3LPE (EXTERNAL)

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3.2 SITE CONDITIONS

Parameters	
Max / Min. Temperature	50/-5 °C
Design Temperature	50°C
Relative Humidity	95%
Altitude above Sea level	Up to 1000 Meters
Atmospheric pollution	Designed to withstand the site conditions, dust, vapour, Industrial Gases
Hazardous Area classification	Zone-2, Gas group IIA,
Control Room/ Electrical room/ D.G. Room/Guard	Safe area

4.0 SCOPE

EPC contractor will engage CP Contractor for the entire pipeline of **"PMC Services for North East Gas Grid Phase-III of IGGL."** based on qualification Criteria stated in this document. All documents of CP agency shall be reviewed by contractor & submit to owner/PMC for review and approval.

It is the responsibility of laying contractor to ensure that CP agency's design and installation work shall be as per approved document.

This document establishes minimum Cathodic Protection Design Parameters and Basis for Design and Detailed Engineering which will be used for **"PMC Services for North East Gas Grid Phase-III of IGGL."**

The scope of specification shall provide the minimum requirements & form the basis for carrying detailed design engineering for Cathodic Protection system, sizing of various Cathodic Protection equipment's, their supply, installation, testing & commissioning of the Cathodic Protection system for New Pipeline & Cathodic Protection associated facility. This document also provides the general guidelines for preparation of Electrical specification, datasheets and other relevant documents.

In case of conflicting requirement of tender documents, following priority shall govern in general. However, in case of conflict, it shall be referred to

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Client for clarifications and decision of Client shall be final and binding with or without any cost implications (as per project scope)

- The requirements of any statutory body shall govern.
- Data Sheets
- This specification / Basis of design
- Job Specifications
- Code & Standards

Unless otherwise specified in project specifications /data sheet, bonding & integration of the permanent impressed current CP system with the sacrificial system anode temporary CP system (whether provided by a different contractor or included along with the impressed current CP system) shall be the responsibility of the Permanent CP contractor whose scope shall include disconnection of sacrificial anode wherever required.

Obtaining approval certificate from electrical inspector for electrical installation and carrying out any modifications as per the requirement of electrical inspectorate shall be included in Contractor scope, in consultation with the Owner.

All civil works associated with the complete CP system are included in scope of Contractor. This shall include providing cable trenches and foundations for all equipment, anode/cathode junction boxes, all test stations, deep well ground bed etc.

Contractor shall clearly bring out during bidding stage, the requirement of additional CP stations if any, over and above those specified.

In case where sacrificial anode CP system is specified as temporary and where both temporary, permanent cathodic protection works are being executed by the same agency, activities of permanent CP system which are common to temporary CP system shall be completed as part of temporary CP system. In case where temporary and permanent CP works are being executed by different agencies, the contractual scope of work shall be referred for further details.

Drawings and documents attached also to be considered as standards and thus contractor to comply all requirements mentioned therein.

5.0 TIME SCHEDULE

Time schedule for TCP completion shall be in line with the mechanical completion of the pipeline. TCP shall be provided progressively along with pipeline laying works, and no pipeline section shall remain unprotected.

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Contractor shall mobilize at site and start execution work within fifteen days from receipt of notice form the Owner to commence work.

TCP monitoring and maintenance shall be carried out during entire TCP execution stage till commissioning of PCP system. PCP monitoring and maintenance shall start from date of commissioning and handing over of TCP system to Owner`s Operation & Maintenance team. Actual zero date for Pipeline laying & Pipeline construction schedule will be provided at the time of contract award.

6.0 STANDARDS

6.1 The work shall be performed in conformity with this specification, standard specifications and installation standards enclosed elsewhere in this tender and code of practices of the Bureau of Indian Standards. In case of any conflict, the stipulations under this specification shall govern.

In addition, the work shall also conform to the requirements of the following:

- The Indian Electricity Act, and the rules framed there under.
- The regulations laid down by the Chief Electrical Inspector of the state government/ Central Electricity Authority (CEA).
- The regulations laid down by the Factory Inspector.
- The regulations laid down by the Chief Controller of Explosives.
- Any other regulations laid down by the Central, State or Local Authorities from time to time during the execution of this contract.
- OISD & PNGRB Standards IGGL's Safety Standard

6.2 The design, selection and installation of equipment and materials shall also conform to the requirements of the relevant latest standards of:

- BS Specification and codes of practice.
- OISD Standards-188,141,113 or other applicable standards
- IS:8437(Part-II)/8062 (Part-I)
- NACE Standards
- DNV Publications
- IEEE Publications

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7.0 GUARANTEE

7.1 The Bidder shall guarantee the installation against any defects of workmanship and materials (supplied by the Bidder) for a period of 12 months from the date of commissioning/as per DLP period defined in the Vol-I. Any damage or defects connected with the erection of materials, equipments or fittings supplied by the Bidder that may be undiscovered at the time of issue of the completion certificate, or may arise or come to light thereafter, shall be rectified or replaced by the Bidder at his own expense as deemed necessary and as per the instruction of the Engineer-in-charge within the time limit specified by the Engineer-in-charge.

7.2 The above guarantee shall be applicable for the quality of work executed as well as for the equipment/ cable/ fittings/ other materials etc supplied by the contractor.

Equipments installed or commissioned by others within the battery limit. This is for the purpose of obtaining a comprehensive approval from competent authority

7.3 CO-ORDINATION WITH OTHER CONTRACTORS

CP contractor shall entirely responsible for Co-ordination with other contractors & it should be ensured that the CP work should be executed simultaneously with laying of pipeline. Contractor shall mobilize necessary teams in each respective section as per the site organisation chart (Annexure-C) enclosed with this tender with the key responsibility, education qualification, designation, experience as defined and shall be responsible for the timely execution of CP work.

If the contractor fails to timely execution of the CP work, mobilization of teams as defined in tender and it founds delay in the pipeline laying due to of CP work & poor co-ordination with laying contractor necessary penalty clause shall be applied as per the direction of the Engineer- in-Charge.

8.0 SCOPE OF WORK (SUPPLY, INSTALLATION, TESTING & COMMISSIONING) GENERAL

Contractor shall execute TCP work simultaneously in coordination with laying contractor when lowering of the -pipeline is going on. Activities like- Cable to pipe connection, installation of ER probe, Polarisation cell, Polarisation coupon etc should be completed before the backfilling of the trench.

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9.0 TEMPORARY CATHODIC PROTECTION SYSTEM

Corrosion survey, design, detail engineering, fabrication, supply, installation, testing and commissioning of the temporary cathodic protection system using Mg/ Zn galvanic anodes to protect the external surface of 3LPE coated pipeline against corrosion for design life of minimum 2 years or till the commissioning of PCP system, whichever is later. The detailed length of pipeline is as under-

Maintaining and keeping of PSP value as specified and monitoring at monthly basis of PSP voltage & AC voltage of the temporary cathodic protection system (As per format Enclosed in Annexure-B) till commissioning of the permanent cathodic protection system. All work shall be carried out conforming to the Scope of work, Design Basis, Data Sheets, national & international standard & as per standard specification No.- VCS-SS-EL-4018 for temporary Cathodic Protection system. Scope shall also include but not limited to the following for completion of jobs:-

- a) **Temporary CP system shall be installed immediately of the any lowered section but not later than 15 days from the time of lowering of pipeline segments. If TCP system is not provided for any of the lowered section in the specified time, necessary deduction shall be carried out from the contractor's head as non-compliance of work.**
- b) Measurement of soil resistivity along the right of way of the main pipeline (At 500mtr Interval) & collection of soil & water samples along ROW at depth of 1M, 2M & 3M at every 10km interval (Min 03 sample at each location) for its chemical & microbial analysis along the pipeline route as per specification for corrosion survey **VCS-SS-EL-4017 & NACE Standard TM0106-2006** for detection of SRB, ARB, TDS, pH, Rx, Moisture & Total dissolved H₂S etc. These sampled shall be stored in sealed container and stored in the dark place.
- c) Collection of additional data related to cathodic protection along the right of way of pipeline as per standard specifications during the survey along with GPS coordinates. Site survey report shall include detailed layout drawings of pipeline / facilities, reflecting all foreign pipeline / Overhead power transmission lines crossings & parallelism, Power cables, river, railway traction (electrified/non-electrified), Substations (HVAC/HVDC), fabrication yard, existing CP facilities (such as transformer rectifiers, anode ground beds, test facilities etc.), soil resistivity survey locations, road crossing locations, etc. Site survey includes details of all AC, DC interfering elements all along pipeline ROW.

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Site survey shall be carried out along the pipeline route to identify the HVAC, HVDC crossing locations and/or HVAC, HVDC line parallelisms (This proposed pipeline is parallel to the HVDC line). Site survey report shall include a comprehensive list, which includes the HVAC, HVDC line rating in KV, distance of HVAC, HVDC line / tower footings from pipelines and length of parallelism.

- d) Design, Detailed Engineering, Preparation of Design Document, Preparation of Test station schedule & Bill of Material as per the corrosion survey & Chemical analysis of Soil / Water samples for Temporary Cathodic Protection system.
- e) Total number of anode shall be calculated as per total anode weight requirement & total protection current required.
- f) Supply, Installation, Testing & commissioning of Test stations (Big Size & Normal Size) weather proof (IP-55) as per specification & enclosed drawings. Selection of TLP size will be as per the nos.of cables terminating at the station. TLP shall be sealed at both ends by means of foam sealing/solid sealing. Termination plate inside the TLP should have high insulation level (FRP or higher grade) to avoid drainage of CP current due to insulation leakage.

All the test-stations and junction boxes shall be provided with shrouded allen screws to avoid vandalism.

- g) Supply, installation, testing & commissioning of Mg (Min 5.0 Kg)/ Zn Galvanic anodes/ Mg ribbonanodes with backfill as per the standard specification- **VCS-SS-EL-4018**. The weight of the MgAnode & the total nos. of anodes shall be calculated as per the corrosion survey, soil chemical analysis, total weight and current requirement of the pipeline section. **However, Min one anode is to be installed at every one KM with test station.**
- h) Cable to pipe connection by thermit welding/Pin brazing (for charged pipeline) for 35, 25, 10, 6 sq.mm copper cable including excavation and exposing piping, recoating with epoxy, testing etc.
- i) **Supply, laying of HDPE sheets (1200mm wide, 6mm thick) between the GAIL pipeline and the other CP protected foreign pipelines at the crossing locations for providing electrical isolation and discharge of the CP System current between the pipelines.**

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- j) Earthing of above ground cathodically unprotected pipeline at consumer station/DRS station/Metering skid etc., the earth electrode shall be 65 mm dia, 4.5 mm thickness & 3000mm long. Total grounding resistance shall be limited to 2 Ohm max.
- k) Earthing of MOV's at DS/RS/SV stations shall be carried out by SSD (Solid state de- coupler/Polarisation cell) Zn anodes with min installation of 02 nos. Of electrode or by Zn ribbon anodes. Grounding resistance shall be limited to the min 02 Ohm.
- l) Supply, installation, testing & commissioning of one set of Explosion proof type spark gap arrestor(100 kA@ 10/350 uS rating for lighting protection and 8/20 uS 100kA for surge protection) across each insulating joint provided at dispatch terminal, receiving terminal, tap-off, SV & various consumer terminals as per P&ID / specification.
- m) All the monolithic insulating joints (MIJs) on the main line, on the tappings for the instruments viz. pressure transmitter, densitometers etc. shall be provided with explosion proof surge divertors.

Note 1-Surge diverter cable needs to be terminated without any joints across the IJ. Surge diverter with its pre-wired connecting cables with suitable length & size should be provided and installed at the Isolating joint.

- n) **CP at cased crossings:**
 - i) Casing should be avoided as far as possible. If cased crossing is unavoidable, Bare casing is always recommended with selecting higher thickness allowance as per API 1102.
 - ii) No sacrificial anodes (ribbon anodes) shall be used inside casing & carrier annular space.
 - iii) Casing filler bentonite shall be filled between annular space of casing and carrier.
- o) Where high voltage (66 KV and above) transmission line runs in parallel or crosses the pipeline, the pipeline shall be grounded through polarisation cells of suitable rating (solid state) & Grounding (a continuous length of Zn Ribbon Anodes/Copper conductors with back fill material shall be laid along the pipeline) shall be done at regular intervals of maximum 1 km where transmission lines run parallel within 1km of the pipeline and have separation distance of 50 mtr. on both side of the pipeline.

The rating of the cell shall depend upon anticipated fault current & ground bed resistance at the location of installation and the calculation of the same shall be furnished to VCS for review & selection of rating of the Polarisation Cell. However, the rating of polarisation cell shall not be less

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than 3.7 KA @ 30 Cycle & number of 20 kg net weight zinc anode shall not be less than two. Zn Ribbon anode (Dia min. 12x14 mm with back fill in trench)/ pre-packed AC mitigator wire of MATCOR make or equivalent also be used for the grounding purpose to get lower grounding resistance (for soil resistivity higher than 25 Ohm-Cm) as per the direction of engineer in-charge. The resistance of grounding shall be limited to 2 ohms max.

At any location of HT line crossing, max 2 (two) nos. zinc anodes shall be provided to limit the grounding resistance to 02 ohms max for not achieved Zn Ribbon anode (Dia 15mm with back fill trench) or Cu conductor with backfill shall be used for the grounding purpose. Calculation for grounding resistance shall be submitted along with design document.

If any proposed additional line of voltage rating 66kV & above is envisaged during construction, the same shall also be considered in the design document. Contractor shall supply polarization cell along with necessary grounding system for the same.

If it is observed during the monthly monitoring that the source of the AC interference is due to the HT lines less than 66kV or LT line, Contractor shall provide the grounding the pipeline through SSD to lower impact of the AC interference on the pipeline.

- p) Supply, installation, testing & commissioning of external electrical resistance Probe (02 nos. probe per laying section for all sections) utilizing the electrical resistance technique shall be provided along the pipeline at marshy / vulnerable locations to monitor the external corrosion activity on the pipeline. Location of external ER probe shall be decided during detail engineering.

Care shall be taken during installation of ER probes so that probe element is opposite to pipe (Not facing the pipeline).

- q) Supply, installation, testing & commissioning of Polarisation coupons (01 every 10Km of pipeline) having total area of 100mm x 100mm having one side exposed area of 25 mm x 25 mm without permanent reference cell shall be provided along the pipeline and at additional vulnerable locations (River crossings, Marshy locations, Interference prone area, stray current source locations, foreign pipeline crossings/parallel (at every KM in case of parallel), at CP stations) to monitor the external corrosion activity on the pipeline as per enclosed standard specification. Location of external Polarisation coupons & Number of magnetic devices for operation of magnetic switch shall be decided during detail engineering in consultation with GAIL/VCS.

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Permanent Reference cell shall be manufactured & constructed in line with drawing no. VCS-STD-EL-4509.

Care shall be taken during installation of polarization coupon that bare face of polarisation coupon is opposite to pipe & polarisation coupon shall not be installed between TLP & Pipeline.

The works related to collection of approximately 2-5 m of pipeline material (In pieces of 300 to 1000mm length) for fabrication of Polarisation coupons is in the scope of the Contractor and shall be supplied by the Owner.

- r) Bonding in between pipelines running parallel or crossing as required including taking of permission from the owner of the foreign pipeline (Permission shall taken by the Pipeline Owner and any fee required for the same shall be paid by the Owner, however contractor shall assist in all respect to get such permissions from foreign pipeline owner).
- i. Bonding of pipelines shall be carried out through bonding stations (variable resistance of suitable value + shunt + diode, if required). Polarization coupons shall be installed at every test station in the parallel section and at crossings.
- ii. The Contractor shall supply and install bonding stations as provision to bond the pipelines. For the new pipeline as a provision for interference mitigation Bonding Junction box (BJB) shall be installed as a minimum at the following locations-
- iii. Where the new pipeline runs parallel to the existing pipelines, at start and end of parallelism and at every five (5) km intervals. As a minimum, all existing parallel pipelines laid with a separation distance of 10 m shall be provided with bonding provision.
- iv. Where the pipeline crosses or intersects the existing buried pipelines or buried section of pipelines / Piping.
- v. BJB shall have provision to terminate 25/35 mm² bonding cables and a 6 mm² potential monitoring cables connected to each foreign pipelines as well as new pipelines. BJB shall be provided with appropriately rated shunts and resistors for each circuit. Rating of the resistors shall be calculated based on the mitigation requirement.
- s) Supplying, laying, termination, Glanding, ferruling & testing of all the cables of TCP system, Cu- Conductor, XLPE insulated, PVC sheathed, Armd/Unrmd (1Cx6 mm², 1Cx10 mm², 1Cx25 mm², 1Cx35mm²) as required.

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- t) Cable coming from 60 Mtr. for Current measurement test stations (Type_B) & cables for foreign pipeline crossing shall be provided with black sleeves for the identification purpose.
- u) Calibration factor of similar thickness pipeline section shall be carried out by the Bidder at each B_Type test stations by arranging separate power source. Bidder shall refer pipe book for the same.
- v) PSP Monitoring on monthly basis of the TCP system till commissioning of the permanent cathodic protection system including the coupon OFF PSP.
- w) All civil/ structural & other miscellaneous works related to TCP system including supply of bricks, cement & steel etc. required for completion of the system.
- X) Coating Integrity test of HDD section of the pipeline shall be conducted immediately after the completion of the HDD of each HDD section by separate temporary power source and anode bed. Bidder shall submit the procedure as per the NACE requirements for approval along with the design document.

Note for TCP-

Note-2 Additional protection of carrier pipe (By Zn ribbon anodes) inside the bare casing is not required.

Note-3 5 kg Mg anodes shall be provided for protection of Casing pipe (external side) wherever required.

Note-4 Connection scheme of CP system in TLP boxes shall be permanently fixed inside the test station box (TLP Box).

Note-5 At saline soil Ag/AgCl Permanent Reference electrode shall be used.

Note-6 Vendor list of Make of CP Materials is enclosed with the tender as appendix-I all CP material shall be as per the make mentioned in the vendor list.

Note-6 For chainages refer Pipeline Schematic Route Diagram

Note-7 Localized soil resistivity at 1.5Mtr depth shall be considered for calculation of number of Anodes.

10.0 TENTATIVE BILL OF MATERIAL

Tentative bill of material of TCP shall be prepared by the successful

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contractor for each section as per the approved design and the same shall be submitted with the detail engineering package for review.

11.0 OTHER MISCELLANEOUS WORKS

- i) The job includes all civil works including supply of bricks, cements steel etc. connected with grouting of equipment to be installed. The job includes repairing of all civil works damaged during installation of electrical and other facilities.
- ii) Preparation of buried cable trenches including excavation, back filling, compacting, providing of brick protection by second-class bricks, spreading of fine river sand, including all supplies.
- iii) CP contractor shall provide Colour code identification for the various CP System cables used in the system with design document for approval.
- iv) The scope of work under this contract shall be inclusive of breaking of walls and floors, and chipping of concrete foundations necessary for the installation of equipment, materials, and making good of the same. Minor modifications wherever required to be done in the owner free supplied equipments or devices to enable cable entry, termination, etc.
- v) Checking of all connections, i.e. power, control, earthing and testing and commissioning of all equipment erected and/or connected under this contract as per testing procedures and instructions of Engineer-in-Charge.
- vi) All electrical equipments are to be doubly earthed by connecting two earth wires from the frame of the equipment to be earth grid. The cable armours will be earthed thro' cable glands.

The following shall be earthed:.

- All non-current carrying metallic parts of electrical equipments such as lighting and power panels, push button stations, cable trays etc.
- vii) Supply and installation of all other accessories not specifically mentioned herein but nevertheless necessary for completion of job.
 - viii) Engineering and preparation of specifications, data sheets, procedures and drawings etc required for procurement & installation of CP System wherever applicable/required by Owner/ VCS and submit to Owner/ VCS for approval/comments.
 - ix) Correction and submission of all owners' drawings for as-built status.
 - x) Obtaining clearance for energising the complete electrical facilities covered under this tender and approval of installation/drawings from Govt. authority if required.
 - xi) Test certificates, catalogues, vendor drawings, installation, operation and

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maintenance manuals for all equipment/materials in contractor's scope of supply.

- xii) All civil work related to the CP work is in scope of the CP contractor.
- xiii) Co-ordination with other Contractors/Pipeline contractor.

12.0 WORK CONTRACT

The entire work as per Scope of Work covered under this contract shall be treated as "Works Contract".

All works included in the scope of CP work will be done simultaneously with main pipeline construction by main pipeline Contractor. Bidder will supply all the materials required for completing the system and organise manpower & equipments accordingly to meet the requirement of Cathodic Protection work in time as per completion schedule given in Volume - I.

13.0 SCOPE OF SUPPLY

13.1 Owner's Supply – NIL

Supply, testing, Packing, Forwarding, Delivery, Installation and commissioning of all the equipment covered in this package are included in the scope of the contractor. No equipment will be free issued by the owner to the contractor.

13.2 Contractor's scope of supply shall include supply and installation of all items required to accomplish all jobs/activities listed under clause 9.0 and 11.0, and their sub-clause.

13.3 Bidder shall submit list of two year operational & maintenance spares along with offer.

O&M CP Spares/ Tool / Tackles for CP system like Multimeter, Clamp meter, Portable reference cell, UT meter, Tool box Complete for each maintenance base etc.

List of O&M spares is enclosed with Annexure-D.

All commissioning & start up spares are in bidder's scope (Included in this package). Any commissioning & startup spare consumed during the start up & commissioning is included in the supply of this package, for which no extra payment is made.

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- (i) Contractor to note that the exact cable routing shall be decided at site based on actual site conditions. Exact cable quantities/sizes shall be based on actual measured route length at site by Contractor in coordination with Engineer-in-Charge/Client. Contractor shall ensure that there is no surplus or shortage of cables at site and procure cables accordingly.
- (ii) Contractor to note that all cabling (including supply & laying) & other electrics for the CP System shall be supplied along with the package and no separate payment shall be admissible for the same. Owner shall provide only single point power supply for the same.
- (iii) Job is lump-sum basis, however the work to be carried out & material to be supplied for the project which is not covered under this contract the payment shall be done as per unit price.

14.0 STATUTORY APPROVAL OF WORKS

The submission of application on behalf of the Owner to Govt. Authority/ Central Electricity Authority/State authority/Private bodies, if required along with copies of required certificates complete in all respects, shall be done by the contractor well ahead of time so that the actual commissioning is not delayed for want of approval from respective authority. The actual inspection of work by the above mentioned authority inspector shall be arranged by the Contractor and necessary coordination and liaison work in this respect shall be the responsibility of the contractor. However any fee paid to these Authorities in this regard shall be reimbursed by the Owner on submission of bills with documentary evidence.

The Inspection and acceptance of the work as above shall not absolve the Contractor from any of responsibilities under this contract.

The necessary permissions required for the bonding etc. for the interference mitigation (from SEB's, water works departments/ boards, railways & other pipeline owners) shall be obtained before taking mitigation measures in the scope of contractor & the same will be hand over to IGGL after commissioning of CP system.

15.0 QUALITY ASSURANCE, INSPECTION AND TESTING

All the equipment supplied by the contractor shall be inspected by the Owner/VCS and/or their approved inspection agency (TPI) at the manufacturer's works prior to despatch. The equipment will be inspected as per the tests pre-identified in the approved QAP to ensure conformity of the same with relevant approved drawings, data sheets, specifications,

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National/International standards. The TPI shall be arranged by the CP contractor for the testing of the material/equipments at the vendor works.

- 15.1 Performance tests of any equipments which cannot be conducted/demonstrated either partially or wholly at the manufacturer's work, shall be conducted after erection at site in the presence of Owner & their inspection agency. In all the cases, prior approval of the approval shall be obtained.
- 15.2 In case of waiver category of items, the same shall be pre identified. For such items, the contractor shall furnish necessary certificates, test reports etc for Review/Approval to Owner/Inspection agency. The issue of Inspection Certificate/Waiver Certificate for any equipment or component there of does absolve the contractor from his contractual obligations towards subsequent satisfactory performance of the equipment at site. Should any equipment be found defective, In whole or part thereof after receipt at site or during erection/commissioning and testing shall be Rectified/Changed by contractor free of cost.
- 15.3 Contractor shall submit test plan for the equipments with four week advance notice.

16.0 TESTING & COMMISSIONING

- 16.1 The successful bidder shall submit detailed installation, site testing & commission procedure with time schedules for Review/Approval to Owner/VCS.

The successful tenderer shall provide adequate supervisory/ skilled personnel and all tools and tackles, testing equipment and instruments required for complete checking of installations and testing and commissioning of all equipment and accessories.

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- 16.2 All the tests shall be conducted in the presence of Owner/ VCS/Engineer-in-charge or his authorized representative unless he waives this requirement in writing.
- 16.3 The testing and commissioning of all equipment under the scope of the bidder & shall be carried out in accordance with the latest edition of relevant Indian Standards, International Standard NACE standards and IE Rules.
- 16.4 Test reports shall be submitted in required number of copies duly signed by the Bidder to VCS and OWNER.
- 16.5 On successful completion of erection of each item /equipment, a final inspection will be carried out at site by Owner / VCS, for correctness and completeness of erection.
- 16.6 After the completion of all tests and rectification of all defects pointed out during final inspection, start-up trials would be commenced. During the start-up trials contractor shall provide skilled / unskilled personnel and supervision round the clock at his cost. The number and category of workmen and duration up to which required, will be decided by the Engineer-in-charge. Any defects noticed during the start-up trial relating to the equipment supplied and work carried out by the Contractor, will be rectified by the contractor at his own cost.
- 16.7 Any work not conforming to the execution drawings, specifications or codes shall be rejected forthwith and the contractor shall carry out the rectification at his own cost.
- 16.8 After the operating conditions are fully achieved for CP system and the other requirements as stated in the General Conditions of Contract are fulfilled, the contractor would be eligible for applying for a completion certificate.

17.0 DRAWINGS, STANDARD SPECIFICATION AND INSTALLATION STANDARDS

- 17.1 The drawings accompanying the tender document are indicative of the nature of work and issued for tendering purposes only. Construction shall be as per drawings/specifications issued/ approved by the owner/ VCS during the course of execution of work.

After the job completion, contractor shall prepare 'AS-BUILT' drawings, final certified as built drawings vendor drawings for bought out equipments shall be submitted by the contractor to owner in bound volume with one set of reproducible original sepia plus five sets of prints & one set to VCS.

The equipments/ materials to be supplied by the contractor shall conform to the requirements of the applicable standard specifications. Also the

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installation of various material/ equipment shall also conform to the standard specification.

The purpose of the pipeline alignment drawings, P&IDs & Plot Plan drawings enclosed with the tender is to enable the tenderer to make an offer in line with the requirements of the Owner. These are indicative of the nature of work and issued for tendering purposes only. The bidders, however, shall visit the site before bidding for proper information of site conditions. Construction shall be as per drawings/ specifications issued/ approved by the Owner/ Consultant during the course of execution of work.

A)	SPECIFICATION	
	Specification for TCP system	VCS-SS-EL-4018
	Specification for Corrosion Survey	VCS-SS-EL-4017
B)	DATA SHEETS & QAP	
	Quality Assurance Plan	VCS/QAP/TCP/001
C)	STANDARD DRAWINGS	
1.0	Prepacked Zinc Anode	VCS-STD-EL-4511
2.0	Prepacked Mg Anode	VCS-STD-EL-4510
3.0	Details of Test Station for TCP	VCS-STD-EL-4510
4.0	Test Station Connection Schemes	VCS-STD-EL-4514
5.0	Galvanic Anode Installation	VCS-STD-EL-4502
6.0	Zinc Ribbon Anode for Cased Crossings with Coated Casings	VCS-STD-EL-4506
7.0	Pipeline Grounding Through Polarisation Cell and Galvanic Anodes	VCS-STD-EL-4507
8.0	Details of Zinc Grounding Cell	VCS-STD-EL-4508
9.0	Permanent Copper – Copper Sulphate Reference Cell& Installation Details	VCS-STD-EL-4509
10.0	Details of thermit weld for cable to pipe joint	VCS-STD-EL-4504

18.0 DRAWINGS FOR TENDER PURPOSE ENCLOSED WITH CONSTRUCTION TENDER

Schematic Route Diagram P&ID

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Plot Plan

19.0 SURVEY DRAWINGS/ DETAILS

Overall Schematic Route Diagram

20.0 RESOURCES FACILITIES

20.1 Recruitment of Personnel by Contractor

The Contractor shall not recruit personnel of any category from among those who are already employed by the other agencies working at the sites but shall make maximum use of local labour available.

20.2 Construction Water and Power Supply

No water and power will be provided by the owner. It should be the responsibilities of the contractor to arrange water and power at his own cost.

20.3 Land for Residential Accommodation

Owner shall not provide any land for residential accommodation of contractor's staff and labour.

21.0 PROJECT SCHEDULING & MONITORING

The following schedules/documents/reports shall be prepared and submitted by the Bidder/Contractor for review/approval at various stages of the contract.

a) Scheduling & Monitoring System

The Bidders should describe their system of Project Scheduling and monitoring, the extent of computerization, level of detailing, tracing methodology etc. with the name of computer package and sample outputs.

b) **After the Award of Contract**

• **Overall Project Schedule**

The Contractor shall submit within 2 week of Fax of Intent, a sufficiently detailed over all Project Schedule in the activity network form, clearly indicating the major milestones, interrelationship/ interdependence

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between various activities together with analysis of critical path and floats.

The network will be reviewed and approved by Engineer- in-Charge and the comments if any shall be incorporated in the network before issuing the same for implementation. The network thus finalised shall form part of the contract document and the same shall not be revised without the prior permission from Engineer-in- Charge during the entire period of contract.

a) Progress Measurement Methodology

The contractor is required to submit within 2 week of award of WORK, the methodology of progress measurement of sub-ordering, manufacturing/ delivery, sub- contracting construction and commissioning works and the basis of computation of overall services/physical progress informed. Owner reserves the right to modify the methodology in part or in full.

b) Functional Schedules

The contractor should prepare detailed functional schedules in line with network for functional monitoring and control and submit scheduled progress covers for each function viz. ordering, delivery and construction.

22.0 PROJECT REVIEW MEETINGS

The Contractor shall present the programme and status at various review meetings as required.

Weekly Review Meeting

Level of : Contractor's/Consultant's RCM/Site In-charge & Job Engineers

Participation

Agenda : a) Weekly programme v/s actual achieved in the past week & programme for next week.

b) Remedial Actions and hold up analysis.

c) Client query/ approval.

Venue : Site Office

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Monthly Review Meeting

Level of : Senior Officers of IGGL/VCS and Participating Contractors.
Participation

- Agenda :
- a) Progress Status/ Statistics
 - b) Completion Outlook
 - c) Major hold ups/slippages
 - d) Assistance required
 - e) Critical issues
 - f) Client query/ approval

Venue : IGGL/VCS Office/ Site Office

23.0 PROGRESS REPORTING PROFORMA

A) Monthly Progress Report

This report shall be submitted on a monthly basis within 10 (ten) calendar days from cut-off date, as agreed upon covering overall scenarios of the work. The report shall include, but not limited to the following:

- Brief Introduction of the work.
- Activities executed/ achievements during the month.
- Schedule versus actual percentage progress and progress curves for Detail Engg. Sub- ordering, Manufacturing/ Delivery, Sub-contracting, Construction, Commissioning and Overall and quantum wise status & purchase orders against schedule.
- Area of concern/ problem/ hold-ups, impacts and action plans.
- Resources deployment status.
- Annexures giving status summary for drawings, MRs, deliveries, sub-contracting and construction.
- Procurement status for items to be supplied by Contractor.

B) Weekly Reports

The report will be prepared and submitted by the Contractor on weekly basis and will cover following items :

- Activities programmed and completed during the week.
- Resource deployed men and machines.
- Quantities achieved against target in construction
- Record of Mandays lost.
- Construction percentage progress schedule and actual.

C) Daily Repots

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- Activity programme for the day
- Progress of the previous day and commutative progress.
- Manpower & machinery deployed.

Successful bidder shall submit DPR (Daily progress report) & Monthly Monitoring Report to the owner/VCS as per the format in Annexure-A & B.

24.0 PROGRESS REPORTS

24.1 CONTRACTOR shall make every effort to keep the OWNER adequately informed as to the progress of the WORK throughout the CONTRACT period.

CONTRACTOR shall keep the OWNER informed well in advance of the construction schedule so as to permit the OWNER to arrange for requisite inspection to be carried out in such a manner as to minimize interference with progress of WORK. It is imperative that close coordination be maintained with the OWNER during all phases of WORK.

24.2 By the 10th (tenth) of each month, CONTRACTOR shall furnish the OWNER a detailed report covering the progress as of the last day of the previous month. These reports will indicate actual and scheduled percentage of completion of construction as well as general comments of interest or the progress of various phases of the WORK. The frequency of progress reporting by the CONTRACTOR shall be weekly.


24.3 Once a week, CONTRACTOR shall submit a summary of the WORK accomplished during the preceding week in form of percentage completion of the various phases of the WORK, to the OWNER.

24.4 Progress reports shall be supplied by CONTRACTOR with documents such as chart, networks, photographs, test certificate etc. Such progress reports shall be in the form and size as may be required by the OWNER and shall be submitted in at least 3 (three) copies.

24.5 Contractor shall prepare daily progress report (DPR) in the desired format and submit it to Engineer-in-charge alongwith schedule of next day to Engineer-in-charge.

25.0 CONSTRUCTION

OWNER reserves the right to inspect all phases of CONTRACTOR's operations to ensure conformity to the SPECIFICATIONS. Owner will have Engineers, Inspectors or other duly authorised representatives, made

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known to the CONTRACTOR present during progress of the WORK and such representatives shall have free access to the WORK at all times. The presence or absence of OWNER's representative does not relieve the CONTRACTOR of the responsibility for quality control in all phases of the WORK. In the event that any of the WORK being done by the CONTRACTOR or any SUB-CONTRACTOR is found by OWNER's representatives to be unsatisfactory or not in accordance with the DRAWINGS, procedures and SPECIFICATIONS, the CONTRACTOR shall, upon verbal notice of such, revise the work in a manner to conform to the relevant DRAWINGS, procedures and SPECIFICATIONS.

26.0 RULES & REGULATIONS

CONTRACTOR shall observe in addition to Codes specified in respective specification, all National and Local Laws, Ordinances, Rules and Regulations and requirements pertaining to the WORK and shall be responsible for extra costs arising from violations of the same.

27.0 PROCEDURES

Various procedures and method statements to be adopted by CONTRACTOR during the construction as required in the respective specifications shall be submitted to OWNER in due time for APPROVAL. No such construction activity shall commence unless approved by OWNER in writing.

28.0 FIELD INSPECTION

CONTRACTOR shall have at all times during the performance of the WORK, a Competent Superintendent on the premises. Any instruction given to such superintendent shall be construed as having been given to the CONTRACTOR.

29.0 ERECTION AND INSTALLATION

The CONTRACTOR shall carry out required supervision and inspection as per quality Assurance plan and furnish all assistance required by the OWNER in carrying out inspection work during this phase. The OWNER will have engineers, inspectors or other authorised representatives present who are to have free access to the WORK at all times. If an Owner's representative notifies the Contractor's authorised representative not lower than a Foreman of any deficiency, or recommends action regarding compliance with the SPECIFICATIONS, the CONTRACTOR shall make every effort to carry out such instructions to complete the WORK conforming to the SPECIFICATIONS and approved DRAWINGS in the fullest degree consistent with best industry practice.

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30.0 CONSTRUCTION AIDS, EQUIPMENT, TOOLS & TACKLES

CONTRACTOR shall be solely responsible for making available for executing the work, all requisite Construction Equipments, Special Aids, Cranes, Tools, Tackles and testing equipments and appliances. Such construction equipments etc. shall be subject to examination by owner and approval for the same being in first class operating condition. Any discrepancies pointed out by OWNER shall be immediately got rectified, repaired or the equipment replaced altogether, by CONTRACTOR. OWNER shall not in any way be responsible for providing any such equipment, machinery, tools and tackles.

The OWNER reserves the right to rearrange such deployment depending upon the progress and priority of work in various sections.
Tie-end between main line and starting point of terminal is included in the scope of contract, as and when main line section is available for Tie-ins.

31.0 ORDER OF WORKS/PERMISSIONS/RIGHT OF ENTRY/CARE OF EXISTING SERVICES

The order in which the WORK shall be carried out shall be subject to the approval of the Engineer-in-charge and shall be so as to suit the detailed method of construction adopted by the CONTRACTOR, as well as the agreed joint programme. The WORK shall be carried out in a manner so as to enable the other contractors, if any, to work concurrently.

OWNER reserves right to fix up priorities which will be conveyed by Engineer-in-Charge and the CONTRACTOR shall plan and execute work accordingly.

Existing Service

Drains, pipes, cables, overhead wires and similar services encountered in course of the works shall be guarded from injury by the CONTRACTOR at his own cost, so that they may continue in full and uninterrupted use to the satisfaction of the Owners thereof, or otherwise occupy any part of the SITE in a manner likely to hinder the operation of such services.

Should any damage be done by the CONTRACTOR to any mains, pipes, cables or lines (whether above or below ground etc.), whether or not shown on the drawings the CONTRACTOR must make good or bear the cost of making good the same without delay to the satisfaction of the Engineer-in-Charge.

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32.0 DOCUMENTATION

32.1 Drawings and design documents

32.1.1 The following documents shall be submitted before procurement of items and execution of works:

32.1.2 Filled up data sheets & check lists

32.1.3 HSE policy

32.1.4 QAP

32.1.5 Bar charts & project completion schedule

32.1.6 Un-priced list of two years operation and maintenance spare

32.2 The following drawings (in three sets) & documents shall be submitted for approval within 3 weeks of award of contract.

32.2.1 Various procedures of CP system installation like- soil survey (TCP), thermit weld, pin brazing, sacrificial anode (Zn/Mg/ribbon) installations, test stations & junction boxes installation, cable laying, installation of polarization cell, external ER probe, surge diverter & grounding cell, connection & sealing of sacrificial anode, earthing of above ground pipeline etc.

32.2.2 Soil survey report with marked location vulnerable area.

32.2.3 QA & QC Procedures.

32.2.4 Basis of system design and design calculations, equipment selection criteria and sizing calculations, formulae used

32.2.5 Detailed design calculations of TCP system (Complete Design Package).

32.2.6 Equipment layout, Cable layout & schedule.

32.2.7 Colour code identification for the various CP System cables used in the system.

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- 32.2.8 Procedure for field testing, pre-commissioning & commissioning of TCP.
- 32.2.9 Procedure for Monitoring & maintenance of CP system.
- 32.2.10 Equipment layout, Cable layout & schedule.
- 32.2.11 TLP's & junction boxes installation & erection details drawings.
- 32.2.12 Incorporation of Polarisation cell, surge arrester, TLP, Junction boxes & other relevant feature in CP system design in Alignment sheet, pipeline route diagram & Plot plan.
- 32.2.13 Schematic
- 32.2.14 Tentative Bill of Material
- 32.3 After the job completion, contractor shall prepare AS-BUILT drawings/data sheets and documents, submit catalogues/manuals (O&M) of major brought out items. Final certified as built drawings, documents and manuals etc shall be submitted by the contractor to owner in bound volume with one set in soft copy (CD) plus five sets of prints to owner & one set to VCS..
- 32.3.1 Other drawings and documents shall be submitted by contractor along with as-built drawings/datasheets-
- 32.3.2 Test documents & drawings for bought out items.
- 32.3.3 Detailed commissioning report of pipeline cp system (tcp).

33.0 MAKE OF MATERIAL/BOUGHT OUT ITEMS

An Appendix-I of approved vendors for various major items is enclosed with this tender specification. The bidder shall consider such names only as indicated in the aforesaid list and clearly indicate in the bid the name(s) as selected against these items. For any other item not covered in the list enclosed with this tender document, prior approval shall be obtained by the contractor for its make/ supplier's name.

34.0 INSPECTION OF SUPPLY ITEMS

All inspections and tests shall be made as required by the specifications forming part of this contract. Contractor shall advise Owner/ Consultant in writing at least 10 days in advance of the date of final inspection/tests. Manufactures inspection or testing certificates for equipment and materials supplied, may be considered for acceptance at the discretion of Owner/ Consultant. All costs towards testing etc. shall be borne by the contractor within their quoted rates. All inspection of various items shall be carried out based on Quality Assurance Plan, which will be submitted

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by the Contractor and duly approved by Owner/ Consultant.

35.0 DOCUMENTS TO BE SUBMITTED/ PRODUCED ALONGWITH R.A. BILLS

- a) Computerized R.A. Bill/ Manual Bill, with IT No./ ST No./ Labour License No. printed thereon.
- b) ESI/ EPF clearance certificates for the last month alongwith R.A. Bills.
- c) Insurance Policy as per relevant clauses of Contract Agreement.
- d) Attendance Register and Salary Records.
- e) Photocopy of the measurement book to be attached with R.A. Bills.
- f) Any other document required for the purpose of processing the bills.
- g) Registration Certificate with Sales tax authorities of state concerned.

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Format for Daily Progress report

DAILY PROGRESS REPORT – TCP SYSTEM							
CLIENT:				DPR NO.			
CONSULTANT:		MECON Limited		PROGRESS DATE:			
CONTRACTOR:				REPORT DATE:			
PROJECT:				PLACE:			
S.No.	ACTIVITY	UOM	SCOPE	PROGRESS (Spreads A, B)			Remarks
				PREVIOUS	TODAY	CUMULATIVE	
1	Soil Resistivity & Chemical Analysis						
2	Additional DataCollection						
3	TCP design Document						
4	P/L LENGTH	KM					
5	P/L LOWERED	KM					
6	TCP PROVIDED	KM					
7	PSP LEVEL	(-V)					
S.No.	Material Work Description						
1	Test station	Nos.					
2	Mg anode	Nos.					
3	Zn anode	Nos.					
5	No. of Thermit	Nos.					
5(a)	No. of Pin Brazing	Nos.					
5	Surge Diverter	Nos.					
6	ER Probe	Nos.					
7	Polarisation Coupon	Nos.					
8	Polarisation Cell	Nos.					
9	Cased crossings	Loc					
10	TCP Cables						
10(a)	1Cx6 mm ² Armoured	Mtr.					
10(b)	1Cx6 mm ² Un-Armoured	Mtr.					
10(c)	1Cx10 mm ²	Mtr.					
10(d)	1CX25 mm ²	Mtr.					

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Annexure –B
Format for TCP system Commissioning

Sr. No	TS No	Chainage	TS Type	Natural PSP	Instant PSP	Polarised PSP (24 Hrs.)	Anode Voltage (V)	Anode Current (mA)	AC Voltage (V)	Other Readings (If Any)	Remarks

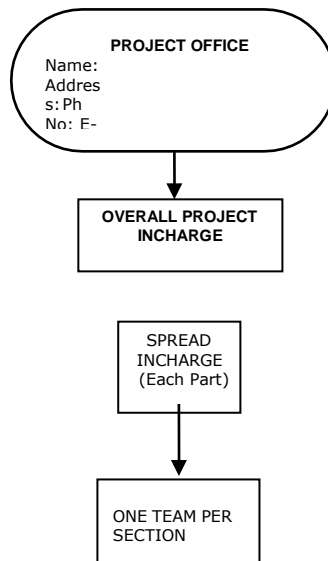
Format for Monthly Monitoring Report of TCP system

Sr. No	TS No	Chainage	TS Type	PSP (-) Voltage			Anode Voltage (V)	Anode current (mA)	AC Voltage (mV)	Other Readings (If Any)	Remarks
				Carrier		Casing					
				Without Bonding	Bonding						

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Annexure-C

Organogram for the TCP work



Note-

1. Overall Project In charge should have B.E. in (Electrical, Electronics and Metallurgical Engineering) & atleast 10 year Experience in the Cathodic Protection (NACE CP Level II) Field.
2. Spread Incharge should have B.E. or Diploma in (Electrical, Electronics and Metallurgical Engineering) & atleast 5 year Experience in the Cathodic Protection (NACE CP Level I/II) Field and shall be available at site office for entire time schedule of the project.
3. CVs including Experience & Qualification shall be submitted by successful bidder.

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Annexure-D

2 Years Operational & Maintenance Spares for Temporary Cathodic Protection System (One Lot for each part)

Sl. No.	Description	Unit	Total Qty.
1	Multimeter- Fluke 87V Digital Multimeter	Nos.	1
2	Clamp Meter (AC&DC)-Fluke	Nos.	1
3	Portable Cu/CuSO4 Reference Cell –Mc-Miller/Tinkar Razor	Nos.	1
4	UT (Ultrasonic Thickness Tester) Meter –Olympus model 27MG orequivalent	Nos.	1
5	Tool Box-Taparia Make (Consisting of Screw Driver Set, Electrical screwdriver set, Adjustable Spanner 12", Flat File 12", Round File 12", Plyer, Chiesel, Hexa Frame, Hexa Blade, Hammer, Nose Plyer, DE Spannerset 6-32, Ring spanner set 6-32", Allen key set etc.)	Set	1
6	Calibrated reference cell to calibrate portable half reference cell	Nos.	1

Note-Price of these spares shall deemed to be considered in the total price of supply of TCP systemquoted by the Bidder

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	ORDER NO. & DATE						PACKAGE NO.		NORTH EAST GAS GRID PIPELINE PROJECT (Section-11)																																																																																																																																												
	SUB-CONTRACTOR						PACKAGE NAME		Part-D																																																																																																																																												
	ORDER NO. & DATE								TCP system																																																																																																																																												
INSTRUCTIONS FOR FILLING UP : 1. QAP shall be submitted for each of the equipment separately with break up of assembly/sub-assembly & part/component or for group of equipment having same specification. 2. Use numerical codes as indicated for extent of inspection & tests and submission of test certificates & documents. Additional codes & description for extent of inspection & tests may be added as applicable for the plant and equipment 3. Separate identification number with quantity for equipment shall be indicated wherever equipment having same specifications belonging to different facilities are grouped together. 4. Weight in tonnes (T) must be indicated under column 5 for each item. Estimated weights may be indicated wherever actual weights are not available.						CODES FOR EXTENT OF INSPECTION, TESTS, TEST CERTIFICATES & DOCUMENTS: <table border="0"> <tr> <td>Code</td> <td>Description</td> <td>Code</td> <td>Description</td> <td>Code</td> <td>Description</td> <td colspan="2">DOCUMENTS:</td> </tr> <tr> <td>1.</td> <td>Visual</td> <td>12.</td> <td>Routine test as per relevant IS other standard</td> <td>23.</td> <td>Short time rating</td> <td colspan="2">D1. Approved GA drawings</td> </tr> <tr> <td>2.</td> <td>Dimensional</td> <td>13.</td> <td>Type test as per relevant IS/ other standard</td> <td>24.</td> <td>Operational & functional check</td> <td colspan="2">D2. Approved single line/ schematic diagram</td> </tr> <tr> <td>3.</td> <td>Fitment & Alignment</td> <td></td> <td></td> <td>25.</td> <td>Over Speed Test</td> <td colspan="2">D3. Approved</td> </tr> <tr> <td>4.</td> <td>Physical Test (Sample)</td> <td></td> <td></td> <td></td> <td></td> <td colspan="2"></td> </tr> <tr> <td>5.</td> <td>Chemical Test (Sample) (Review of test report only)</td> <td>14.</td> <td>Impulse Test</td> <td>26.</td> <td>Flame Proof Test</td> <td colspan="2">data sheet</td> </tr> <tr> <td>6.</td> <td>Ultrasonic Test</td> <td>15.</td> <td>Partial Discharge Test</td> <td>27.</td> <td>Clearance and creepage Distance</td> <td colspan="2">D4. Approved bill of materials</td> </tr> <tr> <td>7.</td> <td>Magnetic Particle Test (MPT)</td> <td>16.</td> <td>Heat run test/temp. rise</td> <td>28.</td> <td>Acceptance Test</td> <td colspan="2">D5. Unpriced P.O. copy</td> </tr> <tr> <td>8.</td> <td>Radiography Test</td> <td>17.</td> <td>Enclosure Protection Test</td> <td>29.</td> <td>Material test</td> <td colspan="2">D6. 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Sl. No.	Description (With equipment heading, place of use, and Brief Specifications)	Identification No.	Quantity		Manufacturer's Name and Address	Expected schedule of Final Inspection	Raw Material and in process stage inspection			Final Inspection/Test by																																																																																																																																											
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1.	CP Cables (1Cx6Sqmm, 1Cx10 Sqmm, 1Cx25Sqmm & 1Cx35Sqmm)		Meters				1,2,28	-	-	1,2,28	1,2,28	HOLD	D1, D2, D3, D4, D5, D6, 20, 13	LS., Approved Data Sheet & Specifications																																																																																																																																							
2.	Test Stations (Big & Small Type)		Nos.				1,2,3,4,22, 29	-	-	1,2,3,4, 22,33	1,2,3,4, 22,33	HOLD	D1, D2, D3, D4, D5, D6, 20, 13	LS., Approved Data Sheet & Specifications																																																																																																																																							
3.	Sacrificial Mg & Zn Anodes		Nos.				1,2,5	-	-	1,2,4, 5, 30, 32*	1,2,4, 5, 30, 32*	HOLD	D1, D2, D3, D4, D5, D6, 20, 13	LS., Approved Data Sheet & Specifications	* on 1% of total nos. of anodes																																																																																																																																						

4.	Spark Gap Arrestor (100 kA)		Nos.				-	-	-	-	-	HOLD	Manufacturer test certificates & Compliance Report	Approved Data Sheet & Specifications		
5.	Polarisation Cell (Solid State)		Nos.				-	-	-	1,2,3,20, 35,36	1,2,3,20, 35,36*	HOLD	Manufacturer test certificates & Compliance Report	Approved Data Sheet & Specifications	*on one no. of each type/offered lot	
6.	External ER Probe		Set				1,2,3,5, 13,29	-	-	1,2,3,5, 13*,17*, 21*,24, 29	1,2,3,5, 13*,17*, 21*,24, 29	HOLD	D1, D3, D4, D5, D6, 20,12,13	Approved Data Sheet & Specifications	*on one no. of each type	
7.	CTSU (Computerized Test Station Unit) & CTSU Reader		Nos.				1,2,3	-	-	1,2,3, 22,24,33	1,2,3, 22,24,33	HOLD	D1, D3, D4, D5, D6, 20,12,13	Approved Data Sheet & Specifications		
8.	Permanent Reference Cell		Nos.				-	-	-	-	-	HOLD	Manufacturer test certificates & Compliance Report	Approved Data Sheet & Specifications		
9.	Zinc Ribbon Anode		Mtr				-	-	-	1,2,30,34	1,2,30,34	HOLD	D1, D3, D4, D5, D6, 20,12,13	Approved Data Sheet & Specifications		
For VCS (Stamp & Signature)											Q.A.P. NO. VCS/QAP/TCP/001					REV. 0
											SHEET 2 OF 2					
											for CONTRACTOR SUB-CONTRACTOR (Stamp & Signature)					

VOLUME-I ANNEXURE II
(CorrosionMonitoringSystem Works)



Energising Quality

PROJECT NUMBER: C221052



**CORROSION MONITORING JOB
SPECIFICATION**

TOTAL SHEETS

19

DOCUMENT NO.

C221052

00

CM

JSP

4001

INDRADHANUSH GAS GRID LIMITED

NORTH EAST GAS GRID PHASE-III OF IGGL

B1	17.11.2022	ISSUED FOR IDC	VV	RD	AA
REV	DATE	DESCRIPTION	PREP	CHKD	APPR

ABBREVIATION

CEA	Central Electricity Authority
SEA	State Electricity Authority
BS	British Standards
IGGL	Indra Dhanush Gas Grid Limited (IGGL),
PNGRB	Petroleum and Natural Gas Regulatory Board
OISD	Oil Industry Safety Directorate
MEDB	Main Electrical Distribution Board
XLPE	Cross-Linked Polyethylene.
PVC	Poly Vinyl Chloride
NEC	National Electrical Code
CC	Corrosion Coupons
CP	Corrosion Probe
CMS	Corrosion Monitoring System
ER	Electrical Resistance
P&ID	Piping and Instrumentation Diagram
PSL	Product Specification Level
SCADA	Supervisory Control and Data Acquisition
FRLS	Flame Retardant Low Smoke

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1.0 DEFINITION

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

PROJECT	PMC Services for North East Gas Grid Phase-III OF IGGL.
OWNER	Indradhanush Gas Grid Limited
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.

2.0 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).

M/s IGGL intends to lay pipeline along with terminal works for section-10 & 11 which consist of 12" NB x 199.007 Km (approx.) in section-10 and 12" NB x 186 Km (approx.) in section-11 mainline. Main line taken from Siliguri DT to Gangtok RT in Section-11. Similarly in section-10 12" Main line taken from T point Jorhat to Dimapur DT to Sekmai gas Bottling plant RT Via IP station at Tadubi (Manipur).

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

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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
PART-D1 (Length 44.2 km)	SPREAD-2B (Length 44.2 km)	Pipeline laying from Ch. 59+800 Km to Ch. 104+000 Km including associated works (Mechanical, Piping & Including Terminal works as per scope matrix) & One (01) SV stations.
PART-D2 (Length 46.3 km)	SPREAD-2C (Length 46.3 km)	Pipeline laying from Ch. 104+000 km to Ch. 150+300 Km. Intermediate Pigging Station (IP station) Lava, West Bengal at Ch. 128+000 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.

3.0 PROJECT BRIEF

Summary of various stations envisaged in the proposed North East Gas Grid Phase-III of IGGL are as under:

A) SILIGURI – GANGTOK PIPELINE (SGPL)

Sr. No	Type of Station	Nos.	Location
1	Dispatch Terminal (DT / SGPL)	0	-----
2	Intermediate Pigging Station (IP/SGPL/01)	1	Tentatively at Lava
3	Receipt Terminal (RT/SGPL) with/ without Tap off	0	-----
4	Sectionalizing Valves with/without Tap off	3	Along the Siliguri-Gangtok route

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A. SILIGURI GANGTOK PIPELINE

Spread	Approx. Length	DT/RT	SV	IP
Spread 2B	44.2 KM	0	1	0
Spread 2C	46.3 KM	0	2	1

3.1 Multi Products Pipeline Details

- A) Design Pressure: 92kg/Cm²g
- B) Design Temperature; -29° TO +65°C
- C) Pipeline Size: - 12" (90.5km)
- D) Pipeline Material: - API 5L Gr. X 70 PSL 2
- E) Pipeline Wall Thickness; -7.14mm / 8.38 mm
- F) Pipeline Total Length (APPROX.): - 90.5 Km (Approx.)
- G) Pipeline Corrosion Coating; - 3LPE (EXTERNAL)

3.2 SITE CONDITIONS

Parameters	
Max / Min. Temperature	50/-5 °C
Design Temperature	50°C
Relative Humidity	95%
Altitude above Sea level	Up to 1000 Meters
Atmospheric pollution	Designed to withstand the site conditions, dust, vapour, Industrial Gases
Hazardous Area classification	Zone-2, Gas group IIA, IIB, for Temp. Class T3
Control Room/ Electrical room/ D.G. Room/Guard	Safe area

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4.0 SCOPE

4.1 SCOPE OF DESIGN & ENGINEERING

4.1.1 Submission of design package, drawings, QAP (quality assurance plan), data sheets, specification, equipment selection criteria, calculations & manuals for approval, various work procedures. Preparation of site engineering drawings, procedures and details for installation works wherever applicable or required by the engineer-in-charge, and submits to the engineer-in-charge for review and approval.

4.1.2 Correction, updating and submission of all owner's drawings for as-built status.

4.2 LOCATIONS OF ER PROBE & CORROSION COUPONS

Refer P&IDs (Enclosed with Vol-IV of Bid Document) for the location of the ER Probe & Corrosion Coupons.

Location	Location/ Line No.	Fluid Flow	Pressure	Temp.	Thickness	Description of CMS
IP at LAVA	Refer P&ID	Refer P&ID	Refer P&ID	Refer P&ID	Refer P&ID	a. Corrosion Probe b. Corrosion Transmitter c. Receiver (Corrosion Meter) d. Corrosion Coupon

Note: The above data is indicative only. The contractor shall get the necessary data from the Owner/VCS before placing the order to the manufacturer of CMS system.

- The thickness of pipes mentioned in the above columns are tentative & the bidder shall confirm the thickness of the pipe from VCS where the installation of CMS system take place before the designing of the length & size of the ER probes, coupons & its fittings etc.
- Corrosion coupon & Probes shall be installed at 6 O'clock position, Spacing & Width, Length & Depth of pit shall be ensured accordingly for ease of retrieval of Coupons & Probes.
- Minimum separation distance between Corrosion Coupon & ER Probe shall be 1.5 times the pipeline diameter on which it is installed.

4.3 SCOPE OF SUPPLY INSTALLATION, TESTING & COMMISSIONING

Following electrical equipment and material are in the contractor's scope of supply in this tender.

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Supply, testing, Packing, Forwarding, Delivery, Installation and commissioning of all the equipment covered in this package are included in the scope of the contractor. No equipment will be free issued by the owner to the contractor.

Design, detail engineering, FAT, supply of all materials, preservation at site/storage at site, fabrication, assembly, erection, installation, testing, commissioning, guarantee, performance evaluation/test at site with all safety & Personnel protective equipment's (PPEs), trained personnel for installation, supervision & commissioning of corrosion monitoring system, submission of first trial/commissioning reports and engineering drawings and obtaining approval from IGGL / VCS for Corrosion Monitoring System as per system description, drawing, specification, standards etc. enclosed with the tender document and as per direction of Engineer-in-charge.

The ER/LPR probes and coupons shall be installed at suitable position on the pipeline as decided during the detail engineering. However, if required a minimum gap of 2.0 meters below the pipeline for retrieval of the ER/LPR probes and coupons shall be prepared by Bidder at CC & CP installation locations. The Size of the Pit shall be Min. 2000 (L) X 2000 (W) X 2000 (D) (Dimensions in MM) and the construction of concrete pit is in the scope of Bidder. The wall thickness of pit shall be 150mm min. This also includes excavation, back filling & restoration at site. Net RCC Volume shall be considered for measurement & payment

Construction of Pit as per Civil drawings (issued during detailed engineering) by IGGL/VCS shall be in scope of Bidder.

O&M Spares/ Tools/ Tackles for CMS system is in the contractor's scope of supply.

List of O&M spares/ Tools/ Tackles is enclosed with appendix-I will be supplied at IGGL's designated store.

All commissioning & start up spares are in bidder's scope (Included in this package). Any commissioning & start up spare consumed during the startup & commissioning is included in the supply of this package, for which no extra payment is made.

4.3.1 MATERIALS AND SCOPE OF SUPPLY

The scope of supply shall consist as minimum requirement of the following components:

i) **ER PROBE, TRANSMITTER AND ACCESS FITTING ASSEMBLY FOR ER PROBES**

a) **ER Probe:** Total Quantity = As per SOR.

ER Probes shall be high-pressure retrievable type, flush mounted, body in SS316 with element of carbon steel for installation with high-pressure hollow plug access fitting assembly. The probeshall be suitable for measurement of corrosion rate in the range of 0-10 mpy. The probe element shall be same as carbon steel of pipeline or API5L Grade B material and element thickness of 20 mils minimum.

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Probe life shall be at least 2-3 yrs. at 1 to 5 mpy corrosion rate.

Probe length is to be decided by the vendor as the pipe size varies from location to location.

Note- Thickness mentioned in SCOPE/ SOR is for bidding purpose only, Optimization of thickness of probe to be done to get higher sensitivity of measurement, Vendor shall furnish all design calculations for approval for selecting the size of probe. Accordingly, the suitable thickness probe shall be supplied.

b) Transmitter: As per SOR.

Panel Mounted Transmitters -The transmitter shall be panel mounted. The transmitter shall have valid intrinsically safety certificate from authorized certifying agency for use in Hazardous area as specified in design basis.

Type – 2 wire IP-66

Input- ER probe Output- 4-20 mA

Cable lead- 5' for ER probe connection and as required for connection to receiver (corrosion meter in control room).

Power Supply-24 VDC from receiver unit

Mounting-At site near probe by bracket/ yoke support

- Intrinsically safe for Hazardous area specified in area classification
- With safety barrier between transmitter and receiver.

c) Access Fitting Assembly for ER Probe –Total Quantity: As per SOR.

The access fitting shall be of flare weld Access Fitting Assembly (non-tee), body carbon steel, and acme thread outlet with hollow-plug assembly in AISI-316 along with heavy duty protective C.S. cover complete with essential spares. Rating 6000 psi and suitable up to design temperature of -29 to 65 deg C.

The access fitting should have rust free design and less chances of damage of threads (thread protection shall also be provided) and should be designed as per the operational & other data collected in site visit.

All the offered Access fittings should be compatible for insertion of ER Probe/Corrosion Coupon made by other manufacturers.

ii) CORROSION COUPONS:

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- a) **Corrosion Coupon:** The corrosion coupons shall be mild Steel flush disc coupons 1.25" dia. x 1/8" thickness with one mounting hole of ID 0.312"- The corrosion coupon shall be made of same pipeline material or API5L Grade B material. The corrosion coupon would be replaced in every 90 days, after exposure to the fluid in the pipeline.
- b) **Coupon Holder: Installation** locations as mentioned above. The coupon holder shall be retrievable type made of SS 316.
- c) **Access Fitting Assembly for Corrosion Coupons** –Total Quantity As per SOR.

The access fitting shall be of flare weld Access Fitting Assembly (non-tee), body carbon steel, and acme thread outlet with solid plug assembly in AISI-316, along with heavy duty protective C.S. cover complete with essential spares. Rating 6000 psi and suitable up to design temperature of -29 to 65 deg C.

The access fitting should have rust free design and less chances of damage of threads (thread protection shall also be provided) and should be designed as per the operational & other data collected in site visit.

All the offered Access fittings should be compatible for insertion of ER Probe / Corrosion Coupon made by other manufacturers.

- iii) **RECEIVER (CORROSION METER):** Total Quantity: As per SOR, for ER probes, for locations connected to UPS (Uninterrupted Power Supply)

- Resolution: ± 0.01 mpy or better
- Measurement repeatability: ± 1 dial division
- Measurement range: 0-10 mpy
- Design Temperature -29°C to 65°C

Complete with suitable safety barrier and two cable of required length between transmitter and receiver (corrosion meter), operation and maintenance manual. - Receiver (corrosion meter) shall be installed in the control room. Approximate minimum distance of 250 meters between control room and field transmitter shall be considered (The length may increase as per the site location & bidder shall provide the single length cable for the Data Acquisition & Transmission). -Owner will provide 220V AC/24V DC power supply for this unit (Bidder must confirm first from the VCS, before the submission of offer which type of power supply is available for the operation of the receiver). The unit shall be suitable to provide 24VDC supply for powering the transmitter is 4-20 mA loop through the two-wire cable.

The unit shall receive 4-20 mA signal proportional to corrosion rate in mils per year (MPY) from the transmitter through the same two-wire cable and provide digital display of corrosion rate through the same two-wire cable. 4-20 mA signals shall also be available from the transmitter-receiver (corrosion meter) for interfacing with DCS/SCADA.

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- Have feature to download all logged data in disk/ Memory drives.
- The receiver (corrosion meter) shall have valid intrinsically safe certificate from authorized certifying agency.

The receiver unit (Display unit for CMS system) shall be installed inside the pipeline control room all the cables, software's & hardware's for communication b/w transmitter (installed outside) are in the scope of vendor. All the required signals of CMS shall be interfaced with station SCADA / PLC system with serial communication (Modbus RTU protocol) is in the scope of the vendor including cables, software's & hardware's.

iv) **RETRIEVER KIT-**

Complete with repair and seal kit for ER probes & coupon holders – Rating: 3600 psi. The retriever shall be manufactured from stainless steel and should have chromium plating for resistance to mechanical / corrosion damage at high pressure. Retriever, shall works on a pressure-balanced principle i.e., sudden released of pressure from the system, the retriever will not telescope.

v) **SERVICE VALVE KIT- Rating: 3600 psi**

Service valve kit, complete with blanking plug, extension lever, and brass hammer, spare face-to- access fitting O-ring, heavy duty field service box, essential repair & seal kit.

Retriever & service valve kit shall be designed for operation on all locations for ER probe and coupons.

Bidder will carry out hydro-test, at Manufacturer's works prior to dispatch, on all supplied service valve and retriever tools at 5400psi for duration of min. 30 minutes and above. & The same shall be witnessed by IGGL/VCS/TPI.

vi) **Access fitting assembly for ER Probes & Coupons, Retriever tool & Service Valve Hydrotest Certification:**

Bidder will carry out hydrotest on all supplied service valve and retriever tools with maximum pressure of 150% of highest operating pressure where the retriever tool and service valve will be used for duration of min. 30 minutes and above.

Bidder will carry out hydro-test, at Manufacturer's works prior to dispatch, on all supplied service valve and retriever tools at 5400psi for duration of min. 30 minutes and above. & The same shall be witnessed by IGGL/VCS/TPI.

vii) **Cables for ER Probe –Transmitter/Off line data logger:**

All ER Probes must be supplied with minimum 5 meters length Cable for Connecting to

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Hand Held Data Logger/Transmitter/Off line data logger. The Cable must have the required connectors for connecting the ER Probe at one end & Hand-Held Data Logger/Transmitter/Off line data logger at the other end.

viii) Interchangeability of Coupon and Probe holders w.r.t. access fittings

It is must that the designed access fittings, coupons & Probe holders can be used with probes of other manufacture's as mentioned in the vendor list. Interchangeability must be guaranteed w.r.t. Probe & Coupon holders, Probes, Coupons and access fittings.

Similarly, it should be applicable to service valves, online retrieval kit, corrosion data logger, online corrosion meters and hand-held meters.

ix) Installation By Hot Tapping:

Hot tapping work for online Installation of access fitting, IGGL's /VCS's approved parties/service provider will carry out corrosion coupon & probe.

x) TRAINING

Successful bidder will provide classroom training as well as field training to the IGGL's personnel for at least of 3 Man days at site i.e., Maintenance base of M/s IGGL at Barauni or Guwahati. The training will broadly consist of operation of ICMS system, its working, insertion / re-insertion of Corrosion Coupons/ER Probes/LPR Probes on the Access Fittings, Collection of corrosion related data, data analysis & assessment, learning & operation of all software's and hardware's provided. The trainer will have vast experience in corrosion monitoring field and corrosion data analysis and preferably from the supplier of the ICMS system. The quoted prices are deemed to be inclusive of such charges for training.

xi) Concrete Pit for safe retrieval of probes & coupons installed at 6'O' Clock position

Construction of RCC concrete (M-25) pit with removable cover (Checkered plate) and PCC bed (100 mm) with supply of all required material for safe retrieval of Corrosion Coupons & Probes includes Excavation, back filling & restoration at site with minimum gap of 2.0 meters or more below the position of pipeline for safe retrieval of ER probes and coupons installed at 6 O'clock position at existing stations. The wall thickness of pit shall be 150mm min. Dimension of the RCC concrete pit shall be as per the safe retrieval of coupons and probes and as per site condition.

xii) All CMS equipment shall be supplied from the List of Preferred makes. In the interest of standardization, the Employer reserves the right of selecting particular manufacturer of CMS items and materials and the Bidder shall supply equipment and materials of the particular make, if so required.

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5.0 SPECIFICATION

TECHNICAL REQUIREMENTS

The electrical resistance (ER) probes and corrosion coupons to be installed at the location as mentioned above shall be retrievable from the line under the operating pressure and temperature. The ER probes & coupons shall be flush mounted on the pipeline at suitable position. All the materials in contact with fluid shall be in accordance with NACE Standard MR-0175. Pipeline inlet pressure may vary according to pipeline pressure drop due to different flow rate; the corrosion monitoring system shall be suitable for operation under this fluctuating pressure conditions.

6.0 INSPECTION AND TESTING

6.1 All the equipment supplied by the contractor shall be inspected by the Owner and/or their inspection agency at the manufacturer's works prior to dispatch. The equipment will be inspected as per the tests pre-identified in the approved QAP to ensure conformity of the same with relevant approved drawings, data sheets, specifications, National/International standards.

6.2 Performance test for CMS system

Vendor shall carry out performance test of CMS system after completion of the installation & commissioning. The PG test to be demonstrated to Client / Client's representative to ensure the correctness of the installed system. If the system performance fails during PG test the whole system will be rejected and all equipment's installed shall be either re- designed/modified is in the scope of the vendor.

The performance evaluation of corrosion monitoring system during commissioning shall be calibrated as per manufacturer's instruction for a period required for a complete cycle of parcel of materials being transported such as crude oil in the pipeline. The contractor shall record and tabulate the corrosion rates at known location of pipelines and submit to owner/VCS along with their comments. The CMS system generated data should not vary over abnormally wide range. CPBG (Contractor's, Performance, Bank Guarantee) shall be released based on performance evaluation.

Performance tests of any equipment which cannot be conducted/ demonstrated either partially or wholly at the manufacturer's work, shall be conducted after erection at site in the presence of Owner & their inspection agency. In all the cases, prior approval of the approval shall be obtained.

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- 6.3** In case of waiver category of items, the same shall be pre identified. For such items, the contractor shall furnish necessary certificates, test reports etc. for Review/Approval to Owner/Inspection agency. The issue of Inspection Certificate/Waiver Certificate for any equipment or component thereof does not absolve the contractor from his contractual obligations towards subsequent satisfactory performance of the equipment at site. Should any equipment be found defective, in whole or part thereof after receipt at site or during erection/commissioning and testing shall be Rectified/Changed by contractor free of cost.
- 6.4** In case of waiver category of items, the manufacturer shall carry out stage wise inspection and testing as per relevant standard codes and service requirements of the specification, for all items of his work prior to shipment. The Manufacturer/contractor shall submit stage wise inspection documents for review/Approval to the Owner/VCS. Manufacturer's third-party inspector's test certificates for finished items in printed format must be sent with the dispatch paper of all supply items.
- 6.5** Contractor shall submit test plan for the equipment's with four-week advance notice.

7.0 PAINTING, MARKING & SHIPMENT

All items shall be painted and marked as per manufacturer's standard before shipment. All items shall be properly packed and protected to avoid damage during shipment. The manufacturer shall ensure insurance during shipment. If any equipment found defective, in whole or part thereof after receipt at site or during shipment/erection/commissioning and testing shall be rectified/changed/supplied by contractor free of cost.

8.0 SPARE & ACCESSORIES

The bidder shall supply recommended spares and accessories for 2 years operation as recommended by Manufacturer and submit un-priced list of 2 Year O&M spares along with bid (Annexure-II).

9.0 GUARANTEE

The Bidder shall guarantee the installation against any defects of workmanship and materials (supplied by the Bidder) for a period of 12 months from the date of commissioning/as per DLP period defined in the Vol-I. Any damage or defects connected with the erection of materials, equipment's or fittings supplied by the Bidder that may be undiscovered at the time of issue of the completion certificate, or may arise or come to light thereafter, shall be rectified or replaced by the Bidder at his own expense as deemed necessary and as per the instruction of the Engineer-in-charge within the time limit specified by the Engineer-in-charge.

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9.1 The above guarantee shall be applicable for the quality of work executed as well as for the equipment/ cable/ fittings/meters/software's/hardware's other materials etc. supplied by the contractor.

10.0 OTHER MISCELLANEOUS WORKS

10.1 The job includes all civil works including supply of bricks, cements steel etc. connected with grouting of equipment to be installed. The job includes repairing of all civil works damaged during installation of electrical and other facilities.

10.2 The job includes any mechanical works including supply of material, pipe, welding etc. required for completeness of job. The job includes modification in existing pipeline required for completeness of job. The job also includes repairing of all civil works damaged during installation of CMS system and other facilities.

10.3 Preparation of buried cable trenches including excavation, back filling, compacting, providing of brick protection by second-class bricks, spreading of fine river sand, including all supplies.

10.4 The scope of work under this contract shall be inclusive of breaking of walls and floors, and chipping of concrete foundations necessary for the installation of equipment, materials, and making good of the same. Minor modifications wherever required to be done in the owner free supplied equipment's or devices to enable cable entry, termination, etc.

10.5 Checking of all connections, i.e., power, control, earthing and testing and commissioning of all equipment erected and/or connected under this contract as per testing procedures and instructions of Engineer-in-Charge.

10.6 Supply and installation of all other accessories not specifically mentioned herein but nevertheless necessary for completion of job.

10.7 Engineering and preparation of specifications, data sheets, procedures and drawings etc. required for procurement & installation of CMS System wherever applicable/required by Owner/ VCS and submit to Owner/ VCS for approval/comments.

10.8 Correction and submission of all owners' drawings for as-built status.

10.9 Obtaining clearance for energizing the complete electrical facilities covered under this tender and approval of installation/drawings from Govt. authority if required.

10.10 Test certificates, catalogues, vendor drawings, installation, operation and maintenance manuals for all equipment/materials in contractor's scope of supply.

10.11 All civil work & Mechanical work related to the CMS work is in scope of contractor.

10.12 Co-ordination with other Contractors.

11.0 AREA CLASSIFICATION

Hydrocarbon handling areas have been generally classified as zone 1 & 2, gas group IIA/IIB as per IS: 5572, API RP-500, OISD - 113 and IP Rules. All equipment's to be installed in these areas shall be suitable for the area classification with temperature class T3 (200°C), CMRI testing and approved by CCOE, DGFAS and having BIS license.

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12.0 JOB SPECIFICATION

- 12.1** The electrical resistance (ER) probes and corrosion coupons to be installed at the location as mentioned above shall be retrievable from the line under the operating pressure and temperature. The ER probes & coupons shall be mounted on the pipeline at suitable position. All the materials in contact with fluid shall be in accordance with NACE Standard MR-0175. Pipeline inlet pressure may vary according to pipeline pressure drop due to different flow rate; the corrosion monitoring system shall be suitable for operation under this fluctuating pressure conditions.
- 12.2** Various works covered under this contract like equipment erection, welding, mechanical work, civil work, cabling and grounding works etc. shall be performed in accordance with applicable specifications / standard practice.
- 12.3** The equipment's/materials to be supplied by the contractor shall conform to the requirements of the applicable specifications enclosed in the tender document.
- 12.4** Price of erection & commissioning spares and special tools shall be included in the quoted price by the bidder.
- 12.5** The above location & no. of ER probes, corrosion coupons, Transmitters & Receivers, Service valve kit, Access Fitting Assembly for probe & coupon, Retriever Kit etc. is indicative (Only for tender purpose), actual no. of these equipment's & their location may change according to site condition/in detail engineering, Contractor shall provide these changed no. of quantities as per unit price quoted in SOR.

13.0 MAKES OF EQUIPMENTS AND MATERIALS

Suggested vendor list for CMS system enclosed with this specification. (See annexure-I)

14.0 SOFTWARE'S & HARDWARE'S

Bidder will supply and install all necessary software's and hardware's required for operation, data collection, data storage & downloading to Personal computers from hand held meters and should have features of data analysis, historical data storage & review, report generation etc.

All the software's will be provided in CDs with valid key and 02 user licenses (Installed 02 nos. of Personal Computers) and have free updates for future.

15.0 DOCUMENTATION

15.1 Drawings and design documents

15.1.1 The following documents shall be submitted along with the offer:

- CMS equipment's data sheets
- Equipment selection criteria & drawings
- QAP
- List of two years operation and maintenance spare
- Catalogues for various equipment's in CMS system

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15.1.2 The following drawings (in three sets) & documents shall be submitted for approval within 3 weeks of award of contract.

- a) Procedures for installation, testing & commissioning of CMS system.
- b) Detail engineering package of CMS system for approval includes the thickness calculation of probe & selection of measurement instrument.
- c) Data sheets of all component of CMS system
- d) Equipment selection criteria & drawings (part no, material etc.)
- e) QAP
- f) List of two years operation and maintenance spare for retriever and service valve kit.
- g) Catalogues for various equipment's in CMS system
- h) O&M manuals of various equipment's of CMS system
- i) Intrinsically safe certificates with catalogue wherever applicable
- j) Third party inspection, calibration certificates & manufacturer stage wise inspection and testing for all the finished items

16.0 DRAWINGS AND DATA SHEET

16.1 Contractor shall submit drawings and data sheet as enumerated in this specification of the equipment's / materials to be supplied.

16.2 After the job completion, contractor shall prepare AS-BUILT drawings and documents, submit catalogues/manuals (O&M), data sheets, test certificates of major brought out items like Transmitter & receiver, Service valve kit, Retriever service valve, Access fittings, service valve kit etc. of CMS system. Final certified as built drawings, documents and manuals etc. shall be submitted by the contractor to owner in bound volume with one set in soft copy (CD) plus five sets of prints & One set to VCS.

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ANNEXURE-I

SUGGESTED VENDOR LIST FOR CORROSION COUPON & ER PROBE ASSEMBLY

The corrosion monitoring items shall be procured from one of the following manufactures:

- 1) Rohrbach Cosasco System
- 2) Metal Sapmples
- 3) Teledyne Cormon Ltd, UK
- 4) Caproco International Ltd
- 5) PT korosi Specindo

All the components including spares shall be purchased from a single manufacturer.

VENDOR LIST FOR HOT TAPPING OF PIPELINE

- 1) M/s TD williamson
- 2) M/s Posco/Bhotika

Note: For procuring bought out items from vendors other than those listed above, the same maybe acceptable subject to the following-

- a) The vendor of bought out item(s) should be manufacturer of said item(s) for intended services and the sizes being offered is in their regular manufacturing range.
- b) The vendor/supplier should not be in the holiday list of IGGL/VCS/ Other PSU.


The successful bidder should submit documentary evidence past track record of vendor (PTR) i.e., detailed PO/WO copies with Schedule of Rates, Inspection Certificates, Completion certificate & performance certificate issued by End User / Owner etc. for approval.

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ANNEXURE-II

List of Spares for 02 Yrs. O&M (For Each Laying Part)		
Sr. no.	Item Description	Quantity
1	SS316 Solid Plug	01 No.
2	SS316 Hollow Plug	01 No.
3	Hollow Plug Seal Kit (1 Packet contains 10 Nos. of Primary Packing, 10 Nos. Probe Packing O-Ring & 10 no. Of each type of sealing ring/gasket)	01 Set
4	Solid Plug Seal Kit (1 packet contain 10 nos. of Primary Packing, 10 nos. of Viton packing O-Ring & 10 no. Of each type of sealing ring/gasket)	01 Set
5	Retrieval Seal Kit (1 set consist of 2 nos. Of each type seal)	01 Set
6	Service valve Seal Kit (1 set consist of 2 nos. Of each type seal)	01 Set
7	Flush disc coupon holder	01 nos.
8	ER probe holder	01 nos.
9	Allen key set	02 nos.
10	Tool box set-Normal (Taparia make orequivalent)	02 no. consist of following tools- Adjustable Spanner (Suitable for ICMS system) Pliers 1 no. 6", Screw Driver set 1 no. Line Tester 01 no., Hammer & Soft (Nylon) Hammer 01 no. each Double Ended Spanner Set 01 no. Hacksaw with Blades 01 no. Pipe wrench 01 no., Wire Cutter 01 no.
11	Tool box set-non-Sparking	02 no. consist of following tools - Adjustable Hook Spanner (For Access fitting) 01 no. Adjustable Spanner 01 no. Hammer 01 no. Pipe wrench 01 no.

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 Emerging Quality	CONTRACTOR		QUALITY ASSURANCE PLAN FOR CORROSION MONITORING SYSTEM				CLIENT: PROJECT:		M/S IGGL NORTH EAST GAS GRID PIPELINE PROJECT (Section-11)		
	ORDER NO. & DATE						PACKAGE NO.		Part-D		
	SUB-CONTRACTOR						PACKAGE NAME		Corrosion Monitoring Systyem		
	ORDER NO. & DATE										

INSTRUCTIONS FOR FILLING UP :

- QAP shall be submitted for each of the equipment separately with break up of assembly/sub-assembly & part/component or for group of equipment having same specification.
- Use numerical codes as indicated for extent of inspection & tests and submission of test certificates & documents. Additional codes & description for extent of inspection & tests may be added as applicable for the plant and equipment
- Separate identification number with quantity for equipment shall be indicated wherever equipment having same specifications belonging to different facilities are grouped together.
- Weight in tonnes (T) must be indicated under column 5 for each item. Estimated weights may be indicated wherever actual weights are not available.

ABBREVIATIONS USED :

CONTR : CONTRACTOR

MFR : MANUFACTURER

CODES FOR EXTENT OF INSPECTION, TESTS, TEST CERTIFICATES & DOCUMENTS:

Code	Description	Code	Description	Code	Description	DOCUMENTS:
1.	Visual					D1. Approved GA drawings & Part Identification No.
2.	Dimensional					D2. Approved single line/ schematic diagram
3.	Fitment & Alignment					D3. Approved data sheet
4.	Physical Test					D4. Approved bill of materials
5.	Part Identification					
6.	Tagging & Marking					
7.	Pressure Test					
8.	Assemble of component					
9.	Installation Check at workshop on sample					D5. Unpriced P.O. copy
10.	Raw Material Test Certificate					D6. Calibration Certificate instruments and gauges of all measuring
11.	Functional test for corrosion meter (Transmitter & receiver)					
12.	Welding					
13.	Hydrostatic test (@5400psi for 30 minutes)					
14.	Packing					
15.	Hardenss test					
16.	MOC					

EQUIPMENT DETAILS						INSPECTION AND TESTS						Test Certificates & documents to be submitted to VCS / OWNER	Acceptance Criteria Standards /IS/ BS/ASME/ Norms and Documents	REMARKS / SAMPLING PLAN	
Sl. No.	Description (With equipment heading, place of use, and Breif Specifications)	Identificatuin No.	Quantity		Manufacturer's Name and Address	Expected schedule of Final Inspection	Raw Material and inprocess stage inspection			Final Inspection/Test by					
			No/M	T			MFR	CONTR/TPI	VCS/ OWNER	MFR	CONTR/ TPI				VCS/ OWNER
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	ER PROBE, ACCESS FITTING ASSEMBLY FOR ER PROBES		Set				10,13 (1 only),14, 16	1,2,5,6,	-	1,2,5,6, 10,13 (1 only),14, 16	1,2,5,6, 10,13 (1 only),14, 16	HOLD	D1, D5, D6, 10 (All test rpeorts)	Tech. Specification, Approved Drawings & Data Sheets	
2	TRANSMITTER & RECEIVER		Set				1,2,5,6,8, 9,11,14	-	-	1,2,5,6,8, 9,11,14	1,2,5,6,8, 9,11,14	HOLD	D1, D5, D6, 10 (All test rpeorts)	Tech. Specification, Approved Drawings & Data Sheets	
3	CORROSION COUPONS, COUPON HOLDER, ACCESS FITTING ASSEMBLY FOR CORROSION COUPONS		Set				10,13 (1 only),14, 16	1,2,5,6,	-	1,2,5,6, 10,13 (1 only),14, 16	1,2,5,6, 10,13 (1 only),14, 16	HOLD	D1, D5, D6, 10 (All test rpeorts)	Tech. Specification, Approved Drawings & Data Sheets	
4	RETRIEVER KIT, SERVICE VALVE KIT		Set				1,2,5,6, 10,13,14, 16	-	-	1,2,5,6, 10,13,14, 16	1,2,5,6, 10,13,14, 16	HOLD	D1, D5, D6, 10 (All test rpeorts)	Tech. Specification, Approved Drawings & Data Sheets	
5	PG (Performance Gaurantee test) at site										Perform	HOLD			

For Manufacturer
(Stamp & Signature)

For CONTR
(Stamp & Signature)

For VCS
(Stamp & Signature)

Q.A.P. NO. VCS/ QAP/CMS/001			REV. 0
SHEET	1	OF 1	



Energising Quality

**PROJECT NUMBER:
C221052**



**CIVIL-STRUCTURAL AND ARCHITECTURAL
SCOPE OF WORK FOR PART D1 & D2**

TOTAL
SHEETS

8

DOCUMENT NO.

C221052

00

CS

SOW

6001

INDRADHANUSH GAS GRID LIMITED

NORTH EAST GAS GRID PHASE-III OF IGGL

D1	09.11.2022	ISSUED FOR BID	IS	PA	GDS
REV	DATE	DESCRIPTION	PREP	CHKD	APPR

ABBREVIATIONS

RCC	Reinforced cement Concrete
PCC	Plain cement Concrete
IGGL	Indra Dhanush Gas Grid Limited (IGGL),
PNGRB	Petroleum and Natural Gas Regulatory Board
OISD	Oil Industry Safety Directorate

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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.

The whole SILIGURI-GANGTOK PIPELINE SECTION (SECTION-11) is divided in to following 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 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.
OWNER	Indradhanush Gas Grid Limited
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.

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).

M/s IGGL intends to lay pipeline along with terminal works for section-10 & 11 which consist of 12" NB x 199.007 Km (approx.) in section-10 and 12" NB x 186 Km (approx.) in section-11 mainline. Main line taken from Siliguri DT to Gangtok RT in Section-11.

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Similarly in section-10 12" Main line taken from T point Jorhat to Dimapur DT to Sekmai gas Bottling plant RT Via IP station at Tadubi (Manipur).

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
PART-D1 (Length 44.2 km)	SPREAD-2B (Length 44.2 km)	Pipeline laying from Ch. 59+800 Km to Ch. 104+000 Km including associated works (Mechanical, Piping & Including Terminal works as per scope matrix) & One (01) SV stations.
PART-D2 (Length 46.3 km)	SPREAD-2C (Length 46.3 km)	Pipeline laying from Ch. 104+000 km to Ch. 150+300 Km. Intermediate Pigging Station (IP station) Lava, West Bengal at Ch. 128+000 Km including associated works (Mechanical, Piping & Terminal works) at Two (02) SV stations.

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

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. are covered elsewhere in the Bid document.

4.0 BRIEF SCOPE OF WORK

This document is to describe the scope of Civil-Structural and Architectural work which will be used for "NORTH EAST GAS GRID PHASE-III OF IGGL".

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In case of conflicting requirement of tender documents, following priority shall govern in general. However, in case of conflict, it shall be referred to Client for clarifications and decision of Client shall be final and binding with or without any cost implications

- The requirements of any statutory body shall govern.
- SOR
- Scope of Works
- Basis of Design/Specifications
- Latest Code & Engineering Standards/drawings

This document establishes minimum requirements of Civil-Structural and Architectural Design Parameters and Basis for Design and Detailed Engineering of the North East Gas Grid Phase-III of IGGL Pipeline (SILIGURI-GANGTOK PIPELINE SECTION, PART-D1 & D2) network & associated facilities covered under this project as defined briefly herein below.

The scope of specification shall provide the minimum requirements & form the basis for carrying detailed design engineering for Civil-Structural and Architectural works for North East Gas Grid Phase-III of IGGL Pipeline (SILIGURI-GANGTOK PIPELINE SECTION, PART-D1 & D2) network & associated facility. This document also provides the general guidelines for preparation of Civil-Structural and Architectural Works This section covers the details of work tendered and scope of work pertaining to Civil-Structural and Architectural construction works including supplying, fabrication, erection, inspection and testing, supplying material and consumable clean up and restoration of site for North East Gas Grid Phase-III of IGGL IP & SV Stations.

Work to be carried out by the Contractor shall include as a minimum, but not limited to, the following:

- a. Geotechnical and topographical survey of the plant.
- b. Demolition and dismantling work of existing structure if any.
- c. Site grading of the plot by removing 300 mm top soil including plot development by filling good quality as per requirement.
- d. Construction of RCC/Brick Work retaining wall all around the plot boundary for retaining filled up earth.
- e. Construction of new RCC framed Boundary Wall column at an interval of 3.0 m c/c but not more than 3.20m c/c or as specified and height 3m with infill brickwork, PCC Coping, MS Y Angle Posts and Concertina coil with RBT fencing etc as per approved drawing.
- f. Supply and stacking of aggregate of non-paved/constructed areas as specified.
- g. Construction of Control Room Building, Guard Room, Store Room, Gate, including internal Plumbing & Sanitary works, internal & external finishes as per relevant Architectural drawings.
- h. Construction of RCC Pavement, Paver Block Flooring, Kerb Stone fixing etc. at specified location.
- i. Boring and installing cast in situ skin friction/end bearing pile of up to

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500 diameter and min. 30T capacity if required or as per recommendations in Geo- technical investigation reports.

- j. Construction of Septic Tank, Soak Pit etc.
- k. Placing of Hand Pump, Drilling and commissioning of Bore well including pump for water supply.
- l. Construction of Approach Road as per MORTH's Specification
- m. Clearing all construction debris and handing over completed work site.
- n. Marking As-built details/drawings on requisite set of construction drawings and return to owner.
- o. Fabrication of all structural components as per approved drawings

Civil works shall be carried out for the scope of work listed as above. Bidder shall understand the scope of work by visiting the work site in advance at his own expenses if required and required to complete all the civil works as per specifications, SOR, drawings and as directed by Engineer-in-charge.

Any other works not specifically listed herein but are required to complete the works covered in the Contract.

5.0 SCOPE OF SUPPLY

Contractor shall procure & supply to site all the materials including cement, reinforcing steel, steel sections/plates other masonry materials, admixtures & bonding agents, sealants, sand, etc. and any other construction material / item required to complete the civil works.

All costs towards testing/inspection of materials/goods shall be borne by the Contractor. No materials/items shall be supplied by the Owner.

6.0 CONSTRUCTION

Complete construction work including supply of labour, construction materials, construction equipment, survey, tools & tackles, dismantling & modification / strengthening, supervision, testing etc. required to complete all the structures, foundations, finishes, steel inserts, painting, including site grading/earthwork in cutting & filling etc. as specified/applicable and required to complete the civil works in all respect.

All enabling works e.g. construction water tank, fabrication yard, electricity, site stores & office, safety and security measures, coordination with other contractors working at site etc. shall be Contractor's responsibility.

Special permits to such as 'Hot Permit', "Fire Safety Permit" to work at project site, if required, shall be contractor's responsibility.)

Coordination and supervising the work of sub-Contractors.

Transportation of appropriate materials to worksite, intermediate storage points, maintaining and operating an adequate material control procedure at worksite.

All associated civil, structural works shall be performed in accordance with relevant specifications, drawings and requirements.

Provide, maintain and operate all temporary facilities required for the construction related works and remove after completion of work.

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All incidental and associated works and any other works not specifically listed herein but are required to be carried out to complete entire work and the associated facilities and making the entire system ready for operation.

All related civil works shall be included in the scope of the Contractor.

As-built drawing & document shall be provided for all work done including old systems where any integration has been done. All documentation to be provided as printed documents and computer files compatible with MS Office and AutoCAD.

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Energising Quality

PROJECT NUMBER: C221052



**CIVIL-STRUCTURAL & ARCHITECTURAL
DESIGN BASIS FOR PART D1 & D2**

TOTAL
SHEETS

27

Document No

C221052

00




CS

DB

6001

INDRADHANUSH GAS GRID LIMITED

NORTH EAST GAS GRID PHASE-III OF IGGL

					
D1	09-11-2022	Issued for Engineering	IS	PA	GDS
REV	DATE	DESCRIPTION	PREP	CHKD	APPR



NORTH EAST GAS GRID PHASE-III OF IGGL

ABBREVIATION

IGGL	Indradhanush Gas Grid Limited
NGL	Natural Ground Level
NHAI	National Highway Authority of India
PWD	Public Works Department
CCoE	Chief Controller of Explosives



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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.

The whole SILIGURI-GANGTOK PIPELINE SECTION (SECTION-11) is divided in to following 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 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.
OWNER	Indradhanush Gas Grid Limited
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.

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).

M/s IGGL intends to lay pipeline along with terminal works for section-10 & 11 which consist of 12" NB x 199.007 Km (approx.) in section-10 and 12" NB x 186 Km (approx.) in section-11 mainline. Main line taken from Siliguri DT to Gangtok RT in Section-11.

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Similarly in section-10 12" Main line taken from T point Jorhat to Dimapur DT to Sekmai gas Bottling plant RT Via IP station at Tadubi (Manipur).

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
PART-D1 (Length 44.2 km)	SPREAD-2B (Length 44.2 km)	Pipeline laying from Ch. 59+800 Km to Ch. 104+000 Km including associated works (Mechanical, Piping & Including Terminal works as per scope matrix) & One (01) SV stations.
PART-D2 (Length 46.3 km)	SPREAD-2C (Length 46.3 km)	Pipeline laying from Ch. 104+000 km to Ch. 150+300 Km. Intermediate Pigging Station (IP station) Lava, West Bengal at Ch. 128+000 Km including associated works (Mechanical, Piping & Terminal works) at Two (02) SV stations.

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

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. are covered elsewhere in the Bid document.

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4.0 SCOPE

4.1 The design considerations given hereunder establish the minimum basic requirements of reinforced cement concrete (RCC) structures, structural steel works and masonry structures. All structures shall be designed for satisfactory performance and functions for which the same are to be constructed.

- All codes referred in this document pertain to BIS (Bureau of Indian Standards) publications and bearing prefix IS.
- Whenever any reference to BIS code is made, the same shall be taken as the latest revision (with all amendments issued there to) on the notified date of submission of tender.
- Apart from the BIS codes mentioned in particular in the various clauses of this document, all other relevant codes related to the specific job under consideration and/or referred to in the above-mentioned codes, shall be followed wherever applicable. Reference to some of the codes in the various clauses of this document does not limit or restrict the scope of applicability of other relevant codes.
- In case of any variation/contradiction between the provisions of BIS codes and the requirements given hereunder, the provisions given in this document shall have precedence over all others. In absence of relevant BIS codes, reference to corresponding British/American codes may be made (in that order of preference).

All designs, detailing and construction shall strictly conform to the enclosed standards, specifications. Only if relevant information is not available in this document, reference to relevant BIS code shall be made.

4.2 The designing of building/structure has been done on the basis given below.

5.0 REFERENCES

The following Indian codes and standards shall be generally used for design of Civil and Structural works. In all cases, latest revisions with amendments, if any, shall be followed. Apart from the specific codes mentioned herein, all other relevant and related codes concerning the specific job under consideration and/or referred to in these codes and technical specifications shall be followed wherever applicable. (All codes shall be latest as on the date of issuing of tender / bid document).

- a. IS: 875 - (part I to V) Code of practice for Design loads (other than earthquake) for Buildings & Structures.
- b. IS: 1893 - Criteria for Earthquake resistant design of structure.
- c. IS: 15498 - guidelines for improving the cyclonic resistance of low rise houses and other buildings/structures.

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5.1 FOUNDATION

- a. IS: 1080- Code of practice for design and construction of shallow foundations in soils (other than raft, ring and shell).
- b. IS: 1904- Code of practice for design and construction of foundations in soils - General requirements.
- c. IS: 2911(part1 to 4) - Code of practice for design and construction of Pile Foundations.
- d. IS: 2974(Part 1 to 2) - Code of practice for design and construction of machine foundations.
- e. IS: 6403- Code of practice for determination of bearing capacity of shallow foundations.
- f. IS: 8009 (Part-I) - Code of practice for settlement of foundations.
- g. IS: 2950(part1) - Code of practice for design and construction of Raft Foundations design.

5.2 CONCRETE STRUCTURES

- a. IS: 432 - 1982 (Part1, 2) - Specification for mild steel and medium Tensile steel bars and hard drawn steel wire for concrete reinforcement.
- b. IS : 456-2000 - Code of practice of plain and reinforce concrete.
- c. IS: 1786 - High strength deformed steel bars and wires for concrete reinforcement.
- d. IS: 1566 - Hard drawn steel wire fabric for concrete reinforcement.
- e. IS: 13920 - code of practice for ductile detailing of RCC structures subjected to seismic forces.
- f. IS: 13620 – code for fusion bonded epoxy coated bars.

5.3 STEEL STRUCTURES

- a. IS: 277 - Galvanized steel sheets (Plain and corrugated).
- b. IS: 800 - Code of practice for general construction in steel.
- c. IS: 806 - Code of practice for use of steel tubes in general building construction.
- d. IS: 808- Dimensions for Hot Rolled Steel Beams, Columns, Channel and Angle Sections.
- e. IS: 813- Scheme of symbols for welding

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- f. IS: 814- Covered electrodes for manual metal arc welding of carbon and carbon manganese steel-Specifications
- g. IS: 816- Code of practice for use of metal arc welding for general construction in mild steel.
- h. IS: 7215 - Tolerances for Fabrication of Steel Structures
- i. IS: 1161 - Steel tubes for general structural purposes.
- j. IS: 12778- Hot rolled parallel flange steel sections for beams, columns and bearing piles- dimensions & sectional properties.
- k. IS: 1367 - Technical supply conditions for threaded steel fasteners
- l. IS: 2062 - Steel for general structural purposes
- m. IS: 3502 -Code of Practice for steel chequered plates
- n. IS: 5624 - Code for foundation bolts
- o. IS: 12893 – tolerances for erection of steel structures.

5.4 OTHER CODES

- a. Indian Road Congress (IRC) Codes.

6.0 SYSTEM OF UNITS

SI units shall be used throughout calculations, documents, reports and drawings and are as follows:

Length	m, mm
Force	kN
Uniform Load	kN/m
Area	m ²
Pressure	kN/m ²
Density	kg/m ³
Deflections	mm
Bending Moment	kN-m

Stress	N/mm ²
--------	-------------------

7.0 DESIGN CRITERIA

Material of construction shall be as specified in the scope of work.

All structures shall be checked and designed to satisfy the worst load combination (refer IS: 875 & IS:456) that produces maximum forces and effects and consequently maximum stresses. Wind and earthquake (or blast) loads shall not be considered to act simultaneously.

The design and detailing of all structures, whether concrete or steel, shall suffice a minimum fire rating of greater than 2 (two) hours or as specified by licensor. Norms as defined in OISD-STD-164, IS: 800 and IS: 456 shall be strictly adhered to for structural steel and concrete works, respectively.

8.0 DESIGN LOADS

The various parameters to be used in analysis and design have been extracted from the project documents. These include the various loads and force to be considered. The same are as listed below.

8.1 DEAD LOAD (D)

These loadings shall be applicable to all structures irrespective of the material employed for construction (Refer IS: 875 part-1).

a. Dead Loads

The weight of all permanent construction including walls, fire proofing, floors, roofs, partitions, stairways and fixed service and other equipment's excluding their content.

- i. Plain and reinforced concrete: 25.0 KN/m³
- ii. Structural steel: 78.5 KN/m³
- iii. Fire proofing concrete: 25.0 KN/m³
- iv. Brick masonry 19.0 KN/m³

8.2 LIVE LOAD (L)

The weight superimposed by the use and occupancy of the building or structure, not including the wind, earthquake or dead load. Live load shall generally be as per IS 875 (Part 2).

The major live loads for different units shall be as per Table – 2.

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8.3 WIND LOAD (W)

Wind loads shall generally be as per IS 875-2015 (Part 3).

Design wind speed is the one for which a structure is to be designed and is calculated from basic wind speed as

$$V_z = k_1 * k_2 * k_3 * k_4 * V_b$$

Where,

V_b = basic wind speed = 47 m/s

k_1 = risk coefficient = 1 (Permanent Structure)

k_1 = risk coefficient = 0.9 (Temporary Structure / boundary wall)

Terrain category=2

k_2 = terrain height structure size factor, as per table-2 of IS:875 (III).

k_3 = topography factor = 1

k_4 = importance factor for cyclonic region = 1

The design life span of all structures shall be taken as 50 years.

Temporary structures shall be designed for a design life span of 5 years.

8.4 SEISMIC LOADS (S)

Seismic forces shall generally be as per IS: 1893 with seismic zone-IV & zone factor of 0.24

8.5 MONORAIL LOAD

Monorail loads shall be considered in design, with impact factors and longitudinal surge as per IS: 875 (Part2).

8.6 SOIL AND HYDROSTATIC PRESSURE

8.6.1 UPLIFT ON FOUNDATIONS

In the design of foundations, the upward pressure of water, if any, shall be taken as the full hydrostatic pressure applied over the entire area. The hydrostatic head shall be measured from the underside of the construction. Factor of safety against uplift shall be 1.2. For purpose of calculating downward load due to over burden, the weight for the same shall be calculated for volume over projected plan area only. In other words, volume of overburden beyond projected plan area shall not be considered. Overburden load shall be considered as dead load of soil under dry condition.

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8.7 PIPING LOAD (P)

8.7.1 PIPING LOAD FOR ERECTION P (E)

It is the weight of pipe including insulation, if any.

8.7.2 PIPING LOAD FOR TEST P (T)

It is the weight of pipe including insulation and weight of water.

8.7.3 PIPING LOAD FOR OPERATION P (O)

It is the weight of pipe including insulation and weight of contents.

8.7.4 In calculating the actual weight of pipe, the class of pipe, material contents and insulation, if any shall be taken into consideration. Insulation density shall be taken as 260 kg/m³, if not furnished.

8.8 THERMAL LOAD (T)

8.8.1 Thermal force is defined as the force occurring due to thermal expansion or contraction of the structural materials, the force occurring at piping and equipment anchor points and the sliding friction forces due to thermal expansion or contraction.

8.8.2 The sliding friction force shall be calculated in accordance with the actual conditions. The friction co-efficient to be used in determining lateral loads due to sliding shall be as follows:

- | | | |
|----|-------------------|------|
| a. | Teflon pads | 0.1 |
| b. | Steel plates | 0.3 |
| c. | Steel to concrete | 0.5 |
| d. | Concrete to soil | 0.40 |

8.9 EQUIPMENT LOAD (E)

8.9.1 EQUIPMENT LOAD FOR ERECTION E (E)

It is the weight of equipment excluding fire proofing, piping all loose internals, platforms supported from the equipment.

8.9.2 EQUIPMENT LOAD FOR TEST E (T)

It is the weight of equipment including fire proofing, piping, all loose internals, insulation, platforms supported from the equipment and weight of water.

8.9.3 EQUIPMENT LOAD FOR OPERATION E (O)

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It is the weight of equipment including fire proofing, piping, all loose internals, insulation, platforms supported from the equipment and liquid/gas contents.

8.9.4 EQUIPMENT LOAD FOR MAINTENANCE (M)

It is the weight of equipment to be considered for maintenance purpose.

8.9.5 In case dead weight and live load on platforms are given on equipment data sheets, it shall be taken accordingly.

9.0 FOUNDATION DESIGN

9.1 Minimum Requirements

9.1.1 Foundation design shall be as per approved Geo-technical report. Piling if required shall be provided as per relevant specification & IS codes.

9.1.2 Minimum depth of foundation for all structures shall be from FGL or NGL, whichever is lower. Factors of safety against overturning and sliding shall be as per values given in Table - 1. Component of soil backfill weight over foundation slab shall be appropriately covered as foundation dead load. For stability checks the weight of soil as overburden shall be as per Table - 1.

9.1.3 The design ground water level shall be as per the approved Geo-technical report/data and shall be adequately accounted for design due to hydrostatic pressure.

9.1.4 Allowable net safe bearing capacity of soil shall be based on the following settlement criteria for dead and imposed load conditions:

- a. Foundations in unit areas, utility areas
and foundations for Plant buildings - 25mm settlement.
- b. Non Plant buildings. - 50mm settlement.

For transient loadings, e.g. wind/seismic, settlement shall not be the criteria and the SBC (safe bearing capacity) based on shear criteria shall be considered.

9.1.5 Permissible increase in SBC/pile capacity shall be as per relevant BIS codes if not otherwise mentioned in the Geo-technical report.

9.1.6 Under blast (due to hydrocarbon explosion) load combinations the design bearing pressure of soil shall not exceed twice the allowable static bearing pressure of soil. Pile capacity shall be similarly increased in blast condition to 1.5 times the permissible capacity under compression, tension and shear modes.

9.1.7 Grade of concrete to be used in foundation shall in general be as per the philosophy adopted for the entire Project. However, minimum cement content, type of cement and any remedial actions required for foundations due to aggressiveness of sub soil water shall be as per the Geo-technical report.

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9.2 Anti-Termite Treatment

Buildings & foundation pits shall be provided with anti-termite treatment as per IS: 8944 and IS: 6313.

9.3 Minimum Cover to Foundation Bolts

Minimum distance from the center line of foundation pocket or anchor bolt to edge of pedestal shall be the maximum of the following:

- a. Clear distance from the edge of the base plate or base frame to the outer edge of the pedestal shall be minimum 50mm.
- b. Clear distance from the face of pocket to the outer edge of the pedestal shall be 75mm.
- c. Clear distance from the edge of the sleeve or anchor plate to the edge of pedestal shall be 75mm.

9.4 Grouting & Minimum Grout Thickness

The minimum thickness of grout shall be 25 mm.

All anchor bolt sleeves/pockets and spaces under column bases, shoe plates etc. shall be grouted with free flow, non-shrink (premix type) grout with 28-day minimum cube crushing strength of 40N/mm².

Grouting requirement for machines and equipment's are not covered here.

10.0 SPECIAL CONSIDERATIONS FOR REINFORCED CEMENT CONCRETE (RCC) STRUCTURES & FOUNDATIONS

10.1. GENERAL/DESIGN METHODS

- a. All buildings, structures, foundations, machine/equipment foundations, liquid retaining/storage structures, trenches, pits etc. shall be of RCC and designed based on IS Codes (latest revision with all amendments issued there to).
- b. Only limit state method as per IS: 456 shall be followed in the design unless otherwise specified elsewhere in this document for special structures.
- c. All structures shall be of frame-type construction. Where ever required detailing shall be as per provisions of IS: 13920.
- d. All underground pits, basements, cable trenches etc. shall be of leak-proof RCC construction using waterproofing compounds.
- e. All liquid retaining/storage RCC structures shall be leak-proof and designed as un-cracked section as per IS: 3370. However, the parts of such structures not coming in contact with the liquid shall be designed according to IS:456 except

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ribs of beams of suspended floor slabs & counter-forts of walls (located on the side remote from the liquid) and roof which shall be designed as un-cracked section. No increase in permissible stresses in concrete and reinforcement shall be made under wind or seismic conditions for such structures.

- f. The walls and base slabs of liquid retaining/storage structures shall be provided with reinforcement on both faces for thicknesses greater than 100mm. In all liquid retaining structures, PVC water bars (230mm wide, 5mm thick) shall be provided at each construction joint.

10.2. REINFORCEMENT BARS

High strength deformed steel bars of grade Fe 500D. conforming to IS: 1786 shall be used for all structures. 18 gauge SWG wire shall be used for binding reinforcement bars.

Reinforcement bars used for underground works shall be factory manufactured corrosion resistant bars, if required as per sub-soil conditions.

10.3. CONCRETE

The minimum grade of reinforced cement concrete to be used for different structures and foundations shall be M25. From Durability considerations the minimum cement content and maximum water-cement ratio shall be as per the table below. However, the maximum cement content shall not exceed 450 kg/m³.

Exposure condition	Plain concrete			Reinforced concrete			Remarks
	Grade of Concrete	Min. cement content (kg/m ³)	Max. free water-cement ratio	Grade of Concrete	Min. cement content (kg/m ³)	Max. free water-cement ratio	
Moderate	M20	250	0.5	M25	300	0.5	

The requirement of grade of concrete, type of cement, minimum cement content and maximum water-cement ratio for concrete to be used in piles shall be as per the requirements given in Geotechnical report.

75mm thick lean concrete of grade 1:4:8 shall be provided under all RCC foundations except under base slab of liquid retaining structures where 100 thick concrete of mix 1:3:6 shall be used. Projection of lean concrete beyond structures will be 75 mm uniform for all structures.

Plain Cement Concrete (PCC) of grade M20 of minimum 150mm thickness shall be provided under all masonry wall foundations.

Plain cement concrete of grade M20 of minimum 40mm thickness shall be provided as damp proof course at plinth level of all masonry walls.

10.4. THE MINIMUM CLEAR COVER TO MAIN REINFORCEMENT SHALL BE AS GIVEN BELOW: -

S.no.	Structure	Normal Cover	Cover for faces in contact with soil
1	Cast-in-situ concrete slabs (roof & floor) including chajja, staircases.	30 mm or dia of bar whichever is greater	
2	Beam (roof, floor, tie & plinth beam), lintel	30 mm or dia of bar whichever is greater	40 mm or dia of bar whichever is greater
3	Column, pedestal	40 mm	55 mm
4	Foundation slab & base slab	50 mm	65 mm
5	Plinth beam	30 mm	40 mm
6	Grade slab	30 mm	40 mm
7	D.G set foundation	50 mm	70 mm
8	Cable trenches	40 mm	55 mm
9	RCC Wall	40 mm	55 mm

10.5. DESIGN OF MACHINE FOUNDATION

- Reinforcement shall be as per provisions of IS: 2974 / IS: 456.
- The soil stress below foundation under dead loads shall not exceed 80% of the allowable soil bearing capacity of static loading.

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- c. All units of the foundation system, except raft shall be provided with symmetric reinforcement on opposite faces, even if not required by design.
- d. The combined center of gravity of the machine and foundation system shall, as far as possible, pass through the center of area of the foundation raft or centroid of the pile group. Where unavoidable, eccentricity shall be less than 5% for block foundations and 3% for frame foundations. However, in highly compressible soils, no eccentricity shall be permitted.
- e. Foundation shall be so designed that natural frequency of the foundation system shall not resonate with the following:
 - i. Operating speed of the motor
 - ii. Operating speed of the machine
 - iii. 2 x operating speed of the machine
 - iv. Critical speed of the machine (for centrifugal machines)
- f. Natural frequency of the foundation shall preferably be +20% away from the above-mentioned frequencies. However, amplitude of vibration of the foundation block shall always be checked to be within permissible limits.
- g. The foundation and its superstructure shall be separated from adjacent foundations.
- h. Amplitudes of vibration shall be less than values specified by the machine manufacturer. If not specified, provision of IS: 2974 shall be followed.
- i. Block foundations shall be cast in a single concreting operation.

10.6. BOUNDARY WALL

- a. Foundation for boundary walls shall be as per soil recommendation. If required, piles shall be provided.
- b. The boundary wall will be of RCC beam column structure with filler walls consisting of 230mm thick brick masonry. The height of brick masonry wall will be 3.0 m above plant level (F.G.L.). Barbed fencing arrangement will be provided above the brick masonry work for a height of 600 mm.
- c. Columns will be spaced approximately at 3m centre to centre (maximum up to 3.2m). The columns will be tied with beams at the top end of the wall.
- d. It will be ensured that no part of construction is protruding out of the battery limits of plot.
- e. Expansion joints will be provided in the boundary wall as per relevant IS code. The expansion joint will be filled with capitek polysulphide gap filler or equivalent.

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- f. If the soil investigation report indicates the presence of harmful chemicals in the subsoil/subsoil water, protective coatings will be provided for all underground structures if required, necessary treatment will be given to the soil coming directly in contact with the RCC structures.

10.7. CABLE & PIPE TRENCHES

- a. The cable trenches will be provided with removable cover with suitable lifting arrangement. The cable trench covers will be of chequered plate inside the Control Room building and outside the building, it will be of precast RCC covers constructed using concrete mix M25.
- b. The trench bed will have a slope of 1 in 600 along the run and 1 in 250 perpendicular to the run sumps will be constructed at the end for pump out accumulated water.
- c. No interference will be permitted with surrounding foundation system. Suitable clear gap will be maintained.
- d. The cable trench walls will be designed for the following load cases.
 - i. Dead load of 150 kg/m length of cable support per tier + 75 Kg on one tier at the end.
 - ii. Triangular earth pressure + uniform surcharge pressure of 1T /m².
- e. Cable trench covers will be designed for self-weight of top slab + UDL of 2.0 t/m for 300 width.
- f. All the construction joints of cable trenches i.e., between base slab to base slab and the junction of vertical wall to base slab will be ensured for water tightness.
- g. All trenches shall be interconnected through PVC pipes and the discharge of all trenches shall go into a recharge well. The recharge well shall have boring in the centre.

11.0 SPECIAL CONSIDERATIONS FOR STEEL STRUCTURES

11.1. GENERAL/DESIGN METHODS

Design, fabrication and erection of the above work shall be carried out in accordance with IS Codes as applicable to the specific structures. Basic consideration of structural frame work shall primarily be stability, ease of fabrication/erection and overall economy satisfying relevant Indian Standard Codes of Practice.

Crane gantry girders shall generally be of welded construction and of single span length. Chequered plate shall be used for gantry girder walkway flooring.

For crossover & platforms steel staircases shall have channels provided as stringers with minimum clear width of 750mm and slope of 41 degree. The vertical height between successive landings shall not be less than 2.6 m nor exceed 4.0 metres. Treads shall be

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minimum 230mm wide made of grating (with suitable nosing) spaced equally so as to restrict the rise to maximum 200mm.

Cage for monkey ladder to be provided for height above 2.5m.

Hand rails, 1000mm high, shall be provided to all walkways, platforms, staircases. Toe plate (100mmx5mm) shall be provided for all hand railing (except for staircases). Spacing of uprights shall be 1500mm (maximum). Two types of hand railing shall be provided.

- a. For walkways, platforms (except platform around circular vessels), and staircases: Top rail, mid-rail and upright shall be 32mm dia (NB) MS tubes.
- b. For platforms around, circular vessels: Top rail shall be 32mm dia (NB) MS tubes but mid-rail and upright shall be of structural steel.

Electro-forged painted / hot dipped galvanized welded MS Gratings shall be minimum 25mm deep. The maximum size of voids in the grating shall be limited to 30mm x 55mm. The minimum thickness of galvanizing shall be 120 microns.

Welded connections shall be adopted as far as practicable except for cases where bolted connections are required viz. galvanized structures. Structural connections shall have minimum two bolts of 16mm dia. unless otherwise limited by the size of members.

Minimum two nuts shall be used for all anchor bolts.

11.2. STEEL GRADE

Structural steel shall be of grade E 250 (Fe 410W) conforming to IS: 2062. Tubular steel shall conform to Yst 240 of IS: 1161.

11.3. LIMITING PERMISSIBLE STRESSES

Permissible stresses for structural members, bolts, welds shall be as per relevant codes.

11.4. LIMITING DEFLECTION

The following limiting deflection criteria shall be considered in sizing of the structures as Per IS: 800 2007(Clause 5.6.1)

a. VERTICAL DEFLECTION

S.no.	Description	Minimum Thickness
1	Gantry girder E.O.T (cap. Upto 50T)	1 / 750 of span
2	Beams and Girders	1/325 of span
3	Girder / Beam supporting dynamic equipment / hoist	1/500 for manually operated cranes. For other refer IS-800

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4	Grating / Chequered plate	1/200 of span or 6mm whichever is smaller.
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b. HORIZONTAL DEFLECTION

S.no.	Description	Minimum Thickness
1	Columns (Normal Loads)	1/325 of span
2	Columns (Under wind / seismic load combination)	1/250 of span

11.5. MINIMUM THICKNESS

Minimum thickness of any part of a structural steel shape shall be as follows:

S.no.	Description	Minimum Thickness
1	Columns, beams	7 mm
2	Stiffeners	8 mm
3	Base plates	10 mm
4	Chequered plate	6 mm (on plain)
5	Grating	3 mm
6	Truss, Purlin, Side girts, Bracing	6 mm

11.5.1 The minimum thickness for rolled beams and channels shall be mean flange thickness regardless of the web thickness.

11.5.2 However, the minimum thickness of structural component (except gratings & chequered plates) which are directly exposed to weather & inaccessible for painting shall be 8mm.

11.5.3 Minimum thickness of tubes shall be as specified in IS: 806. The ends of all tubes shall be sealed by using 6 mm thick. Plates welded all round.

11.6. PAINTING

Painting on Structural Steel shall be as per table 29 of IS: 800 or painting specification.

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12.0 SPECIAL CONSIDERATIONS FOR MASONRY WORKS

12.1 GENERAL

All masonry works shall be designed in accordance with IS: 1905, IS: 1597, IS: 2185, IS: 4326 and other relevant IS Codes as applicable. All external brick, stone and hollow concrete block masonry walls shall be of minimum 230, 350 and 250mm thickness respectively. Bricks for masonry work shall be of class 5.0 conforming to IS: 1077. Hollow concrete blocks shall conform to IS: 2185.

12.2 CEMENT MORTAR

All masonry work shall be constructed in 1:6 cement sand mortar except half brick partition walls which shall be constructed in 1:4 cement sand mortar with two numbers of 8mm diameter MS bars provided at every fourth course properly anchored with cross walls or pillars.

13.0 SITE PREPARATION, ROADS, PAVEMENT, DRAINAGE, U/G PIPING AND TRENCHES

13.1 SITE PREPARATION

- a. The layout of the plot will be prepared and the level will be set.
- b. The site preparation will conform to the requirements of the relevant sections of this design basis and specification.
- c. Minimum Finished Ground Level (FGL) must be 300 mm higher than the maximum level of centerline of nearby road at entry point or highest flood water level that may be anticipated in the locality, whichever is higher.

13.2 ROADS

Road width shall be as per approved plot plan drawing. The radius of curvature of the turnings shall be 6.0m (minimum) unless otherwise mentioned in the relevant drawings. The roads shall be constructed as per the specified drawings. All the roads inside the station building shall be of RCC with TREMIX.

13.3 PAVEMENT/FOOTPATH

The pavement/footpath shall be as per standard drawings.

13.4 DRAINAGES

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- a. Surface storm water drains shall be provided. The minimum width of the drains shall be 300mm and starting depth should be 300mm. Open storm water brick masonry drains shall be provided as per the layout. The drains will have slope of 1 in 1000 (min).
- b. Drains around the building shall be covered with concrete grating. For all buildings, suitable arrangement in the form of drain pits connected by buried RCC / Steel pipes for draining out water from the equipment, leakage, floor washings, fire-fighting, etc shall be provided for each floor, complete up to plant sewers / drains.
- c. Roof gutters shall conduct water to storm water drains. Any drainage outside the building will be conducted away from the building to the nearest existing storm water drains / drainage ditch. The plinth protection drains shall be of brick masonry with RCC base.
- d. Surface drainage system shall be designed considering run off co-efficient for paved and unpaved areas 0.9 and 0.6 respectively.
- e. Drain wall shall be designed to resist earth pressure.

13.5 U/G CONCRETE PIPING

- a. Underground piping shall be constructed by excavating a trench in undisturbed soil. The pipe shall be placed on the bottom of the trench and covered with earth backfill to the original ground surface.
- b. Vehicles wheel loads shall be added to the backfill load to determine the total load on the pipe in vehicle movement area.
- c. Pipe shall be designed to resist the total load as per IS: 4350.

13.6 CULVERTS

ERC/IRC shall be provided for all kinds of pipelines road crossing inside the plot. Outside the plot & at the entry of plot, Culverts under roads shall be of box-shaped/ RCC Pipe culvert for passage of sewerage systems.

13.7 STONE PITCHING

Stone pitching with turfing shall be provided outside the boundary wall.

13.8 FENCING

1.8m high fencing with 2.4m angle iron 50x50x6 mm post placed every 3.0 m c/c, with suitable foundations at least 750mm below from FGL/NGL whichever is lower.

14.0 WATER SUPPLY

- a. Potable water shall be supplied to basins, water closets, urinals, sinks, water coolers, showers and other fixtures.

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- b. Roof water tank of adequate capacity depending on the number of users for 8-hrs storage will be provided for each building. The platform for PVC water tank shall be of masonry instead of RCC.
- c. Internal piping works for potable water supply in building shall be with either UPVC or any other composite material. Waterline shall be extended up to minimum of two points at the end of the plot for purposes of gardening.
- d. Capacity of overhead water shall be 500 liters.

15.0 SEWERAGE

- a. Extra heavy cast iron pipes with lead joints shall be used for sanitary works below the ground of the buildings or below roads / paving. Stoneware pipes shall be used in the other areas. Soil and waste piping with traps shall lead to the site sanitary sewer system, manholes, septic tanks, soak pits, etc.
- b. Heavy cast iron pipes, lead joints PVC pipes will be used for sanitary works above the ground level.
- c. Sanitary sewage shall consist of septic tanks for individual buildings / areas or group of buildings. Connected to the soak pits.
- d. Treated effluent from septic tank shall pass to the soak pit. Alternative arrangement shall also be provided for discharging treated effluent to the nearest drain.
- e. Culvert at the entrance of terminals shall be done as per local authority guidance and requirements.

16.0 STATUTORY RULES

- a. All the applicable statutory rules pertaining to factories act (as applicable for the state); Fire Safety Rules of Tariff Advisory Committee, Water Act for Pollution Control etc. Will be complied with.
- b. Statutory clearance of respective NHAI, PWD, CCOE and norms of State Pollution Control Board will be followed.

17.0 ARCHITECTURAL DESIGN REQUIREMENT

Architectural design shall be in accordance with the following clauses.

17.1 REFERENCED PUBLICATIONS

Provisions of following references shall be taken care in architectural design.

- a. National Building Code of India.

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- b. State Govt. Factory Acts.
- c. Local Municipality or any other Authority's Bye-laws as applicable.
- d. TAC (Tariff Advisory Committee) Recommendations.
- e. OISD-174 and IE Rules for Substation design

17.2 BUILDING ELEMENTS

17.2.1 FINISHED FLOOR LEVEL (FFL)

In general, FFL of the Buildings, sheds shall be determined with respect to top of approach road or pavement. Following schedule shall be adhered to for FFL of various buildings & sheds.

- a. Control Room/ Electrical room/ office room/ Store room -Top of approach Road level + 300mm

Notes: In case of approaches with different top levels, the highest top level of approach road/pavement shall be considered.

17.2.2 STEPS/RAMPS

Steps /ramps shall be provided for access to the buildings/sheds for pedestrian/ vehicular, equipment entry. Minimum 1000 mm wide platform shall be provided in between Entrance door and steps/ramps. Following dimensions of the steps/ramps shall be adhered to.

- a. Tread = 250 mm minimum
- b. Riser = 175 mm maximum
- c. Slope of Ramp = Not steeper than 1:6

17.2.3 WALL

Following schedule shall be adhered to for wall material and thickness.

- a. External, load bearing walls = Minimum. 230 mm.thk. Brick wall
- b. Internal partition wall = 230/115mm thk. Brick wall

17.2.4 DOORS

Doors shall be provided for access, security and safety at all entry & exits of rooms, functional areas & the buildings. Sizes of the doors shall be determined on the basis of the following schedule.

- a. Equipment, Panel area - Size of maximum equipment including packing

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- | | | | |
|----|------------------------------|---|---------------------------------------|
| b. | Other areas | - | Volume of movement through the door |
| c. | Minimum Entrance door size- | | 1500 mm x 2100 mm (wall opening size) |
| d. | WC, Bath Cubicle Door | - | 750 mm x 2100 mm (wall opening size) |
| e. | Minimum size of other doors- | | 1000 mm x 2100 mm (wall opening size) |

Notes:

Rolling shutters shall be provided wherever area requirement of openable shutters exceed 2500 mm x 2500 mm.

17.2.5 WINDOWS/ VENTILATORS

Windows/ventilators shall be provided in all areas for natural lighting, ventilation and visibility at working level.

For the purposes of ventilation, total open able area of the windows/ventilators shall be as per Factory Act subjected to a minimum of 15% of the floor area to be ventilated. However, for non-process Control Room, security block of Gate Houses and in office areas etc. where visibility from inside is of prime importance, increased window area shall be provided. Areas accommodating panels/equipment's shall be normally provided with ventilators at high level for unobstructed distributed lighting.

Notes:

- Requirement of window/ventilation area as stipulated above is for maximum room/area height of 4000 mm. For height more than 4000 mm additional window/ventilator shall be provided in the same manner at every work area such as walkway/gangway etc. at all such working levels. In such cases additional windows/ventilators shall also be provided to ensure min. Illumination & ventilation at every level of the building/shed.
- Wherever due to limitation of external wall area or any other reasons, stipulated area of window/ventilation cannot be provided, suitable mechanical/electrical devices shall be provided.

17.2.6 SHADING DEVICES

Shading devices shall be provided over all windows, open able ventilators for rain & sun protection. These devices shall be in form of horizontal projections, vertical projected fins or combination of both as per building facade treatment. Minimum projection shall be 600 mm. The top surface of the shading devices shall be finished with cement plaster mixed with waterproofing (laid to slope) compound and shall be provided with GI spouts for drainage.

17.2.7 PARAPET

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Parapets shall be minimum 500 mm high for non-approachable roof and 900 mm high for approachable roof. In case of future expansion, GI/MS removable railing shall be provided.

17.2.8 RAIN WATER PIPES, SPOUTS

Rain water pipes shall be provided for roof water drainage. Number of rain water pipes shall be decided on the basis of roof Area, slope and rainfall intensity. Rain water pipes shall be embedded in concrete or brick. RCC or GI spouts may be used for drainage of chajja/ small canopies of ground floor only.

17.2.9 PASSAGES/CORRIDORS

Passages/corridors shall be provided to integrate various spaces. Width of the passages/corridors shall be as per following schedule.

- a. Singly loaded passage/corridor = Minimum 1200 mm.
- b. Doubly loaded passage/corridor = Minimum 1800 mm

But whenever passages/ corridors are to be used for equipment/ machinery/ panels etc. the width shall be determined on the basis of equipment/ machinery /panel sizes.

17.2.10 STAIRCASES

Staircases shall be provided for vertical circulation & emergency exits. Number of staircases shall be based on building/shed sizes and emergency exit requirements. At least one staircase/ladder shall be provided for access to the flat roofs for maintenance.

17.2.11 RAILINGS

Railings shall be provided in stairs, and in all unprotected openings in slabs as a safety device. Railings in loading/unloading bay of Substations shall be of removable type to facilitate the purpose.

17.2.12 TOILET

Toilet shall be provided for all buildings/sheds in every station. Toilet shall consist of Gents Toilet, Ladies Toilet (as per requirement) and separate drinking water enclosure and janitor space. Requirement of fittings & fixtures shall be as per National Building Code of India & Factory Act.

17.2.13 FALSE CEILING

False ceilings shall be provided for following purposes wherever required.

- a. To reduce room volume and hide ducting etc. for air-conditioned space.
- b. To maintain acoustic level inside any space.

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- c. To reduce habitable room, corridor, lobby, and toilet heights located in high ceiling building/shed to min. 3000 mm.

17.2.14 FALSE/CAVITY FLOORING

False/cavity flooring shall be provided to accommodate under floor cabling in Instrumentation Console, Rack and UPS Room etc.

17.2.15 PLINTH PROTECTION

All buildings and structures shall be provided with 750-mm wide plinth protection around where paving / pitching is not done. The plinth protection shall be 100 mm (min) above respective Finished Ground Level.

17.2.16 ROOF DRAINAGE

Water from the roof surface shall be drained by a system of roof drain heads, rainwater down corners and necessary fixtures. The roof will be provided with a slope of 1: 100 (min.) for efficient drainage. Cast iron rainwater down corners conforming to IS: 1230 with water tight lead joints or medium class galvanised mild steel pipes conforming to IS: 1239 / IS: 3589 shall be provided to drain off rainwater from the roof.

17.2.17 ARCHITECTURAL FINISHES

All the building elements i.e. floor, wall, ceiling, roof, doors & windows etc. Shall be provided with architectural finishes as shown in the building drawings.

17.2.18 ROOF TREATMENT

Contractor to propose roof treatment based on following options:

- a. Polyurethane waterproof coating, single component.
- b. Nano technology-based system is also to be explored for roof water proofing.

18.0 GREEN BELT DEVELOPMENT AND SIGN BOARDS

Green Belt will be developed near and around building and also in station area to comply local authority/ forest department requirement. Signboards will be provided at all stations and other points. All works will be carried out as per discretion of Owner/ Owner's representative.

19.0 CONSTRUCTION REQUIREMENTS

Construction requirement shall be as per construction specification enclosed in bid document.

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TABLES

Table 1. Factors of safety

Type of Structure	Factor of safety				% weight of overburden over projected plan area of footing
	Overturning		Sliding		
	With wind or seismic	Without wind or seismic	With wind or seismic	Without wind or seismic	
Foundations and structures (units)	1.5	2.0	1.5	1.75	100%

Table 2. Minimum live loads on floors

SL. No.	Occupancy or use (types of floor)	Live Kg/m ²	Remarks
1a	Cross over	250	
1b	Access walkway	250	
2	Staircases	400	
3	Control room	500	
4	Electrical room	500	
5	Store room	750	
6	UPS / Battery room	750	
7	Office room	400	
8	Valve operating Platform	250	
9a	Non-accessible - Flat roofs	75	Plus hung loads if any
9b	Accessible - Flat roofs	150	Plus hung loads if any
10	Maintenance area	750	
11	Toilet & Bathroom	200	

INSTRUMENTATION & TELECOMMUNICATION WORKS

**(Appendix-IV & V to Particular Job
Specification of Work)**

Contents-Particular Job Specification

Volume- I of III

S No.	Description	Document
1	Scope of Work- Instrumentation & Telecom Works-NEGG Phase-III Part D1 & D2	C221052-00-IN-SOW-5003
2	Design Basis-Instrumentation & Telecom Works-NEGG Phase-III Part D1 & D2	C221052-00-IN-DB-5001
3	Material Requisition for Composite Works Tender-Instrumentation-NEGG Phase-III Part D1 & D2	C221052-00-IN-MR-5003
4	Datasheets-Field Instruments- NEGG Phase-III Part D1 & D2	C221052-00-IN-DS-5003
5	Process Datasheets for GOOV	C221052-00-PC-DS-1001
6	Process Datasheet for Pressure Gauge	C221052-00-PC-PDS-1007
7	Process Datasheet for Pressure Indicating Transmitter	C221052-00-PC-PDS-1008
8	Process Datasheet for Temperature Indicating Transmitter	C221052-00-PC-PDS-1009
9	Process Datasheet for Temperature Gauge	C221052-00-PC-PDS-1010
10	IO List -NEGG Phase-III Part D1 & D2	C221052-00-IN-LST-5002
11	Instrument Index-NEGG Phase-III Part D1 & D2	C221052-SGPL-IN-IIX-5001
12	Cable Schedule-NEGG Phase-III Part D1 & D2	C221052-SGPL-IN-SCH-5002
13	Inspection & Test Plan-Instrumentation	C221052-00-IN-ITP-5003
14	Material Requisition-OFC & PLB-HDPE DUCT NEGG Phase-III Part D1 & D2	C221052-00-IN-MR-5001
15	Datasheets & Specifications- OFC & PLB-HDPE DUCT NEGG Phase-III Part D1 & D2	C221052-00-IN-DS-5001
16	Inspection & Test Plan- OFC & PLB-HDPE DUCT	C221052-00-IN-ITP-5001



Energising Quality

PROJECT NUMBER: C221052



SCOPE OF WORK- INSTRUMENTATION & CONTROL SYSTEM

Total Sheets

14

Document No

C221052

00

IN

SOW

5003

INDRADHANUSH GAS GRID LIMITED

NORTH EAST GAS GRID PHASE-III PIPELINE OF IGGL PART-D1 & D2

D1	13.12.2022	Issued for Bid	VK	DGM	KNC
A1	07.12.2022	Issued for Internal Review	VK	DGM	KNC
REV	DATE	DESCRIPTION	PREP	CHKD	APPR



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1.0 DEFINITION

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

PROJECT	PMC Services for North East Gas Grid Phase-III OF IGGL-Part D1 & D2.
OWNER	Indradhanush Gas Grid Limited
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.

2.0 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).

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

2.1 PROJECT DESCRIPTION

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
PART-D1		Pipeline laying from Ch. 59+800 Km to Ch.

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(Length 44.2 km)	SPREAD-2B (Length 44.2 km)	104+000 Km including associated works for One (01) SV stations.
PART-D2 (Length 46.3 km)	SPREAD-2C (Length 46.3 km)	Pipeline laying from Ch. 104+000 km to Ch. 150+300 Km. Intermediate Pigging Station (IP station) Lava, West Bengal at Ch. 128+000 Km including associated works for Two (02) SV Stations & One (01) IP Station.

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

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

2.2 Abbreviations

LAN	Local Area Network
GOOV	Gas Over Oil Valve
OFC	Optical Fiber Cable
HDPE	High-density polyethylene
TIT	Temperature Indicating Transmitter
PIT	Pressure Indicating Transmitter
PG	Pressure Gauge
PSV	Pressure Safety Valve
TRV	Temperature Relief Valve
GDS	Gas Detection System
MR	Material Requisition
FACP	Fire Alarm Control Panel
CRV	Creep Relief Valve
MCT	Multi Cable Transit

3.0 DOCUMENT PRECEDENCE

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

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

- Material requisition (MR);
- Data sheets;
- Scope of Work & Supply;
- Standard Specifications;
- Other Documents & Drawings;
- International & National Codes & Standards;

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

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

4.0 INSTRUMENTATION & CONTROLS SCOPE

4.1 Brief Scope of Work

Contractor's scope of work includes following activities:

- Supply, Installation, Testing & Commissioning of all Field instruments as per P&ID and project requirement;
- Installation, Testing & Commissioning of Gas Over Oil Actuated Valves followed by testing and commissioning;
- Supply, Installation, Testing and Commissioning of GDS system including detectors, for control room/control equipment room;
- Supply, Installation, Testing & Commissioning of TIC panel as per project requirement
- Supply, Laying & Termination of all instrumentation cable from field instrument to JB, JB to TIC panel, TIC panel to RTU etc.

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- Supply, Laying, Blowing & Termination of single mode 24-Fiber OFC cable along with accessories & PLB-HDPE Duct along with necessary accessories.
- Supply and Installation of set of FTC (in & out) with zero dB connectors & wire mesh (structural size 1.5 Mtr x 1 mtr and mesh size 15 cm x 15 cm) and other accessories, as required for termination of OFC - 24 fibre in the equipment room at all SV & IP.
- Total responsibility of Integration of RTU Panel of Part-D1 & D2 pipeline with Phase-I & II SCADA System with the help of/coordination with Phase -I & II SCADA OEM.
- Supply of erection hardware's, impulse pipes, tubes, fittings, connectors, JB, cable glands, cable trays, 2-valve & 3 valve manifold, cable lugs etc., as required.
- Installation of RTU Panel (free issue items).
- Supply of patch cord cable, pig tails etc., as required for all the SV & IP location
- Project Management & Control Activities;
- Quality Assurance & Quality Control;
- Packing and Shipment to site;
- Inspection and testing as per vendor proposed ITP and approved by Owner;
- Engineering Documentation.

4.2 Detailed Scope of Work

Instrumentation and controls scope of work of the Project is mentioned in order to provide an overview of activities required to be carried out for successful completion of job.

- Supply, Installation, Testing and Commissioning of all the required field instruments at SV & IP stations.
- Installation, Testing and Commissioning of the Gas Over Oil Valve (GOOV) Actuator along with the GOOV.
- Installation, Testing and Commissioning of Third-party Vendor's packages (Free Issue items from the Client like RTU etc.), in the respective Station, as mentioned elsewhere in the Tender Document.
- Supply, Installation, Testing and Commissioning of the Telemetry Interfacing Cabinets (TIC) for all the stations.
- Supply Installation, Testing and Commissioning of the Gas Detection System including Gas Detectors, GDS Panel, Hooter, Beacon, Manual Call Point, etc.
- Supply of all required Instrumentation Cables & cabling from the field instruments to field Junction boxes, field Junction boxes to respective TIC Panels (located in Control Room), TIC Panels to respective Remote Terminal Units (RTU), individual Panels/racks to TIC and RTU Panels.

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- Supply, Laying and Termination of Serial Interface Cables / CAT-6 / CAT-5 cables as required from field instruments to RTU, GDS Panel to RTU, CP Panel to RTU etc., including cable laying & glanding of cables in both sides;
- Supply, Laying and Termination of all the required Cables and Cable Trays along with erection hardware (Lugs, ferrules, Cable ties).
- Interfacing of the CP System for the entire pipeline in the scope with the respective RTU/ SCADA System through TIC Panel for each stations.
- Supply, Installation, Testing and Commissioning of Junction boxes for Analog/Digital and F&G signals as per specifications along with standalone support, erection hardware and canopies/shelter (if required).
- Supply of all the required impulse piping/ tubing, erection hardware, junction boxes, cable glands and accessories etc., as per the approved Construction Drawings and the Standard Specifications attached elsewhere in the Tender Document.
- The scope of work also includes integration of all the RTUs (to be installed for Part-D1 & D2) with the SCADA System of Phase-I&II installed in the Master Control Station (MCS) located at Guwahati Compressor Station (GDT-I) and two nos. Emergency Control Stations (ECS) located at Numaligarh RT & Silchar T-Point with the help of the same OEM Vendor of Phase-I&II SCADA System. All the RTUs required for Part –D1 & D2 will be given to this Contractor as free issue items.

The Contractor will be completely responsible for installation, testing & commissioning of these RTUs of Phase –III, as well as total integration of these RTUs with the SCADA System of Phase-I&II which may require technical co-ordination with the OEM Vendor of SCADA System.

- Supply, laying, blowing & termination of single mode 24-Fiber OFC Cables along with all accessories and PLB-HDPE Duct along with necessary accessories.
- Supply & Installation of set of FTC (in & out) with zero dB connectors & wire mesh (structural size 1.5 Mtr x 1 mtr and mesh size 15 cm x 15 cm) and other accessories, as required for termination of OFC - 24 fibre in the equipment room at all SV & IP.
- Complete earthing of the panels in the control room & field instruments (including supply of cable and termination) shall be in the scope of the Contractor. Separate earthing systems will be provided for electrical safety (Electrical Panel body), UPS, Electronics and 24 V DC system (Instrumentation/ TIC/SCADA) etc. 24 VDC Earth for Instrument & Telecom, SCADA shall be extended to an earth bus in the Control Room. However, 24 VDC Earth can be common for Instrument, Telecom & SCADA

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5.0 SCOPE OF WORK

5.1 Procurement

Contractor scope of work for I & C items procurement shall include, but not limited to the following:

- Contractor shall procure and supply all materials other than Owner supplied free issue items/ materials, required for permanent installation of I&C items in sequence and at appropriate time. All equipment, materials, components etc. shall be for the intended service, with high reliability and proven track record.
- Contractor shall procure and supply all the field instruments (Pressure, Temperature etc.), erection, commission, cable supply and equipment's of I&C items at appropriate time.
- Approved Vendor List has been enclosed with the Bid for various items. For items which are not covered in the Vendor List, Contractor shall obtain Owner's prior approval for the Vendor. Necessary details i.e. Data Sheets & Specifications for the items in the Contractor's scope of supply shall be provided with the Bid Documents.
- Preparation of Material Requisition (MR), Request for Quotation (RFQ), technical bid evaluation and recommend Vendors for Owner's approval. Only single offer shall be provided by the bidder fully complying to specification requirements for Owner's review and approval;
- Stores management including receipt, warehousing, preserving the material in good condition, issue of material to construction site, reconciling / handing over surplus material to Owner for Owner supplied items at Owner's storage yard;
- Carryout proper documentation of inspection and quality assurance programs for bulk materials duly approved by Owner. Contractor shall maintain an accurate and traceable listing of procurement records for the location, quality and character of all permanent materials in the Project;
- Contractor shall immediately report to the Owner of all changes which will affect material quality, and recommend any necessary corrective actions to be taken;

5.2 Construction

Contractor scope of work for I&C items construction shall include, but not limited to the following:

- All construction works shall be carried out as per "Approved for Construction" drawings, procedures, specifications and applicable codes and standards. Any changes at site shall need prior approval from the Owner followed by subsequent revision of relevant drawings upon approval;


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- Construction drawings shall be provided by Owner to successful EPC contractor;
- Contractor shall do the follow up with the concerned authorities to get the permissions to execute the job in time. However, all statutory payments required for such permissions shall be reimbursed by Owner at actuals. Contractor shall obtain permits / clearance from concerned authorities before actual commencement of the job at site including preparation and establishment of safety procedures for pipeline instrumentation job;
- Contractor shall also inform all local authorities in advance and obtain all necessary approvals for works wherever encountered along the system. Contractor shall be required to carry out all the works as mentioned in the work permit;
- In some areas where mechanized excavation is not possible, Contractor shall have to do manual excavation also. Contractor shall consider all these eventualities while bidding;
- Providing schedules, progress reporting, organization chart at construction site, quality assurance plan and developing quality control procedures, as per requirements of the bid package;
- Providing all equipment, manpower, machinery, consumables, apparatus, tools and tackles for fabrication, installation, inspection, testing, pre-commissioning and commissioning complete as required including facilities for inspection and interpretation of testing results by Owner's Representative;
- Obtaining all necessary approvals and work permits from Owner / Concerned local authorities having jurisdiction including all work permit as applicable for performing the work in existing terminal facilities.
- Coordination and supervising the work of sub-Contractors.
- Transportation of appropriate materials to worksite, intermediate storage points, maintaining and operating an adequate material control procedure at worksite.
- Fabrication of all small piping tubing, structural components as per approved drawings.
- All associated civil, structural, electrical, instrumentation; and telecom works shall be performed in accordance with relevant specifications, drawings and requirements.
- Provide, maintain and operate all temporary facilities required for the construction related works and remove after completion of work.
- Receiving and taking-over Owner supplied free issue items from designated warehouse, loading, transportation, unloading, handling, and stacking of items at

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Contractor's worksite(s)/ workshop till the materials are installed in permanent installation.

- Mobilizing and providing all equipment's, manpower (skilled and unskilled), consumables and other resources etc. as required for the execution of complete work.
- Installation of I&C cable trays (perforated type) along with cover and suitable accessories as per approved cable routing drawings and Project requirements.
- Cable laying, dressing and termination of I&C cables between instruments, JB's and cabinets are required.
- All packages such as Gas detection system, FACP, fire suppression system etc. shall be integrated to RTU through TIC Panel at respective Terminal, whereas applicable.
- Preparation of as built drawings, documents, photographs, project records as per specification and instructions of the Owner including furnishing of all Test Certificates/Inspection Reports for all materials used for permanent installation.
- All incidental and associated works and any other works not specifically listed herein but are required to be carried out to complete entire work and the associated facilities and making the entire system ready for operation.
- Other miscellaneous works (civil works, co-ordination, etc.): All related civil works shall be included in the scope of the Contractor.
- Preparation of buried cable trenches (if applicable) including excavation, back filling, compacting, providing of brick protection by second-class bricks, spreading of fine river sand, including all supplies. The job includes repairing of all civil works damaged during installation of electrical facilities.
- The scope of work under this contract shall be inclusive of breaking of walls and floors (if required) and chipping of concrete foundations necessary for the installation of equipments materials, and making good of the same.
- Minor modifications wherever required to be done in the Owner free supplied equipment's or devices to enable cable entry, termination, etc.
- Sealing of openings made in the walls / floors for cable trays, cables, bus ducts, etc. suitably using acceptable practice and standards.
- Supply and installation of all other accessories not specifically mentioned herein, but nevertheless necessary for completion of the job
- As-built drawing & document shall be provided for all the works done including integration job also. All documentation to be provided as printed documents and computer files compatible with MS Office and AutoCAD.

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6.0 NOTES TO CONTRACTOR

Contractor shall facilitate activities in supply installation, testing and commissioning of I&C scope of work as detailed below.

Contractor shall be responsible for complete activities involving all Sub-Contractors including Instrument Sub-Contractor (as applicable) working under him for the complete I&C works as part of his scope.

Scope of work shall be read in conjunction with the Schedule of Rates, design basis, specifications, datasheets, drawings and other documents forming a part of the Contract document. Wherever there is a contradiction between the above, stringent conditions shall take precedence.

In the terminal building, laying and identification of all cables connected between the field and terminal building (RTU through TIC Panel), dressing of the same inside the terminal building, ferruling / tagging and termination of cables in the cabinets.

Contractor shall quote unit rates for all items covered in the "Schedule of Rates" (SOR).

Every month, the Contractor shall submit an account for all the materials issued to him by the Owner (as applicable) in the standard Performa prescribed for this purpose by the Engineer-in-Charge.

On completion of the work, the Contractor shall submit 'Material Appropriation' statements for all materials issued by the Owner in the Performa prescribed by the Engineer-in-Charge.

Contractor shall be responsible for co-ordination during installation, pre commissioning and commissioning with Mechanical and other Sub-Contractors for proper installation of line mounted instruments such as actuated valves, flow meters and skids as applicable.

Contractor shall be responsible for installation, field testing, calibration and providing assistance for pre-commissioning and commissioning of all instrumentation items.

Contractor shall be responsible for all kind of works inside the terminal building i.e. installation of panels/cabinets, cable laying, tray/conduit erection/installation and for proper cable terminations and loop checking, pre commissioning and commissioning.

Drawings and installation standards enclosed with the tender are only for reference and indicative of general nature for scope of work. Actual installation shall be carried out based on final installation standards, bill of material and Vendor's drawings / documents issued to site and as per instructions of Engineer-in-Charge.

Instrument items such as gauges, temperature elements, thermowell, transmitters, valves, barriers, tubes, manifolds & tube fitting, junction boxes, I&C cables and

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related items, cable glands, plugs, adapters, panels/cabinets etc., as required, shall be supplied from approved Vendor's only and the same needs to be installed, commissioned and tested. Contractor shall take prior approval of make and specification of such items before placement of order.

Installation of MCTs at every cable entry to terminal building followed by sealing of cable entries by sealing compound into the terminal building after laying and testing of all cables.

During trial run/startup/commissioning, Contractor shall provide skilled personnel and supervision round the clock at Contractor's cost. Any defect or changes of setting, recalibration, etc., if any during the above activity shall be rectified / done immediately to the satisfaction of Engineer-in-Charge or his representative. The number and category of the personnel shall be as decided by the Engineer-in-Charge. The cost of the above is deemed to be included by the Contractor in the rate quoted.

Contractor's scope shall include making holes in the RCC for fixing up of supports for instrumentation items, trays etc.

Contractor shall note that elbows (if required) shall be installed on the impulse line wherever required as per instructions of the Engineer-in-Charge, even if it is not indicated in the installation standards.

All Vendor supplied equipment and free issue material, JB's, I&C cables, cable glands cable trays and other associated items (suitable power supply, barrier, isolator, selector switch, push buttons, LED etc. along with their installation) along with the cable laying up to the terminal building shall be in Vendor's scope.

The fieldwork shall be carried out under strict safety regulations and work permits as laid down by the Client. The Contractor shall take extreme care regarding safety and all safety gear like helmets; hand gloves, safety belts, spectacles etc. shall have to be provided by the Contractor.

The ferruling for cables shall be done with tag no. of instruments for individual pair. Cross ferruling shall be done for cable ferruling in field and in the terminal building as per instruction of the Engineer-in-Charge.

Contractor shall have to assess the actual site conditions/requirements before placement of order for cable / trays as per the actual site condition. Contractor has to prepare a cable routing layout as per actual site requirements from field to terminal building and get the approval from the Engineer-in-Charge, before placement of procurement.

Allowable minimum bending radius of multi-pair / multi-core cable shall be 6 times the outside diameter for unshielded cables and 8 times the outside diameter for shielded cables unless otherwise recommended by the supplier.

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Location and flow direction of on-line instruments shall be checked by the Contractor and to be rectified in case of any discrepancy as per the instruction of Engineer-in-Charge.

Multi cable transits (MCT) blocks of appropriate size shall be provided by Contractor for cable entry into the terminal building.

Contractor shall run all cables from field to terminal building. The cables shall run through tray / trench / IRC (instrument road crossings) from field to the terminal building as per instrument layout drawings (to be furnished by the Contractor during execution).

Welding / NDT, Charpy V-notch, QA/QC requirement etc. shall be as per Piping Material Specification (PMS), standards & specifications and other requirement attached / mentioned elsewhere in the tender document.

Contractor to note that 100% MPI (Magnetic Particle Inspection) shall be carried out in the entire socket weld joints used in the installation of instruments. The SOR price shall include all the above in the installation of respective instrument / item.

Welding shall be as per welding standard attached elsewhere in the tender document.

In general, I&C scope of work shall include, but not limited to the following for successful completion of the Project:

- Installation of all field instruments and detectors;
- Calibration & testing of field instruments and detectors;
- Installation of cable trays;
- Laying including termination of all interconnecting I&C cabling (single pair & multi-pair signal, single triad & multi-triad, alarm, control, power cables, system cables, etc.) between instruments/Valve actuators/detectors, junction boxes and marshalling cabinet in terminal building;
- Installation of canopies and junction boxes for instruments;
- Installation of instrument valves & manifolds, mounting accessories, impulse piping/ tubing, pipe/tube fittings, cable glands, identification tags, conduits, structural material required for instrument and junction box supports, trays and painting etc.;
- Laying of earthing cables/ strips for instrument enclosures, junction boxes and cable trays to earth grid. Installation of GI / copper strips for grounding of racks / cabinets / panels in the terminal building with earth pit;
- Complete loop checking and megger testing of cables;

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- Hydraulic testing of instrument impulse lines (piping/tubing);
- Arrangement of special tools and tackles as required.

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PROJECT NUMBER: C221052



Design Basis-Instrumentation, SCADA, APPS & Telecom Systems

Total Sheets

41

Document No

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IN

DB

5001

Indradhanush Gas Grid Limited

North East Gas Grid Phase-III of IGGL Part D1 & D2

D1	13.12.2022	Issued for Bid	VK	DGM	KNC
A1	07.12.2022	Issued for Internal Review	VK	DGM	KNC
REV	DATE	DESCRIPTION	PREP	CHKD	APPR

ABBREVIATION

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
CCTV	Closed Circuit Television System
F&G	Fire & Gas
GDS	Gas Detection System
HART	Highway Addressable Remote Transducer
IR	Infrared
IP	Ingress Protection
JB	Junction Box
LER	Local Equipment Room
NFPA	National Fire Protection Association
NMS	Network Management System
OFC	Optical Fiber Cable
OISD	Oil Industry Safety Directorate
PLC	Programmable Logical Controller
RF	Radio Frequency
RTU	Remote Terminal Unit
TIC	Telemetry Interfacing Cabinet
SCADA	Supervisory Control and Data Acquisition System
SV	Sectionalizing Valve Station

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1.0 DEFINITION

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

PROJECT	PMC Services for North-East Gas Grid Phase-III of IGGL Part-D1 & D2.
OWNER	Indradhanush Gas Grid Limited.
CONTRACTOR	VCS Quality Services Private Limited (VCSQSPL) the party to act for and on behalf of the OWNER for the Detailed Engineering Services
VENDOR/ MANUFACTURER	Party, which manufactures and supplies equipment and services to the OWNER or to CONTRACTOR

2.0 CODES & STANDARDS

The equipment shall be designed, constructed and tested in accordance with the latest edition and amendments of the following codes and standards

Code/Std. Ref. No.	Code/Std. Title
ANSI/ISA S71.04	Environmental Conditions for Process Measurement and Control Systems
AGA9	Measurement of Gas by Multipath Ultrasonic Meter
API RP 551	Process Measurement Instrumentation
API RP 554	Process Instrument and Control
ASME PTC 19.3	Temperature measurement Instruments and apparatus
ASTM A213	Seamless Ferritic and Austenitic Alloy Steel Tubes
ASME B 2.1	NPT Pipe Threads
ASTM A269	Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
BS 6739	Code of Practice for Instrumentation in Process Control

Code/Std. Ref. No.	Code/Std. Title
	Systems: Installation Design and Practice
BS EN 50419	Marking of Electrical and Electronic Equipment in Accordance with Article 11(2) of Directive 2002/96/EC (WEEE)
EEMUA 191	Engineering Equipment and Material Users Association (Alarm system, A guide to design, management and procurement)
EN 837	Pressure Gauge, Gauge Dimensions and Testing
EU Directive 94/9/EC	Directive on equipment and protective systems intended for use in potentially explosive atmospheres (ATEX)
EIA TIA 526	Standard Test Procedures For Fiber Optic Systems
EIA TIA 455	Standard Test Procedure For Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and Other Fiber Optic Components
IEC 60079	Electrical Apparatus for Explosive Gas Atmosphere
IEC 60529	Classification of Degrees of Protection Provided by Enclosures (IP code)
IEC 60654	Industrial-Process Measurement and Control Equipment-Operating Conditions, Climatic Conditions.
IEC 60751	Industrial Platinum Resistance Thermometers and Platinum Temperature Sensors
IEC 61000	Electromagnetic Compatibility (EMC)
IEC 61158	Digital Data Communications for Measurement and Control, Field Bus for use in Industrial Control System
IEC 61131	Programmable Logic Controllers – Part 2 and 3
IEC 61508	Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems
IEC 61511	Functional safety - Safety instrumented systems for the process industry sector
IEC-60793-1	Optic Fibers, Part 1 Generic Specification
IEC-61804-3 -2010	Function Blocks (FB) For Process Control: Electronic Device Description Language
IEC 62453	Field Device Tool (FDT) Interface Specification
ISA RP 42.1	Nomenclature for Instrument Tube Fittings

Code/Std. Ref. No.	Code/Std. Title
ISA S5.1	Instrument Symbols and Identification
ISA S5.4	Instrument Loop Diagrams
ISA 18.02	Management of Alarm Systems for the Process Industries
ISA RP42.00.01-2001	Nomenclature for Instrument Tube Fittings
ISO 5168	Measurement of fluid flow - Procedures for the evaluation of uncertainties
NAMUR NE 107	Self-Monitoring & Diagnosis of Field Devices
NAMUR NE 043	Standardization of the signal level for the failure information of digital transmitters
NEMA VE1	Metal Cable Tray Systems
NFPA 72	National Fire Alarm and Signaling Code
OISD 226	Natural Gas Distribution Pipelines and City Gas Distribution Networks
OISD 116	Fire Protection Facilities for Petroleum Refineries and Oil / Gas Processing Plants

3.0 INSTRUMENTATION & CONTROLS SCOPE

The project shall broadly comprise of following instruments and systems:

- Field Instruments (PIT, TIT, PG, TG, T/W, TE, PSV etc.);
- Isolation Valves – Gas Over Oil Actuator Valve (GOOV);
- Package Instrumentation such as Metering Skid, Ultrasonic Flow Meter, Control Room Mounted Metering Panel, GC along with GC Controller & all accessories;
- SCADA, RTU, APPS, TELECOM & CCTV Systems (Not in Phase-III Scope);
- F&G Devices;
- Gas Detection System;
- Fire Alarm Control Panel;
- Pig Signaler(Intrusive & Non-Intrusive type), Corrosion Coupon, Instrumentation Cables, Erection Hardwares, JB cable trays, cable glands,

MCT, SS Tubes, Pipes, fitting valves, manifold(2-valve,3-valve) etc. as required;

4.0 DESIGN CRITERIA

4.1 General

All Instrumentation and Control Systems shall be designed for continuous operation in the given site conditions with the following design criteria:


- Ease of operation and maintenance;
- Suitability for applicable environmental condition;
- Suitability for operation in the designated classification of hazardous areas;
- State of art proven technology and instrumentation;
- Safety to operating and maintenance personnel;
- Safety to connected equipment;
- Safe starting and shutdown of the plant under all conditions;
- High Redundancy with high reliability (high MTBF and low MTTR) and no single point of failure;
- Minimum cost of ownership.

4.2 Environmental Conditions

The equipment considered and the complete installation shall be suitable for continuous operation under the ambient conditions prevailing at site. All electronic field instruments (PIT, TIT, USM, intrusive & non-intrusive type pig signaler etc.) shall be provided with FRP (UV protected) canopy.

4.3 Operations and Design Life

The instrumentation and control equipment shall be designed to operate in the site environmental conditions continuously. The life time of the plant is envisaged to be 25 years. However, optimum design life expectancy of an instrument shall be 10 years and spare parts availability shall be for 10 years after cease of production. The life time expectancy of control equipment such as controllers, modules is expected to be 20 years with the availability of spares for 10 years after discontinuation of product.

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The maintenance/replacement schedule shall be planned accordingly in order to maintain the instruments/control equipment for the duration of the plant life time.

4.4 Equipment Protection

4.4.1 Ingress Protection

All field instruments and outdoor equipment such as junction boxes and cabinets/panels shall have ingress protection to IP 65 / NEMA 4 or better in accordance with IEC 60529. Panels installed indoors shall have ingress protection of IP 42 as a minimum.

Sunshades shall be provided for all field mounted electronic instrumentation.

Instruments shall be tropicalized for humidity and fungus and shall be termite resistant. Electronic boards shall be varnished / potted and electro-statically protected.

4.4.2 Tropicalization

All electronic/ electrical components shall be tropicalized to protect against humidity, moisture and fungal growth by means of hermetically sealed units, protective coating on circuit boards, gold plated edge connectors etc.

4.4.3 Hermetic Sealing


All relays and switches shall be hermetically sealed, and those utilized in 24 V DC control logic circuits shall have gold plated contacts rated 1.0 Amp at 24 V DC. Those interfacing with field equipment shall be rated 2 Amp 24 V DC. All switch contacts shall be single DPDT or two (2) nos. SPDT as a minimum. All relay shall have LED indication.

4.4.4 Explosive Hazard Protection Methods

Field equipment and instruments shall be certified for use in designated areas when installed in hazardous area classified zones as per IEC 60079 and IS 5571.

Hazardous are classification shall be Zone 1, Gr. IIA/B, temperature Class T3. All field instruments shall be Ex 'ia' type, Whereas F&G equipment such as detectors, beacons and hooters shall be Ex 'd' type. All junction boxes shall be Ex'd' type and all cable glands shall be Ex'd' certified.

Instruments shall be certified by an internationally recognized organization (statutory body in the country of origin) such as BASEEFA, PTB, FM, CSA, UL etc. for operation in hazardous area classification. Instruments shall also meet

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the relevant requirements of ATEX directive 94/9/EC and shall carry the ATEX marking as a minimum.

4.4.5 SIL Rating

All instruments including transmitters, valves, actuators and systems used in safety applications shall be certified to appropriate SIL classification as applicable and shall be duly certified. All data required for SIL verification shall be provided by Vendor.

Pipeline control system, Safety system and associated instrumentation shall be SIL 2 rated as a minimum. However, the target SIL level of the Pipeline control system, Safety system and its critical loops shall be in accordance IEC 61508 & IEC 61511.

4.4.6 RF Protection and EMC Compliance

All instruments and equipment shall be immune to Radio Frequency (RF) and Electro Magnetic (EM) Interface.

The design and installation of all electrical / electronic equipment shall meet the Radio Frequency Interference (RFI) or Electro Magnetic Interference (EMI) IEC 61000, emission (IEC61000-6-4) and immunity (IEC-61000-6-2) requirements for an industrial environment.

4.5 Instrument Utilities


The following utilities shall be provided for Instrument & Control Systems:

4.5.1 Power Supply

Instrumentation, control and associated systems power requirements shall be provided by dual redundant Uninterruptible Power Supply (UPS). Dual redundant power supply units are to be fed from different power distribution boards with an auto transfer switch. Refer to Electrical Design Basis for detail information regarding electrical supply distribution.

Field devices shall be loop powered by the corresponding control system as applicable. Field instruments with external power supply requirements shall be fed from dedicated redundant power supply unit in the respective panel.

Battery backup time and details are to be finalized based on the UPS capacity, electrical essential load considered and facility's operation / emergency philosophy. Power distribution to each consumer shall be through proper, independent switch and fuse units. Power supply shall be highly reliable with no single point failures.

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In general, the following power supply shall be used:

- 230 VAC +/- 5%, 50 Hz +/- 2%, Single Phase UPS power supply for all control systems such as RTU/SCADA, metering panel, GC panel/GC Controller, PLC(if any), FDS, GDS, Fire Suppression System panel(if any), telecom equipment and certain field instruments if necessary;
- 24 VDC +/- 5% for all field instruments, derived from the Control Systems;
- 230 VAC +/- 5%, 50Hz +/- 2%, Single Phase Non UPS Utility Power for all DT, RT, IP station maintenance activities, miscellaneous requirements, utility sockets etc.
- 24V DC +/- 5% shall be provided for RTU, FDS, GDS, Fire Suppression System Panel(if any), PLC(if any) & -48 V DC for telecom system for all SV stations, which will be fed from battery/battery charger/solar power etc.

4.5.2 Instrument Gas Supply


Pipeline Natural Gas shall be used for required applications instead of instrument air. Pipeline Natural Gas shall be used for GOOV operation for all DT, RT, IP & SV stations by means of taking tap- off from upstream & downstream Instrument impulse line.

4.6 Earthing System

Instrument and systems shall be connected to the proper earthing system for the protection of personnel and instrument / equipment from fault currents (protective earth) and to minimize electrical interference in signal transmission circuits (instrument earth). The following separate earthing systems are to be provided:

- Protective Earth (PE) – Bonded to the site structure and utilized for electrical safety of metal enclosures and chassis on all instruments and electrical components. This earthing system is used for protection of personnel and equipment from fault currents;
- Instrument Clean Earth (IE) – Insulated from the site structure and other metal work utilized for instrument cable screens and bonded to the main electrical earthing system at a single point. Electronics in the instrument shall be insulated from the metal work.

Cable screens of signal cables shall be segregated from metallic structural earth in the field and earthed at one point only at the cable marshaling point. Cable shields must have a single, continuous path to earth. Earth loops and floating shields shall be avoided. Shield drain wires shall not be daisy-chained to the ground connection.

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The purpose of instrument DC & shield earth bus bar is to reduce the effect of electrical interference upon the signal being transmitted. A DC & shield earth bus bar shall be provided within each cabinet for consolidating instrument signal commons and cable shield drain wires. This earth bus shall be isolated from the safety earth system and from the body of the cabinet except at the plant earthing reference point.

Each instrument signal common shall be connected to the isolated instrument DC & shield earth bus with copper wire sized to carry the expected fault current or 1.5 mm², whichever is larger. Two insulated copper conductors shall be connected from the instrument DC & shield earth bus within each cabinet to a single tie point on the master instrument earth bar within the control building in a closed loop configuration. The resistance from the isolated instrument DC & shield earth bus to the plant ground grid shall be less than 1 ohm.

Isolated instrument DC & shield earth bars from all cabinets shall be consolidated into a master instrument earth bus located within that building. The master instrument earth bar shall be connected to the master reference earth. The master reference earth should then be connected in a loop configuration to a single point on the plant earthing. Bonding cabinet AC or DC & shield earth bus bars in a daisy-chain connection is not acceptable.

The Vendor shall be responsible for all earthing requirements within his scope of supply.

4.7 Material of Construction


The material of construction of the wetted parts and the body of all the individual instruments / equipment shall be suitable to the process fluid / conditions and the site ambient conditions.

All materials and equipment furnished shall be new and unused, of current manufacture and the highest grade and quality available for the required service, and free of defects.

Process wetted parts shall be suitable for process fluid and conditions. Body / trim materials shall be selected based on the applicable pipe class as per Piping Material Specification. Wetted parts material shall be SS316 as a minimum.

Tubing and tube / pipe fittings used to hook up instruments to piping / vessel shall be SS316. Material of construction of enclosures and junction boxes shall be cast aluminum (LM6/LM25).

Galvanic compatibility between dissimilar materials is to be ensured to prevent corrosion due to galvanic action.

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4.8 Painting & Coating

Field instruments shall be epoxy coated as per Manufacturer's standard. The finish of junction boxes (Non IS) shall be light gray shade equivalent to RAL7035 and junction boxes (IS) shall be blue shade.

Field mounted panel's surface and inside coating and finish shall be as per manufacturer's recommendation. Field stanchions shall be coated with corrosive resistant coating and finish shall be light gray shade.

4.9 Tagging and Identification

Each instrument shall be provided with a permanently fastened SS 316 nameplate with details such as tag no., manufacturer name, serial and model no, operating range, hazardous area rating / certification etc. The screws used to fix the nameplate shall be SS 316.

Each instrument shall have a tag plate fixed using 316 SS screws on the instrument support. Tag plate shall be tied to the instrument with SS wire for direct mount instruments on line or vessel. Tag plates shall be made of SS 316 or phenolic plastic (traffolyte) with engraved letters. Adhesive tag plates shall not be used.

Instruments connected to safety systems shall have white background with RED letters.

Instrument and all the ancillary equipment tag numbers shall be provided as per PID's tag numbering philosophy.


5.0 INSTRUMENTATION ITEM SPECIFICATION

5.1 General

All electronic transmitters shall be, "Smart" type with "HART" protocol. Transmitter output shall be 4~20mA, two wire loop powered at 24VDC from the system it is connected to. Smart sensors connected to safety systems shall be write-protected to prevent unintentional modification from a remote location.

All transmitters shall be supplied with integral LCD digital indicators scaled in engineering units; however, scale for level transmitters shall be 0 to 100% of instrument span.

Separate dedicated instruments shall be used for shutdown and process control & monitoring. Shutdown initiating devices shall only be used for shutdown functions.

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Safety functions shall be derived from transmitters instead of switches. Use of switches shall be avoided for safety applications.

Low power signals (i.e. RTD / thermocouple) shall be converted in field to 4-20 mA by means of field mounted transmitters.

Field instrument design and selection shall suit process and environmental conditions as well as hazardous area classification requirements.

All electronic / electric instruments shall have 2 Nos. ½" NPT cable entries. Suitable nickel plated brass adapters shall be provided if the cable entry on the instrument is other than NPT threads. Spare cable entries shall be plugged with certified nickel plated brass plugs.

Sunshades shall be provided for all outdoor electronic/electric instruments exposed to sunlight. The material of construction shall be FRP (non-metal) to have better heat insulation.

Gauges (pressure, temperature) shall have black letters and graduation with white background. All transmitters housing shall be aluminum or stainless steel, complete with SS316 mounting accessories as a minimum.

All field instruments shall be weatherproof to IP65 standard as a minimum. The transmitter body shall have an external earth stud connection for safety grounding.


5.2 Pressure Instruments

Pressure gauges shall be bourdon tube type. Dial size shall be 150 mm and cases shall be stainless steel screw on or bayonet bezel type. Blow out disc and solid front protection shall be provided and gauges shall be orientated such that they vent safely. Bourdon tube material shall be SS316.

Differential pressure gauges shall generally be bellows type. All differential pressure gauges shall be installed so as to minimize the length of impulse lines. Necessary isolation valve / manifold shall be provided for all differential pressure gauges. Gauge enclosure shall be weather proof to IP 65.

Gauge saver/ snubbers shall be provided for lower range gauges and in vibration or pulsation services. Snubbers shall be of same material specification as the element.

Gauge windows shall be constructed from safety pattern/toughened glass.

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Over-range protection for pressure instruments shall be 1.3 times the maximum scale range. Where a gauge is subject to greater pressure, a gauge protector shall be used.

Pressure transmitter shall be electronic SMART type, two wire loop powered at 24 VDC with 4-20 mA output and integral digital output meter. Transmitters shall have HART protocol for digital communication. Pressure and differential pressure (DP) transmitter sensors shall be capacitance, inductance or piezo-resistance type.

Transmitter shall be provided with external span and zero adjustment. Span shall be continuously adjustable over the transmitter range. Pressure transmitter shall have easily approachable zero and span adjustment facility.

Pressure transmitters shall be provided instead of pressure switches as pressure switches are not preferred especially in safety applications.

Range shall be selected such that the normal operating pressure lies approximately in the middle third of full scale (30% - 70% of range) and provide maximum working pressure is within the instrument range.


Manifolds shall be of SS316 material. Gauges and pressure transmitter shall be supplied with a 2-way valve manifold and DP instruments shall be provided with 5-way manifold. Manifolds shall be forged type and capable of withstanding 1.5 times design pressure. The manifold shall be factory fitted and all tests shall be conducted along with manifold. Spare 'O' ring set shall be supplied.

5.3 Temperature Instruments

Temperature gauges shall be used for local indication. These local temperature indicators shall in general be heavy duty, weatherproof, dial type bi-metal thermometers with 150 mm dial size, external zero adjustment, every angle rotatable and rigid stems.

The bi-metal gauges shall be adjustable union stem type with SS 316 material for the stem. The Union size shall be ½" NPT and the diameter shall suit the well diameters. However, Vendor shall verify the compatibility of the material of construction with the site/process requirements and suggest suitable material. Case material for all temperature gauges shall be SS316. Capillary and armor shall be of stainless steel.

The temperature element shall be RTD PT-100, 3-wire system. Elements shall be spring loaded, mineral insulated and shall have SS 316 sheath as minimum. The element head shall be screwed-in type and weatherproof to IP-65 as a minimum.

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Sensor elements of temperature transmitters and temperature gauges shall be installed in a suitable thermowell. Thermowells shall be SS316 as a minimum and shall conform to the process service and shall be one class higher than piping class.

Thermowell s hall be flanged machined from solid bar stock and with tapered end. Thermowell construction details and insertion length criteria shall be defined during detailed design.

Thermowell shall be designed to withstand vibration stresses caused by stream velocity. Wake frequency at maximum flow velocity shall be less than 80% of the natural frequency of the thermowell. The Contractor shall provide calculations to ASME performance Test Code 19.3, Part 3: Instruments and Apparatus for Temperature Measurement.

Temperature transmitters shall not be part of the sensing element assembly. Temperature Transmitter shall not be part of the sensing Element assembly ie. Temperature Element head mounted Temperature Transmitter is not applicable. The sensing element shall be RTD 3 wire type. The temperature element length shall be selected to suit the thermowell insertion length.

The transmitter shall be "SMART" type, two wire loop powered at 24V DC with 4-20 mA output with integral digital output meter. Transmitters shall have HART protocol for digital communication.


The range shall be selected so that the normal operating temperature shall fall in the middle third of the span.

Temperature transmitters shall have a built-in linearization function to produce an output linear to temperature range.

5.4 Pressure Safety Valves

Conventional spring loaded relief valves shall be used for process, thermal or fire relief duties where back pressure is less than 10% of maximum allowable working pressure (MAWP). Balanced bellows relief valves shall be used when back pressure is greater than 10% & less than 40% of MAWP. Pilot Operated bellows relief valves shall be used when back pressure is greater than 40% of MAWP.

Pilot operated safety and relief valves shall not be used on congealing services and generally not recommended for Hydrocarbon services and fouling services as these valves have flexible membranes which withstand only ordinary temperatures. Pilot operated safety relief valves where used shall be provided with back flow preventers.

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Flanges shall be integral part of the body. Weld-on flanges shall not be allowed. Bodies and flanges shall be of the same material. Inlet flange shall be of sufficient rating to withstand the reaction force of the PSV.

Safety and relief valves sizing & selection shall be in accordance with API 520, API 521, API 526 and Section I and VIII or the ASME boiler and Pressure Vessel Code.

All wetted parts of PSV shall be SS316. Safety valves shall be provided with test gags and manual test lever. Springs of safety valves shall be selected as per process conditions.

5.5 Gas Over Oil Actuated Valve


Actuator shall be double acting piston design to enable quarter turn operation of the valve. The design pressure of the actuator shall be suitable to the pipe design to ensure trouble free operation of the actuator.

Actuator torque shall be 1.25 times the valve torque required at full rated differential pressure of valve. The actuator shall be suitable for operation using gas supply from upstream and downstream of the valve. Tapping for gas supply shall be provided on upstream and downstream piping of the valve.

Pneumatic cylinder storing gas with non-return valve shall be provided for emergency operation of valve. The gas tank (storage) shall cater at least 2 open / close cycles of valve operation. Both storage and accumulator cylinders shall be provided with relief valve and gauges and shall be designed as per ASME Sec VII.

Each actuator shall be provided with open / close limit switches, remote / local switch and differential pressure switch. A local actuator panel shall be provided to enable opening and closing of valve under local mode. Solenoid valves shall be 3 way with manual override facility. Independent solenoids shall be provided for open and close conditions.

Tubing and tube fittings shall be minimum SS316. Local panel shall be die-cast aluminum and Eex"d" certified. All signals from GOOV to control system shall be potential free. Operation Logic of GOOV shall be implemented in RTU/SCADA. L/R selector switch signal, limit switches signals, local open/close PB signals, DP switch signal and Open & close SOV shall be pre-wired to local actuator box (part of GOOV) for further signal transmission to remote control system/RTU/SCADA.

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5.6 Corrosion Coupons

Corrosion elements and coupons on the piggable line shall be flush mounted weight loss type ER probe / disc coupon and holders with high pressure access fittings, whereas on the non-piggable line shall be intrusive type.

5.7 Pig Signaler

The clamp on type, based on magnetic non-intrusive type shall be used for pig detection. The magnetic instrument accurately detects the passage of pig in real time.

5.8 Process & Instrument Connection

Field instruments and / or devices that are connected to the process / utility medium shall be provided with suitable tap points and isolation valves. Each instrument shall have its own individual tap and process isolation valve (piping root valve).

All instruments shall have first isolation valves as per the piping specifications. Instrument valves and manifolds shall be provided as required for maintenance and calibration of the instruments. Vent and drain valves shall be provided on the drain and vent tubing / piping. Impulse piping up to the first isolation valve shall be as per piping specifications.

Each tap for pressure / flow instrument shall be provided with isolation valves as per P&IDs. In addition, a 2-valve manifold shall be provided for instrument isolation of pressure transmitters and pressure gauges. A 5-valve manifold shall be provided for instrument isolation of flow and differential pressure instruments.

Manifolds shall be integral to the transmitter and shall be of mono-flange type when possible. All pressure instruments shall have an individual piping block valve and a 2, 3 or 5 - valve manifold as appropriate, providing block, bleed and bypass.

Process connections for instruments on vessels / piping and tanks shall be as per the process connection standard depicted in table below.

Instrument	Process Connection Size			Instrument Connection
	Vessel	Piping	Tank	
Pressure Gauge	2" RF flg	2" RF flg	2" RF flg	½" threaded

Pressure Transmitter	2" RF flg	2" RF flg	2" RF flg	½" threaded
DP Transmitter/Gauge	2" RF flg	2" RF flg	2" RF flg	½" threaded
Thermowell	1 1/2" RF flg	1 1/2" RF flg	1 1/2" RF flg	½" NPTF

*: As per Vendor's recommendations.

A maximum of two pressure instruments may be connected to the same pressure tapping, so long as their function is not safety-related. Instruments for safety systems shall each have their own individual tapping. The nozzle length on vessels & in piping for temperature instruments shall be 150 mm.

5.9 Instrument Installation

Installation of field instruments and panels / cabinets shall be of the highest quality craftsmanship and shall conform to the best applicable engineering practices, and, relevant codes. All instruments, panels / cabinets and their components shall be installed in a neat workmanlike manner ensuring ease of operation and maintenance.

Locally mounted instruments shall be located in accessible areas but must not obstruct aisles, walkways, or equipment access routes.

All installed instruments and valves shall be free from vibration. Instruments shall be mounted / connected so as not to stress vessel nozzles or pipe tapping.

Local Instruments shall be mounted approximately 1.0 to 1.4 meters above the ground or platform level. All local process-connected instruments shall be located as close as possible to the point of measurement while still being accessible.

Instruments shall preferably be installed as a close-coupled type to avoid tubing and fittings. If accessibility cannot be ensured for close-coupled type then instruments shall be line mounted or mounted on a 2" pipe stand at a height of 1400mm from grade/platform. The 2" pipe stand shall be carbon steel, galvanized and painted. The 2" mounting accessories shall be 316 SS. Insulating material shall be used to avoid direct contact between SS and CS materials.

Instruments in air or gas service shall preferably be mounted above the process line connection.

5.9.1 Tubing, Fitting & Instrument Valves / Manifolds

Tubing and tube / pipe fittings used to hook up instruments to piping / vessel shall be suitable for process fluid.

The materials used for tubes and tube / pipe fittings shall be as follows as a minimum based on the area of application:

Sensing Lines (on firewater and instrument air):

- Tubing: SS316;
- Fitting: SS316;
- Valve / Manifold: SS316.

The tubing shall be with OD of 1/4", 3/8" and 1/2" sizes and suitable wall thickness. However, higher wall thickness shall be used if required as per service pressure requirements.

6.0 PIPELINE CONTROL SYSTEM


The pipeline and end user stations shall normally be remotely monitored from the SCADA system in Master Control Station (MCS), and RWS (Remote Work Station). The SCADA system shall accommodate both local and remote control functions as well as data storage and trending.

6.1 SCADA, RTU & Application Package Software (APPS) Systems

SCADA (Supervisory Control and Data Acquisition) based automation control system has been envisaged in North East Gas Grid pipeline project for monitoring and control of Pipelines from single location. The system has a centralized system that monitors and controls all Despatch Terminals, Receipt Terminals, Intermediate Pigging Stations and Sectionalizing Valves across the whole North East Gas Grid pipeline. This SCADA system works by operating with signals that communicate via channels to provide the user with remote controls of any equipment in a given system.

There are four essential composing parts of a SCADA system:

- Human Machine Interface (HMI)
- Supervisory system
- Remote Terminal Units (RTUs)
- Communication infrastructures

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The HMI processes data from each tag and sends it to a human operator, where the operator can monitor or control the system. The supervisory system gathers the data sent from each tag and sends commands or operations to the process. All the Sensors in the field are connected to the RTUs through the Telemetry Interfacing Cabinet (TIC) located in the Control Room. The function of these RTUs is to convert these analog signals from the sensors to corresponding digital data and send it to the Supervisory System, where it can be stored in a distributed database. Finally, the communication infrastructure delivers connectivity to the Supervisory System. Supervisory Control System gives command to the field instruments through RTUs.


The SCADA system is envisaged to ensure effective and reliable control management and supervision of the pipeline from centralized location using Remote Terminal Units (RTUs) at various pipeline facilities.

However, the design of the SCADA & APPS System for Phase-III shall be such that it should be compatible with the SCADA & APPS System to be supplied for Phase-I & II. For this purpose the SCADA & APPS System Vendor of Phase-III should co-ordinate with the concerned SCADA & APPS System Vendor of Phase-I & II.

In Proposed SCADA system shall have dedicated SCADA & APPS system with centralized Master control station (MCS) and two Emergency Control Stations (ECS). The MCS & ECS shall be linked with Remote Telemetry Units (RTUs) installed at SV locations, T-points, Despatch Terminals, Receipt Terminals and Intermediate Pigging Stations along the pipeline. The APPS system shall run at Master Control Station (MCS) and Emergency Control Stations (ECS). The SCADA Remote Workstation shall also be provided at various location across the pipeline for monitoring the operating parameters and other facilities.

Master Control Station is located in Guwahati Compressor Station (GDT-1), which consists of Dual redundant hot standby SCADA servers, redundant APPS servers, redundant historian server, OPC server, GPS time server, Web cum GPRS server, alarm management & Network management SRV, SCADA Operator Workstations (OWS), Engineering Workstation (EWS), print server with printer, RTU, router with firewall etc.

Emergency Control Stations are located in Numaligarh Receipt Terminal and Silchar T-point. In each SCADA ECS station consists of Dual redundant hot standby SCADA server, single/non-redundant APPS servers, redundant historian server, OPC server, GPS time server, Web cum GPRS server, alarm

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management & Network management SRV, SCADA Operator Workstations (OWS), Engineering Workstation (EWS), print server with printer, RTU, router with firewall etc.

Remote Work stations (RWS) are located in Gangtok, Shillong, Agartala, Aizawl, Imphal, Dimapur & Itanagar. Each RWS station consists of Dual redundant SCADA Operator Workstations.

The purpose of Master Control station and Emergency Control stations is to function along with their associated RTUs to provide efficient, safe and reliable operation of the pipeline and the locations along with other installed facilities for effective monitoring and control of the pipeline network under reference.


Master Control Station and Emergency Control stations shall have Supervisory Control and Data Acquisition (SCADA) software running under multiprogramming, multi-tasking, real time system environment.

There shall have redundant web servers at MCS and a single web server at ECS. Similarly, there shall have redundant OPC cum Historian servers at MCS with a backup history server, OPC server at ECS.

All computers (Servers / Workstations) shall be networked to provide a configuration where complete power is distributed around several different nodes. Various S/W incorporated in the system shall be distributed around various computers on the network to provide a more balanced load on the system.

The Master Control Station and Back up Master Control Stations shall have the complete SCADA database for the total pipeline system and shall sync the data at regular intervals. In case of failure of the MCS the SCADA functionalities will be operational from one ECS as per programmed scheme and in case failure of first ECS also the second ECS shall perform the SCADA functionalities and the switch over is automatic.

The system having a real time clock and a calendar, which is maintained with battery backup in the event of power interruption. The time synchronization of servers, work stations and RTUs shall be achieved from the master control station. The MCS shall periodically synchronize the clocks of all control stations,

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RTUs. In case of failure of communication of any control station centre with MCS, ECS shall periodically synchronize the clock of RWS.

The MCS / ECSs and RTUs shall be linked through high-speed WAN on Ethernet interface with 2 MBPS or higher transfer rate. Master control station and Emergency Control stations shall be equipped with required numbers of communication ports with appropriate hardware interface at both the ends and communication routines. Each circuit shall have a normal route of interrogation and in event of failure of normal route, stand by route to be utilized without operator intervention.

The operator / system interface (HMI) shall be via identical color graphic visual display units, keyboards - alphanumeric and functional - with mouse and console, printers.


The system shall be fail safe type under all abnormal conditions with provision of free fail over operation wherein one critical device or process malfunctioning results in server switchover without any data loss.

Master Control Station and Emergency Control stations shall have self-diagnostic routine facilities to check and indicate self and its sub systems and peripherals healthiness at periodic intervals. Provision of diagnostic S/W modules is employed as a troubleshooting tool under the operating system minimally for the following system areas:

- System memory and file system
- Peripherals and
- Network and communication systems.

The normal gathering of data from all the remote stations shall be on programmed basis with periodic polling. The complete database of the pipeline shall be updated every 5 sec or less. Reporting of alarms and events shall be made on priority basis by using interrupt feature or employing faster scan cycle ensuring spontaneous reporting at MCS end.

The RTUs shall have direct communication interfacing with Master Control Station (MCS) and Emergency Control stations (ECS). This enables remote supervision of all important station parameters and is equipped with specific

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controls for safety and normal operating procedures (for example ESD and set point controls).

MCS/ECS and stations shall be provided with following Supervisory Control and Data Acquisition software packages.

- SCADA Software
 - i. Data acquisition, ii. Alarm processing, iii. Event processing, iv. Control processing/ commands v. Data display, vi. Message display, vii. Over view display, viii. Trend generation, ix. Data failure, x. Status charge annunciation, xi. Management information report generation etc.
- Man-Machine Interface
- Networking software
- Leak Detection System Software

6.1.1 Remote Terminal Unit (RTUs)

The RTU shall be microprocessor based programmable units with both ROM & RAM memory.

The RTUs shall have own processor, memory, power supply unit & communication modules, serial interface modules and I/O cards complete in all respects. All RTU shall be modular and from same model product line with identical capacities.

Each card shall perform dedicated functionality w.r.t. Analog input, analog output, digital input and digital output functions.

The RTUs shall intelligent and shall provide the following functions:

- Time Tagging
- Self-Diagnostic
- Check before execute and time out feature to be supported in RTUs in conjunction with the SCADA package at host level.
- Serial interfacing with other devices on Modbus protocol.

RTU shall be communicated to telecom equipment on Ethernet (two ports) on LAN network over OFC.

Master Control Stations shall interrogate the RTUs on Ethernet interface through OFC telecom network or GSM / GPRS connectivity.

Master Control Station, Emergency Control Stations and Remote Work stations shall communicate with each other via Ethernet LAN transported on the SDH communication system on OFC backbone or backup MPLS-VPN network.

All RTUs shall also be provided with provision for GSM / GPRS connectivity. In case of damage/cut of OFC, the interrogation of RTU with MCS/ECS (for monitoring and control) shall be done using the GSM / GPRS connectivity.

6.1.2 Application Package Software (APPS)

The prime objective of application software is to aid the dispatcher in making control decisions and to enable him to take optimal control actions while ensuring the safety and security of the pipeline network.


The core of the system shall be linked to data acquisition facility and provide for acquisition of real-time process data from the SCADA System at regular intervals and carry out pre-processing such as evaluating the credibility of the incoming data through a series of validity checks specifically designed for real time pipeline modeling.

The following models are constituting the Application Software:

- Real Time Pipeline Model
- Leak Detection and Leak Location
- Shut-in Leak Detection
- Pig Tracking
- Survival Analysis
- Inventory Analysis

APPS System shall be independent of the SCADA system and shall access real time data from SCADA system. The APPS software shall be compatible to multiple SCADA software.

LDS shall be able to detect leak & its location under all operating conditions including shut-in and hydrostatic tests.


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The APPS software shall have self-diagnostic features to tell which model is not working up to the full efficiency.

- **Application Software Modules:** The real time module shall use the process data from SCADA as boundary conditions in order to track the actual pipeline operating conditions as closely as possible. The software shall pre-process and validate the data to take care of any erroneous data, which may result in-accurate modelling. The module shall be fine tuned to meet the requirements of accuracy and processing time. To improve the model accuracy and to truly represent the pipeline operations, parameters such as pipe roughness and ambient temperature shall be tuned for each section of the pipeline. The model shall take into account any transient conditions due to opening / closing of valves, change in operating set points, pigging operations so that these transients do not result in false alarms and do not inhibit the sensitivity to leaks.

The modelled profiles (pressure, temperature, flow and density) shall be continuously updated taking into account any operational changes, terminal flow / pressure requirements and variations in fluid characteristics etc. The real time model shall take into account the pipeline elevation profile and ground terrain changes.

- **Leak Detection & Location under dynamic condition:** Leak detection shall be accomplished by using validated relevant dynamic point database values in conjunction with pipeline real time model for detection, sizing and location of leaks. Leak detection system shall be designed to take care of remote valve change (close/ open), the terminal flow requirement changes, pigging operation, other operational changes etc. by automatically raising the leak thresholds and preventing false alarms. Necessary precautions shall be taken for inhibiting false alarms automatically due to opening / closing of valves, surge conditions, transients, starting or stopping of pumping units and delivery, line packing and unpacking conditions etc. of the pipeline. Due care shall be taken to ensure that failure or change in calibration of any field instruments will not cause false alarms. The leak detection programme shall run between different sections of the pipeline. All the leak detection programme shall run independently for each of the sections and any of the section programme can be inhibited without affecting the performance of the other section.

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- **Shut-In Leak Detection and leak location:** Shut-in leak detection model shall look for shut-in sections of the pipeline for static portions of the network during each poll from SCADA using available pressure and temperature data available at both the location. Based on the real time data of shut-in section leak alarms shall be generated. The model shall also detect leaks in multiple shut-in sections and location of leak shall be indicated by the software.


- **Pig Tracking:** Pig tracking program shall be started whenever it receives 'pig launch' signal or command from operator. The progress of the pig along the pipeline shall be calculated from the

advancement of the flow in the pipeline. The program shall correlate the actual arrival time of the pig with the estimated position of the pig and synchronise the same for further estimation for indicating estimated time of arrival (ETA) of pig at pump stations, scraper stations and delivery/ terminal stations. This programme shall run independently between any of the sections from launching barrel to receiving barrel of the section.

- **Software Tuning:** Software tuning shall be applied as a part of leak detection software to minimize false leak alarms. These tuning techniques shall improve the sensitivity of Real Time Transient Model / Negative pressure wave technology model by ensuring that the accuracy of calculations is dependent on repeatability of measurements rather than on absolute accuracy.

Data validation shall be performed after each update to filter out erroneous data and default calculations shall be used so that the efficiency of on line modelling system is not degraded.

- **Inventory Analysis:** The module shall generate current pipeline inventory information accounting for variations in line packs on the basis of pressure, temperature and density profiles. The basis of calculations shall be the profiles determined from the real time dynamic model and available measurements. The module shall compare inventories and packing rates against maximum allowable and minimum allowable limits and raise alarms in case of any limit violations to facilitate the operator in responding the changes in supply and demand. The system shall also have an overall accounting / inventory module to verify the total pipeline throughput on a daily and monthly basis. The system shall provide inventory analysis in volume, mass and energy using the data of flow & Gas Chromatograph.

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- **Survival Time Analysis:** A survival time analysis analyses and gives suggestions like how much time pipeline can continue to operate until a critical condition occurs. This can be triggered through events or manual. Survival time analysis shall calculate the time until violation of minimum or maximum inventory for each pipeline network in the event of loss of supply or delivery point. Calculations shall be based upon current inventory and line packing rates obtained from inventory analysis and current measured supply and delivery rates obtained from Real Time dynamic modelling.

6.2 Telecom Systems

The salient features of the Telecommunication System envisaged for North East Gas Grid Pipeline Project are as below:

A dedicated state of the art OFC based STM-16/4 SDH communication systems with 99.9% availability is envisaged.


However, the design of the Telecom System for Phase-III shall be such that it should be compatible with the Telecom System to be supplied for Phase-I & II. For this purpose the Telecom System Vendor of Phase-III should co-ordinate with the concerned Telecom System Vendor of Phase-I & II.

For the entire communication network of the pipeline, the following type of stations have been considered:

- RWS/MCS/ECS/DT (Attended/manned Stations): SDH Node.
- SV/IP+SV/T- Point: SDH Node/Network switch
- RT: Network switch
- Gas feeder lines: SDH/Network switch

24 Fibre Composite OFC network comprising 18 nos. G652D fibre and 6 nos. G655 fibre has been considered for complete pipeline length under option- I & II. The G655 fibre shall be used for long haul data highway and the G652D fibre shall be used for data connectivity requirement at SV locations. G655 fibre is a Non-zero dispersion fibre which can be used for long hauls (around 100 kms).

RTU data & CCTV requirements of locations considered all along the pipeline shall be catered by the network connectivity using fibre of the OFC network.

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It is planned/proposed to install IP & E1 based new EPABX Systems at all assumed attended station as mentioned above and subscriber shall be extended from these EPABX to all unattended locations.


For power supply of the station telecom system, please refer cl. No. 5.5.1 of this design basis

CCTV based Surveillance system has been considered for this piping area for RT/SV/IP+SV/T- Point/ DT/RWS/MCS/ECS locations. No CCTV are considered for station perimeter surveillance.

Control Centre for CCTV System has been envisaged for monitoring & recording of CCTV cameras of unmanned locations for whole pipeline section at corresponding attended stations. This feed shall be available over LAN at all stations on Ethernet.

Telecommunication Network, meeting the voice & data connectivity requirements of this new pipeline network deployed on Optical Fibre Cable as per details stated below:

- **Optical Fibre Cable for the proposed Telecommunication Link:** For the proposed telecommunication link, a 24-fibre composite single mode optical fibre cable shall be laid along with the pipeline. The Optical Fibre Cable shall be laid up to the building entry at respective attended and unattended locations.
- **Telecommunication Equipment:** There shall be 2.5 GBPS, L16.2 STM-16 and 622 MBPS, L4.2 STM-4 SDH based telecommunication link. The upcoming network shall be a 3-tier network comprising STM-16 long haul hops as Tier-I Network, STM-4 hops (covering all attended stations and unattended Telecommunication Repeater Stations all along the pipeline) as Tier-II Network. The Tier-III Network shall be a ring based network comprising Network Switches with optical interfaces and it shall be utilized for the connectivity of Independent MOV/ SV locations with RWS/ECS/MCS SCADA Systems of respective stretches. The communication system shall be configured in ring/ tier configuration as indicated below:

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- **Tier-I Network:** The Tier-I Network shall cater to the voice, data and CCTV connectivity requirements of these stations with the SCADA RWS (Remote Work Station) and BMCS/ECS of respective stretches. The Tier-I Network shall be formed in 1+1 configuration utilizing 2 nos. G.655 fibres.


- **Tier-II Network:** The Tier-II Network shall cater to the voice, data and CCTV connectivity requirements of these stations with the SCADA of respective pipeline stretches. The Tier-II Network shall be formed in 1+0 configuration utilizing 4 nos. G.652D fibres.

- **Tier-III Network:** The Tier-III network shall be formed using Network Switches having optical interfaces connected in ring configuration between respective stations. This network shall cater to the voice, data and CCTV connectivity requirements of Independent SV/ RT/IP+SV/TAPP OFF POINT of respective stretch. This network shall be formed in ring configuration utilizing 4 nos. G.652D fibres.

- **MPLS Connectivity:** To provide further back-up to the OFC based STM Communication link, MPLS based connectivity is envisaged at the attended station. The MPLS connectivity at equipment rooms of respective stations shall be provided by Client (M/s IGGL). The SCADA Works Contractor shall be using the MPLS back-up connectivity at SCADA Router so as to have an alternate path for SCADA data connectivity, in case of failure of the main Optical Fibre Communication System. The Telecom Works Contractor shall co-ordinate with the SCADA Works Contractor for required configuration, interfacing & testing jobs for the backup connectivity through MPLS. The back-up connectivity over MPLS shall also be utilized by the Telecom Works Contractor to provide back-up voice communication channels using VOIP Box & its integration with EPABX System so as to provide an alternate backup voice communication system.

Data Connectivity of Siliguri - Gangtok pipeline section with Guwahati Dispatch Terminal-1 (MCS) & other two (2) ECS is only over MPLS connection, as no mainline and OFC is laid in Siliguri - Guwahati section and data connectivity through upcoming GAIL Barauni - Guwahati pipeline shall be used for in this section.

MPLS based Data Connectivity with Guwahati Dispatch Terminal-1 (MCS) & other two (2) ECS (Numaligarh & Silchar) is also considered for Dimapur

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dispatch & Imphal receiving terminals of Dimapur-Kohima-Imphal section, as emergency backup communication, other than OFC.

6.2.1 CCTV Systems

MCS, ECS, RWS, all RT, DT, IP & SV stations shall be provided with vandal proof CCTV Camera with reputed make IR Illuminator, required mounting poles/adaptors for remote surveillance of process area valves, metering skid area, pig launcher/pig receiver area, main entrance Gate area, Control room/electrical MCC room area etc.

Network Video Recorder, Keyboard with Joystick and Client Workstations shall be provided at all attended stations for CCTV system. One (1) no of 50" LED Monitor shall be provided in Control Room of all attended stations.

230 V AC UPS power supply shall be provided for CCTV system in all manned station, DT, RT, IP stations. Only for SV station, power supply to CCTV system shall be feed from 24V DC or 48V DC system.


Explosion-proof & Weatherproof IP65 Junction Box shall be used for Explosion proof CCTV Cameras at all manned & unmanned stations.

CCTV camera shall be colour camera (day / night) with high resolution. It shall have programmable facility to restrict access through password. It shall have real time clock and synchronized with telecom system clock. Camera shall be able to generate alarm on detecting loss of video. It shall receive remote control for PTZ & focus functions control commands from operator keyboards.

All outdoor cameras & camera assemblies shall be suitable for outdoor application. All outdoor cameras shall be ingress protected to a minimum of IP65. Indoor cameras shall be ingress protected to a minimum of IP42. There shall be Wash / Wipe assembly / unit for each camera. CCTV cameras shall be with built in Pan / Tilt controllers and suitable environmental housing with stainless steel construction 316 SS suitable for corrosive environment.

The CCTV system shall include, but not limited to, the following equipment:

- Network Digital Video Recorder (NDVR);
- PTZ Camera Ex "d" - Outdoor (CCTV Camera) with housing;

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- PTZ Camera - Indoor (CCTV Camera);
- Fixed Camera – Outdoor;
- Fixed Camera – Indoor;
- Camera Poles.

6.3 PLB-HDPE Duct

Single mode, 24 core fiber optical cables (FOC) shall be laid in 40 mm OD permanently lubricated PLB HDPE duct.

The PLB - HDPE Duct shall consist of two concentric layers, the outer layer being HDPE; co-extruded with an inner layer of solid permanent lubricant, to reduce the internal co-efficient of friction (ICF). The lubricant shall be of a solid layer of uniform thickness so formulated to provide a permanent, low friction boundary layer between the inner surface of the duct & optical fibre cable. The lubricant layer shall be clearly visible in cross-section, concentric with the outer layer.

PLB HDPE ducts shall be suitable for installation of underground armoured/un-armoured optical fibre cables (OFC) by blowing techniques. The life expectancy of these ducts shall not be less than 40 years.


All other materials like silicone inner lubricant master batch, UV stabilizer (if and as required), colour master batch, anti-oxidant compounds or any other material required shall be supplied by CONTRACTOR to produce two layered HDPE permanently lubricated duct.

The anti-oxidants used shall be physiologically harmless. None of the additives shall be in quantity as to impair long term physical and chemical properties of duct. The raw material used for extrusion shall be dried to bring down the moisture content less than 0.1%.

Suitable ultraviolet stabilizers (if and as required) shall be used in manufacturing for protection against UV degradation, when stored in open area for a minimum period of 8 months.

Single pass rework material of the same composition produced from manufacturer's own production shall be used and the same shall not exceed 10% in any condition.

The inner lubrication material shall be friction reducing polymeric material, which shall be integral with HDPE layer. The lubricant material shall have no toxic or dermatic hazard for safe handling. In the finished duct, the co-extruded inner layer of solid permanent lubricant shall be white in color and clearly visible

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in cross section of the duct the inner layer of solid permanent lubricant shall be continuous all through and shall not come out during storage, uses and throughout the life of duct.

The PLB HDPE duct shall unroll off the drums without snaking or waving having zero coil set. Thus the duct shall lay straight into the trench without re-coiling. For this purpose, when a minimum length of 50 metres duct taken from the coil and laid on the ground, it will be straight without any bends or kinks and without deformation, except 5 metres from each end.

Total quantity of HDPE duct shall be pipeline length including the minimum loop length at each station + 1 km extra length. Extra length shall be used for hooking up of OFC to telecom unit at all stations.

6.4 Fire & Gas Detection System


The overall objective of the gas detection system is to protect life, the asset and the environment of the proposed facilities. In order to meet this objective Gas Detection System shall provide early warning of the outbreak of fire, the presence of hazardous gas, smoke or excessive heat to allow appropriate actions to be taken by the operator.

Gas detection devices shall be installed at all DT, IP, SV, RT stations to detect hazardous conditions resulting from accidental gas leakage or fire and to initiate appropriate alarms and actions. Gas detection system result the following duties of the F&G system:

- Monitor all designated areas for fire;
- Monitor all areas where flammable or toxic gas might be present in normal operation;
- Provide facility for raising a fire or gas alarm;
- Alert the person in the main control room for any fault detected by self-test or any fire or gas emergency situation.
- Minimum Ingress Protection (IP) of GDS panel shall be IP-42.

The Gas Detection system shall be designed as per the latest edition of the National Fire Alarm Code NFPA 72.

GDS system shall have 8 channel minimum & that will be decided in detail Engineering stage based on process requirement & system shall be wall

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mounted & have provision to MCP, Hooter, Beacon. GDS system shall have provision for programmable Gas Detector channel & relay card / module to configure field devices. Gas Detection system shall employ the latest field proved microprocessor based technology enabling all functional requirements as per fire and gas specification & OISD requirement. The Gas Detection system shall be modular in design and shall have min. 10 msec resolution or better. The Gas Detection system shall be designed for maximum reliability, safety and integrity while maintaining a better availability. Gas Detection system processor shall have retentive memory with battery backup. The following type of fire and gas devices are provided for the Project facilities:

- HC Detectors (IR Point type and Open Path type);
- Fire Alarm Panels;(Part of Fire Suppression System Package)
- Smoke Detectors; (Part of Fire Suppression System Package)
- Manual Call Points;
- Hooters;
- Beacons;
- Multisensor Detector;(Part of Fire Suppression System Package)
- Heat Detectors;(Part of Fire Suppression System Package)
- Wall mounted GDS panel;
- Required triad cable;
- Cable accessories;
- Junction Boxes;
- Break Glass Unit etc.;(Part of Fire Suppression System Package)

Gas Detection system shall be provided at all DT, IP, SV & RT stations which shall be interfaced with the SCADA system at Master Control Room of the pipeline via RTU & OFC based Telecom network. All these detectors and devices shall be hardwired to the respective addressable type control panel and further to RTU through soft communication (RS-485/ MODBUS).

6.5 Fire Alarm Control Panel (Part of Fire Suppression System Package)

Fire Alarm Control Panel (FACP) shall be provided in Control Room (Pre-Fabricated Shelter) at all stations. FACP shall be a standalone control panel.

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FACP shall be interfaced with all addressable IS and non-IS field devices. Each FACP shall be capable of handling minimum 2 loops. Battery rooms shall be considered as hazardous area for F&G detectors and loops selection. Minimum Ingress Protection (IP) of FACP panel shall be IP-42.

FACP shall be interfaced to RTU through hardwired link for monitoring and executive actions at pipeline control room (Pre-Fabricated Shelter) level.

All potential free NC contact shall be used. FACP shall be interfaced to fire suppression system (if any) through hardwired for initiating flooding system on respective location/zone.

6.6 Control Room

Control Room shall be considered as Local Equipment Room (LER) which is a self-contained fully functional building including but not limited to normal and emergency lighting, HVAC duty and standby, fire detection and communication system, power distribution boards for normal and UPS power, grounding system for electrical and instrument control system.


LERs will be generally located in safe areas as identified in hazardous area classification. Human engineering will play prominent role in the design, space consideration and operator interface facilities. The design space will allow operator the comfort of utilizing the room for full operation and control room whenever required during start-up, operation and maintenance activities.

LER can be a combination of electrical LV, instrumentation I/O and control system.

Pipeline LER shall be strategically located to optimize cable runs thereby reducing cable costs and shall be normally centralized to the pipeline process area which it serves.

LER shall comprise of LV MCC, instrumentation, RTU control system, package control system, UPS, battery system, fire alarm panel, GDS Panel and local telecommunication system required for efficient operation and control of North East Gas Grid Phase-III Pipeline Project.

The LER building shall be elevated to allow bottom cable entry for the panels and shall be tiled raised or computer floor to allow routing of cables and trays. Panels shall be standing on steel structure flushed with the tiled raised floor. Cable penetration to the room shall be side entry below the level of the raised floor through proper openings which shall be sealed after use.

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6.7 TIC Panel (Telemetry Interface Cabinet)

TIC panel shall be relay based Control Panel, of size 800 X 800 X 2100 mm, Colour RAL 7032 Siemens Grey of IP 54 2 nos and shall be interfaced with RTU panel through hardwired.

All wiring shall conform to API-RP-550 Part I Section 7 & 12. All wiring inside racks, cabinets and back of the panels shall be housed in covered, non-flammable plastic raceways arranged to permit easy accessibility to various instruments for maintenance, adjustments, repair and removal.

Separate wiring raceways shall be used for power supply wiring, DC and low level signal wiring and intrinsically safe wiring. Parallel runs of AC and DC wiring closer than 300 mm shall be avoided.

7.0 CABLING AND INSTALLATION

7.1 Instrument Cables

All instrument and F&G cables shall be shielded low smoke, low halogen, resistant to water, oil, solar radiation and ultra-violet light.


Cables shall comply with BS-5308-1, Instrumentation Cables – Part 1: Specification for XLPE insulated cable.

Cables used in essential service applications such as F&G system signals, firefighting system signals and telecommunication system cables shall be fire resistant in accordance with IEC 60331. All other instrumentation cables shall be flame retardant to IEC 60332.

Instrument cable construction shall be in accordance with IEC 60227, IEC 60228 and ANSI MC 96.1 for thermocouple cables. The electrical characteristics such as conductor resistance, capacitance, L/R ratio, insulation, etc. shall be in accordance with IEC 60502-1.

Cables shall be mechanically protected using steel wire armor. The cable construction shall consist of twisted single pair / multi-pairs, single triad / multi-triad conductors of stranded annealed copper type with individual and overall shield for analog signals (AI, AO) and only an overall shield for discrete control signals (DI, DO).

Conductor insulation shall be flame retardant cross linked polyethylene (XLPE).

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Cable sheath (both inner and outer) for instrument cables shall be flame retardant PVC type. Non IS instrument cables shall have black colored outer sheath. IS instrument cables shall have blue colored outer sheath. Screens shall be aluminum backed mylar tape with drain wire. Tape shall be helically wrapped with 25% overlap and shall be in continuous contact with a solid tinned- copper drain wire.

Cables shall be of voltage grade 300/500 and of types single pair / multi-pairs, single triple / multi-triples, individually and collectively screened with drain wire and armoured for the following signals:

- Analogue signals (4 ~ 20 mA);
- Gas detector signals.

Cables shall be of voltage grade 300/500 and of types single pair / multi-pairs, only collectively screened with drain wire and armored for the following signals:

- Digital signals;
- Solenoid valve signals;
- Control signals.

Cables shall be suitably segregated, consisted with the best practice and based on voltage level, direct or alternating current, power or signal service etc. Further details shall be developed during detail engineering.

Separation between instrument and power cable shall be as follows:

Power Cable Rating	Instrument Cable Separation Distance
125V or 10A	300 mm
230V or 50A	500 mm
230V-400V or 200A	750 mm
>=1.1 kV or 800A	2000 mm

Power and instrument cable may be run in the same cable tray only if adequate mechanical segregation such as barrier plates is provided in the middle of the tray.

Redundant cables such as redundant serial / Ethernet link shall be routed in diverse paths preferably.

Minimum distance between parallel power and signal cable trench shall be as follows:

Length of Parallel Trench	Minimum Distance between Trenches
Up to 60 meter	600 mm
60 – 100 meters	1 meter
100 – 150 meters	1.5 meters

Exterior sheath and wire color coding shall be as depicted in table below:

Function	Wire Color	Outer Sheath Color
Instrument Cables (Non-IS - Control)	Black (+) / White (-)	Black
Instrument Cables (IS - Control)	Black (+) / White (-)	Blue
Instrument Cables (Safety Systems)	Black (+) / White (-)	Red
Fire & Gas Cables	Black (+) / White (-)	Red
Thermocouple Cables	As per ANSI MC 96.1	As per ANSI MC 96.1
AC Power	Brown (+ve) / Blue (-ve)	Black
Safety Earth	-	Green / Yellow
Instrument Earth	-	Green

Electrical connections on the instrument side, JB side and panel side shall be NPTF as minimum. End connection for cable termination shall be 1/2"NPTF for 2-wire instruments whereas for 3-wire or 4-wire instrument, 3/4"NPTF is also acceptable.

7.2 Junction Boxes

All junction boxes shall be made of cast aluminum (LM6/LM25) with UV resistant, EEx 'd' certified and IP-65 rated for outdoor and IP-42 rated for indoor installation. The finish of junction boxes (Non IS) shall be light gray (RAL7035) and junction boxes (IS) shall be blue shade.

Separate junction boxes shall be considered for SCADA, F&G system signals. Signal segregation shall be followed for junction box and cables and is as follows:

- Analog Signals for control / monitoring (IS);
- Digital signals for control / monitoring (Non IS);
- Power supply for instrument
- Solenoid signals for control / monitoring (RTU);

Cabling to redundant instruments and actuators (if any) shall be distributed in separate junction box and multi-pair cable.

Cable entries (both single and multi-pair/core cable) shall be at the bottom of the box; where side entry is used, the cable shall be installed in a manner to minimize the possibility of water ingress.


Cable entries shall be sealed for gas/water ingress. All spare entries shall be plugged with certified nickel plated brass plugs; plastic plugs shall not be used. Terminals shall be compression type mounted on a DIN type rail suitable for 2.5 sq.mm conductor, as a minimum.

Junction boxes shall be sized adequately considering the space required inside boxes for cable termination, space required between cable glands, space to operate tools to tighten the glands, etc. 20% spare terminals shall be provided.

Junction boxes shall be provided with internal and external earth studs with associated serrated rings, nuts, etc.

7.3 Cabinets & Panels

Cabinets shall be required to house flow computers, RTU, FACP, F&G, Telecom System and any other systems as applicable. Cabinets and panels utilized to house system components shall have a minimum ingress protection (IP) of IP-42 for installation in a controlled environment.

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Tentative size / dimension of cabinet shall be 2100(H)x 1000(H) x 800(D). Cabinets shall be of the free standing type with bottom cable entry and floor mounting with anchor bolt. Cabinets shall be painted RAL7035 (Light Grey).

Cabinet doors shall be hinged opening, preferably 180 degrees, and detachable. Doors shall be fitted with seals for dust exclusion.

Doors shall be provided with locks, all keys shall be identical for all cabinets under the Vendor's scope of supply. All installed components shall be easily accessible for removal/replacement and to facilitate wiring terminations.

Cables shall enter the cabinet from the bottom through removable, fully gasketed, split gland plates. Cable clamp rails shall be provided for firmly clamping the incoming and outgoing cables. Adequate cable connection stress relief shall be provided.

Door switch activated lighting shall be provided for system and marshaling cabinets & metering Panel. Each cabinet section shall be provided with a LED light with on/off switch, door switch, space heater, thermostat & panel fan and a 230 V AC power socket.

All cabinets and consoles shall be provided with removable eyebolts for lifting. Blanking plugs shall also be provided for these.

Cabinets shall be provided with removable side panels. Facilities shall be provided for bolting adjacent cabinets together. If cabinets are permanently bolted together to form sections, the length of these sections shall not exceed 2400 mm.


Cable segregation shall be provided inside the cabinet based on the type of signal (analog/digital) and signal excitation voltage level.

7.4 Instrument Cable Glands

Cable glands shall be double compression type, brass nickel plated type with ISO threads. All cable glands shall be EEx 'd' certified and shall be weather proof to IP-65 as minimum.

Cable glands shall be supplied and installed with all necessary ancillaries and accessories such as washer, PVC shroud, lock nut and earth ring etc. Cable glands shall have double lock nuts inside the JB.

Cable glands shall not be used for cable entries at the cabinet / panel end and shall be through cutoffs provided in the gland plates.

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7.5 Cable Trays

All cable trays shall be made of hot dip galvanized steel, painted and perforated type with self-secured covers.

The sheet steel thickness shall be minimum 1.5mm for cable tray. Cable trays shall be painted white (RAL 9010). All external cable trays shall be provided with cable tray cover with clamps. The tray cover shall be fabricated from the same material of cable trays and shall be of same color.

Cable trays shall be heavy duty, class C as per NEMA VE1 and designed, manufactured and tested in accordance with the requirements with international codes and standards such as NEMA VE1.

The cable trays assembly shall be designed to ensure personnel and operational safety during all operating conditions, inspection and maintenance. Cable tray construction shall be such as to facilitate easy handling and to ensure easy laying of cables without damage to cables. The inside surface shall be free from sharp edges, burrs or projections.

All cable trays shall have 20% spare capacity for future cables. Cable trays shall be supported on structural steel members, at a distance of not more than 3 meters.


7.6 Multi Cable Transits (MCT)

All cable entries to control room/-closed building shall be through MCT blocks. The MCT shall be used where cables are led through exterior walls, floors or partitions with a fire blocking, water blocking or sealing function. MCT shall be gas tight.

MCT's shall comprise of frame and insert blocks and complete with all accessories. Frame material shall be mild steel suitable for environmental conditions. MCT's shall be installed at all cable penetrations into the control room and other buildings as applicable. MCTs shall be suitably fire rated to suit the purpose.

All MCT's shall be blast proof type capable of withstanding 0.5 Bar. Outdoor MCT's shall be installed for cables crossing from outdoor to indoor. Sizing of MCT shall be designed based on number and size of cables passing through the respective MCT. All MCTs shall comprise 20% spare insert blocks with core for future cables.

Insert blocks shall have a good plasticity, to enable the sealing of uneven diameter cables. Insert blocks shall be suitable to accommodate different cable

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diameter. Any sealing strip to be used to wrap around cables to fit the diameter into the insert blocks, shall have the same characteristics as the insert blocks. Lubricant for assembling blocks of MCT shall be considered as applicable

8.0 SPARES

For all instrument items, Vendor shall provide:

- Spare parts for commissioning and start-up (duly approved by the Company);
- 2 years O&M spare parts priced list.

Vendor shall submit spares form for two-year operational period as a part of required documentation.

Following Installed spare criteria shall be considered as a minimum in instrumentation and control system design:

- Instrument air header shall be provided with 20% spare connections;
- All pairs of multi-pair cables shall be terminated in the junction boxes as well as at panel side (including the unused spare pairs);
- Field junction boxes shall have 20% spare terminals and 20% cable entries for connecting future instrument cables;
- All multi-pair/multi-core instrument cables shall have 20% spare pairs;
- All Instrument cable trays and trenches shall have at least 20% spare capacity for future cables;
- Instrument cabinets shall have 20% spare space for I/O cards, marshaling terminals, cable entries etc. for future additions;
- I/O cards shall have 20% spares for future use (separate for each I/O card type i.e. AI/AO/DI/DO etc.);
- Control room shall have 20% space for future instrument panel / equipment.



Energising Quality

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**Material Requisition of Composite Tender-
Instrumentation**

Total Sheets

27

Document No

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00

IN

MR

5003

Indradhanush Gas Grid Limited

**North East Gas Grid Phase-III of IGGL
Part D1 & D2**


D1	13-12-2022	Issued for Bid	VK	DGM	KNC
A1	07-12-2022	Issued for Internal Review	VK	DGM	KNC
REV	DATE	DESCRIPTION	PREP	CHKD	APPR

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1.0 DEFINITION

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

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PROJECT	North East Gas Grid Phase-III of IGGL-Part D1 & D2
CLIENT/OWNER	Indradhanush Gas Grid Limited
EPMC	VCS Quality Services Limited the party to act for and on behalf of OWNER for the Detailed Engineering Services
VENDOR/ MANUFACTURER	Party, which manufactures and supplies equipment and services to the OWNER or to CONTRACTOR

2.0 DOCUMENT PRECEDENCE

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

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

- Data Sheets
- Scope of work;
- Specifications;
- Basic Documents;
- Codes and Standards.

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

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

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3.0 SCOPE OF SUPPLY

Vendor shall be completely responsible to supply below mentioned materials and services for satisfying the functional / operational requirements stated in this Requisition and its Attachments. (Herein after referred as Requisition).

Part-D1

S. No.	Description	Quantity
Instrumentation & Control System		
1.0	Supply of Pressure Gauges as per tender document (inclusive of supply of necessary piping materials/tubings, dampeners (if required) alongwith all necessary valves & fittings, impulse lines/manifolds as per installation standard)	1 Nos
1.1	Installation, testing, calibration and commissioning of Pressure Gauges as per tender document (inclusive of necessary piping materials/tubings, dampeners (if required) alongwith all necessary valves & fittings, impulse lines/manifolds as per installation standard)	1 Nos
2.0	Supply of Pressure Gauges alongwith Gauge Saver as per tender document (inclusive of necessary piping materials/tubings, dampeners (if required) alongwith all necessary valves & fittings, impulse lines/manifolds as per installation standard)	1 Nos.
2.1	Installation, testing, calibration and commissioning of Pressure Gauges alongwith Gauge Saver as per tender document (inclusive of necessary piping materials/tubings, dampeners (if required) alongwith all necessary valves & fittings, impulse lines/manifolds as per installation standard)	1 Nos.

3.0	Supply of Pressure Transmitters as per tender document (inclusive of supply of yoke, supports for impulse lines (wherever required), SS manifolds/ SS impulse lines & SS valves & fittings with supports	2 Nos.
3.1	Installation, testing, calibration and commissioning of Pressure Transmitters as per tender document (inclusive of yoke, supports for impulse lines (wherever required), SS manifolds/ SS impulse lines & SS valves & fittings with supports	2 Nos
4.0	Supply of Temperature Transmitters as per tender document (inclusive of supply of yoke, supports, etc)	1 Nos.
4.1	Installation, testing, calibration and commissioning of Temperature Transmitters as per tender document (inclusive of yoke, supports, etc)	1 Nos.
5.0	Supply of Temperature Gauges with flanged thermowells inclusive of thermowell and other necessary items as per installation standard	0 Nos.
5.1	Installation, Calibration, Testing & Commissioning of Temperature Gauges with flanged thermowells inclusive of installation of thermowell on the nozzle and installation of instruments as per installation standard	0 Nos.
6.0	Supply of RTD with flanged thermowell inclusive of thermowell and other necessary items as per installation standard	0 Nos.
6.1	Installation, Calibration, Testing & Commissioning of RTD with flanged thermowell inclusive of installation of thermowell on the nozzle and installation of instruments as per installation standard.	0 Nos.
7.0	Supply of RTD (Skin Type) as per tender document (inclusive of supply of mounting pad, yoke, supports, etc as per installation standard)	1 Nos.

7.1	Installation, testing, calibration and commissioning of RTD (Skin Type) as per tender document (inclusive of mounting pad, yoke, supports, etc as per installation standard)	1 Nos.
8.0	Supply, Installation, testing and commissioning of all the components and accessories of the LEL Detection System comprising of Controller rack, Monitoring card (in Control Panel) & LEL Detectors (in the field) as per tender document (inclusive of yoke, supports, calibration kit, etc). Cost for controller racks shall be included in the cost of LEL Sensor with controller cards	
8.1a	Supply of LEL Sensor (point type) with controller cards alongwith accessories	2 Nos.
8.1b	Installation, testing and commissioning of LEL Sensor (point type) with controller cards alongwith accessories	2 Nos.
8.2a	Supply of LEL Controller Rack alongwith accessories	1 Nos.
8.2b	Installation, testing and commissioning of LEL Controller Rack alongwith accessories	1 Nos.
8.3a	Supply of Hooter	1 Nos.
8.3b	Installation, testing and commissioning of Hooter	1 Nos.
8.4a	Supply of Beacon	1 Nos.
8.4b	Installation, testing and commissioning of Beacon	1 Nos.
8.5a	Supply of Manual Call Points	1 Nos.
8.5b	Installation, testing and commissioning of Manual Call Points	1 Nos.
9.0	FULLY WIRED PANELS ALONGWITH ACCESSORIES	
9.1a	Design, Engineering and Supply of Fully wired Control Panel cum TIC Panel (Free standing type, 2115 (mm) H	1 Nos.

	(including 100 mm base + 15 mm anti-vibration pad) x 1200 (mm) W x 800 (mm) D) alongwith all accessories including clock for time, valve auto-closure and environment temperature monitoring and Panel Mounted Instruments as indicated below, including supply of commissioning spares with special tools and tackles as required, as per tender Document but exclusive of supply of below indicated panel mounted items. All the signals of electrical, instrumentation, RTU/SCADA, CP, metering skid, etc. are to be interfaced through TIC Panel and necessary TBs alongwith accessories shall be provided for the same.	
9.1b	Installation, testing and commissioning of Fully wired Control Panel cum TIC Panel (Free standing type, 2115 (mm) H (including 100 mm base + 15 mm anti-vibration pad) x 1200 (mm) W x 800 (mm) D) alongwith all accessories including clock for time, valve auto-closure and environment temperature monitoring and Panel Mounted Instruments as indicated below, including commissioning spares with special tools and tackles as required, as per tender Document but exclusive of below indicated panel mounted items. All the signals of electrical, instrumentation, RTU/SCADA, CP, metering skid, etc. are to be interfaced through TIC Panel and necessary TBs alongwith accessories shall be provided for the same.	1 Nos.
10.0	Panel Mounted Items (rest of the items are to be included in above panels supply)	
10.1a	Supply of Barriers cum Signal Distribution Card	30 Nos.
10.1b	Installation, testing and commissioning of Barriers cum Signal Distribution Card	30 Nos.
10.2a	Supply of Digital Indicators	3 Nos.
10.2b	Installation, testing and commissioning of Digital Indicators	3 Nos.
11.0	Installation, testing and commissioning of RTU Panel (Free Issue item) with the help of RTU OEM Vendor of	1 Nos.

	Phase-I & II.	
12.0	FREE ISSUE ITEMS	
12.1	Supply & Installation of Instrument Erection hardwares like Impulse Tubes/ Pipes/ Fittings/ Valve/ Manifolds/ Instrument mounting Supports/ standpipes/ brackets/ Uclamps etc. as required for erection of instruments & instrument Items.	1 Lot
12.2	Testing , Commissioning , Electrical termination, calibration of Non Intrusive Pig Signallers including all manpower, tools & tackles, equipments, consumables, etc. required as per direction of Engineer-in-charge.	1 Nos
12.3	Calibration of Pressure Safety Valves installed on Scrapper trap, vessels, etc. alongwith all equipment, manpower, consumables etc as required to the satisfaction of company and as per instructions of Engineer-in-charge.	0 Nos.
12.4	SS Tube Connection, Testing and Commissioning of Gas Actuated Ball Valves (AV) /HOV including the Supply and installation of SS tubes and fittings along with supports for impulse lines (wherever required), hydraulic testing, hydraulic oil (if required), painting of supports as per std, manifold/ isolation valves, sockolets etc as required for tubing of each Valve, as per the direction of Engineer-In Charge but exclusive of supply of Valves with actuator.	1 Nos.
13.0	Installation of Junction Boxes including Supply of Junction Boxes with plugs for unused entries, supply, fabrication and installation of supports, plugging of unused entries and painting.	
13.1a	Supply of Explosion proof Instrumentation Analog Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	1 Nos.
13.1b	Installation, testing and commissioning of Explosionproof Instrumentation Analog Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12	1 Nos.

	Triad/ 2 core/ 8 core cable entry	
13.2a	Supply of Explosionproof Instrumentation Digital Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	1 Nos.
13.2b	Installation, testing and commissioning of Explosionproof Instrumentation Digital Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	1 Nos.
13.3a	Supply of Explosionproof Instrumentation Analog Fire Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	1 Nos.
13.3b	Installation, testing and commissioning of Explosionproof Instrumentation Analog Fire Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	1 Nos.
13.4a	Supply of Explosionproof Instrumentation Digital Fire Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	1 Nos.
13.4b	Installation, testing and commissioning of Explosionproof Instrumentation Digital Fire Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	1 Nos.
14.0	Supply of Canopies fabricated out of powder coated MS for electronic transmitters including supply, fabrication of support and reflective painting.	3 Nos.
14.1	Installation, testing and commissioning of Canopies fabricated out of powder coated MS for electronic transmitters including installation of canopy with support and reflective painting.	3 Nos.
15.0	Supply, laying, testing of FRLS cables (control, signal, power, triad cables) including supply of all required cable glands (Explosion proof double compression type) and	

	consumables like ferrules, clamps, PVC tubes, aluminium/SS tag plates etc., clamping , ferruling, glanding of the cables, termination at both ends, including shield/drain/ communication wire, providing/fixing of identifying tags and megger testing and loop testing . Supply and installation of GI pipes / Hume pipes (in road crossings, buildings, etc.) and PVC pipes (for crossing of electrical cables) is included in the scope of cable laying but exclusive of supply & erection of GI Perforated tray.	
15.1a	Supply of 1 P x 1.5 mm²- Individual Screened	75 Mtrs.
15.1b	Installation, testing and commissioning of 1 P x 1.5 mm²- Individual Screened	75 Mtrs.
15.2a	Supply of 1 P x 1.5 mm²- Overall Screened	0 Mtrs.
15.2b	Installation, testing and commissioning of 1 P x 1.5 mm²- Overall Screened	0 Mtrs.
15.3a	Supply of 4 P x 1.5 mm²- Overall Screened	220 Mtrs.
15.3b	Installation, testing and commissioning of 4 P x 1.5 mm²- Overall Screened	220 Mtrs.
15.4a	'Supply of 6 P x 1.5 mm²- Overall Screened + Individual Screened	285 Mtrs.
15.4b	Installation, testing and commissioning of 6 P x 1.5 mm² - Overall Screened + Individual Screened	285 Mtrs.
15.5a	Supply of 6 P x 1.5 mm²- Overall Screened	150 Mtrs.
15.5b	Installation, testing and commissioning of 6 P x 1.5 mm² - Overall Screened	150 Mtrs.
15.6a	Supply of 12 P x 1.5 mm²- Overall Screened	185 Mtrs.
15.6b	Installation, testing and commissioning of 12P x 1.5 mm²- Overall Screened	185 Mtrs.
15.7a	'Supply of 12 P x 1.5 mm²- Overall Screened + Individual Screened	0 Mtrs.

15.7b	Installation, testing and commissioning of 12P x 1.5 mm²- Overall Screened + Individual Screened	0 Mtrs.
15.8a	Supply of 24 P x 1.5 mm² , Overall Screened	0 Mtrs.
15.8b	Installation, testing and commissioning of 24P x 1.5 mm²- Overall Screened	0 Mtrs.
15.9a	Supply of 1T x 1.5 mm²- Individual Screened	80 Mtrs.
15.9b	Installation, testing and commissioning of 1T x 1.5 mm²- Individual Screened	80 Mtrs.
15.10a	Supply of RS-485 serial communication Cable (2P x 1.0 mm², Type-II)	100 Mtrs.
15.10b	Installation, testing and commissioning of RS-485 serial communication Cable (2P x 1.0 mm², Type-II)	100 Mtrs.
15.11a	Supply of 6T x 1.5 mm²- Individual Screened + Overall Screened	125 Mtrs.
15.11b	Installation, testing and commissioning of 6T x 1.5 mm² Individual Screened + Overall Screened	125 Mtrs.
15.12a	Supply of 8T x 1.5 mm²- Individual Screened + Overall Screened	0 Mtrs.
15.12b	Installation, testing and commissioning of 8T x 1.5 mm² Individual Screened + Overall Screened	0 Mtrs.
15.13a	Supply of 2C x 1.5 mm²- Individual Screened + Overall Screened	60 Mtrs.
15.13b	Installation, testing and commissioning of 2C x 1.5 mm² Individual Screened + Overall Screened	60 Mtrs.
15.14a	Supply of 12T x 1.5 mm²- Individual Screened + Overall Screened	0 Mtrs.
15.14b	Installation, testing and commissioning of 12T x 1.5 mm² Individual Screened + Overall Screened	0 Mtrs.
15.15a	Supply of 8C x 1.5 mm²- Individual Screened +	125 Mtrs.

	Overall Screened	
15.15b	Installation, testing and commissioning of 8C x 1.5 mm² Individual Screened + Overall Screened	125 Mtrs.
16.1a	Supply of Multi cable Transit blocks for all the cables entering in control room for all the Terminals (including 100% spares)	1 Lot
16.1b	Installation , testing and commisioning of Multi cable Transit blocks for all the cables entering in control room for all the Terminals (including 100% spares)	1 Lot
16.2a	Supply of Insulated cable glands for all the instruments and GOOVs for Spread-2B*	8 Nos.
16.2b	Installation , testing and commisioning of Insulated cable glands for all the instruments and GOOVs for Spread-2B*	8 Nos.
16.3a	Supply of dielectric fittings for tubing works at all SV stations	1 Lot
16.3b	Installation, testing and commisioning of dielectric fittings for tubing works at all SV stations	1 Lot
17.0	Supply and erection of prefabricated perforated GI trays of thickness 2 mm including tees, bends and elbows, supply, fabrication and erection of required supports and painting of supports with one coat of primer as per IS:2074 and 2 coats of finished paint including supply of paint as per std. and direction of Engineer In-Charge.	
17.1a	Supply of 60 mm wide X 30 mm high*	300 Mtrs.
17.1b	Installation, testing and commissioning of 60 mm wide X 30 mm high*	300 Mtrs.
17.2a	Supply of 100 mm wide X 30 mm high*	200 Mtrs.
17.2b	Installation, testing and commissioning of 100 mm wide X 30 mm high*	200 Mtrs.

17.3a	Supply of 200 mm wide X 30 mm high*	100 Mtrs.
17.3b	Installation, testing and commissioning of 200 mm wide X 30 mm high*	100 Mtrs.
17.4a	Supply of 300 mm wide X 30 mm high*	200 Mtrs.
17.4b	Installation, testing and commissioning of 300 mm wide X 30 mm high*	200 Mtrs.
18.0	Excavation of trenches for burying the cables, preparation of same for laying of cable, filling with river sand, laying of brick, back filling and compacting of the excavated earth, cable route markers, etc. as per specifications including supply of sand and bricks and removal of surplus earth as per instructions of Engineer-in-Charge. Size of Trench : 600 mm (Width) X 675 mm (Depth)*	200 Mtrs.
19.0	EARTHING	
19.1	Supply, Laying, testing and Termination of 8 SWG G.I. Wire from earth grid to Field instruments/JBs/Control Panel (in tray and conduits as required) and 4 sq. mm. PVC insulated armoured copper cable from earth pit to the barrier earth bus bar (in trays/conduits/trenches as required) required for the complete Spread- 2B.	1 L.S
20	Start up & Commissioning of complete terminal instruments of the whole station including all labour, test equipments and other auxiliaries as required, tagging of all the instrumentation items including cables, etc., complete in all respects as per specifications/ drawings/ directions of Engineer-in-Charge. All necessary Testing and commissioning reports, as-built drawings etc., shall also be prepared and to be submitted to the purchaser/consultant	1 L.S.

Part-D2

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S. No.	Description	Quantity
Instrumentation & Control System		
1.0	Supply of Pressure Gauges as per tender document (inclusive of supply of necessary piping materials/tubings, dampeners (if required) alongwith all necessary valves & fittings, impulse lines/manifolds as per installation standard)	13 Nos
1.1	Installation, testing, calibration and commissioning of Pressure Gauges as per tender document (inclusive of necessary piping materials/tubings, dampeners (if required) alongwith all necessary valves & fittings, impulse lines/manifolds as per installation standard)	13 Nos
2.0	Supply of Pressure Gauges alongwith Gauge Saver as per tender document (inclusive of necessary piping materials/tubings, dampeners (if required) alongwith all necessary valves & fittings, impulse lines/manifolds as per installation standard)	8 Nos.
2.1	Installation, testing, calibration and commissioning of Pressure Gauges alongwith Gauge Saver as per tender document (inclusive of necessary piping materials/tubings, dampeners (if required) alongwith all necessary valves & fittings, impulse lines/manifolds as per installation standard)	8 Nos.
3.0	Supply of Pressure Transmitters as per tender document (inclusive of supply of yoke, supports for impulse lines (wherever required), SS manifolds/ SS impulse lines & SS valves & fittings with supports	10 Nos.
3.1	Installation, testing, calibration and commissioning of Pressure Transmitters as per tender document (inclusive of yoke, supports for impulse lines (wherever required), SS manifolds/ SS impulse lines & SS valves & fittings with supports	10 Nos

4.0	Supply of Temperature Transmitters as per tender document (inclusive of supply of yoke, supports, etc)	5 Nos.
4.1	Installation, testing, calibration and commissioning of Temperature Transmitters as per tender document (inclusive of yoke, supports, etc)	5 Nos.
5.0	Supply of Temperature Gauges with flanged thermowells inclusive of thermowell and other necessary items as per installation standard	1 Nos.
5.1	Installation, Calibration, Testing & Commissioning of Temperature Gauges with flanged thermowells inclusive of installation of thermowell on the nozzle and installation of instruments as per installation standard	1 Nos.
6.0	Supply of RTD with flanged thermowell inclusive of thermowell and other necessary items as per installation standard	2 Nos.
6.1	Installation, Calibration, Testing & Commissioning of RTD with flanged thermowell inclusive of installation of thermowell on the nozzle and installation of instruments as per installation standard.	2 Nos.
7.0	Supply of RTD (Skin Type) as per tender document (inclusive of supply of mounting pad, yoke, supports, etc as per installation standard)	4 Nos.
7.1	Installation, testing, calibration and commissioning of RTD (Skin Type) as per tender document (inclusive of mounting pad, yoke, supports, etc as per installation standard)	4 Nos.
8.0	Supply, Installation, testing and commissioning of all the components and accessories of the LEL Detection System comprising of Controller rack, Monitoring card (in Control Panel) & LEL Detectors (in the field) as per tender document (inclusive of yoke, supports, calibration kit, etc). Cost for controller racks shall be included in the cost of LEL	

	Sensor with controller cards	
8.1a	Supply of LEL Sensor (point type) with controller cards alongwith accessories	10 Nos.
8.1b	Installation, testing and commissioning of LEL Sensor (point type) with controller cards alongwith accessories	10 Nos.
8.1c	Supply of LEL Sensor (open path type) with controller cards alongwith accessories	4 Nos.
8.1d	Installation, testing and commissioning of LEL Sensor (open path type) with controller cards alongwith accessories	4 Nos.
8.2a	Supply of LEL Controller Rack alongwith accessories	3 Nos.
8.2b	Installation, testing and commissioning of LEL Controller Rack alongwith accessories	3 Nos.
8.3a	Supply of Hooter	3 Nos.
8.3b	Installation, testing and commissioning of Hooter	3 Nos.
8.4a	Supply of Beacon	3 Nos.
8.4b	Installation, testing and commissioning of Beacon	3 Nos.
8.5a	Supply of Manual Call Points	3 Nos.
8.5b	Installation, testing and commissioning of Manual Call Points	3 Nos.
9.0	FULLY WIRED PANELS ALONGWITH ACCESSORIES	
9.1a	Design, Engineering and Supply of Fully wired Control Panel cum TIC Panel (Free standing type, 2115 (mm) H (including 100 mm base + 15 mm anti-vibration pad) x 1200 (mm) W x 800 (mm) D) alongwith all accessories including clock for time, valve auto-closure and environment temperature monitoring and Panel Mounted Instruments as indicated below, including supply of	3 Nos.

	commissioning spares with special tools and tackles as required, as per tender Document but exclusive of supply of below indicated panel mounted items. All the signals of electrical, instrumentation, RTU/SCADA, CP, metering skid, etc. are to be interfaced through TIC Panel and necessary TBs alongwith accessories shall be provided for the same.	
9.1b	Installation, testing and commissioning of Fully wired Control Panel cum TIC Panel (Free standing type, 2115 (mm) H (including 100 mm base + 15 mm anti-vibration pad) x 1200 (mm) W x 800 (mm) D) alongwith all accessories including clock for time, valve auto-closure and environment temperature monitoring and Panel Mounted Instruments as indicated below, including commissioning spares with special tools and tackles as required, as per tender Document but exclusive of below indicated panel mounted items. All the signals of electrical, instrumentation, RTU/SCADA, CP, metering skid, etc. are to be interfaced through TIC Panel and necessary TBs alongwith accessories shall be provided for the same.	3 Nos.
10.0	Panel Mounted Items (rest of the items are to be included in above panels supply)	
10.1a	Supply of Barriers cum Signal Distribution Card	75 Nos.
10.1b	Installation, testing and commissioning of Barriers cum Signal Distribution Card	75 Nos.
10.2a	Supply of Digital Indicators	10 Nos.
10.2b	Installation, testing and commissioning of Digital Indicators	10 Nos.
11.0	Installation, testing and commissioning of RTU Panel (Free Issue item) with the help of RTU OEM Vendor of Phase-I & II.	3 Nos.
12.0	FREE ISSUE ITEMS	
12.1	Supply & Installation of Instrument Erection hardwares like Impulse Tubes/ Pipes/ Fittings/ Valve/ Manifolds/ Instrument mounting Supports/ standpipes/ brackets/	1 Lot

	Uclamps etc. as required for erection of instruments & instrument Items.	
12.2	Testing , Commissioning , Electrical termination, calibration of Non Intrusive Pig Signallers including all manpower, tools & tackles, equipments, consumables, etc. required as per direction of Engineer-in-charge.	6 Nos
12.3	Calibration of Pressure Safety Valves installed on Scraper trap, vessels, etc. alongwith all equipment, manpower, consumables etc as required to the satisfaction of company and as per instructions of Engineer-in-charge.	2 Nos.
12.4	SS Tube Connection, Testing and Commissioning of Gas Actuated Ball Valves (AV) /HOV including the Supply and installation of SS tubes and fittings along with supports for impulse lines (wherever required), hydraulic testing, hydraulic oil (if required), painting of supports as per std, manifold/ isolation valves, socklets etc as required for tubing of each Valve, as per the direction of Engineer-In Charge but exclusive of supply of Valves with actuator.	6 Nos.
13.0	Installation of Junction Boxes including Supply of Junction Boxes with plugs for unused entries, supply, fabrication and installation of supports, plugging of unused entries and painting.	
13.1a	Supply of Explosionproof Instrumentation Analog Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	4 Nos.
13.1b	Installation, testing and commissioning of Explosionproof Instrumentation Analog Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	4 Nos.
13.2a	Supply of Explosionproof Instrumentation Digital Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	3 Nos.
13.2b	Installation, testing and commissioning of Explosionproof	3 Nos.

	Instrumentation Digital Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	
13.3a	Supply of Explosionproof Instrumentation Analog Fire Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	3 Nos.
13.3b	Installation, testing and commissioning of Explosionproof Instrumentation Analog Fire Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	3 Nos.
13.4a	Supply of Explosionproof Instrumentation Digital Fire Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	3 Nos.
13.4b	Installation, testing and commissioning of Explosionproof Instrumentation Digital Fire Junction Boxes for 6 pair/ 1 pair/ 4 pair/ 12 pair/ 24 pair/ 6 Triad/ 1 Triad/ 8 Triad/ 12 Triad/ 2 core/ 8 core cable entry	3 Nos.
14.0	Supply of Canopies fabricated out of powder coated MS for electronic transmitters including supply, fabrication of support and reflective painting.	13 Nos.
14.1	Installation, testing and commissioning of Canopies fabricated out of powder coated MS for electronic transmitters including installation of canopy with support and reflective painting.	13 Nos.
15.0	Supply, laying, testing of FRLS cables (control, signal, power, triad cables) including supply of all required cable glands (Explosion proof double compression type) and consumables like ferrules, clamps, PVC tubes, aluminium/SS tag plates etc., clamping , ferruling, glanding of the cables, termination at both ends, including shield/drain/ communication wire, providing/fixing of identifying tags and megger testing and loop testing . Supply and installation of GI pipes / Hume pipes (in road	

	crossings, buildings, etc.) and PVC pipes (for crossing of electrical cables) is included in the scope of cable laying but exclusive of supply & erection of GI Perforated tray.	
15.1a	Supply of 1 P x 1.5 mm²- Individual Screened	275 Mtrs.
15.1b	Installation, testing and commissioning of 1 P x 1.5 mm²- Individual Screened	275 Mtrs.
15.2a	Supply of 1 P x 1.5 mm²- Individual Screened	100 Mtrs.
15.2b	Installation, testing and commissioning of 1 P x 1.5 mm²- Individual Screened	100 Mtrs.
15.3a	Supply of 4 P x 1.5 mm²- Overall Screened	440 Mtrs.
15.3b	Installation, testing and commissioning of 4 P x 1.5 mm²- Overall Screened	440 Mtrs.
15.4a	'Supply of 6 P x 1.5 mm²- Overall Screened + Individual Screened	665 Mtrs.
15.4b	Installation, testing and commissioning of 6 P x 1.5 mm² - Overall Screened + Individual Screened	665 Mtrs.
15.5a	Supply of 6 P x 1.5 mm²- Overall Screened	125 Mtrs.
15.5b	Installation, testing and commissioning of 6 P x 1.5 mm² - Overall Screened	125 Mtrs.
15.6a	Supply of 12 P x 1.5 mm²- Overall Screened	685 Mtrs.
15.6b	Installation, testing and commissioning of 12P x 1.5 mm²- Overall Screened	685 Mtrs.
15.7a	'Supply of 12 P x 1.5 mm²- Overall Screened + Individual Screened	30 Mtrs.
15.7b	Installation, testing and commissioning of 12P x 1.5 mm²- Overall Screened + Individual Screened	30 Mtrs.
15.8a	Supply of 24 P x 1.5 mm² , Overall Screened	60 Mtrs.
15.8b	Installation, testing and commissioning of 24P x 1.5	60 Mtrs.

	mm²- Overall Screened	
15.9a	Supply of 1T x 1.5 mm²- Individual Screened	480 Mtrs.
15.9b	Installation, testing and commissioning of 1T x 1.5 mm²- Individual Screened	480 Mtrs.
15.10a	Supply of RS-485 serial communication Cable (2P x 1.0 mm², Type-II)	350 Mtrs.
15.10b	Installation, testing and commissioning of RS-485 serial communication Cable (2P x 1.0 mm², Type-II)	350 Mtrs.
15.11a	Supply of 6T x 1.5 mm²- Individual Screened + Overall Screened	375 Mtrs.
15.11b	Installation, testing and commissioning of 6T x 1.5 mm² Individual Screened + Overall Screened	375 Mtrs.
15.12a	Supply of 8T x 1.5 mm²- Individual Screened + Overall Screened	0 Mtrs.
15.12b	Installation, testing and commissioning of 8T x 1.5 mm² Individual Screened + Overall Screened	0 Mtrs.
15.13a	Supply of 2C x 1.5 mm²- Individual Screened + Overall Screened	120 Mtrs.
15.13b	Installation, testing and commissioning of 2C x 1.5 mm² Individual Screened + Overall Screened	120 Mtrs.
15.14a	Supply of 12T x 1.5 mm²- Individual Screened + Overall Screened	0 Mtrs.
15.14b	Installation, testing and commissioning of 12T x 1.5 mm² Individual Screened + Overall Screened	0 Mtrs.
15.15a	Supply of 8C x 1.5 mm²- Individual Screened + Overall Screened	250 Mtrs.
15.15b	Installation, testing and commissioning of 8C x 1.5 mm² Individual Screened + Overall Screened	250 Mtrs.
16.1a	Supply of Multi cable Transit blocks for all the cables	1 Lot

	entering in control room for all the Terminals (including 100% spares)	
16.1b	Installation , testing and commisioning of Multi cable Transit blocks for all the cables entering in control room for all the Terminals (including 100% spares)	1 Lot
16.2a	Supply of Insulated cable glands for all the instruments and GOOVs for Spread-1A*	25 Nos.
16.2b	Installation , testing and commisioning of Insulated cable glands for all the instruments and GOOVs for Spread-2C*	25 Nos.
16.3a	Supply of dielectric fittings for tubing works at all SV stations	2 Lot
16.3b	Installation, testing and commisioning of dielectric fittings for tubing works at all SV stations	2 Lot
17.0	Supply and erection of prefabricated perforated GI trays of thickness 2 mm including tees, bends and elbows, supply, fabrication and erection of required supports and painting of supports with one coat of primer as per IS:2074 and 2 coats of finished paint including supply of paint as per std. and direction of Engineer In-Charge.	
17.1a	Supply of 60 mm wide X 30 mm high*	200 Mtrs.
17.1b	Installation, testing and commissioning of 60 mm wide X 30 mm high*	200 Mtrs.
17.2a	Supply of 100 mm wide X 30 mm high*	100 Mtrs.
17.2b	Installation, testing and commissioning of 100 mm wide X 30 mm high*	100 Mtrs.
17.3a	Supply of 200 mm wide X 30 mm high*	150 Mtrs.
17.3b	Installation, testing and commissioning of 200 mm wide X 30 mm high*	150 Mtrs.
17.4a	Supply of 300 mm wide X 30 mm high*	150 Mtrs.

17.4b	Installation, testing and commissioning of 300 mm wide X 30 mm high*	150 Mtrs.
18.0	Excavation of trenches for burying the cables, preparation of same for laying of cable, filling with river sand, laying of brick, back filling and compacting of the excavated earth, cable route markers, etc. as per specifications including supply of sand and bricks and removal of surplus earth as per instructions of Engineer-in-Charge. Size of Trench : 600 mm (Width) X 675 mm (Depth)*	200 Mtrs.
19.0	EARTHING	
19.1	Supply, Laying, testing and Termination of 8 SWG G.I. Wire from earth grid to Field instruments/JBs/Control Panel (in tray and conduits as required) and 4 sq. mm. PVC insulated armoured copper cable from earth pit to the barrier earth bus bar (in trays/conduits/trenches as required) required for the complete Spread- 1A.	1 L.S
20	Start up & Commissioning of complete terminal instruments of the whole station including all labour, test equipments and other auxiliaries as required, tagging of all the instrumentation items including cables, etc., complete in all respects as per specifications/ drawings/ directions of Engineer-in-Charge. All necessary Testing and commissioning reports, as-built drawings etc., shall also be prepared and to be submitted to the purchaser/consultant	1 L.S.

Vendor shall have complete responsibility for all the items supplied by him including his sub Vendors if any. The Vendor's scope of work includes, but not limited to:

- Design & Engineering;
- Procurement, Supply, Inspection, Factory Testing and Acceptance
- Supervision of installation, field calibration / testing pre-commissioning & commissioning of the system;

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- Transportation, Transit Insurance, loading and unloading of material at IGGL site/ stores;
- Rectification of any damage (if any) occurred during transportation/ unloading / observed on receipt of material at site;
- Compliance of Checklist points during FAT, SAT, Site, stores (if any);
- Other General scope of work.

It is Vendor's responsibility to verify the selection of type of cable, material of construction of each component as per the data mentioned in individual specifications / data sheets. Vendor shall stand guarantee for all items supplied by them, including his brought-out items.

3.1 Notes to Vendor

Vendor shall submit datasheets and drawings for approval. Vendor to proceed further only upon approval of Vendor submitted documents.

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

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

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

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

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

Purchaser's inspector reserves the right to perform stage wise inspection and witness tests, as indicated in Specification for LPG Blending System at Manufacturer's works prior to shipment. Manufacturer shall give reasonable notice of time and shall provide without charge reasonable access and facilities

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

Vendor shall submit the delivery schedule for the items mentioned in clause no 5.0 for approval. Vendor to proceed further only upon approval of Vendor submitted Schedule.

4.0 WARRANTY

The Vendor will warrant the equipment to be free of defects in material and workmanship and that it is adequately engineered to fulfill the design and operating conditions specified herein. The Vendor shall replace and install without cost to EPC Contractor any materials, supplies or equipment that fails under design conditions due to defects in design, material, or workmanship. If a defect is observed and/or such failure occurs within one (1) year from the date such equipment is put into operation, the Vendor shall replace and install without cost to EPC Contractor any materials, supplies or equipment involved.

Vendor shall provide another twelve (12) months warranty period for any repair or replacement in whole or in part made during the warranty period beginning on the day of satisfactory restoration of services. If the repair or replacement during the warranty period concerns an essential component, the new warranty shall extend to the whole equipment.

5.0 VENDOR DOCUMENTS

This section describes the Vendor Data Requirements applicable to a Vendor's scope. The Vendor data requirements shall be as mentioned in Instrument specification.

Vendor shall submit, as a condition of Purchase Order or Contract, all data requirements specified on the Vendor Data Requirements. Electronic copies of all drawings will be provided on CD in DWG format for all drawing issues.

Each document submitted for review must be clear, legible, complete and properly identified. Failure to provide adequate documents may result in them being returned without review at Vendor's expense. In that event, Vendor will be considered not to have formerly submitted the documents so returned.

Vendor shall submit accurate, properly checked documents approved by the responsible Engineer(s). The documents shall be in English language. Dimensions, weights, and measures for drawings, etc. to be in SI units

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Vendor shall submit Manufacturers Record Books with all certification, test and inspection information of a manufactured item.

Additionally, Vendor shall provide Vendor Data Books consisting of all pertinent Manufacturer's technical data and information relating to all the various elements of the units supplied by the Vendor. The data and information shall pertain to the facilities as a whole, to each major system, to each subsystem and every component. The Data Books shall commence with copy of the Purchase Order (pricing information may be blanked out) followed by the manufacturer's equipment brochures, data sheets, certificates, parts list and relevant "As Built" drawings.

5.1 Vendor Drawing Review

Drawings returned to Vendor for correction after markup by Company and / or Company designated representative shall be resubmitted by Vendor until "Proceed with Fabrication Issue Final Drawings". All revisions to documents must be clouded and identified with the revision number contained within a triangle placed beside the cloud.

Vendor shall not proceed with changes having a commercial impact unless authorized by Change Order.

If, for any reason, Vendor believes that he is not able to comply with Purchaser and / or Purchaser's designated representative marked-up comments on documents returned after review, Vendor shall notify, in writing, Purchaser within five (5) working days of receipt, giving his reasons and requesting a resolution. It is not acceptable to ignore marked-up comments.

Vendor must submit updated documents and drawings one (1) weeks after return of approved documents.

Drawings and data approval do not relieve Vendor of his responsibility to meet Purchase Order or contract conditions relating to specifications, material design or construction, and delivery requirements, nor relieve Vendor of responsibility for compliance with laws, codes and regulations.

6.0 PACKAGE AND STORAGE

Preparation for shipment shall be in accordance with the Vendor's standards and as noted herein. Vendor shall be solely responsible for the adequacy of the preparation for shipment provisions with respect to materials and application,

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and to provide equipment at the destination in ex-works condition when handled by commercial carriers.

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

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PROJECT NUMBER- C211052



INSTRUMENT DATASHEETS FOR FIELD INSTRUMENTS

CLIENT JOB No.

C211052

TOTAL SHEETS

31

DOCUMENT No.

C211052

00

IN


DS

5003

NORTH EAST GAS GRID PHASE -III OF IGGL

INDRADHANUSH GAS GRID LTD.

D1	09.12.2022	Issued for Bid	VK	DGM	KNC
A1	07.12.2022	Issued for Internal Review	VK	DGM	KNC
REV	DATE	DESCRIPTION	PREP	CHK	APPD


PRESSURE GAUGE										Rev.
GENERAL	1	Tag Number		Quantity		Refer Attachment- 1 & 2		Refer Annexure-1 & 2		
	2	Line No		Equipment No.		Refer Doc: Instrument Index (C221052-DIPL/SGPL-IN-IIX-5001)		Refer Doc: Instrument Index (C221052-DIPL/SGPL-IN-IIX-5001)		
	3	P&ID Number		Vendor		Refer Attachment- 1 & 2		*		
	4	Manufacturer		Model No.		*		*		
	5	Process Pipe Connection Size				3/4"				
GAUGE	6	Type			Bourdon					
	7	Case	Type		Direct					
	8		Material		SS316					
	9		Mounting		Local					
	10		Bezel		Bayonet					
	11		Glass Type		Shatter Proof Glass					
	12		Blowout Device		Required					
	13		Gasket Material		*					
	14	Dial Size	Dial Color		150 mm		White with Black Marking			
	15	Enclosure Class			IP - 65					
16	Range			Refer Process Datasheet						
ELEMENT	17	Type	Accuracy		C-type Bourdon		±1% FSD			
	18	Element Material	Socket Material		SS316		SS316			
	19	Movement Material			SS316					
	20	Conn. Size/Type	Connection Location		1/2" NPTM		Bottom			
	21	Zero Adjustment			Micropointer					
	22	Blow Out Protection	Over-Range Protection		Required		Required, 130% of Full Scale			
SEAL	23	Type	Model No.		NA					
	24	Wetted Parts Material	Seal Material							
	25	Housing Lower Material	Housing Upper Material							
	26	Conn. Size/Type	Connection Rating							
	27	Seal Flush Conn.	O-Ring Material							
	28	Seal Fill Fluid								
	29	Design Pressure								
MISC.	30	Manifold Type			2 valve Manifold		Direct			
	31	Manifold Manufacturer	Manifold Model No.		*		*			
	32	Manifold Material			SS316					
	33	Mounting Bracket			Required					
	34	Drain Valve - Type & Size			Needle Valve / 1/4" NB, SW					
	35	Flush ring			NA					
	36	Gauge Manufacturer	Model No.		*		*			
Notes:										
1	* By Vendor									
2	Calibration & Material Test certificates shall be provided by the Vendor.									
3	Tagplate (SS316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).									
4	Pressure gauge shall be selected in such a manner that normal operating pressure is approximately in the middle third of full scale (30% - 70% of range).									
5	Pressure gauge shall be fitted with blow-out protection at back and shall have a over-range protection of 130% of max. reading.									
 ENERGISING QUALITY	CLIENT:		INDRADHANUSH GAS GRID LIMITED							
	PROJECT:		NORTH EAST GAS GRID PHASE -III OF IGGL-PART D1 & D2			D1		09.12.2022		VK
						A1		07.12.2022		VK
						REV.		DATE		PRPD
									DGM	KNC
									DGM	KNC
Document No.: C211052-00-IN-DS-5001										

Attachment-2 (Pressure Gauge)							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
Spread-2B							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-14-PG-1401	Natural Gas	C221052-SGPL-PC-PID-1005	25-50/-29-65	37/92	*	
2	C221052-14-PG-1402	Natural Gas	C221052-SGPL-PC-PID-1005	25-50/-29-65	37/92	*	
Spread-2C							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-15-PG-1501	Natural Gas	C221052-SGPL-PC-PID-1006	25-50/-29-65	37/92	*	
2	C221052-15-PG-1502	Natural Gas	C221052-SGPL-PC-PID-1006	25-50/-29-65	37/92	*	
3	C221052-16-PG-1601	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
4	C221052-16-PG-1602	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
5	C221052-16-PG-1603	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
6	C221052-16-PG-1604	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
7	C221052-16-PG-1605	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
8	C221052-16-PG-1606	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
9	C221052-16-PG-1607	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
10	C221052-16-PG-1608	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
11	C221052-16-PG-1609	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
12	C221052-16-PG-1610	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
13	C221052-16-PG-1611	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
14	C221052-16-PG-1612	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
15	C221052-16-PG-1613	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
16	C221052-16-PG-1614	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
17	C221052-16-PG-1615	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
18	C221052-16-PG-1616	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
19	C221052-16-PG-1617	Natural Gas	C221052-SGPL-PC-PID-1007	25-50/-29-65	37/92	*	
20	C221052-17-PG-1701	Natural Gas	C221052-SGPL-PC-PID-1008	25-50/-29-65	37/92	*	
21	C221052-17-PG-1702	Natural Gas	C221052-SGPL-PC-PID-1008	25-50/-29-65	37/92	*	

Annexure-2**Document No. C221052-DIPL-IN-DS-5001****PIPELINE SCHEMATIC DIAGRAM FOR NORTH EAST GAS GRID PHASE-III OF IGGL****Total Qty.of Pressure gauge = 12 NOS.****Total Qty.of Pressure Gauge low range with gauge saver = 7 NOS.**

SPREAD 2B	SV/SGPL/04 (Pressure Gauge)	QTY 1	TOTAL QTY 02
	SV/SGPL/04 (Pressure gauge low range with gauge saver)	QTY 1	

SPREAD 2C	SV/SGPL/05 (Pressure Gauge)	QTY 1	TOTAL QTY 21
	SV/SGPL/05 (Pressure gauge low range with gauge saver)	QTY 1	
	INTERMEDIATE-PIPING TERMINAL (Pressure Gauge)	QTY 11	
	INTERMEDIATE-PIPING TERMINAL (Pressure gauge low range with gauge saver)	QTY 6	
	SV/SGPL/06 (Pressure Gauge)	QTY 1	
	SV/SGPL/06 (Pressure gauge low range with gauge saver)	QTY 1	

TEMPERATURE GAUGE						Rev.		
GENERAL	1	Tag Number		Refer Attachment-1 & 2(Temperature Gauge)				
	2	P&ID Number	Quantity	Refer Doc: Instrument Index (C221052-DIPL/SGPL-IN-IIIX-5001)	Refer Annexure-1 & 2			
	3	Line No/Equipment No		Refer Attachment-1 & 2(Temperature Gauge)				
	4	Piping Class and Rating		Refer PMS				
	5	Manufacturer	Model No.	*	*			
PROCESS DATA	6	Service		Refer Annexure-1 & 2				
	7	Fluid	Phase	Natural Gas	Gas			
	8	Corrosive	Erosive	Refer Process Datasheet				
	9	Operating Pressure (Min/Nor/Max) (Kg/Cm ² g)						
	10	Operating Temperature (Min/Nor/Max) (Deg.C)						
	11	Design Pressure (Kg/Cm2g)	Design Temperature (Deg.C)					
	12	Viscosity (cP)	Density (Kg/m ³)					
	13	Flow (Kg/hr)		NA				
GAUGE	14	Type	Thermowell	Bi-Mettalic	Required			
	Mounting		Direct					
	15	Case material		SS316	*			
	16	Cage ring type		Bayonet*				
	17	Mounting Connection		1/2" NPTM				
	18	Dial Size	Scale Type	150 mm	All angle rotatable			
	19	Marking	Scale Color	White with black marking	Black			
	20	Dial material		Aluminium				
	21	Lens / Window material		Shatter Proof Glass (3mm thickness)				
	22	Accuracy		Class 1 as per EN13190.				
	23	Over Range Protection		130 % of Range				
	24	Zero Adjustment		External Zero Adjustment				
	25	Enclosure Class		IP-65				
	26	Dial adjustments		Rotatable at all angles				
	27	Instrument Range		Refer Attachment-3				
BIMETAL ELEMENT	28	Type		Adjustable union				
	29	Material		SS316				
	30	Connection Size		1/2" NPTM				
	31	Stem length (L Dim)	stem diameter	To suit insertion length (U)	To suit well			
	32	Zero Adjustment	Temp. Range	Micrometer pointer	Refer Process Datasheet			
FIELD SYSTEM	33	Compensation	SEMA Class	N/A				
	34	Bulb Type	Bulb material					
	35	Bulb extension type	Bulb Dia.					
	36	Capillary length	Capillary material					
	37	Armour Flexible	Armour material					
THERMOWELL	38	Type		Tapered				
	39	Construction	Material	Drilled Bar Stock	SS 316			
	40	Process Connection	Instrument Connection	1.5" 900# RTJ Flange	1/2 " NPTF			
	41	Outside Dia (OD)	Bore	*	*			
	42	Tip Diameter	Tip Thickness	*	*			
	43	Lag Length	Insertion Length (U)	*	Refer Process Datasheet			
	44	Maximum Allowable Insertion (U)		*				
Notes:								
1	Vendor to specify. *							
2	Calibration & material certificates shall be provided by the Vendor.							
3	Tagplate (SS316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).							
4	Temperature Gauge shall be selected in such a manner that normal operating temperature is approximately in the middle third of full scale (30% - 70% of range).							
5	Vendor to perform natural frequency and wake frequency calculations of thermowell as per ASME PTC 19.3 and submit the same for review and approval.							
6	Thermowell Rating shall be 900# class.							
	CLIENT:	INDRADHANUSH GAS GRID LIMITED		D1	09.12.2022	VK	DGM	KNC
	PROJECT:	NORTH EAST GAS GRID PHASE -III OF IGGL- PART D1 & D2		A1	08.12.2022	VK	DGM	KNC
	REV.	DATE	PRPD	CHKD	APPD			
Document No.: C211052-00-IN-DS-5013								

Attachment-1 (Temperature Gauge)							
Spread-2C							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-16-TG-1601	Natural Gas	C221052-SGPL-PC-PID-1008	0-55/(-29)-65	30/92	*	
Document No. C221052-SGPL-IN-DS-5013							


Annexure-2

Document No.: C211052-00-IN-DS-5013

PIPELINE SCHEMATIC DIAGRAM FOR NORTH EAST GAS GRID PHASE-III OF IGGL

Total Qty.of Temperature gauge = 1 NOS.

SPREAD 2C	INTERMEDIATE-PIPING TERMINAL (Temperature Gauge)	QTY 1	TOTAL QTY 1
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PRESSURE TRANSMITTER							Rev.	
GENERAL	1	Tag Number		Refer Attachment- 1 & 2(Pressure Transmitter)				
	2	P&ID Number	Quantity	Refer Attachment- 1 & 2(Pressure Transmitter)	Refer Annexure-1 & 2			
	3	Line No/Equipment No.		Refer Doc: Instrument Index (C221052-DIPL/SGPL-IN-IIX-5001)				
	4	Enclosure Type		IP-65 , Ex 'ia'				
	5	Hazardous Area Classification		Zone 1 Group IIA /IIB as per IEC, T3				
	6	Process Pipe Connection Size		3/4"				
PROCESS DATA	7	Service		Natural Gas				
	8	Fluid	Phase	Refer Process Datasheet				
	9	Corrosive	Erosive					
	10	Pressure (Min/Nor/Max) (Kg/cm2g)						
	11	Temperature (Min/Nor/Max) (°C)						
	12	Design Pressure (Kg/cm2g)	Design Temperature (°C)					
	13	Viscosity (cP)	Liquid Density (kg/m3)					
	14	Steady / Pulsating	% Solids					
	15	Ambient Temperature						
BODY AND SENSOR	16	Sensor Type		Capacitance type / Piezo-resistive Type				
	17	Instrument Connection Size		1/2" NPTM				
	18	Body Material	Sensor Material	Aluminium Epoxy Coated	SS316			
	19	Seal Ring Material		*				
	20	Fill Fluid		Silicone Oil				
	21	Design Pressure		*				
	22	Design Temperature		*				
	23							
	24							
TRANSMITTER	25	Type		2 Wire , SMART, HART				
	26	Output	Power Supply	4 - 20 mA HART	24 VDC 2-wire loop powered			
	27	Instrument Range (Kg/cm2g)		*				
	28	Calibrated Range (Kg/cm2g)		Refer Process Datasheet				
	29	Accuracy	Response Time	±0.1%	*			
	30	Damping	Failure Mode Output	*	*			
	31	Integral Indicator		Required				
	32	Electrical Connection Size		1/2" NPT x 2 entries				
	33	Elevation / Suppression		N/A				
	34	Ambient Temperature Rating		*				
	35							
SEAL	36	Seal Conn Size	Conn Type & Rating	N/A				
	37	Diaphragm Material	Seal Flange Material					
	38	Capillary Conn Size	Capillary Conn Type					
	39	Capillary Material	Capillary Length					
	40	Fill Fluid						
	41	Seal Design Pressure						
	42	Seal Design Temperature						
	43							
MISC.	44	Manifold Type	Manifold Material	2 Valve Manifold	SS316			
	45	Manifold Manufacturer	Manifold Model No.	*	*			
	46	Lightning Protection		N/A				
	47	Drain Valve - Type & Size		*				
	48	Mounting Bracket		Required				
	49	Manufacturer	Model No.	*	*			
Notes:								
1 * Vendor to specify								
2 Calibration, material and hazardous area certificates shall be provided by the Vendor.								
3 Tagplate (SS316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).								
4 Pressure transmitter shall be of the direct sensing type with the sensing element as per Manufacturer's standard.								
6 Pressure Transmitter shall be selected in such a manner that normal operating Pressure is approximately in the middle third of full scale (50% - 70% of range).								
7 Pressure Transmitter shall be of SIL 2 rated.								
8 Load driving capacity of transmitter shall be 600 Ohms (minimum) at 24 Volts DC.								
	CLIENT:	INDRADHANUSH GAS GRID LIMITED		D1	09.12.2022	VK	DGM	KNC
	PROJECT:	NORTH EAST GAS GRID PHASE -III OF IGGL- PART D1 & D2		A1	08.12.2022	VK	DGM	KNC
				REV.	DATE	PRPD	CHKD	APPR
Document No.: C211052-00-IN-DS-5005								

Attachment-2 (Pressure Transmitter)							
Spread-2B							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-14-PIT-1401	Natural Gas	C221052-SGPL-PC-PID-1005	0-55/(-29)-65	30/92	*	
2	C221052-14-PIT-1402	Natural Gas	C221052-SGPL-PC-PID-1005	0-55/(-29)-65	30/92	*	
Spread-2C							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-15-PIT-1501	Natural Gas	C221052-SGPL-PC-PID-1006	0-55/(-29)-65	30/92	*	
2	C221052-15-PIT-1502	Natural Gas	C221052-SGPL-PC-PID-1006	0-55/(-29)-65	30/92	*	
3	C221052-16-PIT-1601	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
4	C221052-16-PIT-1602	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
5	C221052-16-PIT-1603	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
6	C221052-16-PIT-1604	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
7	C221052-16-PIT-1605	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
8	C221052-16-PIT-1606	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
9	C221052-17-PIT-1701	Natural Gas	C221052-SGPL-PC-PID-1008	0-55/(-29)-65	30/92	*	
10	C221052-17-PIT-1702	Natural Gas	C221052-SGPL-PC-PID-1008	0-55/(-29)-65	30/92	*	
Document No. C221052-SGPL-IN-DS-5005							

Annexure-2

Document No.: C211052-00-IN-DS-5005

PIPELINE SCHEMATIC DIAGRAM FOR NORTH EAST GAS GRID PHASE-III OF IGGL

Total Qty.of Pressure Transmitter = 12 Nos.

SPREAD 2B	SV/SGPL/04	QTY 2	TOTAL QTY 02
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SPREAD 2C	SV/SGPL/05	QTY 2	TOTAL QTY 10
	INTERMEDIATE-PIPING TERMINAL	QTY 6	
	SV/SGPL/06	QTY 2	

TEMPERATURE TRANSMITTER WITH SKIN TYPE RTD							REV.
GENERAL	1	Tag Number		Refer Attachment- 1 & 2 (Temperature Transmitter- Skin Type)			
	2	P&ID Number	Quantity	Refer Attachment- 1 & 2 (Temperature Transmitter- Skin Type)	Refer Process Datasheet & Annexure- 1 & 2		
	3	Line No/Equipment No		Refer Doc.-Instrument Index(C221052-DIPL/SGPL-IN-IIIX-5001)			
	4	Enclosure Type		IP-65 , Ex 'ia'			
	5	Hazardous Area Classification		Zone 1 Group IIA /IIB as per IEC, T3			
PROCESS DATA	6	Service fluid		Refer Process Datasheet			
	7	Fluid state	Phase				
	8	Errosive & Corrosive is due to					
	9	Flammable	Toxic				
	10	Operating Pressure (Min/Nor/Max) Kg/cm ² g					
	11	Operating Temperature (Min/Nor/Max) (Deg.C)					
	12	Design Pressure	Design Temperature				
	13	Viscosity (cP)	Density (Kg/m ³)				
	14	Velocity (m/s)					
	15	Ambient Temperature Rating (⁰ C)					
	16						
SENSOR & HEAD	17	Element type		Wire wound Pt RTD,100 ohm resistance at 0 Deg.C with at least 3 meters of lead wire.			
	18	Element Range		-200 to 850 Deg C			
	19	Element Length		* (to suit assembly)			
	20	No of Elements		Duplex RTD, 3 Wire			
	21	Lead Wire		PTFE insulated Lead wire. Size (1X7X0.2mm), 6 Nos., 3000mm long			
	22	Extended Cable		SS armour with PVC extrusion with PTFE insulated lead wires with overall PTFE insulation.			
	23	Sleeve		PTFE over SS cold end pot			
	24	Extension Leads		26 AWG Stranded Nickel plated Copper Teflon Insulated			
	25	Washer		SS			
	26	Sheath diameter	Sheath Material	6 mm	SS316		
	27	Calibration		As per IEC 60751			
	28	Accuracy		Class A			
	29	Cable Entry		1/2" NPT x 2 entries			
	30	Make & Model		*			
	WELD PAD	31			N/A		
32		Electrical Connection Size		1/2" NPT x 2 entries			
33		Ambient Temperature Rating		N/A			
34		Connection Type / Mounting		Weld Pad			
35		Weld Pad Material		SS316			
36		Pad Dimensions		Refer Note-4			
37		Weld Pad Bore Diameter for RTD insertion		*			
38		Bore Length within Weld Pad		*			
39							
TRANSMITTER	40	Type		2 Wire , SMART, HART			
	41	Output	Power Supply	4 - 20 mA HART	24 VDC loop powered		
	42	Instrument Range (⁰ C)		*			
	43	Calibrated Range (⁰ C)	Input	Refer Process Datasheet	Directly Connected to RTD (PT-100)		
	44	Accuracy	Response Time	±0.1%	*		
	45	Damping	Failure Mode Output	*			
	46	Integral Indicator		Required			
	47	Electrical Connection Size		1/2" NPT x 2 entries			
	48	Ambient Temperature Rating		N/A			
MISC.	49	SIL requirement		Required, SIL 2 certified			
	50	Mounting Location		Stanchion			
	51	Mounting Bracket		Required			
	52	Manufacturer	Model No.	Required, 2" Pipe mount	*		
	53						
	54						
	Notes:						
1	Vendor to specify. *						
2	Calibration, material and hazardous area certificates shall be provided by the Vendor.						
3	Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).						
4	Skin type RTD element shall be designed to be mounted in weld pad which shall be welded on to the pipe. Connection of RTD to Weld pad shall be as per manufacturer's standard.						
5	Vendor shall submit test certificates in compliance with EN 10204 "Type 3.1 " inspection certificates.						
6	Cable shall have individual & overall teflon insulation with SS braided with overall insulation.						
7	Canopy of Transmitters shall be in Vendor scope, and Transmitter shall be provided with canopy of MOC GRP						
8	All Skin type RTD shall be supplied with PVC conduit.						
9	Extension lead wire shall be 26 AWG stranded nickel plated copper teflon insulated.						
10	Load driving capacity of transmitter shall be 600 Ohms (minimum) at 24 Volts DC.						
	CLIENT:	INDRADHANUSH GAS GRID LIMITED					
	PROJECT:	NORTH EAST GAS GRID PHASE -III OF IGGL-PART D1 & D2	D1	09.12.2022	VK	DGM	KNC
			A1	08.12.2022	VK	DGM	KNC
			REV	DATE	PRPD	CHKD	APPR
Document No.: C211052-00-IN-DS-5003							

Attachment-2 (Temperature Transmitter With Skin Type RTD)							
Spread-2B							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-14-TIT-1401	Natural Gas	C221052-SGPL-PC-PID-1005	0-55/(-29)-65	30/92		
Spread-2C							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-15-TIT-1501	Natural Gas	C221052-SGPL-PC-PID-1006	0-55/(-29)-65	30/92		
2	C221052-16-TIT-1602	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92		
3	C221052-16-TIT-1603	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92		
4	C221052-17-TIT-1701	Natural Gas	C221052-SGPL-PC-PID-1008	0-55/(-29)-65	30/92		
Document No. C221052-SGPL-IN-DS-5003							

Annexure-2


Document No.: C211052-00-IN-DS-5003

PIPELINE SCHEMATIC DIAGRAM FOR NORTH EAST GAS GRID PHASE-III OF IGGL

Total Qty.of Temperature Transmitter (Skin Type) = 05 Nos.

SPREAD 2B	SV/SGPL/04 (Skin Type)	QTY 1	TOTAL QTY 1
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SPREAD 2C	SV/SGPL/05 (Skin Type)	QTY 1	TOTAL QTY 4
	Intermediate Pigging Station at Lava	QTY 2	
	SV/SGPL/06(Skin Type)	QTY 1	

TEMPERATURE TRANSMITTER WITH RTD THERMOWELL							Rev.
GENERAL	1	Tag Number		Refer Attachment-1 & 2 (Temperature Transmitter)			
	2	P&ID Number	Quantity	Refer Attachment-1 & 2 (Temperature Transmitter)	Refer Annexure- 1 & 2		
	3	Line No/Equipment No		Refer Doc: Instrument Index (C221052-DIPL/SGPL-IN-IIX-5001)			
	4	Enclosure Type		IP-65 , Ex 'ia'			
	5	Hazardous Area Classification		Zone 1 Group IIA /IIB as per IEC, T3			
	6	Ambient Temperature		Refer Process Datasheet			
PROCESS DATA	7	Service		Refer Process Datasheet			
	8	Fluid	Phase				
	9	Corrosive	Erosive				
	10	Operating Pressure (Min/Nor/Max) (Kg/cm2g)					
	11	Operating Temperature (Min/Nor/Max) (Deg.C)					
	12	Design Pressure (Kg/cm2g)	Design Temperature (Deg.C)				
	13	Viscosity (cP)	Density (Kg/m³)				
	14	Velocity (m/s)					
ELEMENT	15						
	16	Type	Material	RTD-Pt100	SS316		
	17	Simplex/Duplex	Grounded	Duplex	N/A		
	18	Cold Junciton Comp.	Ice Point Resistance	*	*		
	19	Temperature Range		*			
	20	Mounting Connection		1/2" NPTM			
	21	Sheath Material	Outside Diameter	*	*		
	22	No. of Lead Wires	Termination Type	*	*		
	23	Vibration Req.	Spring Loaded	*	*		
	24	Replacement Element Length		*			
HEAD	25						
	26	Type		Screwed Cap with SS chain			
	27	Material		Die Cast Aluminium			
	28	Mounting Connection	Conduit Connection	1/2" NPTF	1/2" NPT		
	29	Nipple	Union	*	1/2" NPT		
	30	Nipple/Union/Nipple Length		To suit well and element			
THERMMOWELL	31						
	32	Type		Tapered			
	33	Construction	Material	Drilled Bar Stock	SS 316		
	34	Process Connection	Instrument Connection	1.5 " 900# RTJ Flange	1/2 " NPTF		
	35	Outside Dia (OD)	Bore	*	*		
	36	Tip Diameter	Tip Thickness	*	*		
	37	Lag Length	Insertion Length (U)	*	*		
	38	Maximum Allowable Insertion (U)		*			
TRANSMITTER	39						
	40	Type		2 Wire , SMART, HART			
	41	Output	Power Supply	4 - 20 mA HART	24 VDC loop powered		
	42	Instrument Range (°C) *		*			
	43	Calibrated Range (°C)		Refer Attachment-2			
	44	Accuracy	Response Time	±0.1%	*		
	45	Damping	Failure Mode Output	*	*		
	46	Integral Indicator		Required			
	47	Electrical Connection Size		1/2" NPT x 2 entries			
	48	Ambient Temperature Rating		N/A			
MISC.	49	SIL requirement		Required, SIL 2 certified			
	50	Mounting Location		Stanchion			
	51	Lightning Protection		N/A			
	52	Mounting Bracket		Required			
	53	Manufacturer	Model No.	*	*		
Notes:							
1	Vendor to specify. *						
2	Calibration, material and hazardous area certificates shall be provided by the Vendor.						
3	Tagplate (SS316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).						
4	Temperature Transmitter shall be selected in such a manner that normal operating temperature is approximately in the middle third of full scale (50% - 70% of range).						
5	Vendor to perform natural frequency and wake frequency calculations of thermowell as per ASME PTC 19.3 and submit the same for review and approval.						
6	Thermowell Rating shall be 900# RTJ Type class.						
7	Load driving capacity of transmitter shall be 600 Ohms (minimum) at 24 Volts DC.						
	CLIENT:	INDRADHANUSH GAS GRID LIMITED					
	PROJECT:	NORTH EAST GAS GRID PHASE -III OF IGGL-PART D1 & D2		D1	09.12.2022	VK	DGM
				A1	08.12.2022	VK	DGM
				REV.	DATE	PRPD	CHKD
							APPD
Document No.: C211052-00-IN-DS-5004							

Annexure-2


Document No.: C211052-00-IN-DS-5004

PIPELINE SCHEMATIC DIAGRAM FOR NORTH EAST GAS GRID PHASE-III OF IGGL

Total Qty.of Temperature Transmitter = 01 Nos.

SPREAD 2C		QTY 1	TOTAL QTY 1
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INTERMEDIATE-PIPING TERMINAL

OPEN PATH GAS DETECTOR				Rev.			
GENERAL	S No.						
	1	Tag Number	Refer Attachment-1 & 2 (Open Path Gas Detectors)				
	2	Quantity	Refer Annexure 1 & 2				
	3	Ambient Temperature (°C)	Refer Process Datasheet				
	4	Relative Humidity (RH)	Refer Process Datasheet				
	5	Service	Natural Gas				
	6	% of Governing Component in Gas	Refer Process Datasheet				
	7	Monitoring system	Gas detection system				
	8	Area Classification	Zone-1, IIA/IIB,T3				
	9	Certification	ATEX or IECx with PESO				
	10	Operating Temperature (°C)	Refer Process Datasheet				
TRANSMITTER & RECEIVER	11						
	12	Sensor Type	IR Absorption Type				
	13	Output	4~20 mA, HART				
	14	Power Supply	24 VDC*				
	15	Range	0 - 100% LEL (0 - 5 LEL.Meters)				
	16	Response time	T50 < 3 Seconds				
	17	Accuracy	± 3% of FS				
	18	Distance B/w Transmitter & Receiver	30 Mtrs*				
	19	Transmitter / Receiver Cable Entry	M15 X 1.5				
	20	Enclosure Material	SS316				
	21	Enclosure Protection	Ex 'd', IP 67				
OTHERS	22	Power Consumption	*				
	23	SIL Certification	SIL 3				
	24						
	25	Rain Guard Protection	Required				
	26	Mounting Accessories	Mounting Brackets with Swivel mounting accessories				
	27	Site Alignment Kit	Required				
	28						
Notes : To be decide**							
1	Vendor to specify. *						
2	Tagplate (SS316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).						
3	Calibration and hazardous area certificates shall be provided by the Vendor.						
4	Vendor to consider sunshade (MOC: FRP) and mounting accessories in the offer						
5	Vendor to include commissioning spares and 2 years operating spares in the offer.						
 ENERGISING QUALITY	CLIENT:	INDRADHANUSH GAS GRID LIMITED	D1	09.12.2022	VK	DGM	KNC
			A1	08.12.2022	VK	DGM	KNC
	PROJECT:	NORTH EAST GAS GRID PHASE -III OF IGGL-PART-D1 & D2	REV.	DATE	PRPD	CHKD	APPD
Document No.: C211052-00-IN-DS-5006							

Attachment-2 (Open Path Gas Detector)							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
Spread-2C							
1	C221052-16-OPGD-1601A	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
2	C221052-16-OPGD-1601B	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
3	C221052-16-OPGD-1602A	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
4	C221052-16-OPGD-1602B	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
Document No. C221052-SGPL-IN-DS-5006							

Annexure-2

Document No.: C211052-00-IN-DS-5006

PIPELINE SCHEMATIC DIAGRAM FOR NORTH EAST GAS GRID PHASE-III OF IGGL

Total Qty.of Open path type gas detector (OPGD)= 02 Nos.

SPREAD 2C	DISPATCH TERMINAL -: Open path type gas detector (OPGD)	QTY 2	TOTAL QTY 02
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[illegible]


Attachment-2 (Point Gas Detector)							
Spread-2B							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-14-PGD-1401	Natural Gas	C221052-SGPL-PC-PID-1005	0-55/(-29)-65	30/92	*	
2	C221052-14-PGD-1402	Natural Gas	C221052-SGPL-PC-PID-1005	0-55/(-29)-65	30/92	*	
Spread-2C							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-16-PGD-1601	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
2	C221052-16-PGD-1602	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
3	C221052-16-PGD-1603	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
4	C221052-16-PGD-1604	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
5	C221052-16-PGD-1605	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
6	C221052-16-PGD-1606	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
7	C221052-15-PGD-1501	Natural Gas	C221052-SGPL-PC-PID-1006	0-55/(-29)-65	30/92	*	
8	C221052-15-PGD-1502	Natural Gas	C221052-SGPL-PC-PID-1006	0-55/(-29)-65	30/92	*	
9	C221052-17-PGD-1701	Natural Gas	C221052-SGPL-PC-PID-1008	0-55/(-29)-65	30/92	*	
10	C221052-17-PGD-1702	Natural Gas	C221052-SGPL-PC-PID-1008	0-55/(-29)-65	30/92	*	

Annexure-2
Document No.: C211052-00-IN-DS-5007
PIPELINE SCHEMATIC DIAGRAM FOR NORTH EAST GAS GRID PHASE-III OF IGGL

Total Qty.of Point type gas detector (PGD)= 12 Nos.

SPREAD 2B	SV/SGPL/04 -: Point type gas detector (PGD)	QTY 2	TOTAL QTY 02
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SPREAD 2C	SV/SGPL/05 -: Point type gas detector (PGD)	QTY 2	TOTAL QTY 10
	INTERMEDIATE PIPING TERMINAL -: Point type gas detector (PGD)	QTY 6	
	SV/SGPL/06 -: Point type gas detector (PGD)	QTY 2	

MANUAL ALARM CALL POINT					Rev.		
GENERAL	S No.						
	1	Tag Numbers	Refer Attachment-1 & 2(Manual Call Points)				
	2	Quantity	Refer Annexure 1 & 2				
	3	Ambient Temperature	Refer Process Datasheet				
	4	Relative Humidity (RH)	Refer Process Datasheet				
	5	Operating Temperature	Refer Process Datasheet				
	6	Service	Natural Gas				
	7	Monitoring system	F&G System				
	8	Area Classification	Zone 1 Group IIA /IIB as per IEC, T3				
	9	Certification	ATEX, IECEx, UL & SIL3				
10	Flameproof:	ATEX Ex II 2GD, Exd IIC T6					
MCP	11	Enclosure Material:	Stainless Steel or Alloy				
	12	Weight & dimension:	Vendor to specify				
	13	Operating Voltage	24V d.c. loop				
	14	Contact Rating	2A				
	15	Output	Voltage free Contact to F&G System				
	16	Cable Entries	½” NPTF, 2 nos.				
	17	Finish Colour	EPOXY COATED, AS PER SHADE 631 OF IS- 5.				
	18	Switches	2 pole c/o, wired up to terminals.				
	19	MCP Type	Push button latching key reset				
	20	MCP Duty Level	Push Button				
	21	Mounting	Outdoor Pipe Mounting				
	22	No. of TERMINALS	Minimum 12 NOS., 2.5 mm2 SCREW CLAMP TYPE.				
	23	EARTHING	1 NO. INSIDE & 2 NOS. OUTSIDE.				
	24	NAME PLATE	SS. NAME CUM WARNING LABEL AS PER IS/IEC.REQUIREMENT.				
	25	Canopy over MCP	Required.2 mm thick GI sheet steel canopy for extra protection from top & two sides.				
	26						
Notes : To be decided**							
1	Vendor to specify. *						
2	Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).						
3	Calibration and hazardous area certificates shall be provided by the Vendor.						
4	Vendor to consider mounting accessories in the offer						
 ENERGISING QUALITY	CLIENT:	INDRADHANUSH GAS GRID LIMITED					
	PROJECT:	NORTH EAST GAS GRID PHASE -III OF IGGL- PART D1 & D2	D1	09.12.2022	VK	DGM	KNC
			A1	08.12.2022	VK	DGM	KNC
			REV.	DATE	PRPD	CHKD	APPR

Document No.: C211052-00-IN-DS-5008

Attachment-2 (Manual Call Points)							
Spread-2B							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-14-MCP-1401	Natural Gas	C221052-SGPL-PC-PID-1005	0-55/(-29)-65	30/92	*	
Spread-2C							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-15-MCP-1501	Natural Gas	C221052-SGPL-PC-PID-1006	0-55/(-29)-65	30/92	*	
2	C221052-16-MCP-1601	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
3	C221052-17-MCP-1701	Natural Gas	C221052-SGPL-PC-PID-1008	0-55/(-29)-65	30/92	*	
Document No. C221052-SGPL-IN-DS-5008							

Annexure-2
Document No.: C211052-00-IN-DS-5008

PIPELINE SCHEMATIC DIAGRAM FOR NORTH EAST GAS GRID PHASE-III OF IGGL

Total Qty.of Manual Call Point (MCP) = 04 Nos.

SPREAD 2B	SV/SGPL/04 -: Manual Call Point (MCP)	QTY 1	TOTAL QTY 01
------------------	---------------------------------------	-------	---------------------

SPREAD 2C	SV/SGPL/05 -: Manual Call Point (MCP)	QTY 1	TOTAL QTY 03
	INTERMEDIATE PIPING TERMINAL -: Manual Call Point (MCP)	QTY 1	
	SV/SGPL/06 -: Manual Call Point (MCP)	QTY 1	

[illegible]

Attachment-2 (Beacon)							
Spread-2B							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-14-BA-1401	Natural Gas	C221052-SGPL-PC-PID-1005	0-55/(-29)-65	30/92	*	
Spread-2C							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-15-BA-1501	Natural Gas	C221052-SGPL-PC-PID-1006	0-55/(-29)-65	30/92	*	
2	C221052-16-BA-1601	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
3	C221052-17-BA-1701	Natural Gas	C221052-SGPL-PC-PID-1008	0-55/(-29)-65	30/92	*	
Document No. C221052-SGPL-IN-DS-5009							

Annexure-2


Document No.: C211052-00-IN-DS-5009

PIPELINE SCHEMATIC DIAGRAM FOR NORTH EAST GAS GRID PHASE-III OF IGGL

Total Qty.of Beacon = 04 Nos.

SPREAD 2B	SV/SGPL/04 -: Beacon	QTY 1	TOTAL QTY 01
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SPREAD 2C	SV/SGPL/05 -: Beacon	QTY 1	TOTAL QTY 03
	INTERMEDIATE PIPING TERMINAL -: Beacon	QTY 1	
	SV/SGPL/06 -: Beacon	QTY 1	

HORN				Rev.			
GENERAL	S No.						
	1	Tag Number	Refer Attachment- 1 & 2(Hooter)				
	2	Quantity	Refer Annexure 1 & 2				
	3	Ambient Temperature	Refer Process Datasheet				
	4	Relative Humidity (RH)	Refer Process Datasheet				
	5	Service	Natural Gas				
	6	Monitoring system	Gas detection system				
	7	Area Classification	Zone-1, IIA/IIB,T3				
	8	Certification	ATEX or IECx with PESO				
	9						
HORN	10	Type	Dual Tone				
	11	Sound Level	90 dB @ 3 meter				
	12	Volume Adjustment	Required				
	13	Power Supply	24 VDC				
	14	Enclosure Material	SS316				
	15	Enclosure Protection	Ex 'd', IP 67				
	16	Cable Entry	M15 X 1.5				
	17	Power Consumption	*				
	18	SIL Certification	SIL 3				
	19						
OPTIONS	20	Mounting Accessories	Flush Mounting				
	21	Make & Model No.	*				
	22						
Notes :							
1	Vendor to specify. *						
2	Tagplate (SS316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).						
3	Hazardous area certificates shall be provided by the Vendor.						
4	Vendor to consider mounting accessories in the offer						
5	Vendor to include commissioning spares and 2 years operating spares in the offer.						
 ENERGISING QUALITY	CLIENT:	INDRADHANUSH GAS GRID LIMITED					
	PROJECT:	NORTH EAST GAS GRID PHASE -III OF IGGL- PART D1 & D2	D1	09.12.2022	VK	DGM	KNC
			A1	08.12.2022	VK	DGM	KNC
			REV.	DATE	PRPD	CHKD	APPD
Document No.: C211052-00-IN-DS-5009							

Attachment-2 (Hooter)							
Spread-2C							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-15-HA-1501	Natural Gas	C221052-SGPL-PC-PID-1006	0-55/(-29)-65	30/92	*	
2	C221052-16-HA-1601	Natural Gas	C221052-SGPL-PC-PID-1007	0-55/(-29)-65	30/92	*	
3	C221052-17-HA-1701	Natural Gas	C221052-SGPL-PC-PID-1008	0-55/(-29)-65	30/92	*	
Spread-2B							
SNo.	Tag.No	Fluid	P&ID Number	Temperature (Operating / Design) (degC)	Pressure (Operating / Design) (Kg/cm ² g)	Instrument Range (Kg/cm2g)	Remarks
1	C221052-14-HA-1401	Natural Gas	C221052-SGPL-PC-PID-1005	25-50/(-29)-65	30/92	*	
Document No. C221052-SGPL-IN-DS-5010							

Annexure-2

Document No.: C211052-00-IN-DS-5010

PIPELINE SCHEMATIC DIAGRAM FOR NORTH EAST GAS GRID PHASE-III OF IGGL

Total Qty.of Hooter = 04 Nos.

SPREAD 2B	SV/SGPL/04 -: Hooter	QTY 1	TOTAL QTY 01
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SPREAD 2C	SV/SGPL/05 -: Hooter	QTY 1	TOTAL QTY 03
	INTERMEDIATE PIPING TERMINAL -: Hooter	QTY 1	
	SV/SGPL/06 -: Hooter	QTY 1	



Energising Quality
VCS Quality Services Pvt. Ltd.

PROJECT NUMBER: C221052



PROCESS DATASHEET FOR GOOV VALVES

Total
Sheets

7

Document no.

C221052

SGPL

PC



DS



1001



INDRADHANUSH GAS GRID LIMITED

NORTH EAST GAS GRID PHASE-III OF IGGL

C1	31.05.2022	Issued for Client Review	KT	AD	SKP
REV	DATE	DESCRIPTION	PREP	CHKD	APPR

<div></div> <div>IGGL</div> <div>Energising Quality</div>			CLIENT : Indradhanush Gas Grid Limited							JOB. NO. C211052		
			PROJECT : North East Gas Grid Phase - III of IGGL							C221052-SGPL-PC-DS-1001		
										Sh 2 of 7	Rev	
			PROCESS DATA SHEET FOR GOOV VALVES (NATURAL GAS PIPELINE SYSTEM)								C1	
GENERAL	Tag No.	Unit	GOOV-1001			GOOV-1002			GOOV-1101			
	P&ID Reference	-	C221052-SGPL-PC-PID-1001			C221052-SGPL-PC-PID-1001			C221052-SGPL-PC-PID-1002			
	Line Designation	-	12"-P-10-1001-D1A			12"-P-10-1003-X70			12"-P-10-1003-X70			
	Location	-	Dispatch terminal at Siliguri			Dispatch terminal at Siliguri			SV/SGPL/01 STATION			
FLUID DATA	Fluid Name, phase at WP/WT	-	Natural Gas, Gaseous			Natural Gas, Gaseous			Natural Gas, Gaseous			
	Erosive/Corrosive/Flammable/Toxic	-	- / -/ Yes / -			- / -/ Yes / -			- / -/ Yes / -			
	Specific Gravity :	-	0.562			0.562			0.562			
	Viscosity at WP/WT	cP	0.00184			0.00184			0.00184			
	Vapour fraction (mass)	-	1.00			1.00			1.00			
OPERATING / DESIGN DATA	Flow rate, Design	MMSCMD	0.07			0.07			0.07			
	Allowable DP at above flow rate	kg/cm ²	-			-			-			
	Pressure, Inlet / Shutoff / Design	kg/cm ² g	30	92	92	30	92	92	30	92	92	
	Temp., Inlet / Shutoff / Design	° C	25 - 50	-29 / 65	-29 / 65	25 - 50	-29 / 65	-29 / 65	25 - 50	-29 / 65	-29 / 65	
	Shutoff pressure direction (forward/reverse)	-	-			-			-			
	Closing time	sec	By Instrumentation			By Instrumentation			By Instrumentation			
	Failure position	-	Fail Last			Fail Last			Fail Last			
	Handwheel (override) required or not	-	Yes			Yes			Yes (Note-3)			
	Leakage rate/class	-	By Instrumentation			By Instrumentation			By Instrumentation			
	Fire safety required or not	-	Yes			Yes			Yes			
	Design for : offshore, refinery, IBR, etc.	-	Onshore			Onshore			Onshore			
	Actuator principle (Solenoid/Motor/Pneum.)	-	Gas Over Oil Actuated			Gas Over Oil Actuated			Gas Over Oil Actuated			
	Position switches required for open/closed/both	-	Both			Both			Both			
	Hazardous Area Classification & Enclosure	-	By Instrumentation			By Instrumentation			By Instrumentation			
	Type of valve e.g. ball, gate, etc..	-	Ball			Ball			Ball			
	Line size valve required or not	Yes/No	Yes			Yes			Yes			
	Full bore/ Reduced bore	-	Reduced bore			Full bore			Full bore			
	Pipe class/rating/Basic MOC	-	D1A / 600# / CS (Note-2)			X70 / - / CS (Note-2)			X70 / - / CS (Note-2)			
	Installation Type	-	Above ground			Above ground			Under ground			
REV	REVISION DESCRIPTION	DATE	PREP	CHKD	APPD	NOTES		1. All instruments tag number shall be prefixed as project code and area code "C221052-SGPL".				
								2. Basic MOC given is of the line. Suitable MOC for Instruement shall be selected by Instrumentation.				
								3. Valve shall have rising stem.				
C1	Issued for Client Review	31.05.2022	KT	AD	SKP							

  IGGL Energising Quality			CLIENT : Indradhanush Gas Grid Limited					JOB. NO. C211052				
			PROJECT : North East Gas Grid Phase - III of IGGL					C221052-SGPL-PC-DS-1001				
			PROCESS DATA SHEET FOR GOOV VALVES (NATURAL GAS PIPELINE SYSTEM)					Sh 3 of 7		Rev		
GENERAL			Tag No.		Unit		GOOV-1201		GOOV-1301		GOOV-1401	
			P&ID Reference		-		C221052-SGPL-PC-PID-1003		C221052-SGPL-PC-PID-1004		C221052-SGPL-PC-PID-1005	
			Line Designation		-		12"-P-11-1108-X70		12"-P-12-1208-X70		12"-P-13-1308-X70	
			Location		-		SV/SGPL/02 STATION		SV/SGPL/03 STATION		SV/SGPL/04 STATION	
FLUID DATA			Fluid Name, phase at WP/WT		-		Natural Gas, Gaseous		Natural Gas, Gaseous		Natural Gas, Gaseous	
			Erosive/corrosive/flammable/toxic		-		- / - / Yes / -		- / - / Yes / -		- / - / Yes / -	
			Density : liquid / gas / vapour		-		0.562		0.562		0.562	
			Liquid viscosity at WP/WT		cP		0.00184		0.00184		0.00184	
			Vapour fraction (mass)		-		1.00		1.00		1.00	
OPERATING / DESIGN DATA			Flow rate, Design		MMSCMD		0.07		0.07		0.07	
			Allowable DP at above flow rate		kg/cm ²		-		-		-	
			Pressure, Inlet / Shutoff / Design		kg/cm ² g		30 92 92		30 92 92		30 92 92	
			Temp., Inlet / Shutoff / Design		° C		25 - 50 -29 / 65 -29 / 65		25 - 50 -29 / 65 -29 / 65		25 - 50 -29 / 65 -29 / 65	
			Shutoff pressure direction (forward/reverse)		-		-		-		-	
			Closing time		sec		By Instrumentation		By Instrumentation		By Instrumentation	
			Failure position		-		Fail Last		Fail Last		Fail Last	
			Handwheel (override) required or not		-		Yes (Note-3)		Yes (Note-3)		Yes (Note-3)	
			Leakage rate/class		-		By Instrumentation		By Instrumentation		By Instrumentation	
			Fire safety required or not		-		Yes		Yes		Yes	
			Design for : offshore, refinery, IBR, etc.		-		Onshore		Onshore		Onshore	
			Actuator principle (Solenoid/Motor/Pneum.)		-		Gas Over Oil Actuated		Gas Over Oil Actuated		Gas Over Oil Actuated	
			Position switches required for open/closed/both		-		Both		Both		Both	
			Hazardous Area Classification & Enclosure		-		By Instrumentation		By Instrumentation		By Instrumentation	
			Type of valve e.g. ball, gate, etc..		-		Ball		Ball		Ball	
			Line size valve required or not		Yes/No		Yes		Yes		Yes	
			Full bore/ Reduced bore		-		Full bore		Full bore		Full bore	
			Pipe class/rating/Basic MOC		-		X70 / - / CS (Note-2)		X70 / - / CS (Note-2)		X70 / - / CS (Note-2)	
			Installation Type		-		Under ground		Under ground		Under ground	
REV			REVISION DESCRIPTION		DATE		PREP		CHKD		APPD	
											NOTES	
											1. All instruments tag number shall be prefixed	
											as project code and area code "C221052-SGPL".	
											2. Basic MOC given is of the line. Suitable MOC for Instruement shall be selected by Instrumentation.	
											3. Valve shall have rising stem.	
C1			Issued for Client Review		31.05.2022		KT		AD		SKP	

  IGGL Energising Quality			CLIENT : Indradhanush Gas Grid Limited					JOB. NO. C211052			
			PROJECT : North East Gas Grid Phase - III of IGGL					C221052-SGPL-PC-DS-1001			
			PROCESS DATA SHEET FOR GOOV VALVES (NATURAL GAS PIPELINE SYSTEM)					Sh 4 of 7		Rev C1	
GENERAL	Tag No.	Unit	GOOV-1501			GOOV-1601			GOOV-1602		
	P&ID Reference	-	C221052-SGPL-PC-PID-1006			C221052-SGPL-PC-PID-1007			C221052-SGPL-PC-PID-1007		
	Line Designation	-	12"-P-14-1408-X70			12"-P-16-1623-X70			12"-P-16-1637-X70		
	Location	-	SV/DIPL/05 STATION			IP STATION AT LAVA			IP STATION AT LAVA		
FLUID DATA	Fluid Name, phase at WP/WT	-	Natural Gas, Gaseous			Natural Gas, Gaseous			Natural Gas, Gaseous		
	Erosive/corrosive/flammable/toxic	-	- / - / Yes / -			- / - / Yes / -			- / - / Yes / -		
	Density : liquid / gas / vapour	-	0.562			0.562			0.562		
	Liquid viscosity at WP/WT	cP	0.00184			0.00184			0.00184		
	Vapour fraction (mass)	-	1.00			1.00			1.00		
		-	1.00			1.00			1.00		
OPERATING / DESIGN DATA	Flow rate, Design	MMSCMD	0.07			0.07			0.07		
	Allowable DP at above flow rate	kg/cm ²	-			-			-		
	Pressure, Inlet / Shutoff / Design	kg/cm ² g	30	92	92	30	92	92	30	92	92
	Temp., Inlet / Shutoff / Design	° C	25 - 50	-29 / 65	-29 / 65	25 - 50	-29 / 65	-29 / 65	25 - 50	-29 / 65	-29 / 65
	Shutoff pressure direction (forward/reverse)	-	-			-			-		
	Closing time	sec	By Instrumentation			By Instrumentation			By Instrumentation		
	Failure position	-	Fail Last			Fail Last			Fail Last		
	Handwheel (override) required or not	-	Yes (Note-3)			Yes			Yes		
	Leakage rate/class	-	By Instrumentation			By Instrumentation			By Instrumentation		
	Fire safety required or not	-	Yes			Yes			Yes		
	Design for : offshore, refinery, IBR, etc.	-	Onshore			Onshore			Onshore		
	Actuator principle (Solenoid/Motor/Pneum.)	-	Gas Over Oil Actuated			Gas Over Oil Actuated			Gas Over Oil Actuated		
	Position switches required for open/closed/both	-	Both			Both			Both		
	Hazardous Area Classification & Enclosure	-	By Instrumentation			By Instrumentation			By Instrumentation		
	Type of valve e.g. ball, gate, etc..	-	Ball			Ball			Ball		
	Line size valve required or not	Yes/No	Yes			Yes			Yes		
	Full bore/ Reduced bore	-	Full bore			Full bore			Full bore		
	Pipe class/rating/Basic MOC	-	X70 / - / CS (Note-2)			X70 / - / CS (Note-2)			X70 / - / CS (Note-2)		
Installation Type	-	Under ground			Above ground			Above ground			
REV	REVISION DESCRIPTION	DATE	PREP	CHKD	APPD	NOTES		1. All instruments tag number shall be prefixed as project code and area code "C221052-SGPL".			
								2. Basic MOC given is of the line. Suitable MOC for Instruement shall be selected by Instrumentation.			
								3. Valve shall have rising stem.			
C1	Issued for Client Review	31.05.2022	KT	AD	SKP						



JOB. NO. C211052

C221052-SGPL-PC-DS-1001

Sh 5 of 7

Rev

C1

GENERAL	Tag No.	Unit	GOOV-1603			GOOV-1604			GOOV-1701		
	P&ID Reference	-	C221052-SGPL-PC-PID-1007			C221052-SGPL-PC-PID-1007			C221052-SGPL-PC-PID-1008		
	Line Designation	-	12"-P-16-1629-D1A			12"-P-16-1615-D1A			12"-P-16-1637-X70		
	Location	-	IP STATION AT LAVA			IP STATION AT LAVA			SV/SGPL/06 STATION		
FLUID DATA	Fluid Name, phase at WP/WT	-	Natural Gas, Gaseous			Natural Gas, Gaseous			Natural Gas, Gaseous		
	Erosive/corrosive/flammable/toxic	-	- / - / Yes / -			- / - / Yes / -			- / - / Yes / -		
	Density : liquid / gas / vapour	-	0.562			0.562			0.562		
	Liquid viscosity at WP/WT	cP	0.00184			0.00184			0.00184		
OPERATING / DESIGN DATA	Vapour fraction (mass)	-	1.00			1.00			1.00		
	Flow rate, Design	MMSCMD	0.07			0.07			0.07		
	Allowable DP at above flow rate	kg/cm ²	-			-			-		
	Pressure, Inlet / Shutoff / Design	kg/cm ² g	30	92	92	30	92	92	30	92	92
	Temp., Inlet / Shutoff / Design	° C	25 - 50	-29 / 65	-29 / 65	25 - 50	-29 / 65	-29 / 65	25 - 50	-29 / 65	-29 / 65
	Shutoff pressure direction (forward/reverse)	-	-			-			-		
	Closing time	sec	By Instrumentation			By Instrumentation			By Instrumentation		
	Failure position	-	Fail Last			Fail Last			Fail Last		
	Handwheel (override) required or not	-	Yes			Yes			Yes (Note-3)		
	Leakage rate/class	-	By Instrumentation			By Instrumentation			By Instrumentation		
	Fire safety required or not	-	Yes			Yes			Yes		
	Design for : offshore, refinery, IBR, etc.	-	Onshore			Onshore			Onshore		
	Actuator principle (Solenoid/Motor/Pneum.)	-	Gas Over Oil Actuated			Gas Over Oil Actuated			Gas Over Oil Actuated		
	Position switches required for open/closed/both	-	Both			Both			Both		
	Hazardous Area Classification & Enclosure	-	By Instrumentation			By Instrumentation			By Instrumentation		
	Type of valve e.g. ball, gate, etc..	-	Ball			Ball			Ball		
	Line size valve required or not	Yes/No	Yes			Yes			Yes		
	Full bore/ Reduced bore	-	Reduced bore			Reduced bore			Full bore		
	Pipe class/rating/Basic MOC	-	D1A / 600# / CS (Note-2)			D1A / 600# / CS (Note-2)			X70 / - / CS (Note-2)		
	Installation Type	-	Above ground			Above ground			Under ground		
REV	REVISION DESCRIPTION	DATE	PREP	CHKD	APPD	NOTES		1. All instruments tag number shall be prefixed as project code and area code "C221052-SGPL".			
								2. Basic MOC given is of the line. Suitable MOC for Instruement shall be selected by Instrumentation.			
								3. Valve shall have rising stem.			
C1	Issued for Client Review	31.05.2022	KT	AD	SKP						



CLIENT : Indradhanush Gas Grid Limited

JOB. NO. C211052

PROJECT : North East Gas Grid Phase - III of IGGL

C221052-SGPL-PC-DS-1001

**PROCESS DATA SHEET FOR GOOV VALVES
(NATURAL GAS PIPELINE SYSTEM)**

Sh 6 of 7

Rev

C1

GENERAL	Tag No.	Unit	GOOV-1801			GOOV-1901			GOOV-2001			
	P&ID Reference	-	C221052-SGPL-PC-PID-1009			C221052-SGPL-PC-PID-1010			C221052-SGPL-PC-PID-1011			
	Line Designation	-	12"-P-17-1708-X70			12"-P-18-1808-X70			12"-P-19-1908-X70			
	Location	-	SV/SGPL/07 STATION			SV/SGPL/08 STATION			Reciept terminal at Gangtok			
FLUID DATA	Fluid Name, phase at WP/WT	-	Natural Gas, Gaseous			Natural Gas, Gaseous			Natural Gas, Gaseous			
	Erosive/corrosive/flammable/toxic	-	- / - / Yes / -			- / - / Yes / -			- / - / Yes / -			
	Density : liquid / gas / vapour	-	0.562			0.562			0.562			
	Liquid viscosity at WP/WT	cP	0.00184			0.00184			0.00184			
	Vapour fraction (mass)	-	1.00			1.00			1.00			
	Flow rate, Design	MMSCMD	0.07 - 0.15			0.07 - 0.15			0.07 - 0.15			
OPERATING / DESIGN DATA	Allowable DP at above flow rate	kg/cm ²	-			-			-			
	Pressure, Inlet / Shutoff / Design	kg/cm ² g	37	92	92	37	92	92	37	92	92	
	Temp., Inlet / Shutoff / Design	° C	25 - 50	-29 / 65	-29 / 65	25 - 50	-29 / 65	-29 / 65	25 - 50	-29 / 65	-29 / 65	
	Shutoff pressure direction (forward/reverse)	-	-			-			-			
	Closing time	sec	By Instrumentation			By Instrumentation			By Instrumentation			
	Failure position	-	Fail Last			Fail Last			Fail Last			
	Handwheel (override) required or not	-	Yes (Note-3)			Yes (Note-3)			Yes			
	Leakage rate/class	-	By Instrumentation			By Instrumentation			By Instrumentation			
	Fire safety required or not	-	Yes			Yes			Yes			
	Design for : offshore, refinery, IBR, etc.	-	Onshore			Onshore			Onshore			
	Actuator principle (Solenoid/Motor/Pneum.)	-	Gas Over Oil Actuated			Gas Over Oil Actuated			Gas Over Oil Actuated			
	Position switches required for open/closed/both	-	Both			Both			Both			
	Hazardous Area Classification & Enclosure	-	By Instrumentation			By Instrumentation			By Instrumentation			
	Type of valve e.g. ball, gate, etc..	-	Ball			Ball			Ball			
	Line size valve required or not	Yes/No	Yes			Yes			Yes			
	Full bore/ Reduced bore	-	Full bore			Full bore			Full bore			
	Full bore/ Reduced bore	-	X70 / - / CS (Note-2)			X70 / - / CS (Note-2)			X70 / - / CS (Note-2)			
	Installation Type	-	Under ground			Under ground			Above ground			
	REV	REVISION DESCRIPTION	DATE	PREP	CHKD	APPD	NOTES		1. All instruments tag number shall be prefixed as project code and area code "C221052-SGPL".			
									2. Basic MOC given is of the line. Suitable MOC for Instruement shall be selected by			
								3. Valve shall have rising stem.				
C1	Issued for Client Review	31.05.2022	KT	AD	SKP							



Energising Quality

CLIENT : Indradhanush Gas Grid Limited

JOB. NO. C211052

PROJECT : North East Gas Grid Phase - III of IGGL

C221052-SGPL-PC-DS-1001

PROCESS DATA SHEET FOR GOOV VALVES
(NATURAL GAS PIPELINE SYSTEM)

Sh 7 of 7

Rev

C1

GENERAL	Tag No.	Unit	GOOV-2002					
GENERAL	P&ID Reference	-	C221052-SGPL-PC-PID-1011					
	Line Designation	-	12"-P-20-2002-D1A					
	Location	-	Reciept terminal at Gangtok					
FLUID DATA	Fluid Name, phase at WP/WT	-	Natural Gas, Gaseous					
	Erosive/corrosive/flammable/toxic	-	- / - / Yes / -					
	Density : liquid / gas / vapour	-	0.562					
	Liquid viscosity at WP/WT	cP	0.00184					
	Vapour fraction (mass)	-	1.00					
OPERATING / DESIGN DATA	Flow rate, Design	MMSCMD	0.07					
	Allowable DP at above flow rate	kg/cm ²	-					
	Pressure, Inlet / Shutoff / Design	kg/cm ² g	30	92	92			
	Temp., Inlet / Shutoff / Design	° C	25 - 50	-29 / 65	-29 / 65			
	Shutoff pressure direction (forward/reverse)	-	-					
	Closing time	sec	By Instrumentation					
	Failure position	-	Fail Last					
	Handwheel (override) required or not	-	Yes					
	Leakage rate/class	-	By Instrumentation					
	Fire safety required or not	-	Yes					
	Design for : offshore, refinery, IBR, etc.	-	Onshore					
	Actuator principle (Solenoid/Motor/Pneum.)	-	Gas Over Oil Actuated					
	Position switches required for open/closed/both	-	Both					
	Hazardous Area Classification & Enclosure	-	By Instrumentation					
	Type of valve e.g. ball, gate, etc..	-	Ball					
	Line size valve required or not	Yes/No	Yes					
	Full bore/ Reduced bore	-	Reduced bore					
	Pipe class/rating/Basic MOC	-	D1A / 600# / CS (Note-2)					
	Installation Type	-	Above ground					
REV	REVISION DESCRIPTION	DATE	PREP	CHKD	APPD	NOTES		
						1. All instruments tag number shall be prefixed as project code and area code "C221052-SGPL".		
						2. Basic MOC given is of the line. Suitable MOC for Instruement shall be selected by		
C1	Issued for Client Review	31.05.2022	KT	AD	SKP			



PROJECT NUMBER: C221052



PROCESS DATA SHEET FOR PRESSURE GAUGE

**Total
Sheets**

11

Document No.

C221052

SGPL

PC



PDS



1007



INDRADHANUSH GAS GRID LIMITED



NORTH EAST GAS GRID PHASE-III OF IGGL



C1	18.08.2022	Issued for Client Review	KT	AD	SKP
REV	DATE	DESCRIPTION	PREP	CHKD	APPR



 		PROCESS DATA SHEET FOR PRESSURE GAUGE					PAGE	1 OF 10
							SHEET	2 OF 11
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1007	
GENERAL	Tag No.	Units	PG-1001	PG-1002	PG-1005	PG-1006	PG-1007	
	P&ID Reference		C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1001	
	Location / Service		UNIT-10	UNIT-10	UNIT-10	UNIT-10	UNIT-10	
	Vessel Tag No. / line designation		12"-P-10-1009-D1A	12"-P-10-1004-D1A	4"-P-10-1021-D1A	VENT WITH QOEC	4"-P-10-1023-D1A	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation		
Remarks		-	-	-	NOTE-1	NOTE-2		
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
						1. LOW RANGE PRESSURE GAUGE (0-1 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER.		
						2. PRESSURE GAUGE SHALL HAVE A RANGE OF (0-5 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER		
						AND LEAST COUNT OF 0.1 kg/cm²g.		
C1	Issued for Client review	18.08.2022	KT	AD	SKP			



 		PROCESS DATA SHEET FOR PRESSURE GAUGE					PAGE	2 OF 10
							SHEET	3 OF 11
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1007	
GENERAL	Tag No.	Units	PG-1008	PG-1009	PG-1010	PG-1011	PG-1101	
	P&ID Reference		C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1002	
	Location / Service		UNIT-10	UNIT-10	UNIT-10	UNIT-10	UNIT-11	
	Vessel Tag No. / line designation		2"-P-10-1010-D1A	DT/SGPL-1001	2"-P-10-1014-D1A	12"-P-10-1001-D1A	8"-P-11-1101-D1A	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
Remarks		-	NOTE-1	-	-	-		
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
						1. LOW RANGE PRESSURE GAUGE (0-1 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER.		
C1	Issued for Client review	18.08.2022	KT	AD	SKP			



 		PROCESS DATA SHEET FOR PRESSURE GAUGE					PAGE	3 OF 10
							SHEET	4 OF 11
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1007	
GENERAL	Tag No.	Units	PG-1102	PG-1201	PG-1202	PG-1301	PG-1302	
	P&ID Reference		C221052-SGPL-PC-PID-1002	C221052-SGPL-PC-PID-1003	C221052-SGPL-PC-PID-1003	C221052-SGPL-PC-PID-1004	C221052-SGPL-PC-PID-1004	
	Location / Service		UNIT-11	UNIT-12	UNIT-12	UNIT-13	UNIT-13	
	Vessel Tag No. / line designation		VENT WITH QOEC	8"-P-12-1201-D1A	VENT WITH QOEC	8"-P-13-1301-D1A	VENT WITH QOEC	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Remarks		NOTE-1	-	NOTE-1	-	NOTE-1	
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
						1. LOW RANGE PRESSURE GAUGE (0-1 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER.		
C1	Issued for Client review	18.08.2022	KT	AD	SKP			



 		PROCESS DATA SHEET FOR PRESSURE GAUGE					PAGE	4 OF 10
							SHEET	5 OF 11
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1007	
GENERAL	Tag No.	Units	PG-1401	PG-1402	PG-1501	PG-1502	PG-1601	
	P&ID Reference		C221052-SGPL-PC-PID-1005	C221052-SGPL-PC-PID-1005	C221052-SGPL-PC-PID-1006	C221052-SGPL-PC-PID-1006	C221052-SGPL-PC-PID-1007	
	Location / Service		UNIT-14	UNIT-14	UNIT-15	UNIT-15	UNIT-16	
	Vessel Tag No. / line designation		8"-P-14-1401-D1A	VENT WITH QOEC	8"-P-15-1501-D1A	VENT WITH QOEC	IP/SGPL-1601	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
Remarks		-	NOTE-1	-	NOTE-1	-		
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
						1. LOW RANGE PRESSURE GAUGE (0-1 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER.		
C1	Issued for Client review	18.08.2022	KT	AD	SKP			

 		PROCESS DATA SHEET FOR PRESSURE GAUGE					PAGE	5 OF 10
							SHEET	6 OF 11
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1007	
GENERAL	Tag No.	Units	PG-1602	PG-1603	PG-1604	PG-1605	PG-1606	
	P&ID Reference		C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	
	Location / Service		UNIT-16	UNIT-16	UNIT-16	UNIT-16	UNIT-16	
	Vessel Tag No. / line designation		IP/SGPL-1601	IP/SGPL-1601	IP/SGPL-1602	IP/SGPL-1602	IP/SGPL-1602	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Remarks		-	NOTE-1	NOTE-1	-	-	
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
						1. LOW RANGE PRESSURE GAUGE (0-1 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER.		
C1	Issued for Client review	18.08.2022	KT	AD	SKP			

 		PROCESS DATA SHEET FOR PRESSURE GAUGE					PAGE	6 OF 10
							SHEET	7 OF 11
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1007	
GENERAL	Tag No.	Units	PG-1607	PG-1608	PG-1609	PG-1610	PG-1611	
	P&ID Reference		C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	
	Location / Service		UNIT-16	UNIT-16	UNIT-16	UNIT-16	UNIT-16	
	Vessel Tag No. / line designation		4"-P-16-1618-X70	12"-P-16-1615-D1A	12"-P-16-1615-D1A	VENT WITH QOEC	4"-P-16-1610-D1A	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Remarks		NOTE-2	-	-	NOTE-1	-	
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
						1. LOW RANGE PRESSURE GAUGE (0-1 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER.		
						2. PRESSURE GAUGE SHALL HAVE A RANGE OF (0-5 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER		
						AND LEAST COUNT OF 0.1 kg/cm²g.		
C1	Issued for Client review	18.08.2022	KT	AD	SKP			

 		PROCESS DATA SHEET FOR PRESSURE GAUGE					PAGE	7 OF 10
							SHEET	8 OF 11
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1007	
GENERAL	Tag No.	Units	PG-1612	PG-1613	PG-1614	PG-1615	PG-1616	
	P&ID Reference		C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	
	Location / Service		UNIT-16	UNIT-16	UNIT-16	UNIT-16	UNIT-16	
	Vessel Tag No. / line designation		4"-P-16-1635-X70	VENT WITH QOEC	12"-P-16-1615-D1A	4"-P-16-1617-X70	12"-P-16-1629-D1A	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Remarks		-	NOTE-1	-	NOTE-2	-	
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
						1. LOW RANGE PRESSURE GAUGE (0-1 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER.		
						2. PRESSURE GAUGE SHALL HAVE A RANGE OF (0-5 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER		
						AND LEAST COUNT OF 0.1 kg/cm²g.		
C1	Issued for Client review	18.08.2022	KT	AD	SKP			

 		PROCESS DATA SHEET FOR PRESSURE GAUGE					PAGE	8 OF 10
							SHEET	9 OF 11
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1007	
GENERAL	Tag No.	Units	PG-1617	PG-1701	PG-1702	PG-1801	PG-1802	
	P&ID Reference		C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1008	C221052-SGPL-PC-PID-1008	C221052-SGPL-PC-PID-1009	C221052-SGPL-PC-PID-1009	
	Location / Service		UNIT-16	UNIT-17	UNIT-17	UNIT-18	UNIT-18	
	Vessel Tag No. / line designation		8"-P-16-1607-D1A	8"-P-17-1701-D1A	VENT WITH QOEC	8"-P-17-1701-D1A	VENT WITH QOEC	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
Remarks		-	-	NOTE-1	-	NOTE-1		
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
						1. LOW RANGE PRESSURE GAUGE (0-1 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER.		
C1	Issued for Client review	18.08.2022	KT	AD	SKP			

 		PROCESS DATA SHEET FOR PRESSURE GAUGE					PAGE	9 OF 10
							SHEET	10 OF 11
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1007	
GENERAL	Tag No.	Units	PG-1901	PG-1902	PG-2001	PG-2002	PG-2003	
	P&ID Reference		C221052-SGPL-PC-PID-1010	C221052-SGPL-PC-PID-1010	C221052-SGPL-PC-PID-1011	C221052-SGPL-PC-PID-1011	C221052-SGPL-PC-PID-1011	
	Location / Service		UNIT-19	UNIT-19	UNIT-20	UNIT-20	UNIT-20	
	Vessel Tag No. / line designation		8"-P-19-1901-D1A	VENT WITH QOEC	RT/SGPL-2001	2"-P-20-2015-D1A	RT/SGPL-2001	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Remarks		-	NOTE-1	-	-	NOTE-1	
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
						1. LOW RANGE PRESSURE GAUGE (0-1 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER.		
C1	Issued for Client review	18.08.2022	KT	AD	SKP			

**PROCESS DATA SHEET FOR PRESSURE GAUGE**

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OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1007	
GENERAL	Tag No.	Units	PG-2004	PG-2005	PG-2006	PG-2007	PG-2008	
	P&ID Reference		C221052-SGPL-PC-PID-1011	C221052-SGPL-PC-PID-1011	C221052-SGPL-PC-PID-1011	C221052-SGPL-PC-PID-1011	C221052-SGPL-PC-PID-1011	
	Location / Service		UNIT-20	UNIT-20	UNIT-20	UNIT-20	UNIT-20	
	Vessel Tag No. / line designation		4"-P-20-2003-X70	12"-P-20-2010-D1A	VENT WITH QOEC	4"-P-20-2019-D1A	8"-P-20-2006-D1A	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	Cp	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Remarks		NOTE-2	-	NOTE-1	-	-	
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
						1. LOW RANGE PRESSURE GAUGE (0-1 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER.		
						2. PRESSURE GAUGE SHALL HAVE A RANGE OF (0-5 kg/cm²g) SHALL BE PROVIDED WITH GAUGE SAVER		
						AND LEAST COUNT OF 0.1 kg/cm²g.		
C1	Issued for Client review	18.08.2022	KT	AD	SKP			

VPC-FMT-PC-1052_00



Energising Quality
VCS Quality Services Pvt. Ltd.

PROJECT NUMBER: C221052



PROCESS DATA SHEET FOR PRESSURE INDICATOR TRANSMITTER

**Total
Sheets**

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Document No.

C221052

SGPL

PC



PDS

1008



INDRADHANUSH GAS GRID LIMITED



NORTH EAST GAS GRID PHASE-III OF IGGL



C1	18.08.2022	Issued for Client Review	KT	AD	SKP
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 		PROCESS DATA SHEET FOR PRESSURE INDICATOR TRANSMITTER					PAGE SHEET	1 OF 6 2 OF 7
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1008	
GENERAL	Tag No.	Units	PIT-1001	PIT-1002	PIT-1003	PIT-1101	PIT-1102	
	P&ID Reference		C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1002	C221052-SGPL-PC-PID-1002	
	Location / Service		UNIT-10	UNIT-10	UNIT-10	UNIT-11	UNIT-11	
	Vessel Tag No. / Line Designation		DT/SGPL-1001	12"-P-10-1001-D1A	12"-P-10-1002-D1A	2"-P-11-1103-D1A	2"-P-11-1105-D1A	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation		
Remarks		-	-	-	-	-		
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
C1	Issued for Client Review	18.08.2022	KT	AD	SKP			



VPC-FMT-PC-1052_00

 		PROCESS DATA SHEET FOR PRESSURE INDICATOR TRANSMITTER					PAGE SHEET	2 OF 6 3 OF 7
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1008	
GENERAL	Tag No.	Units	PIT-1201	PIT-1202	PIT-1301	PIT-1302	PIT-1401	
	P&ID Reference		C221052-SGPL-PC-PID-1003	C221052-SGPL-PC-PID-1003	C221052-SGPL-PC-PID-1004	C221052-SGPL-PC-PID-1004	C221052-SGPL-PC-PID-1005	
	Location / Service		UNIT-12	UNIT-12	UNIT-13	UNIT-13	UNIT-14	
	Vessel Tag No. / Line Designation		2"-P-12-1203-D1A	2"-P-12-1205-D1A	2"-P-13-1303-D1A	2"-P-13-1305-D1A	2"-P-14-1403-D1A	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
Remarks		-	-	-	-	-		
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
C1	Issued for Client Review	18.08.2022	KT	AD	SKP			

 		PROCESS DATA SHEET FOR PRESSURE INDICATOR TRANSMITTER					PAGE SHEET	3 OF 6 4 OF 7
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1008	
GENERAL	Tag No.	Units	PIT-1402	PIT-1501	PIT-1502	PIT-1601	PIT-1602	
	P&ID Reference		C221052-SGPL-PC-PID-1005	C221052-SGPL-PC-PID-1006	C221052-SGPL-PC-PID-1006	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	
	Location / Service		UNIT-14	UNIT-15	UNIT-15	UNIT-16	UNIT-16	
	Vessel Tag No. / Line Designation		2"-P-14-1405-D1A	2"-P-15-1503-D1A	2"-P-15-1505-D1A	IP/SGPL-1601	IP/SGPL-1602	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
Remarks		-	-	-	-	-		
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
C1	Issued for Client Review	18.08.2022	KT	AD	SKP			

 		PROCESS DATA SHEET FOR PRESSURE INDICATOR TRANSMITTER					PAGE SHEET	4 OF 6 5 OF 7
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1008	
GENERAL	Tag No.	Units	PIT-1603	PIT-1604	PIT-1605	PIT-1606	PIT-1701	
	P&ID Reference		C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1008	
	Location / Service		UNIT-16	UNIT-16	UNIT-16	UNIT-16	UNIT-17	
	Vessel Tag No. / Line Designation		12"-P-16-1629-D1A	12"-P-16-1615-D1A	12"-P-16-1615-D1A	12"-P-16-1634-D1A	2"-P-17-1703-D1A	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
Remarks		-	-	-	-	-		
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
C1	Issued for Client Review	18.08.2022	KT	AD	SKP			

 		PROCESS DATA SHEET FOR PRESSURE INDICATOR TRANSMITTER					PAGE SHEET	5 OF 6 6 OF 7
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1008	
GENERAL	Tag No.	Units	PIT-1702	PIT-1801	PIT-1802	PIT-1901	PIT-1902	
	P&ID Reference		C221052-SGPL-PC-PID-1008	C221052-SGPL-PC-PID-1009	C221052-SGPL-PC-PID-1009	C221052-SGPL-PC-PID-1010	C221052-SGPL-PC-PID-1010	
	Location / Service		UNIT-17	UNIT-18	UNIT-18	UNIT-19	UNIT-19	
	Vessel Tag No. / Line Designation		2"-P-17-1705-D1A	2"-P-18-1803-D1A	2"-P-18-1805-D1A	2"-P-19-1903-D1A	2"-P-19-1905-D1A	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	- / 30 / -	
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55	0 - 55	0 - 55	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		3/4"	3/4"	3/4"	3/4"	3/4"	
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	D1A / 600#	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
Remarks		-	-	-	-	-		
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
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 		PROCESS DATA SHEET FOR PRESSURE INDICATOR TRANSMITTER					PAGE SHEET	6 OF 6 7 OF 7
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1008	
GENERAL	Tag No.	Units	PIT-2001	PIT-2002	PIT-2003			
	P&ID Reference		C221052-SGPL-PC-PID-1011	C221052-SGPL-PC-PID-1011	C221052-SGPL-PC-PID-1011			
	Location / Service		UNIT-20	UNIT-20	UNIT-20			
	Vessel Tag No. / Line Designation		RT/SGPL-2001	12"-P-20-2002-D1A	12"-P-20-2010-D1A			
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS			
	Phase at WP & WT		GAS	GAS	GAS			
	Erosive/corrosive due to		-	-	-			
	Flammable, Toxic		YES, NO	YES, NO	YES, NO			
	Density at WP & WT	kg/cm3	0.76	0.76	0.76			
	Viscosity at WP & WT	cP	0.012	0.012	0.012			
	Dew point at WP		-	-	-			
	Bubble point at WP		-	-	-			
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-			
	Pressure,min/norm/max (WP)	kg/cm2(g)	- / 30 / -	- / 30 / -	- / 30 / -			
	Working temperature (WT)	°C	0 - 55	0 - 55	0 - 55			
	Design Pressure	kg/cm2(g)	92	92	92			
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65			
	Special measuring range / units		-	-	-			
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation			
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation			
	Process tapping size		3/4"	3/4"	3/4"			
	Vessel trim or pipe class/rating		D1A / 600#	D1A / 600#	D1A / 600#			
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement			
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation			
Remarks		-	-	-				
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
C1	Issued for Client Review	18.08.2022	KT	AD	SKP			



Energising Quality
VCS Quality Services Pvt. Ltd.

PROJECT NUMBER: C221052



**PROCESS DATA SHEET FOR TEMPERATURE INDICATOR
TRANSMITTER**

**Total
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INDRADHANUSH GAS GRID LIMITED



NORTH EAST GAS GRID PHASE-III OF IGGL

C1	18.08.2022	Issued for Client Review	KT	AD	SKP
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 		PROCESS DATA SHEET FOR TEMPERATURE INDICATOR TRANSMITTER					PAGE SHEET	1 OF 3 2 OF 4
OWNER: IGGL CLIENT: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL AREA: SGPL				CONTRACT No.: C221052 DOCUMENT No.: C221052-SGPL-PC-PDS-1009	
GENERAL	Tag No.	Units	TIT-1001	TIT-1002	TIT-1101	TIT-1201	TIT-1301	
	P&ID Reference		C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1002	C221052-SGPL-PC-PID-1003	C221052-SGPL-PC-PID-1002	
	Location / Service		UNIT-10	UNIT-10	UNIT-11	UNIT-12	UNIT-13	
	Vessel Tag No. / Line Designation		12"-P-10-1001-D1A	12"-P-10-1003-X70	12"-P-11-1108-X70	12"-P-12-12108-X70	12"-P-13-1308-X70	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
OPERATING /DESIGN DATA	Freezing point at WP		-	-	-	-	-	
	Temperature,min/max(WT)	°C	0 / 55	0 / 55	0 / 55	0 / 55	0 / 55	
	Working pressure (WP)	kg/cm2(g)	30	30	30	30	30	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		1.5" WNRF for Thermowell	-	-	-	-	
	Connection Type		1500# Flanged	Skin Type	Skin Type	Skin Type	Skin Type	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
Remarks		-	-	-	-	-		
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
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 		PROCESS DATA SHEET FOR TEMPERATURE INDICATOR TRANSMITTER					PAGE SHEET	2 OF 3 3 OF 4
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1009	
GENERAL	Tag No.	Units	TIT-1401	TIT-1501	TIT-1601	TIT-1602	TIT-1603	
	P&ID Reference		C221052-SGPL-PC-PID-1005	C221052-SGPL-PC-PID-1006	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1007	
	Location / Service		UNIT-14	UNIT-15	UNIT-16	UNIT-16	UNIT-16	
	Vessel Tag No. / Line Designation		12"-P-14-1408-X70	12"-P-15-1508-X70	12"-P-16-1615-X70	12"-P-16-1623-X70	12"-P-16-1637-D1A	
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS	
	Phase at WP & WT		GAS	GAS	GAS	GAS	GAS	
	Erosive/corrosive due to		-	-	-	-	-	
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO	YES, NO	
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76	0.76	
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012	0.012	
	Dew point at WP		-	-	-	-	-	
	Bubble point at WP		-	-	-	-	-	
	Freezing point at WP		-	-	-	-	-	
OPERATING / DESIGN DATA	Temperature,min/max(WT)	°C	0 / 55	0 / 55	0 / 55	0 / 55	0 / 55	
	Working pressure (WP)	kg/cm2(g)	30	30	30	30	30	
	Design Pressure	kg/cm2(g)	92	92	92	92	92	
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65	-29 / 65	
	Special measuring range / units		-	-	-	-	-	
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Process tapping size		-	-	1.5" WNRF for Thermowell	-	-	
	Connection Type		Skin Type	Skin Type	1500# Flanged	Skin Type	Skin Type	
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement	As per process requirement	
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation	
	Remarks		-	-	-	-	-	
	REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES	
C1	Issued for Client Review	18.08.2022	KT	AD	SKP			

 		PROCESS DATA SHEET FOR TEMPERATURE INDICATOR TRANSMITTER					PAGE SHEET	3 OF 3 4 OF 4
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1009	
GENERAL	Tag No.	Units	TIT-1701	TIT-1801	TIT-1901	TIT-2001		
	P&ID Reference		C221052-SGPL-PC-PID-1008	C221052-SGPL-PC-PID-1009	C221052-SGPL-PC-PID-1010	C221052-SGPL-PC-PID-1011		
	Location / Service		UNIT-17	UNIT-18	UNIT-19	UNIT-20		
	Vessel Tag No. / Line Designation		12"-P-17-1708-X70	12"-P-18-1808-X70	12"-P-19-1908-X70	12"-P-19-1908-D1A		
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS	NATURAL GAS		
	Phase at WP & WT		GAS	GAS	GAS	GAS		
	Erosive/corrosive due to		-	-	-	-		
	Flammable, Toxic		YES, NO	YES, NO	YES, NO	YES, NO		
	Density at WP & WT	kg/cm3	0.76	0.76	0.76	0.76		
	Viscosity at WP & WT	cP	0.012	0.012	0.012	0.012		
	Dew point at WP		-	-	-	-		
	Bubble point at WP		-	-	-	-		
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-	-		
	Temperature,min/max(WT)	°C	0 / 55	0 / 55	0 / 55	0 / 55		
	Working pressure (WP)	kg/cm2(g)	30	30	30	30		
	Design Pressure	kg/cm2(g)	92	92	92	92		
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65	-29 / 65		
	Special measuring range / units		-	-	-	-		
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation		
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation		
	Process tapping size		-	-	-	-		
	Connection Type		Skin Type	Skin Type	Skin Type	Skin Type		
	Basic material of construction		As per process requirement	As per process requirement	As per process requirement	As per process requirement		
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation	By Instrumentation		
Remarks		-	-	-	-			
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
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VCS Quality Services Pvt. Ltd.

PROJECT NUMBER: C221052



PROCESS DATA SHEET FOR TEMPERATURE GAUGE

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INDRADHANUSH GAS GRID LIMITED

NORTH EAST GAS GRID PHASE-III OF IGGL

C1	18.08.2022	Issued for Client Review	KT	AD	SKP
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 		PROCESS DATA SHEET FOR TEMPERATURE GAUGE					PAGE SHEET	1 OF 1 2 OF 2
OWNER: IGGL			PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL				CONTRACT No.: C221052	
CLIENT: IGGL			AREA: SGPL				DOCUMENT No.: C221052-SGPL-PC-PDS-1010	
GENERAL	Tag No.	Units	TG-1001	TG-1601	TG-2001			
	P&ID Reference		C221052-SGPL-PC-PID-1001	C221052-SGPL-PC-PID-1007	C221052-SGPL-PC-PID-1011			
	Location / Service		UNIT-11	UNIT-16	UNIT-20			
	Vessel Tag No. / Line Designation		12"-P-10-1001-D1A	12"-P-16-1615-D1A	12"-P-20-2010-D1A			
FLUID DATA	Fluid Name		NATURAL GAS	NATURAL GAS	NATURAL GAS			
	Phase at WP & WT		GAS	GAS	GAS			
	Erosive/corrosive due to		-	-	-			
	Flammable, Toxic		YES, NO	YES, NO	YES, NO			
	Density at WP & WT	kg/cm3	0.76	0.76	0.76			
	Viscosity at WP & WT	cP	0.012	0.012	0.012			
	Dew point at WP		-	-	-			
	Bubble point at WP		-	-	-			
OPERATING / DESIGN DATA	Freezing point at WP		-	-	-			
	Temperature,min/max(WT)	°C	0 / 55	0 / 55	0 / 55			
	Working pressure (WP)	kg/cm2(g)	30	30	30			
	Design Pressure	kg/cm2(g)	92	92	92			
	Design Temperature	°C	-29 / 65	-29 / 65	-29 / 65			
	Special measuring range / units		-	-	-			
	Type of Instrument		By Instrumentation	By Instrumentation	By Instrumentation			
	Heat tracing req'd/type/set point		By Instrumentation	By Instrumentation	By Instrumentation			
	Process tapping size		1.5" WNRF	1.5" WNRF	1.5" WNRF			
	Connection Type		1500#, Flanged	1500#, Flanged	1500#, Flanged			
	Basic material of construction		SS304	SS304	SS304			
	Hazardous area classification		By Instrumentation	By Instrumentation	By Instrumentation			
	Remarks		-	-	-			
REV.	REVISION DESCRIPTION	DATE	PREPD	CHKD	APPD	NOTES		
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Instrument Index - NORTH EAST GAS GRID OF IGGL PHASE-III PART D1 & D2

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Indradhanush Gas Grid Limited

D1	13.12.2022	Issued for Bid	VK	DGM	KNC
A1	07.12.2022	Issued for Internal Review	VK	DGM	KNC
REV	DATE	DESCRIPTION	PREP	CHKD	APPR

<div></div>			NORTH EAST GAS GRID OF IGGL- PHASE-III-PART D1 & D2												Rev. D1	Sheet 2 of 5
			INSTRUMENT INDEX - SILIGURI-GANGTOK PIPELINE-IP STATION												Doc.NO: C221052-SGPL-IN-IIX-5001	
North East Gas Grid of IGGL- Phase-III-SILIGURI-GANGTOK LINE																
Sr. No.	Tag Number	Service	Location	Instrument Type	Line / Equipment Number	P & ID	System Type	Engg.Unit	Calibration Range	Data Sheet No.	Hookup Drawing No.	Terminal Drawing No.	Loop Drawing No.	Cable Schedule No.	Remarks	
1	C221052-16-PG-1601	Natural Gas	At IP/SGPL-1601	Pressure Gauge	IP/SGPL-1601	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
2	C221052-16-PG-1602	Natural Gas	At IP/SGPL-1601	Pressure Gauge	IP/SGPL-1601	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
3	C221052-16-PG-1603	Natural Gas	At IP/SGPL-1601	Pressure Gauge along with Gauge Saver	IP/SGPL-1601	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
4	C221052-16-PG-1604	Natural Gas	At IP/SGPL-1602	Pressure Gauge along with Gauge Saver	IP/SGPL-1601	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
5	C221052-16-PG-1605	Natural Gas	At IP/SGPL-1602	Pressure Gauge	IP/SGPL-1601	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
6	C221052-16-PG-1606	Natural Gas	At IP/SGPL-1602	Pressure Gauge	IP/SGPL-1601	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
7	C221052-16-PG-1607	Natural Gas	At the Downstream of Bypass of GOOV-1601	Pressure Gauge along with Gauge Saver	12"-P-16-1618-X70	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
8	C221052-16-PG-1608	Natural Gas	At the Downstream of GOOV-1603	Pressure Gauge	12"-P-16-1615-X70	C221052-16-PC-PID-1007				C221052-00-IN-DS-5001				C221052-00-IN-SCH-5002		
9	C221052-16-PG-1608	Natural Gas	At the Upstream of the Check Metering Skid for Future Provision	Pressure Gauge	12"-P-16-1614-X70	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
10	C221052-16-PG-1609	Natural Gas	At the Downstream of the Check Metering Skid for Future Provision	Pressure Gauge	12"-P-16-1616-X70	C221052-16-PC-PID-1007				C221052-00-IN-DS-5001				C221052-00-IN-SCH-5002		
11	C221052-16-PG-1609	Natural Gas	At the Downstream of Flow Tee- 12" x 8"	Pressure Gauge	8"-P-16-1607-D1A	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
12	C221052-16-PG-1610	Natural Gas	At Vent Line	Pressure Gauge along with Gauge Saver	4"-P-16-1609-D1A	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
13	C221052-16-PG-1611	Natural Gas	At Vent Line	Pressure Gauge	4"-P-16-1609-D1A	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
14	C221052-16-PG-1612	Natural Gas	At Vent Line	Pressure Gauge	4"-P-16-1635-D1A	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
15	C221052-16-PG-1613	Natural Gas	At Vent Line	Pressure Gauge along with Gauge Saver	4"-P-16-1635-D1A	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
16	C221052-16-PG-1614	Natural Gas	At the Upstream of Flow-Tee 12" x 12"	Pressure Gauge	12"-P-16-1634-D1A	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
17	C221052-16-PG-1615	Natural Gas	At Upstream of the Bypass of GOOV-1602	Pressure Gauge	12"-P-16-1617-X70	C221052-16-PC-PID-1007	-	kg/ cm2g		C221052-00-IN-DS-5001	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
18	C221052-16-PIT-1601	Natural Gas	At Pig Receiver IP/SGPL-1601	Pressure Indicating Transmitter	IP/SGPL-1601	C221052-16-PC-PID-1007	RTU	kg/ cm2g		C221052-00-IN-DS-5005	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
19	C221052-16-PIT-1602	Natural Gas	At Pig Launcher IP/SGPL-1602	Pressure Indicating Transmitter	IP/SGPL-1602	C221052-16-PC-PID-1007	RTU	kg/ cm2g		C221052-00-IN-DS-5005	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
20	C221052-16-PIT-1603	Natural Gas	At the downstream of Flow Tee-12" x 12" x 8"	Pressure Indicating Transmitter	2"-P-16-1612-X70	C221052-16-PC-PID-1007	RTU	kg/ cm2g		C221052-00-IN-DS-5005	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
21	C221052-16-PIT-1604	Natural Gas	At Downstream of GOOV-1603	Pressure Indicating Transmitter	2"-P-16-1613-X70	C221052-16-PC-PID-1007	RTU	kg/ cm2g		C221052-00-IN-DS-5005	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
22	C221052-41-PIT-1605	Natural Gas	At The upstream of GOOV-1604	Pressure Indicating Transmitter	12"-P-16-1634-X70	C221052-16-PC-PID-1007	RTU	kg/ cm2g		C221052-00-IN-DS-5005	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
23	C221052-41-PIT-1606	Natural Gas	At the downstream of GOOV-1604	Pressure Indicating Transmitter	12"-P-16-1634-X70	C221052-16-PC-PID-1007	RTU	kg/ cm2g		C221052-00-IN-DS-5005	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		

24	C221052-16-TIT-1601	Natural Gas	At the downstream of GOOV-1603	Temperature Indicating Transmitter	12"-P-16-1615-D1A	C221052-16-PC-PID-1007	RTU	Deg C		C221052-00-IN-DS-5004	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
25	C221052-16-TE-1601	Natural Gas	At the downstream of GOOV-1603	RTD-Thermowell	12"-P-16-1615-D1A	C221052-16-PC-PID-1007	-	Deg C		C221052-00-IN-DS-5004	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
26	C221052-16-TIT-1602	Natural Gas	In the Burried Line from SV/SGPL/05	Temperature Indicating Transmitter	Burried Line from SV/SGPL/05	C221052-16-PC-PID-1007	PLC	Deg C		C221052-00-IN-DS-5003	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
27	C221052-16-TE-1602	Natural Gas	In the Burried Line from SV/SGPL/05	RTD-Skin Type	Burried Line from SV/SGPL/05	C221052-16-PC-PID-1007	-	Deg C		C221052-00-IN-DS-5003	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
28	C221052-16-TIT-1603	Natural Gas	In the Burried Line to SV/SGPL/06	Temperature Indicating Transmitter	Burried Line to SV/SGPL/06	C221052-16-PC-PID-1007	PLC	Deg C		C221052-00-IN-DS-5003	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
29	C221052-16-TE-1603	Natural Gas	In the Burried Line to SV/SGPL/06	RTD-Skin Type	Burried Line to SV/SGPL/06	C221052-16-PC-PID-1007	-	Deg C		C221052-00-IN-DS-5003	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
30	C221052-16-TG-1606	Natural Gas	At The Downstream of GOOV-1603	Temperature Gauge	12"-P-16-1615-D1A	C221052-16-PC-PID-1007	-	Deg C		C221052-00-IN-DS-5013	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
31	C221052-16-GOOV-1601	Natural Gas	At the Downstream of Flow Tee-12" x 12"	Gas Over Oil Actuated Valve	12"-P-16-1623-X70	C221052-16-PC-PID-1007	RTU	-		C221052-00-IN-DS-5002	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
32	C221052-16-GOOV-1602	Natural Gas	At the Outlet of IP/SGPL-1602	Gas Over Oil Actuated Valve	12"-P-16-1637-X70	C221052-16-PC-PID-1007	RTU	-		C221052-00-IN-DS-5002	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
33	C221052-16-GOOV-1603	Natural Gas	At the downstream of Flow Tee-12" x 12" x 8"	Gas Over Oil Actuated Valve	12"-P-16-1615-D1A	C221052-16-PC-PID-1007	RTU	-		C221052-00-IN-DS-5002	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
34	C221052-16-GOOV-1604	Natural Gas	At the Downstream of Flow Tee-12" x 12"	Gas Over Oil Actuated Valve	12"-P-16-1634-X70	C221052-16-PC-PID-1007	RTU	-		C221052-00-IN-DS-5002	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
35	C221052-16-XXS-1601	Natural Gas	At the Upstream of Flow Tee-12" x 12"	Pig Signaler	12"-P-16-1623-X70	C221052-16-PC-PID-1007	RTU	-		HOLD	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
36	C221052-16-XXS-1602	Natural Gas	At Pig Receiver IP/SGPL-1601	Pig Signaler	IP/SGPL-1601	C221052-16-PC-PID-1007	RTU	-		HOLD	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
37	C221052-16-XXS-1603	Natural Gas	At Pig Launcher IP/SGPL-1602	Pig Signaler	IP/SGPL-1602	C221052-16-PC-PID-1007	RTU	-		HOLD	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
38	C221052-16-XXS-1604	Natural Gas	At the Downstream of Flow Tee-12" x 12"	Pig Signaler	12"-P-16-1637-X70	C221052-16-PC-PID-1007	RTU	-		HOLD	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
39	C221052-16-PSV-1601	Natural Gas	At Pig Receiver IP/SGPL-1601	Pressure Safety Valve	2"-P-16-1625-D1A	C221052-16-PC-PID-1007	-	-		HOLD	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	
40	C221052-16-PSV-1602	Natural Gas	At Pig Launcher IP/SGPL-1602	Pressure Safety Valve	2"-P-16-1606-D1A	C221052-16-PC-PID-1007	-	-		HOLD	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002	

	NORTH EAST GAS GRID OF IGGL- PHASE-III											Rev.	Sheet
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	INSTRUMENT INDEX - SILIGURI-GANGTOK PIPELINE-SV STATION											Doc.NO: C221052-SGPL-IN-IIX-5001	



NORTH EAST GAS GRID OF IGGL- PHASE-III- SILIGURI-GANGTOK LINE

Sr. No.	Tag Number	Service	Location	Instrument Type	Line / Equipment Number	P & ID	System Type	Engg.Unit	Calibration Range	Data Sheet No.	Hookup Drawing No.	Terminal Drawing No.	Loop Drawing No.	Cable Schedule No.	Remarks
1	C221052-15-PG-1501	Natural Gas	At the Inlet of existing pipeline from SV Station	Pressure Gauge	8"-P-15-1501-D1A	C221052-SGPL-PC-PID-1006	-	kg/ cm2g	0-50	C221052-00-IN-DS-5001	C221052-00-IN-5004	HOLD	HOLD	-	
2	C221052-15-PG-1502	Natural Gas	At Vent Line	Pressure Gauge along with Gauge Saver	4"-P-15-1507-D1A	C221052-SGPL-PC-PID-1006	-	kg/ cm2g	0-50	C221052-00-IN-DS-5001	C221052-00-IN-5004	HOLD	HOLD	-	
3	C221052-15-PIT-1501	Natural Gas	At the Downstream of Flow-Tee(12" x 12" x 6")	Pressure Indicating Transmitter	2"-P-15-1503-D1A	C221052-SGPL-PC-PID-1006	RTU	kg/ cm2g	0-50	C221052-00-IN-DS-5005	C221052-00-IN-5004	HOLD	HOLD	C221052-00-IN-SCH-5002	
4	C221052-15-PIT-1502	Natural Gas	At the Downstream of Flow-Tee(12" x 12" x 6")	Pressure Indicating Transmitter	2"-P-15-1505-D1A	C221052-SGPL-PC-PID-1006	RTU	kg/ cm2g	0-50	C221052-00-IN-DS-5005	C221052-00-IN-5004	HOLD	HOLD	C221052-00-IN-SCH-5002	
5	C221052-15-TIT-1501	Natural Gas	At the Downstream of Flow-Tee(12" x 12" x 6")	Temperature Indicating Transmitter	12"-P-15-1508-X70	C221052-SGPL-PC-PID-1006	RTU	Deg C	0-80	C221052-00-IN-DS-5003	C221052-00-IN-5004	HOLD	HOLD	C221052-00-IN-SCH-5002	
6	C221052-15-TE-1501	Natural Gas	At the Downstream of Flow-Tee(12" x 12" x 6")	RTD-Skin Type	12"-P-15-1508-X70	C221052-SGPL-PC-PID-1006	-	DegC	-	C221052-00-IN-DS-5003	C221052-00-IN-5004	HOLD	HOLD	-	
7	C221052-15-XXS-1501	Natural Gas	At the Downstream of Flow-Tee(12" x 12" x 6")	Pig-Signaller(Non-Intrusive Type)	12"-P-15-1508-X70	C221052-SGPL-PC-PID-1006	-	-	-	-	-	HOLD	HOLD	C221052-00-IN-SCH-5002	
8	C221052-15-GOOV-1501	Natural Gas	At the Downstream of Flow-Tee(12" x 12" x 6")	Gas Over Oil Actuated Valve	12"-P-15-1508-X70	C221052-SGPL-PC-PID-1006	RTU	-	-	C221052-00-IN-DS-5002	-	HOLD	HOLD	C221052-00-IN-SCH-5002	

Note:-

1. The Quantities of Various instruments will be same for all the SV stations. However, only the instrument Tag Numbers & Line Numbers will be changed according to the corresponding Unit Numbers as mentioned in the respective P&IDs, which is listed in the attached Annexure. The list of instruments mentioned in this document is typical for all the SV Stations.

2. Pig-Signaller is required for SV-05 and SV-06 of Spread 2C only.

<div> ENERGISING QUALITY</div> <div> IGGL</div>		North East Gas Grid Phase-III of IGGL													Rev.	Sheet
		F&G INDEX - SILIGURI-GANGTOK PIPELINE													D1	5 of 5
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NORTH EAST GAS GRID PHASE-III OF IGGL(SILIGURI-GANGTOK LINE)																
SV Station																
Sr. No.	Tag Number	Service	Location	Instrument Type	Line / Equipment Number	P & ID	System Type	Calibration Range	Alarm Level	Data Sheet No.	Hookup Drawing No.	Terminal Drawing No.	Loop Drawing No.	Cable Schedule No.	Remarks	
1	C221052-15-PGD-1501	Natural Gas	Near GOOV-100	Point Gas Detector	-	-	GDS	0 - 10		C221052-00-IN-DS-5006	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
2	C221052-15-PGD-1502	Natural Gas	Near GOOV-1002	Point Gas Detector	-	-	GDS	0 - 10		C221052-00-IN-DS-5006	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
3	C221052-15-HA-1501	Natural Gas	GDS Panel	Hooter	-	-	GDS	-		C221052-00-IN-DS-5009	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
4	C221052-15-BA-1501	Natural Gas	GDS Panel	Beacon	-	-	GDS	-		C221052-00-IN-DS-5008	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
5	C221052-15-MCP-1501	Natural Gas	GDS Panel	Manual Call Points	-	-	GDS	-		C221052-00-IN-DS-5007	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
IP Station																
Sr. No.	Tag Number	Service	Location	Instrument Type	Line / Equipment Number	P & ID	System Type	Calibration Range	Alarm Level	Data Sheet No.	Hookup Drawing No.	Terminal Drawing No.	Loop Drawing No.	Cable Schedule No.	Remarks	
1	C221052-16-PGD-1601	Natural Gas	Near GOOV-4101	Point Gas Detector	-	-	GDS	0 - 10		C221052-00-IN-DS-5006	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
2	C221052-16-PGD-1602	Natural Gas	Near GOOV-4102	Point Gas Detector	-	-	GDS	0 - 10		C221052-00-IN-DS-5006	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
3	C221052-16-PGD-1603	Natural Gas	Near GOOV-4103	Point Gas Detector	-	-	GDS	0 - 10		C221052-00-IN-DS-5006	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
4	C221052-16-PGD-1604	Natural Gas	Near GOOV-4104	Point Gas Detector	-	-	GDS	0 - 10		C221052-00-IN-DS-5006	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
5	C221052-16-PGD-1605	Natural Gas	Near Check Metering For Future Provision	Point Gas Detector	-	-	GDS	0 - 10		C221052-00-IN-DS-5006	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
6	C221052-16-PGD-1606	Natural Gas	Near Flow-Tee-12" x 8"	Point Gas Detector	-	-	GDS	0 - 10		C221052-00-IN-DS-5006	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
7	C221052-16-OPGD-1601A	Natural Gas	Near Pig Launcher at IP Station	Open Path Gas Detector	-	-	GDS	0 - 100		C221052-00-IN-DS-5005	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
8	C221052-16-OPGD-1601B	Natural Gas	Near Pig Launcher at IP Station	Open Path Gas Detector	-	-	GDS	0 - 100		C221052-00-IN-DS-5005	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
9	C221052-16-OPGD-1602A	Natural Gas	Near Pig Receiver at IP Station	Open Path Gas Detector	-	-	GDS	0 - 100		C221052-00-IN-DS-5005	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
10	C221052-16-OPGD-1602B	Natural Gas	Near Pig Receiver at IP Station	Open Path Gas Detector	-	-	GDS	0 - 100		C221052-00-IN-DS-5005	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
11	C221052-16-BA-1601	Natural Gas	GDS Panel	Beacon	-	-	GDS	-		C221052-00-IN-DS-5008	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
12	C221052-16-HA-1601	Natural Gas	GDS Panel	Hooter	-	-	GDS	-		C221052-00-IN-DS-5009	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		
13	C221052-16-MCP-1601	Natural Gas	GDS Panel	Manual Call Points	-	-	GDS	-		C221052-00-IN-DS-5007	HOLD	HOLD	HOLD	C221052-00-IN-SCH-5002		

ANNEXURE-I		
UNIT NOS. & PID NOS. FOR ALL THE STATIONS		
Siliguri-Gangtok Line		
Station No.	Unit No.	P&ID Number
SV/SGPL/04	14	C221052-SGPL-PC-PID-1005
SV/SGPL/05	15	C221052-SGPL-PC-PID-1006
IP Station at Tadubi	16	C221052-SGPL-PC-PID-1007
SV/SGPL/06	17	C221052-SGPL-PC-PID-1008



Energising Quality

PROJECT NUMBER:C221052



I/O LIST FOR NORTH EAST GAS GRID PHASE-III OF IGGL PART D1 & D2

Total Sheets

8

Document no.

C221052

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IN



LST



5002



Indradhanush Gas Grid Limited



NORTH EAST GAS GRID PHASE-III OF IGGL Part D1 & D2

D1	13.12.2022	Issued for Bid	VK	DGM	KNC
A1	08.12.2022	Issued for Internal Review	VK	DGM	KNC
REV	DATE	DESCRIPTION	PREP	CHKD	APPR



<div></div>		INDRADHANUSH GAS GRID LIMITED														<div></div>		
		NORTH EAST GAS GRID LIMITED PHASE-III OF IGGL-PART D1 & D2																
PROJECT NUMBER : C221052		I/O LIST FOR SV 01, UNIT 11 SGPL STATION														REV.		
Doc No:-C221052-00-IN-LST-5002 Sht 2 of 8																D1		
Sr. No.	Tag Number	IO Type				Service	Location	Instrument Type	Line / Equipment Number	P & ID	IS / NIS	Signal Level	System Type	Junction Box No	Calibration Range	Instrument Range	Units	Remarks
AI	AO	DI	DO															
SV Stations																		
1	C221052-15-PIT-1501	1				Natural Gas	Uptream of GOOV-1501	Pressure Transmitter	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	HOLD	HOLD	kg/cm2g	
2	C221052-15-PIT-1502	1				Natural Gas	Downstream of GOOV-1501	Pressure Transmitter	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	HOLD	HOLD	kg/cm2g	
3	C221052-15-TIT-1501	1				Natural Gas	Downstream of GOOV-1501	Temperature Transmitter(Skin Type)	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	HOLD	HOLD	deg C	
4	C221052-15-XXS-1501			1		Natural Gas	Downstream of GOOV-1501	Pig-Signaller(Non-Intrusive Type)	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
5	C221052-15-GOOV-1501	-	-	-	-	Natural Gas	-	Gas Over Oil Actuator	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	-	-	-	-	-	-	-	
6	C221052-15-HSH-1501				1	-	-	Valve Open Command	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
7	C221052-15-HSL-1501				1	-	-	Valve Close Command	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
8	C221052-15-ZSH-1501			1		-	-	Valve Open Feed back	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
9	C221052-15-ZSL-1501			1		-	-	Valve Close Feed back	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
10	C221052-15-DPSH-1501			1		-	-	DP High Across the valve	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
11	C221052-15-XL-1501A			1		-	-	Valve Remote selected	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
12	C221052-15-XL-1501B			1		-	-	Valve Local selected	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
13	C221052-15-HSH-1502			1		-	-	Valve Open Command From Local	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	NIS	25 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
14	C221052-15-HSL-1502			1		-	-	Valve Close Command From Local	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	NIS	26 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
15	TIC Panel Door Open			1		-	Control Room	TIC Panel door open indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
16	TIC Panel 24 V DC bus/System Healthy			1		-	Control Room	TIC Panel 24 V DC Bus/System healthiness indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
17	MEDB ON			1		-	Electrical Room / System	MEDB "ON" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
18	MEDB OFF			1		-	Electrical Room / System	MEDB "OFF" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
19	MEDB TRIP			1		-	Electrical Room / System	MEDB " TRIP" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
20	MEDB BUS VOLTAGE	1				-	Electrical Room / System	MEDB Bus Volatge Indication	---	---	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	-	-	-	
21	MEDB BUS CURRENT	1				-	Electrical Room / System	MEDB Bus Current Indication	---	---	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	-	-	-	
22	DCDB ON			1		-	Electrical Room / System	DCDB "ON" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
23	DCDB OFF			1		-	Electrical Room / System	DCDB "OFF" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
24	DCDB TRIP			1		-	Electrical Room / System	DCDB "TRIP" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
25	SOLAR SYSTEM ON			1		-	Electrical Room / System	Solar System "ON" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
26	SOLAR SYSTEM OFF			1		-	Electrical Room / System	Solar System "OFF" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
27	SOLAR SYSTEM KWH (4-20 mA DC)	1				-	Electrical Room / System	Solar System "KWH" Indication	---	---	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	-	-	-	
28	DC System battery Voltage(4-20 mA DC)	1				-	Electrical Room / System	DC System Battery Voltage Indication	---	---	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	-	-	-	
29	CPTR UNIT DC CURRENT	1*				-	Electrical Room / System	CPTR Unit "DC Current" Indication	---	---	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	-	-	-	* Note "2"
30	CPTR UNIT DC VOLTAGE	1*				-	Electrical Room / System	CPTR Unit "DC Voltage" Indication	---	---	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	-	-	-	* Note "2"
31	CPTR UNIT Pipe to Soil Potential	1*				-	Electrical Room / System	Pipe to Soil Potential Indication	---	---	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	-	-	-	* Note "2"
32	FACP FIRE ON/ALARM			1		-	Control Room	Fire "On/Alarm" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
33	FACP SYSTEM FAULT			1		-	Control Room	FACP System "FAULT" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
34	FACP SYSTEM HEALTHY			1		-	Control Room	FACP System "Healthiness" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
35	Fire Suppression System Panel Spray ON			1		-	Control Room	Fire Suppression System Panel "Spray ON" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
36	Fire Suppression System Panel Healthy			1		-	Control Room	Fire Suppression System Panel "Healthiness" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
37	Fire Suppression System Panel Serial Link					MODBUS RTU/RS-485	Control Room	Serial Link	---	---			To RTU	HOLD	-	-	-	Note "5"
38	GDS System Serial Link to RTU					MODBUS RTU/RS-485	Control Room	Serial Link	---	---			To RTU	HOLD	-	-	-	Note "5"

					INDRADHANUSH GAS GRID LIMITED													
					NORTH EAST GAS GRID LIMITED PHASE-III OF IGGL-PART D1 & D2													
PROJECT NUMBER : C221052					I/O LIST FOR SV 01, UNIT 11 SGPL STATION										REV.			
Doc No::C221052-00-IN-LST-5002 Sht 2 of 8															D1			
Sr. No.	Tag Number	IO Type				Service	Location	Instrument Type	Line / Equipment Number	P & ID	IS / NIS	Signal Level	System Type	Junction Box No	Calibration Range	Instrument Range	Units	Remarks
		AI	AO	DI	DO													
	<p>Notes</p> <p>(1) Above IO list is Typical for One SV Station(Unit 15) . This list is similar for following SV stations. P&ID to follow for tag numbers and other P&ID details.</p> <p>(c) Unit 14 at SV 04</p> <p>(d) Unit 15 at SV 05</p> <p>(e) Unit 17 at SV 06</p> <p>(2) * These I/O's shall be considered in RTU of SV station 04.</p> <p>(3) All the Signals of Electrical, Instrumentation RTU, SCADA, Skid Metering etc are to be interfaced through TIC Panel.</p> <p>(4) I/O's Spare Philosophy for Ph-III shall be followed as per existing spare philosophy for RTU Ph-I and Ph II.</p> <p>(5) Signal Communication with RTU through Soft Link, RS-485/MODBUS RTU</p> <p>(6) Pig-Signaller is required for spread 2C.</p>																	

		INDRADHANUSH GAS GRID LIMITED																
		NORTH EAST GAS GRID LIMITED PHASE-III OF IGGL PART D1 & D2																
PROJECT NUMBER : C221052		F&G System- I/O LIST FOR SV 04, UNIT 15 SGPL STATION														REV.		
Doc No:-C221052-00-IN-LST-5002 Sht 4 of 8																D1		
Sr. No.	Tag Number	IO Type				Service	Location	Instrument Type	Line / Equipment Number	P & ID	IS / NIS	Signal Level	System Type	Junction Box No	Calibration Range	Instrument Range	Units	Remarks
		AI	AO	DI	DO													
SV Stations																		
1	C221052-15-PGD-1501	1				Natural Gas	In the Vent Line at the Downstream of Flow Tee-12" X 12" X 6"	Point Gas Detector	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via GDS Panel	HOLD	-	-	-	
2	C221052-15-PGD-1502	1				Natural Gas	In the Vent Line at the Downstream of Flow Tee-12" X 12" X 8"	Point Gas Detector	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via GDS Panel	HOLD	-	-	-	
3	C221052-15-MCP-1501			1		Natural Gas	-	Manual Call Points	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	NIS	4 - 20 mA	To RTU Via GDS Panel	HOLD	-	-	-	
4	C221052-15-BA-1501			1		Natural Gas	-	Beacon	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via GDS Panel	HOLD	-	-	-	
5	C221052-15-HA-1501	-	-	1	-	Natural Gas	-	Hooter	---	C221052-SGPL-PC-PID-1006 (Sheet no.: 1 OF 1)	NIS	24 VDC	-	-	-	-	-	
Notes																		

<div><div>Energising Quality</div></div>		INDRADHANUSH GAS GRID LIMITED														<div><div>IGGL</div></div>		
		NORTH EAST GAS GRID LIMITED PHASE-III OF IGGL PART D1 & D2																
PROJECT NUMBER : C221052		I/O LIST FOR IP STATION (UNIT 16) AT LAVA (WEST BENGAL)														REV.		
Doc No:-C221052-00-IN-LST-5002 Sht 5 of 8																D1		
Sr. No.	Tag Number	IO Type				Service	Location	Instrument Type	Line / Equipment Number	P & ID	IS / NIS	Signal Level	System Type	Junction Box No	Calibration Range	Instrument Range	Units	Remarks
AI	AO	DI	DO															
IP Stations																		
1	C221052-16-PIT-1601	1				Natural Gas	Pig Receiver	Pressure Transmitter	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	HOLD	HOLD	kg/cm2g	
2	C221052-16-PIT-1603	1				Natural Gas	Uptream of GOOV-1603	Pressure Transmitter	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	HOLD	HOLD	kg/cm2g	
3	C221052-16-PIT-1604	1				Natural Gas	Downstream of GOOV-1603	Pressure Transmitter	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	HOLD	HOLD	kg/cm2g	
4	C221052-16-PIT-1602	1				Natural Gas	Pig Launcher	Pressure Transmitter	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	HOLD	HOLD	kg/cm2g	
5	C221052-16-PIT-1605	1				Natural Gas	Uptream of GOOV-1604	Pressure Transmitter	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	HOLD	HOLD	kg/cm2g	
6	C221052-16-PIT-1606	1				Natural Gas	Downstream of GOOV-1604	Pressure Transmitter	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	HOLD	HOLD	kg/cm2g	
7	C221052-16-TIT-1601	1				Natural Gas	Downstream of GOOV-1603	Temperature Transmitter	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	HOLD	HOLD	Deg C	
8	C221052-16-TIT-1602	1				Natural Gas	Burried Line from SV/SGPL/05	Temperature Transmitter	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	HOLD	HOLD	Deg C	
9	C221052-16-TIT-1603	1				Natural Gas	Burried Line to SV/SGPL/06	Temperature Transmitter	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	HOLD	HOLD	Deg C	
10	C221052-16-XXS-1601			1		Natural Gas	Uptream of GOOV-1601	Pig Signaler(Non-Intrusive Type)	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
11	C221052-16-XXS-1602			1		Natural Gas	Inlet of Pig Receiver	Pig Signaler(Non-Intrusive Type)	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
12	C221052-16-XXS-1603			1		Natural Gas	Inlet of Pig Launcher	Pig Signaler(Non-Intrusive Type)	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
13	C221052-16-XXS-1604			1		Natural Gas	Downstream of GOOV-1602	Pig Signaler(Non-Intrusive Type)	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
14	C221052-16-GOOV-1601	-	-	-	-	Natural Gas	-	Gas Over Oil Actuator	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	-	-	-	-	-	-	-	
15	C221052-16-HSH-1601				1	-	-	Valve Open Command	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
16	C221052-16-HSL-1601				1	-	-	Valve Close Command	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
17	C221052-16-ZSH-1601			1		-	-	Valve Open Feed back	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
18	C221052-16-ZSL-1601			1		-	-	Valve Close Feed back	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
19	C221052-16-DPSH-1601			1		-	-	DP High Across the valve	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
20	C221052-16-XL-1601A			1		-	-	Valve Remote selected	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
21	C221052-16-XL-1601B			1		-	-	Valve Local selected	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
14	C221052-16-HSH-1601			1		-	-	Valve Open Command From Local	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	25 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
15	C221052-16-HSL-1601			1		-	-	Valve Close Command From Local	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	26 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
22	C221052-16-GOOV-1602	-	-	-	-	Natural Gas	-	Gas Over Oil Actuator	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	-	-	-	-	-	-	-	
23	C221052-16-HSH-1602				1	-	-	Valve Open Command	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
24	C221052-16-HSL-1602				1	-	-	Valve Close Command	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
25	C221052-16-ZSH-1602			1		-	-	Valve Open Feed back	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
26	C221052-16-ZSL-1602			1		-	-	Valve Close Feed back	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
27	C221052-16-DPSH-1602			1		-	-	DP High Across the valve	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
28	C221052-16-XL-1602A			1		-	-	Valve Remote selected	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
29	C221052-16-XL-1602B			1		-	-	Valve Local selected	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
14	C221052-16-HSH-1602			1		-	-	Valve Open Command From Local	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	25 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
15	C221052-16-HSL-1602			1		-	-	Valve Close Command From Local	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	26 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
30	C221052-16-GOOV-1603	-	-	-	-	Natural Gas	-	Gas Over Oil Actuator	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	-	-	-	-	-	-	-	
31	C221052-16-HSH-1603				1	-	-	Valve Open Command	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
32	C221052-16-HSL-1603				1	-	-	Valve Close Command	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
33	C221052-16-ZSH-1603			1		-	-	Valve Open Feed back	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	

<div> Energising Quality</div>		INDRADHANUSH GAS GRID LIMITED														<div> IGGL</div>		
		NORTH EAST GAS GRID LIMITED PHASE-III OF IGGL PART D1 & D2																
PROJECT NUMBER : C221052		I/O LIST FOR IP STATION (UNIT 16) AT LAVA (WEST BENGAL)														REV.		
Doc No:-C221052-00-IN-LST-5002 Sht 5 of 8																D1		
Sr. No.	Tag Number	IO Type				Service	Location	Instrument Type	Line / Equipment Number	P & ID	IS / NIS	Signal Level	System Type	Junction Box No	Calibration Range	Instrument Range	Units	Remarks
		AI	AO	DI	DO													
34	C221052-16-ZSL-1603			1		-	-	Valve Close Feed back	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
35	C221052-16-DPSH-1603			1		-	-	DP High Across the valve	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
36	C221052-16-XL-1603A			1		-	-	Valve Remote selected	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
37	C221052-16-XL-1603B			1		-	-	Valve Local selected	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
14	C221052-16-HSH-1603			1		-	-	Valve Open Command From Local	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	25 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
15	C221052-16-HSL-1603			1		-	-	Valve Close Command From Local	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	26 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
38	C221052-16-GOOV-1604	-	-	-	-	Natural Gas	-	Gas Over Oil Actuator	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	-	-	-	-	-	-	-	
39	C221052-16-HSH-1604				1	-	-	Valve Open Command	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
40	C221052-16-HSL-1604				1	-	-	Valve Close Command	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
41	C221052-16-ZSH-1604			1		-	-	Valve Open Feed back	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
42	C221052-16-ZSL-1604			1		-	-	Valve Close Feed back	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
43	C221052-16-DPSH-1604			1		-	-	DP High Across the valve	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
44	C221052-16-XL-1604A			1		-	-	Valve Remote selected	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
45	C221052-16-XL-1604B			1		-	-	Valve Local selected	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	24 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
14	C221052-16-HSH-1604			1		-	-	Valve Open Command From Local	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	25 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
15	C221052-16-HSL-1604			1		-	-	Valve Close Command From Local	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	NIS	26 VDC	To RTU Via TIC Panel	GOOV Actuator box/JB	-	-	-	
46	C221052-16-CP-1601	1				-	Downstream of GOOV-1603	Corrosion Probe	---	C221052-SGPL-PC-PID-1007 (Sheet no.: 1 OF 1)	IS	4-20 mA	To RTU Via TIC Panel	HOLD	-	-	-	
47	TIC Panel Door Open			1		-	Control Room	TIC Panel door open indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
48	TIC Panel 24 V DC bus/System Healthy			1		-	Control Room	TIC Panel 24 V DC Bus/System healthiness indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
49	MEDB ON			1		-	Electrical Room / System	MEDB "ON" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
50	MEDB OFF			1		-	Electrical Room / System	MEDB "OFF" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
51	MEDB TRIP			1		-	Electrical Room / System	MEDB " TRIP" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
52	MEDB BUS VOLTAGE	1				-	Electrical Room / System	MEDB Bus Volatge Indication	---	---	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	-	-	-	
53	MEDB BUS CURRENT	1				-	Electrical Room / System	MEDB Bus Current Indication	---	---	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	-	-	-	
54	DCDB ON			1		-	Electrical Room / System	DCDB "ON" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
55	DCDB OFF			1		-	Electrical Room / System	DCDB "OFF" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
56	DCDB TRIP			1		-	Electrical Room / System	DCDB "TRIP" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
57	SOLAR SYSTEM ON			1		-	Electrical Room / System	Solar System "ON" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
58	SOLAR SYSTEM OFF			1		-	Electrical Room / System	Solar System "OFF" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
59	SOLAR SYSTEM KWH (4-20 mA DC)	1				-	Electrical Room / System	Solar System "KWH" Indication	---	---	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	-	-	-	
60	CPTR UNIT DC CURRENT	1				-	Electrical Room / System	CPTR Unit "DC Current" Indication	---	---	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	-	-	-	
61	CPTR UNIT DC VOLTAGE	1				-	Electrical Room / System	CPTR Unit "DC Voltage" Indication	---	---	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	-	-	-	
62	CPTR UNIT Pipe to Soil Potential	1				-	Electrical Room / System	Pipe to Soil Potential Indication	---	---	IS	4 - 20 mA	To RTU Via TIC Panel	HOLD	-	-	-	
63	FACP FIRE ON/ALARM			1		-	Control Room	Fire "On/Alarm" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
64	FACP SYSTEM FAULT			1		-	Control Room	FACP System "FAULT" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
65	FACP SYSTEM HEALTHY			1		-	Control Room	FACP System "Healthiness" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
66	Fire Suppression System Panel Spray ON			1		-	Control Room	Fire Suppression System Panel "Spray ON" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	
67	Fire Suppression System Panel Healthy			1		-	Control Room	Fire Suppression System Panel "Healthiness" Indication	---	---	NIS	24 VDC	To RTU Via TIC Panel	HOLD	-	-	-	

<div> Energising Quality</div>		INDRADHANUSH GAS GRID LIMITED													<div> IGGL</div>				
		NORTH EAST GAS GRID LIMITED PHASE-III OF IGGL PART D1 & D2																	
PROJECT NUMBER : C221052		I/O LIST FOR IP STATION (UNIT 16) AT LAVA (WEST BENGAL)													REV.				
Doc No:-C221052-00-IN-LST-5002 Sht 5 of 8															D1				
Sr. No.	Tag Number	IO Type				Service	Location	Instrument Type	Line / Equipment Number	P & ID	IS / NIS	Signal Level	System Type	Junction Box No	Calibration Range	Instrument Range	Units	Remarks	
		AI	AO	DI	DO														
68	Fire Suppression System Panel Serial Link					MODBUS RTU/RS-485	Control Room	Serial Link	---	---			To RTU	HOLD	-	-	-	Note "3"	
69	GDS System Serial Link to RTU					MODBUS RTU/RS-485	Control Room	Serial Link	---	---			To RTU	HOLD	-	-	-	Note "3"	
70	UPS System Serial Link to RTU					MODBUS RTU/RS-485	Control Room	Serial Link	---	---			To RTU	HOLD	-	-	-	Note "3"	
Notes																			
(1) All the Signals of Electrical, Instrumentation RTU, SCADA, Skid Metering etc are to be interfaced through TIC Panel.																			
(2) I/O's Spare Philosophy for Ph-III shall be followed as per existing spare philosophy for RTU Ph-I and Ph II.																			
(3) Signal Communication with RTU through Soft Link, RS-485/MODBUS RTU																			

