INDRAPRASTHA GAS LIMITED (IGL)

TENDER FOR
LAYING OF MDPE NETWORK, GI/CU/MLC INSTALLATION AND MRS FABRICATION IN NCT OF DELHI, UP, HARYANA & RAJASTHAN

TENDER NO.:
IGL/XXX/XX/CPXXXX

DATE.: XX.XX.XXXX

VOLUME II OF II: TECHNICAL

ENERGISING QUALITY

PREPARED AND ISSUED BY:

VCS QUALITY SERVICES PVT. LTD.
NOIDA, INDIA

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Energising Quality	**PROJECT NUMBER: CP18519**	

SCOPE OF WORK - **MDPE NETWORK, GI/CU/MLC INSTALLATION & MRS FABRICATION**		**CLIENT JOB NO.**			CP18519
		TOTAL SHEETS			15
DOCUMENT NO.	CP18519	CGD	PL	SOW	2001

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REV	DATE	DESCRIPTION	PREP	CHK	APPR
0	13.06.2025	ISSUED FOR CLIENT REVIEW	SR	PA	DKB

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1.0 INTRODUCTION

INDRAPRASTHA GAS LTD. (IGL), a joint venture company of Gas Authority of India Limited (GAIL), M/s Bharat Petroleum Corporation Limited (BPCL) and Govt. of National Capital Territory of Delhi (NCT) plans to augment the PNG Network. It supplies natural gas to domestic & commercial consumers in Delhi, Uttar Pradesh, Haryana & Rajasthan.

VCS Quality Services Pvt. Ltd. (VCSQSPL) has been appointed as the Project Management Consultant (PMC) for all the tender related activities for MDPE Laying, GI/CU/MLC Installation and MRS Fabrication.

2.0 PURPOSE

This document is for the scope of hiring contactor for Laying of MDPE Network, GI/CU/MLC Installation and MRS Fabrication.

3.0 DEFINITIONS

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

PROJECT	LAYING OF MDPE NETWORK, GI/CU/MLC INSTALLATION AND MRS FABRICATION IN NCT OF DELHI, UP, HARYANA & RAJASTHAN
OWNER	INDRAPRASTHA GAS LIMITED (IGL)
CONSULTANT	VCS QUALITY SERVICES PRIVATE LIMITED (VCSQSPL) the party to act for and on behalf of OWNER for the PMC services related to the tender activities
MANUFACTURER	The party, which manufactures and supplies equipment and services to the OWNER or to Contractor (for supply materials required for execution of work as per SOR).
CONTRACTOR / BIDDER	The party, which has awarded the tender for the execution of work at site including supply, installation and commissioning (if any) of materials required for completion of Work.

4.0 DOCUMENT PRECEDENCE

It shall be the responsibility of the Contractor/ Bidder to inform the OWNER of any errors, ambiguities, inconsistencies, discrepancies, or conflict of information that may be found to exist in any document, specification or drawing provided in the tender by the OWNER.

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

a) Scope of Work (SOW)
b) Schedule of Rates (SOR)
c) Data Sheets & QAP

d) Standard Specifications

e) 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.

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

5.0 SCOPE OF WORK

The main scope of work comprises laying, testing, and commissioning of underground Medium Density Polyethylene (MDPE) service pipelines network of sizes ranging from 20mm up to 180mm Dia., along with above ground GI/ Cu/MLC pipe installation (LMC) and Installation of DRS / MRS / Metering Skid / SR / Meters / Regulators etc., as per SOR. The scope also covers all the activities associated with the supply of materials (except free issue items).

The scope of work for MDPE laying & Associated Works has been divided into the following schedules:

Segments	GA	Description
1	Delhi (North & West)	MDPE laying of 1200 Km and domestic PNG connections of 1,20,000 nos.
2	Delhi (East, Central, South)	MDPE laying of 1100 Km and domestic PNG connections of 1,10,000 nos.
3	Gautambudh Nagar & Ghaziabad (inc.Hapur)	MDPE laying of 600 Km and domestic PNG connections of 60,000 nos. MDPE laying of 600 Km and domestic PNG connections of 60,000 nos.
4	Rewari Gurugram Karnal Kaithal	MDPE laying of 90 Km and domestic PNG connections of 6,000 nos. MDPE laying of 90 Km and domestic PNG connections of 6,000 nos. MDPE laying of 90 Km and domestic PNG connections of 6,000 nos. MDPE laying of 90 Km and domestic PNG connections of 6,000 nos.
5	Muzzafarnagar, Meerut & Shamli Kanpur, Hamirpur & Fatehpur	MDPE laying of 390 Km and domestic PNG connections of 26,000 nos. MDPE laying of 300 Km and domestic PNG connections of 20,000 nos.

Segments	GA	Description
	Banda, Chitrakoot & Mahoba	MDPE laying of 300 Km and domestic PNG connections of 20,000 nos.
6	Ajmer, Pali & Rajsamand	MDPE laying of 900 Km and domestic PNG connections of 60,000 nos.
	Total MDPE laying of 5,750 Km and total domestic PNG connections of 5,00,000 nos.	

OWNER's SCOPE OF SUPPLY (FREE ISSUE ITEM):

- MDPE Pipes & fittings of sizes from 20mm to 180mm with Meters, Regulators, Isolation Valves, Appliance Valves, DRS, MRS, SR and Skid.

CONTRACTOR'S SCOPE OF WORK:

- Supply and Installation of GI Sleeve/ Half Round Concrete Sleeves.
- Supply and Installation of Powder coated GI/Cu/MLC Pipes & associated fittings.
- Supply and Installation of Welded Riser.
- Supply and Installation of Valves as per relevant SOR items.
- Supply and Installation of CS pipes & fittings as per relevant SOR items.
- Supply and Installation of Reinforced Rubber Hose and all materials required for natural gas conversion.
- Supply and Laying of Warning Mat.
- Providing and Laying PCC, RCC & all necessary civil works as per relevant SOR items.
- Supply & Fabrication/Erection of Wired cages for MRS and crash guard for cage protection.
- All PPE materials required for safe execution of projects.
- Carrying out subsurface utility survey along the proposed pipeline route and/ or as specified by IGL-in charge for 5 m corridor using Ground Penetrating Radar (GPR) (as per IGL requirement) for depth up to 5m below the existing ground level to locate and identify all existing underground utilities/buried objects including but not limited to pipelines, sewers, conduits, cables, drains, manholes, appurtenances etc., in the proposed corridor along with location, DGPS coordinates, depth, shape and dimensional details of utilities.
- All material required for PNG industrial & commercial connections except meter & regulator.
- All other materials required for smooth execution of project over and above as mentioned.

All above supply quantity as per relevant SOR item and shall be procured from owner's approved vendors only after approval from Client/ VCS & as per instruction of Engineer-in-charge (EIC).

Generally, the following shall constitute the Contractor's scope of work but not limited to:

1. Contractor to provide Work Implementation & Execution plan along with a schedule for execution and work implementation as per QA/QC plans to be issued by Owner/Owner's representative. Contractor has to submit the Construction/ Execution procedures before commencement of work to Owner/ Owner's representative for approval.

2. Prior to start of construction activity, contractor shall carry out the route survey and prepare the approval for construction (AFC) drawings marked for proposed gas pipe line laying and submit to OWNER/ EIC for approval. The standard templates and colour coding as per Owners standard.

3. Co-ordination/ Liaison from respective land-owning agencies such as Municipal Corporation, CPWD, ADA/ LDA, Nagar Nigam, PWD-NH, NHAI, Indian Railway, Forest & Environment Department, Irrigation department and other land owing agencies for road cutting for laying of the pipelines, Liaison with the concerned authorities during execution of the job, obtaining NOC from concerned authorities once the work is completed. Getting back/refund of bank guarantee/ security deposits made to the agencies for laying of the pipelines.

4. Obtaining clearances and coordination with concerned RWA of the allotted area for internal network laying and obtaining NOC from RWA after completion of work.

5. Transportation of Free Issue material from OWNER stores to contractor stores and proper storing, stacking, providing security, insurance cover during transportation and storage, laying, commissioning and handing over pipelines to owner.

6. Obtaining the approval for optimum route and ROU from the concerned authority and EIC.

7. Intimation to the parallel utilities (Electrical/ Communication/ Water) owners and making trial pits to determine the underground utilities/services such as existing pipelines, cables (electrical/ communication), conduits, U/G drainage, Sewers, tunnels, subways foundations etc. for deciding optimum feasible route and depths for laying the pipelines based on the route plans indicated by owner.

8. Mandatory Use of CBuD Application or any other application mandated by the Government.

   - The Contractor shall mandatorily use the "Call Before You Dig" (CBuD) application or any other application mandated by the Government for all excavation-related activities during the execution of the works.
   - Prior to commencement of any excavation work, the Contractor shall submit detailed information including but not limited to location coordinates, length of excavation, expected start and completion dates, or any other mandatory requirements within the CBuD application.
   - The Contractor shall ensure that all relevant staff and subcontractors are trained in the use of the CBuD application prior to initiating excavation activities.

- The Engineer/Employer reserves the right to audit the CBuD application records periodically to verify the compliance.
- Failure to update excavation details may lead to penalties, withholding of payments, or other contractual remedies as deemed necessary by IGL.
- The Contractor shall bear full responsibility for any damages or claims arising from failure to comply with this clause, including damages to existing underground utilities.

9. Mandatory Use of Client-Provided Digital Application for Project Monitoring

- The Contractor shall be required to use the Client's designated digital application for the real-time updating of all project activities, including but not limited to Riser Installation, RFC, NG Conversion, Customer acquisition and MDPE Laying progress.
- All data entered into this application will be considered the official record of project status.
- The Contractor is responsible for ensuring their staff are equipped with the necessary devices and connectivity to utilize this application.
- Failure to comply with this requirement may result in a delay in payment processing.

10. Contractor must arrange road cutter machine/ power tools for all areas where road cutting needs to be done.

11. Wherever required, the grass/ turfing, pavement, linings, drains, roads and other such 'pucca' area shall be locally removed to facilitate trenching and pipe laying works. The same is to be reinstated as original.

12. Installation of safety/warning signs and barricading of the entire route to be trenched. Pits to be similarly barricaded along with warning signs and caution boards.

13. To make trenches with stable slopes but restricting minimum disturbance to above ground/underground services/installation as per specifications and approved route plans keeping the trenches free from water and soil till placement of pipes.

14. Uncoiling/stringing the MDPE pipes of required sizes (i.e. 180, 125, 63, 32 & 20 mm) pipes into trenches as per approved procedure.

15. Installation of MDPE pipe and fittings like Elbow, Tees, Reducers, Couplers, tapping saddles, Transition fittings, End cap and Sleeves etc. including construction of supports, Valves pits, Inspection chambers etc. as per specification, drawing & satisfaction of the Engineer in charge (EIC).

16. Joining the pipe ends with fittings of valves by approved automated electro-fusion techniques only as per tender specification.

- EF operator to be deployed for EF welding must be certified from approved vendors of EF fittings manufacturer like GF/ Kimplas/ Section IX of ASME BPV.

- Contractor obtain latest welder I-Card by getting training from approved agencies with practical knowledge of welding on highest dia. on which work is intended.

- Contractor arrange to have reports of destructive testing of GI fittings for a lot every six months at its own cost to ensure the quality of GI fittings as per instructions of EIC.

17. Contractor must ensure that the man power deployed at site should have valid STC card.

18. Laying pipelines by any methodology including trench less technology methods with or without casing pipes (MDPE pipes) as per specifications and as directed by EIC.

19. Installation of pipes (by open cut/ Moling/ HDD) assembly, including supply of all materials (excluding free issue material if any) viz. as per the drawings/ specifications enclosed with bid package. HDD methodology and its profile submission prior to execution of HDD should be in contractor scope.

20. Moling should be done with proper ventilation in Moling pit. Electrical utility to be identified prior to attempting manual boring.

21. HDD profile & Utility coordination report to be submitted.

22. In case, it is impractical to provide 1.0-meter cover due to physical constrain, additional protective measures such as concrete slab or high impact resistance plastic sheet shall be installed (for the minimum top cover of 600 mm) by the contractor in consultation with EIC/ Site-in-charge. EIC/ Site-in-charge after examining thoroughly and considering the PNGRB Guidelines may allow the contractor. However, the contractor has to raise technical deviation for approval before commence of work. All the technical deviation shall be submitted with the RA bills.

23. Contractor should submit following set of daily reports (Planning, Manpower, Material Inventory, DPR) and monthly reports (QC, Meter reconciliation, material reconciliation, DPR, etc.)

24. Contractor must also have to arrange his own equipment like water tanker for Water showering on construction site (trench valves pit areas).

25. Contractor to depute Store keeper and draftsmen for each GA. 1 supervisor required for each site area. 1 safety officer required for per zone.

26. Fabrication, supply and inspection of approved quality GI sleeve, half concrete sleeves and other material, fittings to be supplied by the contractors as per the provisions of tender.

27. Back filling and compaction by jumping jack compactor wherever required, using approved 'good' soil or using excavated earth or borrow earth as per requirement and specifications and replacement of the tiles, slabs removed during the excavation. Cleaning all unserviceable materials, debris, excess earth trenches etc. to designated disposal area.

28. The contractor shall be responsible to arrange the supply of approved coarse sand (size 0.6 - 2 mm as per IS 383) free from any impurities like clay, mica, and soft flaky pieces, as per the instructions of EIC /Owner's representative.

29. Sand / soft soil padding around pipe wherever required in areas where trenching has been done in hard soil area / rocky area including supply of sand/ soft soil. The thickness of sand/ soft soil padding at the top of coated pipe shall be minimum 150 mm and bottom of coasted pipe shall be minimum 150 mm or as per standard drawing.

30. Carrying out pneumatic testing and purging as per specifications and approved procedures, providing all tools & tackles, instruments, manpower and other related accessories for carrying out the testing of pipes.

31. Supply, fabrication & installation of Plate markers, valve chamber etc. as per the directions of the EIC/Owner's representative.

32. Supply, fabrication & installation of Pipeline markers as per relevant SOR Items.

33. Client may also provide serial details for marker identification which vendor will engrave/ incorporate on the marker.

34. Purging should be done to point till Oxygen percentage is less than 2%. Contractor must arrange Purity certificate of N2 used for purging. It is compulsory to use Nitrogen cylinder trolley while using Nitrogen for purging/ testing. It must be necessary to qualify welder/ manpower for Procedure Qualification Record for performing testing by pressure testing the MDPE pipe coil.

35. Restoration of existing ground features such as grass/ turfing, paving, roads, drains, concrete, floral beds, fencing, tiles, marbles, flooring masonry etc. to original condition and to match with adjoining conditions, functionally and aesthetically up to the entire satisfaction of Owner / Owner's representative /any other third-party agency designated by owner and local authorities, failing which, it will be done at the risk and cost of the contractor. Obtaining No Objection Certificates for the restoration work done from the concerned authorities.

36. Returning surplus material to Owner stores after obtaining clearance from TPIA/Consultant/ Owner, reconciliation of free issue material/ consumables.

37. Handing over the completed works to owner along with detailed as built drawing showing pipeline route, fittings provided in the pipelines, for their operation purposes. Handing over 3 sets of completed as Built drawings in editable Auto-Cad as well as PDF format along with the submission of GIS mapping to the owner/ owner's representative. Also required handing over of GI/CU work of above ground drawings (including Riser drawings and domestic PNG connections drawings).

38. Maintaining the completed pipelines/installation for any failure and defect arising due to poor workmanship during defect liability period.

39. Preparation and submission of all documents like Pit Wise as graph, As-built drawings, details of crossings, utility graphs, measurement sheet, PE cards for service line and deviation statements on completion/commissioning of work by way of drawing, sketches and tables in soft & hard copy.

40. Providing adequate manpower, tools, tackles, equipment including client prescribed special tools, devices for achieving the target of pipeline laying, data logging for pipeline, valves and fittings inventory status, attending complaints, day to day interaction with customers and residents so that work can be executed within defined time period with safety.

41. Contractors' responsibility to provide details as follows (whenever required by client): collection of industry details, its current fuel and its consumption and product they manufacture. Identify and locate the collector rate applicable in the particular road in case of NHAI, Forest and Railway. Contractor should Indicate pipeline route for EIC approval and indicate line sizing after network hydraulics check/ confirmation by EIC. Contractor should identify and indicate the name of local authority maintaining the road or drainage/ canal Should provide hard copy of final survey drawing after incorporating all comments from owner's representative. (For Discussion)

42. Following activities are also in contractor's scope:

- Receive Customer's complaints logged during PE Laying.
- Attend and Carry out joint technical feasibility survey for requests and resolve the complaint.
- Maintain and update the complaint status.

43. All skilled personnel like jointers, conversion technicians will be approved and certified by Owner based on the test conducted by approved trainers.

44. Contractor shall visit and survey all areas where PE laying is planned or in progress to carry out DMA/LMC work in all such areas.

45. GIS data shall be collected of laid MDPE pipeline network. Data like Geo Co-ordinates (latitude, longitude) of Pipeline and related features like fittings, valves, FRS, MRS, Markers etc. shall be collected as per given procedure along with 50 m land base corridor (25m on either side of the pipeline) with min. accuracy of 50 cm. Data format shall be in shape (.shp) or Geo Database (.gdb).

Part I: MDPE Service Line

1. Obtaining the approval for optimum route and permission for work from society management, RWA, individual residents and any other concerned authority, if required, for completion of the work.

2. Selection of route with the Owner/Consultant/TPIA and marking the same on walls/floors from PE network, transition fittings to stove/cooking oven/appliance, making

openings and making provisions for fixing clamps. Making temporary but stable platforms/scaffolding/rope/ladder etc., required for installation of pipes/fittings at all heights/multi storied flats and locations. Vendor to ensure 100% safe execution of work ensuring no damage to any human or property.

3. Uncoiling/stringing the MDPE pipes of required sizes (20mm, 32mm, 63mm, 125mm & 180mm) pipes into trenches ensuring no damage to pipe/ equipment's as per client approved procedure.

4. Joining the pipe ends with fittings of valves by approved automated electro-fusion techniques only as per tender specification.

5. Receiving, Handling, Loading, Transportation and Unloading of owner supplied MDPE pipe & fittings including construction of supports, Valves pits, Inspection chambers etc. as per specification, drawing & satisfaction of the Engineer in charge (EIC).

6. Laying pipelines by any methodology including open cut, trench less technology methods like Moling, HDD, etc.

7. Fabrication, supply and inspection of approved quality GI sleeve, HDPE duct and half concrete sleeves and other material, fittings to be supplied by the contractors as per the provisions of tender.

8. Back filling and compaction by jumping jack compactor wherever required, using approved 'good' soil or using excavated earth or borrow earth as per requirement and specifications and replacement of the tiles, slabs removed during the excavation. Cleaning all unserviceable materials, debris, excess earth trenches etc. to designated disposal area.

9. Carrying out pneumatic testing and purging as per specifications and approved procedures, providing all tools & tackles, instruments, manpower and other related accessories for carrying out the testing of pipes.

10. Restoration of existing ground features such as grass/turfing, paving, roads, drains, concrete, floral beds, fencing, tiles, marbles, flooring masonry etc. to original condition and to match with adjoining conditions, functionally and aesthetically up to the entire satisfaction of Owner / Owner's representative /any other third party agency designated by owner and local authorities, failing which, it will be done at the risk and cost of the contractor. Obtaining No Objection Certificates for the restoration work done from the concerned authorities

11. Handing over the completed works to owner along with detailed as built drawing showing pipeline route, fittings provided in the pipelines, for their operation purposes.

Part II: Supply and Installation of GI/CU/MLC

1. Supply and Installation of powder coated GI pipes between transition fittings to customer's kitchen appliances including NPT threading of GI pipes, supply proper seal outs for threads to join fittings such as elbows, tees, connectors, regulators, meters,

appliance & isolation valve etc., as per laid procedures and specification including clamping and sealing etc. The scratched powder coated GI pipe and fittings shall be painted after the testing of the GI installation.

2. Supply and Installation of GI fittings such as elbows, tees, connectors, etc., complete as per procedures and specifications including clamping and sealing etc.

3. Supply of clamps for fixing pipes, meters, valves wherever required. Providing consumable grout material, repair/restoration of walls/floors changes for the pipes including the materials required for conversions and tools and tackles etc. shall be complete as per specification.

4. Installation of Isolation Valve, Appliance Valve, etc., to complete the connection to the customer's appliance/stove.

5. Cleaning, flushing, pneumatic testing and commissioning to the GI pipe and fittings, meters, valves etc., as per specification and hand over the same to Owner/customer to the entire satisfaction of EIC.

6. Conversion of all types of LPG kitchen appliance to NG based appliance along with supply and installation of Steel Reinforced Flexible Rubber Hose as per IS 9573.

7. Preparation and submission of Ready for Conversion (RFC) card for each house indicating the laid GI pipe including fittings, mentioned the reasons, if connection is not provided to the customers and deviation statements on completion/commissioning of work.

8. Approval of customer on RFC card & recording Joint Meter Reading (JMR) of customer.

9. Details for commercial connection.

10. To Demonstrate the Customer regarding use, safety and maintenance related aspects of NG based appliances and installations.

11. Dismantling of scaffolding/temporary structures and cleaning of site & restore the site as per its original condition.

12. Restoration of walls, flooring and other damages while executing the above ground installation.

13. All risers and lateral pipe shall be clamped to the building at intervals not exceeding 1 m in place of 1.5m. Two clamps to be installed at each bend fittings or Tee fittings. Clamps should be 150mm away from each joint.

Contractor shall conduct Cu joining Qualification Test for jointers

Contractor has to supply different types/sizes of approved clamps.

14. Pneumatic testing of Riser at 2 bar (g) for 2 hours and Copper testing at 80 mbar for 5 minutes shall be done.

15. Only pretested riser shall be erected using pulley. Pretesting shall be done with compressed air @ 2 bar (g) for minimum duration of 30 minutes.

All the painting work must be done after completion of testing activity only

Testing of GI / Copper Installation * Arrangement for pressurizing the installation should be shown with diagram. The testing of Gl riser pipe up to regulator inlet point shall be done with isolation valve in open condition at TF side and closed condition at regulator side. PPT/Riser Testing and MMT/RFC must be certified by TPIA.

17. All GI fittings must be Powder coated.

18. Inspection: It is responsibility of contractor to get Job Card / RCF check drawing certified at site only by TPIA/Owner's Representatives. Each meter geo tagged location and time stamped photo required at the time of commissioning

19. Certified copies of RFC card in form of editable Auto-Cad drawings, PDF and hard copy to be submitted along with geo co-ordinates of Riser to be submitted. JMR to mention geo co-ordinates stamped and time stamped meter reading photo WAH ropes must be certified by PETZL and all WAH accessories must be of PETZL make, only Printable material i.e. RFC book and sticker as per owner design for each connection must be in contractor's scope in place of Client's scope as per their format.

20. The contractor shall supply the Calibrated Go-No Go Gauge and BSPT/ NPT (as decided) Gauges 1 set each of 1/2" and 1".

21. Any other activities not mentioned/covered explicitly above, but otherwise required for satisfactory completion/operation/ safety/ statutory/ maintenance of the works shall also be covered under the Scope of work and has to be completed by the Contractor within specified schedule at no extra cost to Owner.

Part III: Services related to Commercial and Industrial Connection

Installation of Commercial and Industrial connection which includes taking tap off from PE network, laying of MDPE pipeline along with associated fittings, installation of GI pipes with associated fittings, installation of meter & regulator etc.

Variation in pressure and meter running fast issue shall be check by contractor time to time for smooth execution of projects.

6.0 CONDITIONS FOR ISSUE OF MATERIALS

Whenever any material is issued by Owner, following conditions for issue of material in addition to other conditions specified in the contract shall be applicable.

1. Necessary indents will have to be raised by the Contractor as per procedure laid down by the Engineer-in-charge from time to time, when he requires the above material for incorporation in permanent works.

2. Materials will be issued only for permanent works and not for temporary works, enabling works etc. unless specifically approved by the Engineer-in-charge and the same shall not be taken into account for the purpose of materials reconciliation.

3. The contractor shall bear all other cost including lifting, carting from issue points to work site/ contractor's store, custody and handling etc. and return of surplus/ serviceable scrap materials to Owner's storage points to be designated by the Engineer in-charge etc. No separate payment for such expenditure will be made.

4. No material shall be allowed to be taken outside the plant without a gate pass.

5. The contractor shall be responsible for proper storage, preservation and watch & ward of the materials.

7.0 RECONCILIATION OF OWNER SUPPLIED MATERIALS

Every month, the contractor shall submit an account for all materials issued by Owner in the Performa prescribed by the Engineer-in-charge. On completion of the work the contractor shall submit "Material Appropriation Statement" for all materials issued by the Owner in the Performa prescribed by the Engineer-in-charge.

Waste materials like part lengths of pipes and other partly used items are the property of Client and must be returned to the store with the appreciate documentation so that they can be considered as part of the material reconciliation.

ITEM	UNACCOUNTABLE	SCRAP
Regulators, meters	0%	0%
Isolation & appliance valves	0%	0%
GI Pipes	2%	2% (less than 0.5 mtrs)
MDPE pipes	2%	2% (less than 2.0 mtrs)
Consumables	Discretionary	-

* In case supplied by Owner

Unaccountable wastage/ scrap shall be at actual as per site assessment subject to maximum as stated above.

The percentage allowance shall be accounted on the basis of final measurement book.

1. All unused, scrap materials and salvageable materials shall be the property of the Owner and shall be returned by the Contractor category-wise at his cost to the Owner's designated store yard(s). In case the Contractor fails to do so/ or exceeds the limits of allowances specified above for scrap/ serviceable materials, then recovery for such quantities not returned as well as returned in excess of permitted limit by the Contractor will be done at the penal rate i.e. 125% of landed cost at the time of final bill/ closing of contract by Engineer-in-charge shall be effected from the Contractor's bill(s) or from any other dues of the Contractor to the Owner. Contractor shall be responsible for the

adjustment/ weighment/ measurement of the surplus materials to be returned to the store. Contractor shall also be responsible for suitable segregation of returned materials into separate stacks of serviceable and scrap materials.

2. Scratched MDPE pipe line acceptable allowance should not more than 10 % of the O.D.

3. Wherever certain material is covered under Contractor's scope of supply whether part or in full for any item of work covered under SOR, no allowance towards wastage /scrap etc. shall be accounted for during execution stage.

ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION

FOR

LAYING OF POLYETHYLENE MAIN PIPELINES AND SERVICE PIPELINE FOR DOMESTIC CONNECTIONS

VCS – SS – PE - 0001

01	**10.05.21**	**ISSUED AS STANDARD**	**RKY**	**RKT**	**HK**
00	**18.03.19**	**ISSUED AS STANDARD**	**BS**	**MVK**	**AD**
REV.	**DATE**	**Purpose**	**Prepared By**	**Checked By**	**Approved By**

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1.0 GENERAL INFORMATION

Indraprastha Gas Ltd. is a Joint Venture Company of Gas Authority of India Ltd. (GAIL), Bharat Petroleum Corporation Ltd. (BPCL) and Govt. of NCT of Delhi. IGL plans to install an underground Natural Gas Distribution network throughout the NCT of Delhi, Uttar Pradesh, Haryana & Rajasthan. The objective is to supply Natural Gas to both DOMESTIC and COMMERCIAL customers, and to provide compressed gas as a fuel for Automobiles. IGL is seeking Contractors to assist in meeting the above objective.

The main scope of this Specification comprises of laying of underground Medium Density Polyethylene (MDPE) main pipelines and service pipeline. The scope covers all the activities associated with the purchasing (specified items only), laying, testing and commissioning of MDPE main pipelines and service pipelines in new & existing gas charged areas of sizes ranging from 20mm up to 180mm OD, which includes PE/GI transition fitting above ground level and above ground laying and commissioning of powder coated GI/CU pipe line, meter regulator etc. including burner conversion and commissioning.

This technical specification defines the basic guidelines to develop an acceptable design and suitable construction methodology for carrying out different activities listed out in the schedule of rates of this tender.

Compliance with these specifications and/ or approval of any of the Contractor's documents shall in no case relieve the Contractor of his contractual obligations.

2.0 DEFINITIONS

OWNER	INDRAPRASTHA GAS LTD. IGL
PMC	VCS QUALITY SERVICES PVT. LTD. (VCSQSPL)
SS	STANDARD SPECIFICATION
TPIA	THIRD PARTY INSPECTION AGENCY (TO BE APPOINTED BY IGL)
EIC	ENGINEER- IN – CHARGE

3.0 SCOPE OF WORK

Generally, the following shall constitute the contractor's scope of work but not limited to:

Plan and prepare a schedule for execution and work implementation as per QA/QC plans to be issued by Owner/Owner's representative. Contractor has to submit the Construction/Execution procedures before commencement of work to Owner/ Owner's representative for approval.

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Prior to start of construction activity, contractor shall prepare route survey drawing in AUTO CAD / Computerized drawing (minimum size of sheet is A3) marked for proposed gas pipe line laying and submit to IGL/PMC for approval

Obtaining permissions from respective land owning agencies such as MCD, NDMC, PWD, DDA, NHAI, GNN, GDA, Railway Irrigation department, DSIDC, UPSIDC, NOIDA, Greater Noida etc. for road cutting for laying of the pipelines, liaison with the concerned authorities during execution of the job, obtaining NOC from concerned authorities once the work is completed. Getting back/refund of bank guarantee/security deposits made to the agencies for laying of the pipelines.

Obtaining clearances and coordination with concerned RWA of the allotted area for internal network laying and obtaining NOC from RWA after completion of work.

Transportation of Free Issue Material from IGL stores to contractor stores, proper storing, and stacking, providing security, transit insurance cover during storage, laying, commissioning and handling over pipelines to owner.

Obtaining the approval for optimum route and ROU from the concerned authority.

Making trial pits to determine the underground utilities/services such as existing pipelines, cables (electrical/communication), conduits, u/g drainage, sewers, tunnels, subways foundations etc. for deciding optimum feasible route and depths for laying the pipelines based on the route plans indicated by Owner.

Wherever required the grass/turfing, pavement, linings, drains, roads and other such 'pucca' area shall be locally removed to facilitate trenching and pipe laying works. The same is to be reinstated as original.

Installation of safety/warning signs and barricading of the entire route to be trenched. Pits to be similarly barricaded along with warning signs and caution boards.

To make trenches with stable slopes but restricting minimum disturbance to above ground/underground services/installation as per specifications and approved route plans keeping the trenches free from water and soil till placement of pipes.

Uncoiling/stringing the MDPE pipes of required sizes (i.e. 180, 125, 63, 32 & 20 mm) pipes into trenches as per approved procedure.

Joining the pipe ends with fittings of valves by approved automated electro-fusion techniques only as per tender specification.

Installation of pipe fittings like elbow, tees, reducers, couplers, tapping saddles, transition fittings, valves etc., including construction of supports, valves pits,

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inspection chambers etc. as per specification & satisfaction of the EIC.

Laying pipelines by any methodology including trenchless technology methods with or without casing pipes (HDPE pipes) as per specifications and as directed by EIC.

Fabrication, supply and inspection of approved quality GI sleeve and half concrete sleeves and other materials, fittings to be supplied by the contractors as per the provisions of tender.

Back filling and compaction by jumping jack compactor wherever required, using approved 'good' soil or using excavated earth or borrow earth as per requirement and specifications and replacement of the tiles, slabs removed during the excavation. Cleaning all unserviceable materials, debris, excess earth trenches etc. to designated disposal area.

Carrying out pneumatic testing and purging as per specifications and approved procedures, providing all tools & tackles, instruments, manpower and other related accessories for carrying out the testing of pipes.

Supply, fabrication & installation of Stone route marker, Pole/ FRP marker with foundations, Plate markers, valve chamber etc. as per the directions of the EIC/Owner's representative.

Commissioning of gas in the tested PE line shall be done as per the approved procedure.

Restoration of existing ground features such as grass/turfing, paving, roads, drains, concrete, floral beds, fencing, tiles, marbles, flooring masonry etc. to original condition and to match with adjoining conditions, functionally and aesthetically up to the entire satisfaction of Owner / Owner's representative /any other third party agency designated by owner and local authorities, failing which, it will be done at the risk and cost of the contractor. Obtaining No Objection Certificates for the restoration work done from the concerned authorities.

Returning surplus material to Owner stores after obtaining clearance from TPIA/Consultant/ Owner, reconciliation of free issue material/consumables.

Handing over the completed works to owner for their operation/use purposes.

Rectification of defects arising due to poor workmanship during defect liability period of pipelines/installations handed over to Owner.

Preparation and submission of all documents like Pit wise as graph, As-built drawings, details of crossings, utility graphs, PE cards for service line and deviation statements on completion/commissioning of work by way of drawing,

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sketches and tables in soft & hard copy.

Providing adequate manpower, minimum 2 no's each such as data entry operator, customer care executive etc. for data logging like new connection request, NG conversion request & GI tracking, attending complaints, day to day interaction with customers and residents so that work can be executed within defined time period (TAT) Turnaround Time. At present TAT period is 90 days which may vary time to time as per guidelines of PNGRB and IGL policy. Data entry operator & customer care executive should be minimum 12th pass (intermediate) with minimum experience of 2 years in relevant field.

Providing adequate manpower for carrying out laying for PNG installation for emergency cases as and when required. Providing adequate manpower for material for carrying out laying for PNG installation for emergency cases as and when required, as per instruction of EIC.

Following activities are also in contractor's scope:

- Receive Customer's request and complaints logged on IGL's CRM/Offline.
- Carry out joint technical feasibility survey for requests received.
- Attend and resolve customer complaints.
- Maintain and update the request and complaint status in IGL's CRM.
- Maintain new connection tracking on IGL's CRM.
- Meter sticker and safety pamphlet Shall be provided by contactor as attached with the tender document. Pamphlet shall be of 130 GSM Imported Art Paper, A-4 size, both sides printed in colored.

Any other activities not mentioned/covered explicitly above, but otherwise required for satisfactory completion/operation/ safety/ statutory/ maintenance of the works shall also be covered under the Scope of work and has to be completed by the Contractor within specified schedule at no extra cost to Owner.

Carrying out GPR and GIS survey from recognized agencies in NCT of Delhi, UP, Haryana & Rajasthan GA
Providing asked manpower & material on daily wages as per instruction received from IGL
Construction of trenches in builder segment as per approved drawings.

4.0 MATERIAL, MANPOWER, EQUIPMENT AND MACHINERY

Material to be supplied by Owner as Free Issue.

Unless otherwise specified, owner will supply following material such as MDPE - pipes, fittings, valves, transition fittings, HDPE pipe as casing material to contractor (of all sizes) and all materials other than mentioned above shall be supplied by contractor as per technical specification to complete the laying of gas main pipelines and service pipelines.

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The free issue material shall not be procured from any other source by contractor. Material reconciliation statement of free issue material duly certified by Owner and PMC shall be submitted to IGL on monthly basis.

Material to be supplied by the contractor:

The supply of items as indicated in SOR but not limited to shall be strictly as per relevant technical specifications enclosed with the Tender and as per guidelines of various clauses of SCC and SOR.

All materials shall be handled safely and stored in a permanent, covered, lockable store/ ware house preferably near site in such a manner as to prevent any damage to the materials from scratching, gouging, indentation, excessive heat or by contact with any sharp objects or chemicals. The MDPE pipes and fittings shall be stored properly to protect material from sunshine, rain etc.

Contractor's store/ware-house should be located on main road/commercial locations with access to heavy vehicle.
Independent store-keeper with computer, printer & stationaries has to be provided on full time basis in order to maintain ledgers as per IGL approved formats.
Contractor will be responsible for getting the regular audits done with IGL/PMC/Internal/External

4.1 Backfilling Material

The contractor shall be responsible to arrange the supply of approved coarse sand (size 0.6 - 2 mm as per IS 383) free from any impurities like clay, mica, and soft flaky pieces, as per the instructions of EIC /Owner's representative. For supply of sand in trench for rocky terrain, no separate charges are payable and is included in rates. Also supply of sand in valve chambers, Normal surface & built up surface, if required, as per the instructions of EIC is not separately payable.

In case specified trench, depths are not achieved or if directed by Engineer-In Charge Contractor has to provide concrete casing pipes/ slabs, extra rate of PCC may be payable with prior approval of EIC/PMC.

Other materials: The contractor shall supply the following items wherever required:

- All materials required for framework, trench support and temporary trench Crossings.
- All sign boards, barricades, tin sheets, lighting arrangement and protective equipment.
- All minor items not mentioned in the specification but necessary for the satisfactory completion and performance of the work.
- Material required for installation of valve chambers.
- GI, Half Round Concrete Sleeves. (Refer enclosed drawing no 15792-10-03-33)

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- Permanent markers (Refer enclosed drawingno15792-10-03-28, 29, 30, 31)
- Warning Mat

4.2 Manpower

The contractor shall provide the skilled labour, tools, material and equipment necessary for the proper execution of the work.
Manpower with required tools/tackles and material shall be provided by contractors within scheduled time frame.

4.3 Equipment, Machinery &Tools

This will include but is not limited to the list of specialized items included in Annexure# I

All vehicular type machinery shall be in good working order and shall not cause spillage of oil or grease. To avoid damage to paved surfaces, the Contractor will provide pads of timber or thick rubber under the hydraulic feet or outriggers of machinery.

Contractor must also have to arrange his own equipment for restoration work like water tanker and jumping jack compactor for compaction of backfilled trenches and roller and other required equipment/ machinery for asphalting/ road works.

In case there is non-availability of approved equipment's, tools and tackles during the work at site, suitable penalties, as per special terms and conditions of the contract, will be levied and deducted from the running bills.

4.4 Acquisition, Receipt & Storage of Materials

The Contractor shall collect all materials from IGL during stores working hours following all documentation procedures laid down and as directed by the EIC. The Contractor shall carry pipe in such a manner as to preclude damage during transportation and handling. PE pipes supplied in straight lengths may be carried in straight pipe racks.

The contractor shall at the time of receipt of material physically examine all materials and notify the EIC immediately of any damage or defect noticed by the contractor. Any damage not so recorded will be deemed not to have existed at the time of receipt of material by the contractor and the cost of repair or replacement or rectification shall be borne by the contractor. Any material once issued from IGL store, if found in non-working condition at site shall be brought to the notice of EIC with PO reference in written within 15 days and after subsequent approval shall return defective material in IGL stores within 30 days.

If delay is more than 30 days and material is under warranty, the material will be accepted with a penalty, else the material will not be reconciled and amount of the same will be deducted from bills. Penalty shall be levied as per SCC. The contractor shall ensure that no defective material shall be returned to store at the time of closure of contract. The format for defective materials returning to stores will be made available by EIC.

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The contractor shall maintain locked store preferably near at site so that all the materials are stored in such a manner so as to prevent any damage to the materials from scratching, gouging, indentation, excessive heat or by contact with any sharp objects or chemicals. The PE pipes and fittings shall be stored properly to protect material from sunshine, rain, water logging etc. The contractor shall make adequate security arrangements for the stacked material & any loss to the material on account of theft on improper storage is attributable to the contractor.

The Contractor shall maintain log book at their respective stores stating issue and availability of free issue material at a given day. Further, it is mandatory that the contractor is required to undertake and submit inventory details of free issue and purchased materials on monthly basis to Owner/ Owner's representative as per the approved format of the owner. The inventory details shall be in correlation with the Daily progress chart and material reconciliation sheet.

In case of non-submission of material reconciliation on first week of every month, applicable penalties shall be levied as per SCC from the running bills. In case if shortage in free issue material is observed at the time of quarterly physical verification by IGL, equivalent value of material found short shall be withheld from running bills, same shall be released after settlement of free issue material.

5.0 PROGRESS OF WORK

The contractor shall proceed with the work under the contract with due expedition and without delay. The EIC may direct in what order and at what time, the various stages or parts of the work under the contract shall be performed. Contractor has to regularly submit daily progress reports, weekly progress reports, graphs with utilities, testing reports, material consumption and inventory reports, deviation statements, completion schedule etc.

6.0 APPROVALS & PERMISSIONS FOR PIPELINE LAYING

Contractor has to obtain permissions from statutory bodies for laying of pipelines. Statutory bodies in this case are MCD, NDMC, PWD, NHAI, CPWD, AAI, Indian railways, DDA, GNN, GDA, Noida, G. Noida and any other government agencies who maintain the public lands and accord permissions for laying of the utilities. The contractor shall obtain demand note (road restoration charges) from these statutory bodies. Contractor shall ensure that the road restoration charges are to the minimum against the work to be carried out. IGL may return back the demand note, if the charges are not found reasonable and contractor shall not be liable for any liaison charges against the same.

However, IGL will pay the road restoration / Departmental charges / security deposit / Bank guarantees for getting the clearances from statutory bodies. It is the contractor's responsibility to inform and co-ordinate the concerned local authorities and also other utility agencies before and after the commencement of work at site. To ensure smooth execution of the work on a day-do-day basis, the contractor has to liaison with respective

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authorities. The contractor shall plan and ensure that work taken up under a single permission shall be completed within the stipulated time period and revalidation process is avoided. No separate liaison charges are liable to lGL for revalidation cases.

It is the responsibility of the contractor to obtain "No Objection Certificate" (NOC) from land owing agencies/Statutory bodies after completion of the restoration to their satisfaction and getting released the security deposit / bank guarantees submitted by lGL for obtaining permissions on production of documentary evidence. Separate payment in running meters will be made on account of approvals/permissions as per the SOR item No. 9 based on total applied length except for GENERAL SOR item No. 4, where the rates are inclusive of liaison rates. In case of any deviation/change in the route/additional laying, IGL shall pay the additional Road Restoration Charges only after receiving of revised estimate and further to written confirmation from the concerned Owner site in-charge.

On behalf of the Owner, contractor shall prepare in advance and submit the proposed route plan complete in all respect and well ahead of time so that the actual construction work is not delayed because of approval/inspection/permission by concerned authorities. Further, the contractor shall also coordinate with the relevant authorities for necessary approvals of these proposed pipeline route drawings/certificates. The inspection of work by statutory authorities shall be the responsibility of the contractor without any extra cost to IGL.

In case contractor delays laying of pipeline work under a single permission, the work or part of work may be offloaded to some other contractor on his risk and cost. Any change / addition required to made to meet the requirements of the statutory authorities shall be carried out by the contractor without any extra cost to IGL. The inspection and acceptance of the work by statutory authorities shall however, not absolve the contractor from any of his responsibilities under this contract.

7.0 REFERENCE SPECIFICATION, CODES AND STANDARD

The contractor shall carry out the work in accordance with the requirement of latest relevant applicable standards, this specification, Owner's Engineering Standards; relevant Oil Indian Safety Directorate (OISD) norms, PNGRB Regulations, ASME B31.8-Gas Transmission and Distribution Piping Systems; Australian Standard 3723-Installation and Maintenance of Plastics Pipe Systems for Gas; and the American Gas Association Document - Purging Principles and Practice. IS0-4437/JS: 14885 for underground polyethylene pipes and OWNER’s approved procedures.

Should the contractor find any discrepancy, ambiguity or conflict in or between any of the standards and the contract documents, then this should be promptly referred to the Engineer-In-Charge (EIC) for his decision, which shall be considered binding on the contractor.

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8.0 QUALITY OF WORK

All works carried out under this contract shall confirm to applicable standards, codes of practice, construction procedures and other technical requirements as defined in the technical specifications.

The manpower deployed on the respective activities shall be adequately trained & shall have necessary skills to execute / supervise the work. However, the assessment on the qualification of the personnel shall be at the discretion of EIC.

Fusion operators and other skilled personnel shall be approved by Owner/ Owner's representative based on the test conducted at site and identification cards duly signed by IGL Sit In-charge shall be issued to them. Only those personnel who are approved by shall be allowed to execute the critical activities like electro fusion jointing of MDPE pipes & fittings. IGL may provide training and certification on chargeable basis where the cost shall be borne by Contractor.

9.0 SAFETY

The Contractor shall conform to the safety requirements outlined elsewhere in the tender document. In addition, the Contractor shall observe safe working practices in the storage and handling of cleaning fluids, flammable fluids, etc., and ensure smoking or naked flames are not permitted in the vicinity when these materials are being used.

Trench walls shall be battered with sufficient slope in order to minimize a trench collapse. Where there is a danger of an earth slide or collapse, the trench shall remain open for the minimum time possible with proper barricading. The Contractor is to ensure that no person enters a trench, which is of a depth of 1.5 meters or greater, unless the trench has adequate shoring or the sides are battered to such an extent as to prevent a trench collapse.

The Contractor shall also protect all work sites with warning signs, barricades and night lighting. The Contractor shall inspect all fenced excavations daily, and maintain them in good order.

The trenches/ pits shall not be kept open in night times. However, in case the same is essential the same shall be properly barricaded with proper lighting arrangements & manned.

The Contractor shall provide PPE's like helmets, safety shoes, etc. to the labour which are necessary for safe working practice.

Any accident causing injury to any person or damage to property or equipment shall be reported to the EIC and the cost of repair / replacement of the damage equipment shall be borne by the contractor. Where the EIC determines that the work is being performed by the Contractor in an unsafe manner, he may suspend the Work until corrective action

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is taken by the Contractor.

PPE, Continuous Barricades and caution tapes along the trenches as per approved drawing in tender, Use of Safety Boots, Hand gloves, Reflective jackets, Hard hats(helmets), Safety shoes, eye and ear safety equipment, Fire extinguishers and as per the detailed scope of work in tender specifications. Contractor shall be paid as per SOR item No. 10.1; measurement sheet of laying should also include length of barricading. Refer drawing number 15792-10-03-26, 32. For further details Refer "Special Terms and conditions of Contract" & SOR.

10.0 ROUTE SURVEY

Planning, detailing the size, route survey drawings, identification of underground utilities, foreign pipelines, crossings, and location of valve chamber, FRS, DRS, MRS as well as service line location is in scope of contractor.

10.1 Mainlines

The final alignment of mainlines will be worked out at site in consultations with the Owner/Owner's representatives after route survey and trial pits, at contractor cost. Any change in routing from the issued drawings due to site constraint will be notified to EIC & his specific written approval shall be obtained before carrying out the job.

10.2 Service lines

Consultant/Third Party Inspection Agency and the contractor will conduct a joint survey at each probable premise/ housing colony/pockets/area to be supplied with gas. The survey record will note customer's detailed potential gas supply points, proposed regulator positions and estimates of material quantities. The contractor's representatives will make sketch of the agreed pipe routes.

The contractor will be responsible for contacting the customer and making the necessary arrangements for access and appointments to carry out the work. Contractor shall maintain job card at site. Owner will not be responsible for time lost due to failed appointments or disputes with customers.

11.0 ORGANISATION STRUCTURE

Contractor shall designate Project Manager/ Coordinator who will be responsible to interact with EIC/Consultant/TPIA and authorized to attend review meetings, receive material, authorized to sign documents, claims and receive payments etc. Contractor shall employ a Project Manager Coordinator on company roll. Project manager / coordinator & Site Engineers on company roll. The Project Manager/ Coordinator must have qualification of BE Mech. /Diploma in Mech. Engg. With min. 2-5 years & Site Engineer must have minimum Diploma in Mechanical Engineering with 3 years of work experience in gas pipe line job. He shall be single point of contact for all the works and must represent company in the review meetings.

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All construction work will be carried out as per direction of EIC, and this will be the primary point of contact between the contractor and Owner on site. All work will be issued and sanctioned through the EIC and site control exercised by Site Engineers. The contractor shall ensure that technical quality standards are maintained, that construction is carried out cost effectively and that a good customer and public image is maintained for Owner.

The contractor will deploy his own supervisors as directed by site engineers/EIC. These personnel will be reporting to the Site Engineer for monitoring construction standards and for ensuring that all technical requirements are met for the job being carried out. The contractor's supervisor(s) will have day-to-day liaison with the Site Engineer, and will provide the Site Engineer with technical reports and audits, and other management information as is required on work progress and construction quality standards.

The contractor's supervisor shall have mobile telephones to ensure that they can be contacted at all times. The contractor will also nominate one person who can be contacted if necessary in odd hours, for the duration of the works. The contractor's supervisor will have access to transport at all times to allow them to visit sites and attend meetings with Owner. Supervisor shall attend to normal day-to-day issue of work instructions, communication between Owner / Owner's representative and the contractor's supervisor.

Contractor shall maintain a Customer Care Centre, Project Site Office, and Material Store in their allotted site with following facilities:

- Telephone, Mobile Phones, Fax machines, Printers/Scanning/Xerox machines, Computers with internet facility.
- One Nos. -Four-wheeler with driver, he shall be well equipped with tools and tackles for attending any emergency complaints and ongoing execution work.
- On award of the contract, the contractor shall establish and submit documentary evidence for above, which will be verified by the owner before award of the work order.

12.0 STRUCTURES, SERVICES AND OTHER PROPERTY

12.1 Location of Underground Utilities

The contractor shall locate all buried utility pipes, underground cables, water mains and other obstructions intersecting or adjacent to the Works, and shall make available the necessary labour to expose and record the depth of cover over all obstructions in advance of excavation. This shall be done far enough in advance of excavation to facilitate gradual change in grade or position found necessary to clear any obstructions.

In addition, the contractor shall excavate trial pits as necessary to determine the pipe route. The number of trial pits will be agreed with the Site Engineer in advance of any excavation. In any event, trial pits shall be made at intervals of a maximum of 30 meters. Restoration of the abandoned trial pits and trenches shall be the contractor's

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responsibility and contractor shall ensure all open pit/ trench shall be back filled/ levelled/ restoration of pits at the time of day closing (end of day). No payments shall be made for such type of jobs. The trial pits shall be excavated to minimum depth of 1.5 meters so as to locate any utilities present in the trench.

It is contractor's responsibility to interact with other utility agencies regarding their existing utilities and finalize the route along with these agencies and Owner/ Owner's representative.

There will be no additional payments in respect of abandoned trenches incurred because of insufficient or inadequate trial pits, or any associated loss of time or delays.

Contractor must ensure that before starting the execution of lying of pipeline, the intimation/information must cascade to all utilities agencies seeking the information about the existing utility in the proposed route.

12.2 Protection of Structures and Utilities

The Contractor shall at his own cost support and protect all buildings, walls, fences or other structures and all utilities e.g. Electrical cables, Telephone Cables, Water pipelines, Sewer pipelines etc., and property which may be damaged as a result of the execution of the works. He shall also comply with the requirements in the specification relating to protective measures applicable to particular operations or kind of work. Special care shall be taken while laying of pipelines near the trees.

12.3 Interference with Traffic, Street Drainage and General Public

The Work shall be executed in such a manner so as to cause a minimum inconvenience to persons using public or private roads, lanes, thoroughfares, walkways, rights-of use or passages through which the Works are to be executed. The trench shall be back filled; compacted, leveled and extra soil shall be removed immediately after laying of pipeline to avoid public inconvenience. Closure of roads, etc., shall not be permitted without the approval of the EIC.

The Contractor shall comply with all local Authorities requirements to traffic and keep roads open to traffic and maintain access to and within any private property.

Wherever the pipe route crosses driveways, access tracks or entrances to private properties the Contractor shall give the owner, occupier or relevant authority at least 24 hours prior notice of intended commencement of excavation and shall be restricted to pass through.

The Contractor shall not use a private driveway, access track or entrance without the prior approval of the EIC in any circumstance.

The Contractor shall provide suitable access wherever necessary in the form of temporary bridges, culverts, flumes, etc., of a size and type approved by the EIC.

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The Contractor shall comply with all relevant road Laws. Where limits and/or speed limits have been placed in the vicinity of the Works, the Contractor shall provide for the necessary movement of plant and equipment in accordance with the requirements of the relevant authority.

The Contractor shall not obstruct any drainage pipes or channels in any road but shall divert them wherever necessary and use all proper measures to provide for the free passage of water.

The Contractor shall handover the completed works after proper cleaning of the site.

The contractor shall conduct his operation at all times, with a view to minimize as far as practicable noise and other objectionable nuisances (e.g. oil leakage, spillage, debris etc.)

13.0 TRENCHING

The schematic drawing with the details of trench is enclosed in the tender as per drawing No. 15792-10-03-27

The Contractor shall perform the excavation works so as to enable the pipe to be laid in conformity with the levels, depths, slopes, curves, dimensions and instructions shown in the Drawings, Specifications or as otherwise directed by the EIC.

Contractor shall excavate and maintain the pipeline trench on staked center line as per approved drawing taking into account the horizontal curves of the pipelines.

While trenching, care shall be taken to ensure that all underground structures and utilities are disturbed to the minimum. Suitable crossing shall be provided and maintained over the ROU wherever necessary to permit general public, property owners or his tenants to cross or move stock or equipment from side of the trench or another.

Trenching shall be made with sufficient slopes on sides in order to minimize collapsing of the trench. On slopes wherever there is danger of landslides, the pipeline trench shall be maintained open only for the time strictly necessary. Owner may require excavation by hand, local route and detouring and limiting the period of executing of the works. Before trench cuts through water table, proper drainage shall be ensured, both near the ditch and ROU in order to guarantee the soil stability.

The Contractor shall ensure that trench bottom is maintained in the square form as far as possible, with equipment, so as to avoid/minimize the hand grading at the bottom of the trench. The Contractor shall do all such handwork in the trench as required to free the bottom of trench from loose rock, pebbles and to trim protruding roots the bottom and sidewalls of the trench.

Excavation of trench/pit having PCC/RCC surface, more than 12" in thickness or more than 12" thick continuous asphalted multi-layer/Malba/Brick/Boulder, Additional rates are

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payable over and above the Laying rates (of SOR No. 1) as per SOR item no 5.1. Sand padding to be done in case of Malba/Boulder or wherever required as per site conditions.

Excavation in Hard Rock:

Hard rock is defined as trench material with a single piece of rock, dimension exceeding 1.0 m in any direction, which requires cutting only by use of chisel/pneumatic chisel/drill or sledge hammer or removal of the same by additional excavation technique approved by EIC. Additional rates shall be payable for hard rock excavation as per the item SOR no 5.2 over and above the pipeline laying rates. Excavation through soil mixed with small boulders that have been used for a road base will not be considered as hard rock for the purpose of payment.

Excavation in congested Areas:

Congested area shall be defined as an area where MDPE pipeline has to be laid in narrow lanes (Less than 4.5M including footpath/drains) & houses in such locations have only one side entrance i.e. there is no back-lane between two back to back houses & pipeline has to be laid in front of the house. The rates are payable over and above the Laying rates as per relevant SOR item no 1. Such excavation shall be payable under SOR item no.- 5.3.

In addition, the contractor shall excavate trial pits as necessary to determine the pipe route. The number of trial pits will be agreed with the Site Engineer in advance of any excavation. In any event, trial pits shall be made at intervals of a maximum of 30 meters. Restoration of the abandoned trial pits and trenches shall be the contractor's responsibility and contractor shall ensure all open pit/ trench shall be back filled/ levelled/ restoration of pits at the time of day closing (end of day) otherwise the rates against the same shall not be payable. No payments shall be made for such type of jobs. The trial pits shall be excavated to minimum depth of 1.5 meters so as to locate any utilities present in the trench.

13.1 Depth of Trench

The minimum depth of cover shall be measured from top of pipe to the top of undisturbed surface of the soil or top of the graded working strip or top of road or top of rail, whichever is lower.

In case of crossing of water bodies, the minimum depth shall be measured from the top of the pipe to the bottom of Scour level.
The depth of the trench will be such as to provide minimum cover as stipulated below:

For Distribution and service lines

Minor Water Crossing/Canal	1.5 Meter
Uncased/Cased Road Crossing	1.2 Meter
Rail/Road Cased Crossing	1.7 Meter
Normal Areas	1.0 Meter

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The minimum depth may be greater than as mentioned above as may be required by Government/Public authorities under jurisdictions. The Contractor shall perform such work without extra compensation, according to the requirement of concerned authorities.

Also, in case of Drains/Culverts/Utilities crossing through open cut where excavation cut is more than 1.5m, the extra excavation is inclusive in the laying rates. No separate payment is chargeable for extra excavation and includes backfilling as well.

In case, the depth could not be achieved due to practical problems and the same is demonstrated, EIC after examining thoroughly and considering the codes and standards may allow the contractor to provide suitable protection by way of concrete casing pipes or slabs.

13.2 Width of Trench

The width of the trench shall be wide enough to provide bedding around the pipe as specified and to prevent damage to the pipe inside the trench. Unless otherwise directed by the EIC and where ground conditions permit, the minimum distance from the inside edge of the trench wall to the outside of the pipe shall be as per the Drawing no 15792-10-03-27.

13.3 Trench Base

The trench bottom shall be cut or trimmed to provide a uniform bedding for the pipe and shall be free from stones, metal, wood, vegetation, clods of earth or other debris before placement of the pipe.

In case trenching is done in rocky terrain, a bedding of soft soil or sand shall be provided in the trench base at no extra cost to the satisfaction of EIC.

13.4 Malba

Accumulation of construction debris/building rubbish or discarded pieces of bricks/stones or excavation through soil mixed with small boulders/powdered rock due to which moiling is not possible and only open cut method can be used.

13.5 Clearances

Unless otherwise approved, the following clearances shall be maintained between the external wall of the gas pipe and the external surface of other underground assets/utilities in the vicinity of the Works.

- 150 - 300 mm where the gas pipe crosses other assets/utilities, etc., for electric cables, the clearance shall be 300mm minimum or special protection shall be provided as per approval of EIC.
- 300mm where the gas pipe is on a similar alignment to the other assets/utilities.

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Where the above clearances cannot be achieved, or in other special circumstances, the EIC may approve/specify protection with concrete/MS coated pipe, etc. The protective material shall be supplied and installed by the Contractor at his cost subject to discretion of EIC.

13.6 Under Ground Interferences

The Contractor shall locate and expose manually all underground facilities if any during trenching. Safety barriers shall be erected along the trench to prevent any damages or accident. On locations where pipeline is laid under the existing facilities and near the approaches of the crossing, the trench shall be gradually deepened to avoid sharp bends.

All sewers, drains, ditches and other natural waterways encountered while trenching shall be maintained open and functional by providing proper temporary installations if required. Suitable dewatering pumps shall be deployed to dewater, if required.

Whenever it is permitted by Authorities and /or Owner to open cut paved road crossing, or where the line is routed within the road pavement, the Contractor shall remove the paving in accordance with the restrictions and requirements of the authorities having jurisdiction thereof as directed by Owner. After laying the pipeline, backfilling shall be immediately performed and all the areas affected connected with the excavation works shall be temporarily restored.

In case of damage to any of above referred structures/utilities the Contractor shall be responsible for repairs/replacement at his own cost, which shall be carried out to the satisfaction of concerned authorities, resident and Owner.

13.7 Others

Throughout the period of execution of such work, the Contractor shall provide and use warning signs, traffic lights or lanterns, barricades, fencing, watchman etc. As required by the local authorities' jurisdiction and/or Owner.

For all roads, paths, walkways etc. which are open-cut, the Contractor shall provide temporary diversions properly constructed to allow the passage of normal traffic with the minimum inconvenience and interruptions.

The paving shall be resorted to its original condition after the pipeline is installed.

The Contractor shall excavate to additional depth at all the points where the contour of the earth may require extra depth, or where deep trench is required at the approaches to crossings of roadways, railroads, rivers, streams, drainage and ditches without any extra cost implication to Owner.

The Contractor shall excavate all such aforesaid depths as may be required at no extra cost to Owner. The trench shall be cut to a grade that will provide a firm, uniform and continuous support for the pipe.

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The Contractor shall take conducive measures to ensure the protection of underground utilities as per the instructions of Owner or relevant authorities.

Where the pipeline crosses underground utilities/structures, Contractor shall first manually excavate to a depth and in such a manner that the utilities/structures are located, then proceed with the conventional methods.

The locations, where the pipeline has to be laid more or less parallel to an existing pipeline cable and/or other utilities in the Right-of-way the Contractor shall perform the work to the satisfaction of the Owner of the existing pipeline/cable/utility. In such locations, the Contractor shall perform work in such a way that even under the worst weather and flooding conditions, the existing pipeline/utilities remain stable and shall neither become undermined nor have the tendency to slide towards the trench.

13.8 Bedding

The Contractor shall ensure that the pipe when placed in the trench is supported and surrounded by a bed of screened excavated soil, which shall be stone free and have a maximum grit size of 5mm, in order to ensure no damage occurs to the pipe. However, in case of rocky soil the bedding shall be done with approved good quality packing sand subject to the approval of the Site Engineer. The packing sand shall be placed to a minimum thickness of 150mm around the pipe in case of rocky terrain.

Unless directed by the EIC the quantity of bedding and surrounding sand shall confirm specifications. There shall be no void space in the packing sand around the pipe.

14.0 LAYING

14.1 Main line

Laying of MDPE pipelines shall be commenced only after ensuring proper dimensions and clean surface of the trench. The trench bottom shall be free from the presence of cuts, stones, roots, debris, stakes, rock projections up to 150 mm below underside of pipe and any other material, which could lead of perforation/tearing of the pipe wall. After ensuring above, the MDPE pipe coil shall be uncoiled smoothly through proper equipment's/care before laying pipe inside the trench ensuring no damage to pipe.

The contractor must ensure that Pipe caps are provided before lowering of Pipeline. The trench after this can be released for back filling leaving adequate lengths open at the ends for jointing.

Contractors shall ensure open ends of pipe placed in the trench shall be securely capped or plugged to prevent the ingress of water or other matter. The Contractor is to ensure that nothing enters inside the pipe during the laying process as this could cause a future blockage or regulator malfunction due to dust, etc.

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In case of open cuts and moiling, where two pipes are to be laid parallel in same trench or same pits, charges shall be paid as per relevant SOR items.

Valves shall be installed at locations shown in the Design Plan or as directed by the EIC and joined with PE pipes by electro fusion techniques. The valves shall be placed on a concrete square block at the bottom to achieve equivalent support of the incoming and outgoing pipe.

Laying graphs/As-graphs with details of depth, length, offsets from minimum three (03) fixed different references, other utility crossings, fittings, sizes of the casing pipe used for the pipeline shall be prepared on daily basis and to be submitted to IGL representative/ EIC for approval. These details will further be incorporated in to As-Built Drawings.

Pipe may pass through an open drain or nallah with prior approval from EIC. Where this is permitted, the PE pipe shall be installed inside a concrete or steel sleeve for protection with no cost implications to the owner. The sleeve material shall be procured and laid by the Contractor with prior inspection and approval of the EIC for the quality of material. In general, the GI Sleeve material specification shall be confirming to IS 1239 (Heavy Duty) specification of reputed make; cost of GI sleeve shall be included in laying SOR.

In case of service line laying, where the excavated pit for mainline is used for laying of service line, the length of service pipe laid in the same pit and vertical pipe which rises out of the ground with transition fittings shall be paid as per SOR item no 1 to 5. The contractor shall excavate a minimum pit of size 0.5-meter x 0.5 meter (L X W) on any kind of surface along the wall at the customer premises for the service pipe which rises out of the ground with transition fittings through GI pipe sleeve/Half Round Concrete sleeve. This excavation along with other work necessary to break through the walls of the obstruction, insertion of MDPE pipe, sealing of the annulus between the pipe and the sleeve, sleeve and the wall, installation of sleeve, making of pedestal as per Drawing No 15792-20-03-18 min. Size 300 x 150 x 150 mm for GI Sleeve, min. Size 550 x 230 x 150 mm for Half Round Concrete Sleeve Drawing 15792-10-03-33 and simultaneous restoration of these pits shall be deemed included in the laying rates of pipes respectively. No separate payment of GI Sleeve / Half round concrete sleeve shall be charged to the owner. The material shall be inspected by TPIA / Consultant before installation. Also, the material test certificates, inspection reports approved by TPI/Consultant shall be submitted at the time of submission of bill. Any installation without inspection & approval may lead to penalties as per Special Conditions of Contract.

In case of service lines, Site In-charge shall decide either half round concrete sleeve or GI pipe sleeve shall be installed at any particular site depending upon site condition. The half round concrete sleeve shall be preferred over GI Sleeve, however in case where the installation of half round Concrete Sleeve is not possible due to technical feasibility and site conditions, GI sleeves shall be installed only after written approval from IGL Site In-charge. The rate of GI Sleeve / half round concrete sleeve shall be included in laying of 20/32 mm dia. As per SOR no 1.1 & 1.2 depending upon surface conditions. The details are mentioned below:

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14.2 GI Sleeve

The contractor shall supply the minimum dia. Size of 2.5" & 3", 300 mm in length, GI sleeves (Heavy Duty reputed make) respectively for domestic & commercial / industrial installations. The material shall be inspected by TPIA / Consultant before installation. The material test certificates/ inspection reports shall be submitted at the time of submission of bill.

The installation of GI sleeve for service lines shall be done by sealing the annulus between pipe and sleeve, firm fixing of the GI sleeves by concrete mix pedestal, clamping, sand filling, etc.

The vertical portion of the sleeves shall be fixed to the wall of the premises in a secure manner. The Service lines shall be installed in accordance with the drawing enclosed in the tender.

14.3 Half Round Concrete Sleeve

The installation of Half Round Concrete sleeve for service lines shall be done by sealing the annulus between pipe and sleeve, firm fixing of the Concrete sleeves by concrete mix pedestal, clamping, sand filling, etc. Half round concrete sleeve shall be made as per attached drawing no 15792-10-03-33 or as per instruction of Site In-charge. The dimensions shown are tentative and may vary depending upon the site conditions. The material shall be inspected by TPIA / Consultant at the fabrication stage & prior to final dispatch at site for installation.

14.4 Crash Guard : - (For O&M and Project)

The installation of pre-cast RCC crash guard over Half Round Concrete Sleeve/ Pedestal shall be done by installing it resting on wall of building by fixing it with grouting nut and bolts in wall that may be detached during the event of leakage/testing. The material shall be inspected by TPIA / Consultant at the fabrication stage & prior to final dispatch at site for installation. The material test certificates/ inspection reports shall be submitted at the time of submission of bill.

The Crash Guard shall be installed in accordance with the drawing no. 15792-10-03-33 enclosed in the tender as per instruction of EIC.

14.5 LAYING OF SERVICE LINE IN OLD PROJECT AND O&M AREA:

O&M area shall be defined as those areas where PE line is already charged and handed over to owner. However, Old Project area shall be defined as an area where MDPE line is already been laid by another contractor (currently not working in respective zone), only service line connectivity shall be done by the contractor.

Laying of pipeline (for 20 & 32mm) in all type of surface i.e. all kinds including Kutcha, metal, concrete (PCC/RCC), bituminous, tiled, brick lined etc. after racking up of hard surface of any type by any methodology. Roads, Pavement, Footpaths etc. shall be made motor able once the pipeline is laid. Supply & installation of GI Sleeve / Half round Concrete sleeve shall be included in laying rates. The rate includes liasoning with statutory bodies and no separate rates are payable. Wherever service lines are to be laid after dismantling nallah / drain, no additional cost for dismantling and repairing shall be payable.

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All service lines left out initially during mainline laying and laid by same contractor within six months of gas charging of that particular area shall be paid as per SOR no 1.

All service lines left out initially during mainline laying and laid by other contractor after gas charging shall be paid as per SOR 4.

Construction of RCC structure for MDPE protection for drain/nallah crossing as per Dwg.-15792-10-03-46A; payment against such executed item shall be payable as per SOR item no. 4.5. Construction of this structure shall be as per instruction of Site In-charge & in locations which are not prone to damage by heavy vehicular movement (Rates shall be irrespective of drain width).

14.6 MDPE PIPE LINE LAYING (20MM / 32 MM / 63MM) IN ALREADY EXCAVATED TRENCH IN BUILDER SEGMENT

Scope includes laying of MDPE pipeline in already excavated trench with or without casing insertion of the carrier pipe in casing pipe (on case to case basis) laying of warning mat electro-fusion of joints and re-installation of pre-cast slabs as per specification after instruction of EIC / Site Engineer of Owner.

In Case sand filling is also required as instructed by EIC/IGL representative SOR no. 28.4 shall be applicable over and above this rate. Refer Drawing no. 15792-10-03-34, 35.

15.0 JOINTING OF POLYETHYLENE PIPE

The procedure for jointing of PE pipe and fittings machines is attached as Annexure #2 and as per Specification for ELECTROFUSION FOR PE PIPES AND FITTINGS. Only Bar coded into electro-fusion machine (Automatically Readable) that can read the bar code of the fittings automatically shall be used for joining of the MDPE pipes/fittings. Manual feeding Electro-fusion machines are not acceptable for jointing purpose. The contractor has to submit the certificate of calibration of Fusion machine at the time of start of work and must attach in RA Bill at fixed intervals. Contractor shall ensure that the machines are always available at site.

The contractor shall flush the Pipeline with air to remove dust, water, mud etc. before fusing the joints. Before jointing, the Contractor shall place packing sand under the pipes on both sides of the joint to keep the pipes in line and at the correct alignment during the jointing process. The jointing process shall start only after Alignment clamps with the correct size are aligned with the pipe and coupler during the electro-fusion cycle.

The Contractor shall ensure that polyethylene pipe is only cut with an approved plastic pipe-cutting tool (Rotary Cutter up to 63mm/Guillotine Cutter for 63mm and above). Before fusion is attempted, the contractor shall remove the oxidized surface of the pipe using Universal Scrapper up to 63mm/Rotary Peeler for 63 mm and above before inserting into the electro-fusion coupler. The tool must remove a layer of 0.1mm to 0.4mm from the outer surface of the polyethylene pipe. No fusion will be allowed without

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clamping device and the approved cutting tools (Hack saw shall not be allowed for cutting the pipe).

The contractor has to supply all the consumables required for carrying fusion of the joints (like tissue paper, napkin, acetone etc.).

If, upon inspection, the EIC determines a joint is defective, Contractor shall remove the joint by an approved method. The cost of replacing joint shall be borne by the Contractor including the cost of pipe and fittings removed.

For electro-fusion joining, the contractor must bring own tools, tackles and equipment's. Only, approved Jointers shall carry out fusion of all joints. Contractors shall provide the list of jointers to be used on the job and make arrangements for Qualification Testing of the jointers in presence of Owner / Owner's representative as per the standard procedures. All approved Jointers shall bear identity cards signed by Owner / Owner's representative during fusion job and shall furnish the same on demand by Owner / Owner's representative. Applicable penalties shall be levied, in case; it is found that fusion is being carried by non-qualified jointers as per the provisions made in Special Conditions of the Contract.

Contractor shall arrange generator along with voltage stabilizer for power supply to fusion machine. Taking power connection form electric poles, connections without written permission from the concerned authorities or residential premises is strictly not permitted.

Note : Contractor must ensure that the records of fusion shall be maintained in the database of the fusion machines and will be submitted to the owner's representative as and when required else no job allocation will be done.

16.0 BACKFILLING

Backfilling shall be done after ensuring that appurtenance have been properly fitted and the pipe is following the trench profile at the required depth that will provide the required cover and has a bed which is free of extraneous material and which allows the pipe to rest smoothly and evenly. Dewatering shall be carried out prior to backfilling. No backfilling shall be allowed if the trench is not completely dewatered.

Prior to backfilling it should be ensured that the post padding of compacted thickness 150 mm is put over and around the pipe immediately after lowering where required.

Backfilling shall be carried out immediately after the post padding where required has been completed in the trench, inspected and approved by Owner/ Owner's representative, so as to provide a natural anchorage for the pipe avoiding sliding down of trench sides and pipe moment in the trench. If immediate backfilling is not possible, a padding of at least 300mm of earth, free of rock and hard lumps shall be placed over and around the pipe and coating.

The backfill material shall contain no extraneous material and/or hard lumps of soil, which could damage the pipe and/or coating or leave voids in the backfilled trench. In case, it is required and directed by EIC screening of the backfill material shall be carried out with specified equipment before backfilling the trench.

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The surplus material shall be neatly crowned directly over the trench and the adjacent excavated areas on both sides of the trench to such a height which will, in Owner/Owner's representative opinion of provide adequately for future settlement of the trench backfill during the maintenance period and thereafter. The down shall be high enough to prevent the formation of the depression in the soil when backfill has settled into its permanent position should depression occur after backfill, Contractor shall be responsible for remedial work at no extra cost to Company. Surplus material, including rock left from this operation shall be disposed of to the satisfaction of landowner or authority having jurisdiction at no extra cost to Owner.

Where rock, gravel, lumps of hard soil or like materials are encountered at the time of trench excavation, sufficient earth, sand or select backfill materials shall be placed around and over the pipe to form a protective cushion extending at least to a height of 150 mm above the top of the pipe. Select backfill materials for padding that area acceptable shall be soil, sand, clay or other material containing no gravel, required selected backfill material has been placed, provided the rock or lumps of hard soil. The padding earth shall not contain any stones, i.e. the earth shall be screened for sand padding of the Pipeline in order to avoid damage to the pipeline. Contractor shall carry out all these works at no extra cost to Owner. Loose rock may be returned to the trench after the required selected backfill material has been placed, provided the rock placed in the ditch will not interfere with the use of the land by landowner, or tenant.

In case where hard rock is encountered or as desired by EIC / site engineer sand padding is to be provided up to height of 150 mm around the pipe.

When the trench has been dug through driveways or roads, all backfilling shall be executed with sand/suitable material in layers as approved by Owner /Owner's representative and shall be thoroughly compacted. Special compaction methods as specified may be adopted. All costs incurred there upon shall be borne by the Contractor. Trenches excavated in dikes which are the properties of railways or which are parts of main roads shall be graded and backfilled in their original profile and condition. If necessary, new and/or special backfill materials shall be supplied and worked-up to.

PE Warning Grid/Mat shall be placed on distribution main and service line inside premises, after backfill of the trench up to a height of 300mm on the top of the carrier pipes. The warning grid is to be unrolled centrally over the pipe section and thereafter further backfilling will commence.

Backfilling activity shall include proper compaction by jumping jack compactor, wherever required and as per instruction of EIC, and watering in layers of 150mm above the warning mat. Proper crowning of not more than 150mm shall be done. All the excavated material that could be used during the Restoration process shall be stacked and kept separately and properly. Wherever Road cutting/Tiles removal/PCC cutting has been done during excavation for laying, the area shall be back filled and compacted immediately so that no inconvenience is caused to the general public.

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Electro-fusion of joints is to be undertaken immediately after lowering and the activity shall not be kept pending for lack of Electro-fusion jointing. The backfilling shall be considered complete only after the jointing of pipes.

Debris and other surplus material shall be removed immediately after the back filling.

The contractor shall not be entitled for payment as defined in commercial on laying and backfilling till the above activities are completed.

17.0 MOLING

The Manual Moling shall be carried out as per the requirement specified by Owner / Owner's representative and approved procedures. The contractor has to carry out survey of the underground utilities before going for the Moling to avoid any damage to other utilities. No extra payment will be made for any trial/abandoned pits made during the survey. The supply of all equipment required for carrying out moling work is in contractor's scope. The type of moling to be carried out i.e. with or without casing shall be at the discretion of Owner and prior approval is to be taken before starting the Moling.

For Moling the contractor shall ensure that the size of the hole shall not be more than 20% of the size of the casing/carrier pipes whichever is applicable. After completion of Moling the hole shall be properly compacted / filled with soil by watering and by approved procedures.

The moling rates are payable as per the SOR and the moling rates are common for MDPE pipe laying with or without casing pipe through the hole. The length of the Hole (excluding the sizes of the pits on both ends) shall be considered for the measurement of Moling length. However, the extra length of casing shall be considered for material consumption purpose only. In case of moling, where partial laying is carried out in casing and rest without casing. Further, the payment for the pipeline laying in the excavated pits for Moling purpose will be made as per the SOR for normal laying.

Any damage occurred to other utilities during the moling operation shall be immediately, notified and rectified by the contractor without any cost implication to owner.

18.0 HORIZONTAL DIRECTIONAL DRILLING (HDD)

HDD is required to be carried out by the Contractor where conventional Trenching/Moling is not possible viz. Railways, major waterways, highways, roads, congested areas etc. The Contractor shall obtain details of such crossings and the Contractor in consultation with Owner shall prepare construction drawings. Execution of the work shall be based on the Owner / Owner's representative approved drawings. The contractor has to do the thorough survey of the underground utilities before commencement of HDD to avoid the damage to the other utilities. No other extra payment will be made for any trail/abandoned pits made during the survey. The supply of all equipment required for carrying out the HDD is in contractor's scope. The HDD operation shall be carried out in accordance with API-1102. The type and availability of machines is sole responsibility of the contractor and as per the site conditions & requirements to entire satisfaction of EIC.

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Once the work is allotted, any delay in mobilizing / non-availability of HDD machines as per site requirement and conditions shall result in levying of suitable penalties as per SCC. However, in such cases, owner shall mobilize HDD machines and carry out execution of work on the contractor's risk and cost as per SCC.

The type of HDD to be carried out with or without casing shall be at the discretion of Owner and prior approval is to be taken before starting the HDD.

The rates for HDD, as indicated in SOR item no. 2 & 3, as applicable on the site conditions, are payable as per the size of the carrier pipe and inclusive of excavation of pits, jointing, pilot boring, bentonite cleaning, reaming, insertion of carrier pipe, backfilling, compaction, etc.

As per the specification, HDD to be carried out with or without casing pipe depends on the type of crossing as per instruction of Owner/ Consultant.

Any damages occurred to other utilities during the HDD operation shall be immediately notified and rectified by the contractor without any cost implication to OWNER.

The measurement for the payment shall be measured as per the span for which the beacon/sensing source which is attached to the reamer at the time of pulling carrier pipe for HDD. HDD profiles should be properly marked in the as built drawing in scale.

19.0 CASING PIPE

The tentative sizes of the HDPE casing pipe for Moling/Horizontal Directional Drilling shall be as follows:

S. No.	MDPE Carrier Pipe Dia. size (mm)	Min. Dia. of HDPE Casing Pipe (mm)	Max. Dia. of HDPE Casing Pipe (mm)
1	32	50	90
2	63	125	160
3	125	200	250
4	180	250	315

However, the size of the casing pipe may vary according to the length of the carrier pipe and requirement of laying of HDPE duct & OFC cable, if required. Also, the higher size of HDPE casing pipe shall be preferred over lower size casing pipe without any extra cost to the Owner.

20.0 RESTORATION

Wherever the restoration to the original surface condition is in the scope of Owner or as directed by EIC, all roads, footpaths (including roads and footpaths inside colonies) shall be restored to its original condition and the same shall be done as per CPWD/IRC norms and to the satisfaction of the concerned local Authority/Third Party Agencies designated

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by Owner. To retard curing of the installed concrete, wet sackcloth is to be placed on the finished surface and kept damp for a period of 7 days.

Where slabs and blocks are to be restored, the level of the compacted sub-base is to be adjusted according to the slab/block thickness. The slabs or blocks should be laid on moist bedding material, which should be graded sand, mortar or mortar mix. The slabs or blocks should be tapped into position to ensure they do not rock after lying.

The restored slabs or blocks should match the surrounding surface levels. Joint widths should match the existing conditions, and be filled with a dry or wet mix of mortar.

The procedure for restoration of Road/Footpath is just indicative. However, the restoration shall be done in accordance with the norms of the concerned Land owning agencies.

Turf shall be replaced in highly developed grassed area. In lesser-developed grassed areas top soil should be replaced during the restoration process.

Where permanent surface restoration cannot be completed immediately, the Contractor shall provide and maintain a suitable temporary running surface for vehicular traffic and pedestrians. The Contractor will be responsible for the maintenance of all restoration carried out, for the duration of the Contract guarantee period.

The Contractor is to ensure the restoration work is properly supervised and that the material used is suitable for the purpose and properly compacted. Where the required standards are not achieved, the Contractor will be required to restore the defective work.

Payment to the restoration shall be paid as per SOR item no. 6. Further, the rate of restoration includes WBM, Asphalted /Bituminous, concrete pavement, Agra Stone/ Kota stone/ Tiles (Chequered / any other type of tiles), interlocking paver blocks, Dry brick pavements etc. and payable under relevant SOR.

Note that payment for restoration will be released only after satisfactory completion and certification by Third party/Consultant.

Contractor has to obtain the No Objection Certificate (NOC) from the concerned local authorities/RWA after completion of the restoration work. The restoration specification specified in the tender is only a typical specification and the contractor has to carry out restoration as per the latest version CPWD/IRC/MCD specification to its original condition and also to the entire satisfaction of landowner (Private/Public).

The expenditure incurred towards testing of the material used for restoration, as per the applicable standards, shall be borne by contractor.

21.0 TESTING

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Pressure testing will be carried out with compressed air (free from oil and greases). Compressed air will be provided by Contractor for testing purposes and is to be included in the laying rates.

For main pipeline laying, the Contractor shall perform progressive pressure testing to ensure no leaks in long lengths of pipe. The test pressure shall be 6.0 bar (g), and there shall be no unaccountable pressure loss during the test period.

Overall scheme drawing for pressure testing shall be prepared by the contractor and get approval from Owner/Owner representative.

For main line the test duration shall be minimum 24 hours for length greater than 1 km and minimum 4 hours for length shorter than 1 km. The pressure should be allowed to stabilize for a period of 30 minutes after pressurization. The holding period may then commence and continue for time period as specified above. Measuring instruments shall have been calibrated and their accuracy and sensitivity confirmed. For testing of Network, calibrated pressure gauges of suitable range shall be supplied by the contractor. The pressure gauges shall be calibrated from time to time as desired by EIC. All testing shall be witnessed and approved by the EIC or his delegated representative. Tie-in joints may be tested at working pressure following commissioning.

For service lines up to a length of 15 mtrs testing will be carried out independently of the testing of the mains (if service line is laid separately after commissioning of mainline) for which the test duration may be reduced to 30 minutes at 6 bar (g) pressure. The service line testing in this case will be performed after the service line installation is complete but before the service line tee has been tapped. Also in some cases the tapping of the service tee will be delayed after the completion and purging of the main pipelines.

Suitable relief valve set at 5% higher than test pressure shall be fitted at the test heads to avoid over pressurization during testing.

22.0 PURGING

Purging shall be carried out in accordance with the principles defined in the American Gas Association publication "Purging Principles and Practice".

The Contractor shall also provide nitrogen required for purging as per the direction of Site In-charge. Nitrogen shall be supplied in labeled, tested and certified cylinders and completed with all necessary regulators, hoses and connections, which will be in good and working condition. No separate payment shall be paid for supplying Nitrogen cylinders for purging and is included in the laying rates. Before purging cylinder should be checked for containing Nitrogen only.

In addition, the Contractor shall submit purging plan and get approval from Owner / Owner representative before commencing any purging work. The Plan shall include, but not be limited to the provision of the following materials and equipment: Personal Safety Equipment, Fire Extinguisher, Purging Adaptor, Purge stack with flame trap and gas

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sampling point, Gas sampling equipment (may be gas leak detector), squash-off tool, Polyethylene connecting pipe.

The Plan shall also include the purging process along with detail on the sequence of events. The process is to also specifically mention the need to lay a wet cloth over the PE main and in contact with the ground, to disperse static electricity during the purging work.

A purge stack with flame trap shall be used when purging services. Care shall be taken to ensure that the purge outlet is so located that vent gas cannot drift into buildings.

23.0 VALVE PITS

Valve pits (RCC/Brick Wall) shall be constructed as per enclosed drawing 15792-20-03-20, 21, 22, 23, 24, 25, 26 in the document.

Payment for the valve pit construction shall be paid as per SOR item no. 26. The construction of the valve chambers shall be taken up immediately after installation of valve.

23.1 Material for Valve Pit

RCC Pre-Cast Slab shall conform to IS: 456. Heavy Duty RCC Manhole Cover shall be used. It shall be with raised with Lifting hooks. The RCC manhole cover shall have a clear opening as per the Construction Drawings issued to the contractor.

23.2 Workmanship

The excavation work shall be done at a location given by Engineer-in-Charge. All care shall be taken not to damage existing facilities and surface of construction shall be restored to its original state.

Sand bags to be placed below pipeline without disturbing the laid pipe. Gunny bags and Sand should be of approved quality.

PCC to be placed below the pipe as indicated. Once PCC is set sand is to be filled and properly rammed so that pipe and pre-cast concrete blocks are firmly place.

Valve will be supplied without the operating stem. Approved quality sand is to be placed in between area. The supply of sand is included in the rates.

Surrounding area to be properly cleared and PCC to be placed around the location where pre-cast slab with RCC Manhole cover is placed. The RCC pre-cast slab to be laid in level and finished smooth.

24.0 CONSTRUCTION OF TRENCHES AND OTHER SCOPE OF WORK IN BUILDER SEGMENT-

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24.1 Construction of dedicated trench (as per approved drawing)

Trench Dimension- 0.6m x 0.66m x 1.0m (d x w x l)

Scope includes excavation of trench in any type of surface, construction of brick wall, waterproofing of trench (If required), removal of surplus malba, plastering of walls, watering and curing including supply & installation of precast RCC slab covers Site cleaning and restoration of all damaged surfaces during construction activity. Contractor should submit NOC through concerned RWA/Builder/Authority. For other details please refer drawing no 15792-10-03-34

24.2 Construction of dedicated trench (as per approved drawing)

Trench Dimension- 0.375m x 0.66m x 1.0m (d x w x l)

Scope includes excavation of trench in any type of surface, construction of brick wall, waterproofing of trench (If required), removal of surplus malba, plastering of walls, watering and curing including supply & installation of precast RCC slab covers Site cleaning and restoration of all damaged surfaces during construction activity. Contractor should submit NOC through concerned RWA/Builder/Authority. For other details please refer drawing no.- 15792-10-03-35

24.3 Excavation of trench and installation of casing pipe by any method (Open /Moling)

Scope includes excavation of trench/moiling in any type of surface and installation of 6" GI Pipe C Class as casing pipe, restoration for road crossing up-to 7.0 m inside society and obtaining NOC through concerned RWA/Builder/Authority.

Note- In case of restoration SOR Item no. 6 shall be applicable over and above this SOR.

24.4 Sand Filling in any type of trenches in builder segment only;

Scope includes supply and filling of coarse sand (Size 0.6 To 2.0mm) as per IS 383 free from impurity like clay, mica and soft flaky pieces in the trench as per instruction of EIC/Owners representatives.

Note- Actual quantity (Cubic meter) of sand filling for 28.1, 28.2 & 28.3 shall be claimed in this SOR

Note- In all of the above items 10% amount shall be withheld till availability of NOC from concerned authority.

25.0 ROUTE MARKERS

Route Markers shall be fabricated, supplied and installed on the ROU at regular intervals immediately after laying of the Pipeline. The installation of the type of the Permanent Marker shall be decided by the EIC depending on the site condition. The contractor shall also ensure that a sample of all type of markers shall be inspected and approved by

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Owner / Owner representative before shipment of the lot at site and prior to installation at the site. The inspection of all types of markers shall be carried out lot wise.

The Stone Markers shall be painted before installation as per the approved procedure. Whereas the Pole/FRP marker (Markers with foundation) & plate marker are to be supplied with powder coated Golden Yellow Paint The supply of the paint as per drawing no 15792-10-03-29 and application. The supply of paint and application as per the specification is in contractor's scope. Payment shall be paid as per relevant SOR item no.8. Contractor shall obtain the approval lot wise & before installation at site from the Consultant / TPIA.

26.0 GUIDELINES:

- The installation of these markers shall be such that in between two pole/FRP markers two Stone markers are installed with spacing of 50 mtrs on either side. However, Pole/ FRP markers shall be installed at all the Tapping /Branching points in the mainline.
- Interval between any two Stone Route markers for mainline (180mm to 63mm) shall not be more than 50m.
- A Pole/FRP marker shall be installed near to valve chambers on Mainline & inside the pockets respectively for indication.
- Pole/FRP markers with foundations (As per the Drawings in Tender document) shall be installed after two Stone markers.
- The entry and exit pits for laying of pipeline by HDD / Moling for Road crossings shall be marked by Pole/FRP markers or Stone markers depending upon the site conditions.

In addition to above, Pole/FRP markers with foundation (As per drawings in Tender document) shall be installed outside of individual societies/areas as per the instructions of the Owner representative.

- For the distribution network 32mm & 20mm pipe, Stone / plate markers shall be installed as per the site conditions and directions of the Site-in-Charge.
- The artwork is typical for all the markers, with Owner's logo on it. The contractor must take prior approval for the artwork from EIC before installation of Markers. The lot wise approval shall be attached with bills.

27.0 ASSISTANCE IN COMMISSIONING

Contractor shall provide the required personnel, Vehicles, labour, supervision, tools, equipment, instruments and technical assistance for performance tests and commissioning activities as per requirement / satisfaction of Owner /Owner's representative.

28.0 STANDARD OF WORK

All work carried out under this contract shall be to standards, codes of practice construction procedures and other technical requirements as defined in the technical

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specifications. The manpower deployed on the respective work shall be adequately trained and shall have necessary skills to execute/supervise the work. However, the assessment on the qualification of the personal shall be at the discretion of EIC.

Fusion Operators and other skilled personnel like plumbers, conversion techniques shall be approved by Consultant/ Owner. Simultaneously Identification Cards duly signed by Consultant/ Owner shall be issued to them. The contractor shall maintain proper record for the identification cards issued to their workers.

29.0 RECORDING (AS-BUILT DRAWINGS)

- The following points shall be taken care to the preparation of as built drawings.
- The as built drawings should be in the scale of 1:200 and shall be submitted in an A-0 sheet. The drawings shall be in layers according the AUTOCAD features category.

- Pipeline feature shall be shown as a continuous line, breaks only at joints, fittings, valves, tee point, etc. Diameter, Pipe material, length, and location of pipeline whether on the road or footpath, should be clearly indicated.
- Minimum three (03) offsets of every joint, from permanent structure shall be recorded on As Built.
- Distance of pipeline from permanent property/structure should be provided at least every 20 mtrs. If there is any change in alignment / orientation and offset distances etc. Of the pipeline in between the above said 20 mtrs, the same shall be dearly mentioned in the as laid. Gas objects (off valves, tees, elbows, couplers, transition fittings etc.,) shall be shown as block objects (which form a single node to connect) with respect to Owner symbols / legend. The As laid drawings shall be as per the approved legends provided by EIC.
- Details & offset distances from other utilities present (e.g. MTNL, NDPL, BSES, DJB etc.) should be given in as laid drawing. If there is any change in depth of the pipeline, the same shall be clearly marked with details in the as laid drawings. The details (material, size &.Length) of additional protection provided to pipeline shall also be clearly indicated.
- Details of the PE stop off valves &. Other fittings used (i.e. tees, elbows, couplers, transition fittings, etc.) should be shown with adequate information orientation &. Offsets from permanent structures in the immediate vicinity.
- Technical deviations (if any) should be provided with reference to the buildings permanent structures around, and the same should be cited clearly with all the relevant details, including separate sketches/Blowups / sectioned drawings / exploded view.
- Total as laid-length (size wise), bill of materials should be mentioned in each sheet.

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- Complete details of nallah crossings should be shown in a separate sketch.
- Names of roads, major landmarks and buildings should be mentioned appropriately for reference.
- Proper chainage shall be mentioned on all the drawings to be referred with continuation reference.
- Direction of gas flow shall be indicated in each of the drawings.
- Text on the as laid drawing should be clearly visible.
- Land base features shown on the drawing shall match the exact distance as they were on real ground with respect to scale (1:200).
- As built drawings shall be duly signed & stamped by area TPIA / Consultant.
- The details shall be prepared in standard format using MAP INFO/AUTOCAD MAP and submitted CD RAM. Contractor shall also make the item wise material consumption report for the respective areas in a soft copy and to be submitted along with the as-built drawings.

30.0 CIVIL WORKS

The contractor has to supply the adequate materials and skilled manpower for the completion of all the civil works. The contractor shall also ensure that the work is carried out as per the details mentioned in the Schedule of rates.

Special cares shall be taken at the time of labours working in depths/lifting of the skids by hydras/ cranes considering all the safety guidelines.

The contractor has to ensure that sample of the all the materials shall be inspected and approved by EIC before carrying out installation or erection work. The contractor has to submit the test certificates for all the materials to be used at the site. The construction shall be carried out strictly as per the drawings provided by the IGL/Consultant. The contractor shall ensure extra / surplus materials / malba shall be immediately removed from the site after completion of the job. Separate payments shall be made as per the SOR PART III.

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ANNEXURE # 1

TOOLS & EQUIPMENTS TO BE PROVIDED BY THE CONTRACTOR FOR PRE LAYING

Sl. No.	Equipment Details	Minimum Requirement (In Nos.)
1	Electro Fusion Box machine make such as GF, Friamat, Kimplas, Hurner, Pegasus, Ritmo etc. and should have the feature of storage of fusion records. (Automatically readable)	2
2	Voltage Stabilizer	1
3	Generator (5.5 KVA)	2
4	Moiling Equipment (for all sizes)	As and when required
5	HDD Machines & Equipment (for all types & sizes)	As and when required
6	Squeeze Tools (Manual) up to 63 mm	2
7	Squeeze Tools (Hydraulic) from 63 mm up to 180 mm* like GF, Kimplass, SV Gas Solutions, Hy Ram, Caldertech, Trustlane	2
8	Rotary Peelers	2
9	Universal Scrapers	3
10	Tapping Tools/Allen Keys	Two sets of all sizes
11	Pipe Cutter (Round)	2
12	Pipe Cutter (Guillotine)	1
13	Pipe Cutter (ratchet type)	2
14	Gas Detection Unit	As and when required
15	Cable and Pipe Locator	As and when required
16	Test Ends	One set of all sizes
17	Pipe Alignment Clamps	As and when required
18	Joining Clamps for Coupler (All sizes)	2
19	Joining Clamps for Saddle (All sizes)	2
20	Pipe Straightness	As and when required
21	Re-rounding Tools (All sizes)	As and when required
22	Jumping Jack Compactor	As and when required
23	Roller for Asphalting	As and when required
24	Calibrated Pressure Gauges (0-6 Bar)	6
25	Water Tankers	As and when required
26	Automatic Thread cutting machine	As and when required
27	Heating Element for HDPE Butt joint along with clamping, roller and other accessories	As and when required
28	Hydra 3rd Generation, such as Farana etc.	At the time of loading and unloading of material at store/ at site.

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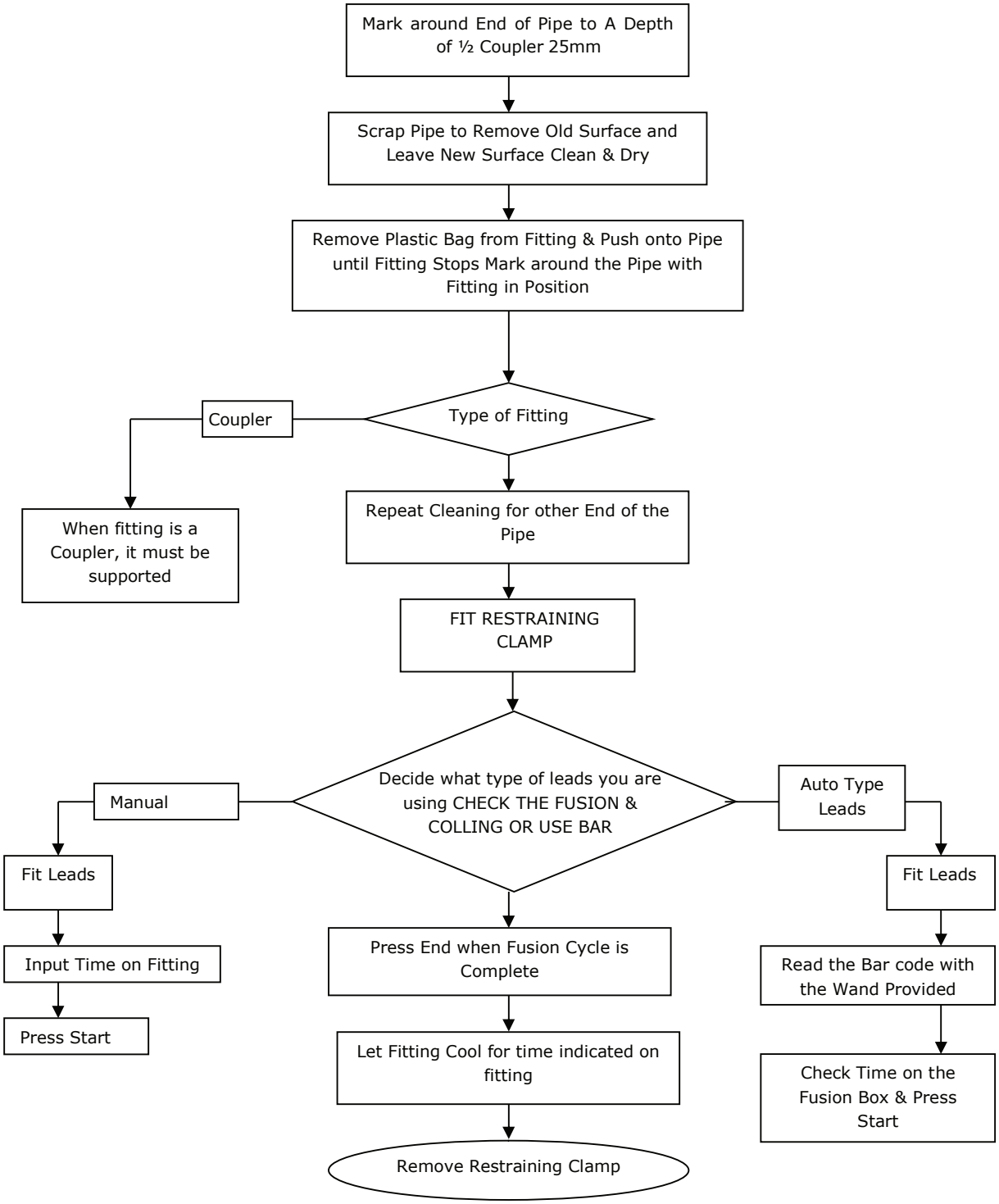
ANNEXURE # 2

FUSION COUPLERS FROM 20MM TO 180MM



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ANNEXURE # 3

RESTORATION PROCEDURE/GUIDELINES FOR ROAD CUTS OF MCD AND OTHER LANDOWNING AGENCIES

PURPOSE AND OBJECTIVE

The main purpose and objective of this document is to ensure that all the work are carried out with proper specifications and standards with high quality and timely accomplishment, and the restoration of infrastructure is according to standards Aimed at achieving the original condition of the road infrastructure.

DOCUMENTS/FILES TO BE MAINTAINED:

The following documents shall be maintained during execution of the job and shall be handed over to OWNER/Consultant/TPI after completion of the job;

- Copy of permission letter obtained from landing owning agencies like MCD etc.
- Drawing/Sketch showing the details of stretch to be cut, highlighting the type of surfaces and its chainage/length (area)
- Stage wise Photographs of the stretch.
- Test Certificates of the Construction materials to be used.
- Routine Test Certificates for construction materials during progress of job.
- Prior to Restoration approval is required from owner.

31.0 RESTORATION OF TRENCHES/PITS:

After laying pipeline, backfill material without containing extraneous material or hard lumps of soil or stones shall be filled and watered in layers of 150mm. Warning mats shall be placed as per specification. Earth shall be filled watered and compacted in layers with the help of earth compactor (Jumping jack compactor where ever space is available). After backfilling, the crown of the earth shall be between 50mm and 100mm above road surface and shall be free from sharp-edge stone and boulders.

After consolidation of backfill, the surplus earth shall be removed and disposed at place directed by OWNER (at suitable locations, as per direction of MCD)

Further, depending upon the Surface types of following specification shall be adopted:

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Sl. No.	Surface Types	Specification Recommended
1	Cement Concrete Surface	Top Surface – PCC 1:2:4, 100 mm Thick Compacted with Plate Vibrator shall be laid over base course. Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth.
2	Brick Soiling	Top Surface – Brick Soiling (as per original type) shall be laid over base course. Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth.
3	Interlocking CC Paver Block	Top Surface – Interlocking CC Paver Blocks (as per original type) shall be laid over compacted fine sand 50 mm Thick over base course. Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth.
4	Chequered Cement Concrete Tiles/Pre-cast CC Tiles/Kota Stone Floor/Red Stone Floor	Top Surface – Tiles/Floor (as per original type) shall be laid over Cement Sand Mortar 1:6, 20mm Thick over base course, Joints shall be pointed/finished to match colour. Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth.
5	Bituminous Surface (for Category D Roads i.e.; Roads less than 13.70 M width)	Top Surface – 40mm Thick Bituminous Concrete (as per original type) shall be laid over PCC 1:2:4, 100 mm Thick over base course. Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth.
6	Bituminous Surface (for Category C Roads i.e.; Roads less than 18 M width but greater than 13.70 M width.)	Top Surface – 40mm Thick Bituminous Concrete (as per original type) shall be laid over PCC 1:2:4, 150mm Thick over base course. Base Course – PCC 1:5:10, 150 mm Thick laid over compacted backfilled earth.

The specification mentioned above may be modified in line with relevant MCD/CPWD/IRC specifications. Contractor has to follow the changes as informed to them time and again.

NOTE:

Wherever the Bituminous portion is cut in small patches or isolated location where area of Bituminous portion is very less due to constraints like other utilities, the

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surface shall be restored, same as specified for the cement concrete surface, with prior approval of EIC/TPI.

32.0 TESTING OF CONSTRUCTION MATERIALS

For the different construction materials proposed to be used the following tests are required to be carried out for approval:

Sl.No.	Material	Test	Method of Testing	Frequency of Test
1	Cement	Setting time, soundness, compressive strength and fineness	As per IS: 4031	Once for each consignment or as and when required/directed
2	Bricks	Compressive strength, water absorption and efflorescence	As per IS: 3495	Minimum five samples or as per IS: 5454
3	Coarse Aggregates	Sieve analysis, flakiness index, estimation of deleterious materials, organic impurities, moisture contents and specific gravity	As per IS: 2386	One test per source of supply and routine test regularly as directed
4	Fine Aggregates	Sieve analysis, clay silt and moisture contents and specific gravity	As per IS: 2386	One test per source of supply and routine test regularly as directed

In addition to the above construction materials such as inter locking paver blocks, chequered cement concrete tiles, Pre-cast CC tiles, Kota/Red Stones Flooring samples shall be arranged for approval before use and if required testing shall be arranged.

For Cement concrete works the minimum frequency of sampling of concrete (CC cubes) shall be as follows:

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Sr. No.	Quantity of concrete in Cu. M	No. of Samples
1	1 – 5	1
2	6 – 15	2
3	16 – 30	3
4	31 – 50	4
5	51 and above	4 + 1 additional sample for each additional 50 Cu. M and part thereof.

The cement concrete cubes shall be tested for 7 & 28 days as per relevant IS code.

33.0 INSPECTION BY THIRD PARTY INSPECTION (TPI) AGENCIES NOMINATED BY LAND OWNING AGENCIES

It is the responsibility of the contractor to give inspection call, at least one week in advance to OWNER, to arrange for inspection by TPI nominated by land owning agencies along with the file containing all documents. Before inspection by TPI nominated by land owning agencies, contractor has to arrange for the inspection of the restored area by OWNER/Consultant/TPI and get the work certified. Contractor has to arrange for all necessary equipment, tools & tackles, labour for carrying out the inspection of the restored area. It is the responsibility of the contractor to obtain "No Objection Certificate" (NOC) from the TPI nominated by the land-owning agencies and further NOC from Land Owning Agencies and to get the securities/Bank Guarantees paid to them, for obtaining the permissions.

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ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION - INSTALLATION OF ABOVE GROUND GI/COPPER/MLC PIPING & FITTINGS IN LOW RISE DOMESTIC CONNECTIONS

VCS – SS – PE - 0003

REV	DATE	Purpose	Prepared By	Checked By	Approved By
01	10.05.21	ISSUED AS STANDARD	RKY	RKT	HK
00	18.03.19	ISSUED AS STANDARD	BS	MVK	AD

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1.0 GENERAL INFORMATION

Indraprastha Gas Limited (OWNER) is a Joint Venture Company of Gas Authority of India Ltd (GAIL), Bharat Petroleum Corporation Limited (BPCL) and Govt. of NCT of Delhi. Owner plants to install an underground Natural Gas Distribution Network at NCT of Delhi, Uttar Pradesh, Haryana & Rajasthan GA. The objective is to supply Natural gas to both domestic and commercial consumers and to provide compressed gas as a fuel for Automobiles. Owner is seeking Contractors to assist in meeting the above objective.

The main scope of this contract comprises the installation of above ground pipes from the outlet of 'PE/GI transition fitting' up to the domestic/commercial Customers 'Appliance/stove/oven valve' as per the Distribution schedule placed in enclosed drawing No:15792-20-05-01 in New as well as in Existing Gas charged areas.

The scope includes installation & procurement of above ground GI/Cu pipes and associated fittings for commercial/domestic consumers. However, the piping may have to be carried out up to Appliance Valve, in case of some commercial/domestic customers required.

Except domestic meter, regulator, Isolation and appliance valve, Contractor shall procure each material (Powder Coated GI fittings, Powder coated GI Pipes, Cu Pipes/MLC Pipes, Cu/Brass fittings, etc.) which is required from the out of PE/GI transition fitting up to the Domestic/Commercial Customers "Appliance/stove/oven valve".

This technical specification defines the basic guidelines to develop an acceptable design and suitable construction methodology for carrying out different activities listed out in the schedule of rates of this tender.

Compliance with these specifications and/or approval of any of the Contractor's documents shall in no case relive the contractor of his contractual obligations.

2.0 DEFINITIONS

OWNER	Indraprastha Gas limited (IGL)
PMC	VCS Quality Services Pvt. Ltd. (VCSQSPL)
SS	Present <<Standard Specification>> and its entire appendix, if any
TPIA	Third Party Inspection Agency to be appointed by IGL
EIC	Engineer-in-charge
CUMULATIVE LENGTH	The riser length (excluding lateral tapping) shall be considered and averaged out among all the households, whereas the lateral piping shall be included only for one particular connection

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REGULATOR PIECE	The GI pipe from transition fittings to Regulator

3.0 SCOPE OF WORK

Generally the following shall constitute the Contractor's scope of work but not limited to:

- Plan and prepare a schedule for execution and work implementation as per QA/QC plans to be issued by Owner/Owner's representative. Contractor has to submit the Construction/Execution procedures before commencement of work to Owner / Owner's representative for approval.
- Contractor shall submit the QCT/procedure/drawing etc. of all the material to be procured by him for approval before procuring the items. If, QCT/procedure/drawing etc. are not approved from client/consultant then owner has the authority to refuse /reject the same lot material.
- Receipt of regulators, domestic meters, Isolation and Appliance Valve as a free issue items from Owner's stores, loading, transportation, unloads at project site. Proper storing, stacking, identification, providing security and insurance during and before installation and commissioning of pipelines. Obtaining the approval for optimum route and permission for work from the concerned authority and EIC.
- Selection of route with the EIC/Consultant and marking the same on walls/floors between 'transition fitting' to 'cooking oven/stove/appliance', making openings and making provisions for fixing clamps. Making temporary but stable platforms/scaffolding /rope ladder etc., required for installation of pipes/fittings at all heights/multi storied flats and locations.
- Contractor shall procure all material except free issue items for installation at the outlet of PE/ GI transition fitting up to the Domestic customers "Appliance /stove / oven for satisfactory completion to the owner/owner's representative.
- Supply and Installation of powder coated GI pipes of ½", ¾" dia. between transition fittings to customers kitchen appliances including NPT threading of GI pipes, supply of proper seal outs for threads to join fittings such as elbows, tees, connectors, regulators, meters, appliances & isolation valves etc., as per laid procedures and specifications including clamping and sealing etc. The powder coated GI pipe and Fittings shall be painted after the testing of the GI installation wherever touching is required to eliminate any coating defects during installation.
- Supply & Installation of Copper pipes including supply of lead free solder wire and flux to join fittings / MLC Pipe including supply of fittings such as elbows, tees, connectors, meters,

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valves etc., complete as per procedures and specifications including clamping and sealing etc.

- Supply of clamps for fixing pipes, Meters wherever required, painting of pipes and fittings. Providing consumables grout material, repair/restoration of walls/floors changes for the pipes including the materials required for conversions and tools and tackles etc. shall be completed as per specification.
- Submit certified copies of RFC card to Projects & O&M after uploading the details in SAP/CRM/Fleet-Port/Any other software prescribed by Client.
- Cleaning, flushing, pneumatic testing and commissioning to the GI/Cu pipe/MLC Pipe & fittings, meters, valves etc. as per specification and hand over the same to Owner/Customer to the entire satisfaction of EIC/CONSULTANT.
- Dismantling of scaffolding/temporary structures and cleaning of site & restore the site as per its original condition.
- Restoration of walls, flooring and other damages while executing the above ground installation up to satisfaction of properly owner.
- Preparation and submission of above ground installation card for each house indicating the laid GI/Cu pipe/MLC Pipe including fittings, mentioned the reasons, if connecting, testing, etc. is not provided to the customers and deviation statements on completion /commissioning of work.
- Any other activities not mentioned/covered explicitly above, but otherwise required for satisfactory completion/operation/safety/statutory/maintenance of the works in new & existing gas charged areas shall also be covered under the Scope of work and has to be completed by the Contractor within specified schedule at no extra cost to Owner.
- Following activities are also in Contractor's Scope:
  - Receive Customer’s request and complaints logged on IGL's portal/Offline.
  - Carry out joint technical feasibility survey for requests received.
  - Attend and resolve customer complaints within defined TAT.
  - Maintain and update the request and complaint status in IGL's portal.
  - Contractor should execute GI/Cu Installation works with following priority
  - Online Domestic connections: Gas Supply is available in the locality and pipeline is available just outside kitchen – 20 days from date of receipt of registration
  - Fresh Riser Installation in Domestic Connections: Gas available in an apartment/complex but pipeline installation pending in the concerned Tower (for

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building with less than G+14 floors) Or In case of Kothi /Bungalow, where gas pipeline is available outside the premises (where service line is already installed)– TAT-40 days

- Underground gas pipeline available across road : i.e. Where service line has to be laid (Laying of service line up to 20m)–TAT-60 days
- Connection rates in project areas; in High Rise segment (TAT-90 Days) & low-rise segment (TAT-75 Days)

- Maintain new connection tracking on IGL's portal. Providing adequate manpower, minimum 2 no's each such as data entry operator, customer care executive etc. for data logging like new connection request & GI tracking, attending complaints, day to day interaction with customers and residents so that work can be executed within defined time period (TAT) Turn Around Time.
- Providing adequate manpower for carrying out laying for PNG installation for emergency cases as and when required. The TAT period for carrying out such emergency cases are defined in tender document.
- Printable material i.e. RFC book, sticker & safety Guidelines shall be provided by owner. All other printable materials like feasibility report etc. shall be in contractor's scope.
- All size of GI pipes & GI Fittings shall be powder coated before installation and it is in the scope of contractors. Contractor shall submit powder coating procedure to EIC/ Consultants before powder coating of pipes & Fittings.

4.0 MATERIAL, MANPOWER EQUIPMENT AND MACHINERY

4.1 Material to be supplied as a free issue material

Domestic meter, Regulator, Isolation and Appliance valve shall be supplied as a free issue material to the contractor. The contractor shall not use any other material from any other source of supply other than owner's supplied material without any written approval from EIC.

4.2 Material/Equipment & machinery to be supplied by contractor

Contractor shall procure/ purchase Powder GI Pipe & fittings, Brass fittings, Cu pipe/MLC Pipe & fittings, and Reinforced rubber hose with other material which is required to satisfactory completion/safety/statutory of the works as per tender at no extra cost to Owner. The IGL logo shall be marked on the material supplied by contractor. The contractor shall take approval from owner/owner representative for marking on the material to be

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procured by contractor before placement of order.
The Contractor shall provide labour, tools (such as Hammer Drill, Piston Drill, Pipe Cutters, Dies for threading, Pipe wrenches, spanners, conversion kits, solder torch, copper tube Cutters, tube benders, lacquering, thinner etc.) in specified numbers, all types of clamps, Plant and equipment necessary for the proper execution of the work. This will include but not limited to list of specialized tools and tackles indicated in Annexure #1.

Special tools shall be required at site for carrying out drilling work in walls other than Brick or RCC (Ex. Granite, Marble, Wooden, Glass Cutting etc.)

The contractor has to ensure the availability of DG sets for continuous power supply. In case the power supply is availed at the site from societies, individual residents, contractor shall settle the claims raised by the electricity providers without any cost implication to OWNER. In case contractor doesn't settle the claims for using the electricity from societies/individual residents, on demand by the providers, OWNER will settle the claims and the same will be deducted from the contractor's bills. The progress of work shall not hamper due to non-availability of power supply.

The contractor has to submit the valid calibration certificate for Pressure gauges.
Contractor shall submit the manufacturer test certificate slab test certificate for all items procured by him for approval before commencing the execution.

No hiring of equipment’s, tools and tackles by the contractors is allowed at the site. In case any contractor is found not in possession of enlisted required tools and tackles, penalty will be levied as per the SCC which shall be deducted from the running bills.

4.3 Plant and Equipment

All vehicular type machinery shall be in good working condition and shall not cause spillage of oil or grease. To avoid damage to paved surfaces, the contractor will provide pads of timber or thick rubber under the hydraulic feet or outriggers of machinery.

4.4 Sealant, Grout

The contractor shall be responsible to arrange the supply of any consumable sealant or ready mix grout material required for restoration of holes. The sealant/grout supplied by the contractor shall be compatible with the area to be restored/ rectified. No separate payment for the supply of sealant and grout shall be made to the contractor.

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4.5 Clamps, Rawal Plugs, Screws and etc.

The Clamps, Brackets for meter, Rawal Plugs, SS-304 Screws (2" length), Nozzles, etc. shall be approved lot wise by EIC prior to installation. Re-drilling of existing appliance (burners) nozzles is strictly not permitted. The quality of materials procured will be got approved and will be as directed by EIC.

The indicative sketch of the Brackets for Meter, and GI/Copper Pipe Clamps is enclosed with the tender. No separate payment for the supply of Meter Brackets and GI/Copper clamps shall be made to the contractor.

4.6 Consumable Items

- Special Consumables such as Teflon Tapes with make Loctite 55, Champion etc., solder wire, flux, lacquer, thinner shall be supplied by the contractor and are included in installation rates.

- These consumables shall be of reputed make companies and required grades/class

4.7 Other Materials

The contractor shall supply the following items where required:

4.7.1 All materials required for work, NPT threading, copper pipe jointing, testing etc.

4.7.2 All signs, barricades, lights and protective equipment.

4.7.3 All material required for working at higher floor levels (i.e., scaffolding, Ladder, Safety Belts, Self-Locking Safety Harness Belts etc.).

4.7.4 Special consumable such as grease for maintenance of domestic appliances, all paints for painting of GI Pipes, Consumables such as Teflon Tapes, Solder- wire, Flux, Lacquer, Thinner, Petrol, Diesel, Fuels and Oils required are to be supplied by the contractor and are included for within the rates.

4.7.5 All minor items not expressly mentioned in the contract but which are necessary for the satisfactory completion and performance of the work under this contract.

4.8 Acquisition, Receipt and Storage of Materials

The Contractor shall collect Domestic meter, Regulators, Isolation and Appliance Valve from Owner's designated stores in between the hours to be advised by the EIC.

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The contractor shall carry out assessment of material required for GI/Copper/MLC installation in allocated area. After approval from Owner, contractor shall place order for purchasing of GI Pipes & fittings, Copper pipes/MLC Pipes & fittings, Brass Fittings, and Reinforced Rubber hose (Technical specifications attached in the tender document) to anyone of approved vendors as per the list attached in the tender document. The contractor shall also ensure that the QCT for these materials shall be approved before the start of production activity. Once QCT is approved, contractor shall forward inspection call to the Owner depending upon the material requirement at the site. The inspection of these materials shall be carried out by Owner appointed third party inspection agency. It is contractor's responsibility for document submission, arranging dispatch clearance, handling, loading, transportation and unloading of these materials at their own respective store.

Any other activity not mentioned/covered, explicitly, but otherwise required for satisfactory completion/operation/safety/statutory/maintenance of works shall also be covered under scope of work and has to be completed by contractor within specified schedule at no extra cost to Owner. The Contractor shall carry free issue material in such a manner as to preclude damage using transportation and handling.

The Contractor shall physically examine all materials at the time of acceptance the material in store and notify the EIC immediately of any damage or defect noticed by the Contractor. The IGL representative shall duly note any damage or defect in a site instruction book and both parties shall counter sign the entry.

Any damage not so recorded will be deemed not to have existed at the time of acceptance of material in store by the Contractor and the cost of repair or replacement or rectification shall be borne by the Contractor.

All materials shall be stored in contractor's stores near site in such a manner so as to prevent any damage to the materials from scratching, gouging, indentation, excessive heat or by contact with any sharp objects or chemicals.

The Contractor shall be required to submit inventory details of materials every month. The Contractor shall maintain log book at their respective stores stating issue and availability of free issue material at a given day. Further, it is mandatory that the contractor is required to undertake and submit inventory details of free issue and purchased materials on monthly basis to Owner/ Owner's representative as per the approved format of the owner. The inventory details shall be in correlation with the Daily progress chart and material reconciliation sheet.

Material reconciliation indicating issue of material, consumptions and defective material shall be submitted on every three months basis.

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5.0 ISSUE OF WORK INSTRUCTIONS

- The contractor will be required to carry out GI installation in the areas where MDPE laying is under progress. However, testing of GI installation shall be done in conjunction with laying of MDPE Service Lines to respective premises. A general scheme of distribution to domestic consumer is indicated in enclosed drawing No: 15792-20-05-02 for reference. It may vary in case of individual and multi storied flats.

- All skilled personnel like jointers, conversion technicians will be approved and certified by Site In-charge. The technicians who will carry out joining of copper material and conversions will undergo a test by Owner. Those who clear the test will be issued identity cards duly signed by Site In-charge. These technicians shall be only authorized to take up respective jobs. In case it is found that contractor personnel other than authorized are carrying out these works, applicable penalty will be levied to the contractor as per contract.

- The rates to be quoted by contractor shall be inclusive of all preparatory/bye works, platform materials, labour, supervision, tools, taxes, duties, levies, salaries, wages, overheads, profits, escalations, fluctuations in exchange rates and no change in the rates shall be admissible during tenancy of the contract.

- The schedule of items of GI/Cu/MLC installations have been described in brief and shall be held to be completed in all respect including safety requirements as per Standard Specification of HSE, tests, inspection, QA/QC works, enabling and sundry works. The payment shall be made against completed and measured works only. No extra works whatsoever shall be considered in execution of these items.

6.0 PROGRESS OF WORK

The contractor shall proceed with the work under the contract with due expedition and without delay. Contractor shall assess the material requirement of the allotted area and submit the schedule plan for execution & purchasing before start of actual work.

The EIC may direct in what order and at what time the various stages or parts of the work under the contract shall be performed. Weekly progress reports shall be submitted in the formats approved by Owner, indicating broadly the laying, testing, RFC, conversions and extra piping.

7.0 WORK SHEETS

- The quantities of GI/Cu/MLC pipe and other details will be checked by Owner's site engineer and the same shall be incorporated in RFC cards, signed & dated as certified, on site. The cards will then be approved by the EIC.

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- Measurement sheets shall be prepared based on the RFC cards and checked and certified by the site engineers for billing purpose.

- If measurement sheets submitted are illegible, incomplete or incorrectly booked they will be returned to the contractor.

8.0 PERMISSIONS / APPROVALS

- Contractor shall be responsible for obtaining permissions from society management, RWA, individual residents and any other concerned authority, if required, for completion of the work. Contractor must take the prior appointment from the residents for carrying out the work.
- The contractor shall work in close consultation/coordination with the ElC.
- The contractor shall not sign/execute any agreement and/or undertaking on any such documents which amounts to be under taken by Owner. The same shall only be signed and executed by Owner; however, the contractor shall also liaison and coordinates for the same.
- The necessary coordination, liaison and arrangements for inspection and approval shall be the contractor's responsibility. Inspection and acceptance of the work by authority shall not relieve the contractor from any of these responsibilities under this contract. The contractor shall plan the execution of work in such a manner so that all the registered customers are attended in phased manner. However, it is the contractor's responsibility to fix a firm appointment with the consumer for carrying out the work.
- A log book/job card for such appointments with Consumer/any other agencies shall be maintained and the schedule/appointment once taken shall be adhered to by the contractor. PMC/ElC shall review the records every week. The contractor shall submit the detailed list of RFC/Conversions and balance work on Registrations at least once a week as per approved format.
- The contractor is also required to obtain a "Labour License" from the Assistant Labour Commissioner of respective Administration/Central Govt.
- It will be the contractor's responsibility to familiarize himself and comply with, any other local rules, regulations or statutory requirements applicable to the work.
- The contractor has to take responsibility of the action of supervisors, plumbers and helpers provided by him.

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9.0 REFERENCE SPECIFICATION, CODES AND STANDARDS

The contractor shall carry out the work in accordance with this specification, Owner's Engineering Standards: ASME B31.8 - Gas Transmission and Distribution Piping Systems; Oil Indian Safety Directorate Norms (OISD), the American Gas Association Document - Purging Principles and Practice and PNGRB Guidelines.

If the contractor find any discrepancy, ambiguity or conflict in between any of the Standards and the contract documents, then this should be promptly referred to the Engineer -in-Charge (EIC) for his decision, which shall be considered binding on the contractor.

10.0 RIGHT-OF-USE SERVEY AND MARKING

The route of the pipeline to be installed shall be decided with consent of the consumer and Site Engineer/EIC. Contractor must ensure that the persons/workers/supervisors/ working at site shall have proper identity cards prior to entering the premises of the consumer.

No temporary or permanent deposit of any kind of material resulting from the work shall be permitted in the approach or any other position, which might hinder the passage and/ or natural water drainage, or any area where there is objection from consumer.

The contractor shall obtain necessary permissions from land Owners and tenants and shall be responsible for all damages caused by the construction and use of such approaches, pavements, gardens, rooms, walls, roof etc., at no extra cost to Owner.

Owner/Consultant and the contractor at each premises or housing colony to be supplied with gas will conduct a joint survey. The survey record will note Customer details, the potential gas supply points and proposed meter positions and estimates of material quantities. The contractor's representatives will make as sketch of the agreed pipe routes, if necessary.

The contractor will be responsible for contacting the Customer and making the necessary arrangements for access and appointments to carry out the work. Owner will not be responsible for any time lost due to failed appointments or disputes with Customer.

The contractor shall confine its operations within limits of the Right in use. The contractor shall restore any damage to property outside ROU.

The contractor shall also carry-out all necessary preparatory work if needed to permit the passage of men and equipment. Lights, Curbs, signs shall be provided wherever and/or required by the Owner necessary to protect the public.

11.0 PROTECTION OF STRUCTURES AND UTILITIES

The contractor shall at his own cost, support and protect all buildings, walls, fences or

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other structures and all utilities and property which may, unless so protected, be damaged as a result of the execution of the works. He shall also comply with the requirements in the specification relating to protective measures applicable to particular operations or kind of work.

While painting, contractor must take care of the consumer premises while carrying out the job such as spillage on floor, walls, ceilings, sun shades etc. If the same does occur, the contractor has to immediately make things to original.

12.0 POWDER COATED GI AND COPPER/MLC ABOVE GROUND SERVICE PIPE

The powder coated GI service pipe installation work includes all work necessary to connect from the PE/GI transition fitting on the down-stream of the PE service, to the Customers appliance, including the installation of regulator, valves, fittings, meters, clamps etc. The contractor shall be required to provide all equipment, tools and materials necessary to execute the work in an efficient and effective manner. Along with ladders, scaffolding pipe, dies, tripods, vices, fittings and Teflon tape, drills for concrete and other masonry, drills for timber, Granite, Marble Stones and laminated surfaces inside Customers property, bending tools, clamps, sleeves to facilitate the pipe passing through floors and walls, paint for marking etc.

All powder coated GI risers at the outside of buildings shall be fully supported to carry the weight of piping. A flanged foot or similar device, capable of supporting the total weight of the riser, shall support risers. The riser shall be installed in a vertical line from its point of support to its highest point with a minimum of changes in direction. The threading of GI pipe shall be NPT and conforming to ANSI B 1.20.1

Contractor has to supply different types/sizes of powder coated clamps (Mild Steel) for fixing GI pipes suiting to the site conditions. The detailed cross sectional of Gl Pipe Clamps/Meter brackets are as per Drawing No. 15792-20-05-05;

All riser and lateral pipe shall be clamped to the building at intervals not exceeding 1.5 mtrs. Maximum distance between clamps shall be 1.0 - 1.5m when pipe goes to the straight, if any tee or fittings lies in between the pipe then clamp shall be placed 150 mm far away from center line of fittings at every sides. However, the same may be changed as per site conditions/as directed by EIC. Minimum gap between pipe & wall shall be 25 mm. The joints/ fittings of the GI installation shall be painted only after carrying out testing of the installation.

Where pipe passes through the balcony and the surface is slightly elevated around the service pipe or its surrounding sleeve to prevent the accumulation of water at that point. Where a short piece of sleeve is used around the gas pipe, the sleeve should be embedded in the concrete with a mix of mortar and the void between the pipe and sleeve filled with a suitable sealant. The sealant should be beveled such as to prevent an accumulation of water. Supply of clamps for all sizes of the GI pipes is in contractor's scope. Contractor has to take prior approval for design/types of clamps, paintings etc. Pipe shall preferably be entered into building above ground and remain in a ventilated location. The location for entry shall be such that it can be easily routed to the usage points by the shortest

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practicable route.

12.1 NON LMC

Non LMC GI Pipe shall be defined as the GI pipe installed from transition fitting to lateral isolation valves.

Regulator piece: Regulator Piece: Powder coated GI pipe of 1/2'' dia installed of length 1.5m from transition fitting up to inlet of regulator. Its length may very as per site situation subject to prior approval from Site In-Charge or as per instruction of EIC. The Laying of GI Pipe from the transition fittings to regulators shall be payable in the numbers as per SOR item no.11.1

- **Riser for Bungalow /Apartments having single kitchen and no floors:** Powder coated GI riser pipe of ½'' dia shall be installed from regulator isolation valve to lateral isolation valve for single kitchen as mention in Drawing No. 15792-20-05-01A.
- **Riser for Bungalow /Apartments having floors up to G+3:** Powder coated GI riser pipe of ½'' dia shall be installed from regulator isolation valve to lateral isolation valve for G+3 Apt and Individual kothi /Bungalow. Refer Drawing No. 15792-20-05-02.
- **Riser for Bunglow/Apartments having floors more than G+3:** Powder coated GI riser pipe of ¾'' dia shall be installed from regular isolation valve to lateral isolation valve for Apt and Individual Kothi/Bungalow having floors more than G+3. Drawing No. 15792-20-05-03

12.2 LMC

LMC GI/CU/MLC pipe shall be defined as the GI pipe installed from lateral isolation valve to appliance valve.

- **PNG CONNECTIONS IN PROJECT AREA**

  Supply and installations from riser (lateral isolation valve)-. Supply and Installation of GI/Cu MLC pipe from lateral Isolation valve upto appliance valve excluding the installation of Cu Pipe/GI/MLC from MIV to Meter inlet. However the pipe from MIV to Meter inlet shall be covered in SOR of meter installation with required fittings as desribed in Drawing no. 15792-20-05-01. Payment against additional length of (GI/Cu/MLC) shall be against item 12 of SOR.

- **PNG CONNECTIONS IN O&M AREA (ON EXISTING RISER)**

  Supply and installations from existing riser- The cumulative length of ½'' dia. powder coated GI Pipe within 2 m & Cu/MLC pipe within 2m or (GI+CU/MLC) within 4 m after lateral isolation valve up to appliance along with installation of meter. Additional

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quantity above 4 meter (GI+CU/MLC) shall be payable only in case if cumulative length exceeds 4 m. Payment against additional length of (GI/CU/MLC) shall be against item 12 of SOR. This SOR is applicable only if the riser is commissioned by other contractor or riser is commissioned by same contractor six month ago.

The GI/Cu/brass fittings shall not be counted separately & shall be measured along with GI & Cu/MLC pipe.

Except Meter, Regulator, Isolation and appliance valve, Contractor shall procure all other materials (i.e. Pipe, fittings, clamps etc.) as per attached specification for installation and to the entire satisfaction of EIC/consultant.

The contractor shall also ensure that gas supply shall not be provided to the customer in any Concealed Piping

The Copper/MLC service pipe installation work includes all work necessary to connect downstream of the meter to the Customers appliances. The contractor shall be required to provide all equipment, tools and materials necessary to execute the work in an efficient and effective manner. Along with these, he will be required to provide ladders, scaffolding pipe, drills for concrete and other masonry, special drills for timber, Granite, Marble Stones and laminated surfaces inside Customers property, bending tools, sleeves to facilitate the pipe passing through floors and walls, etc. Copper pipes & fittings shall be provided by Contractor.

During installation the Copper pipe is to be cut to proper length with tube Cutter, the burrs removed with a file, cleaning of outside surface of pipe & inside surface of fitting, applying flux to the tube and fitting around the outer/inner ends, inserting the tube in to the fitting, applying heat to the assembled joints using conventional blow torch to melt solder wire. Contractor ensure that jointing of Cu pipe & Fittings shall be done by skilled manpower.

Or

During installation, the MLC pipe is to be cut to proper length with pipe Cutter, correct the ovality of pipe end with a plastic reamer, cleaning of inside surface of pipe & outside surface of fitting, put the fitting nut over the pipe and slide the compression ring over the pipe. Make sure that the mouth of the nut and pipe face in same direction. Push the fitting insert into the pipe up to shoulder and use the spanner to tighten it up completely. Contractor shall ensure that jointing of MLC pipe & Fittings shall be done by skilled manpower.

Contractor has to supply different types/sizes of approved clamps (PE 80/PVC) for fixing Copper/MLC pipes suiting to the site conditions Contractor has to take prior approval of EIC for quality of the clamps, solder, flux, lacquer, thinner etc.The approval shall be taken for every fresh lot of clamps from EIC before installation at site.

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All copper/MLC piping shall be clamped to the walls at intervals not exceeding 500 mm. For copper pipe the solder wire shall be of reputed company of diameter size 3.25mm, lead free as per BS 29453:1994 (Soft solder alloys) and supplied in coils. The detail specification is attached in tender for reference. Solders for use with copper tube & fittings generally melt within the temperature range 180°C- 250°C. The contractor has to furnish the certificate of confirmation of standards before start of work.

IGL reserves the right of the release of payment against the RFC services on the basis of completion of NG conversion or submission of the NG consent not attributable to vendor.

- **Installation of Meter**

Installation of domestic meters with associated inlet and outlet connections (GI/Brass fittings), on the wall with approved powder coated meter brackets and angles in new & existing gas charged areas ensure a clear gap between meter and wall.

The contractor shall supply approved powder coated meter brackets and angle brackets. A sketch of the brackets is referred from the enclosed drawing for reference. It is required that one sample of each type of bracket is approved before the work is started.

Firmly secure the meters on the wall with good quality Rawal Plugs, screws etc. In case the Rawal Plugs are not holding then wooden blocks or other fixing arrangements like cement etc. to be used for proper grouting.
Note: Installation of meter should be done at height of approx. 04 to 06 feet.

The Meter installation will be preferred in open/ventilated space so as to prevent Gas accumulation and easy dispensation of gas to atmosphere in case of any smell/leakage of gas. The Meter installations will not be provided in any fixed enclosures, cabinets (below or above the slab) or confined space in the customer premises.

The Contractor shall ensure that GI installations and rubber hoses shall not be exposed to direct heat of Gas burners. The installation should have minimum clearance of about 300 mm from electric point mains& switches. Minimum distance between Appliance Valve & Gas Burners shall be 0.3 Meters. The isolation valve shall be installed after entering the customer premises/kitchen but before the meter installation.

The above activities along with restoration of the area to original shall be carried out to the complete satisfaction of consumer and EIC.

- **NG Conversion**

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Further, after RFC if customer is not ready for NG conversion within 3 months than the contractor has to do the sealing of the LIV without extra cost and after NG seal may be return to the IGL. Seal shall be the free issue material. List of gasified NGC pending case will be shared with the vendors. Contractors has to seal the IV for the not interested customers.

Powder Coating /Painting of GI Pipes

The entire lengths of the pipeline along with fittings are to be painted / powder coated after proper surface preparation as follows:

(a) **Painted (for scratched powder coated pipes and fittings only)**:

- One coat of Primer Application (Appropriate Zinc based primer)
- Two coats of synthetic enamel paint- canary yellow of minimum of 30 microns per coat of reputed make like Asian, Berger, Durolac and Nerolac. (No other make shall be used for painting).

All painting materials including primers and thinners brought to site by contractor for application shall be procured directly from manufacturers/dealers as per specifications and shall be accompanied by manufacturer's test certificates. The contractor shall ensure that smooth finish is attained after carrying out painting.

Engineer-in-Charge at his discretion may call for test for paint formulations. Contractor shall arrange to have such tests performed including batch wise test of wet paints for physical and chemical analysis. All costs there shall be borne by the contractor.

The painting work shall be subject to inspection and certification by Engineer-in-Charge at all times. Painting of GI pipe shall be paid with installation of GI pipes.

(b) Powder coating (refer attached Specification for powder coating)

Contractor will be required to install powder coated GI pipes & GI Fittings shall submit detailed procedure of powder coating for approval to Consultant prior to supply of Gl pipes & GI fittings. After installation of the entire piping system, final touching shall be done to the satisfaction of EIC.

13.0 TESTING OF GI / COPPER/MLC INSTALLATION

- The installation from PE/GI transition fitting up to regulator shall be tested at the pressure of 6.0bar (g).
- The GI installation from regulator outlet to Isolation valve at meter inlet (except meter) shall be tested at a pressure of 2.0 bar (g) for a hold period of 2 hours with no pressure drop. All the joints in the installation shall be checked with soap solution.

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- The GI/copper/MLC installation from Meter outlet to appliance valve (except meter) shall be tested at a pressure of 100 mbar with manometers or diaphragm gauge for a hold period of minimum 15 minutes and all the joints shall be checked with soap solution. Testing to be carried out with the entire satisfaction to TPIA/PMC.
- The meter shall be removed while carrying out the testing and joints of the meter shall be tested on line with soap solution after completion of the work. Proper test ends shall be made along with gauges.
- The contractor shall supply the Calibrated Pressure Gauges/ Manometer/Diaphragm Gauges of suitable range for testing of GI/Copper/MLC Installations ranging from 0-4 bars/0-150 m bar/0-250 m bar respectively. The calibration certificate shall be submitted before the start of the execution work.
- The pressure gauges shall be calibrated from time-to-time as desired by EIC but positively once in every six months.
- The details of testing shall be properly recorded in the GI/Copper/MLC cards.
- The ends/joints shall be painted only after carrying out testing of the installation. Powder coating to GI pipes shall be carried out in factory/ shop, and repair/ touching shall be carried out at site.

14.0 INSPECTION

The contractor to the entire satisfaction of EIC before proceeding further shall rectify any defect noticed during the various stages of inspection. Irrespective of the inspection, repair and approval at intermediate stages of work, contractor shall be responsible for making good any defects found during final inspection/guarantee period/defect liability period as defined in general condition of contract.

15.0 PURGING & COMMISSIONING

The rate for purging & commissioning shall be included in the GI/Cu/MLC installations.

Care shall be taken to ensure that the outlet is so located that vent gas cannot drift into buildings.

The commissioning of the Gl installation should be performed as follows:

- Ensure the method of purging is such that no pockets of air are left in any part of the Customer's piping.
- Ensure the area is well ventilated, and free from ignition sources.
- Continue to purge until gas is available at other appliances; Check availability of gas using Methane- detector
- Internal piping i.e. Meter Inlet, Diaphragm Meter & copper/MLC pipe shall be tested pneumatically & with soap solution from inside of each domestic connection

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16.0 RESTORATION

Contractor has to restore the area wherever he has carried out drilling, clamping etc. to its original condition to the satisfaction of the consumer and to ensure no passage to the premises and seepage. If the work was carried out in Govt. Flats (CPWD/NDMC/Institutional areas), contractor has to restore the area according to CPWD specifications and obtain a NOC/Clearance certificate from the concerned authorities maintaining the flats, after completion of the work.

The restored slabs or brickwork should match the surrounding surface levels. Joint widths should match the existing conditions and be filled with a dry or wet mix of mortar.

Wherever any items of the consumer is damaged/broken during working, the same will be made good or replace to the total satisfaction of the consumer.

The contractor will be responsible for the maintenance of all restoration carried out, for the duration of the contract guarantee period.

The contractor is to ensure the restoration work is properly supervised, and that the material used is suitable for the purpose. Wherever the required standards are not achieved the contractor will be required to replace the defective reinstatement work.

Note that Payment for GI/Copper/MLC installation will be released only after satisfactory restoration and clearing of the sites of all surplus materials etc.

17.0 SUBMISSION OF FINAL RECORDS

Contractor shall submit three sets each of the following documents in hard & soft copy:

- Total list of houses in the area allotted to him giving details of connections provided & reasons where connection could not be given completed.
- The details recorded in RFC cards of every domestic house.
- Details of houses where piping done along with materials used.
- Total material consumption report.
- Material reconciliation with respect to the materials issued.
- Test reports & calibration certificates of gauges etc.
- Any other documents/records required.
- Extra Piping details

18.0 COMPLIANCE TO HEALTH, SAFETY & ENVIRONMENT (HSE) FOR LOW RISE GI:

Scope include use of Fall arrestor, Ascenders / descenders, PPE, Barricades/ Warning Boards (03 No's) connected with warning board & Caution tapes (Refer drawing no.

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15792-10-05-32, 26) in areas where piping work is in progress, Use of Safety shoes, Walky talky, Hand gloves, Reflective jackets, Hard hats (helmets), eye and ear safety equipment, Fire extinguishers and as per the detailed scope of work in tender specifications. Contractor shall also prepare and submit duly certified Safety check list signed by TPIA/PMC. In case of non-compliance, penalty shall be applicable as per SCC clause.

This set-up is applicable up to 4th (G+4) floor and full body safety harness with accessories shall be of KARAM or equivalent make.

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19.0 ANNEXURE 1
TOOLS & EQUIPMENT TO BE PROVIDED BY CONTRACTOR FOR GI/COPPER WORK

S. No.	Hand Tools Description	Per Technician	Per Team
1	Pipe Wrench 250 mm	1	4
2	Pipe Wrench 350 mm	1	4
3	Pipe Wrench 450 mm	-	2
4	Adjustable Spanner 50 mm	-	4
5	Adjustable Spanner 150 mm	1	2
6	Adjustable Spanner 250 mm	1	2
7	Set of combination spanner 3/16"- 11/4"AF	1	1
8	Set of combination spanners 5mm-30mm	1	1
9	Large tool boxes	1	2
10	Set flat – headed screw drivers	1	2
11	Set Philips screw drivers	1	2
12	Small hammer	1	2
13	Combination pliers/mole grips	1	2
14	Set of files	1	2
15	Drill bits for 1"pipe	-	2
16	Stocks and dies for NPT threading ½", ¾", GI pipe	-	3
17	Blowtorch	-	1
18	Soldering Iron	-	2
19	Copper Pipe Bending Machine	-	2
20	Hand drill 3/8"chuck	-	2
21	Portable electric drill 240v, heavy duty	-	2
22	Spare blades	4	4
23	Batter Powered torches	2	2
24	Measuring Tape 30m	1	2
25	Wire Brush	1	2
26	Portable Pipe vice & tripod	-	2
27	Set steel twist drills 0.5-2.0mm (for appliance conversion)	-	1
28	Set steel twist drill 1mm-10mm	-	2
29	Set masonry drills 1mm-10mm	1	2
30	Graphite based grease	As required	As required
31	Lubricating Oil	As required	As required
32	Hand Cleaner	As required	As required
33	Copper pipe cutter 12mm	-	4
34	GI Pipe Cutters ½" Gas Detection Equipment Power Generator 2.5 KVA Pressure Gauge (0-10 bar) Pressure Gauge (0-4 bar) Diaphragm Gauge (0-400m bar) Manometer (0-150m bar)	- As required As required 2 2 1 1	2 - - 4 8 2 1
35	Automatic Thread Cutting Machine	-	As required
36	GI Pipe Cutter	-	2

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37	Cable Tracker (Wall Scanner) to locate cable inside the wall like BOSCH GMS 120 etc	-	1
38	MLC Pipe crimping and bending tools or any other tool required for MLC piping installation	-	1
39	Teflon Tape with make Loctite 55, Champion etc. to be used	As Required	As Required

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ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION FOR WELDED RISER & GI/COPPER/MLC PIPING INSTALLATIONS FOR PNG CONNECTIONS IN HIGH RISE BUILDINGS

VCS-SS-PE-0004

REV. No	DATE	Purpose	Prepared By	Checked By	Approved By
01	10.05.21	ISSUED AS STANDARD	RKY	RKT	HK
00	18.03.19	ISSUED AS STANDARD	BS	MVK	AD

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1.0 INTRODUCTION

Indraprastha Gas Ltd. (OWNER) is a Joint Venture Company of Gas Authority of India Ltd. (GAIL), Bharat Petroleum Corporation Ltd. (BPCL) and Govt. of NCT of Delhi. Owner plans to extend the PNG pipeline network in NCR region for supplying natural gas to Domestic, Commercial and Industrial consumers. It is proposed to execute the work of Welded Riser & GI / Copper/MLC installations for PNG connections in High Rise Buildings in NCT of Delhi, Uttar Pradesh, Haryana & Rajasthan GA. Owner is seeking Contractors to assist in meeting the above objective.

The main scope of this contract comprises the installation of above ground pipes from the outlet of 'PE/GI transition fitting' up to the domestic/commercial Customers 'Appliance/stove/oven valve' as per the Distribution schedule placed in enclosed drawing no. 15792-20-05-07.
The scope includes installation & procurement of above ground GI / Cu pipes/MLC Pipes and associated fittings for Domestic Customers in High Rise Buildings above fourteen floors.

Except service regulator, domestic meter, meter regulator, Isolation and appliance valve, Contractor shall procure each material (Powder coated GI fittings, Powder coated GI pipes, powder coated wrought steel fittings (forged fittings), Cu/MLC pipe, Cu/Brass fittings, MS/PVC clamps using SS304/brass screws, super hold nylon raw plug anchor etc.) which is required from the outlet of PE / GI transition fitting up to the Domestic customers "Appliance / stove /oven").

This technical specification defines the basic guidelines to develop an acceptable design and suitable construction methodology for carrying out different activities listed out in the schedule of rates of this tender.
Compliance with these specifications and/or approval of any of the Contractor's documents shall in no case relieve the Contractor of his contractual obligations.

2.0 DEFINITIONS

OWNER	Indraprastha Gas Ltd., IGL
PMC	VCS QUALITY SERVICES PVT. LTD. (VCSQSPL)
TPIA	Third Party Inspection Agency to be appointed by IGL.
EIC	Engineer – in –charge
CUMULATIVE LENGTH	The riser length (excluding lateral tapping) shall be considered and averaged out among all the households, whereas the lateral piping shall be included only for one particular connection

3.0 MATERIAL, MANPOWER, EQUIPMENT AND MACHINERY

- **Material to be supplied as a free issue material**

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Service Regulators, Domestic Meters, Meter Regulators, Isolation and Appliance valves shall be supplied as a free issue material to the contractor. The contractor shall not use any other material from any other source of supply other than owner's supplied material without any written approval from EIC.

- **Material / Equipment & machinery to be supplied by contractor**

Contractor shall procure / purchase Powder coated GI Pipe & fittings, Powder coated Wrought Steel Fittings (Forged Fittings), Brass fittings, Cu/MLC pipe & fittings and Reinforced rubber hose with other material which is required for satisfactory completion / safety / statutory of the works as per tender at no extra cost to Owner. IGL logo/IGL shall be marked on the material supplied by contractor. The contractor shall take approval from owner / owner representative for marking on the material to be procured by contractor before placement of order.

The Contractor shall provide labour, tools (such as Hammer Drill, Piston Drill, Pipe Cutters, Dies for threading, Pipe wrenches, spanners, conversion kits, solder torch, copper tube Cutters, tube benders, lacquering, thinner etc.) in specified numbers, all types of clamps, Plant and equipment necessary for the proper execution of the work. This will include but not limited to list of specialized tools and tackles indicated in Annexure # 1.

Special tools shall be required at site for carrying out drilling work in walls other than Brick or RCC (Ex. Granite, Marble, Wooden, Glass Cutting etc.)

The contractor has to ensure the availability of DG sets for continuous power supply. In case the power supply is availed at the site from societies, individual residents, contractor shall settle the claims raised by the electricity providers without any cost implication to OWNER. In case contractor doesn't settle the claims for using the electricity from societies/individual residents, on demand by the providers, OWNER will settle the claims and the same will be deducted from the contractor's bills. The progress of work shall not hamper due to non-availability of power supply.
The contractor has to submit the valid calibration certificate for Pressure gauges.

Contractor shall submit the manufacturer test certificate / lab test certificate for all items procured by him for approval before commencing the execution.

No hiring of equipments, tools and tackles by the contractors is allowed at the site. In case, any contractor is found not in possession of enlisted required tools and tackles, penalty will be levied as per SCC which shall be deducted from the running bill.

- **Plant and Equipment**

All vehicular type machinery shall be in good working condition and shall not cause spillage of oil or grease. To avoid damage to paved surfaces, the contractor will

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provide pads of timber or thick rubber under the hydraulic feet or outriggers of machinery.

- **Sealant, Grout**

  The contractor shall be responsible to arrange the supply of any consumable sealant or ready mix grout material required for restoration of holes. The sealant/grout supplied by the contractor shall be compatible with the area to be restored / rectified. No separate payment for the supply of sealant and grout shall be made to the contractor.

- **Clamps, Rawal Plugs, Screws and Nozzles etc.**

  The Clamps, Brackets for meter, Nylon Rawal Plugs, SS/Brass Screws, Nozzles, etc. shall be approved lot wise by EIC prior to installation. Re-drilling of existing appliance (burners) nozzles is strictly not permitted. The quality of materials procured will be approved by Owner/Owner's representative or as directed by EIC.

  The indicative sketch of the Brackets for Meter, Regulator Boxes and GI/Copper Pipe Clamps is enclosed with the tender. No separate payment for the supply of Meter Brackets and GI/Copper clamps shall be made to the contractor.

- **Consumables Items**

  - Consumables such as Electrodes, Teflon Tapes, solder wire, flux, lacquer; thinner shall be supplied by the contractor and are included in installation rates.
  - These consumables shall be of reputed make companies and required grades/ class.

- **Other Materials**

  The contractor shall supply the following items wherever required:

  - All materials required for work, NPT threading, copper pipe jointing, testing etc.
  - All signs, barricades, lights and protective equipment.
  - All material required for working at height (i.e. scaffolding, Ladder, Safety Belts).
  - Self-Locking Safety Harness Belts PETZL make as mentioned in safety procedure are mandatory.). Contractor shall provide but not limited to ascender, descended and pulley system essentially to carry out work at height.
  - Motorized suspended platform with skilled operator shall be preferred for

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installation above 25th storey building.

- Special consumable such as grease for maintenance of domestic appliances, all paints for painting of GI Pipes, Regulator Boxes, Consumables such as Teflon Tapes, Solder-wire, Flux, Lacquer, Thinner, Petrol, Diesel, Fuels and Oils required are to be supplied by the contractor and are included within the rates.
- All minor items not expressly mentioned in the contract but which are necessary for the satisfactory completion and performance of the work under this contract.

- **Acquisition, Receipt and Storage of Materials**

The Contractor shall collect Service Regulators, Domestic Meter, Meter Regulators, Isolation and Appliance Valve estimated for maximum one month from Owner's designated stores in between the hours to be advised by the EIC.

The Contractor shall carry out assessment of material required for GI/Copper/MLC installation in allocated area. After approval from Owner, contractor shall place order for purchasing of Powder coated GI Pipes & fittings, Powder coated Wrought Steel Fittings (Forged Fittings), Copper pipes & fittings, Brass Fittings and Reinforced Rubber hose (Technical specifications attached in the tender document), MS/PVC clamps using SS304/brass screws, super hold nylon rawl plug anchor to any of the approved vendors as per the list attached in the tender document. The contractor shall also ensure that the ITP for these materials shall be approved before the start of production activity. Once ITP is approved, contractor shall forward inspection call to the Owner depending upon the material requirement at the site. The inspection of these materials shall be carried out by Owner appointed third party inspection agency. It is contractor's responsibility to submit documents, arranging dispatch clearance, handling, loading, transportation and unloading of these materials at their own respective stores. In case of any defective material found shall be returned to IGL store within one month of issue.

Any other activity not mentioned / covered, explicitly, but otherwise required for satisfactory completion / operation / safety / statutory / maintenance of works shall also be covered under scope of work and has to be completed by contractor within specified schedule at no extra cost to Owner. The Contractor shall carry free issue material in such a manner as to preclude damage during transportation and handling.

The Contractor shall physically examine all free issue materials at the time of acceptance of the material in IGL' store.

Any damage not so recorded will be deemed not to have existed at the time of acceptance of material in store by the Contractor and the cost of repair or replacement or rectification shall be borne by the Contractor.

All materials shall be stored in contractor's stores near site in such a manner so as to prevent any damage to the materials from scratching, gouging, indentation, excessive heat or by contact with any sharp objects or chemicals.

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The Contractor shall be required to submit material reconciliation statement every month/ before issuing any free issue material from IGLs tore duly certified by IGL representative.

The Contractor shall maintain stock register at their respective stores stating issue and availability of free issue material at a given day. Further, it is mandatory that the contractor is required to undertake and submit inventory details of free issue and purchased materials on monthly basis to Owner/ Owner's representative as per the approved format of the owner. The inventory details shall be in correlation with the Daily progress chart and material reconciliation sheet.

Material reconciliation indicating issue of material, consumptions and defective material shall be submitted on monthly basis.

4.0 ISSUE OF WORK INSTRUCTIONS

- The contractor will be required to carry out GI installation as per instructions of EIC.

- All skilled personnel like welders, jointers, conversion technicians will be approved and certified by Owner/Owner's Representative. The technicians who will carry out welding of Risers, joining of copper material and conversions will undergo a test by Owner. Those who clear the test will be issued identity cards duly signed by Owner/Owner's representative. Approved technicians shall be only authorized to take up respective jobs. In case it is found that contractor personnel other than authorized are carrying out these works, applicable penalty will be levied to the contractor as per contract.

- The rates to be quoted by contractor shall be inclusive of all preparatory/bye works, platform materials, labour , supervision, tools, taxes, duties, levies, salaries, wages, overheads, profits, escalations, fluctuations in exchange rates and no change in the rates shall be admissible during tenancy of the contract.

- The schedule of items of GI/Cu installations have been described in brief and shall be held to be completed in all respect including safety requirements as per Technical specification of HSE, tests, inspection, QA/QC works, enabling and sundry works. The payment shall be made against completed and measured works only. No extra works whatsoever shall be considered in execution of these items.

5.0 PROGRESS OF WORK

The contractor shall proceed with the work under the contract with due expedition and without delay.

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Contractor shall assess the material requirement of the allotted area and submit the schedule plan for execution & purchasing before start of actual work.

The EIC may direct in what order and at what time the various stages or parts of the work under the contract shall be performed. Daily and Weekly progress reports shall be submitted in the formats approved by Owner, indicating broadly the laying, testing, RFC, conversions and extra piping.

The penalty and incentives will be calculated and applied on basis of monthly target as per SCC of Tender.

6.0 WORK SHEETS

- The quantities of GI/Cu/MLC pipe and other details will be checked by Owner's site engineer and the same shall be incorporated in RFC cards, signed & dated as certified, on site. The cards will then be approved by the Owner/Owner's Representative.

- Measurement sheets shall be prepared based on the RFC cards and checked and certified by the site engineers for billing purpose.

- If measurement sheets submitted are illegible, incomplete or incorrectly booked, it will be returned to the contractor.

7.0 PERMISSIONS / APPROVALS

- Contractor shall be responsible for obtaining permissions from society management, RWA, individual residents and any other concerned authority, if required, for completion of the work. Contractor must take the prior appointment from the residents for carrying out the work.

- The Contractor shall work in close consultation/ co-ordination with the Owner/ Owner's Representative.

- The Contractor shall not sign/execute any agreement and/or undertaking on any such documents which amounts to be undertaken by Owner. The same shall only be signed and executed by Owner; however, the prospective bidders shall also liaison and coordinate for the same.

- The necessary coordination, liaison and arrangements for inspection and approval shall be the contractor's responsibility. Inspection and acceptance of the work by authority shall not relieve the contractor from any of these responsibilities under this contract. The contractor shall plan the execution of work in such a manner so that all the registered customers are attended in phased manner. However, it is the contractor's

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responsibility to fix a firm appointment with the consumer for carrying out the work.

A log book/job card for such appointments with Consumer/any other agencies shall be maintained and the schedule/appointment once taken shall be adhered to by the contractor. Owner/Owner's Representative shall review the records every week. The contractor shall submit the detailed list of RFC/Conversions and balance work on Registrations at least once a week as per approved format.

- The contractor is also required to obtain a "Labour License" and BOCW registration from the Assistant Labour Commissioner of respective Administration/Central Govt.

- It will be the contractor's responsibility to familiarise himself and comply with, any other local rules, regulations or statutory requirements applicable to the work.

- The contractor has to take responsibility of the actions of supervisors, plumbers and helpers provided by him.

8.0 REFERENCE SPECIFICATION, CODES AND STANDARDS

The contractor shall carry out the work in accordance with this specification, Owner's Engineering Standards: ASME B31.8 – Gas Transmission and Distribution Piping Systems; Oil Indian Safety Directorate Norms (OISD), the American Gas Association Document – Purging Principles and Practice and PNGRB Guidelines.

If the contractor finds any discrepancy, ambiguity or conflict in between any of the Standards and the contract documents, then this should be promptly referred to the Engineer-in-Charge (EIC) for his decision, which shall be considered binding on the contractor.

9.0 RIGHT-OF-USE SURVEY AND MARKING

The route of the pipeline to be installed shall be decided with consent of the consumer and Owner/Owner's Representative. Contractor must ensure that the persons/workers/supervisors/ working at site shall have proper identity cards prior to entering the premises of the consumer.

No temporary or permanent deposit of any kind of material resulting from the work shall be permitted in the approach or any other position, which might hinder the passage and / or natural water drainage, or any area where there is objection from consumer.

The contractor shall obtain necessary permissions from land Owners and tenants and shall be responsible for all damages caused by the construction and use of such approaches, pavements, gardens, rooms, walls, roof etc., at no extra cost to Owner.

Owner/Owner's Representative and the contractor will conduct a joint survey at each premises or housing colony to be supplied with gas. The survey record will note Customer

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details, the potential gas supply points and proposed meter positions and estimates of material quantities. The Contractor will make a sketch of the agreed pipe routes.

The Contractor will be responsible for contacting the Customer and making the necessary arrangements for access and appointments to carry out the work. Owner will not be responsible for any time lost due to failed appointments or disputes with Customer.

The Contractor shall confine its operations within limits of the Right in use. The contractor shall restore any damage to property.

The Contractor shall also carry out all necessary preparatory work if needed to permit the passage of men and equipment. Lights, Curbs, signs shall be provided wherever and/or required by the Owner necessary to protect the public.

10.0 PROTECTION OF STRUCTURES AND UTILITIES:

The contractor shall at his own cost, support and protect all buildings, walls, fences or other structures and all utilities and property which may, unless so protected, be damaged as a result of the execution of the works. He shall also comply with the requirements in the specification relating to protective measures applicable to particular operations or kind of work.
During painting, contractor must take care of the consumer premises while carrying out the job such as spillage on floor, walls, ceilings, such shades etc. If the same does occur, the contractor has to immediately make things to original.

11.0 GI AND COPPER/MLC PIPE ABOVE GROUND SERVICE PIPE

- **Definitions:**

a. High Rise Buildings – A building having fourteen or more storey's above ground level. (i.e. of G + 14 orientation)

b. Riser - A riser is the vertical section of a service pipe laid up a building which supplies a number of laterals.

c. Lateral-A lateral is a horizontal off-take from a riser, which supplies a single customer/dwelling.

d. Service Regulator (SR) – Service Regulator is a regulator installed on a gas service line to control the pressure from 4 bar to100 mbar that, in an emergency automatically assumes control of the pressure downstream of the station, in case that pressure exceeds a set maximum.

e. Meter Regulator (MR) – Meter regulator is a pressure regulator installed in series with another pressure regulator which reduces the pressure from 100 mbar to 21mbar.

f. Riser Isolation Valve (RIV) - Riser Isolation valve is fitted at the bottom of the riser to isolate the riser from the underground gas supply network.
g. Lateral Isolation Valve (LIV) – Lateral Isolation Valve is fitted on horizontal riser

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(lateral) after TEE to facilitate online Tappings and other maintenance works.

h. Meter Control Valve (MCV) - A Meter Control Valve is fitted immediately upstream of the meter to enable the internal pipe work inside the property to be isolated from the upstream gas supply network. It must be fitted in a manner that the consumer can easily operate the valve handle.

- **Specification for Welding**

The requirements stated herein shall be followed for the fabrication of fillet type of welded joints of GI (IS 1239 heavy class) piping systems connected with pipe line and related facilities.
The welded pipe joints shall include the followings:

a. All line pipe joints of the Circumferential fillet welded type
b. Attachments of fitting and other supports pipes

Welding Consumables:

The Welding electrodes shall confirm to the class AWS E 6013. All electrodes shall be purchased in sealed containers stored properly to prevent deterioration. The electrodes shall be handled with care to avoid damage.

Welding Process:

Welding of GI material under this specification shall be carried out using Shielded Metal Arc Welding Process (SMAW).

Welding

Root pass and final pass shall be done with 2.5 mm dia. Electrode. Welding to be carried out in line with PQR / WPS approved by IGL/PMC. Welding to be done by qualified welders only.

- **Planning and Design of GI Welded Riser**

a. Risers and laterals must be designed to run through the optimal possible route approved by IGL representatives, taking into consideration potential meter positions, design regulations and access for future maintenance.
b. The riser and associated laterals must be constructed in the most economical manner using the minimum no. of fittings, minimum pipe and considering future maintenance requirements.
c. For buildings above 14 floors - for ease in construction and maintenance the preferred method will be welded pipe –work laid in a purpose designed and built ventilated utilities shaft.
d. Risers and laterals must be laid a minimum of 300 mm from any electrical equipment or installations. On occasions where the pipe has to cross over a cable,

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this has to be done at right angles and a minimum gap of 25 mm must be maintained between the pipe and cable. Consideration may be given to wrapping the pipe with electrical insulation tape for protection against electrical short circuiting.

e. Provision for access to the riser for future maintenance must be made at the design stage & involved undertaking a risk assessment for undertaking future maintenance work.

f. The GI service pipe installation work includes all work necessary to connect from the PE/GI transition fitting on the down-stream of the PE service, to the Customers appliance, including the installation of service regulator, meter regulator, valves, fittings, meters, clamps etc. The contractor shall be required to provide all equipment, tools and materials necessary to execute the work in an efficient and effective manner. Along with ladders, scaffolding pipe, dies, tripods, vices, fittings and Teflon tape, drills for concrete and other masonry, drills for timber, Granite, Marble Stones and laminated surfaces inside Customers property, bending tools, clamps, sleeves to facilitate the pipe passing through floors and walls, paint for marking etc.

g. All Welded GI risers at the outside of buildings shall be fully supported to carry the weight of piping. A flanged foot or similar device, capable of supporting the total weight of the riser, shall support risers. The riser shall be installed in a vertical line from its point of support to its highest point with a minimum of changes in direction. The threading of GI pipe shall be NPT and conforming to ANSI B1 20.1

h. Contractor has to supply different types/sizes of approved powder coated clamps (Mild Steel) for fixing GI pipes suiting to the site conditions. The contractor shall get approval from Owner/Owner's Representative for every fresh lot of the clamps, brackets, regulator boxes and other consumables, prior to start of installation.

i. All riser and lateral pipe shall be clamped to the building at intervals not exceeding 1.5 mtrs. Maximum distance between clamps shall be 1.0 - 1.5 m when pipe goes to the straight, if any tee or fittings lies in between the pipe then clamp shall be placed 150 mm far away from center line of fittings at every sides. However, the same may be changed as per site conditions/as directed by EIC. Minimum gap between pipe & wall shall be 25 mm. The joints/ fittings of the GI installation shall be painted only after carrying out testing of the installation.

j. Where pipe passes through the balcony and the surface is slightly elevated around the service pipe or its surrounding, sleeves to be provided to prevent the accumulation of water at that point. Where a short piece of sleeve is used around the gas pipe, the sleeve should be embedded in the concrete with a mix of mortar and the void between the pipe and sleeve filled with a suitable sealant. The sealant should be beveled such as to prevent an accumulation of water. Supply of clamps for all sizes of the GI pipes is in contractor's scope. Contractor has to take prior approval for design/types of clamps, paintings etc.

k. Pipe shall preferably be entered into building above ground and remain in a ventilated location. The location for entry shall be such that it can be easily routed to the usage points by the shortest practicable route.

l. For welded riser, riser length (excluding lateral tapping) shall be considered and averaged out among all the households, whereas the lateral piping shall be

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included only for one particular connection. The payment shall be done through running meter rates as per SOR Item No. 15.1, 15.2, 15.3 & 15.4.

m. The rates of GI Pipe and Copper/MLC pipe including installation of valves and fitting etc. from Lateral isolation valve till home appliances are payable as per SOR Item No. 16.1 & 16.2.

n. Installation of Meter and Meter Regulators with associated inlet and outlet connections/fittings shall be connected with meter and the payment shall be done as per SOR Item No. 16.1 & 16.2. The rate also includes testing of joints till commissioning.

o. Installation of Service Regulator with support and supply and installation of regulator boxes having locking arrangement with base frame, including fabrication as per attached drawing no. 15792-20-05-37A and 15792-20-05-37B.
Material for the CAGE shall be metallic. Payment shall be done as per SOR Item No. 19.

p. Foundation works for service regulators includes providing and laying of Plain Cement Concrete (PCC– 1:2:4) as per attached drawing no. 15792-20-03-39 and the payment shall be done as per SOR Item No. 22.

q. Except Service Regulator, Meter, Meter Regulator, Isolation and appliance valve, Contractor shall procure all other materials (i.e. Pipe, fittings, clamps, SS screws etc.) as per attached specification for installation and to the entire satisfaction of Owner/ Owner's Representative.

r. The contractor shall also ensure that gas supply shall not be provided to the customer in any Concealed Piping.

s. The Copper/MLC service pipe installation work includes all work necessary to connect downstream of the meter (inside the kitchen) to the Customers appliances. The contractor shall be required to provide all equipment, tools and materials necessary to execute the work in an efficient and effective manner. Along with these, he will be required to provide ladders, scaffolding pipe, drills for concrete and other masonry, special drills for timber, Granite, Marble Stones and laminated surfaces, provisions for cutting glass of window inside Customers property, bending tools, sleeves to facilitate the pipe passing through floors and walls, etc. Copper pipes & fittings shall be provided by Contractor.

t. During installation the Copper pipe is to be cut to proper length with tube Cutter, the burrs removed with a file, cleaning of outside surface of pipe & inside surface of fitting, applying flux to the tube and fitting around the outer/inner ends, inserting the tube in to the fitting, applying heat to the assembled joints using conventional blow torch to melt solder wire. Contractor ensure that jointing of Cu pipe & Fittings shall be done by skilled manpower.

Or

u. During installation, the MLC pipe is to be cut to proper length with pipe Cutter, correct the ovality of pipe end with a plastic reamer, cleaning of inside surface of pipe & outside surface of fitting, put the fitting nut over the pipe and slide the compression ring over the pipe. Make sure that the mouth of the nut and pipe face in same direction. Push the fitting insert into the pipe up to shoulder and use the spanner to tighten it up completely. Contractor ensure that jointing of Cu pipe & Fittings shall be done by skilled manpower.

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v. Contractor has to supply different types/sizes of approved clamps (PE 80/PVC) for fixing Copper/MLC pipes suiting to the site conditions. Contractor has to take prior approval of EIC for quality of the clamps, solder, flux, lacquer, thinner etc. The approval shall be taken for every fresh lot of clamps from EIC before installation at site.

w. All copper piping shall be clamped to the walls at intervals not exceeding 500 mm. The solder wire shall be of reputed company of diameter size 3.25mm, lead free as per BS 29453:1994 (Soft solder alloys) and supplied in coils. The detail specification is attached in tender for reference. Solders for use with copper tube & fittings generally melt within the temperature range 180°C - 250°C. The contractor has to furnish the certificate of confirmation of standards before start of work.

- **Riser and Laterals Fabrication, Installation and Testing: -**

Heavy class Galvanized Iron (GI) pipes, conforming to IS 1239- Part 1 duly Polyester Powder Coated with 70 microns' thickness and Wrought Steel fittings (Forged fittings) conforming to IS-1239 Part 2 shall be used for welded riser.

Powder and Galvanized (Zinc) coating shall be removed by light duty grinder or by any other suitable tool at both ends of riser pipe at about 25mm in length where welding is to be performed.

Pipe and required fittings shall be first coupled with threaded (NPT) joints. The threaded joints to be made using male tapered thread and female parallel thread fittings. Teflon/PTFE Tape or any other joining compound shall not be used in threaded joints for welded riser.

The entire riser assembly shall be fabricated with socket welds for threaded riser assembly. Threaded joints are permitted after first isolation valve on laterals where riser is not approachable from balcony and in case if riser is in approach of balcony within 300 mm gap from balcony laterals may be threaded with tee of welded riser on account of workability and future maintenance considerations.

The Welding electrodes shall confirm to the class AWS E 6013 of reputed make such as Advani, Lincoln, ESAB or equivalent.

Welding to be carried out in line with PQR / WPS approved by IGL/PMC. Welding to be done by qualified welders approved by IGL / PMC only.

A riser must not be constructed so that the laterals face directly into the wall from the riser. All laterals must extend a minimum of 400 mm from the riser.

Ventilation is provided to prevent gas leaks from causing the atmosphere to become unsafe. Ventilation shall be natural. It is not permitted to use mechanical ventilation to achieve the required ventilation levels. Special Safety Harness and Protective equipment's of PETZL make are mandatory for riser installation. Details would be as per approved Safety Job Procedure. Ensure that all equipment's and safety devices

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used are inspected, certified by competent authority valid & suitable for use. Plumber deployed for riser installation for high rise buildings shall be certified and prequalified with medical tests as per Safety Job Procedure.

- **Meter & Meter Regulator Positions**

  Meters will normally be located inside the property at approachable location. The kitchen / utility balcony is the preferred place to install the meter – thereby minimizing the length of the outlet pipe work.

  The Meter installation will be preferred in open/ventilated space so as to prevent Gas accumulation and easy dispensation of gas to atmosphere in case of any smell/leakage of gas. The Meter installations will not be provided in any fixed enclosures, cabinets (below or above the slab) or confined space in the customer premises.

  Meter Regulators will be installed as per enclosed drawing 15792-20-05-07.

  Only pretested riser shall be erected using pulley. Pretesting shall be done with compressed air @ 2 bar (g) for minimum duration of 30 minutes.

  Risers and laterals up to Isolation Valves shall be Leak tested with compressed air @ 2 bar (g) for minimum 2 hrs after vertical installation.

  Once testing is satisfactorily completed, uncoated portion (weldment) of risers and laterals shall be painted as per painting procedure.

  For the laterals beyond eighth floor, shall be used in compliance to the material specification of SS316, fittings shall be used with brass connections conforming to IS 319, in order to account for the temperature induced stresses.

- **Installation of Meter**

  Installation of domestic meters with associated inlet and outlet connections (GI/Brass fittings), on the wall with approved powder coated meter brackets and angles in new & existing gas charged areas.

  The contractor shall supply approved powder coated meter brackets and angle brackets. A sketch of the brackets is referred from the enclosed drawing for reference. It is required that one sample of each type of bracket is approved before the work is started.

  Firmly secure the meters on the wall with good quality super hold nylon anchor Rawl Plugs, SS 304/brass screws etc. In case the Rawl Plugs are not holding then wooden blocks or other fixing arrangements like cement etc. to be used for proper grouting.

  The Meter installation will be preferred in open/ventilated space so as to prevent Gas accumulation and easy dispensation of gas to atmosphere in case of any smell/leakage

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of gas. The Meter installations will not be provided in any fixed enclosures, cabinets (below or above the slab) or confined space in the customer premises.

The contractor shall ensure that GI installations and rubber hoses shall not be exposed to direct heat of Gas burners & chimney vents. The installation should have minimum clearance of about 1 meter from electric point mains & switches. Minimum distance between Appliance Valve & Gas Burners shall be 0.3 Meters. The isolation valves shall be installed after entering the customer premises/kitchen but before the meter installation.

The above activities along with restoration of the area to original shall be carried out to the complete satisfaction of consumer and EIC.

- **Laterals**

The lateral extending from the riser at right- angles must extend a minimum of 400 mm from the riser before passing through a wall.

- **Ventilation**

Ventilation is provided to prevent gas leaks from causing the atmosphere to become unsafe. Ventilation shall be natural. It is not permitted to use mechanical ventilation to achieve the required ventilation levels.

- **Pipes Passing Through Walls**

Where risers or laterals pass through walls the following requirements must be observed:

a. The pipe must be sleeved in a continuous non corrosive sleeve. Joints or any other part of a joint shall not be enclosed within the sleeve.

b. Pre-sleeved wall pieces are the preferred method for passing through walls and floors.

- **Painting of GI Pipes & GI Fittings**

Contractor shall install powder coated GI pipes & GI Fittings in consultation with EIC. Contractor shall submit detailed procedure of powder coating for approval to PMC prior to supply of GI pipes.

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12.0 TESTING OF GI/COPPER INSTALLATION

- Only pretested riser shall be erected using pulley arrangement. Pretesting shall be done with compressed air at 2 bar (g) for minimum duration of 30minutes.
- Risers and laterals shall be Leak tested with compressed air at 2bar (g) for minimum 2hrs after vertical installation.
- Once testing is satisfactorily completed, uncoated portion (welded) of risers and laterals shall be painted as per painting procedure.

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- The GI/Copper/MLC installation from lateral valve to appliance valve shall be tested at a pressure of 100 mbar (g) for a holding period of 15 minutes with no pressure drop. All the joints in the installation shall be checked with soap solution.
- The contractor shall supply the Calibrated Pressure Gauges / Manometer / Diaphragm Gauges of suitable range for testing of GI/Copper/MLC Installations ranging from 0-4bars / 0-500mbar respectively. The calibration certificate shall be submitted before the start of the execution work.
- The pressure gauges shall be calibrated from time-to-time as desired by EIC but positively once in every six months.
- The details of testing shall be properly recorded in the GI/Copper cards.

13.0 INSPECTION

The contractor to the entire satisfaction of EIC before proceeding further shall rectify any defect noticed during the various stages of inspection. Irrespective of the inspection, repair and approval at intermediate stages of work, contractor shall be responsible for making good any defects found during final inspection/guarantee period/defect liability period as defined in general condition of contract.

14.0 PURGING & COMMISSIONING

The rate for purging & commissioning shall be included in the GI/Cu/MLC installations.

Care shall be taken to ensure that the outlet is so located that vent gas cannot drift into buildings. The commissioning of the GI installation should be performed as follows:

- Ensure the method of purging is such that no pockets of air are left in any part of the Customer's piping.
- Ensure the area is well ventilated and free from ignition sources.
- Continue to purge until gas is available at other appliances.
- Internal piping i.e. Meter Inlet, Diaphragm Meter & copper pipe shall be tested pneumatically & with soap solution from inside of each domestic connection.

15.0 RESTORATION

Contractor has to restore the area wherever he has carried out drilling, clamping etc. to its original condition to the satisfaction of the consumer and to ensure no passage to the premises and seepage. If the work was carried out in Govt. Flats (CPWD/NDMC/Institutional areas), contractor has to restore the area according to CPWD specifications and obtain a NOC/Clearance certificate from the concerned authorities/RWA maintaining the flats, after completion of the work.

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The restored slabs or brickwork should match the surrounding surface levels. Joint widths should match the existing conditions and be filled with a dry or wet mix of mortar.

Wherever any items of the consumer are damaged/broken during working, the same will be made good or replace to the total satisfaction of the consumer.

The contractor will be responsible for the maintenance of all restoration carried out, for the duration of the contract guarantee period.

The contractor is to ensure the restoration work is properly supervised, and that the material used is suitable for the purpose. Wherever the required standards are not achieved the contractor will be required to replace the defective reinstatement work.

Note that Payment for GI/Copper/MLC installation will be released only after satisfactory restoration and clearing of the sites of all surplus materials etc.

16.0 SUBMISSION OF FINAL RECORDS

Contractor shall submit three sets each of the following documents in hard & soft copy:

- Total list of houses in the area allotted to him giving details of connections provided & reasons where connection could not be given /completed.
- The details recorded in RFC cards of every domestic house.
- Details of houses where piping done along with materials used.
- Total material consumption report.
- Material reconciliation with respect to the materials issued.
- Test reports & calibration certificates of gauges etc.
- Any other documents/records required.
- Extra Piping details

17.0 Compliance to Health, Safety & Environment (HSE) High Rise:

Scope includes use of fall arrestor, Ascenders / descended, PPE, Barricades/ Warning Boards (03 No's) connected with warning board/Caution tapes (Refer drawing no. 15792-10-03-26 & 15792-10-03-32) in areas where piping work is in progress, Use of Safety shoes, Wacky talky, Hand gloves, Reflective jackets, Hard hats (helmets), eye and ear safety equipment, Fire extinguishers and as per the detailed scope of work in tender specifications. Contractor shall also prepare and submit duly certified Safety check list signed by TPIA/PMC. In case of non-compliance, penalty shall be applicable as per SCC clause.

This set-up is applicable for more than 5^{th} (G+5) and above including high rise. Above 4th floor full body safety harness & accessories of PETZL make is compulsory.

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ANNEXURE # 1

TOOLS & EQUIPMENT TO BE PROVIDED BY CONTRACTOR FOR GI/COPPER WORK

S.N0.	HAND TOOLS DESCRIPTION	PER TECHNICIAN	PER TEAM
1	Pipe wrench 250 mm	1	4
2	Pipe wrench 350 mm	1	4
3	Pipe wrench 450 mm	-	2
4	Adjustable spanner 50 mm	-	4
5	Adjustable spanner 150 mm	1	2
6	Adjustable spanner 250 mm	1	2
7	Set of combination spanner 3/16"-11/4" AF	1	1
8	Set of combination spanners 5mm - 30mm	1	1
9	Large tool boxes	1	2
10	Set flat-headed screw drivers	1	2
11	Set Philips screw drivers	1	2
12	Small hammer	1	2
13	Combination pliers/mole grips	1	2
14	Set of files	1	2
15	Drill bits for 1" pipe	-	2
16	Stocks and dies for NPT threading ½", ¾", GI Pipe	-	3
17	Blowtorch	-	1
18	Soldering iron	-	2
19	Copper Pipe Bending Machine	-	2
20	Hand drill 3/8" chuck	-	2
21	Portable electric drill 240V, heavy duty	-	2
22	Spare blades	4	4
23	Battery powered torches	2	2
24	Measuring tape 30 m	1	2
25	Wire brush	1	2
26	Portable pipe vice & tripod	-	2
27	Set steel twist drills 1mm-10mm	-	2
28	Set masonry drills 1mm-10mm	1	2
29	Graphite based grease	As required	As required
30	Lubricating oil	As required	As required

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31	Hand cleaner	As required	As required
32	Copper pipe Cutter 12mm	-	4
33	GI Pipe Cutters ½" Gas Detection Equipment Power Generator 2.5 KVA Pressure Gauge (0-10 bar) Pressure Gauge (0-4 bar) Diaphragm Gauge (0-400 m bar) Manometer (0-150 m bar)	- As required 1 2 2 1 1	2 - - 4 8 2 1
	Automatic Thread cutting machine	-	2
35	GI Pipe Cutter	-	2
36	MLC Pipe Cutter	-	4
37	Welding Equipment	01 set per site	01 set per site
37	Full Body Safety Harness like PETZL or Equivalent	03 set per site	03 set per site
38	Motorized Suspended Platform	As required	As required

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ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION

FOR

INSTALLATION OF MRS & INTERNAL PIPING FOR COMMERCIAL & INDUSTRIAL CUSTOMERS

VCS – SS – PL – 0051

REV.	DATE	Purpose	Prepared By	Checked By	Approved By
00	18.06.2018	ISSUED AS STANDARD	PK	MVK	AD

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1.0 GENERAL INFORMATION

Indraprastha Gas Ltd. is a Joint Venture Company of Gas Authority of India Ltd. (GAIL), Bharat Petroleum Corporation Ltd. (BPCL) and Govt. of NCT of Delhi. IGL plans to install an underground Natural Gas Distribution network throughout the NCT, NCR & Rewari Region. The objective is to supply Natural Gas to both DOMESTIC and COMMERCIAL customers, and to provide compressed gas as a fuel for Automobiles. IGL is seeking Contractors to assist in meeting the above objective.

The present document gives the specification to be adopted for procurement of CS pipes & fittings, fabrication, erection, installation, and commissioning of MRS (Meter Regulating Skid) along with internal piping (on request) on downstream of MRS to supply Natural Gas for commercial and industrial customers in NCT of Delhi and NCR complying with OISD standards & petroleum and Natural Gas Regularly Board (PNGRB) guidelines.

2.0 APPLICABLE CODES & STANDARDS

3.1 GENERAL

Piping works shall be carried out in accordance with the requirement of this specification and other National/international relevant applicable standards like Oil India Safety Directorate (OISD) norms, PNGRB, ASME B 31.3-Process Piping Systems, ASME B 31.8 "Gas transmission and distribution piping systems."
Minimum requirement shall be as per latest edition of following codes and standards

ASME STANDARDS

ASME B 16.5	Pipe flanges and flanged fittings up to 24"
ASME B16.34	Valves-flanged and Butt welding ends
ASME B 31.8	Gas transmissions and distribution piping system
ASME VIII, DIV-I	Boiler and Pressure Vessel code
ASME B 16.9	Factory-made wrought steel butt welding fittings
ASME B 31.3	Process piping

ASTM STANDARDS

ASTM A 53/A 53 M	Pipe steel black and hot dipped, Zinc-Coated, Welded and seamless
ASTM A 105/A 105 M	Forgings, Carbon steel, for piping components
ASTM A193/A 193 M	Alloy steel and stainless steel bolting materials for high temperature services.
ASTM A194/A194 M	Carbon and alloy steel nuts for bolts for high temperature Services
ASTM A234/A 234 M	Piping, fitting, of wrought carbon steel and alloy steel for

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	moderate and elevated temperature
ASTM A 370	Mechanical testing of steel product
ASTM A 515	Pressure vessel plate, carbon steel for intermediate and higher temperature services
ASTM A 516	Pressure vessel plate, carbon steel for intermediate and higher temperature services
ASTM A 707/A 707 M	Flanges, forged, carbon and alloy steel for low temperature Service

API STANDARDS

API 5L	Specification for line pipe
API 1104	Specification for welding pipeline and related facilities
API 6D	Specification for pipeline valves (Ball, Gate, Plug Ball and Check Valves)
API 6 FA (Spec 6 FA)	Specification for fire Test for valves
BS 5351	Specification of small size valves (Below 2")

ISO STANDARDS

ISO 148	Determine the impact strength of steel and energy absorbed by charpy.
ISO 9001	Quality Management Standards

OIL INDUSTRY SAFETY DIRECTORATE (OISD STANDARDS)

OISD-GGN-115	Guidelines on fire fighting, Equipment and appliances in Petroleum industry
OISD-standard-113	Hazardous area classification
OISD-Standard-163	Process Control Room Safety

In case of contradiction, the most stringent will apply

3.0 SYSTEM OF UNITS

The international system of Units (SI), also known as the "Metric system" shall be used.

The international Gas union (IGU) has also recommended, generalizing the use of the SI system in all matters relating to Gas and Gas facilities.

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4.0 PROCESS PARAMETERS

Inlet pressure	:	Max. 4 barg
Out let pressure	:	0.1 barg-4 bar (Variable)
Operating temp	:	0 – 45^{0}C
Design Pressure	:	19 barg
Design temp. (min/max)	:	0/+60^{0}C
Hydro test Pressure (MRS)	:	1.5 x Design Pressure (Hydrostatic Test) with minimum test duration of 4 hrs.
Pneumatic Leak Test	:	6 bar for minimum 4 hrs.
Flow (m^3/hr)	:	Up to 250 m^3/hr (at 2 barg 750 SCMH)
Process Fluid	:	Natural Gas

5.0 MATERIAL SPECIFICATION OF PIPING SYSTEM

Materials to be used for piping system shall comply with the minimum requirements of relevant standards & codes.

Pipes	ASTM A106 Gr. B (Seamless)/API 5L Gr.B/ IS-ASTM A 53/A53 M Gr.B/ 1239Heavy
Flanges	ASTM A105/ A 105
Restricting Orifice* plate	SS 304
Rubber Gasket (washer)	High Nitrile Synthetic Rubber Grade 215
Fittings	ASTM A234 Gr WPB
Ball Valves	A 105/A 216 Gr WCB
Insulation	NA
Insulating gasket	Same as Pipe (Ring A 105)
Spiral Wound Gasket (washer)	ANSI B 16.20
Nuts and Bolts	AS per PMS
Rubber hose	Type-4 as per IS:9573
Painting	As per enclosed "

The size of orifice of restricting orifice plate shall be 11 mm for G10/G16/G25, 13mm for G40 and 15mm for G65 RPD meter.

The size of orifice of rubber gasket (washer) shall be 5mm for G4, 8mm for G6, 10mm for G10 & G16 and 13mm for G25 Diaphragm meter.

Note: - Over and above these specifications and materials, please refer below the specifications.

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1. For Piping material refer "PMS-1C1"
2. All stud bolts and nuts shall hot have dipped galvanized as per ASTM A53.

6.0 SITE ENVIRIONMENTAL DATA/CONDITIONS

Environmental/ climatic conditions for various sites are given below

Typical	:	
Temperature	:	(Min/Max.)^{0}1.7^{0}C/48.5^{0}C
Rain fall	:	*
Wind	:	*
Seismic Zone	:	*
Relative humidity	:	90%
Elevation from Mean Sea Level	:	205 met.
Hazardous Area Classification	:	*

7.0 PIPE DESIGN/ SIZING

8.1 Coding of Piping Classes

Each Class is named by a code consisting in three of four parts:

First parts:

A figure designating the material:

- 1= 1500 lbs ANSI - PRESSURE – 18.75 bar g
- 3= 300 lbs ANSI - PRESSURE – 49.00 bar g
- 6= 600 lbs ANSI - PRESSURE - 98.00 bar g
- 9= 900 lbs ANSI -

Second part:

A letter designing the material:

- A= Allot steel
- C= Carbon steel
- F= Fiberglass reinforced plastic/epoxy (FRP)
- G= Galvanized
- P= Plastic (HDPE)
- S= Stainless steel
- V= PVC

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Third part:

A sequential number to differentiate two or more piping classes of the same rating and same material but presenting some differences related to the handled fluid.

Fourth part:

A letter designing the underground:

- U= Underground
- AG= Above Ground

8.2 Wall Thickness

The wall thickness of pipe shall be as follows:

Wall thickness of pipe shall be calculated as specified in the applicable sections of:

- ANSI B 31.8 for classes covering the main process and auxiliary gas lines.
- ANSI B 31.3 for classes covering utilities lines.

8.3 Corrosion Allowance

The minimum corrosion allowances used to calculate wall thickness as follows:

- Carbon steel and ferrite alloys in classes calculated following ANSI B 31.8 : 1.6 mm
- Carbon steel and ferrite alloys in classed calculated following ANSI B 31.3 : 1.6 mm
- Stainless steel : 0 mm
- Plastic and PRP pipes : 0 mm

8.4 Wall Thickness Calculation

a) Pipes for natural gas shall comply with ASME/ANSI B 31.8 code. Pipe wall thickness will be calculated as follows:

$$t = \frac{PD}{2xSxFxExT} + C$$

T = nominal wall thickness (mm)
P = design pressure (MPa)
S = minimum yield strength (Mpa)
F = design factor = 0.40
E = longitudinal joint factor
= 1.0 for API 5L (seamless or ERW or SAW)

T = temperature de-rating factor = 1.0
C = corrosion allowance (mm)

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b) Pipes for Utilities lines have a wall thickness complying with ASME/ANSI B 31.3 code:

$$t = \left\{ \frac{PD}{2xSxFxExT} + C \right\} x (1+a)$$

T = Nominal wall thickness (mm)
S = Allowable stress (MPa)
P = Design pressure (MPa)
E = Longitudinal joint factor
Y = Coefficient as per table 304.1.1 of ANSI 31.3
C = Corrosion allowance (mm)
A = Negative fabrication tolerance (%)

8.0 Wall Thickness Calculation

1.0 Nitrogen at 7kg/cm2

2.0 Above utility data may change according site condition and availability of resources.

9.0 SAFETY

All required Personal Protective Equipments (PPEs) for carrying out the jobs safely to be provided to the workers.

The agency has to ensure that potential safety factors, health and environment effects are assessed before execution of the job and necessary actions required for ensuring safety of human and environment are taken care of.

Jobs at customer locations are to be carried out as per safety Work Permit System of IGL- i.e, permit will be issued at site every day after ensuring all safety precautions and execution of the job to be done in presence of representatives of IGL's Technical, Fire & Safety and designated Contract Supervisor.

10.0 FABRICATION OF MRS AND INTERNAL PIPING:

This part covers fabrication, erection and installation of MRS, Common header for MRS installation, internal pipeline with fittings for supply natural gas to commercials and Industrial units from MRS till customer's appliances. Work for internal Piping shall be carried out as per instructions and after allotment of work by EIC. The Indicative diagram is shown in bid documents.

On allotment of work, Contractor shall carry out join survey along with IGL/IGL's representative of the customer's premises for finalization of location of MRS/Common header

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or route of internal Piping and as per requirement and shall subsequently submit construction plan to IGL for Procurement of material (Pipe, fittings, consumables etc.), Inspection, Fabrication Erection Installation Testing and Commissioning of MRS, Common header & Internal Piping as enclosed at Annexure – 3. The material procurement plan includes make of pipes & fittings to be procured as per the approved make list
(enclosed in tender document at) for approval from EIC.

After approval of plan from EIC and before start of fabrication, Contractor shall procure material and submit material test certificates (MTC'S) of all materials including pipes, fittings ball valves, consumables (incl. Electrodes) etc. for review of EIC and shall subsequently arrange their physical inspection. Contractor shall also submit documents for welding procedure specifications (WPS) for the similar kind of job for IGL's approval.

IGL may instruct the contractor to carry out survey of proposed customer and shall in turn submit the estimate for material and execution along with drawing without any changes
Welder shall be qualified for proposed WPS according to the applicable codes. If the same welder is doing the similar kind of job continuously for the last six months and qualified by reputed consulting organizations like EIL/MECON/TEPL, the welder shall be allowed to work on submission of welder's qualification Certificate.

Only E6010/E7018 electrodes of reputed make (LINCOLN, ESAB etc.) shall be used for welding of piping joints. The electrode E7018 shall be baked in mother oven before usage at site. All flanges used shall be of welded neck type. No plate flanges made by Gas cutting shall be used. Flanges dimensions, ratings, facing, face finish and manufacturing shall be as per ANSI B16.5 unless otherwise specified. All fittings shall be seamless in construction unless otherwise specified. All fittings of size 1" and above shall have butt-welded ends and shall comply with attached piping class.

Mitre joint shall not be used and the same shall be replaced with a Standard Elbow with short radius (<_1D). Piping Spools (If required), Supports etc. shall be pre-fabricated or shop fabricated. Pipe shall be supported on walls or Suitable supports (clamps, steel supports etc.) (refe drawing in tender document at Annexure – 4) and at adequate interval of space not less than 2 metres. The material and size of angles shall be MS and of minimum size 75 x 75x 8 mm.

End Preparation, alignment and fit up of the pipe length to be welded, pre heating, welding, post heating and heat treatment (if required) shall be as per IGL welding specification/design codes and standards. Pipe joints shall be butt-welded. However as per site requirement, flanged joints (if necessary) may also be used Contractor to ensure provision for locking/sealing arrangement for meter/valves to avoid misuse.

All (100%) root joints alignment & fit up shall be witnessed by IGL/IGL representative followed with a mandatory DP (Dry penetrate) test. In addition to the DP test. RT will be carried out in presence of IGL's representative on at least 10% of joints in single MRs using unique joint no. The dimension tolerances for piping fabrication shall be as per IGL's standards design codes and standards.

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Contractor shall carry out Hydro test for each MRS in their factory and shall carry out installation only after duly certification from IGL/IGL's representative. The test reports/certificates (DP test RT, Hydro test, NDT) issued against a single MRs shall be presented to IGL's site representative for verification and before start of installation. The format FPR DPT, RT, Hydro test, welding inspection & NDT is attached at Annexure – 5, 6, 7, 8 & 9 respectively.

For MRS, dimensions tolerance of 100% both ways against pre-defined length (refer drawings attached in tender) shall be included in fabrication & installation rates (payable as per SOR Item no. 29) and no separate charges shall be claimed in case of any additional joints, fittings etc. used for completion of installation. The bidder shall quote rates against each SOR in correlation with drawings, tentative BOM (Bill of Materials) attached in tender document. Any installation/piping in excess/ short to predefined length of MRS shall be payable/deductible through SOR item no. 31.1.3 to 31.1.5 as per size of pipe used. The length of the MRS shall be measured after installation and RFC and shall duly be certified in RFC card for payments. Contractor shall provide suitable locking arrangement in MRS with isolation valve by wire sealing as per instruction of Engineer In-charge.

The rates for internal piping (downstream of MRS) are payable through SOR item nos. 31 includes procurements, fabrications, welding and installation till commissioning. No separate charges are payable for any repair & modifications (on customer's request) even after installation & testing however before commissioning and are inclusive in rates. The ball valves installed in common header/Internal piping shall be payable separately through SOR item no. 30.9 to 30.11, depending upon the size of pipeline.

Laying of concealed pipeline in the cavity of the walls/ceiling/basement shall be avoided. In locations where the pipeline has to be laid in a covered trench or below ground level, it should be avoided however considering the minimal alternatives/ constraints at site, the laying is possible after written approval from EIC, cold wrap & coating shall be applied on the surface of the pipe followed by Holiday test. The pipe shall be properly supported on clamps/I supports with minimum clearance of 4" from ground level. IGL may also instruct the contractor for installation/laying of MDPE pipeline and transition fittings for such below ground sections which shall be laid in correlation of technical specification of MDPE pipeline laying and payable as per the respective pipe SOR's.

In case where MRs fabrication & installation is carried out considering twin metering and single regulation (in a single MRS), the payment against the installation of both streams shall be made as per SOR item no. 29.3 or 29.4 for one of the stream and as per SOR item no. 31 for the other stream depending upon the type and size of the CS Pipeline used for MRs fabrication. Also, in case of twin metering and twin regulation, the payment against the installation of either of the streams shall be made as per SOR item no. 29 and for loop line connecting both streams in running meter as per SOR item no. 31 depending upon the type and size of the CS pipeline used for MRS fabrication.

Any preparation of the threads for installation, completion of MRS, common Header & internal piping is inclusive in rates. All the MRS shall be fabricated in the Contractors workshop and tested in presence of IGL's representative before installation. After complete

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installation of the MRS at the allocated locations; the flange joints shall be tested online along with Meter & Regulator before commissioning.

The branches of the pipeline shall be using standard fittings. Also, branching on common header will be payable in running meters.

11.0 ERECTION OF MRS SKID

11.1. Cleaning of piping before erection.

Before erection, all pre-fabricated spool pieces, pipe, fittings etc. shall be cleaned inside and outside by suitable means (Mechanical or chemical). The cleaning process shall include

- Removal of all foreign materials such as scale, sand, weld spatters, cutting chips etc. by wire brush, cleaning tools and blowing out the foreign material with compressed air and/or flushing out with water.

- Special cleaning requirements (if any), shall be carried out as per IGL specification/piping design codes/standards.

11.2. Pipe routing and Layout

Pipe routing and lay-out shall be as per IGL approved pipe route, GAD, P&IDs and piping support drawings and applicable design code and standards. In case of fouling of a line with other piping, structure, equipments etc. The matter shall be brought to the notice of Engineer-in-charge and corrective action shall be taken as per his instructions. Above ground pipeline shall be laid either on MS clamps fixed on the wall or on the pipe supports with BOP more than 2 mtr height.

The selection of route of installation gas pipeline connection in the premises of the industry/ commercial establishment is key to safety and integrity of gas installation and public. It should be installed above ground having in well-ventilated area and having easy approach.

All risers and lateral piping should be clamped to the building at intervals not exceeding one meter. Laying of concealed pipeline inside the cavity of the walls, ceiling, basement etc. should be avoided, Platform and cross-over shall be provided for ease of operation and maintenance of pipeline if required. All supports shall be installed strictly as per approved support drawing/instruction of engineer-in-charge.

While laying the pipeline, care should be taken that valves installed on the pipeline should be approachable for easy operation and maintenance.

11.3. Flanges Connections

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While lilting up mating flanges, care shall be taken to properly align the pipe and to check the flanges for trueness so that the faces of the, flanges can be pulled together without inducing any stresses in the pipe and the equipment.

The assembly of the flange joint shall be done in such a way that the spiral wound gasket between the two flange faces is uniformly compressed. To achieve this bolt shall be tightened in a' proper sequence. Copper strips/ jumpers shall be installed on all flange joints in order to provide earth continuity to MRS & internal piping.

11.4. Vents

Venting facilities shall be provided for any emergency evacuation of gas from the pipeline. Vent line shall be fitted with a flapper and shall be at 3-meter height from the nearest operating platform, with ends at open space.

11.5. Painting

Alter installation of the above ground MRS & Internal piping system, painting of MRS/piping shall be done after RFC with proper surface preparation and application of primer and finish coat of paints as per IGL painting specifications enclosed in Annexure I, to prevent atmospheric corrosion, the standard colour code for Natural gas piping shall be 'Canary yellow'. The gas flow direction shall be marked "in Red" on the MRS or Internal Piping.

11.6. Valve Installation

Valve shall be installed in a position as specified in the valve manufacturer installation and O&M manual. Care shall be exercised to ensure that all hL11 bore ball valve shall be installed with the "Gas Flow direction arrow" marked on the valve body pointing in the right direction after written consent from EIC.

11.7. Instruments

All the required instruments (PG, TG, flow control valves, interlocks, control panel etc..) shall be installed on the pipeline as per attached MRS Drawings, Owner's approved installations procedure, applicable design code and standards, manufacturer's installation, O&M Manual after proper calibration, testing and inspection of the instruments as per manufacturer's calibration procedures. It is mandatory to install pressure gauges on the downstream internal piping at start and end point. Any installation of additional pressure gauge will be payable as per **SOR item No. 30.8** and subsequent fillet welding of sockets & installation of pressure gauge will be payable as per **SOR item no. 30.13**.

11.8. Rubber Hose

The Steel Pipe and Appliances connect to Hose shall be in the same room. The length of' hose should be kept minimum but shall not exceed 1.50 meters. Hose shall be easily accessible to inspect. Hose shall not be used in conditions where ambient temperature exceeds its design temperature. Hose shall be so installed [hat it is not twisted, looped or kinked in and should be free from external pressure. Design and Construction of Hose shall

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be Type IV as per IS: 9573 (Latest revision).

11.9. Supports

Pipeline for PNG supply to Commercial/Industrial connection shall be adequately supported at suitable intervals as per piping design code and standard and good engineering practices. There are various types of clamp supports for supporting and suspending horizontal as well as vertical/riser pipes. The support's schematic drawing for piping are attached with the tender documents at Annexure -- 4. The material & size of the angle shall be MS & minimum size ---75 x 75 x 8 mm.

11.10. Electrical Equipments

All the required Electrical equipments shall be installed as per Owner's approved installation procedure, applicable design code (OISI). 149) and standards, manufacturer's installation / O&M Manual after proper calibration, testing and inspection of the equipments as per manufacturer's calibration procedures.

12.0 INSPECTION AND TESTING

12.1. Material Inspection

All materials, items and their parts shall be subjected to all mandatory as well as supplementary (wherever specified) inspection, testing and checks called for in the respective codes/standards/data sheets/IGL approved manufacturer's QAP of Vendor at manufacturer's workshop/factory as well construction site. All fit-ups shall be checked for proper Root gap, surface cleaning and orientation etc. before starting the welding and inspected by lGL / IGL's representative.

Dye-penetrate test shall be done after root welding for all the butt & Socket weld joints. As per the instruction of EIC/PMC, Radiography test may be performed randomly on joints for 10% (percentage) on random selection basis.

12.2. Execution Inspection

- Ensure availability of Work Permit and Fire permit
- Visual Inspection of installation of carious equipments, instruments and their associated components, electrical equipment's, pipe fitting and valves etc.
- Dimensional checking of equipment, pipe, fitting and valves etc.
- Inspection of Calibration of instruments
- Inspection of testing and commissioning or pipeline system
- Inspection and checking of DFT of painting of equipment, pipe, pipe supports etc.
- Inspection and checking of Mechanical completion of pipeline system with the approved construction drawing and work procedures for installation and erection of various equipment/pipeline

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- Ensure availability of First AID Box, PPE and fire extinguishers.
- Inspection of flushing, cleaning and Hydro testing of Piping system
- All welded joints shall be subjected to visual inspection according to ASME 1.3/31.8 and radiography according to API1104.
- Inspection test plan shall be as per ANNEXURE-2
- Verification/Inspection of all the mill and workshop test certificates applicable to related material. spare, equipment, pipe, fittings, valves, supports, paints, IJ etc.
- The entire piping system shall be subjected to hydrostatic testing or pneumatic strength testing.
- 10% RT shall be done for all the Butt joints on random selection basis. Overall decisions rests with the EIC to increase %(percentage) of RT on joints, in case of any additional RT (on instruction of EIC) rates shall be payable as per SOR item no. 30.14
- The test pressure should be 1.5 times of design pressure in case of Hydrostatic testing or 1.1 times or the design pressure in case of Pneumatic testing. However, test pressure and time duration may vary depending upon the application and flow.
- Before commencement of strength Test, calibration reports of pressure gauges and equipments shall be reviewed by IGL/IGL's representative.
- Pressure gauge range shall be minimum1.5 times and maximum 4 times of test pressure.
- Before starting hydrostatic testing, testing and inspection reports shall be submitted to IGL for verification and only after getting formal clearance from IGL, testing shall be carried out.
- The test pressure for the piping system shall be kept on hold for 4 hr with no pressure drop. For internal piping with pipe length less than 25 meters, the test pressure shall be kept on hold for 4 hrs. Whereas if length more than 25 meters, minimum test pressure duration shall be minimum 12 hr to max. 24 hrs. depending upon customer's/ site requirement.
- After hydro testing proper dewatering and purging shall be carried out.
- Care should be taken to ensure that the purge outlet is so located that vent gas cannot drift in the building.
- The method of purging should be such that no pockets of air left in any part of the piping.
- It should be ensured that the area is well ventilated and free from ignition source.
- Inspection and testing of Electrical, Civil and Instrumentation work shall be carried out by quality control inspector of related Engineering disciplines.
- All the MTC/TC, Inspection and test reports for mandatory as well as supplementary (wherever specified) shall be submitted to IGL.

13.0 PRE-COMMISSIONING AND COMMISSINING

The various acceptance criteria and handover of the MRS system shall comprise of

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the following 2 stages.

- Pre commissioning
- Commissioning/Start-up

13.1. Pre-Commissioning

IGL representative shall carry out the following minimum check (including other relevant checks as may consider described by manufacturer of meter, regulator, valves, etc. to ensure that the MRS has been mechanically completed in all respect for pre-commissioning.

- A schedule of required activities for pre- commissioning /commissioning/ performance guarantee test/handover shall be readily available.
- Prior to pre-commissioning of MRS and associated facilities (piping, valves, instrumentation, electrical system) shall be mechanically completed to be ready for commissioning
- All the consumables, tools and tackles, utilities, etc. bare available.
- Fire fighting system and PPE are readily available.
- All the statutory permits are available.
- The emergency management plan is available.

Following are the minimum required pre-commissioning checks but not limited to:

13.2. System Check

Checking of piping /Mechanical System

The entire facilities/system shall be checked against the IGL's/IGL's representative latest approved P & Id, GADs and other relevant design specified and codes.

Checking of utilities

Checking of all relevant utilities like, service water, compressed air, nitrogen, power, power back-up system etc.. to facilitate commissioning and safety.

13.3. Pneumatic testing

Air Flushing

The entire MRS and associated facilities shall be flushed and air cleaned to ensure readiness of the system for pneumatic test. Chemical cleaning may also be considered as per site requirements

Pressure Testing

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Pneumatic testing shall be carried out a pressure of 6 bar g by means of compressed air. The test pressure shall be maintained to permit through inspection of all joints for leakage or signs of failure.
Any joint found leakage during the pressure test shall be re-tested to the specified pressure after repair.

13.4. Completion of Testing and Drying

After pneumatic test are completed, the pressure is released gradually without damaging the equipment, facilities and maintaining personnel safety measures. All vents and drains shall be kept opened till the entire system is completely drained. After draining, the system shall be completely dried using dry air.

13.5. Insertion

The insertion operation should start immediately after drying is complete. The contractor shall submit a detailed purging procedure for approval of IGL/IGL's representative prior to its implementation. During the insertion operation, the air left in the piping system shall be replaced by nitrogen before admitting the natural gas into the pipe system. The maximum allowable oxygen content inside the piping system shall be less than 1% by volume. No extra payment shall be made for nitrogen cylinders and is included in SOR.

13.6. Test Records

Records in triplicate shall be prepared and submitted by the contractor to the IGL/IGL's representative for each piping system/ facilities for the test performed.

13.7. Safety Review before start-up of commissioning

A pre-start up safety review shall be carried out of the entire piping system before permitting natural gas into the new facility.

The following minimum safety review is envisaged: Availability of all relevant design documents, welding

Availability of all relevant design documents, welding.

13.8. Commissioning

Once all pre-requisite activities (safety and pre-commissioning) test have been completed, clearance for commissioning the system shall be obtained from IGL/IGL's representative.

- The commissioning operation shall be controlled and supervised by authorize personnel who are fully known to their responsibilities during commissioning.

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- The pipeline system shall be slowly charged with natural gas and pressurized gradually up to its operating conditions/parameters.

- The contractor shall obtain the IGL/IGL's representative approval of his commissioning procedure prior to starting commissioning operation.

- The pipeline system shall be slowly charged with natural gas and pressurized gradually up to its operating conditions / parameters.

- Commissioning of MRS system shall be considered completed and acceptable when the piping system is charged with natural gas at operating pressure and the MRS system is operated at normal operating conditions with all instruments/controls working satisfactorily at normal operating conditions.

GAS CHARGING IN INTERNAL PIPING

From safety point of view gas should be taken to the burners, section wise namely:

- Gas charging in internal piping
- Gas Charging in gas train burner

Sr. No	Activities	Precautions
1	Confirm the closure of gas train inlet	Observe carefully closing mark
2	Crack open the MRS outlet valve and raise the section pressure to 1 or 2 bar g or as required	Keep valve key ON position and a man with walky-talky
3	Crack open the pressure gauge tapping valve near gas train Intel valve and vent out nitrogen	Do not inhale nitrogen gas Ensure No spark. No naked flame. Methane concentration in atmosphere should not increase more than 2% if required, do venting/draining intermittently
4	Measure methane percentage. It should match feed gas composition	
5	Close the pressure gauge tapping valve completely	
6	Open the MRS outlet valve fully and observe the system for 5-10 minutes	

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14.0 CONVERSION

Conversion of Burners & supply of Rubber Hose

The work in this section shall be carried out along with the internal piping or on request i.e. case to case basis and includes:

The changing of nozzles and associated controls in accordance with manufactures instructions for canteen, T-type, RV, imported burners/ovens/grills/hotplate etc.. the and imported burners/ovens/grills/hotplate. The contractor shall supply the Reinforced rubber hoses at the time of conversions, Minimum size 8 mm dia. per connection -- 1.5 meters with fixing clamps, however the size may vary for type of burners converted on NG. The contractor has to supply all types of nozzles/jets required for all types or appliances including canteen, T-type, RV, imported burners, Grills, Ovens, without any extra charges to IGL, all activities are inclusive and are payable through SOR. Item no. 34**.**

Cleaning and performing minor maintenance of appliances, during the tenure of the contract. Attend all complaints related to proper working of appliances, testing for gas escapes, soundness and performance of appliances. Instructing & educating customer for safe use of natural gas and for fixing of safety and conversion labels. Contractor must attend the complaints regarding appliances, leakage, fire etc. till the total area is handed over to Owner's operation and maintenance.

All consumables (Nozzles, greases etc..), changing or repairing of any items damaged during conversion arc in contractor's scope, the contractor will have to provide both pin gauges and standard sized nozzles, The payment will be released by IGL only after submission of necessary documents i.e. JMR card of the individual commercial/ industrial connection.

15.0 MODIFICATION IN EXISTING MRS

It includes taking shutdown of existing MRS, dismantling meters/ regulators, replacement/Fixing of meters/regulators with associated inlet and outlet connections/fittings supply of pipes & fittings, pipe cutting, threading, welding & firmly fixing with approved meter clamps/ brackets and other supports by proper grouting. Restoring the area to the original condition as per the specifications and complete satisfaction of consumer.

Modifications / replacements (of meter or regulator or both) in MRS using threaded fittings/ flanged end (same size or bigger) shall be payable through SOR Item 31 depending upon the types and unit of meters and regulators replaced,
the rates include all as above along with testing of joints till re- commissioning. Wherever, there is modifications in MRS which can be carried out only through welding for same length of MRS or bigger upto 3.00 mtrs in addition to MRS length, the work is payable only through no. or joints welded tor completion of

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modifications and no separate payments is applicable for additional pipe/fitting used and payable as per SOR Item no 31.7 only. In case erected length after modification is more than 3.00 mtrs of original length of MRS, then the running meters shall be applicable and payable through SOR item no. 31.8 only.

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ANNEXURE - 01

PAINT SYSTEM FOR ABOVE GROUND PIPING

Paint system Nr.	Substrate	Exposure conditions	Surface preparations	1st Coat	2 nd coat	3rd coat	4th coat	5th coat	Nominal Total DFT
201	Bare carbon steel & ferritic alloys	T up to 65^{0}C	Sa3	Zinc rich eithyl silicate primer 75(µm)	Epoxy Sealer polyamide/ C 50 (µm)	High Build epoxy polyamide U/C recoatable 80(µm)	PU finish recoatable 50(µm)		255µm
201P	As above but site touch-up	T up to 650C	Sa3 (spot blast)S03 only when blasting is not possible	Zinc rich two pack epoxy primer 50(µm)	Epoxy M.I.O. recoatable 80 (µm)	Epoxy HB U/C. recoatable 60 (µm)	PU finish 50µm		240µm
201 W	Bare carbon steel to be welded	T up to 650C	Sa 2.5 min.	Welding primer two components epoxy 20 (µm)	6 to 9 months after welding procedure cleaning of weld With 3rd coat Touch-up If needed	HB M.I.O Epoxy Modified U/C 80µm	HB M.I.O Epoxy Modified U/C 80µm	PU finish 50µm	230µm
202	Bare carbon steel & ferritic alloys	T up to 650C	Sa3	Zinc rich ethyl silicate primer 75(µm)	Heat resist. Silicone Acrylic White 30µm	Heat resist. Silicone Acrylic White 30µm			135µm
202 P	As above but site touch-up	T up to 65^{0}C	Sa3 (spot blast)	Zinc ethyl silicate primer 75(µm)	Heat resist. Silicone Acrylic White 30µm	Heat resist. Silicone Acrylic White 30µm			135µm

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ANNEXURE - 02

Sr.	Particulars	Type of Inspection	% of Inspection	Scope	
1	Material Test Certificate verification	TC verification (Raw Material)	100%	Contractor	IGL/TPI
2	Welding Procedure Specification	Document verification /approval	100%	P	R
3	Welders qualification Test	Document verification/ witness	100%	P	R
4	DP Test	DP rest on root	100%	P	R/W (in case of new welder
5	Welding Inspection	Visual inspection	100%	P	RW(min 10%)
6	Radiography	Review of films	100%	P	RW(min 10%)
7	Hydro/Pneumatic Testing	Hydro/Pneumatic testing of entire pipeline	100%	P	W

Legend:

P- Perform, R-Review, RW- Random Witness (min 10%), W-Witness, TPI- Third Party Inspector

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ANNEXURE – 03

ANNEXURE-3

CONSTRUCTION PLAN

S.No	Work Allotted for	Type of work			Route Survey/Feasibility Status				Availability of Material Under Contractors Scope	Any Deviation	Schedule of completion			Approval from zonal In-charge
		PE Laying	MRS	Internal Laying	PE Laying	MRS	Internal Laying				PE Laying	MRS	Internal Laying	

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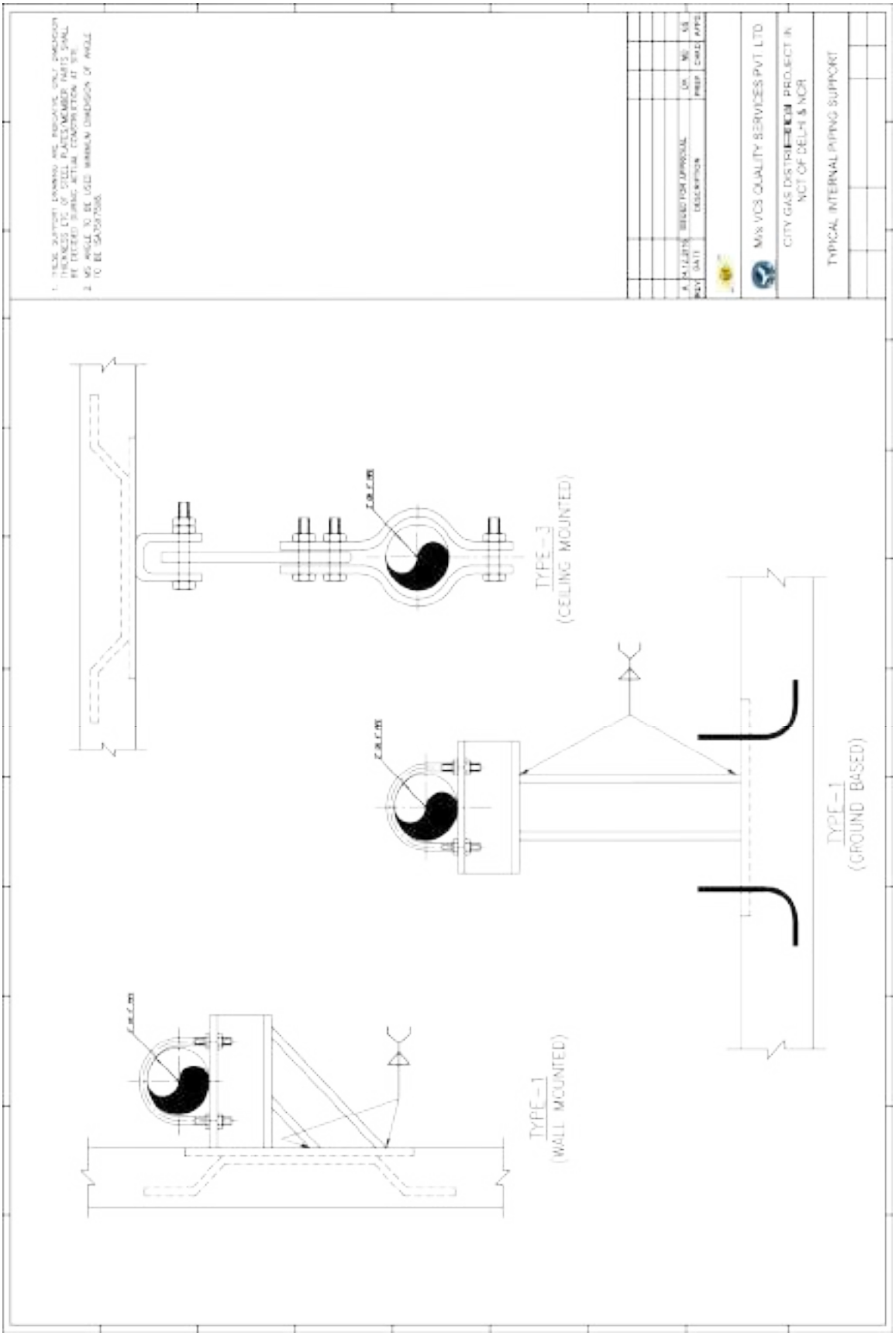

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ANNEXURE - 05

DP TEST REPORT					
Client:	INDRAPRASTHA GAS LIMITED			REPORT NO.	
Project:				DATE	
MRS No.				PIPE MATERIAL	
S. No	Size	JOINT NO.	SEGMENT	INSPECTED BY	REMARKS
CONTRACTOR's (Name & Signature)		TPIA (Name & Signature)		PMC (Name & Signature)	IGL (Name & Signature)

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ANNEXURE - 06

RADIOGRAPHY TEST REPORT					
Client:	INDRAPRASTHA GAS LIMITED			REPORT NO.	
Project:				DATE	
				SITE	
S. No	JOINT NO.	PIPE SIZE	WELDING REPORT NO	RADIOGRAPHY REPORT NO	REMARKS
CONTRACTOR's (Name & Signature)		TPIA (Name & Signature)		PMC (Name & Signature)	IGL (Name & Signature)

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ANNEXURE – 07

HYDROTEST REPORT						
Client:	INDRAPRASTHA GAS LIMITED			REPORT NO.		
Project:				DATE		
				SITE		
S. No	TIME	PRESSURE (kg/cm2)	TEMPERATURE (deg.C)	PRESSURE RELEASED (kg/cm2)	PRESSURE DROPPED/INCREASED	REMARKS
CONTRACTOR's (Name & Signature)		TPIA (Name & Signature)			PMC (Name & Signature)	IGL (Name & Signature)

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ANNEXURE – 08

WELDING INSPECTION REPORT									
Client:	INDRAPRASTHA GAS LIMITED					REPORT NO.			
Project:						DATE			
MRS NO						PIPE MATERIAL			
S. No	SIZE	PIPE / FITTINGS	HEAT NO	LENGTH	JOINT NO	FIT UP CHECK	WELDER NO	VISUAL INSPECTION	REMARKS
CONTRACTOR's (Name & Signature)		TPIA (Name & Signature)			PMC (Name & Signature)			IGL (Name & Signature)	

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ANNEXURE – 09

NDT REPORT					
Client:	INDRAPRASTHA GAS LIMITED			REPORT NO.	
Project:				DATE	
				SITE	
S. No	SIZE	JOINT NO	SEGMENT	INSPECTED BY	REMARKS
CONTRACTOR's (Name & Signature)		TPIA (Name & Signature)		PMC (Name & Signature)	IGL (Name & Signature)

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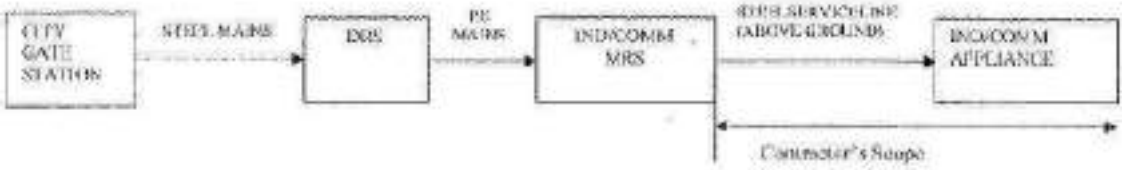
ANNEXURE -10

(TYPICAL PNG DISTRIBUTION SYSTEM FOR INDUSTRIAL / COMMERCIAL CUSTOMERS)



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STANDARD SPECIFICATION FOR SERVICE REGULATOR ASSEMBLY

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1.0 TECHNICAL REQUIREMENTS

Service Regulator Assembly shall be installed at Domestic installation applications in order to provide the gas at required capacity. Service regulator assembly shall be designed to operate on clean and dry natural gas.

1.1 SERVICE REGULATOR ASSEMBLY

The assembly shall consist of the following parts

a) Transition Fittings at both inlet & outlet (Free Issue Material)

b) Brass Ball Valves required at the inlet, outlet and pressure test points. (Free Issue Material)

c) An external filter in the upstream of the Regulator. (Free Issue Material)

d) Slam Shut Off Valve in the upstream of the Service regulator with SS Tubing for pressure sensing. (Same shall be installed if required as per the site conditions) (Free Issue Material)

e) Service Regulator (Free Issue Material)

f) Outlet pressure tapping

g) Pipes and Fittings

h) Housing (Canopy) with Lock and Key

i) Base Frame with proper support

1.2 Codes, Standard and Legal Requirements

The following National & International codes / standards / references (Latest edition) shall be applicable.

EN 334 & EN 88-2	Service Regulator
ASME B 16.10	Face to Face and End to end dimensions for valves
ASME B 16.20	Ring joint Gasket, and groves for Steel Pipe Flanges
ASME B16.5	Pipe flange and flange fittings
ASME B1.20.1	Pipe Threads
ASME B 16.34	Valves Flanged, threaded and weld ended
EN 334 / BS EN 13785	Gas pressure regulator for inlet pressure up to 100 Bar
EN 14382	Safety devices for gas pressure regulating stations and installations. Gas safety shut-off devices for inlet pressures up to 100 bar
API 598	Valve Inspection and testing
API 6D	Specification for Pipeline valves
BS 6755	Testing of Valves
FC170-2	Control Valve seat leakage Classification
MSS SP-25	Standard Marking System for Valves, Fittings, Flanges and Unions
DIN-50049	Document on Material Testing
ISA-S-75.03	Face to Face Dimensions for Flanged Globe-Style Valve Bodies.

1.3 FITTINGS

Fittings used shall be forged GI/CS fittings as per IS1239, IS14329, IS 1879, API 6D, ASTM A105 & ASTM A234 and pipe work shall be as per C class GI/CS pipe as per IS1239, IS14329, IS 1879, ASTM

A106 (Gr. B) & API 5L and protected against corrosion by galvanizing as per IS 4759: 1996 or by the application of another suitable protective coating. Threads shall be ISO 7 Part 1: 1994 & tapered.

Joints shall be made using PTFE tape only, & of an appropriate quality. Jointing paste or hemp shall not be used. The disconnecting unions to be fitted shall have tapered face seats only & rubber or other washers shall not be used.

The supplier shall inspect all fittings prior to installation & shall check the thread against a standard gauge.

1.4 HOUSING

This Specification covers the requirements of MS Kiosk used for the Service Regulator Assembly as housing.

The housing for the unit shall be a one-piece reinforced construction (1.6 mm thick) & with base dimensions to suit with the fabricated assembly, a sample of which shall be made available. The housing shall be reinforced wherever necessary, to provide adequate strength, particularly at the base to ensure that it is sufficiently rigid.

The housing material shall be Canary Yellow in color & have warning notices embossed/written/pasted to its front & rear portions, containing the **IGL logo**, '**INDRAPRASTHA GAS LTD.**' text, & the legend (may change as per the requirement):

'NO SMOKING - NO NAKED FLAMES '

'WARNING – HIGH PRESSURE GAS '

'IGL TOLL FREE NO. 18001025109 '

The warning notices shall be approved by IGL-In-charge. The housing & frame shall be fitted with locking arrangement on both sides using the standard arrangement with a triangular section driver & key, which shall be compatible with the existing IGL units.

The housing should have fire resistant properties and should be able to withstand fire at least till 30 minutes without catching fire. The housing shall have a sloping roof to avoid the possibility of rainwater accumulating on it. The housing should have free ventilation of at least 5% of surface area of the kiosk.

1.5 FRAME / MOUNTING ARRANGEMENT

The assembly shall be mounted on secure welded steel frame using pipe clamps at the approximate positions as shown in the arrangement drawings in Appendix-II. The frame design & clamps used shall be rigid so that any movement due to loading from internal gas pressure or accidental impact is restrained. The pipe work shall be protected from damage (to the coating) by the clamps, by the use of rubber or other similar packing materials. The pipe clamp should be removable to allow for subsequent removal of the assembly from the mounting frame.

The base of the frame shall accommodate & firmly secure the proposed housing with a locking arrangement, as described above. The housing must be secured in such a way that it is not possible to remove it without using the appropriate key. The frame shall have a leg of angle size 25 mm x 25 mm x 4 mm thick, fitted at each corner for mounting in a concrete foundation. The legs shall extend 350 mm and have a 75 mm square or round (5 mm thick) foot attached for resting on site.

The assembly should be constructed to be entirely self-contained inside a secure and unobstructed kiosk, to be mounted at ground level.

Gas velocity in pipe work must not exceed 20 meter/sec on upstream side of filter & 40 meter/sec on downstream side of filter, when the maximum flow occurs at the lowest expected inlet pressure and normal outlet pressure.

The assembled assembly shall be fitted with inlet and outlet pressure tapping to which pressure gauges can be connected under normal operating conditions (valves in plugged condition). The outlet tapping shall also incorporate a bleed facility to enable the regulator set point to be adjusted under flow conditions.

1.6 FABRICATION AND PAINTING REQUIREMENTS

Vendor shall refer the relevant codes and standards for manufacturing herein and spray painting. Painting scheme shall be suitable to environmental conditions prevailing at the place of installation of regulator.

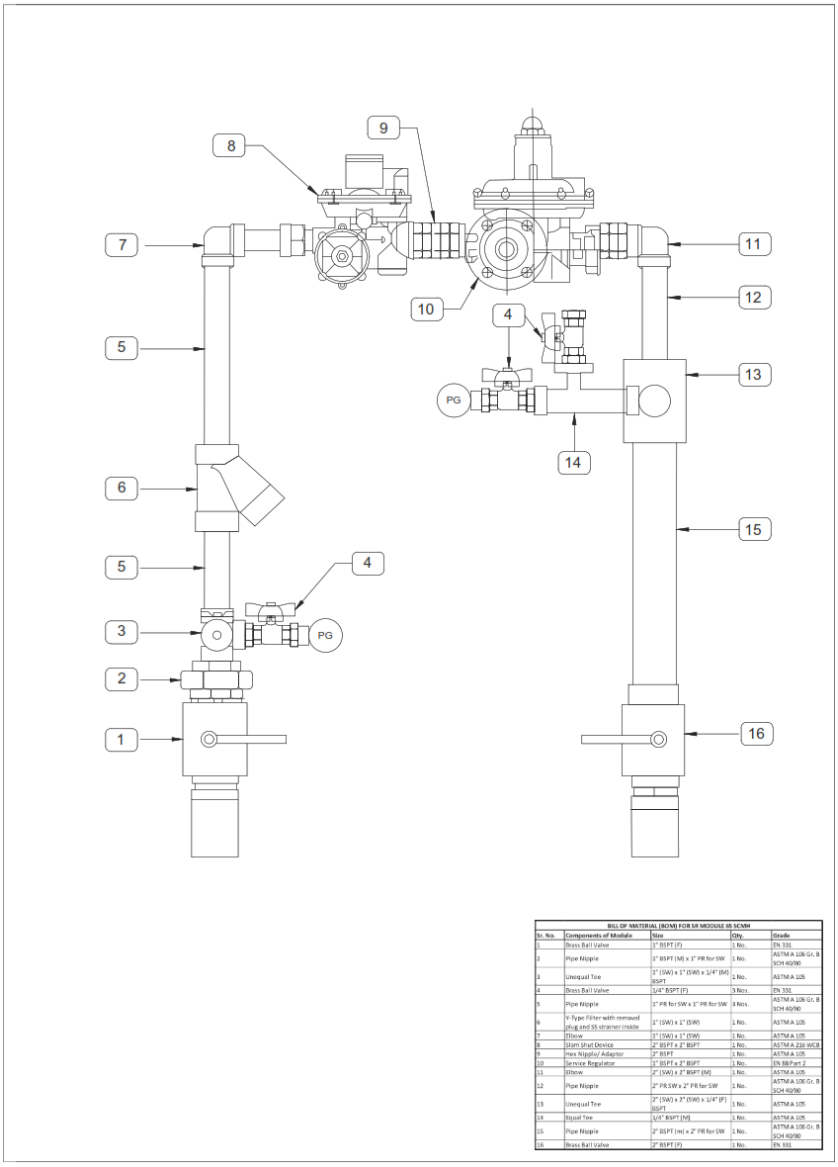
2.0 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per IGL specification requirements and as per relevant codes, prior to commissioning. The inspection and testing for assembly shall be carried out as per the Inspection and Test Plan as mentioned below.

Inspection and Testing Plan for Service Regulator Assembly

Sr. No.	Test Description	Acceptance Criteria
1	Visual Inspection	IGL Specifications / Approved Drawing
2	Leakage test of inlet pipeline at 6.0 bar (g)	No leakage
3	Leakage test of outlet pipeline at 6.0 bar (g)	No leakage
4	Leakage test of joint of SR with inlet pipeline at 4.4 bar (g)	No leakage

Nitrogen or compressed air is to be used as the testing medium. During the testing procedure, the test pressure should be reached by slowly increasing the pressure. Once the test pressure is achieved, the pressure should be allowed to stabilize for 15 minutes. Check all the inlet and outlet joints on the unit with leakage detection fluid / soap water solution.



BILL OF MATERIAL (BOM) FOR SR MODULE 05 SCMH

Sr. No.	Components of Module	Size	Qty.	Grade
1	Brass Ball Valve	1" BSPT (F)	1 No.	EN 331
2	Pipe Nipple	1" BSPT (M) x 1" PR for SW	1 No.	ASTM A 106 Gr. B SCH 40/80
3	Unequal Tee	1" (SW) x 1" (SW) x 1/4" (M) BSPT	1 No.	ASTM A 105
4	Brass Ball Valve	1/4" BSPT (F)	3 Nos.	EN 331
5	Pipe Nipple	1" PR for SW x 1" PR for SW	3 Nos.	ASTM A 106 Gr. B SCH 40/80
6	Y-Type Filter with removed plug and SS strainer inside	1" (SW) x 1" (SW)	1 No.	ASTM A 105
7	Elbow	1" (SW) x 1" (SW)	1 No.	ASTM A 105
8	Slam Shut Device	2" BSPT x 2" BSPT	1 No.	ASTM A 216 WCB
9	Hex Nipple/ Adaptor	2" BSPT	1 No.	ASTM A 105
10	Service Regulator	1" BSPT x 2" BSPT	1 No.	EN 88/Part 2
11	Elbow	2" (SW) x 2" BSPT (M)	1 No.	ASTM A 105
12	Pipe Nipple	2" PR SW x 2" PR for SW	1 No.	ASTM A 106 Gr. B SCH 40/80
13	Unequal Tee	2" (SW) x 2" (SW) x 1/4" (F) BSPT	1 No.	ASTM A 105
14	Equal Tee	1/4" BSPT (M)	1 No.	ASTM A 105
15	Pipe Nipple	2" BSPT (m) x 2" PR for SW	1 No.	ASTM A 106 Gr. B SCH 40/80
16	Brass Ball Valve	2" BSPT (F)	1 No.	EN 331

ENERGISING QUALITY

VCS QUALITY SERVICES PVT.LTD.

STANDARD SPECIFICATION ELECTRO FUSION FOR PE PIPES & FITTINGS

VCS – SS – PE - 0002

REV.	DATE	Purpose	Prepared By	Checked By	Approved By
00	19.06.18	ISSUED AS STANDARD	BS	MVK	AD

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1.0 ELECTRO FUSION FOR PE PIPE

1.1 ELECTRO FUSION FITTING JOINTING

1.1.1 For electro fusion fitting jointing, an electrical resistance element is incorporated in the socket of the fitting which, when connected to an appropriate power supply, melts and fuses the materials of the pipe and fitting together.

1.1.2 The effectiveness of this technique depends on attention to the preparation of the jointing surfaces, in particular the removal of the oxidized surface of the pipe over the socket depth and ensuring the jointing surfaces area clean. Also, the pipe should be checked for ovality. If ovality causes a gap between concentrically located pipe and the fitting to exceed l% of the pipe OD, the pipe must be re-rounded to ensure correct welding. If the gap still exceeds 1% of the pipe OD after re-rounding then a check should be made of the pipe OD dimensions to determine if it meets specification.

Max gap 1% of pipe OD

Concentrically Located

Max gap 2% of pipe OD

Eccentrically Located

1.1.3 The maximum gap between eccentrically located pipe and fitting i.e. Pipe touching fitting at one point, must not exceed 2% of the pipe OD.

1.1.4 Sometimes coiled pipes may be too oval to fit into couplers, or the end of the pipe may make the alignment of the ends impossible. In such circumstances the use of a mechanical pipe straightener or rounding tool is necessary.

1.1.5 The equipment and procedures following relate to fittings with center stops. If fittings without center stops are used, the maximum insertion depth must be clearly marked on the pipe ends prior to joining (felt tip pen).

Equipment

- The control box input supply to be from a nominal 240V generator, which is normally of approximately 5kVA capacity. The nominal output of the generator is to be 240V +15%, I 0% between no load and full load. Control boxes are to include safety devices to prevent excessive voltages being present at the control box output. The safety device shall operate in less than 0.5s.

Note that extension leads are not to be used on the control box outlet connections.

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WARNING: Control boxes are not intrinsically safe and must therefore not be taken into the trench.

- A mechanical pipe surface preparation tool is to be used before fusion is attempted. The tool is to be capable of removing the oxidized surface of the pipe in excess of the insertion depth. The tool is to remove a layer of surface material 0.2 to 0.4 mm thick from the outer surface of the pipe preferably in a continuous strip of swarf over that length and round of the pipe.

- Pipe clamps for restraining, aligning and re-rounding the pipes in the fusion process are to be used.

- Pipe cutters with saw and saw guide.

- Protection against adverse weather conditions.

1.2 ELECTRO FUSION JOINTING METHOD / PROCEDURE

Preparation

- Ensure there is sufficient space to permit access to the jointing area. In a trench, a minimum clearance of 150 mm is required.

- Check that the pipe ends to be jointed are cut square to the axis of the pipe and any burrs removed.

- Wipe pipe ends using clean lint-free material to remove traces of dirt or mud, etc...

- Mark the area over which the oxidized pipe surface is to be removed, i.e. In excess of the insertion depth, on each pipe to be joined by placing the socket of the bagged fitting alongside the pipe end. Trace a line round the circumference at the appropriate distance from the end of the pipe using a felt tip pen or similar.

Note that the fitting should not to be removed from the packaging at this stage.

- Connect the electro fusion control box input leads to the generator.
- Check that the reset stop button, if fitted on the control box, is in the correct mode.
- Using the pipe end preparation tool, remove the entire surface of the pipe uniformly, preferably in continuous swarf over the area identified, i.e. In excess of the insertion depth.
- A mechanical scraper could be used however; there is a considerable risk that the end preparation will not be adequate with the use of such a tool.

Note that the prepared pipe surface should not be touched by hand.

- Remove the fitting from its packing and clean the scraped area of the pipe surface and the bore of the fitting with a disposable wipe impregnated with Iso-propanol *I*

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Acetone. Ensure the prepared surfaces are completely dry before proceeding.

Note that while Iso-propanol is a suitable cleaner, its use is subject to local Health and Safety Regulations.

- Check that the pipe clamps are of the correct size for the pipes to be jointed.
- Insert the pipe ends into the fitting so that they are in contact with the center stop.
- Using the pipe clamps, secure the pipes so that they cannot move during the fusion cycle. Check that the pipe ends and the fitting are correctly aligned.
- Check that there is sufficient fuel for the generator to finish the joint. Start the generator and check that it is functioning correctly.
- Switch on the control box.
- Connect the control box output leads to the fitting terminals and check that they have been fully inserted.

If required by the control box enter the fusion jointing time into the control box timer. The jointing time is indicated on the fitting. Check the correct time is shown on the control box display.

Note 1: Automatic control boxes are available which obviate the need to enter the fusion time.

Note 2: Gloves and goggles should be worn during the Fusion process.

- Press the start button on the control box and check that the heating cycle is proceeding as indicated on the display.
- On completion of the heating cycle, the melt indicators should have risen. If there is no apparent move in the melt indicators, the joint should be cut out and a fresh joint made (See note 3below).
- If a satisfactory joint has been made, the joint is to be left in the clamps for the cooling time specified on the fitting or the automatic control box.

Note 3: If the fusion cycle terminates before completion of the countdown, check for faults as indicated by the control box warning lights and check that there is adequate fuel in the generator. DO NOT attempt a second fusion cycle within one hour *I* cooling of joint at Ambient Temperature of the first attempt.

1.3 RECORDS

Records of appropriate servicing and calibration shall be kept else no job allocation will be given to the contractor .

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1.4 TRAINING

It is necessary that operators, inspection and supervisory personnel acquire the skills of electro fusion fitting fusion. The necessary training should be carried out by a qualified instructor with the objective of enabling participants to;

- Understand the principles of electro fusion fitting jointing.
- Identify pipe and appropriate fitting markings.
- Carry out pre-jointing machine and equipment checks.
- Make satisfactory electro fusion fitting joints from pipes and fittings of different sizes.
- Inspect for and identify joints of acceptable quality.

Note that some form of assessment and certification should be associated with the training. The certificate should detail the pipe and fitting size range. And the equipment used. A register of successful participants should be kept.

1.5 ELECTRO FUSION SADDLE JOINTING

- With electro fusion saddle jointing, an electrical resistance element is incorporated in the base of the saddle which, when connected to the appropriate power supply, melts and fuses the material of the fitting and the pipe together.
- The success of the technique depends on effective preparation of the jointing surfaces, in particular the removal of the oxidized surface of the pipe over the area equivalent to the area of the saddle base, and cleaning of the pipe surfaces.
- Methods of holding the tapping tee saddle during the fusion cycle are used namely, top loading and under clamping. The general parameters are similar. In some cases, if the manufacturer's procedure for holding the fitting is provided, then the same should be followed during the fusion cycle.

1.6 ELECTRO FUSION SADDLE JOINTING METHOD/ PROCEDURE

- Expose the pipe onto which the tapping tee is to be assembled, ensuring there is sufficient clear space around the pipe. In a trench, a minimum clearance of 150 mm is required.
- Clean the pipe over the general area on which the saddle is to be assembled using clean, disposable lint-free material.
- Without removing the fitting from its packaging, place it over the required position on the main. Mark the pipe surface all around and clear of the saddle base area using a felt tip pen or similar.

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- Remove the surface of the pipe to a depth of 0.2 to 0.4 mm over the full area marked using a suitable tool. Remove the swarf.

- Connect the electro fusion control box input leads to the generator.

Check that the reset stop button, if fitted on the control box, is in the correct mode.

- Remove the two halves of fitting from its packing and clean the scraped area of the pipe surface and the bore of the fitting with a disposable wipe impregnated with Iso-propanol / Acetone. Ensure the prepared surfaces are completely dry before proceeding.

Note again that while Iso-propanol is a suitable cleaner, its use is subject to local Health and Safety Regulations.

- Position the fitting base onto the prepared pipe surface, and bring the lower saddle into position then gradually and evenly tighten the nuts until the upper saddle makes firm contact with the scraped pipe.

- Check that there is sufficient fuel for the generator to complete the joint. Start the generator and check that it is functioning correctly.

- Switch on the control box if applicable.

- Connect the control box output leads to the fitting terminals and check that they have been fully inserted.

- If required by the control box, enter the fusion jointing time into the control box timer. The jointing time is indicated on the fitting. Check the correct time is shown on the control box display.

Note 1: Automatic control boxes are available which obviate the need to enter the fusion time.
Note 2: Gloves and goggles should be worn during the jointing process.

- Press the start button on the control box and check that the heating cycle is proceeding as indicated on the display.

- On completion of the heating cycle, the melt indicators, where incorporated should have risen. If there is no apparent move in the melt indicators, a new saddle joint should be made. Cut the tee of the faulty joint from its base.

- If a satisfactory joint has been made, the joint is to be left in the clamps for the cooling time specified on the fitting label or by the automatic control box.

Note 3: If the fusion cycle terminates before completion of the countdown, check for

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faults as indicated by the control box warning lights and check that there is adequate fuel in the generator. DO NOT attempt a second fusion cycle within one hour of the first attempt.

Note 4: The connection of the service pipe to the fitting outlet should be carried out in accordance with the procedure of the appropriate section of this Item.

Note 5: DO NOT attempt to tap the main with the integral cutter for at least I0 minutes after completion of the cooling cycle.

1.7 RECORDS

Records of appropriate servicing and calibration of Electro Fusion machines/ joints shall be kept.

1.8 TRAINING

AS PER 1.6
Note that some form of assessment and certification should be associated with the training. The certificate should detail the pipe and fitting size range and the equipment used. A register of successful participants should be kept.

1.9 STOPPING THE GAS FLOW

In the operation of a distribution system there is a periodic need to stop the gas flow for either routine or emergency maintenance. The flow may be stopped through the use of installed fittings such as valves. Where installed fittings are not available or the use of such would cause significant supply disruption, then one of the following methods may be employed.

1.10 SQUEEZE-OFF

- To control the gas flow a special tool may be used to squeeze the pipe walls together. Hydraulic jacks are used to supply the necessary force to compress the pipe walls for sizes 90 mm and above.

- It will be seen the squeeze-off equipment comprises two bars to apply pressure to the outside of the pipe. The bars are brought together, either manually or hydraulically, squeezing the pipe material together until a seal is formed where the upper and lower walls meet.

- The hydraulic machines should have a spring return for the jack and locking to prevent accidental release of pressure during operation. All squeeze-off machines should be fitted with check plate or stops to avoid over compression of the pipe.

- Where the pipe walls are compressed the polyethylene pipe will be severely deformed in the regions of maximum compression. The pipe will eventually regain its original shall after squeezing but there will be some reduction in the pressure bearing properties.

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- A complete stop may not always be obtainable because of wrinkling of the inside of the pipe. If a complete stop is required then a second squeeze can be used, with an intermediate vent to remove the gas which passes the first squeeze from say the trench area. A second squeeze-off procedure should be a minimum of three pipe diameters and right angles to the initial squeeze.

- While not essential it would be good practice to fit a reinforcing stainless steel band do not squeeze again adhesive tape around the pipe upon the completion of a squeezing operation.

1.11 BENDING-BACK

Bending back of the pipe may be performed where the pipe has been severed damaged and stopping the gas flow is imperative. Its application is of a temporary nature, and will provide relief until a permanent repair can be affected. The section of pipe, which has been bent back, will have to be replaced because of the damage caused by the severe ness of the bend back operation. The need for any bend back operation is most likely to occur as a consequence of damage caused to a PE service pipe.

While it is not the prime function of a saddle tee, controlling the flow in a service may be achieved by opening up on an installed saddle tee and winding down the internal tapping tool to shut off the flow into the service pipe.

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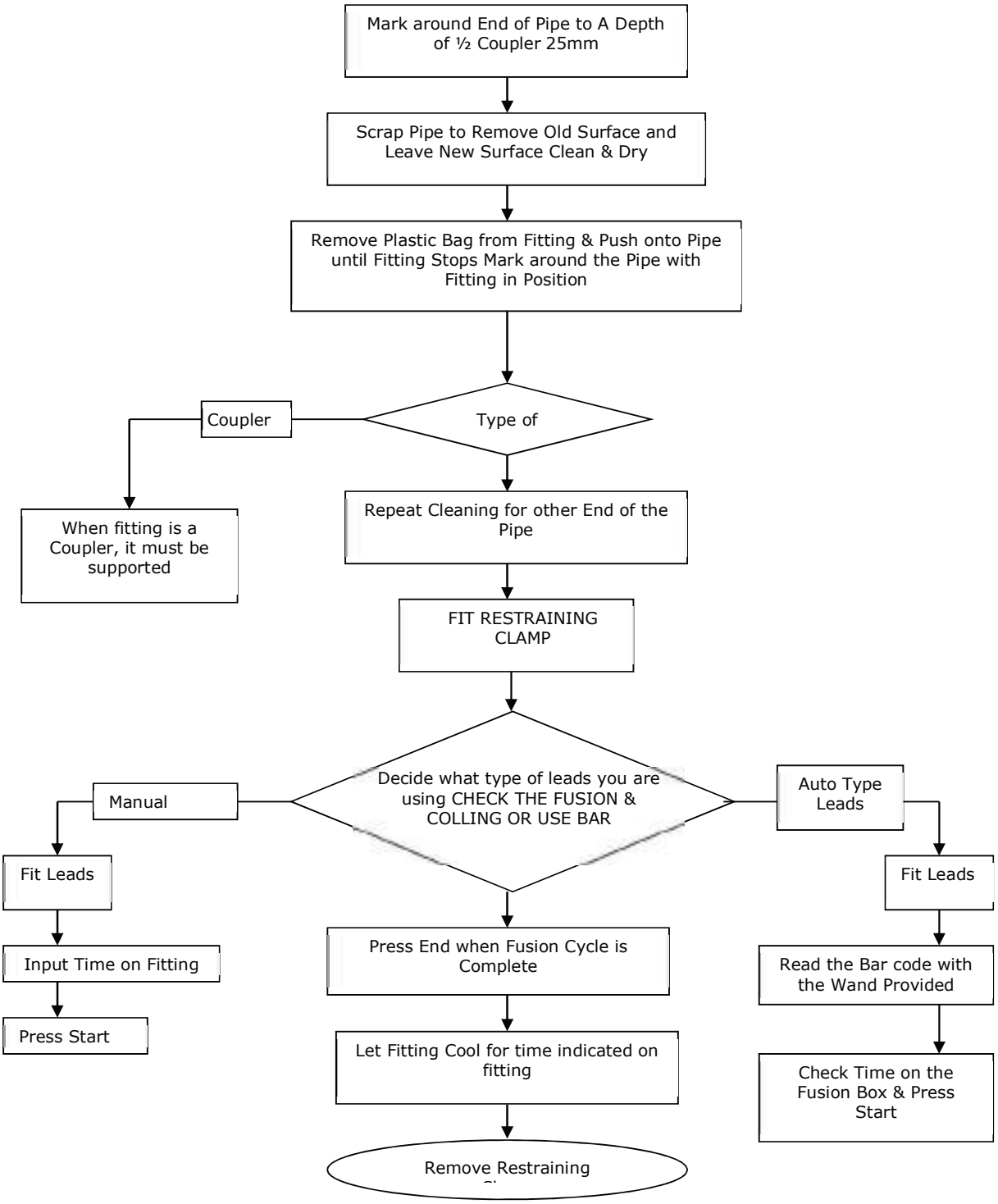
ANNEXURE # 1

FUSION COUPLERS FROM 20MM TO 180MM



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ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION–FABRICATION, SUPPLY AND INSTALLATION OF WIRDED CAGES FOR MRS IN NCT OF DELHI & NCR

VCS – SS – PL - 0052

REV	DATE	Purpose	Prepared By	Checked By	Approved By
00	18.06.18	ISSUED AS STANDARD	BS	MVK	AD

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1.0 DEFINATIONS

Owner	Shall mean Indraprastha Gas Ltd. (IGL).
Manufacturer	Means the Manufacturer of the Steel Reinforced Rubber Hose.
SS	Means the present <<Standard Specification>> and its appendix, if any.
Third Party Inspection Agency	Means the Inspection Agency to be appointed by IGL.
PMC	Means the Project Management Consultant

2.0 SCOPE OF WORK

Installation of single entry key lock arrangement in MRS and wall mounting meter installation Including structure fabrication, supply and installation with material and hardware, single key lock etc.

- Material for MRS cages used shall be as follows:

Sr. No.	Item	Material	Dimensions/size (mm)
1	Angle	MS	65 X 65 X6
2	Flat	MS	50 X 6
3	Wire mesh	MS	75 X 30 X 4

- Material for wall Mounted cages used shall be as follows:

Sr. No.	Item	Material	Dimensions/size (mm)
1	Angle	MS	40 X 40 X 5
2	Flat	MS	25 X 4
3	Wire mesh	MS	75 X 30 X 4

- The MRS shall be enclosed by MS wire net fencing. The fencing shall be supported by adequate angle iron frame work and shall have iron bracings of the angle iron frames. Framework of gates of the MRS skid shall be made up of M.S. plate and angles. Angles are jointed with nuts and bolts. The corner of the fencing joints must be permanent (welded). The complete fencing work shall be painted with two coats of primer and two coats of suitable weatherproof plaint.

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- As per the requirement of fabrication & installation of fencing, the contractor will visit different sites for measurement /accessibility of the jobs. Once the measurement is done, fabrication and installation of fencing in proper size with reference to the skid, is the responsibility of the contractor.

  At certain MRS skids where cages are already in place but require little modification shall also be in contractor's scope and payment shall be made accordingly.
- For fabrication of fencing (cage) structure, all the essential jobs viz. cutting, welding, grinding, finishing, painting including all materials like Angle, channel, wire net, support sheet, hardware ,electrode, grinding, wheel, gas cylinder, paint, primer, grouting, equipment, tools, generator for power welding machine, accessory etc.isunder contractor's scope.
- All activities related to offsite fabrication of structure will be carried out contractor's work shop. Only after complete fabrication and painting (red oxide primer plus two coat of Canary yellow paint on wire mesh and green bus colour paint on angle and flats). The structure will be installed to different sites of Delhi and NCR and is within the scope of contractor.
- Transportation and installation of fabricated structure/ fencing on different sites is under contractor's scope.
- All loading and unloading related jobs are to be carried out by the contractor.
- Contractor shall arrange own transport for movement of welding equipment, generator and man power.
- All necessary PPE's (personal protective equipment) required for carrying out jobs at sites as per the safety norms of IGL shall be provided by the contractor to their welder and helpers.
- The contractor shall inform well in advance after completion of cage fabrication at the workshop, the date of installation of cage to the IGL representative in order to arrange a shutdown of MRS at the customer's premises.
- The contractor has to complete all site jobs in one day at one site (Site jobs i.e. grouting of MRS cage /structure, fastening, installation, finishing, final painting, removal and disposal of waste items) after completion of jobs from customer's premises.
- The cage shall cover the MRS from all four sides and top also. Door is to be provided of the size 2400x1000 mm to approach the MRS. Wall mounted installation doors will be of size by 600x600 mm.
- In the MRS Cage ,following materials need to be used:

  Welding of heavy duty handle with black color Teflon covers for opening and closing the door to the locking arrangement.

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Installation of single entry key type lock (Harrison make 8 mm 5 lever lock with computerize key only).

Bolting of roof fame and side frame by 10 MM HT bolt and nut & washer and welded after fastening.

- Installation charges also includes providing 2 seats of welding machine, two welder teams And DG sets for site work.
- The complete cage should be well grouted and stable.

3.0 TECHNICAL SPECIFICATION

Civil, Structural & finishing works contents

- Civil & Structural Works
- Plain and reinforced cement concrete
- Structural steel works
- Synthetic enamel paint

Civil & Structural Works Material Specifications

Material Specifications

- **Brick**

  Bricks for masonry work shall confirm to IS: 1077 specification for common burn clay building bricks and crushing strength not less than 75 kg/cm^2.Specific requirement like dimensions, tolerances and other common requirements shall confirm to IS: 1077. Bricks shall have smooth rectangular faces with sharp corners and shall be well burn, sound hard, tough and uniform in color. These shall be free from cracks, chips, flaws and Florence. All tests shall confirm as per the requirements of IS 5454 and IS 3495.Water absorption shall not more than 20% by its dry weight when soaked in cold water for 24 hours.

- **Cement**

  Cement to be used for civil & structural work shall be of 43 grade/53 grade ordinary Portland Cement confirming to IS: 88112/IS: 12269 respectively.

- **Steel**

  All steel bars, sections, plates and other miscellaneous steel materials shall be free from rust, oil, mud, paint or other coatings. Reinforcement bars to be used for civil & Structural work shall be of high strength deformed steel bars of grade FE 415 confirming to IS: 1786.

- **Aggregate**

  Coarse & fine aggregates for civil & structural work shall confirm in all respects to IS: 383 latest.

- **Water**

  Water used for Civil & structural work shall be cleaned and free from injurious amount of oil, acids Alkalis, organic matters or other harmful substances which

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may be deleterious to concrete, masonry or steel. Potable water shall be considered satisfactory.
Tests on water samples shall be carried out in accordance with IS: 3025 and they will fulfill all the guide lines and requirements given in IS: 456:2000.

- **Excavation & Backfilling for foundation, pits, walls etc.**

  Excavation shall be carried out to true line and levels in all types of soil and shall be carried out for all lifts as required by the work.

  The Contractor shall provide suitable drainage arrangement to keep the pits dry. Contractor shall also carry out all de-watering required within the quoted rate.

  If excavation is made in excess of the depth required, the contractor shall at his own expenses fill up the required level with lean concrete of mix 1:5:10 (1 cement: 5 coarse sand: 10 aggregate) or as decided by site-in-charge.

  The contractor shall make necessary arrangements for lighting, fencing and other suitable measures for protection against risk of accidents due to open excavation at his own expense.

  All shoring and strutting required holding the sides of excavation from collapse are included in the quoted rates.

  No excavated material shall be deposited within 1.5M of edge of excavation.

  The contractor shall not undertake any concreting in foundation until the excavation pit is approved by the site-in-charge.

  The contractor shall not back fill around any work until it has been approved by the site-in-charge.

  Backfilling shall be carried out of selected earth coming out of excavation. Backfilling shall be carried out in layers of 150 mm and compacted to achieve 95% maximum dry density of the soil being used. Any surplus earth generated shall be transported to areas designated by the Engineer-in- charge.

- **Sand filling in Plinth/Foundations**

  Filling shall be carried out in layers not exceeding 15 cams and shall be compacted mechanically or by saturation to specified grade and level and to obtain 90% laboratory maximum dry density or as specified in schedule of rates.

  Compaction by flooding may be accepted at the discretion of the Engineer-in-charge, provide the required compaction is achieved.

  The Contractor shall not commence filling in around any work until it has been permitted by the Engineer-in-charge.

- **Plain and Reinforced Cement Concrete.**

  The cement and steel reinforcement is in the contractor's scope of supply. Engineer-in-charge may require tests to be carried out by the contractor's as a part of his quoted rates to ensure conformity with the relevant standards.
  Engineer-in-charge may rejects such of the cement supplied in the event of either unsatisfactory tests or in the event of deterioration due to age ,bad storage etc. Decision of Engineer-in-charge shall be final in this regard.

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Water used for concreting work shall be suitable for drinking and shall conform to IS: 456:2000. It shall be free from injurious substances.

- **Source of Coarse and find aggregates shall be approved by Engineer-in-charge.**

  - Contractor shall store each type and grade of aggregate separately. He shall maintain at site of work adequate quantities to ensure conformity of work. Wet aggregate delivered to site shall be stored for 24 hrs to facilitate drying before being to be used.
  - Admixtures shall be used only with the specific permission of Engineer-in-charge and where used shall be conforming to the instruction of the manufacturer of such extent as being undesirable the engineer-in-charge may reject the work totally and his decision shall be binding on the contractor. No extra payment shall be made for rectifying these defects. All burs and uneven faces shall be rubbed smooth by carborundum stone.
  - The Surface of non-shuttered faces shall be smoothed with a wooden float to give a finish equal to that of the rubbed down shuttered faces. Concealed concrete faces shall be left as from the shuttering except that honey combed surface shall be made good as detailed above. The floating shall not be executed to the extent of bringing excess fine material to the surfaces. The top faces of slab intended to be covered with screed, granolithic or similar surface shall be left with a rough finish. Sides and soffits to be later covered with plaster shall be suitably roughened.

4.0 Structure steel works

Steel works

All finished steel unless otherwise specified shall be well and clearly rolled to dimensions and weight as specified by ISI subject to permissible tolerances as per IS-1852-1973.

Material shall be free from cracks, surface, flaws, laminations, rough and imperfect edges and other harmful defects like excessive rust, scaling and pitting etc. Structural steel work shall conform to requirements depending upon the designation of steel that is being selected to be used for particular structural function as specified in drawings.

All structural steel girders, channels, plates and other rolled section shall confirm to IS: 2062 grade-A Pipes shall confirm to IS: 1161 – YST 240 MPa.

Electrodes required for metal arc welding shall be covered electrodes conforming to IS 814 – 1970. 88
Fabrication Steel section as required shall be straightened and cut to square and exact lengths. Cut ends exposed to view shall be finished smooth. No two pieces shall be otherwise welded or joined to make up the required length of the number. If straightening, flattening or bending is necessary, shall be done in process that

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will not damage the material or impair its strength. Shearing, flame cutting or chipping shall be done carefully and accurately. Finished member shall be free from undue twists, bends, wrapping, distortion or other irregularities. Holes, where required shall be drilled to required size and not made nor enlarged by burning. Holes shall have their axis perpendicular to surface bored through. Any fabricated assembly shall be without the member being strained or forced into position and components shall meet at perfect angles. Where practicable, welds should preferably be made in flat position. Welds shall be free from cracks, discontinuity in welding or other defects categorized as such in relevant standards. Welds will be inspected and cost of the same shall be deemed to be included in the quoted rates. A defective weld, harmful to structural strength, shall be cut out and re-welded. All welds shall be cleaned of slag and other deposits after completion.

All structural steel works for canopy and other structures shall have butt welds between adjacent surfaces ground smooth. Items concealed from view need not require grinding of welds. Architectural metal work shall be well formed to shape and size with sharp lines, angles and true curves. Drilling and punches shall produce clean true line and surface. All site connections shall be preferably by permanent bolts. Welding at Site shall be done with the prior permission of engineer-in- charge. Exposed weld shall be ground smooth, exposed surfaces shall have smooth finish. Joints shall be milled to close fit and corner joints shall be well formed and in true alignment. Work shall be accurately fastened in place.

Painting shall be as described under the head "Painting".

5.0 Painting on Metal Work: Painting shall be done to meet the following specification,

- **ON STEEL MEMBERS**
  - Surface preparation as per grade St – 2 according to Swedish Standard SIS055900.
  - Two coats of zinc phosphate in phenolic alkyd medium (DFT 35u / coat)
  - Two coats of synthetic enamel (DFT 25u / coat) conforming to IS: 2932-1974.

    Surface Preparation & Primer

    One coat of primer shall be applied on shop. The shop coated surface shall be rubbed down thoroughly with abrasive paper to remove dust, rust, other foreign matters and degreased cleaned with warm fresh water and air dried.

    Primer coat of zinc phosphate primer shall be applied by brushing/spraying over the shop coat in a manner so as to ensure a continuous and uniform film throughout.

- **Final Paint**

  After the primer is hard dry, the surface shall be dusted of and one coat of synthetic enamel paint of approved colour and shade (conforming to IS:

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2932) shall be applied by brushing/ spraying to achieve the required DFT. Second coat will be applied after drying of previous one to give a uniform surface. Paints can be diluted by means of thinner as approved by paint manufacturer only.

White Washing with Whiting.

- **Preparation of mix:**

  Whiting (ground white chalk) shall be dissolved in sufficient quantity of warm water and thoroughly stirred to form thin slurry which shall then be screened through a clean coarse cloth. Two kg of gum (DDL) and 0.4 kg of copper sulphate dissolved separately in hot water shall be added for every cum of the slurry which shall then be diluted with water to the consistency of milk so as to make a wash ready for use.

- **Preparation of surface**

  Before new work is white washed, the surface shall be thoroughly brushed free from mortar droppings and foreign matter.

- **Application:**

  The white wash shall be applied with moonj brushes to the specified number of coats. The operation for each coat shall consist of a stroke of the brush given from the top downward, another from the bottom upwards over the first stroke, and similarly one stroke horizontally from the right and another from the left before it dries.
  Each coat shall be allowed to dry before the next one is applied. Further each coat shall be inspected and approved by the engineer-in-charge before the subsequent coat is applied. No portion of the surface shall be left out initially to be patched up later on.
  For new work, three or more coats shall be applied till the surface presents a smooth and uniform finish through which the plaster does nit show. The finished dry surface shall not show any signs of cracking and peeling nor shall it come off readily on the hand when rubbed.

- **Synthetic Enamel Paint**

  The shop coated surface shall be rubbed down thoroughly with abrasive paper to remove dust, rust. Other foreign matters and degreased cleaned with warm fresh water and air dried.
  Primer coat of red-oxide zinc chromate primer conforming to IS: 2074 shall be applied by brushing/spraying over the shop coat in a manner so as to ensure a continuous and uniform film throughout.

- **Final Paint**

  After the primer is hard dry the surface shall be dusted off and one coat of synthetic enamel paint of approved colour and shade (conforming to IS: 2932) shall be applied by brushing/spraying. The coats are applied after

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drying one after another to give a uniform surface. Paints can be diluted/thinning by means of thinner only as per the requirements of the finished paint surface.

LIST OF APPROVED MAKES FOR CIVIL WORK

- Ordinary Portland Cement (OPC)-ACC,DLF,JK,& Sarvshaktiman
- Pozolona Portland cement (PPC) – Ultratech
- Steel (Tor Steel) – Sail,Tisco & Rathi
- Steel (Structural Steel) – Sail & Tisco
- Bolts – Unbrako, TVS & GKW
- Electrodes – ESAB, Advani, D&H
- GI / MS Pipes (IS: 1239,IS : 3589) – Tata, Jindal,Prakash,Surya & TISCO
- Paint – Asian Paints,ICI, Shalimar & Berger
- Construction Chemicals – CICO,FOSROC,ROFFE,ST,MC & Pidilite
- Ceramic Tiles – Kajaria ,Orient, Bell & Somani
- Vitreous Tiles – Diamond , Granamite, Spartek & Somani (gravity)
- Grout – ACC, Roffe, Fosroc & Unitile

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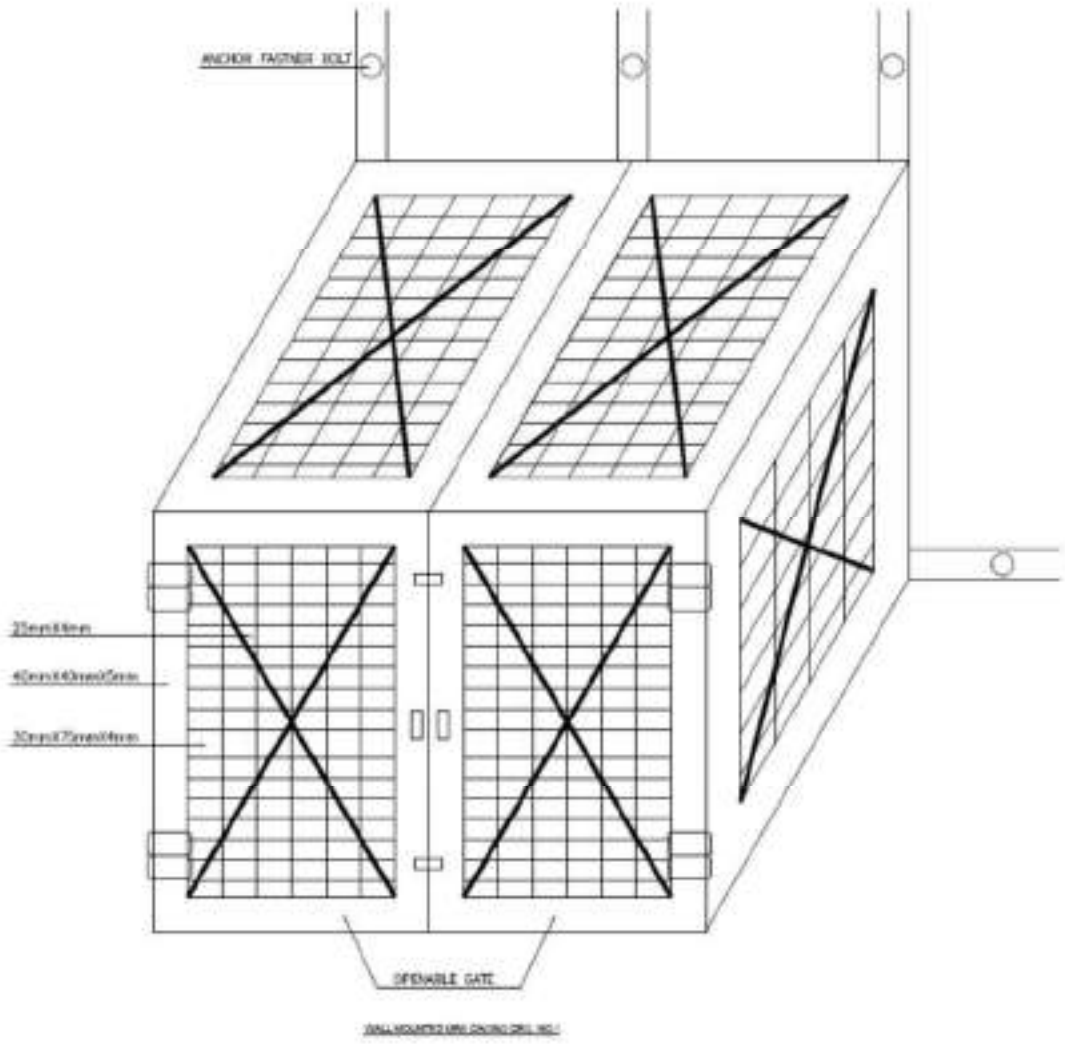

DRAWING – 01

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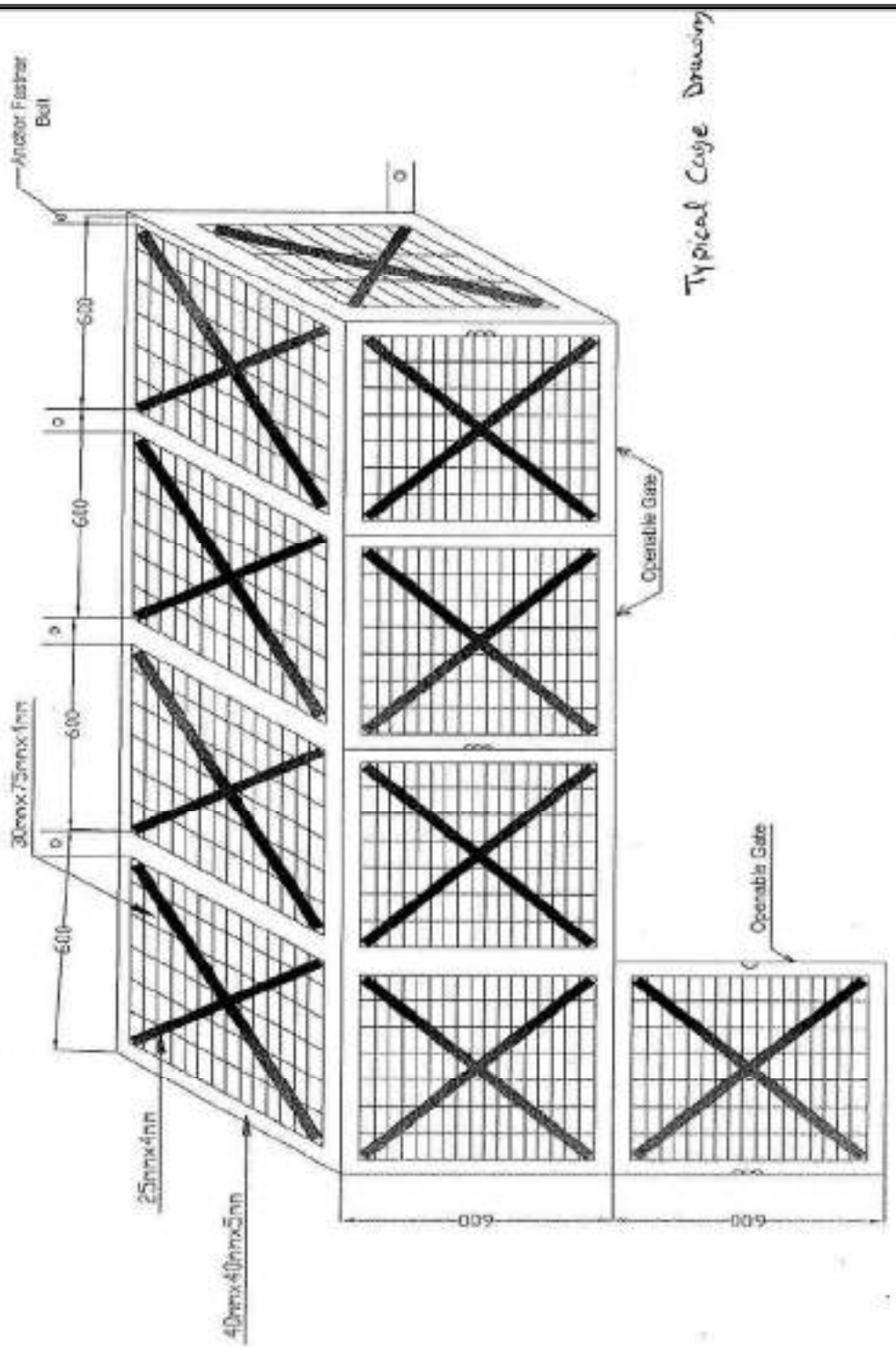

WALL MOUNTED 2 BAR MRS CAGING
DRAWING- 02

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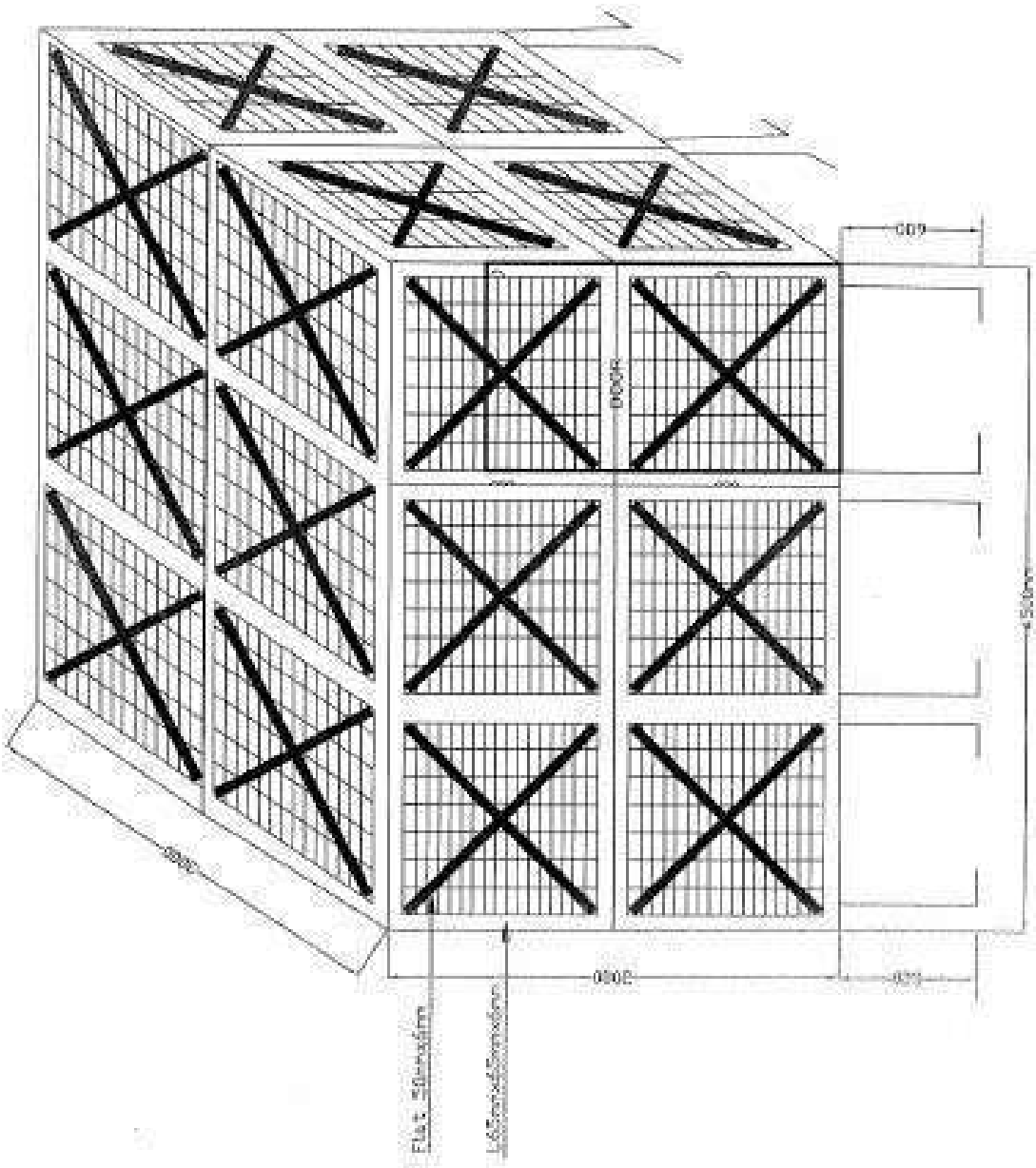

SKID CAGING
DRAWING- 03

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STANDARD SPECIFICATION FOR ISOLATION VALVE

0	09.03.2021	Issued for Approval	RKY	RKT	HK
Rev.	Date	Subject of revision	Author	Checked	Approved

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1.0 INTENT OF SPECIFICATION

The intent of this specification is to establish minimum requirements to manufacture and supply of Isolation Ball Valves used for supply of natural gas to domestic & commercial connections.

2.0 SCOPE OF WORKS

The scope of the tenderer will include manufacture/ supply, inspection/ testing/ marking/ packaging/ handling and despatch of Isolation Ball Valves, as indicated in the Material Requisition & Schedule of Rates, meeting all the requirements as laid down in manufacturing standard EN331 (latest edition).

2.1. All codes and standard for manufacture, testing, inspection etc. shall be of latest edition.

2.2. Owner/ Owner's Representative reserves the right to delete or order additional quantities during execution of order, based on unit rates and other terms & conditions in the original order.

3.0 DEFINITIONS

Owner	Shall mean Indraprastha Gas Ltd. (IGL)
Manufacturer	Means the Manufacturer of the isolation ball valves
SS	Means the present <<Standard Specification>> and all its appendix, if any.
Third Party Inspection Agency	Means the Inspection Agency to be appointed by IGL.

4.0 MATERIAL SPECIFICATION FOR ISOLATION VALVES

Please Refer Data Sheet

4.1.1. Markings

Markings shall be provided & shall include:

i) Manufacturer's name or trade mark, Model designation.

ii) Rate working pressure in Bar(g).

iii) Embossing on valves shall be "**EN 331**" only.

4.1.2. Packaging

Isolation valve 1/2",3/4",	**100 nos. per box**	Packed in cardboard boxes of standard design, & surrounded by polyester band & mentioned description & weight
Isolation valve 1",1*1/2",2"	**20 per box**	Packed in cardboard boxes of standard design, & surrounded by polyester band & mentioned description & weight

4.1.3. Gas Tightness

Valves shall be leak tightness tested in closed position and shall not leak to atmosphere in open and closed position when subjected progressively to internal air pressure of first 0.006 barg and then to at least 1.5 times the maximum operating pressure (MOP) of the valve. This test shall be performed as per EN331 (latest edition).

4.1.4. Temperature resistance test

This test shall be carried out as per EN331 (latest edition).

4.1.5. Mechanical Strength

i) The body of the valves shall be capable of withstanding, without deformation or leakage, a min. torque as per EN331 (latest edition) as applied to a pipe being connected to the valve.

ii) Valve shall be capable of withstanding, without deformation or leakage, a min. bending moment as per EN331 (latest edition) as applied to a pipe being connected to the valve.

iii) The valves shall be capable of withstanding impact without breakage or leakage as per EN331 (latest edition).

iv) Vendor shall submit Model Number along with catalogues in English language along with un-priced bids.

v) Maximum turning torque to operate the valve as per EN331 (latest edition).

DATA SHEET - ISOLATION VALVE

S.NO	DESCRIPTION	DATA	
1.00	**PROCESS DATA**		
1.01	Fluid	Natural Gas	
2.00	**Operating condition**		
2.01	Pressure	4 bar (g)	
2.02	Temperature (^{0}C)	0 - 45	
3.00	**Design condition**		
3.01	Pressure	6 bar (g)	
3.02	Temperature (^{0}C)	-5 to 60	
4.00	**VALVE DATA**		
4.01	Size	½" , ¾" & 1"	1 ½" & 2"
4.02	Type	Isolation Ball Valve, Full Bore with NPT (Confirming to ANSI B1.20.1) Female Threaded Ends (both inlet & outlet) for natural gas application with operating knob and locking arrangement, sealing wire and lead seal (without Key). Valve full open/close position shall be at 90^0. The material is required for Domestic Natural Gas Service.	
4.03	Pressure Rating	*	
4.04	End connection	End connection should be NPT Female (conforming to ANSI B1.20.1).	
4.05	Body material	Total body shall be of Forged Brass (ASTM B 283, Alloy UNSC37700) with hard Nickel / Chrome Plated. UTS – Min. 345 Mpa & Elongation 25 %	
4.06	Ball material	Hard Chrome / Nickel Plated (*), Forged Brass (ASTM B 283, Alloy UNSC37700) with Teflon Seat. UTS – Min. 345 Mpa & Elongation 25 %	
4.07	Stem	*	
4.08	Seat & seal	*	
4.09	Fire safe	*	
4.10	Anti blow out	*	
4.11	Antistatic	*	
4.12	Extension stem	NA	
4.13	Operator	Knob and locking arrangement with Butterfly type Handle	Knob and locking arrangement with Lever type Handle
5.00	**PAINTING**		
5.01	Surface preparation	*	
5.02	Primer	*	
5.03	Finish	*	
5.04	Insulation	*	
6.00	**TEST**		
6.01	Hydrostatic Shell Test		
	Test Pressure	7.8 bar(g)	
	Test Medium	*	
6.02	Hydrostatic Seat Test		

	Test Pressure	*
	Test medium	*
6.03	Functional / Pneumatic Test	
	Test Pressure	7.8 bar(g)
	Test medium	Air
6.04	Tensile Strength Test	As per EN331 (latest edition)
6.05	Bending Test	As per EN331 (latest edition)
6.06	Torque Test	As per EN331 (latest edition)
6.07	Turning Torque Test	As per EN331 (latest edition)
6.08	Antistatic Test	*
6.09	Fire Test	*
6.10	Visual and dimensional examination	As per QAP
Note	Unless otherwise stated all tests will be witnessed by the purchaser	
7.00	**QUALITY CONTROL**	
7.01	Material certificates	EN-10204, 3.2 Certificate
7.02	All testing certificates	*
8.00	**NICKEL-CHROME PLATING**	
8.01	Body, Ball etc.	* (Note-3)

NOTE:

1. All Tests shall be carried out as per EN-331 (Latest Edition).
2. Data / Information as marked " * " shall be provided by Vendor / Manufacturer for review and approval by Client / PMC.
3. Nickel-Chrome Plating thickness shall be 10 micron ± 2 micron on valve body and ball.

ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION – MLC PIPE

VPC –SS-PE-0014

REV	DATE	Purpose	Prepared By	Checked By	Approved By
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1 INTENT OF SPECIFICATION

The intent of this specification is to establish minimum requirements to manufacture and supply of anti-rodent Multi-Layer Composite (MLC) Pipe used for supply of natural gas.

2 SCOPE OF WORKS

The scope will include manufacture/ supply, inspection/ testing/ marking/ packaging/ handling and dispatch of anti-rodent MLC pipe, as indicated in the Material Requisition & Schedule of Rates, meeting all the requirements as laid down in manufacturing standard ISO 17484-1 (latest edition).

2.1 All codes and standard for manufacture, testing, inspection etc. shall be of latest edition.

3 DEFINITIONS

Owner	Shall mean Indraprastha Gas Ltd. (IGL)
Manufacturer	Means the Manufacturer of the MLC pipe
SS	Means the present <<Standard Specification>> and all its appendix, if any.
Third Party Inspection Agency	Means the Inspection Agency to be Approved by IGL & appointed by vendor.

4 MATERIAL SPECIFICATION FOR MLC PIPE

4.1.1.1 *General*

Materials intended for the stress-bearing layers and inner layers shall conform to the material requirements of the reference product standard(s) specified in Annex A of ISO 17484-1. The pipe manufacturer shall declare the reference material standard applicable to his product, as listed in Annex A of ISO 17484-1.

Adhesives are not considered as stress-bearing layers.

4.1.1.2 *Metallic materials*

Aluminium materials used shall be in accordance with EN 573-3.

4.1.1.3 *Color of pipes*

The outer layer of pipes shall be yellow.

5 MECHANICAL PROPERTIES

5.1.1.1 *Long-term pressure strength*

The test shall be carried out in accordance with clause 5.4.1 of the ISO 17484-1.

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5.1.1.2 *Strength of the joint line of M-pipe*

When the outside diameter of the pipe is increased by 10 %, no failures relative to the joint line of the metal layer shall occur. The test shall be carried out in accordance with Annex B of ISO 17484-1.

5.1.1.3 *Resistance to slow crack growth of the outer layer (cone test) for M-pipes*

When tested in accordance with ISO 13480, the crack growth rate of the outer layer shall be less than 10 mm/day. The test shall be carried out on pipe produced from material used for the outer layer. This test shall be performed as per EN331 (latest edition).

5.1.2 Physical properties

Pipes shall fulfil the requirements for physical properties as given in the table below.

Characteristic	Requirements	Tests		
		Parameter	Value	Reference
Resistance to gas constituents	≥ 20 h No delamination	Conditioning	1 500 h/(23 ± 2) °C	Annex C of ISO 17484-1
		Temperature	80 °C	
		Pressure	0.4 p_D	
	No delamination	Conditioning	1 500 h/(23 ± 2) °C	
		Temperature	(23 ± 2) °C	
		Cone test	10 % expansion	
Thermal durability of theouter layer of M-pipes	No visual cracks in outer layer	PE or PE-X		Annex D of ISO 17484-1
		At 100° or	0.5 year	
		at 110°C	0.25 year	
		Strain	3 %	
Oxidation induction time(OIT)	≥ 20 min	Temperature	(200 ± 2) °C[a]	ISO 11357-6
Delamination: P-pipes	No cracks or delamination	Expansion	10 % (by cone with 15° angle)	Annex B of ISO 17484-1
		Temperature	(23 ± 2) °C	
Delamination: M-pipes	Peel strength ≥ 15 N/ cm	Temperature	(23 ± 2)°C	Annex E of ISO 17484-1
		Cycling test	(−20 ± 2) °C/ (+60 ± 2) °C	
		Number of cycles	10	
Odorant permeability	No perception of THT smell by experienced observer	Odorant Exposure timeTemperature	THT 60 days (23 ± 2) °C	Annex F of ISO 17484-1

[a] Test may be carried out at 210 °C providing that there is clear correlation with the results at (200 ± 2) °C. In case of dispute, the reference temperature shall be (200 ± 2) °C.

6 FITTINGS

6.1.1.1 *General*

Fittings shall comply with the requirements of clause 6 of ISO 17484-1.

The reference in ISO 17484-1 clause 6 to ISO 10838 (all parts) and ISO 14531-3 should be replaced by ISO 17885, Plastic piping systems – Mechanical fittings for pressure piping systems – Specification, except clause 9.3, Fitting assemblies.

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6.1.1.2 *Construction*

The fittings for multilayer pipes shall be able to make a mechanical connection with the multilayer pipe by pressing or clamping.

6.1.1.3 *Fitness for purpose*

Fittings shall comply with the requirements given in Table 3 of ISO 17484-1.

7 MARKINGS

Markings Legend shall be repeated at intervals of 1M and should be of different color from that of external pipe surface & shall include:

i) Manufacturer's name or trade mark.

ii) Owner's name as IGL to be marked on each pipe

iii) Design pressure (Pd) in Bar(g).

iv) Material designation: Layer construction and type of material required; description from outside to inside e.g. PEX-Al-PEX or PE80-PEX.

v) Standard reference number "ISO 17484"

7.1.1.1 *Packaging*

MLC pipe	**200 mtrs. coil**	Wrapping with polythene & Gunny sheet & tied with plastic strips

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STANDARD SPECIFICATION - BRASS FITTINGS

VPC –SS-PE-0009

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1.0 SCOPE

This specification covers the requirements for Brass Capillary fittings (End feed fittings). Unless modified by this specification, requirement of BS 864 / EN 1254 Part 1 shall be valid.

2.0 MATERIAL

- The material used for the manufacturer of Brass Capillary Fittings shall conform to EN 1254-1 (latest), Half Hard.

- Material used for the solder should conform to BS EN 29453 and should be lead free. Solder material shall be generally melting within the temperature range 180 ° C to 250 °C.

- Threading on the Brass fittings shall be done as per BS21.

3.0 DIMENSIONAL TOLERANCES

Dimensions tolerances of various types of brass capillary fittings (End feed fittings). shall be as per EN 1254 Part 1.

The tolerances at the end shall be as per EN 1254 Part I in nominal diameter which is as follows (Ref. table 2)

Diameter	Tolerance on the mean diameter with respect to the nominal		Resulting Diametrical difference	
D	Outside Dia of male end (mm)	Inside Dia of socket (mm)	Max (mm)	Min (mm)
12 mm	+.0.04 -.0.05	+ 0.15 +0.06	0.20	0.02

The minimum wall thickness of a fitting shall be in accordance as given below (Ref Table 3 of EN 1254 Part 1)

Nominal Dia mm D	Minimum Wall thickness (mm) Brass
12	1.1

4.0 END CONNECTION

End connection of the fitting must be capable of end feeding to the NPT x 12 mm. Internal solder ring type fitting is not acceptable.

5.0 CHEMICAL PROPERTIES

Chemical composition of Brass shall be as mentioned in EN 1254 PART I. Dezincification-resistant brass material CuZn36Pb2As or CW602N.

Cu 61.0-63.0 %
Pb 01.7-02.8 %
As 0.02 -0.15%
Remaining is zinc.

6.0 CARBON IN BORE

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The internal surface of brass capillary fittings for soldering or brazing shall not contain any detrimental film nor present a carbon level high enough to allow the formation of such a film during installation. The maximum total carbon level on internal surfaces shall not exceed 1.0 mg/dm^2 when tested in accordance with the specification. This test shall be carried out as per clause no. 5.4 of EN 1254 -1.

7.0 RESISTANCE TO DEZINCIFICATION

The fittings shall be manufactured from alloys containing more than 10% Zinc. So fittings shall be required to be resistant to dezincification. It shall be carried out as per Cl. 5.5 of EN 1254 -1.

8.0 STRESS CORROSION RESISTANCE TEST

A stress corrosion resistance is to be carried out as per method defined in ISO 6957 using test solution of pH9.5 but without pickling.

9.0 FREEDOM FROM DEFECT

The fittings shall be free from internal fins, blow holes, skin defects etc. or other irregularities which might restrict the free flow of fluid, and shall be designed that resistance to the flow of fluid through the fittings is minimized.

10.0 HYDROSTATIC PRESSURE TEST

All fittings shall be leak tightness tested at 1.5x25 bars for a period of 15 minutes and no leakage is permitted. This test shall be performed on each size of the fittings.

11.0 PNEUMATIC PRESSURE TEST

All fittings shall be leak tested at 6 bars for a period of 10 seconds and no leakage is permitted.

12.0 MARKING

Each fittings shall be embossed with IGL' s logo, manufacturers name and trade mark BS 864 / EN 1254 Part– I and designation of fittings.

Each packing containing fittings shall carry the following stamped or written in indelible ink.

13.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Bidder shall submit the packaging details during QAP and also complied with at the time of delivery.

14.0 INSPECTION/ DOCUMENTS

- Inspection shall be carried out as per design codes/standards, IGL Technical Specification and Inspection Plan/ Vendor's detailed QAP duly approved by owner/owner's representative.

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- IGL representative or third party inspection agency appointed by IGL shall carry out random inspection during manufacturing/ final inspection.

- Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports as per IGL Technical Specification, at the time of final inspection of each supply lot of material.

- Even after third party inspection, IGL reserves the right to select a sample of tube randomly from each manufacturing batch and have these independently tested. If the results of these tests fall outside the limits specified in IGL Technical specification, then IGL reserves the rights to reject all production supplied from the batch.

- Vendor shall prepare and submit the detail drawings of required brass fitting for approval by IGL/VCSQSPL before starting production.

- For any control test or examination required under the supervision of TPIA/owner/owner's representative, latter shall be informed in writing one (1) week in advance by vender about inspection date & place along with production schedule.

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ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION - GI PIPES

VPC – SS – PE - 0005

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1.0 INTRODUCTION AND SCOPE

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

This present document covers the technical specification for the procurement of GI Pipes used in high pressure natural gas transportation and distribution systems. It describes the general requirements, controls, tests, QA/QC examination and final acceptance criteria which need to be fulfilled.

This specification covers the requirements for GI pipes of heavy steel tube. Unless modified by this specification, requirements of IS 1239 (Part-I): 2004 (Latest edition) shall be valid.

2.0 DEFINITIONS

Owner	Shall mean Indraprastha Gas Ltd. (IGL).
Manufacturer	Means the Manufacturer of the GI pipe.
SS	Means the present <<Standard Specification>> and all its appendix, if any.
Third Party Inspection Agency	Means the Inspection Agency to be appointed by IGL.
GTS	Means the present <<General Technical Specification>> and its entire appendix, if any.

3.0 MATERIAL

The material used for the manufacturing of GI pipes confirming to IS 1239 (Part -1): 2004 (Latest edition).

4.0 DIMENSIONS, THICKNESS & DIMENSIONALTOLERANCES

The dimensions & nominal mass of tubes shall be in accordance with Table 5 subject to the tolerances permitted in CL.8.1 & 9 of IS 1239 (Part-I) : 2004 (Latest edition). Length of each pipe shall be 6 mtrs with + 6, - 0 mm tolerance. However, pipe length shall be considered 6 m. only for measurement / payment purpose.

Nominal Diameter DN	15 mm	20 mm
Grade	Heavy	Heavy
Outer Dia. (Max. / Min.)	21.8 mm / 21.0 mm	27.3 mm / 26.5 mm
Thickness (mm)	3.2	3.2
Nominal weight (Kg / m)	1.44	1.87

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5.0 END CONNECTION OF PIPE

GI Pipes shall be supplied with plain end.

6.0 FREEDOM FROM DEFECTS

On visual examination the outside & inside surfaces of pipes shall be smooth & free from defects such as cracks etc.

7.0 GALVANIZING

- Pipes shall be galvanized to meet the requirement of IS: 4736 – 1986 with latest amendment.
- Zinc conforming to any grade specified in IS: 13229- 1991 with latest amendment shall be used for the purpose of galvanizing.
- Galvanizing bath: The molten metal in the galvanizing bath shall contain not less than 98.5% by mass of zinc.
- Mass of zinc coating: Minimum mass of zinc coating determined as per IS: 6745 shall be 360gms/m^2.
- Uniformity of galvanized coating: The galvanized coating when determined on a 100 mm long test piece in accordance with IS 2633: 1986 with latest amendment shall withstand 5 one – minute dips.
- Freedom from defect: The zinc coating on internal & external surfaces shall be uniform adhered, reasonably smooth & free from such imperfections as flux, ash & drop inclusions, bare patches, black spots, pimples, lumpiness runs, rust stains, bulky white deposits & blisters. Rejection & acceptance for these defects shall be as per Appendix - A of IS 2629: 1985 with latest amendments.
- **Samplings**

  a) All materials of the same type in coating bath having uniform coating characteristics shall be grouped together to continue a lot. Each lot shall be tested separately for the various requirements of the specification. The number of units to be selected from each lot for this purpose shall be IS: 4711 1995 with latest amendment.

  b) The sample selected according to Clause 6.1 & 6.2 of IS: 4736 – latest edition.

  c) The sample found conforming to above requirements shall then be tested for mass of zinc coating in accordance with Clause 5.1 of IS: 4736 – 1986 with latest amendment.

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d) Criteria for conformity: As per IS: 4736 – 1986 with latest amendments.

8.0 PRESSURE TEST

Hydrostatic pressure test shall be carried out at a pressure of 5 Mpa for the duration of at least 3 second and shall not show any leakage in the pipe. Vendor to submit the internal pressure test certificate for the same. Owner Representative or Third party Inspection Agency appointed by Owner shall witness finish goods testing as per the sample procedure specified in IS: 1239 (Part-1) – latest edition.

9.0 MARKING

Each pipe shall be embossed with IGL's logo, manufacturer's name or trademark, size designation, class of pipe at the interval of not more than 1 meters.

Each packing containing pipes shall carry the following embossed, stamped or written by indelible ink.

- Manufacturers name or trademark.
- Class of pipe –Heavy.
- Indian standard mark (ISI).
- Lot number / Batch no. of production.

Each pipe conforming to this standard shall also be marked with BIS standard mark.

10.0 INSPECTION / DOCUMENTS

Inspection shall be carried out as per Owner Technical Specification.

Owner Representative or Third Party Inspection Agency appointed by Owner shall carry out stage wise inspection during manufacturing / final inspection.

The manufacturer shall have a valid licence to use ISI monogram for manufacturing of pipe in accordance with the requirement of IS: 1239.

Vendor shall furnish all the material test certificates, proof of approval / licence from specified authority as per specified standard, if relevant, internal test / inspection reports as per Owner Tech. Spec. & specified code for 100% material, at the time of final inspection of each supply lot of material.

For any control, test or examination required under the supervision of TPIA/Owner/Owner's representative, latter shall be informed in writing one (1) week in advance by vendor about inspection date and place along with production schedule.

Even after third party inspection, Owner reserves the right to select a sample of pipes

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randomly from each manufacturing batch & have these independently tested. Should the results of these tests fall outside the limits specified in Owner technical specification, then Owner reserves the right to reject all production supplied from the batch.

11.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Bidder shall submit the packaging details during QAP and also complied with at the time of delivery.

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ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION -GI FITTINGS

VPC-SS-PE-0006

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1.0 SCOPE

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

This present document covers the technical specification for the procurement of GI fittings used in high pressure natural gas transportation and distribution systems. It describes the general requirements, controls, tests, QA/QC examination and final acceptance criteria which need to be fulfilled.

This specification covers the requirements for Malleable Cast Iron Fittings unless modified by this specification, requirements of IS 1879 – latest edition shall be valid.

2.0 DEFINATIONS

Owner	Shall mean Indraprastha Gas Ltd. (IGL).
Manufacturer	Means the Manufacturer of the GI fittings.
SS	Means the present <<Standard Specification>>and its appendix, if any.
Third Party Inspection Agency	Means the Inspection Agency to be appointed by IGL.

3.0 MATERIAL

The material used for the manufacturing of GI fittings shall conform to ISI 14329 – 1995 with latest amendments Grade BM 300.

4.0 DIMENSIONS THICKNESS & DIMENSIONAL TOLERANCES

- Dimensions of various types of fittings shall be as specified in sections 2 to 10 of IS 1879 – 1987 with latest amendments, as applicable.
- Wall thickness of fittings and tolerances on them shall be as given in Table 1.2 of S 1879 – 1987 with latest amendments,
- In case of reducing fittings, the dimensions at each outlet shall be those appropriate to the nominal size of the outlet.
- Elbows, Tees, Sockets and caps shall be of reinforced type.

5.0 WEIGHT

Weights of various types of fittings shall be as specified in sections 2 to 10 of S 1879 – 1987 with latest amendments, as applicable.

6.0 THREADS

- Threads shall be NPT type and conforming to ASME B1.20.1.
- Outlets of fittings shall be threaded to dimensions & the tolerances as specified in ASME B1.20.1.
- All internal & external threads shall be tapered.

- For checking conformity of threads gauging practice in accordance with ASME B1.20.1

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shall be followed.

- Chamfering: The outlet of fittings shall have chamfer.

7.0 FREEDOM FROM DEFECTS

On visual examination, the outside & inside surfaces of fittings shall be smooth & free from any defects such as cracks, injurious flaws, fine sand depth etc.

8.0 GALVANIZING

- Fittings shall be galvanized to meet the requirement of IS: 4759–1996with latest amendments.

- Zinc conforming to any grade specified in IS: 13229-1991 with latest amendments shall be used for the purpose of galvanizing.

- Galvanizing bath: The molten metal in the galvanizing bath shall contain not less than 98.5% by mass of zinc.

- Coating requirements: Mass of coating shall be 610 - 700gms/m2.

- Freedom from defect: The zinc coating shall be uniform adhered, reasonably smooth & free from such imperfections as flux, ash bare patches, black spots, pimples, lumpiness runs, rust stains, bulky white deposits &blisters.

- Samplings

    a. All materials of the same type in coating bath having uniform coating characteristics shall be grouped together to continue a lot. Each lot shall be tested separately for the various requirements of the specification. The number of units to be selected from each lot for this purpose shall be given in Table 2 of IS 4759 – latest edition.

    b. The sample selected according to Column 1 & 2 of Table 2, IS: 4759 – latest edition shall be tested for visual requirements as per Clause 6.2 of IS:4759 – latest edition

    c. The sample found conforming to above requirements shall then be tested for mass of zinc coating in accordance with Clause 9.2 of IS: 4759 – latest edition.

    d. Criteria for conformity: As per Clause 8.3 of IS: 4759-latestedition.

    e. Test procedure shall be as per Clause 9 of IS: 4759-latestedition.

9.0 PRESSURE TEST

Vendor shall carry out pneumatic pressure test as per Clause 11.1b of 1879 – 1987 with latest amendments on each &every fittings. Vendor to submit the Internal Quality control certificate for the same. Owner shall witness pneumatic testing as per the sampling procedure specified in 1879 – 1987 with latest amendments.

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10.0 COMPRESSION TEST

This test shall be conducted to judge the malleability of the pipe fittings & shall be carried out as per Clause 12 of 1879 – 1987 with latest amendments.

11.0 SAMPLING

Owner Representative of Third Party Inspection Agency appointed by Owner shall witness the tests as per clause 14 of 1879 – 1987 with latest amendments. However, vendor to perform 100% inspection of visual, dimensional & pressure test. Vendor shall furnish Internal test certificates at the time of final inspection to the Owner.

12.0 MARKING

Each fitting shall be embossed/Laser printed with IGL's logo, manufacturer's name or trademark and the size designation.

Each packing containing fittings shall carry the following embossed/Laser printed, stamped or written by indelible ink.

- Manufacturer's name or trademark.
- Designation of fittings.
- Lot number.

Each fitting conforming to this standard shall also be marked with BIS standard mark.

13.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Packing size shall be approved by owner / owner's representative before packing the material. The vendor shall submit the packaging details during QAP and also complied with at the time of delivery.

14.0 INSPECTION / DOCUMENTS

- Inspection shall be carried out as per Owner Technical Specification.
- Owner Representative or Third Party Inspection Agency appointed by Owner shall carry out stage wise inspection during manufacturing / final inspection.
- Vendor shall furnish all the material test certificates, proof of approval / license from specified authority as per specified standard, if relevant, internal test / Inspection reports as per Owner Tech Spec. & specified code for 100% material, at the time of final inspection of each supply lot of material.

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STANDARD SPECIFICATION - COPPER TUBE

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1.0 SCOPE

This specification covers the requirements for 12 mm OD X 0.6 mm wall thickness Copper tube, Half Hard. Unless modified by this specification, requirement of BS EN 1057 (latest), Half Hard, shall be valid, with the recommended changes in physical properties to suit wrinkle free bend ability.

2.0 MATERIAL

The material used for the manufacturer of Copper tube shall confirm to BS EN 1057(latest), Grade Cu - DHP or CW024A.

- **Mechanical Properties**:

  a. Ultimate Tensile Strength–235 N/sq.mm(min)

  b. Elongation – 30% (min)

  c. Hardness - 53 to 80 on HV scale.

- **Chemical Properties:**

  In Each heat one no. of the copper tube will be tested for chemical properties to confirm to non-arsenical Cu - DHP / CW024A as per BS EN 1057 to have the following chemical composition:

Copper Percentage including silver	**:**	Min 99.9%
Phosphorus Percentage	**:**	0.015 to 0.040%

3.0 DIMENSIONAL TOLERANCES

The mean outside Diameter of the tube shall not vary from the specified outside diameter by more than the amount of tolerances specified in table 4 of BS EN 1057. The tolerance on the wall thickness shall be as specified in table 5 of BS EN 1057.

The length of the tube shall be 3 m. Allowable tolerance shall be (-0, +0.5 mm).

4.0 MANUFACTURE

The tubes shall be solid drawn by the process of melting, extrusion and thereafter Bright annealing. The ends shall be cut clean & square with the axis of the tube in no case shall tubes be redrawn from old or used tubes.

5.0 FREEDOM FROM DEFECTS

- The tubes shall be free from internal & external fins, flaws, skin defects, blow holes etc. or other irregularities which might restrict the free flow of fluid and shall be so designed that resistance to the flow of fluid through the tubes is minimized.
- All tubes will be supplied 100% Eddy Current tested as per ASTM E243 and BS EN 1057. Eddy Current testing is a computer aided test, wherein the tube passes through a probe & an electromagnetic field is created around the peripheral of the tube to detect

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any flaw or blow hole which may not be visible to the naked eye. The manufacturer must have in-house Eddy Current testing facilities to supply to IGL. IGL reserves the right to witness the Eddy Current facility at the manufacturer's factory premises.

6.0 HYDROSTATIC TEST

Hydrostatic test shall be carried out minimum 35 bar pressure for a period of 10 second as per EN 1057 (latest).

7.0 DRIFT EXPANDING TEST

Drift expanding test shall be carried out as per EN 1057. The O.D. of the tube end shall be expanded by 30% using a conical mandrel (at angle 45º) with no wrinkles, cracks, break or any form of defect should occur on the tube during & after the test.

8.0 CARBON FILM TEST

Copper tubes to be tested for carbon film test & the manufacturer will certify that the tubes meet the requirement of clause 8.5 of BS EN 1057.

9.0 CARBON CONTENT TEST

Copper tubes to be tested for carbon content test to ensure a carbon level to avoid the formation of carbon film during installation. Max. Carbon level shall be permitted as per clause 6.5 of BS EN1057.

10.0 MARKING

Each tube shall be permanently marked every meter with IGL's Logo, manufactures name & size and specification of the tube.

Each packing containing tubes shall carry the following, stamped or written in indelible ink.

- Manufacturers name or trademark
- Designation of tubes (OD x wall thk)
- Lot number.
- No. of the standard (EN1057)

11.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Packing size shall be approved by owner / owner's representative before packing the material. The vendor shall submit the packaging details during QAP and also complied with at the time of delivery.

12.0 INSPECTION/ DOCUMENTS

- Inspection shall be carried out as per IGL Technical Specifications, relevant codes/standard and Inspection Plan/ QAP. Vendor to prepare detailed QAP and submit the same for approval of IGL / IGL's Authorized Representative.
- IGL representative or third party inspection agency appointed by IGL shall carry out

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stage wise inspection during manufacturing/ final inspection.

- Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports as per IGL Technical Specification and specified code for 100% material, at the time of final inspection of each supply lot of material.

- Even after third party inspection, IGL reserves the right to select a sample of tube randomly from each manufacturing batch and have these independently tested. Should the results of these tests fall outside the limits specified in IGL Technical specification, then IGL reserves the rights to reject all production supplied from the batch.

- For any control test or examination required under the supervision of TPIA/owner/owner's representative, latter shall be informed in writing one (1) week in advance by vendor about inspection date & place along with production schedule.

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ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION - COPPER FITTINGS

VPC –SS-PE-0007

REV. No	DATE	Purpose	Prepared By	Checked By	Approved By
00	18.06.18	ISSUED AS STANDARD	BS	MVK	AD

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1.0 SCOPE

This specification covers the requirements for 12 mm OD X 0.6 mm wall thickness Copper tube, Half Hard. Unless modified by this specification, requirement of BS EN 1057 (latest), Half Hard, shall be valid, with the recommended changes in physical properties to suit wrinkle free bend ability.

2.0 MATERIAL

The material used for the manufacturer of Copper tube shall confirm to BS EN 1057(latest), Grade Cu - DHP or CW024A.

- **Mechanical Properties**:

  a. Ultimate Tensile Strength–250N/sq.mm(min)

  b. Elongation – 30% (min)

  c. Hardness - 75 to 100 on HV scale.

- **Chemical Properties:**

  In Each heat one no. of the copper tube will be tested for chemical properties to confirm to non-arsenical Cu - DHP / CW024A as per BS EN 1057 to have the following chemical composition:

Copper Percentage including silver	:	Min 99.9%
Phosphorus Percentage	:	0.015 to 0.040%

3.0 DIMENSIONAL TOLERANCES

The mean outside Diameter of the tube shall not vary from the specified outside diameter by more than the amount of tolerances specified in table 4 of BS EN 1057. The tolerance on the wall thickness shall be as specified in table 5 of BS EN 1057.

The length of the tube shall be 3 m. Allowable tolerance shall be (-0, +0.5 mm).

4.0 MANUFACTURE

The tubes shall be solid drawn by the process of melting, extrusion and thereafter Bright annealing. The ends shall be cut clean & square with the axis of the tube in no case shall tubes be redrawn from old or used tubes.

5.0 FREEDOM FROM DEFECTS

- The tubes shall be free from internal & external fins, flaws, skin defects, blow holes etc. or other irregularities which might restrict the free flow of fluid and shall be so designed that resistance to the flow of fluid through the tubes is minimized.
- All tubes will be supplied 100% Eddy Current tested as per ASTM E243 and BS EN 1057. Eddy Current testing is a computer aided test, wherein the tube passes through a probe & an electromagnetic field is created around the peripheral of the tube to detect

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any flaw or blow hole which may not be visible to the naked eye. The manufacturer must have in-house Eddy Current testing facilities to supply to IGL. IGL reserves the right to witness the Eddy Current facility at the manufacturer's factory premises.

6.0 HYDROSTATIC TEST

Hydrostatic test shall be carried out minimum 35 bar pressure for a period of 10 second as per EN 1057 (latest).

7.0 DRIFT EXPANDING TEST

Drift expanding test shall be carried out as per EN 1057. The O.D. of the tube end shall be expanded by 30% using a conical mandrel (at angle 45º) with no wrinkles, cracks, break or any form of defect should occur on the tube during & after the test.

8.0 CARBON FILM TEST

Copper tubes to be tested for carbon film test & the manufacturer will certify that the tubes meet the requirement of clause 8.5 of BS EN 1057.

9.0 CARBON CONTENT TEST

Copper tubes to be tested for carbon content test to ensure a carbon level to avoid the formation of carbon film during installation. Max. Carbon level shall be permitted as per clause 6.5 of BS EN1057.

10.0 MARKING

Each tube shall be permanently marked every meter with IGL's Logo, manufactures name & size and specification of the tube.

Each packing containing tubes shall carry the following, stamped or written in indelible ink.

- Manufacturers name or trademark
- Designation of tubes (OD x wall thk)
- Lot number.
- No. of the standard (EN1057)

11.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Packing size shall be approved by owner / owner's representative before packing the material. The vendor shall submit the packaging details during QAP and also complied with at the time of delivery.

12.0 INSPECTION/ DOCUMENTS

- Inspection shall be carried out as per IGL Technical Specifications, relevant codes/standard and Inspection Plan/ QAP. Vendor to prepare detailed QAP and submit the same for approval of IGL / IGL's Authorized Representative.
- IGL representative or third party inspection agency appointed by IGL shall carry out

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stage wise inspection during manufacturing/ final inspection.

- Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports as per IGL Technical Specification and specified code for 100% material, at the time of final inspection of each supply lot of material.

- Even after third party inspection, IGL reserves the right to select a sample of tube randomly from each manufacturing batch and have these independently tested. Should the results of these tests fall outside the limits specified in IGL Technical specification, then IGL reserves the rights to reject all production supplied from the batch.

- For any control test or examination required under the supervision of TPIA/owner/owner's representative, latter shall be informed in writing one (1) week in advance by vendor about inspection date & place along with production schedule.

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ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION – FORGED FITTINGS (WROUGHT STEEL FITTINGS) FOR USE AT PRESSURE UP TO 100 MBAR (G)

VPC-SS-PE-0012

00	**18.06.18**	**ISSUED AS STANDARD**	**BS**	**MVK**	**AD**
REV	**DATE**	**Purpose**	**Prepared By**	**Checked By**	**Approved By**

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1.0 SCOPE

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

This specification covers the requirements for Wrought Steel Fittings for Natural Gas for use at pressures up to 100 mbar (g). Unless modified by this specification, all the requirements of IS 1239 Part 2: 1992 and the latest editions of the standards mentioned herein this specification, including all revisions, shall apply.

2.0 SPECIFICATION FOR POWDER COATING

Owner	Shall mean Indraprastha Gas Ltd. (IGL).
Manufacturer	Means the Manufacturer of the Steel Reinforced Rubber Hose.
SS	Means the present <<Standard Specification>> and its appendix, if any.
Third Party Inspection Agency	Means the Inspection Agency to be appointed by IGL.

3.0 MATERIAL

The material used for the manufacturing of wrought steel fittings shall confirm to IS 1387: 1967 generally, and IS 1239 Part 2: 1992

4.0 DIMENSIONS & TOLERANCES

- Dimensions of various types of fittings shall be as specified in the table 1 to 31 of IS 1239 Part 2: 1992.
- Wall thickness on fittings & tolerances on them shall be as given in table 1 to 31 of IS 1239 Part 2: 1992.
- In case of reducing fittings, the dimensions at each outlet shall be those appropriate to the nominal size of the outlet.

5.0 THREADS

- Outlet of fittings shall be threaded to dimensions & the tolerances as specified in IS 554: 1999.
- All internal & external threads shall be tapered.
- After threading, the pipe body may be hot dip galvanized as per normal practice followed by cold galvanizing (spraying) of the threaded portions. The threaded portions shall be protected using end caps, etc.
- For checking conformity of threads gauging practice in accordance with IS 8999:

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2003 shall be followed.

- Chamfering: The outlet of fittings shall have chamfer. The chamfer shall have an included angle of 900 ± 50 for internal threads & 700 ± 100 for external threads.

6.0 FREEDOM FROM DEFECTS

On visual examination the outside & inside surfaces of fittings shall be smooth & free from defects such as cracks, injurious flows, fine sand depth, etc. Other workmanship shall be as per Clause 14 of IS 1239 Part 2: 1992.

7.0 GALVANIZING

- Fittings shall be galvanized to meet the requirements of IS 4759: 1996.
- Zinc conforming to any grade specified in IS 209: 1992 or IS 13229: 1991 shall be used for the purpose of galvanizing.
- **Galvanized Bath:** The molten metal in the galvanizing bath shall contain not less than 98.5% by mass of zinc.
- **Coating requirements:** Mass of coating shall be 610 gms/ m2. In case of pipe nipples (manufactured in accordance with the requirements of IS 1239 Part 1: 2004), the mass of coating of 400 gms/m2 shall also be acceptable.
- **Freedom from defects:** The zinc coating shall be uniformly adhered, reasonably smooth & free from such imperfections as flux, ash bare patches, black spots, pimples, lumpiness runs, rust strains, bulky white deposits & blisters; otherwise the pipes shall be liable for rejection.
- **Sampling Plan for galvanizing**

  a) All materials of the same type in a coating bath having uniform coating characteristics shall be grouped together to constitute a lot. Each lot shall be tested separately for the various requirements of the specification. The number of units to be selected from each lot for this purpose shall be as given in Table 2 of IS 4759: 1996.

  b) The sample selected according to Column 1 & 2 of Table 2, IS 4759: 1996 shall be tested for visual requirements as per Para 8 of IS 4759: 1996. Vendor shall have appropriate correspondence between galvanizing lot number and pipe manufacturing lot number for identification / traceability.

  c) The sample found conforming to above requirements shall then be tested for mass of zinc coating in accordance with Clause 9.2 of IS 4759: 1996.

  d) Criteria for conformity: As per Clause 8.3 of IS 4759: 1996.

  e) Test procedure shall be as per Clause 9 of IS 4759: 1996. All galvanizing test results shall be included in the Manufacturer's Test Certificate.

8.0 PRESSURE TEST

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Pneumatic pressure test shall be carried out on each & every fittings as per procedure given in IS 1239 Part 2: 1992.

9.0 COMPRESSION TEST

As per IS 1239 Part 2: 1992.

10.0 SAMPLING

Owner Representative of Third Party Inspection Agency appointed by Owner shall witness the tests as per procedure for sampling plan given in IS 4711: 1974. However, vendor to perform 100% inspection of visual, dimensional & pressure test. Vendor shall furnish Internal test certificates at the time of final inspection to the Owner.

11.0 MARKING

Each fitting shall be embossed / Laser Printed with IGL's logo, manufacturer's name or trademark and the size designation.

Each packing containing fittings shall carry the following embossed, stamped or written by indelible ink.

- Manufacturer's name or trade mark.
- Designation of fittings.
- Lot number.

Each fitting conforming to this standard shall also be marked with BIS standard mark.

12.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Packing size shall be approved by owner / owner's representative before packing the material. The vendor shall submit the packaging details during QAP and also complied with at the time of delivery.

13.0 INSPECTION/ DOCUMENTS

- Inspection shall be carried out as per Owner Technical Specification.

- Owner Representative or Third Party Inspection Agency appointed by Owner shall carry out stage wise inspection during manufacturing / final inspection.

- Vendor shall furnish all the material test certificates, proof of approval / license from specified authority as per specified standard, if relevant, internal test / Inspection reports as per Owner Tech Spec. & specified code for 100% material, at the time of final inspection of each supply lot of material.

- Even after third party inspection, Owner reserves the rights to select a sample of fittings randomly from each manufacturing batch & have these independently

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tested. Should the results of these tests fall outside the limits specified in Owner technical specification, then Owner reserves the rights to reject all production supplied from the batch.

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ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION FOR STEEL REINFORCED RUBBER HOSE

VPC-SS-PE-0010

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1.0 SCOPE

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

This present document covers the technical specification for the procurement of steel reinforced rubber hose, Type 4 used in distribution systems. It describes the general requirements, controls, tests, QA/QC examination and final acceptance criteria which need to be fulfilled.

This specification covers the requirements for steel reinforced rubber hose unless modified by this specification, requirements of IS: 9573 shall be valid.

2.0 SPECIFICATION FOR POWDER COATING

Owner	Shall mean Indraprastha Gas Ltd. (IGL).
Manufacturer	Means the Manufacturer of the Steel Reinforced Rubber Hose.
PTS	Means the present <<Particular Technical Specification>> and its appendix, if any.
Third Party Inspection Agency	Means the Inspection Agency to be appointed by IGL.
Type 4	Wire Reinforced hose for domestic / commercial installations

3.0 MATERIAL

- Lining: - It shall be nitrile – butadiene rubber (NBR) or chloroprene rubber (CR) compound. It shall be smooth in bore, uniform in thickness and free from air blisters, porosity and splits.

- Reinforcement material: - It shall have wire reinforcement in braided form in between the lining & cover.

- Cover:- It shall be manufactured out of synthetic rubber compound resistant to abrasion, weather and natural gas. The cover color shall be orange.

- The whole shall be consolidated by wrapping or any other suitable method and uniformly vulcanized to give good adhesion between reinforcement plies and the rubber lining of the cover.

4.0 DIMENSIONS & TOLERANCES

- Bore size

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Nominal base (mm)	Minimum base diameter(mm)	Minimum bend radius(mm)
8mm	7.9	95

The Nominal bore size of the hose shall be accordance to table # 1 of IS 9573: 1998 shall be as given above table. It shall be tested/ checked as method defined in IS 4143.

- The Minimum thickness so lining & cover shall be 2 mm & 1 mm respectively.

- Length of hose shall be as defined in M.R. & the tolerances on length shall be permitted ±1%.

5.0 FEATURES

- **Mechanical properties**

  Tensile Strength (Lining & Cover) at break - 10 MPa (minimum)

  Elongation (Lining & Cover) in at break (%) - 200 & 250 respectively (minimum)

- **Resistance of Lining to n-pentane**

  The n-pentane absorbed and the n-pentane extractable matter as determined Clause no. 5.4.3.2 of IS 9573: 1998 shall not exceed 10% & 5% respectively to the initial mass of lining.

- **Adhesion**

  The minimum adhesion between rubber lining & reinforcement, between layers of reinforcement and between reinforcement & cover shall be 2KN/m.

- **Low temperature flexibility**

  Flexible hose is conditioned at - 40 ° C for at least 5 hrs. and then bent at 180° around a mandrel with a diameter 12 times the nominal bore diameter of the hose, no cracks or breaks shall be shown.

- **Flexibility of Hose**

  The hose shall be capable of being bent empty to the radius 95 mm without flattening and suffering structural damages.

- **Ozone resistance**

  It shall be carried out as per clause no. 5.5.of IS 9573: 1978

- **Hydro static test**

  All hoses shall be leak tightness tested at 2 MPa for a period of 1 minutes and no leakage is permitted. This test shall be performed on each size of the hoses as per clause no. 5.5.5.1 of IS 9573: 1978.

- **Bursting pressure**

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It shall be carried out as per Clause 5.5.2 of IS 9573. The minimum burst pressure shall be 5 Mpa.

- **Grip strength test**

  The hose shall comply to the requirement of Clause no. 5.5.7 of IS 9573.

- **Burning behavior**

  The burning test shall be carried out on hose as per clause no. 5.5.8 of IS9573. The hose at least shall not burn till 45second.

6.0 MARKING

Each hose shall be indelibly marked as follows:

- Manufacturer's name or trade mark., if any
- Nominal bore
- Batch no. / Lot no.
- Month and year of manufacturer
- Type of hose i.e. Type 4
- BIS marking

7.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Bidder shall submit the packaging details during offer and also complied with at the time of delivery.

8.0 INSPECTION/ DOCUMENTS

- Inspection shall be carried out as per design codes/standards, IGL Technical Specification and Inspection Plan/ Vendor's detailed QAP duly approved by owner/owner's representative.
- For all tests purposes, the minimum time between vulcanization & testing shall be 16h.
- IGL representative or third party inspection agency appointed by IGL shall carry out random inspection during manufacturing/ final inspection.
- Vendor shall furnish all the material test certificates, proof of approval/ license from

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specified authority as per specified standard, if relevant, internal test/ inspection reports as per IGL Technical Specification, at the time of final inspection of each supply lot of material.

- Even after third party inspection, IGL reserves the right to select a sample of hose randomly from each manufacturing batch and have these independently tested. If the results of these tests fall outside the limits specified in IGL Technical specification, then IGL reserves the rights to reject all production supplied from the batch.

- Vendor shall prepare and submit the detail drawings of required steel reinforced rubber hose for approval by IGL /VCSQSPL before starting production.

- For any control test or examination required under the supervision of TPIA/owner/owner's representative, latter shall be informed in writing one (1) week in advance by vender about inspection date & place along with production schedule.

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ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION FOR PURE POLYSTER POWDER COATING

VPC –SS-PE-0011

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00	18.06.18	ISSUED AS STANDARD	BS	MVK	AD

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1.0 SCOPE

This Specification specifies the requirements for powder coating (Pure Polyester) of GI Pipes & fitting suitable to use for carrying Natural Gas directly expose to sunlight.

2.0 SPECIFICATION FOR POWDER COATING

Powder Material	:	Pure Polyester.
Application	:	Electrostatic Spraying (40 — 90 KV Manual/ Automatic)
Backing Schedule	:	180^0C to 200^0C for 10 mm (Metal Temperature)
Coating Thickness	:	50-60Microns

3.0 TESTING

Film Type	:	Glossy/Satin 86
Gloss60^0	:	95%
Cross Hatch Adhesion (ASTM D-5870)	:	GT = 0/100
Cylindrical bending Test (ASTM D -522) 5mm Rod dia	:	Passes
Enrichsen cupping (min)	:	8 Passes
Pencil Hardness(mm)	:	2H
Scratch Resistance (Kg. Mm)	:	3
Impact Resistance Kg. Min(ASTM D- 2794)	:	Direct 150 Indirect 150
Salt Spray Resistance (ASTM B-117)	:	1000 Hrs (min)
Porosity (DIN 53161)	:	Passes
Humidity Resistance	:	1000 Hrs(min)

4.0 MARKING

Each fitting shall be embossed with manufacture's name or trademark and the size designation. Each packing containing fittings shall carry the following stamped or written by indelible ink.

- Manufacturers name or trademark.

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- Designation of fitting.
- Lot number.

Each fitting conforming to this standard shall also be marked with BIS standard mark.

5.0 INSPECTION/ DOCUMENTS

- Inspection shall be carried out as per OWNER Technical Specification.

- OWNER representative or Third Party Inspection Agency appointed by OWNER shall carry out stage wise inspection during manufacturing/final inspection.

- Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test inspection reports as per OWNER Tech Spec. &- specified code for 100% material, at the time of final inspection of each supply lot of material.

- Even after third party inspection, OWNER/ OWNER REPRESENTATIVE reserves the rights to select a sample of fittings randomly from each manufacturing batch & have these independently tested. Should the results of these tests fall outside the limits specified in OWNER technical specification, then OWNER/ OWNER REPRESENTATIVE Reserves the rights to reject all production supplied from the batch. (ASTM D- 2247)

Weathering (sun test with water immersion, Xenon 150K.lux)	:60-70% Gloss retention after 1000Hrs.
Colour	: Light colour as approved by OWNER/CONSULTANT

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ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION – WARNING MAT

VPC –SS-PE-0013

REV. No	DATE	Purpose	Prepared By	Checked By	Approved By
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1.0 SCOPE

INDRAPRASTHA GAS LTD. (IGL) plans to augment the PNG Network. It supplies natural gas to domestic & commercial consumers in the city of NCT Delhi, Uttar Pradesh, Haryana & Rajasthan GA.
The present document covers the technical specifications for the procurement of Warning Mat. Warning mats shall be laid in the ground above the gas main line in order to indicate their presence.

2.0 DEFINATIONS

Owner	Shall mean Indraprastha Gas Ltd. (IGL).
Manufacturer	Means the Manufacturer of the Steel Reinforced Rubber Hose.
SS	Means the present <<Standard Specification>> and its appendix, if any.
Third Party Inspection Agency	Means the Inspection Agency to be appointed by IGL.

3.0 REFERENCE CODE

IS 10889	High Density Polyethylene Films
ASTM D - 638	Standard test method for tensile properties of plastics.

4.0 FEATURES

- **Material**

  Raw material of the warning mat shall be Virgin material.

  The material grade of Warning Mat shall be HDPE with warning sticker / stamp.

  a. Mechanical properties
  b. Tensile strength at break (Machine direction) - 300 Kgf /cm^2(minimum)
  c. Elongation in machine & Transverse direction (%)- 300 (minimum)

- **Colour**

  The Mat shall be of bright golden yellow colour. This colour must not take any appreciable alteration in the course of time.

- **Dimensions**

  Warning Mat shall have following dimensions:
  Width 300 mm ± 5 mm
  Thickness 1 mm (Minimum)
  Negative tolerance on thickness is not allowed.

- **Marking**

  a. Marking on the Mat shall be approved by owner. The warning Mat shall be provided with Chainage marking and the warning mat must be engraved with "Caution: High pressure gas pipeline below" in both English and Hindi along with IGL's Logo at a frequency of every meter.
  b. Vendor shall submit proposed Artwork to be marked on the Mat for the approval

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from Owner / Owner's representative.

- **Tests**

  a. Colour- Fast test

  Test specimen 100 mm to 150 mm wide shall be immersed in a 20% solution of ammonium sulphide at 15 to 20 ºC temperature for 15 days. The colour fastness shall be evaluated by comparing the test specimen with a sample specimen. The comparison shall be made by placing the two specimens on a white back ground in day light, but without exposing them directly to sun light. Test shall be accepted satisfactory, if the colour of the strip remains intact.

  b. Other tests shall be carried out as per relevant national / international standard enclosed in QAP.

- **Packing**

  The warning mat shall be delivered in rolls of 50meters. Packing size to be mentioned to ensure uniformity in delivery conditions of the materials being procured. Bidder shall submit the packing details during offer and also compiled with at the time of delivery.

5.0 QUALITY ASSURANCE (QA)

Manufacturer shall prepare detailed QAP and submit for the approval from Owner / Owner's representative.

6.0 DEFECT LIABILITY

Defect liability period shall be as per the commercial volume I of II

7.0 APPENDIX - I

Vendor to submit the following Data along with BID.

SR.NO.	DESCRIPTION	UNIT	DATA	REMARKS
01.	Average gravimetric Thickness	mm		
02.	Tensile strength at Break (in machine direction)	Kg / cm^2		
03.	Tensile strength at Break (in Transverse direction)	Kg / cm^2		
04.	Elongation at Break (in Transverse direction)	%		
05.	Elongation at Break (in Transverse direction)	%		
06.	Color bleeding	-		
07.	Dimensional stability	% change		

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	STANDARD SPECIFICATION FOR SEAMLESS FITTINGS AND FLANGES {SIZE UPTO DN 400MM(16”)}		
		TOTAL SHEETS	07
DOCUMENT NO	SS	PL	025

STANDARD SPECIFICATION
FOR
SEAMLESS FITTINGS
AND FLANGES {SIZE UPTO DN 400MM(16”)}

REV	DATE	DESCRIPTION	PREP	CHK	APPR
0	10.07.2017	ISSUED AS STANDARD SPECIFICATION	BS	MV	AD

ABBREVIATIONS:

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

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1.0 SCOPE

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

2.0 REFERENCE DOCUMENTS

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

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

B31.4	:	Pipeline Transportation system for liquid Hydrocarbon & other liquids.
B 31.8	:	Gas Transmission and Distribution Piping Systems.
B16.5	:	Pipe Flanges and Flanged Fitting.
B16.9	:	Factory made Wrought Butt Weld Fittings.
B 16.11	:	Forged Steel Fittings, Socket welding and Threaded.
B 16.48	:	Steel Line Blanks.
Section VIII	:	Boiler and Pressure Vessel Code - Rules for Construction of Pressure Vessels.
Section IX	:	Welding and Brazing Qualifications.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

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

MANUFACTURERS STANDARDIZATION SOCIETY (MSS)

SP-25	:	Standard Marking System for Valves, Fittings, Flanges and Unions.
SP-97	:	Forged Carbon Steel Branch Outlet Fittings- Socket Welding, Threaded and Butt Welding Ends

In case of conflict between various requirements of this specification and the requirements

of above referred Codes and Standards, more stringent requirement shall apply unless otherwise agreed by Purchaser.

3.0 MATERIALS

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

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

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

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

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

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

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

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

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

4.0 DESIGN AND MANUFACTURE

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

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

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

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

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

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

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

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

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

5.0 INSPECTION AND TESTS

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

5.1 TESTING OF MATERIALS

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

5.2 VISUAL INSPECTION AND DIMENSIONAL CHECK

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

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

5.3 NON-DESTRUCTIVE EXAMINATION

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

5.4 The Purchaser reserves the right to perform stage wise inspection and witness tests as indicated above, at the Manufacturer's works, prior to shipment. The Manufacturer shall give reasonable notice of date and time for such inspection and shall provide reasonable access and facilities required for inspection, to the Purchaser’s Inspector.

The Purchaser reserves the right to require additional testing, at any time, to confirm Or further investigate a suspected fault. All costs incurred shall be for the Manufacturer’s account. In no case shall any action of the Purchaser, or his Inspector, relieve the Manufacturer of his responsibility for material, design, quality, or Performance of the materials concerned. Inspection and tests performed/witnessed by the Purchaser's Inspector shall in no way relieve the Manufacturer of his obligation to perform the required inspection and tests.

6.0 PAINTING

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

7.0 MARKING

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

- PO Number.
- Item Code.

8.0 TEST CERTIFICATES

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

Manufacturer shall furnish the following certificates:

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

9.0 PACKING & SHIPPING

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

10.0 DOCUMENTATION

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

ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION

FOR

HEALTH, SAFETY & ENVIRONMENT

VPC – SS – PL - 0021

00	20.06.2018	ISSUED AS STANDARD	PK	MVK	AD
REV. No	DATE	Purpose	Prepared By	Checked By	Approved By

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1. SCOPE

This specification establishes the Health, safety and Environment (HSE) aspects to be complied with by the contractor during construction at site.

2. APPLICABLE SYSTEMS ANDPROCEDURES

The reference standard for setting Quality, Health, Safety and Environment Systems and procedures will be as linked below –

- Guidelines issued by PNGRB.
- ISO 9001 – 2008 - For Quality System.
- ISO 14001 – 2004 - For Environmental Management System
- (OSHAS) 18001-2007 -For occupational health and safety management Systems.

The Occupational Health & Safety Assurance Standard (OHSAS) 18001-2007 gives requirements for an occupational health and safety (OH&S) management system. It enables an organization to control its OH&S risks and improve its performance. It provides a basis for an organization to specify its OH&S performance criteria and design the management system.

OHSAS 18001 is compatible with the ISO 9001 (Quality) and ISO 14001 (Environmental) management systems standards. This facilitates integration of quality, environmental and occupational health and safety management systems by an organization.

Organization structure of the proposed CGD project includes a position for developing, installing and maintaining (with assistance by a specialist entity) Quality Assurance (QA) and Health, Safety and Environment (HSE) systems in line with ISO 9001-2008, OHSAS 18001-2007 and ISO 14001- 2004 Standards.

Documented Standard Operating Procedures (SOP) will be prepared by the Owner/Owner's representative for CGD entity for QA and HSE, for application across the organization. Development of the SOPs and implementation of the same at construction sites, control rooms, regional and corporate offices will be followed by an internal audit to verify conformance.

The CGD Network operating entity will thereafter regularly monitor, through periodic internal and mandatory external audits, effective implementation of the SOPs at the construction sites, control rooms regional and corporate offices as per systems and procedures.

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3. REFERENCES

This document should be read in conjunction with following.

- General Condition of Contract (GCC)
- Special Condition of Contract (SCC)
- Job Specifications
- Relevant IS codes, OSHAS standard
- Reporting Formats

4. RESPONSIBILITY & ORGANISATION

Health, Safety and Environment activities at site shall be under Contractor's scope. Contractor shall be responsible for implementation of HSE provisions. The nominated or designated safety engineer/ officer shall assist and perform day to day HSE work as per his advice.

5. GENERALREQUIREMENT

5.1. The contractor should follow HSE policy of owner as applicable to construction site.

5.2. The contractor shall ensure that HSE requirements are clearly understood & faithfully implemented at all level, at each site.

5.3. The contractor shall organize safety awareness programs regularly.

5.4. The contractor shall ensure his participation in every HSE meeting called by owner/owner representative.

5.5. The contractor shall conduct daily tool box talk.

5.6. Contractor shall ensure that their safety supervisor must always be present at site.

5.7. Contractor shall take sufficient care in moving his plants, equipment's and materials from one place to another place so that they do not cause any damage to any person or the property of the owner or any third party.

5.8. Working after sunset is strictly prohibited.

5.9. Hygiene requirement must be met on site by providing fresh drinking water at each site

5.10. The contractor shall submit Monthly HSE reports (Form attached in ANNEXURES).

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5.11. The contractor shall provide one four wheeler at site during working hour to meet any contingency.

5.12. The contractor shall adhere consistently to all provisions of HSE. In case of non- compliance or continuous failure the owner/ owner representative may impose stoppage of work for the serious HSE violation. All works shall be carried out in presence of Owner/Owner's Representative only.

6. TRAINING

The Contractor duties shall include conducting HSE training for all activities and personnel involved.

The Contractor shall ensure that their Personnel have been given the necessary HSE and work-related skills training in compliance with regulatory requirements prior to engaging the personnel for the work.

7. TOOL BOX TALKS

Contractor's Site Supervisor for specific work location shall conduct a tool box at the commencement of work on daily basis. If different team is working in different area, separate tool box talk covering location and hazard involved shall be carried out.

Each toolbox meeting shall cover the following agenda:

- Discuss safety issues of previous day
- Brief description of activities planned for the day &associated hazard
- Information & resources required to put controls in place
- Location specific hazard and instructions.
- Requirements Open

It is the responsibility of supervisor to convey PPE requirement to all workers and ensure compliance of the same and shall be checked during tool box talk before embarking on work.

Tool box talk report shall be prepared and kept at site within one hour of talk and it must be signed by all attendee to ensure participation of all in the talk. Tool box report shall be submitted to CONSULTANT/ OWNER

8. INCIDENT/ACCIDENT AND NEAR-MISS REPORTING, INVESTIGATION AND FOLLOW UP

8.1. Incident/Accident and Near-Misreporting

All incidents/accidents must be reported immediately. A report should be prepared by the Supervisor and submitted to the Site Manager within 12 hours of the occurrence and shall serve as a source for education of employee to prevent reoccurrence of similar incident/accident.

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Contractor shall submit the Initial report of all Accidents/Incidents within 12 hrs.to Owner / Consultant and detail report within 24 hrs. For serious incidents and near misses, with the potential for fatality, serious injury or significant environmental or material damage, Contractor shall notify Owner/Consultant without delay and within twenty-four (24) hours.

8.2. Incident/Accident Investigation

All incidents/accidents must be reviewed and analyzed to establish root causes and type of injury, trends and practices.

Investigation shall begin promptly after the occurrence of the incidents/accidents. The completed incidents/accidents investigation report shall be submitted to the Contractor Site Manager within 7 days of the occurrence. A copy shall be submitted to Owner/Consultant.

8.3. Follow-up

All incidents/accidents, including investigation results and recommendations, shall be discussed in the Site HSE meeting and shall be brought to the notice of employees in toolbox meetings.

Key Risks Identification and Management Risks

Working at height is a critical activity. Following hazards are associated with Working at height:

- Person Fall from height
- Material falling From height
- Slips, trips and falls
- Concealed utilities (i.e. electric cable Telephone cable, water line, Drainage line}
- Electric shock

9. HAZARD IDENTIFICATION AND RISK ASSESSMENT SYSTEM (HIRA)

The Contractor shall prepare and implement comprehensive HIRA as part of the HSE Management Plan prior to Commencement of the work or services and during the execution of the work also.

10. SITE HSE INSPECTION/AUDIT

All Site HSE checklists/Inspection reports shall incorporate a follow–up procedure to ensure that any recorded HSE violations have been promptly attended to in a satisfactory manner.

The Site HSE Inspections/Audit shall be planned by the Contractor.

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11. FIRST AID FACILITY

The contractor shall provide the first aid box at all the sites. The content of the first aid box shall include the following items:

- Twenty-four small sterilized dressings.
- Twelve medium size sterilized dressings.
- Twelve large size sterilized dressings.
- Twelve large size sterilized burn dressings.
- Twelve (15 gin) packets of sterilized cottonwood.
- One (200 ml) bottle of certified solution (1 per cent) or a suitable antiseptic solution.
- One (200 ml) bottle of mercurochrome (2 per cent) solution in water. (viii) One (200 ml) bottle of salt-volatile having the dose and mode of administration indicated on the label.
- One pair of scissors
- One roll of adhesive plaster (6 cm x 1in).
- Two rolls of adhesive plaster (2 cm. x 1in).
- Twelve pieces of sterilized eye pads in separate sealed packets.
- One polythene wash bottle (500 cc) for washing eyes.
- Twelve roller bandages 10 cm wide.
- Twelve roller bandages 5 cowhide.
- Six triangular bandages.
- One tourniquet.
- A supply of suitable splints.
- Two packets of safety pins.
- Kidney tray.
- One copy of first-aid leaflet issued by the Directorate General of Factory Advice Service and Labor Institutes, Government of India, Bombay.

All the content shall be kept in clearly marked and easy to remove cartons stored in such a manner that there is no rattling or spilling over even when the container is being moved Whenever applicable the cartons shall bear instructions for use, dosage etc.

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12. FITNESS TO WORK

The objective of Medical Assessment for Fitness to Work (FTW) is to assess health of employees in relation to their specific jobs such as working at height, to ensure they could perform required task without risk to health and safety.

The Contractors workers (as per the above category) shall under go through FTW prior to start work at site. It will be the responsibility of the Contractor to ensure compliance to this requirement.

12.1. Medical Examination requirement for working at height

Below specific requirements are must for Medical examination of Contractors employees working at height:

- History of Epilepsy.
- Blood Pressure.
- ECG+ any History of any Seizures.
- Vision Check.
- Blood Sugar (fasting &PP).
- And other general tests.
- Physical Examination- to confirm the person is physically fit.
- Blood Group (One time Test).
- General check about fear of Heights.

12.2. Other Requirements:

- Contractor to ensure that persons involved in working at height are trained, certified and having Valid I Card.
- Carry out tool box talk before starting of the work.
- Carry out site specific risk assessment and identify risk control measures for specific site work. (Ref doc).
- Ensure that persons are physically & mentally fit for working at height.
- Ensure that equipment shall be used as per approved standard for working at height.
- Ensure that equipment shall have facility of emergency rescue operation.
- Ensure person involved in working at height are trained in emergency rescue

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operation.

- Ensure that all equipment and safety devices used are inspected, certified by competent authority & valid & suitable for use.
- Quality conformance shall be carried out prior to start of work for working at height equipment's.
- Life cycle of equipment shall be checked
- In case of any part of equipment is found damaged or defective, it will be destroyed. "Working at height equipment's shall never being repaired". The Records, showing reasons for all the defective and damaged material shall be available and shall be stored separately at Contractor's yards.
- Ensure that Personnel Protective Equipment are inspected & in good condition
- Ensure that equipment used is within Safe working load mentioned on equipment.
- Ensure all tools are secured or kept in Tool kit / bag and there are no loose objects or tools.

13. PERSONNEL PROTECTIVE EQUIPMENTS

The contractors shall provide sufficient numbers of following personnel protective equipment's (PPEs) to workmen and supervisors/engineers to use them properly at work site.
Following five numbers of Personnel protective equipment's are identified as MANDATORY for all.

- Safety Helmet
- Coverall
- Safety shoes/footwear
- Safety Glasses
- Hand Gloves (as per job requirement) Other PPEs shall be as per job requirementlike Work at height- Full body harness (PETZL or equivalent make), Life line, Safety Net Arc Welding – Welding face shield Grinding – Grinding face shield Height work – Full Body harness (above 2 meters) Contractor to ensureproper use and selection of protective clothing / equipment for specialized jobs.

PPE's to be used shall be as per following Specification:

IS : 2925 – 1984 : Industrial Safety Helmets.

IS : 4770 – 1968 : Rubber gloves for electrical purposes

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IS : 6994 – 1973 (Part – I)	: Industrial Safety Gloves (Leather& Cotton)
IS : 1989 – 1986 (Part – I &	: Leather safety boots and shoes
IS : 3738 – 1975	: Rubber knee boots
IS : 5557 – 1969	: Industrial and Safety rubber knee boots
IS : 6519 – 1971	: Code of practice for selection, care and repair of Safety footwear
IS : 11226 – 1985	: Leather Safety footwear having direct molding sole
IS : 5983 – 1978	: Eye protectors
IS : 9167 – 1979	: Ear protectors.
IS : 3521 – 1983	: Industrial Safety belts and harness

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Technical Standard for working at height equipment's shall be as per following standard:

Quality Standards

Sr. No.	Name of equipment's	EN Standard
1	Energy absorbers	365
2	Slings	566
3	Retractable type fall arresters	360
4	Guide Type fall arresters on a rigid	353-1
5	Connectors	362
6	Dynamic mountaineering rope	892
7	Descended device	341
8	Anchor device Type-A/B	795
9	Fall arrester harness	361
10	Sit harness	813
11	Lanyards	354
12	Pulleys	12278
13	Fall arrester system	363
14	Work positioning belt	358

14. EQUIPMENT LIST AND INSPECTION CERTIFICATE

Equipment list must be made available and must be certified for safety as per the requirement of Factory Act. Tools and Tackles should be calibrated from the approved agency only.

List of Tools and Tackles

Item	Inspection/Calibration Date
Full body harness	Once in six Month
Rope Grab fall arrestor	Once in six Month
First Aid Box	Once in Month
Fire Extinguisher (10 Kg.)	Once in a Year
Extension board(without cable Joint with Socket) with Circuit Breaker	Monthly
Nylon tie line for tools	Once in a day

15. HSE REQUIREMENTS AT SITE

Contractor may conduct survey to assess the requirement of GI riser for high rise building.

For Work at Height: Contractor shall provide PETZL or equivalent system/metallic

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scaffolding as a working platform and full body harness with self-locking arrangement. Full body harness with self-locking arrangement shall be used for ascending/descending/work rest.

PETZL system or equivalent system/metallic scaffold should comply with relevant IS/EN/BS standard.

Only certified trained plumber undergone practical training on work at height shall be deployed.

15.1. Any working at height related activities has to be carried out with Permit system.

Work at Height

Working at Height is performing work at height where workers can fall 1.8m or more from where they stand or sit to perform work. This includes gaining access to working at height if there is a risk of falling 1.8m or more.

Examples of Working at Height are:

- Working on temporary platform more than 1.8mhigh
- Working on top of vehicles/tankers or building more than 1.8 m high Risk of Working at Height
- Fall from height
- Falling objects

Safety net, fall arrest system and two lanyard full body harness when working at height
While working at height, all loose tools shall be kept inside a container and good housekeeping shall be maintained.

All Working at Height shall comply with Working at Height Procedures Safety Net System.

"Safety net systems" Safety net systems and their use shall comply with the following provisions.

Safety nets shall be installed as close as practicable under the walking/working surface on which workers are working, but in no case more than 30 feet (9.1 m) below such level. When nets are used on bridges or similar kind, the potential fall area from the walking/working surface to the net shall be un obstructed.

Vertical distance from working level to horizontal plan of net	Minimum required horizontal distance of outer edge of net from the edge of the working surface
Up to 5 feet	8 feet
More than 5 feet up to 10 feet	10 feet.
More than 10 feet	13 feet

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- Safety nets shall be installed with sufficient clearance under them to prevent contact with the surface or structures below when subjected to an impact force.
- Safety nets and safety net installations shall be drop-tested at the jobsite after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at 6-month intervals if left in one place. If drop test not possible designated competent person shall certify that the net and net installation is in compliance with the requirement by preparing a certification record prior to the net being used as a fall protection system. The certification record must include an identification.
- Determined that the identified net and net installation were in compliance and the signature of the person making the determination and certification. The most recent certification record for each net and net installation shall be available at the jobsite for inspection.
- Defective nets shall not be used. Safety nets shall be inspected at least once a week for wear, damage, and other deterioration. Defective components shall be removed from service. Safety nets shall also be inspected after any occurrence which could affect the integrity of the safety net system.
- Materials, scrap pieces, equipment, and tools which have fallen into the safety net shall be removed as soon as possible from the net and at least before the next work shift.
- The maximum size of each safety net mesh opening shall not exceed 36 square inches (230 cm) nor be longer than 6 inches (15 cm) on any side, and the opening, measured center-to-center of mesh ropes or webbing, shall not be longer than 6 inches (15 cm). All mesh crossings shall be secured to prevent enlargement of the mesh opening.
- Each safety net (or section of it) shall have a border rope for webbing with a minimum breaking strength of 5,000 pounds (22.2kN).
- Connections between safety net panels shall be as strong as integral net components and shall be spaced not more than 6 inches (15 cm) apart.

15.6.1 Lifeline

- Horizontal or vertical life line shall be used while working on suspended platform or similar type of platform or working at thereof/edge
- Horizontal/Vertical lifelines shall be designed, installed, and used, under the supervision of a qualified person, as part of a complete personal fall arrest

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system, which maintains safety factor of at least two.

- Lanyards and vertical life line shall have a minimum breaking strength of 5,000 pounds (22.2kN).
- When vertical lifelines are used, each worker shall be attached to a separate lifeline.

15.6.2 Full Body Harness

- Ensure that the full body harness must be inspected prior tousle.
- Ensure that full body harness must be worn by the workmen while working at height.
- Full body harness lanyard must be anchored with a strong member.
- While climbing up or climbing down, one of the hooks of lanyard must be locked alternatively all the time.

15.6.3 Working Platform

Every working platform more than 1.8 mtr. High from which a person is likely to fall shall be of steel plates/planks/cage and shall be:

- Closely boarded, planked or plated.
- At least 700 mm wide if the platform is used as a footing only and not for the deposit/ keeping of materials.
- At least 900 mm wide if the platform is used for the deposit of materials.
- At least 1100 mm wide if the platform is used for the support of higher platform.
- Two metal/planks shall not have 25 mm gap between them the distance between two consecutive transoms or other supports on which a platform rests shall be fixed with due regards to the anticipated load and the nature of platform flooring. As a general rule such transoms shall not be placed more than 1.0 mtr. apart.

15.6.4 Scaffold

Scaffold Inspector (Project Field Officer)

This is the competent individual who shall inspect scaffolding prior to each use and perform full inspections as per the Inspection procedure. He will accept the Scaffold after ensuring the followings;

- The scaffold erected complies with legislation.

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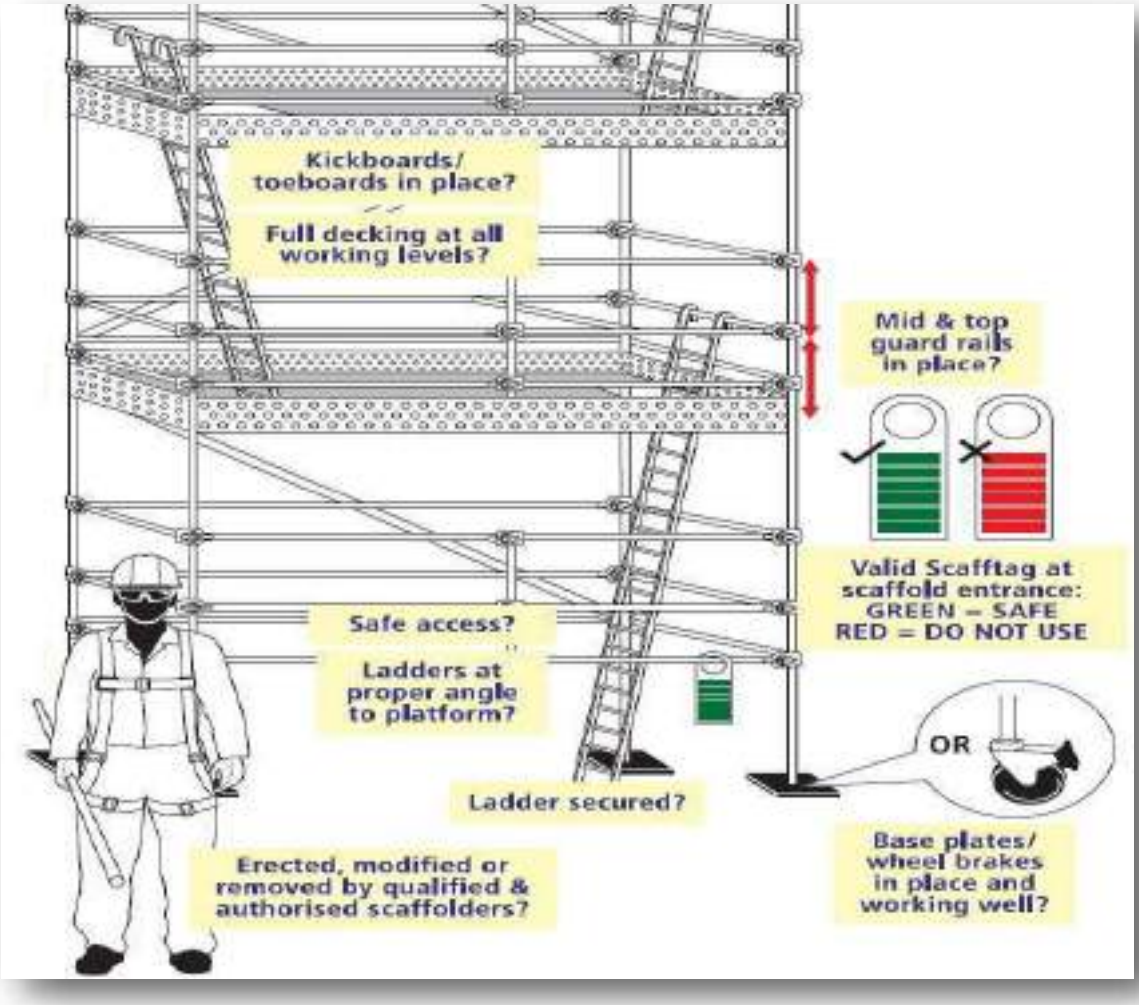
- The permissible loads per deck and the working distance between the scaffold and the work surface are examined.
- Materials used for the scaffold are in a proper condition and in throughout the time it is in place.
- Existence and proper installation of collective protective equipment and means of access.
- Clear display of details of permissible loads on the scaffold.
- Acceptance is carried out prior to the scaffold being made available for the first time and is repeated after any alterations.
- Inspection is repeated at the frequency of 7 days. Issues scaffold tag (Green Tag) before its first use.

Scaffold Contractor

This refers to the company involved in the installation (erection, dismantling and alteration) and/or design of the scaffolding on behalf of CONTRACTOR.



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- The erection contractor shall ensure that the scaffolding is erected in compliance with the OHSAS/IS standards. Worksite specifications and considerations shall be incorporated into any such plan.
- Ensure availability of competent staff and certified material all the time.
- Scaffolding may be erected, dismantled or altered only under the supervision of a competent individual who has received adequate specific training for the intended operations, specifically including the following:
- Understanding the erection, dismantling and alteration plans for the scaffolding
- Ensure PPEs and Safety at work during erection ,dismantling and alteration of the scaffolding.
- Measures designed to prevent the risk of falling person's and objects.
- Safety measures applicable in the event of a change in weather conditions.
- Permissible structural load criteria.
- Any other risk that may be entailed by erection, dismantling and alteration operations.
- Scaffold material: Safe handling, and storage.

Scaffold User

- The User shall ensure that acceptance of the scaffold has been properly carried out; green Tag is issued and provide notification of any alterations. Work from tagged scaffolds only. Comply with special conditions/additional controls noted on the access tag.
- It shall observe all restrictions on use (particularly permissible loads). Its requirements should be taken into consideration in the specifications during erection.
- Use scaffolds only for their intended purpose.
- Do not use unstable objects or makeshift devices to increase the working height of the scaffolds.
- Use portable ladders as a means of increasing the working height only after the competent person has determined that the stability of the structure has not been compromised, and adequate fall protection is in place.

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- Do not straddles, stand on, or work outside of the guardrail.
- Use designed access means to descend or ascend a scaffold (stairs, attached ladder, or specially designed end frames). Do not uses cross bracing or side rail
- Keep only the tools and materials on the platform that are necessary to perform the task. Control all slipping and tripping hazards by removing or securing the tools/materials.
- Do not modify or remove a scaffold system/component or status tag.
- Notify supervision immediately if a scaffold is damaged, weakened, or otherwise deficient.
- Scaffold users/ Scaffold erectors shall use IS and EN standard double lanyard safety harness with absorbent.

Inspection Points

To ensure the integrity and proper installation of scaffolding, a certain number of points shall be inspected. Inspection of these points ensures a basic level of safety. Following fundamental inspection points are as follows:

- Environment and location
- Supports and soleplates
- Structure and posts
- Decks
- Scaffold Capacity Standards
- Working levels
- Access
- Signs and signage

Mobile Scaffolding

- Mobile scaffolds are identical in design to fixed scaffolds, except that their tubular structure is lighter and in terms of support, the wheels do not offer the same load-bearing area as footplates on fixed scaffolds.
- Erection is simple and shall be carried out using personal protective equipment. Lastly, during erection, dismantling and use, the brakes shall also be applied. Care should be taken to ensure that mobile scaffolds are installed on flat surfaces.

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- Mobile scaffolds are highly practical for short jobs at relatively low heights.
- Acceptance is carried out after erection has been completed.
- They are moved as the work being carried out progresses. No fresh acceptance is required after each move, but the workstation shall be verified (working distance, brakes applied)
- A freestanding scaffold shall be considered safe when the total height is equal to or less than four times the minimum or least base dimension.
- Rules for use
- Do not extend the base to increase the height.
- Brace each frame level as per the manufacturer's instructions.
- Do not raise work surfaces by placing decks on rails or midribs.
- Do not climb on the guardrails or other structural components.
- Observe the manufacturer's guidelines governing the installation of brackets, material hoists etc.
- Stay clear of power lines and observe safety distances. (If any)

Scaffold safety

The following safety tips are as guidelines in avoiding job-site situations that could prove dangerous to scaffold workmen.

- The Scaffold to the Building: Scaffolding should be tied to the structure using heavy wire or tie-in devices. The first vertical tie should be at the maximum height of 4 times the narrowest base dimension. Additional ties are not to exceed 26 feet vertically. Maximum horizontal distance between ties is not to exceed 30feet.
- Don't Overload Scaffolding: Follow the safe load capacities as given by the scaffold manufacturer. There's a limit even to what steel cansupport.A4-to-1-safetyfactor must be figured on scaffolding.
- Use Metal Catwalks, Platforms; where available. If wood plank is used, it must be scaffold grade or better. Inspect thoroughly before every job to make sure it is free from breaks, knots, and cracks or warp age. Decking should be full width.
- All working platform must be constructed with the specific requirement of job.
- If the working platform is not permanent then safety belt must be used.
- There shall be firm foundation for all scaffoldings. All scaffolding shall be made of sound material.

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- Scaffolding material shall be inspected and used, only if found in good condition.
- Provide metal base plate is used under all upright or standard scaffoldings. Correct type of couplers shall be used for all connections.
- Plumb and level scaffoldings as erection proceeds, so that braces will fit without forcing.
- Fasten all braces securely.
- Working platforms shall be provided with guards. This should consist of top rail, mid rail, and toe board. The toe board shall be of minimum height 100 mm, while the mid rail and top rail shall be at heights of 600 mm and 1200 mm respectively.
- Do not use ladders or makeshift devices on top of scaffoldings to increase the height.
- Shall be placed at least 75 deg. to the floor.
- Fall arrestor to be used where ever applicable.
- The following safety tips are as guidelines in avoiding job-site situations that could prove dangerous to scaffold workmen.
- Don't Ride Moving Scaffold; and remember scaffold units are limited in height to 4* times
- Their narrowest base dimension (unless base is widened by outriggers or more end frames; or tied into building.) Always keep casters locked. (except tore-spot)
- Don't Climb Braces: Use the steps provided on most steel scaffolds to climb up to or down from work levels. Use scaffold climbing ladders where required.
- Protect Working Levels: Use overhead canopies to protect workers on lower work levels when work is being done overhead. Rope off un safe areas underneath scaffold or provide wire mesh around work area.
- Use Double Guard Rails; and toe board so exposed side sat platform heights of 1.8 meter or more.

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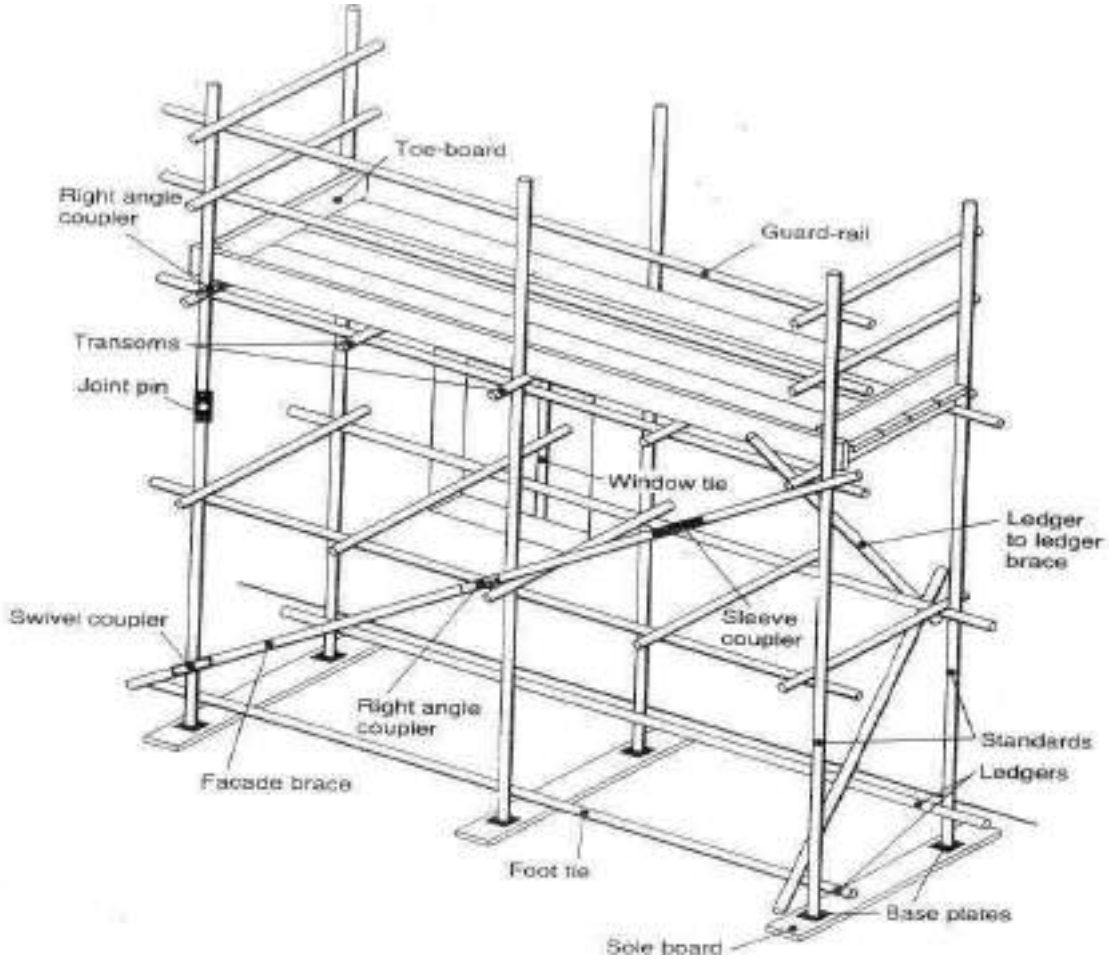
Illustration of a Sample Independent Scaffold



15.6.5 Ladders

- Fall protection is not needed when climbing up or down ladders less than 20 feet/6.1 meters, using 3 points of contacts.
- Portable ladders, steps and trestles should only be used for light duties of short duration. Otherwise, properly constructed means of access should be provided.
- Aluminum ladders can generate sparks when struck against rusty iron, so it must be used in Hazardous Areas with special care.
- Aluminum ladders must not be used in areas where they might be splashed with acids or alkalis ; e.g. Utilities Area

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- Ladders with metal reinforced, Damaged or rotten stiles, Missed footing on ladder rungs must not be used.
- Over-reaching and over-balancing is not allowed.
- Every time before use, the user will carry out inspection of ladder.
- If the work to be done necessitates the use of both hands, a safety belt must be used.
- Tools and materials must not be hand carried by persons ascending or descending ladders. Where applicable light tools should be carried in pockets, tool belts or shoulder bags, provided they do not impair movement and are held securely.
- Rungs, stiles, or treads to be checked for bending, twisting or signs of abuse or undue wear.
- Feet to be fitted with various types of bases and in good order. Synthetic non-slip, wooden or metal.
- Non-slip stair treads mats of stepladders, should be fitted and in good condition.
- In case of moving ladders fitted with wheels, Hinges and locking devices to be secure and in good working order.
- All portable ladders must be in good condition as per the site norms.
- Ladder shall extend 3' to 4'above the point of Landing and topmost 3 rungs shall not be used.
- Ladder is checked visually for defects before every use.
- Ladders shall not be used in a horizontal position as runways or scaffoldings.
- Ladders shall not be placed in front of a door that opens toward the ladder unless the door is locked, blocked or guarded.

15.6.6 User Ladder Safety Checklist

The following check list specifies the main points to remember when using ladders:

- Do not erect:
- On sloping ground
- On top of movable objects
- In high wind
- In front of a door which may be opened
- Against a slippery or unstable surface

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- At a shallow angle, or use horizontally as a plank or bridge
- Leaning to onside

15.6.7 Donor

- Drop things from ladder.
- Straddle from the ladder to a nearby foothold..
- Allow more than one person up a ladder at time.
- Use a ladder which is too short.
- Use a makeshift or 'home-made 'ladder.
- Over-reach (generally always keep hips within the stiles).
- Slide down ladder.
- No ladder should be used if it has: A missing, loose or defective rung or tread.
- A defective stile side member.
- A defective rope or associated fitting (rope operated extension ladders).
- Any sign of warping.
- Missing fastenings or rivets, guide or latching hooks.
- Always Return ladders to store as soon as they are finished with.
- Inspect a ladder immediately after any fall or overload.

15.6.8 Activities Allowed on Ladder

- A ladder is considered to be suitable for access of personnel to an elevated area only. No significant works may be carried out from a ladder. In particular, activities such as those below may not be carried out on ladder:
- Carrying tools (other than those which might clip onto a tool belt) up to an elevated level.
- Activities involving heavy manual labour.
- Activities requiring reaching or stretching such that the body is no longer centered over the ladder.
- For these types of jobs, a work platform such as a scaffold is required. The safe working position from a ladder is to have both thighs and hips within the styles.

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15.6.9 Color code and inspection

- Color code of the year shall be painted on one style only and equal to one rung spacing.

15.2. Roof work

- All roof-work operations should be pre-planned and properly supervised.
- Roof work should only be undertaken by workers who are physically and psychologically fit and have the necessary knowledge and experience for such work.
- Work on roofs shouldn't be carried on in weather condition that threaten the safety of workers.
- Crawling boards, walkways and roof ladders should be securely fastened to a firm structure.
- Roofing brackets should fit the slope of the roof and be securely supported. Where it is necessary for a person to kneel or crouch near the edge of the roof, necessary precautions should be taken.
- On a large roof where work have to be carried out at or near the edge, a simple barrier consisting of crossed scaffold tubes supporting a tubing guardrail may be provided.
- All covers for openings in roofs should be of substantial construction and be secured imposition.
- Roofs with a pitch of more than 10 should be treated as sloping.
- When work is being carried out on sloping roofs, sufficient and suitable crawling boards or roof ladders should be provided and firmly secured imposition.
- During extensive work on the roof, strong barriers or guardrails and toe-boards should be provided to stop a person from falling off thereof.
- Where workers are required to work on or near roofs or other places covered with fragile material, through which they are liable to fall, they should be provided with suitable roof ladders or crawling boards strong enough and
- When spanning across the supports for the roof covering to support those workers.
- A minimum of two boards should be provided so that it is not necessary for a person to stand on a fragile roof to move a board or a ladder, or for any other reason.

15.3. Electrical Safety

- Only authorized electrical engineer / electricians are permitted to do the electrical work.

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- Do not use extension cords or electric hand tools with exposed wires.
- To switch-off electrical supply in case of an emergency must be enabled at all times.
- All temporary electrical installations carried out on the site must be in accordance with the local regulations and specifications.
- The installations must be inspected regularly by a competent person (e.g. electrical engineer/supervisor) to ensure that they are in safe condition and working faultlessly.
- Each electrical power tools and electrical equipment must be under protection of earth leakage/residual current protective device(ELCB/RCCB).
- Portable power tools used on site must have protective insulation ("double insulation").
- All electrical machines, tools and appliances must be inspected by a competent person (e.g. electrician) to ensure that all equipment's are in safe condition and working faultlessly. To confirm that the inspection was conducted the equipment must be labeled or marked clearly and registered. The documentation must be submitted to TE for records.
- Assume that all circuits are live until they have been thoroughly checked and proven dead. Never work on a live circuit.
- When using electrical equipment in an environment with electrical conductivity (e.g. in confined spaces like case pipes, containers, towers) the voltage used may at maximum be 24 Volt AC. (fed from a safety low voltage transformer)
- Never use a fuse heavier than the capacity of the circuit. Also never attempt to bridge abuse.
- Never tamper with any electrical wiring or apparatus.
- Do the cable laying as per standard specifications and requirement; do not lay down power cables adjacent to secondary cables of welding machine.
- Assess overhead power line hazard and keep safe distance from it.
- All electrical equipment's, motors, transformers, welding machines, etc. to be provided with earth connections.

15.4. Power & Hand Tool Operation

- All portable tools are to be connected through control bus with ELCB.
- All contractors should ensure proper Earthling of all electrical equipment's used by

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them. Suitable earthling pits must be made if required.

- Examine electric cable for defects before use.
- Do not ever insert free ends of wires into sockets and hold them in place with matchsticks / other means. Always use industrial three pin plugs.
- Check the RPM rating of grinding wheels. The RPM rating must be greater than or same to that of the driver. Wheel guard should be used in proper position before grinding. Also proper PPEs must be ensured (goggles &hand gloves).
- Do not tie electric cords to metal rods or nails.
- No cable should run under the ground. It must run overhead at a 2 m height to avoid pinch point and creating trip hazard
- AlltoolsandTacklesmustbeexamineddailybeforecommencingworkandrecordtobemaintain ed.
- Defective tools are to return to store.
- All electrical tools must be inspected at regular intervals by an authorized electrical person and record to be maintained.
- The weight, size & type of tool should be selected to suit the job carried out.
- The handles of tools should be intact and properly tightened. Split handles should be replaced. To avoid slippage, grease and oil should be wiped off.
- Insulated and non-conducting tools shall be tested for electrical resistance.
- Wrenches should not be pushed but pulled. Chisels struck by others should be held by tongs and not by hands.
- Chipping should always be done away from self.
- Hand tools should not be allowed to lie down on benches, scaffoldings etc. from where they can fall. They should be properly stored.

15.5. Welding

The metal frames and cases of mains-powered welding rectifiers, transformers and voltage regulators and of engine driven welding machines must be positively earthed locally throughout the work.

- Welding leads and return leads must be protected against physical damage.
- Insulated electrode holders and cable lugs / protectors must be used.
- The return lead must be attached to the work place as close as reasonably practicable to the welding point.
- If mains power is used, the work piece must be positively earthed using a well-

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protected earth wire connected at both ends by bolted lugs or secure screw clamps.

- Bolted joints in pipelines and structures must not be relied upon to provide adequate electrical continuity for welding currents.
- Electric arc welding should not be carried out on equipment suspended from a crane because of the risk of damage to lifting wires from uncontrolled stray currents.
- Welders must not wear metal rings, bracelets or necklaces during the work as induced currents from the welding equipment might heat these.
- Dry, non-conductive gloves should be worn.
- The welder must always disconnect the electrode holder from the supply before attempting to replace an electrode.
- The welder should not lean against an earthed conductor whilst manipulating live electrodes.
- Welders working with electrodes fed from different phases of a three-phase supply should not work in close proximity to one another.
- Ensure that welding machine is in order and approved by site engineer.
- Ensure that welding cables are in order.
- Remove all combustible material from welding area to avoid fire.
- Place a fire extinguisher nearby welding premises.
- Ensure welding holder, cable and its lugs in good condition and use only industrial power socket and plugs (3 Pin) to avoid electricity risk.
- Make sure that welding machine is provided with ON/OFF switch and is earthed/grounding.
- Do not over load electrical appliances and cable, shocked pined.

15.6. Gas Cutting

- Gas cylinders must be secured in the vertical position to prevent them being knocked or pulled over.
- Long lengths of hose should be avoided, but;-
- Cylindersmustbekeptfarenoughawayfromtheweldingorcuttingoperationsto prevent contact with sparks, flames and metals platter.

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- Cylinders must be placed where they are unlikely to be damaged by stray electric currents or falling objects.
- Cylinders must not be taken into confined spaces.
- The torch must always be lit from a lighter provided for the purpose. There should be no attempt to light it from hot metal.
- Check the cylinder and its valve or leakage and move out any leaking cylinder immediately.
- Ensure that flash back arresters are installed with torch and NRV (Non return valve) on the gas cylinders side.
- Ensure cylinder is far away from fall of sparks and hot metal.
- Check the regulator and torches that they are inspected prior to every use.
- Check for leaks around regulators, hoses/fittings & nozzle with soap solution.
- Check the entire hose length if it is cracked or worn out cut that length of hose or replace the hose.
- Check that flash back arrester used for the purpose is of approved make/specification only.
- Place a fire extinguisher nearby welding premises.

15.6.1. Gas Cylinders

The handling of gas cylinders must comply with local legislation and TE's regulations as per particulars given below:

- Gas cylinders must be stored protected from excessive heat, fire, dangerous corrosion, mechanical damage or access by unauthorized.
- Gas cylinders must not be stored together with flammable materials.
- Gas cylinders must be secured to prevent them from falling over.
- Gas cylinders must be capped and operated upright.
- Use cylinder trolley / cage for the transportation of gas cylinders at site.
- Never use oil or grease on the regulator of a cylinder valve.
- Store gas cylinders in ventilated area.
- Don’t keep LPG cylinder in confine/below ground area.
- Gas stores must not be set up in critical areas such as stairways, corridors,

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emergency routes, garages or passages for person's or vehicles.

- Never transport by rolling them on the ground or use them as rollers or supports.
- Never attempt to repair cylinder.
- Leaking regulators, cylinder valves, hose pipes or other equipment should be taken out of service.

15.7. Grinding Operation

- Grinding wheels should be stored in dry place.
- After expiry date, grinding wheel must be condemned, broken in to pieces.
- Power supply cable of adequate current carrying capacity shall be used and it should be in good workable condition without abrasions, cuts or puncture in outer insulation.
- Socket pin provided at supply end and On/off switch in working condition.
- Proper earthling of the body in case of metallic body.
- Wheel guard properly fitted imposition.
- Machine body without any damage like cricket.
- Moving part (wheel) must be properly fixed to the machine with the help of spanner.
- Grinding wheel must be of suitable size as per the speed of grinding machine.
- Grinding wheel without manufacturer's stickers having size, speed and expiry date must be condemned.
- Don't use portable grinding machine as bench grinder.
- Don't fit over size wheel than recommended size by machine/wheel manufacturer.
- Don't grind small, unstable object without fixing it in the vice.
- Don't over press the grinding wheel against the job for fast removal of metal.
- Put OFF the main switch, while machine is not in use (tea breakneck.).
- Don't chip off grinding/cutting wheel for achieving fast cutting rate.

PPEs:

- Use of helmet, face shield or safety goggles (where face shield is not possible.) and hand gloves.

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15.8. Use of Power Tools and Cables

- All electrical equipment and tools used by the contractors and their employees shall be properly checked by contractor's supervisor before use.
- All power tools must have proper guard at all-time.
- Leads /cables must be placed so that they do not create a trippig hazard.

15.9. Pressure / Leak Testing

Hydrostatic and Pneumatic Test

Access to the test area shall be limited to essential personnel only. before the test commences compliance is required with the following points:

- Persons supervising pressure or leak tests must have sufficient knowledge and experience of testing to fully understand the hazards of the activity and the precaution, which must be taken.
- Effective communication, including formal procedures, must be established between sites whenever the test envelope extends beyond one site, for example, pipelines.
- The area shall be cordoned off (using tape, shields or barriers, etc.) at an adequate distance from the equipment to be tested, as specified on the Permit to Work
- Warning signs shall be posted at access ways, at other strategic positions, and on the equipment to be tested (including the doors of test workshops or other designated areas.
- Pressuring equipment shall be provided with suitably calibrated pressure control/regulator devices
- Pressuring equipment shall not be left unattended at any time during the test.
- Pressuring equipment shall be isolated from the equipment under test and where practicable disconnected, when the test pressure has been reached.
- Care must be taken to ensure that materials of construction have the required ductility at the test temperature to prevent brittle fracture.
- A safety valve should be fitted to the equipment/system being tested, set to relieve at a pressure that will prevent over pressurization.
- Sufficient venting / draining points shall be provided in order to prevent trapping of pressurizing medium behind non-return valves, check valves, between isolation

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valves, or within dead legs of the pressure envelope.

- The equipment/plant to be pressure tested must be subjected to thorough examination prior to testing. It may be necessary to 100% inspect all welds using visual, radio graphic or other NDT techniques.
- The gas supply must be isolated when test pressure has been achieved.
- The pressure envelope must contain sufficient vents, to a safe location.
- De-pressurization after pneumatic testing must be gradual.

15.10. Barricades and Warning Signs

- Area where work is being carried out above man height or below 1' ground depth must be barricaded. Linked barrier with link chains must be provided by the contractor for cordoning the area at ground level, during GI work.
- Follow the instruction of all types of warning signs like "NO SMOKING" "NOENTRY" "DANGER" "Work at height", "Inconvenience to member of public regretted/work in progress","
- Name of the Contractor and contact details"

15.11. Basic Safety Rules For The Construction Site

- The construction site shall be considered a restricted area and unauthorized entry into the site is strictly prohibited. Anyone found trespassing should be asked to leave the site immediately.
- All persons of CLIENT/Consultant/Contractor shall be responsible for their own safety in plant or work sites.
- Nobody authorized to touch any valve, switch, or interfere with plant/site activities.
- Children below 18 years are not allowed inside plant / worksite.
- Never walk on the pipes, equipment, structure etc.
- Always use stairs, handrails & walkover platforms.
- Never carry sharp or pointed tools in pockets.
- Alcoholic beverages will not be consumed, brought into, or manufactured on the work sites or inside the plant.
- Drugs/intoxicant substances will not be used, brought into, or manufacture don't he site or plant.

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- Cigarette, beedi smoking is not allowed except in the designated smoking booths.
- Firearms, explosives, knives or other types of weapons will not be allowed on the site.
- Gambling or any other form of betting games is prohibited.
- Discrimination on the basis of race, sex or national origin is prohibited.
- Horseplay, Fight, Practical jokes, Aggressive or abnormal behavior is prohibited.
- Individuals under the influence of alcohol or drugs will not be permitted entry to the site.
- Safety helmet, safety shoes, ear plug or ear muff, hand gloves, safety goggles, safety harness &clothing for body protection are mandatory in the plant or work site.
- Use other personal protective equipment as displayed in plan/site.
- It is strictly not allowed to use non-intrinsically safe equipment or instruments in the operational area of site.
- All vehicles for use on the site shall conform to the requirements of the Vehicle Entry Permit. Maximum Speed limit inside complex is 10km/Hr.
- In case of Emergency dial appropriate agency like Fire, Hospital, Security etc as displayed.

Violation of the Rules and Regulations might result in removing the person(s) concerned from the premises and denying the person(s) concerned from any future access to the site. The site in-charge will judge whether permanent removal of the individual from the premises is justified depending on the seriousness of the violation(s). All Indian laws shall be complied with at all the time.

15.12. Site Emergency Preparedness and Response

The CONTRACTOR shall establish, what are the arrangements in the event of an emergency.

The CONTRACTOR shall ensure that their Personnel are familiar with the essential emergency equipment, the use of which shall be demonstrated and practiced in drills.

The CONTRACTOR shall check the emergency procedures and the location and condition of the emergency equipment.

The CONTRACTOR personnel will be instructed of the actions to take in the event of serious personal injury, gas or toxic release, fire, explosion, heavy rains, wind storms, chemical spillage, land slide, scaffolding or structure collapse, critical damage to operating equipment, etc. and other emergency situations during the induction training and other

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ongoing training sessions.

These situations may demand adequate rescue and relief measure to handle such events quickly and effectively.

In an emergency, or on hearing the alarm, every supervisor shall ensure the following;

- All work is stopped atone.
- All equipment vehicles and tools are shut down (all sources of ignition).
- All men are evacuated to a pre-determined Muster point.
- A roll call is taken and every man is accounted for.
- No one is permitted to return to work until notification has been received from the CONTRACTOR representative that it is safe to dose.

15.12.1. Emergency Preparedness

The basic and essential features of any emergency Preparedness are to analyses and plan for the potential risk. This includes;

- Establishing and maintaining effective communications.
- Liaison with local emergency services and authorities.
- Action Procedure (evacuation routes and assembly pointed.).
- Appointment of key personnel and specifying their duties and responsibility.
- Emergency Response Drills

15.12.2. Emergency Response Drills

Effectiveness and comprehensiveness of Emergency Response Plan must be tested on a regular basis. Drills which reflect the conditions induced from the more likely emergency occurrences must be conducted. CONTRACTOR should conduct such drill on periodic basis. All emergency drills, exercises and responses to actual incidents shall be fully documented and followed by a complete review and when necessary, procedure revision process.

Initiate any required procedural changes, and initiate the dissemination of any lessons learned through the Site HSE communication system.

15.13. Road Safety Norms

- For roadside working site to be barricaded..
- Only eligible driver can drive required vehicle inside site
- Speed limit norms of site must be followed
- No riding or travelling on the back of open end vehicle, fork lift or trailers should be done.

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15.14. Environment

The CONTRACTOR shall pay due regard to the environment by preserving air, water, soil, animal and plant life from adverse effects of the CONTRACTOR's activities and minimizing any nuisance which may arise from such operations.

All waste generated by the CONTRACTOR shall be contained and disposed of in accordance with the legal requirement on waste management.

15.15. Labor Welfare &Legal Requirement

- All mandatory provisions with regard to safety as prescribed under contract Labor (Abolition & Regulation) Act 1970 and Rules made there under are applicable.
- Workmen compensation insurance and registration under ESI should be maintained.
- Time to time, all rules and regulations suggested by safety committee of site must be followed and implemented

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ANNEXURES

ANNEXURE – A

RELEVANT IS-CODES FOR PERSONNEL PROTECTION

IS : 2925 – 1984	:Industrial Safety Helmets
IS : 4770 – 1968	:Rubber gloves for electrical purposes
IS : 6994 – 1973	:Industrial Safety Gloves (Leather & Cotton)
(Part – I)	
IS : 1989–1986	:Leather safety boots and shoes
(Part – I & III)	
IS : 3738 – 1975	:Rubber knee boots
IS : 6519 – 1971	:Code of practice for selection, care and repair of Safety footwear
IS : 11226 – 1985	:Leather Safety footwear having direct molding sole
IS : 5983 – 1978	:Eye protectors
IS : 9167 – 1979	:Ear protectors.
IS : 3521 – 1983	:Industrial Safety belts and harness

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ANNEXURE – B

FORMAT - 1.0

1.0 : HEALTHY, SAFETY & ENVIRONMENT (HSE) PLAN

Project : ----------

Contractor:----------

Date : ----------

Owner: ……

(To be prepared & submitted by each Construction Agency)

Activity Description	Procedure/ W.I./ Guidelines	Code of Conformance	Performing Function			Audit Function
			Performance	Checker	Approver	Customer Review/ Audit Requirements

PREPARED BY REVIEWED BY APPROVED BY

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MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (1/6)

Project: _____ Contractor: _____

Date: _____ Owner: _____

Inspection By: _____

Note: write 'NC' (Not Concern) wherever any of the items are not applicable

Item	Yes	No	Remarks	Action
HOUSEKEEPING				
Waste containers provided and used				
Sanitary facilities adequate and Clean				
Passageways and Walkways Clear				
General neatness of working areas				
Proper Material Storage				
Wooden Boards properly stacked and nails removed				
Cords, leads out of walk and traffic ways				
Scraps removed from the work site				
Other				
PERSONNEL PROTECTIVE EQUIPMENT				
Goggles : Shields				
Face protection				
Hearing protection				
Safety Shoes provided				
Hand protection				
Respiratory Masks etc.				
Safety Belts				
Safety Helmets				
Other				
EXCAVATIONS / OPENINGS				
Excavation permit				
Excavated earth kept away from edge				
Dewatering pump kept away from edge				
Safe access into excavated area				
Opening properly covered or barricaded				
Excavations shored				
Excavations barricaded				
Overnight lighting provided				
Other				

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MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (2/6)

Item	Yes	No	Remark	Action
Welding Cutting				
Valid not work permit				
Flashback arrester provided for cylinders				
Power cable not crossing the welding cable				
Adequate earthing provided				
No combustible materials kept near welding & cutting works				
Gas cylinder chained upright & kept in trolleys				
Cables and hoses not obstructing				
Screens or shields used				
Flammable materials protected				
Fire extinguisher (s) accessible				
Other				
SCAFFOLDING				
Fully decked platform				
Guard and intermediate rails in place				
Toe boards in place & tied properly				
Adequate shoring				
Adequate access				
Other				
LADDERS				
Extension side rails I m above				
Top of landing				
Properly secured at top & bottom				
Angle $\pm$ 70° from horizontal				
Other				

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MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (3/6)

Item	Yes	No	Remark	Action
HOISTS, CRANES AND DERRICKS				
Condition of cables and sheaves OK				
Condition of slings, chains, hooks and eyes OK				
Inspection and maintenance logs maintained				
Outriggers used				
Singh/ barricades provided				
Signals observed and understood				
Qualified operators				
Other				
MACHINERY, TOOLS AND EQUIPMENT				
Proper instruction				
Saftey devices				
Proper cords				
Inspections and maintenance				
Other				
VEHICLE AND TRAFFIC				
Rules and regulations observed				
Inspection and maintenance				
Licensed drivers				
Others				

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MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (4/6)

Item	Yes	No	Remark	Action
TEMPORARY FACILITIES				
Emergency instruction posted				
Fire extinguishers provided				
Fire-aid equipment				
Secured against storm damage				
General nemeses				
In accordance with electrical requirements				
Other				
Fire Prevention				
Personnel instructed				
Fire extinguishers checked				
No smoking in prohibited areas				
Hydrants clear				
Other				
ELECTRICAL				
Proper wiring &earthing				
ELCB's provided				
Ground fault circuit interruptors				
Protection against damage				
Prevention of tripping hazards				
Proper electrical cable joints				
Light poles secured				
Clear way to power distribution board				
Proper rating of fuses				

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MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (5/6)

Item	Yes	No	Remark	Action
HANDLING AND STORAGE OF MATERIALS				
Properly stored or stacked				
Passageways clear				
Other				
FLAMMABLE GASES AND LIQUIDS				
Containers clearly identified				
Proper storage				
Fire extinguiHSErs nearby				
Other				
WORKING AT HEIGHT				
Erection plan				
Safety nets				
Safety belts tied properly				
Illumination				
No loose material at height				
No body under working area				
All openings covered				
Other				
ENVIRONMENT				
Chemical and other Effluents properly disposed				
Cleaning liquid of pipes disposed off properly				
Seawater used for hydrotesting disposed off as per agreed proceeding				
Lubricant Waste/ Engine oils properly disposed				
Waster from Canteen office, sanitation etc. disposed properly				
Disposal of surplus earth stripping materials, Oily rags and combustible materials done properly				
Green belt protection.				

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MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (6/6)

Item	Yes	No	Remark	Action
HEALTH CHECK				
Hygienic conditions at labour camps OL				
Availability of First Aid facilities				
Proper sanitation at site, office and labour camps				
Arrangements of medical facility				
Measures for dealing with illness				
Availability of potable drinking waters for workmen & staff				
Provision of cretches for children				
ERECTION				
Slings/ D shackle checked				
Signal Man				
Tag line for guiding the load				
Protecting the slings from sharp edges				
No loose materials at height				
Ladder & platform welding inspected				
No one under the suspended load				
Stay rope				
SWL				

.....

Signature Of Resident Engineer with Seal

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Monthly Health, Safety & Environmental (HSE) Report
(To be submitted by each Contractor)

Actual work start date : _____for the month of:_____

Project:_____Report No : _____

Name of the Contractor:_____Status as on:_____

Name of work:_____

Name of safety officer_____

Item	This Month	Cumulative
Total strength (Staff – Workmen)		
Number of HSE meeting organised at site		
Number of HSE awareness programs conducted at site		
Whether workmen compensation policy taken	Y/N	
Whether workmen compensation policy valid	Y/N	
Whether workmen registered under ESI Act	Y/N	
Number of Fatal Accident		
Number of Loss Time Accident (Other than Fatal)		
Other accident (non loss time)		
Total No. of accident		
Total man-hours worked		
Man-hour loss due to fire and accident		
Compensation cases raised with insurance		
Compensation cases resolved and paid to workmen		

Remark

Date:_____/_____/_____ Safety Officer/RCM

(Signature and Name)

To: OWNER…… 1 COPY
1 COPY RCM/SITE-IN-CHARGE 1 COPY

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SUPPLEMENTARY ACCIDENT, INCIDENT&NEAR MISS REPORT

Project:_____Supplementary to report No._____

Site : _____Date:_____

Contractor: _____

NAME OF THE INJURED……

FATHER'S NAME……

SUB-CONTRACTOR M/S……

DATE & TIME OF ACCIDENT……

LOCATION……

BRIEF DESCRIPTION & CAUSE OF A ACCIDENT

NATURE OF INJURY / DAMAGE

COMMENTS FROM MEDICAL PRACTITIONER WHO ATTENDED THE VICITIM/INJURED

SUGGESTED IMPROVEMENT IN THE WORKING CONDITION IF ANY

LOSS OF MANHOURS AND IMPACT ON SITE WORKS

ANY OTHER COMMENT BY SAFETY OFFICER

Date:_____/_____/_____ SIGNATURE OF CONTRACTOR WITH SEAL

To : OWNER……1 COPY

: RCM/SITE-IN-CHARGE……1 COPY

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ACCIDENT REPORT

(To be submitted by Contractor after every accident within 2 hours of accident)

Report No._____ Date:___
Name of Site:_____ COTRACTOR_____

NAME OF THE INJURED……..
FATHER'S NAME…… SUB-CONTRACTOR M/S…….

DATE & TIME OF ACCIDENT……
LOCATION…….

BRIEF DESCRIPTION OF ACCIDENT

CAUSE OF ACCIDENT

NATURE OF INJURY / DAMAGE

MEDICAL AID PROVIDED / ACTIONS TAKEN

INTIMATION TO LOCAL AUTHORITIES

Date :_____/_____/_____ SIGNATURE OF CONTRACTOR WITH SEAL

To : OWNER…… 1 COPY
: RCM/SITE-IN-CHARGE 1 COPY

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PIPING SPECIFICATION

SPECIFICATION NO
1C1
SHEET 1 OF 6
REV 0

BASIC PIPING SPECIFICATION DATAS		MAXIMUM DESIGN CONDITIONS			
		TEMPERATURE ° C		PRESSURE bar g	
PRIMARY FLANGE RATING	150#-RF	**NG**	**0 to 60**	**NG**	**19.00**
		AG	**60**	**AG**	**19.00**
BASIC MATERIAL	CARBON STEEL				
CORROSION ALLOWACE	1.6 mm				
X-RAYS	100%				
SIZE RANGE	1/2"-12"				
CODE	**ANSI B 31.8**				

FLUIDS

NG : NATURAL GAS

AG : ACTUATING GAS

REV	DESCRIPTION	DATE	AUTHOR	CHECKER	APPROVED
0	**FIRST ISSUE**	**20.06.2017**	**MD**	**ADE**	**AD**

	PIPING SPECIFICATIONS						SPECIFICATION NO 1C1 SHEET 2 OF 6 REV 0
ITEM	**SHORT CODE**	**SIZE FROM-THRU**	**END CONNECTION**	**RATING AND/OR SCHED.**	**DIMENSION STANDARD**	**MATERIAL**	**REMARKS**
PIPES	**P**	1/2" - 2" 3" - 12"	BE-ANSI B16-25 BE-ANSI B16-25	40 40	ANSI B36-10 ANSI B36-10	ASTM A 106 Gr. B ASTM A 106 Gr. B	SEAMLESS SEAMLESS
ELBOWS 90 LR	**E**	1/2"- 12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
ELBOWS 46 LR	**E46**	1/2"- 12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
ELBOWS 30 LR	**E30**	1/2"- 12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
ELBOWS 22.5 LR	**E22.6**	1/2"- 12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
ELBOWS 16 LR	**E16**	1/2"- 12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
REDUCERS	**RC**	3/4"- 12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
REDUCERS	**RE**	3/4"- 12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
TEES EQUAL	**T**	1/2"- 12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
TEES RED	**TR**	3/4"- 12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
WELDOLETS	**WEL**	1.1/2"-12"	BW - ANSI B16-25	SEE PIPE	MANUFACTURER	ASTM A 105	SEAMLESS
CAPS	**C**	1/2"- 12"	BW - ANSI B16-25	SEE PIPE	ANSI B16-9	ASTM A 234 WPB	SEAMLESS
NIPPLES	**NBEP** **NOET** **NBET**	1/2" - 1.1/2" 1/2" - 1.1/2" 1/2" - 1.1/2"	BOTH ENDS PLAIN ONE END THRD-MNPT OTH ENDS THRD-MNP	80 80 80	ANSI B36-10 ANSI B36-10 ANSI B36-10	ASTM A 106 Gr. B ASTM A 106 Gr. B ASTM A 106 Gr. B	SEAMLESS-LG=100mm SEAMLESS-LG=100mm SEAMLESS-LG=100mm
FULL COUPLINGS THRD	**CF**	1/2" - 1.1/2"	FNPT ANSI B1-20-1	1500#	ANSI B16-11	ASTM A 105	SEAMLESS
CAPS THRD	**C2**	1/2" - 1.1/2"	FNPT ANSI B1-20-1	1500#	ANSI B16-11	ASTM A 105	SEAMLESS
PLUGS THRD	**PL**	1/2" - 1.1/2"	MNPT ANSI B1-20-1	1500#	ANSI B16-11	ASTM A 105	SEAMLESS

	PIPING SPECIFICATIONS	SPECIFICATION NO 1C1 SHEET 3 OF 6 REV 0

ITEM	SHORT CODE	SIZE FROM-THRU	END CONNECTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS
WN FLANGES	F	1/2"-12"		150# RF SEE PIPE	ANSI B16-5	ASTM A 105	WN to match with 1C1 pipe
ORIFICE FLANGES	FO	1" - 12"		150# RF SEE PIPE	ANSI B16-36	ASTM A 105	COMPLETE WITH GASKET BOLTS, NUTS JACK-SCREWS AND PLUGS
BLIND FLANGES	FB	1"-12"		150# RF	ANSI B16-5	ASTM A 105	
DRIP RINGS	DR	1" - 12"		150# RF	MANUF STD.	ASTM A 105	3/4" FNPT OUTLET CONNECTION
SPECTACLE BLINDS	SB	1" - 12"		150# RF	ANSI B16-5	ASTM A 515 GR 70	
RESTRICTION ORIFICES	RO	1" - 12"		150# RF	ANSI B16-5	ASTM A240 GR 304	
MONOLITHIC INSULATING JOINTS	IJ	2"-12"	BW - ANSI B16-25	150#	ANSI B16-5	PIPE PUPS: ASTM A 106 Gr.B	REFER DATA SHEET
STUD BOLTS	B	1/2" - 12"		150# RF	ANSI B18.2.1 ANSI B18.2.2	ASTM A 193 B 7 HEXAGONAL NUTS ASTM A194 GR 2H	
GASKETS SPIRAL WOUND	G	1/2"-12"		150# RF	API 601 MSS SP 44	WINDING ANSI 304 FILLING PURE GRAPHITE CENTERING RING CS	4.5 mm THK

PIPING SPECIFICATIONS

SPECIFICATION NO
1C1
SHEET 4 OF 6
REV 0

ITEM	SHORT CODE	SIZE FROM-THRU	END CONNECTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS
BALL VALVES	**VBA**	1/2" - 11/2"	FLGD RF:ANSI B16-5	600#	ANSI B16-10	BODY: ASTM A 105 BALL: ASTM A218 WCB / A 234 WPA / A 395 WITH ENP (75 microns)	FULL BORE WRENCH OPERATED. FIRE SAFE
		2"- 3"	FLGD RF:ANSI B16-5	150#	ANSI B16-10	BODY: ASTM A 216 WCB BALL: ASTM A 216 WCB / A 234 WPB / A 395 with ENP (75 microns)	FULL BORE WRENCH OPERATED. FIRE SAFE
		4"- 8"	FLGD RF:ANSI B16-5	150#	ANSI B16-10	BODY: ASTM A 216 WCB BALL: ASTM A 216 WCB / A 234 WPB / A 395 with ENP (75 microns)	FULL BORE GEAR OPERATED FIRE SAFE
GLOBE VALVES	**VGL**	1/2"-1 1/2"	FLGD RF:ANSI B16-5	600#	ANSI B16-10	BODY: ASTM A 105 TRIM: ASTM A182 F6	HANDWHEEL FIRE SAFE
		2" - 8"	FLGD RF:ANSI B16-5	150#	ANSI B16-10	BODY: ASTM A 216 WCB TRIM: ASTM A 182 F6	HANDWHEEL FIRE SAFE
SWING CHECK VALVES	**VCH**	1/2" - 11/2"	FLGD RF:ANSI B16-5	600#	ANSI B16-10	BODY: ASTM A 105 TRIM: ASTM A182 F6	HORIZONTAL INSTALLATION VERTICAL INSTALLATION FLOW UPWARDS
		2"-18"	FLGD RF:ANSI B16-5	150#	ANSI B16-10	BODY: ASTM A 216 WCB TRIM: ASTM A182 F6	HORIZONTAL INSTALLATION VERTICAL INSTALLATION FLOW UPWARDS

REDUCERS CHART

SMALL SIZE

LARGE SIZE	1/2"	3/4"	1"	1.1/2"	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	28"	30"	32"	36"
1/2"																				
3/4"	X																			
1"	X	X																		
1.1/2"	X	X	X																	
2"		X	X	X																
3"				X	X															
4"				X	X	X														
6"						X	X													
8"							X	X												
10"							X	X	X											
12"								X	X	X										
14"																				
16"																				
18"																				
20"																				
24"																				
28"																				
30"																				
32"																				
36"																				
42"																				

LEGEND

X :CONCENTRIC AND ECCENTRIC REDUCERS-BW

BRANCH CHART

BRANCH SIZE

HEADER SIZE

	1/2"	3/4"	1"	1.1/2"	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	28"	30"	32"	36"
1/2"	T																			
3/4"	TR	T																		
1"	TR	TR	T																	
1.1/2"	W	TR	TR	T																
2"	W	W	TR	TR	T															
3"	W	W	W	TR	TR	T														
4"	W	W	W	W	TR	TR	T													
6"	W	W	W	W	W	TR	TR	T												
8"	W	W	W	W	W	BW	TR	TR	T											
10"	W	W	W	W	W	BW	BW	TR	TR	T										
12"	W	W	W	W	W	BW	BW	BW	TR	TR	T									
14"																				
16"																				
18"																				
20"																				
24"																				
28"																				
30"																				
32"																				
36"																				

LEGEND

T : TEE EQUAL-BW

TR : REDUCING TEE-BW

W : WELDOLET- BW

BW : BRANCH WELD-CHECK IF REINFORCING PLATE IS NECESSARY ACCORDING ANSI B 31.8

I. PROCESS DATA

- PIPE CLASS : 1C1
- FLUID : Natural Gas Fluid Symbol :NG
- OPERATING CONDITIONS
  - Pressure (barg) : 4 Barg
  - Temperature (°C) : 03 to 48 (°C)
- DESIGN CONDITIONS
  - Pressure (barg) : 19 Barg
  - Temperature (°C) : -20 to 60 (°C)

II. VALVE DATA

- CONSTRUCTION DESIGN : BS 1873
- TYPE : HIGH RESISTANCE TO VIBRATIONS AND HIGH DIFFERENTIAL PRESSURE
  : UNIDIRECTIONAL
  : GLAND TYPE-BOLTED BONNET-NON ROTATING STEM
  PATTERN : STRAIGHT THROUGH GLOBE
- END CONNECTION : FLANGED RF - ANSI B16.5, 150#
- FACE TO FACE : ANSI B16.10
- BODY MATERIAL :

Below 2"	2"& above
ASTM 105	ASTM or ASTM A 216 Gr WCB

- DISC MATERIAL : ASTM 216 Gr. WCB +STELLITED or Equivalent/Superior
- SEAT : ASTM 216 Gr. WCB +STELLITED or Equivalent/Superior
- TRIM : ASTM A182 F6 or Equivalent/Superior
- STEM : ASTM A182 F6 or Equivalent/Superior
- GASKET : GRAPHITE or Equivalent/Superior
- PACKING : GRAPHITE or Equivalent/Superior
- OPERATOR : Wrench Upto 4", Gear for above 4"
- EXTENSION STEM : NO
- **PAINTING**
  - Surface preparation : SA 2.5
  - Primer : 30 - 40 µm
  - Finish : 30 - 40 µm
  - Final Paint DFT : 300 µm (min.)
- INSULATION : No

III. VALVE INSPECTION AND TESTING

- SHELL TEST : SEE API 598
- BACKSEAT TEST : SEE API 598
- LOW -PRESSURE CLOSURE TEST : SEE API 598
- HIGH-PRESSURE CLOSURE TEST : SEE API 598
- VISUAL EXAMINATION OF CASTINGS : SEE API 598
- HIGH-PRESSURE PNEUMATIC SHELL TEST : SEE API 598
- FIRE SAFE TEST : N/A

IV. QUALITY CONTROL

- MATERIAL CERTIFICATES : EN 10204 - 3.1
- ALL NECESSARY CERTIFICATES : ALL TEST CERTIFICATE INCLUDING FIRE SAFE. ANTISTATIC, PHYSICAL, IMPACT, CHEMICAL, PAINTING ETC.

NOTE :

1 Unless otherwise stated, all tests will be witnessed by the purchaser.

2 For detail of Painting, refer Painting Table

I. PROCESS DATA

- **FLUID**	:	Natural Gas
- **FLUID SYMBOL**	:	NG
- **OPERATING CONDITION**	:	A/G
- **TEMPERATURE (˚C)**		0-50 °C
- **PRESSURE (Barg)**		04 barg
- **DESIGN CONDITION**	:	A/G
- **TEMPERATURE (˚C)**		0-60 °C
- **PRESSURE (Barg)**		19 barg

II SPECIFICATION

- **DIMENSIONAL STANDARD**		ANSI B 16.10
- **CONSTRUCTION DESIGN**	:	API 6D
- **PIPE CLASS**	:	1C1
- **RATING**	:	150#
- **TYPE**	:	SWING CHECK
- **END CONNECTION**	:	FLANGED (RF) ANSI B 16.5
- **BODY MATERIAL**	:	ASTM A 350 Gr. LF2/ASTM A352 or LCB or Equivalent/Superior
- **WEDGE**	:	ASTM A 350 Gr. LF2/ASTM A182 F6 or Equivalent
- **DISC**	:	ASTM A 350 Gr. LF2/ASTM A182 F6 or Equivalent
- **HINGE PIN**	:	ASTM A 182 F6
- **GASKET**	:	GRAPHITE
- **PUPS (Applicable only for BW end)**		
- **LENGTH**	:	At least 2.0 D for size below 6" & 300mm for 6" and above size valves
- **MATERIAL OF CONSTRUCTION**		Suitable to Connecting pipe material in terms of strength and thickness
- **PAINTING (Refer Annexure II of PTS)**		A/G
- **SURFACE PREPARATION**	:	SA 2.5 Type of paint, DFT and total DFT shall be as per paint system number
- **PRIMER**	:	Choose from table AS ISO 12944-5 suitable for highly corrosive environment
- **FINISH**	:	Final shade of valve shall be as per atached painting table. Final Paint DFT - 300 microns minimum
- **INSULATION**	:	NO

III. TEST :

- **HYDROSTATIC SHELL TEST**
- Test pressure : 1.5 x Design Pressure

- **HYDROSTATIC SEAT TEST**
- Test pressure : 1.1 x Design Pressure

- **AIR SEAT TEST :**
  Test pressure : 6 barg

- **HIGH PRESSURE CLOSURE TEST** : API 598
- **LOW PRESSURE CLOSURE TEST** : API 598
- **LEAK TEST** : API 598
- **FIRE TEST** : API 6FA
- **VISUAL AND DIMENSIONAL EXAMINATION TEST** : YES

IV. QUALITY CONTROL :

- **MATERIAL CERTIFICATES** : EN 10204-3.1
- **ALL TEST CERTIFICATES** : TEST CERTIFICATES INCLUDING, FIRE SAFE, ANTISTATIC, PHYSICAL IMPACT, CHEMICAL, PAINTING

CLIENT : INDRAPRASTHA GAS LIMITED	DATA SHEET (1C1) Y-TYPE STRAINER FOR ABOVE GROUND (A/G) SERVICES	DATA SHEET No. : VCS-DS-PL-023 Page 1 of 2

I. PROCESS DATA :

- FLUID	:	Natural Gas
- FLUID SYMBOL	:	NG

- OPERATING CONDITION

- FLOW RATE (m^3/hr)	:	NA
- TEMPERATURE ($^{\circ}$C)	:	0 to 60
- PRESSURE (Barg)	:	04

- DESIGN CONDITION

- FLOW RATE (m^3/hr)	:	
TEMPERATURE ($^{\circ}$C)	:	-20 to 65
- PRESSURE (Barg)		19

II. STRAINER DATA :

- DIMENSIONAL STANDARD	:	ASME B16.5, B16.9, B16.11, B16.20, B18.2.1 & B18.2.2
- CONSTRUCTION DESIGN	:	AS PER CODES AND TECHNICAL SPECIFICATION DOC. NO. 14588-CD-SS-001, PMS
- PIPE CLASS	:	1C1
- ANSI PRESSURE RATING	:	150#
- TYPE	:	Y-TYPE
- SIZE	:	1"
- END CONNECTION	:	FLANGED (RF) AS PER ASME B16.5
- BODY MATERIAL		ASTM A 216 Gr. WCB
- CAP / PLUG	:	ASTM A105
- SCREEN MESH		SS-304, CYLINDRICAL WIRE MESH WITH PERFORATED SHEET
- FILTRATION SIZE		100 MICRON
- STUD BOLTS / NUTS		ASTM A193-B7 / ASTM A194 2H (GALVANISED)
- GASKET		SS-304 SPIRAL WOUND, GRAPHITE FILLED, 4.5MM THK. WITH CS OUTER RING

III TESTS

- **HYDROSTATIC BODY TEST :**

Test pressure	:	1.5 x Design Pressure
Test Duration	:	1/2 HR

NOTES:-

1 Unless otherwise stated, all tests will be witnessed by the purchaser/authorised inspector
2 Net opening area of element shall be minimum 3 times X sectional area of inlet
3 Strainer body casting shall be defect free and shall be MPI/DP tested.

DATE	REV	BY	CHK	APP	REMARKS
17.07.2018	0	ADE	RNR	AD	ISSUED FOR REVIEW

GAS DETECTOR				Rev.
GENERAL	1	Tag Number	To be provided later	
	2	Quantity	As per SOR	
	3	Ambient Temperature	- 5 to 50 Deg.C	
	4	Service	Natural Gas	
	5	Purpose	Gas Detection in CGD application	
	6	% of Governing Component in Gas	94.5% Methane	
	7			
	8			
GAS DETECTOR	9	Sensor Type	IR Absorption Sensor *	
	10	Power Supply	24 VDC	
	11	Alarm Limit	10% LEL	
	12	Enclosure Material	Aluminium / CPVC	
	13	Enclosure Protection	IP42 or Better	
	14	Response time	T90 < 5 Seconds	
	15	Accuracy	± 1%	
	16	Electrical Connection size	3/4" NPT	
	17	Wattage	*	
	18	Mounting Accessories	Required	
	19	Relay Output	8A max*	
	20	Alarm Indication	LED's for alarm status (Power On, Failure, Gas Detection)	
	21	Hooter	Required, Integral	
	22	Allowable Hooter Sound Limit	Max. 85 dBA	
	23			
MISC.	24	Make / Model	*	
	25	Dimensions	*	
	26	Weight	*	
	27			
	28			

TABLE	S.NO	TAG NUMBER	LOCATION	QTY	MAKE / MODEL	
	1	To be provided later	-	As per SOR	*	

Notes: * TBD

1 Vendor to specifiy.*

2 Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).

3 Calibration certificates shall be provided by the Vendor.

4 Gas detector shall be installed above piping arramgement at a maximum distance of 30 cm from ceiling.

	CLIENT:	INDRAPRASTHA GAS LIMITED (IGL)					
	PROJECT:		0	22.04.2021	ND	UM	KP
			REV.	DATE	PRPD	CHKD	APPD

SOLENOID VALVE				Rev.
GENERAL	1	Tag Numbers	To be provided later (Note-2)	
	2	Quantity	As per SOR	
	3	Service	Natural Gas	
	4	Enclosure Certification	IP65	
	5	Operation: Direct/Pilot	Direct	
	6	Operating Mode NC/NO/UNIVERSAL	NO	
	7			
PROCESS DATA	8	Max. operating pressure (Kg/Cm2g)	*	
	9	Design Pressure (Kg/Cm2g)	*	
	10	Design Temperature (Deg.C)	-20 to 60	
	11	Ambient Temperature (Deg.C)	- 5 to 50 Deg C	
	12			
	13			
	14			
	15			
VALVE	16	Body Size/ Rating	As per SOR / 150#, Socket Weld	
	17	Body Material	SS 316 / Brass*	
	18	Trim Material	SS 316 / Brass*	
	19			
	20			
SOLENOID	21	Style of Coil	*	
	22	Coil Voltage	230 VAC	
	23	Coil Insulation Class	H	
	24	Electrical Connection	Required	
	25	Cable Entry	1/2" NPTF	
	26	Manual Reset	Required	
	27	Close Time	< 1 sec	
	28			
	29			
	30			
	31			
MISC.	32	Make	*	
	33	Model No.	*	
	34			
	35			
	36			

Notes:

1 **As per site requirement
2 Vendor to specify *
3 Tag no. is to be finalised later.
4 Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).

	CLIENT:	INDRAPRASTHA GAS LIMITED (IGL)					
	PROJECT:		0	22.04.2021	ND	UM	KP
			REV.	DATE	PRPD	CHKD	APPD

		SLAM SHUT VALVE				Rev.
GENERAL	1	Tag No.		To be provided later (Note-3)		
	2	Inlet Line No.		-		
	3	Outlet Line No.		-		
	4	Line Size & Schedule		**		
	5	Service		Down stream pressure protection		
	6					
	7					
PROCESS DATA	8	Fluid	State	Natural Gas	Gas	
	9	Flow Gas : Min. / Nor. / Max.		**		
	10	Inlet Pressure		4 barg		
	11	Pressure Drop at Various Flow Rates		**		
	12	Shut Off Pressure		**		
	13	Temperature : Operating / Maximum		**		
	14	Oper S.G	Mol Wt.	**		
	15	Cp/Cv	Compress. Factor	**		
VALVE DATA	16	Kg or Cg Min.	Kg or Cg Max.	*		
	17	Kg or Cg Selected		*		
	18	Predicted Sound Level (dBA)		* Less than 85 dBA		
	19	Valve Setpoint	Adjustable Range	*	*	
	20	Inlet Velocity (meters/second)		* Less than 40 m/sec		
	21					
VALVE BODY	22	Type of Valve		Slam Shut		
	23	Body Size	Port Size	*	*	
	24	End Conn: Flgd. Size & Rating		*, As per PMS		
	25	Facing & Finish		RF, 125 - 250 AARH		
	26	Body Material		ASTM A216 Gr. WCB or better		
	27	Trim Material		SS 316 / Brass*		
	28	Other Wetted Parts		SS 316 / Brass*		
	29	Leakage Class		Class VI as per FCI 70.2		
	30	Closing Time		Less than 2 secs		
	31					
	32					
OPTIONS	33	Pilot Operated		Integral Pilot Required		
	34	Manual Reset		Required		
	35	Failure Position		Close		
	36	Limit Switch		-		
	37	Valve Position Indicator (Local)		Required		
	38	Radiography		Not Required		
	39	Charpy V-Notch		Required		
	40	Impulse Tubing/Fittings		Required		
	41	Pressure Indicator		-		
	42	Installation		Horizontal / Vertical		
MISC.	43	Make		*		
	44	Model No.		*		
	45					
	46					
	47					

Notes:

1 ** As per site requirement.
2 Vendor to specify *
3 Tag no. is to be finalised later.
4 Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).
5 Vendor shall provide detailed GA drawing along with all parts name and MOC for the slam shut valve along with data sheet.

	CLIENT:	INDRAPRASTHA GAS LIMITED (IGL)					
	PROJECT:		0	22.04.2021	ND	UM	KP
			REV.	DATE	PRPD	CHKD	APPD

Document No.: 15792-PL-IC-DS-001

DATA SHEET-PRESSURE GAUGE

UNITS: Flow<-> Liquid- m*3/hr Gas- Sm*3/hr Steam- kg/hr Pressure-> kg/cm*2 G Temperatu**re<-> oC Level/Length<-> mm**

1	Type:-	Direct	
2	Mounting:-	Local	
3	Dial Size:-	150 mm	
	Colour:-	White with black inscriptions	
4	Case Material:-	SS316	
5	Bezel Ring:-	Beyonet type SS316/Screwed	
6	Window Material:-	Shatterproof glass	
7	Enclosure:-	WP to IP 65 as per IEC 60529 / IS 2147	
8	Pressure Element:-	Bourdon	
9	Element Material:-	SS316	
10	Socket Material	SS316	
11	Accuracy:-	+/-1% of FSD	
12	Zero adjustment:-	Micropointer	
13	Connection:-	1/2" NPT(M)	
	Connection Location:-	Bottom	
14	Movement:-	SS316	
15	Diaphargm Seal:-	--	
	Type:-	--	
	Wetted Parts Material:-	--	
	Others Material:-	--	
	Process Connection: Size & Rating	--	
	Facing & Finish:-	--	
	Capillary Material:-	--	
	Armour - Flexible Material:-	--	
	Capillary Length:-	--	
	Flushing/Filling connection with:-	--	
16	Over Range Protection:-	130% of FSD	
17	Blow Out Protection:-	Yes	
18	Options :-	a) Snubber	
	b) Syphon	c) Gauge Saver	
	d) Liquid Filled casing	e) Vaccum Protection	
	f) Solid front		
	g) Two valve manifold	Yes	
19	Quantity :-	*	

SL. NO.	TAG NO.	RANGE	PRESSURE kg/cm2			TEMPERATURE ºc			SERVICE	OPTIONS
			OP.	MAX.	DES.	MIN	MAX	DES.		
	*	*	0-40	-	49	-	65	-	Natural Gas	e,f,g

NOTES:

'*' Venodr to furnish

1 Since the natural gas is saturated with water and has corrosive constituents CO2-2.08%, the wetted parts of the instruments shall be suitable for that accordingly.
2 Vendor shall furnish Make and Model No. with product catalogues along with the offer.
3 Above data-sheet is typical for all Pressure Gauges used in the respective P&ID.Vendor shall submit the individual data sheet of each pressure gauge .
4 Make of the PG shall be Waree / A N Instruments / General Instruments.

☐ DEVIATION ☐ NO DEVIATION ☐ VENDOR'S SIGNATURE WITH SEAL

DATE	REV	BY	CHK	APP	REMARKS	
18.06.2018	0	PK	MD	AD		DATA SHEET FOR PRESSURE GUAGE

INSPECTION AND TEST PLAN – FLANGES SPECTACLE BLINDS & DRIP RINGS

0	24.05.2017	ISSUED AS STANDARD	GS	ADE	AD
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

ABBREVIATIONS

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

1.0 SCOPE:

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

2.0 REFERENCE DOCUMENTS:

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

3.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	TPIA
1.0	**Procedure**						
1.1	Heat Treatment, NDT and Other Procedures	Documented Procedures	100%	Procedure Documents	-	H	R
1.2	WPS,PQR & WPQ	Welding Parameters & Qualification Record	100%	WPS,PQR &WPQ	-	H	W- New R- Existing
2.0	**Material Inspection**						
2.1	Raw Material Inspection	Chemical & Mechanical Properties	100%	Test Certificates	-	H	R

3.0	**In Process Inspection**						
3.1	Welding / Forging	Forging /Welding Parameters	100%	Inspection Reports	-	H	-
3.2	Heat Treatment	Stress Relieving, Normalising, Tempering, Solution Annealing, Stabilization Heat Treatment etc. as applicable	100%	HT chart	-	H	R
3.3	Identification of Test Samples	Product Chemical, Mechanical, Impact, IGC and Other test as applicable	100%	Test Reports	-	H	H(Note-1)
3.4	Product Analysis (As applicable	Chemical Composition	As per PR/Purchase Specification	Test Reports	-	H	R
3.5	Destructive Testing	Mechanical, Impact, IGC and Other test as applicable	100%	Test Reports	-	H	H(Note-1)
3.6	NDT as applicable	Surface & Internal Imperfections	As per PR/Purchase Specification	NDT Reports	-	H	R
3.7	Galvanizing (If Applicable)	Integrity Of Galvanised Coating	100%	Inspection Report	-	H	-
4.0	**Final Inspection**						

4.1	Final Inspection	1.Visual 2. Dimensions 3.Hardness 4. Marking etc	100%	Inspection report	-	H	H(Note-1)
4.2	PMI Check	Chemical Check	As Per VCS Spec.	Inspection report	-	H	RW
4.3	Final Stamping	Stamping of accepted Items	Stamping of Items which are witnessed by TPIA.	Inspection report	-	H	H(Note-1)
5.0	**Painting**						
5.1	Rust Preventive Coating & Colour Coding	Visual Inspection & Colour Coding as applicable	100%	Inspection report	-	H	-
6.0	**Documentation & IC**						
6.1	Documentation & Inspection Certificate(IC)	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	Supplier TC & IC	-	H	H

Legend:

H - Hold (Do not proceed without approval),

P - Perform,

RW - Random Witness (As specified or 10% [min.1 no. of each size and type of Bulk item]),

R - Review,

W - Witness (Give due notice, work may proceed after scheduled date).PR- PURCHASE REQUISITION

NOTES (As applicable):

1. For Non NACE & Non Hydrogen service Carbon Steel Flanges, Spectacle Blinds & Drip Rings up to size 24"-300ANSI Class Will be accepted on review of Supplier Test Certificates. Supplier Test Certificate to be reviewed by TPIA.

2. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be Applicable (unless otherwise agreed upon).

3. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in /Job Specification /Approved Documents.

4. For orders placed on stockist, items shall be accepted based on manufacturer's TC with EN310204 type 3.2 certification from VCS / OWNER approved suppliers.

		QUALITY ASSURANCE PLAN **MULTI LAYER COMPOSITE (MLC) PIPE**				QAP NO : 15792/VPC-PE-SS-0014-QAP		Rev. 0
						Date : 22.04.2021		
						Prepared by: AS		
						Checked by: RKT		Approved by: HK
SR. NO.	**INSPECTION AND TESTING**	**QUANTUM OF CHECK / TEST**	**PROCEDURE**	**ACCEPTANCE CRITERIA AND CERTIFICATE**	**FORMAT OF RECORD**	**INSPECTION BY**		**REMARKS**
						Manufacturer	**TPIA**	
1.0	Raw Materials	Each Batch	ISO 17484-1	ISO 17484-1	RMTC	H	R	
2.0	Dimesion & visual Inspection	100%	ISO 17484-1/PTS	ISO 17484-1/PTS	IR	P	W	
3.0	Long-term pressure strength	100%	ISO 17484-1/PTS	ISO 17484-1/PTS	IR	P	W	
4.0	Resistance to slow crack growth of the outer layer	100%	ISO 17484-1/PTS	ISO 17484-1/PTS	IR	P	W	
5.0	Resistance to gas constituents	One sample per Lot	ISO 17484-1/PTS	ISO 17484-1/PTS	TC	P	R	
6.0	Thermal durability of the outer layer of M-pipes	One sample per Lot	ISO 17484-1/PTS	ISO 17484-1/PTS	TC	P	R	
7.0	Oxidation induction time (OIT)	One sample per Lot	ISO 11357-6	ISO 11357-6	TC	P	R	
8.0	Delamination:P-pipes	One sample per Lot	ISO 17484-1/PTS	ISO 17484-1/PTS	IR	P	W	
9.0	Delamination:M-pipes	One sample per Lot	ISO 17484-1/PTS	ISO 17484-1/PTS	IR	P	W	
10.0	Odorant permeability	One sample per Lot	ISO 17484-1/PTS	ISO 17484-1/PTS	TC	P	R	

LEGEND: R - Review, W - Witness, H - Hold, P - Perform, TPIA - Third Party Inspection Agency.

Notes: -

1 The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the additional requirements as per PTS/ SS.

2 The TPIA shall use this QAP for inspection against subject tender and may consider this document as approved.

3 Special manufacturing procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more stringent condition shall be applicable.

4 Owner / Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.

5 All reference Codes/ Standards, Documents, P.O. Copies shall be arranged by vendor / supplier for reference of TPIA at the time of Inspection

6 At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note & MTC.

	QUALITY ASSURANCE PLAN ISOLATION VALVE	QAP NO : 15792/03-CD-MC-QAP-001	Rev. 0
		Date : 09.03.2021	
		Prepared by: RKY	
		Checked by: RKT	Approved by: HK

SR. NO.	INSPECTION AND TESTING	QUANTUM OF CHECK / TEST	PROCEDURE	ACCEPTANCE CRITERIA AND CERTIFICATE	FORMAT OF RECORD	INSPECTION BY		REMARKS
						Manufacturer	TPIA	
1.0	Raw Material							
1.1	Metallic Parts (Chemical / Physical Requirement)	One in each heat	As per ASTM B 283 (ALLOY UNS C37700) / EN 331	As per ASTM B 283 (ALLOY UNS C37700) / EN 331	MATERIAL TEST CERTIFICATE	P	R	
1.2	Seat & Stem Seal	One in each heat	As per EN 331 / Manufacturer's Standard	As per EN 331 / Manufacturer's Standard	MATERIAL TEST CERTIFICATE	P	R	
2.0	Final Product :							
2.1	Gas Tightness Test	100%	As per EN 331	As per EN 331	TEST REPORT	P	W = Ten nos. per size per Lot	
2.2	Bending Test	One no. per Heat per Size	As per EN 331	As per EN 331	TEST REPORT	P	W = One no. per size per Lot	
2.3	Turning Torque Test	One no. per Heat per Size	As per EN 331	As per EN 331	TEST REPORT	P	W = One no. per size per Lot	
2.4	Temperature Resistance Test	One no. per Heat per Size	As per EN 331	As per EN 331	TEST REPORT	P	W = One no. per size per Lot	
2.5	Flow Capacity Test	One no. per Heat per Size	As per EN 331	As per EN 331	TEST REPORT	P	W = One no. per size per Lot	
3.0	Visual Inspection (Free from defects)	100%	As per EN 331	As per EN 331	INSPECTION REPORT	P	W = Ten nos. per size per Lot	
4.0	Dimension Tolerances (Min. length of engagement , OD , wall thk.)	100%	As per Approved Drawing	As per Approved Drawing	INSPECTION REPORT	P	W = Ten nos. per size per Lot	
5.0	Marking	100%	As per EN 331	As per EN 331	INSPECTION REPORT	P	W = Ten nos. per size per Lot	
6.0	Final Documentation		As per P.O. / SS	As per P.O. / SS	EN 10204 3.2 CERTIFICATE	P	H	

LEGEND: R - Review, W - Witness, H - Hold, P - Perform, TPIA - Third Party Inspection Agency, CA - Control Authority (Owner / Owner's representative)

Notes: -

1. The Above Testing and acceptance criteria are minimum requirements, however, manufacturer shall ensure that the product shall also comply to the additional requirements as per Standard Specification (SS)
2. The supplier shall submit their own detailed QAP prepared on the basis of above / Standard specification for approval of Owner/Owner's representative.
3. Owner/Owner representative shall review/approve all the documents related to QAP/Quality manuals/Drawings etc. submitted by supplier.
4. Contractor shall in coordination with Supplier/Sub vendor shall issue detailed Production and Inspection schedule indicating the dates and the locations to facilitate Owner/Owner's representative and TPIA to organize Inspection.
5. Special manufacturing procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more stringent condition shall be applicable.
6. Owner / Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time
7. All reference Codes/ Standards, Documents, P.O. Copies shall be arranged by vendor / supplier for reference of TPIA/IGL at the time of Inspection
8. At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note & MTC.
9. All Tests shall be carried out as per EN-331 (Latest Edition).

QUALITY CONTROL TABLES
GI PIPES CONFORMING TO IS:1239 (PART-1):2004 (Latest edition)

S.NO.	COMPONENTS /OPERATIONS	CHARACHTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	VENDOR	TPIA
1	2	3	4	s	6	7	8	9	10	11
1	**Raw Material Inspection**									
1.1	RAW MATERIAL (Steel Tube Heavy Duty Class C)	IDENTIFICATION	Major	Co-relation with MTC.	100%	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	T.C.	p	R
		CHEMICAL COMPOSITION	Major	Chem. Analysis	One Per Heat	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	T.C.	p	R
		PHYSICAL PROPERTIES (T.S., Y.S., % Elongation)	Major	Lab. Test	One Per Heat	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	T.C.	P	R
		VISUAL & DIMENSIONS	Major	Visual & Measurement	100%	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	T.C.	P	R
2	**IN PROCESS INSPECTION**									
2.1	PIPE MANUFECTURING	SURFACE DEFECT	Major	Visual	100%	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	IIR	p	R
		DIMENSIONS (O.D., THK., LENGTH etc.)	Major	Measurement	As Per Relevant Std.	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	IIR	p	R
		MASS (Kg/ Mtr .)	Major	Measurement	As Per Relevant Std.	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	IIR	p	R
2.2	END PREPARATION	END TYPE & DIMENSIONS	Major	Visual & Measurement	100%	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	IIR	p	R
2.3	PHYSICAL PROPERTIES	TENSILE STRENGTH , ELONGATION & BEND TEST/ FLATTENING TEST AS APPLICABLE	Major	Lab. Test	As Per Relevant Std.	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	lIR	p	R
2.4	LEAK TEST	HYDRAULIC	Critical	Leak Test	100%	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	IIR	p	w
2.5	GALVANIZING	ZINC COATING UNIFORMITY & MASS	Major	Mass of Zinc Coating & Uniformity	One sample at every hour & As per relevant Stand.	IS: 4736	IS: 4736 & IS: 2633	IIR	p	w
2.6	FINISH, PAINTING & MARKING	OVERALL FINISH, PAINTING & MARKING	Major	Visual	100%	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	lIR	p	R

QUALITY CONTROL TABLES
GI PIPES CONFORMING TO IS:1239 (PART-1):2004 (Latest edition)

S.No.	COMPONENTS OPERATIONS	CHARACHTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	VENDOR	TPIA
1	2	3	4	s	6	7	8	9	10	11
3	**POWDER COATING TEST**									
3.1	POWDER COATING TEST	SALT SPRAY RESISTANCE	Major	Visual	1000 Hrs (MIN.)	IS: 13871	IS: 13871	IIR	P	R
3.2		POROSITY	Major	Visual	-	IS: 13871	IS: 13871	IIR	P	R
3.3		HUMIDITY RESISTANCE	Major	Visual	1000 Hrs (MIN.)	IS: 13871	IS: 13871	IIR	P	R
3.4		WEATHERING GLOSS RETENTION AFTER 1000 Hrs.(Sun Test with Water Impression , Xenon 150 K lux)	Major	Visual	60 - 70%	IS: 13871	IS: 13871	IIR	P	R
3.5		COLOUR	Major	Visual	CANARY YELLOW	IS: 13871	IS: 13871	IIR	P	R
4	**FINAL INSPECTION**									
4.1	FINISHED PRODUCT	FINISH DIMENSIONS	Critical	Visual & Measurement.	Random As Per IS:47ll	IS:1239/P.O. Spec./PTS	IS:1239/P.O. Spec./PTS	Dimensional IR	P	W
		PHYSICAL PROPERTIES (TENSILE STRENGTH, ELONGATION & BEND TEST/ FLATTENING TEST AS APPLICABLE)	Critical	Lab Test	Random As Per IS 4711	IS:1239/P.O. Spec./PTS	IS:1239/P.O. Spec./PTS	Physical IR	P	W
		MASS OF ZINC COATING, UNIFORMITY & ADHESION TEST	Critical	GALV. TEST(LAB Test)	AS PER IS: 4736	IS 4736	IS 4736	GALV. REPORT	P	W
		LEAK TEST (HYDRAULIC TEST)	Critical	Leak Test	100% by MFR.	IS:1239/P.O. Spec./Tender Spec	IS:1239/P .O. Spec./Tender Spec	IR	P	RW (Min 10% per lot by TPIA)
		REVIEW OF ALL TEST CERTIFICATE I REPORTS & VENDOR'S llR	Major	Review	All TC	IS:1239/P.O. Spec./Tender Spec., EN 10204	IS:1239/P.O. Spec./Tender Spec , EN 10204	R	P	R
		Coating Thickness	Major	Visual	Random as per IS: 13871	IS: 13871/ PTS	IS: 13871/ PTS	IIR	P	W

		QUALITY CONTROL TABLES GI PIPES CONFORMING TO IS:1239 (PART-1):2004 (Latest edition)								
S.No										
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	***9***	**10**	**11**
4.2	POWDER COATING TEST	GLOSS 60 DEG.	Major	VISUAL	AS PER IS: 4711/ IS:13871	IS: 13871/ PTS	IS: 13871/ PTS	IR	P	W
		CROSS HATCH ADHESION	Major	VISUAL	AS PER IS: 13871	IS: 13871/ PTS	IS: 13871/ PTS	IR	P	W
		CYLINDRICAL BENDING TEST	Major	VISUAL	AS PER IS: 13871	IS: 13871/ PTS	IS: 13871/ PTS	IR	P	W
		ENRICHSEN CUPPING	Major	VISUAL	AS PER IS: 13871	IS: 13871/ PTS	IS: 13871/ PTS	IR	P	W
		PENCIL HARDNESS	Major	VISUAL	AS PER IS: 13871	IS: 13871/ PTS	IS: 13871/ PTS	IR	P	W
		SCRATCH RESISTANCE	Major	VISUAL	AS PER IS: 13871	IS: 13871/ PTS	IS: 13871/ PTS	IR	P	W
		IMPACT RESISTANCE	Major	VISUAL	AS PER IS: 13871	IS: 13871/ PTS	IS: 13871/ PTS	IR	P	W
4.3	-	IDENTIFICATION & MARKING	Major	VISUAL	IS: 4711	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	-	P	W
4.4	-	WORKMANSHIP	Major	VISUAL	IS: 4711	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	-	P	R
4.5	-	PERFORMANCE OF INSTRUMENTS	Major	CALIBERATION	EACH INSTRUMENT	IS: 1239 / P.O. Spec./PTS	IS: 1239 / P.O. Spec./PTS	CALIBERATION CERTIFICATE	P	R

LEGENDS H-HOLD P-PERFORMANCE R-REVIEW W-WITNESS TC-TEST CERTIFICATE IIR-INTERNAL INSPECTIONR EPORT CA-CONTROL AUTHOIRTY TPIA - THIRD PARTY INSPECTION AGENCY

1. **The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the additional requirements as per Particular Technical specifications (PTS).**
2. **The supplier shall submit their own detailed ITP prepared on the basis of above I Technical specification for approval of Owner/ Owner's representative.**
3. **Owner / Owner representative shall review / approve all the documents related to ITP / Quality manuals / Drawings etc. submitted by supplier**
4. **Contractor shall in coordination with Supplier / Sub vendor issue detailed Production and Inspection schedule indicating the dates and the locations to facilitate Owner / Owner's representative and TPIA to organize Inspection**
5. **Special manufacturing procedures have to be specially approved or only previously approved procedures have to be used in case of conflict between specifications more stringent condition shall be applicable.**
6. **Owner/Owner'srepresentativeincludingTPIAwillhavetherighttoinspectanyactivityofmanufacturingatanytime.**
7. **All reference Codes / Standards. Documents, P.O. Copies shall be arranged by vendor I supplier for reference of TPIA / IGL at the time of inspection.**
8. **At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC.**

QUALITY CONTROL TABLES GI FITTINGS

SR. No	DESCRIPTION	COMPONENT	CHARACTERISTICS	QUANTUM OF CHECK	REF. DOC.	ACCEPTANCE NORMS	RECORD	INSPECTION			REMARKS
								MANUF.	TPIA	CA	
1	Chemical composition of material	Test Bar	Marking and correlation with TC	IS: 14329 Grade BM 300	PO, Material specification	IS 14329/ PO, Material specifications	Mill TC	R	R	R	
2	Chemical composition of Final product	Fitting	Chemical properties	IS: 14329 Grade BM 300	PO, Material specification	IS 14329/ PTS	TC	P	E	R	
3	Cleaning and Flushing	Fitting	Descaling / Peel off	100%	IS 14329/ PTS	IS 14329/ PTS	Inspection Report	P	RW	R	
4	Destructive Testing (Tensile, Elongation & Hardness)	Fitting	Mechanical Properties	IS 14329	IS 14329/ PTS	IS 14329/ PTS	Lab Report	P	W	RW	
5	Compression Test	Fitting	Malleability	Three samples per Heat	IS 1879/ PTS	IS 1879/ PTS	Inspection Report	P	W	RW	
6	Pressure Test	Fitting	Pneumatic	IS 1879	IS 1879/ PTS	IS 1879/ PTS	Inspection Report	P	W	RW	As per sampling procedure of IS 1839
7	Alignments of Thread	Fitting	ASME B1.20.1/NPT	IS 1879	IS 1879/ PTS	IS 1879/ PTS	Inspection Report	P	W	RW	
8	Galvanizing	Fitting	Integrity of galvanized coating	As listed in IS 4759	IS 4736/ PTS	PTS	Inspection / Lab Report	P	W	RW	
9	Powder Coating	Fitting	Coating	IS: 13871/PTS	IS: 13871/PTS	IS: 13871/PTS	Inspection Report	P	W	RW	
10	Final inspection	Fitting	Visual, Dimensions, Finish, weld bevel, Bore, Marking, Powder Coating Thickness*	IS 1879	IS 1879/ PTS	IS 1879/ PTS	Inspection Report	P	W	R	
11	Marking	Fitting	PTS	100%	PTS	PTS	Inspection Report	P	R	R	
12	Documentation	-	-	-	As per the terms and conditions of the PO & PTS	As per the terms and conditions of the PO & PTS	Compliance certificate	-	-	-	

*60 Microns Minimum

LEGENDSH-HOLD P-PERFORMANCE R-REVIEW W-WITNESS TC-TEST CERTIFICATE IIR-INTERNAL INSPECTION REPORT CA-CONTROL AUTHOIRTY TPIA-THIRD PARTY INSPECTION AGENCY

1. The above testing and acceptance criteria are minimum requirements, however, manufacturer shall ensure that the product shall also comply to the additional requirements as per Particular Technical specifications(PTS)
2. The supplier shall submit their own detailed ITP prepared on the basis of above I Technical specification for approval of Owner / Owner's representative
3. Owner / Owner representative shall review / approve all the documents related to ITP / Quality manuals / Drawings etc. submitted by supplier
4. Contractor shall in coordination with Supplier / Sub vendor issue detailed Production and Inspection schedule indicating the dates and the locations to facilitate Owner / Owner's representative and TPIA to organize Inspection
5. Special manufacturing procedure shave to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more stringent condition shall be applicable.
6. Owner/ Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.
7. All reference Codes / Standards documents, P.O. Copies shall be arranged by vendor I supplier for reference of TPIA / IGL at the time of inspection.
8. At the time of deleivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC.

QUALITY CONTROL TABLES COPPER TUBE

SR. No	DESCRIPTION	QUANTUM OF CHECK	PROCEDURE	ACCEPTANCE CRITERIA (As per EN 1057/ PTS)	FORMAT OF RECORD	INSPECTIO		REMARKS
						VENDOR	TPIA/ CLIENT	
1	Raw material: Chemical Requirement	As per EN 1057	As per EN 1057	Material grade Cu-DHP/ CW 024A Cu + Ag : Min 99.9% P: 0.0015% TO 0.040%	MTC	P	R	
2	Final product: Chemical Requirement	As per EN 1057	As per EN 1057		Inspection Report	P	W	
3	Physical test (Tensile, Elongation, Hardness etc.)	As per EN 1057	As per EN 1057	UTS- Min. 250 N/ Sq.mm Elongation - Min 30% Hardness- 75 to 100 HV	Inspection Report	P	W	
4	Carbon film tets	As per EN 1057	As per EN 1057	Maximum Residual carbon- 0.20 mm/ sq. dm	Inspection Report	P	W	
5	Carbon content test	As per EN 1057	As per EN 1057	As per EN 1057/ PTS	Inspection Report	P	W	
6	Drift expanding test	As per EN 1057	As per EN 1057	As per EN 1057/ PTS	Inspection Report	P	W	
7	Hydrostatic test	As per EN 1057	As per EN 1057	Min 35 bar/ 10 second	Inspection Report	P	W	
8	Eddy current test	As per EN 1057	As per EN 1057	As per EN 1057/ PTS	Inspection Report	P	W	
9	Dimensional Inspection (O.D, Wllthk, Length etc.)	As per EN 1057	As per EN 1057	As per EN 1057/ PTS	Inspection Report	P	W	
10	Visual Inspection (Free from defect)	As per EN 1057	As per EN 1057	As per EN 1057/ PTS	Inspection Report	P	R	
11	Marking	As per EN 1057	As per EN 1057	As per EN 1057/ PTS	Inspection Report	P	R	
12	Documentation	-	As per EN 1057	As per EN 1057/ PTS	Inspection Report	P	R	

LEGENDS H-HOLD W- WITNESS P- PERFORM TPIA- THIRD PARTY INSPECTION AGENCY CA- CONTROL AUTHOIRTY

1. The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the additional requirements as per specification.
2. The supplier shall submit their own detailed ITP prepared on the basis of above I Technical specification for approval of Owner / Owner's representative.
3. Owner/ Owner representative shall review/ approve all the documents related to ITP / Quality manuals / Drawings etc. submitted by supplier
4. Contractor shall in coordination with Supplier / Sub vendor issue detailed Production and Inspection schedule indicating the dates and the locations to facilitate Owner / Owner's representative and TPIA
5. Special manufacturing procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more stringent
6. Owner / Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.
7. All reference Codes / Standards. Documents, P.O. Copies shall be arranged by vendor I supplier for reference of TPIA/ IGL at the time of inspection.
8. At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC.

QUALITY CONTROL TABLES COPPER FITTINGS

SR. No	DESCRIPTION	QUANTUM OF CHECK	PROCEDURE	ACCEPTANCE CRITERIA (As per EN 1057/ PTS)	FORMAT OF	INSPECTIO VENDOR	TPIA/ CLIENT	REMARKS
1	Raw material: Chemical Requirement	one in each heat	As per EN 1254	Material grade Cu-DHP/ CW 024A Cu + Ag : Min 99.9% P: 0.0015% TO 0.040%	MTC	P	R	
2	Final product: Chemical Requirement	one in each heat	As per EN 1254		Test Report	P	W	
3	Carbon in bore tests (Carbon film test, carbon content test)	one in each heat	As per EN 1254	As per EN 1254/ PTS	Test Report	P	W	
4	Stress corrosion resistance test	one in each heat	As per EN 6957	As per ISO 6957/ PTS	Test Report	P	W	
5	Hydrostatic pressure test	100%	As per EN 1254	Min 37.5 bar @ 15 min.	Test Report	P	W	
6	Pneumatic pressure test	100%	As per EN 1254	Min 6 bar @ 10 second	Test Report	P	W	
7	Dimensional Inspection (O.D, Wll thk, Length etc.)	100%	As per EN 1254	As per EN 1254/ PTS	Test Report	P	W	
8	Visual Inspection (Free from defect)	100%	As per EN 1254	As per EN 1254/ PTS	Test Report	P	R	
9	Marking	100%	As per EN 1254	As per EN 1254/ PTS		P	R	
10	Documentation	-	As per EN 1254	As per EN 1254/ PTS	Inspection Report	P	R	

LEGENDS H-HOLD W-WITNESS P-PERFORM TPIA- THIRD PARTY INSPECTION AGENCY CA- CONTROL AUTHOIRTY

1. The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the additional requirements as per specification.
2. The supplier shall submit their own detailed ITP prepared on the basis of above I Technical specification for approval of Owner / Owner's representative.
3. Owner/ Owner representative shall review/ approve all the documents related to ITP / Quality manuals / Drawings etc. submitted by supplier
4. Contractor shall in coordination with Supplier / Sub vendor issue detailed Production and Inspection schedule indicating the dates and the locations to facilitate Owner / Owner's representative and TPIA
5. Special manufacturing procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more stringent
6. Owner / Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.
7. All reference Codes / Standards. Documents, P.O. Copies shall be arranged by vendor I supplier for reference of TPIA/ IGL at the time of inspection.
8. At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC.

QUALITY CONTROL TABLES BRASS FITTINGS

SR. No	DESCRIPTION	QUANTUM OF CHECK	PROCEDURE	ACCEPTANCE CRITERIA (As per EN 1057/ PTS)	FORMAT OF RECORD	INSPECTION		REMARKS
						VENDOR	TPIA/ CLIENT	
1	Raw material: Chemical/ Physical Requirement	one in each heat	As per EN 2164	As per EN 12164/ PTS	MTC	P	W	Preferably witness by CA
2	Final product		As per EN 2164			P	W	
3	Resistance dezincification	one in each heat	As per EN 6957	As per EN 1254	Test Report	P	W	
4	Carbon bore test	one in each heat	As per EN 2164	As per ISO 6957/ PTS	Test Report			
5	Stress corrosion resistance test	one in each heat	As per EN 2164	As per ISO 1254/ PTS	Test Report	P	W	
6	Hydrostatic pressure test	100%	As per EN 2164	Min 37.5 bar @ 15 min.	Test Report	P	W	Preferably witness by CA
7	Pneumatic pressure test	100%	As per EN 12164	Min 6 bar @ 15 second	Test Report	P	W	Preferably witness by CA
8	Visual Inspection (Free from defect)	100%	As per EN 12164	As per EN 1254/ PTS	Test Report	P	R	
9	Dimensional Inspection (O.D, Wll thk, Length etc.)	100%	As per EN 12164	As per EN 1254/ PTS	Test Report	P	W	
10	Marking	100%	As per EN 12164	As per EN 1254		P	R	
11	Documentation	-	PO/ PTS	PO/ PTS	Test Report	P	H	

LEGENDS H-HOLD W-WITNESS P-PERFORM TPIA- THIRD PARTY INSPECTION AGENCY CA- CONTROL AUTHOIRTY

1. The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the additional requirements as per specification.
2. The supplier shall submit their own detailed ITP prepared on the basis of above I Technical specification for approval of Owner / Owner's representative.
3. Owner/ Owner representative shall review/ approve all the documents related to ITP / Quality manuals / Drawings etc. submitted by supplier
4. Contractor shall in coordination with Supplier / Sub vendor issue detailed Production and Inspection schedule indicating the dates and the locations to facilitate Owner / Owner's representative and TPIA
5. Special manufacturing procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more stringent
6. Owner / Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.
7. All reference Codes / Standards. Documents, P.O. Copies shall be arranged by vendor I supplier for reference of TPIA/ IGL at the time of inspection.
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QUALITY CONTROL TABLES STEEL REINFORCED RUBBER HOSE

SR. No	DESCRIPTION	TEST PARAMETERS	QUANTUM OF CHECK	PROCEDURE	ACCEPTANCE CRITERIA (As per EN 1057/ PTS)	CERTIFICATE	INSPECTION		REMARKS
							VENDOR	TPIA/ CLIEN	
1.	Raw Material	Chemical &Mech. Test of material or Steel Reinforced Rubber Hose (Lining, Reinforced material & cover)	100%	IS 9573	IS 9573	MTC	P	R	
2.	Final Product								
2.1	Final Inspection	Mechanical Properties	one (1) per batch	Tensile Strength = 10Mpa (Min.) El (Lining & Cover) is 200 & 250 resp. (Min.)	PTS & IS 9573	Inspection Report	P	W	
2.2		Resistance of Lining to n-pentane	one (1) per batch	Shall not exceed 10% absorbed & 5% extractable as per Cl. No. 5.2 of PTS	Cl. 5.4.3.2 of IS 9573	Inspection Report	P	W	
2.3		Adhesion Test	one (1) per batch	Min. Adhesion shall be 2 KN/m as Cl. No. 5.3 of PTS	Cl. 5.5.1 of IS 9573	Inspection Report	P	W	
2.4		Low Temperature Flexibility Test	One (1) per batch	Conditioned at -40 deg for 50 hours and bent at 180 deg around mandrel of dia 12 times the Nominal Bore of hose as per Cl no. 5.4 of PTS	Cl. 5.5.2 of IS 9573	Inspection Report	P	W	
2.5		Flexibility of hose at 1.5 x design pressure	one (1) per batch	Bend empty to radius 95 mm without Flattening & suffering structural damages.	Cl. 5.5.3 of IS 9573	Inspection Report	P	W	Witness by CA
2.6		Ozone Resistance Test	one (1) per batch	Cl. No 5.9 of PTS	Cl. 5.5.4 of IS 9573	Inspection Report	P	W	Witness by CA
2.7		Hydrostatic/ Proof Pr. Test	100%	2MPa for 1 min. as per Cl. No. 5.7 of PTS	Cl. 5.5.1 of IS 9573	Inspection Report	P	W	Witness by CA
2.8		Burst test	one (1) per batch	Cl. No. 5.9 of PTS	Cl. 5.5.2 of IS 9573	Inspection Report	P	W	
2.9		Grip Strength test	one (1) per batch		Cl. 5.5.7 of IS 9573 & Annex A of IS 9573	Inspection Report	P	W	
2.10		Burning Test	one (1) per batch	Shall not burn till 45 sec. as per Cl. No. 5.10	Cl. 5.5.8 of IS 9573	Inspection Report	P	W	
2.11		Visual & dimensional check	100%	Cl. No. 4.0 of PTS & IS 9573	IS 9573	Inspection Report	P	R	
2.12		Cover color- Orange	100%	Cl. No. 5.2.3 of PTS	PTS & IS 9573	Inspection Report	P	R	
3	End Fittings (Adaptors, nuts, washer)	-	100%	As per Cl. No. 6.0 of PTS	PTS & IS 9573	Inspection Report		R	
4	Marking	-	100%	As per Cl. No. 7.0 of PTS	PTS & IS 9573	Inspection Report	P	R	
5	Documentation	-	-	term & conditions of P.O & PTS	As per term & conditions of P.O & PTS	3.2 Certification as per EN 1024	P	H	

LEGENDSH-HOLD W-WITNESS P-PERFORM TPIA- THIRD PARTY INSPECTIONAGENCY CA- CONTROL AUTHOIRTY

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7. All reference Codes / Standards. Documents, P.O. Copies shall be arranged by vendor I supplier for reference of TPIA/ IGL at the time of inspection.
8. At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC

LIST OF RECOMMENDED VENDORS FOR BOUGHT OUT ITEMS

MECHANICAL & FIRE FIGHTING EQUIPMENT

i) GI Pipe:

1. Swastik Pipe Ltd.
2. Jindal Industries Ltd.
3. Vishal Pipes Ltd.
4. Indus Tubes Ltd.
5. Advance Steel Tubes Ltd.
6. Goodluck India Ltd.
7. Surya Roshni Limited
8. APL Apollo Tubes Limited
9. Jindal Pipes Limited
10. M/s. Ravindra Tubes Ltd.

ii) Casting GI Fittings

1. Sarin Industries Ltd.
2. Jupiter Metal Industries Ltd.
3. Jainsons Industries Ltd.
4. Jinan Meide Casting Co. Ltd.
5. Green Malleable Pvt. Ltd.
6. M/s. MG Industries
7. M/s Unique Pipe Fittings Co.
8. M/s. Jay Corporation Pvt. Ltd.
9. M/s. Vishal Pipe Limited

iii) Forged GI Fittings (for High Rise Segment)

1. Jainsons Industries Ltd.
2. B.M. Meters Pvt. Ltd.

iv) Copper Tubes

1. Jay Banas
2. Mehta Tubes Limited- Trade Mark "MEXFLOW"
3. Rajco Metal (Tubes & Fittings)
4. Paras Industries

5. Mercure Metal & Alloys Pvt. Ltd.
6. M/s. Global Copper Pvt. Ltd
7. M/s. Janya Extrusions Pvt. Ltd.

v) MLC Pipe & associated fittings

8. M/s. KITEC INDUSTRIES (INDIA) PVT. LTD.
9. M/s. JINDAL PE-X TUBES PRIVATE LIMITED
10. M/s. Nexgen Composite Industries

vi) Brass Fittings

a. Chandan Enterprises
b. Paras Industries Ltd.
c. Chokhawala Distributors- Brass Adaptor
d. Saumya Electricals Industries
e. Umesh Enterprises
f. M/s. Astro Brass components
g. M/s. Jay Corporation Pvt. Ltd.

vii) Steel Re-inforced Rubber Hose (Type-4)

1. Super Seal Flexible Hose Ltd.
2. Suraksha Products Pvt. Ltd.
3. Vansh Industries
4. T & L Gases

viii) Pipe Carbon Steel To Indian Standards

1. A.S.T. Pipes Pvt. Ltd. (AST Group)
2. Advance Steel Tube Ltd.
3. Apl Apollo Tubes Ltd. (Er. Bihar Tubes Ltd.
4. Asian Mills Pvt. Ltd.
5. Asrani Tubes Limited
6. Dadu Pipes (P) Ltd.
7. Essar Steel Limited (Er Hazira Pipes Mill)
8. Gaurang Products Pvt Ltd. (Ast Group)
9. Goodluck India Ltd.
10. Hi-Tech Pipes Limited
11. Indus Tube Limited
12. Jindal Industries Ltd
13. Jindal Pipes Ltd.
14. Jindal Saw Ltd (Kosi Works)

15. Jotindra Steel & Tube Ltd
16. Lalit Pipes And Pipes Ltd.
17. Maharashtra Seamless Ltd.
18. Man Industries (India) Ltd. – Pithampur
19. Man Industries (India) Ltd. Anjar
20. Mukat Tanks & Vessels Ltd.
21. Nezone Tubes Limited
22. North Eastern Tubes Limited
23. Pratibha Industries Limited
24. Pratibha Pipes & Structural Ltd.
25. Psl Ltd (Chennai)
26. Psl Ltd (V1, V2 & Nc)
27. Rama Steel Tubes Ltd.
28. Ratnamani Metals And Tubes Ltd.
29. Ravindra Tubes Limited
30. Samshi Pipe Industries Limited
31. Surya Roshni Ltd.
32. Swastik Pipes Ltd.
33. Utkarsh Tubes & Pipes Ltd. (Formly Bmw)
34. Welspun Corp. Limited (Dahej)
35. Zenith Birla (India) Limited

ix) Pipe & Tubulars To A.P.I. Standards

1. Arcelormittal Tubular Products Roman Sa, Romania
2. Bhel (Trichy), India
3. Dalmine Spa (Enquiry To Tenaris), UAE
4. Eewkorea Co. Ltd (Germany), Korea
5. Eew Korea Co. Ltd. (Korea), Korea
6. Eisenbau Kramer Gmbh, Germany
7. Hyundai Rb Co. Ltd. South Korea
8. Ilva Lamiere E Tubi Srl (Enq To Ilva Spa, Italy
9. Inox Tech. Spa, Italy
10. Ismt Ltd. Ahmedngr, India
11. Ismt Ltd. Baramati, India
12. Jindal Pipes Ltd., India
13. Jindal Saw Ltd. (Kosi Works), India
14. Jindal Saw Ltd. (Nashik Works), India
15. Lalit Pipes And Pipes Ltd. India

16. Maharashtra Seamless Ltd., India
17. Man Industries (I) Ltd. (Pithampur), India
18. Mukat Tanks & Vessels Ltd., India
19. Pratibha Industries Limited, India
20. Ratnamani Metals And Tubes Ltd., India
21. Siderca S.A.I.C (Enquiry Totenaris), UAE
22. Sumitomo Metal Ind. Ltd., India
23. Surya Roshni Ltd., India
24. Swastik Pipes Ltd, India
25. Tata Steel UK Limited (Formerly C702)
26. Tubos De Acero De Mexico Sa (Enq. Tenaris), UAE
27. Tubos Reunidos Sa Spain
28. Umran Steel Pipe Inc (Turkey), Turkey
29. Valcovny Trub Chomutov, Czech Republic
30. Vallourec And Mannesmann Tubes, France
31. Welspun Corp Limited (Dahej), India

x) Pipe/Tube CS (Seamless) To ASTM Stds

1. Arcelormittal Tubular Products Roman Sa, Romania
2. Bhel (Trichy), India
3. Changshu Seamless Steel Tube Co. Ltd., China
4. Dalmine Spa (Enquiry To Tenaris), UAE
5. Heavy Metals & Tubes Limited (Mehsana), India
6. Ismt Ltd. Ahmedngr, India
7. Ismt Ltd. Baramati India
8. Jfe Steel Corporation, UAE
9. Jindal Sdaw Ltd (Nashik Works) India
10. Klt Automotive And Tubular Products Ltd., India
11. Mahalaxmi Seamless Limited, India
12. Maharashtra Seamless Ltd, India
13. Products Tubulares S.A.U, Spain
14. Ratnadeep Metal Tubes Ltd., India
15. Staineest Tubes Pvt Ltd., India
16. Sumitomo Metal Ind. Ltd., India
17. Tubos Reunidos Sa Spain
18. Valcovny Trub Chomutov, Czech Republic
19. Vallourec Andmannesmann Tubes France
20. Yangzhou Chengde Steel Pipe Co. Ltd Dubai (UAE)

xi) Pipe Carbon Steel (Welded) To ASTM Stds

1. Eew Korea Co. Ltd. (Germany), Korea
2. Eew Korea Co. Ltd. (Korea), Korea
3. Eisenbau Kramer Gmbh, Germany
4. Hyundai Rb Co. Ltd., South Korea
5. Inox Tech. Spa, Italy
6. Jindal Saw Ltd (Kosi Works), India
7. Lalit Pipes and Pipes Ltd., India
8. Man Industeries (I) Ltd. (Pithampur), India
9. Man Industries (India) Ltd. Anjar, India
10. Mukat Tanks & Vessels Ltd., India
11. Ratnamani Metals And Tubes Ltd., India
12. Sumitomo Metal India Ltd., India
13. Tata Steel Uk Limited

xii) Valve

a) Globe Valves

1. Datre Corpn (Calcutta)
2. BDK (New Delhi)
3. KSB Pumps (New Delhi)
4. L&T (New Delhi)
5. Neco Schuber & Salzer Ltd. (New Delhi)
6. Niton Valve (Mumbai)
7. Ornate Valves (Mumbai)
8. Panchavati Valves (Mumbai)
9. AV Valves Ltd.
10. BHEL (Trichy), India
11. Econo Valves Pvt Ltd, India
12. Fouress Engg (I) Ltd (Aurangabad)
13. Guru Industrial Valves Pvt Ltd
14. Leader Valves Ltd, India
15. NSSL Ltd. (Neco Schubert & Salzerltd)
16. Oswal Industries Ltd, India
17. Petrochemical Engineering Enterprises, India
18. Sakhi Engineers Pvt Ltd
19. Shalimar Valves Pvt Ltd

20. Steel Strong Valves India Pvt Ltd, India
21. Petro Valves Pvt. Limited, Ahmedabad
22. Hawa Engineers Limited, Ahmedabad
23. JC Valvulas India Pvt Ltd (JCVIPL)

b) Check Valves

1. Advance Valves Pvt. Ltd., Noida
2. Aksons & Mechanical Enterprises, Mumbai
3. Larsen & Toubro Limited (M/s Audco India Limited, Chennai)
4. AV valves Ltd., Agra
5. BDK engineering India Ltd., Hubli
6. BHEL, OFE&OE Group, New Delhi
7. Datre Coroportion Limited, Calcutta
8. Leader Valves Ltd., Jalandhar
9. Neco schubert &Salzer Ltd., New Delhi
10. Niton Valves Industries (P) Ltd., Mumbai
11. Precision Engg.Co., Mumbai
12. Econo Valves Pvt Ltd, India
13. Fouress Engg (I) Ltd (Aurangabad)
14. KSB Pumps Ltd (Coimbattore), India
15. NSSL Ltd. (Neco Schubert & SalzerLtd)
16. Oswal Industries Ltd, India
17. Panchvati Valves & Flanges Pvt Ltd, India
18. Petrochemical Engineering Enterprises, India
19. Sakhi Engineers Pvt Ltd
20. Shalimar Valves Pvt Ltd
21. Steel Strong Valves India Pvt Ltd, India
22. Hawa Engineers Limited, Ahmedabad

c) Plug Valves

1. Breda Energia Sesto Industria Spa, Italy
2. Fisher Sanmar Ltd., Chennai
3. Larsen & Toubro Ltd., New Delhi
4. Nordstrom Valves, USA
5. Serck Audco Valves, UK
6. Sumitomo Corporation India Pvt. Ltd., New Delhi
7. Z Corporation, Korea

8. Hawa Valves (India) Pvt. Ltd., Mumbai
9. Steel Strong Valves India Pvt. Ltd., Navi Mumbai
10. Econo Valves
11. Flow-Serve PTE (Mfr. SERCK), India

d) Ball Valves

1. Hawa Valves (India) Pvt. Ltd, Navi Mumbai
2. Larsen & Toubro, Delhi
3. Microfinish Valves Pvt. Ltd., Noida
4. Oswal Industries Ltd., Gandhi nagar
5. Virgo Engineers Ltd., Delhi
6. Boteli Valve Group Co. Ltd., China
7. Cameron (Malaysia) SDN BHD, Malaysia
8. Dafram S.P.A., Italy
9. Fangyuan Valve Group Co. Ltd., China
10. Franz Schuck GmbH, Germany
11. O.M.S. Saleri (Italy)
12. Pibi Viesse S.P.A (Italy)
13. Nuovo Pignone (Italy)
14. Perar S.P.A (Italy)
15. Pietro Fiorentini (Italy)
16. Cooper Cameron Valv Italy SRL-FRM, Itly
17. Petrol Valves SRL
18. Tormene Gas Technology S.P.A (VALVITALIA)
19. Petro Valves Pvt. Limited, Ahmedabad
20. Hawa Engineers Limited, Ahmedabad
21. JC VALVULAS INDIA PVT LTD

xiii) Flow Tee

1. Coprosider SPA, Italy
2. GEA Energy System India Limited, Chennai
3. Multitex Filteration
4. Pipeline Engineering, UK
5. Scomark Engg. Limited (U.K.)
6. Skeltonhall Limited, Engaland (U.K.)
7. Technospecial SPA, Italy
8. Tectubi SPA, Italy
9. RMA Germany

10. Pipefit Engineers Pvt. Ltd.

xiv) Split Tee

1) Ipsco, Canda
2) TD Willamsons, USA

xv) Flanges

1. Aditya Forge Ltd., Vadodara
2. Amforge Industries Ltd., Mumbai
3. CD Engineering Co., Ghaziabad
4. Echjay Forgings Pvt. Ltd. (Bombay), Mumbai
5. Echjay Industries Ltd., Rajkot
6. Forge & Forge Pvt. Ltd., Rajkot
7. Golden Iron & Steel Works, New Delhi
8. JK Forgings, New Delhi
9. Metal Forgings Pvt. Ltd., Mumbai
10. Perfect Marketings Pvt. Ltd., New Delhi
11. Sky Forge, Faridabad
12. S&G, Faridabad
13. Chaudhry Hammer Works Ltd, India
14. JAV Forgings (P) Ltd, India
15. Kunj Forgings Pvt Ltd, India
16. MS Fittings
17. R.N. Gupta & Co. Ltd, India
18. R.P. Engineering Pvt Ltd, India
19. Sanghvi Forgings & Engineering Ltd
20. Shri Ganesh Forgings Ltd., India
21. Uma Shankar Khandelwal & Co., India
22. Sawan Engineers, Baroda
23. Stewarts & Lloyds of India Ltd., Kolkata
24. Engineering Services Enterprises
25. Pipefit Engineers Pvt. Ltd.
26. Vivial Forge Pvt. Ltd.
27. Anandmayee Forgings Pvt. Ltd, Sahibabad (UP to 10”-300#)
28. United Forge Private Limited
29. Lal Metal
30. Jai Auto Pvt.Ltd, Ghaziabad

xvi) Fittings

1. Commercial Supplying Agency, Mumbai
2. Dee Development Engineers Ltd.
3. Eby Industries, Mumbai
4. Flash Forge Pvt. Ltd., Vishakhapatnam
5. Gujarat Infra Pipes Pvt. Ltd., Vadodara
6. M.S. Fittings Mfg. Co. Pvt. Ltd., Kolkata
7. Stewarts & Lloyds of India Ltd., Kolkata
8. Teekay Tubes Pvt. Ltd., Mumbai
9. Pipe Fit,Baroda
10. Sky Forge, Faridabad
11. S&G, Faridabad
12. Sawan Engineers, Baroda
13. Eby Fasteners, India
14. Leader Valves Ltd, India
15. R.N. Gupta & Co. Ltd, India
16. Exten Engg Pvt Ltd
17. Sivananda Pipe & Fittings Ltd
18. Jindal Forging
19. Vivial Forge Pvt. Ltd.
20. United Forge Private Limited

xvii) Gaskets

1. IGP Engineers (P) Ltd., Madras
2. Madras Industrial Products, Madras
3. Dikson & Company, Bombay
4. Banco Products (P) Ltd., Vadodara
5. Goodrich Gaskets Pvt Ltd
6. Starflex Sealing India Pvt Ltd, India
7. Teekay Meta Flex Pvt Ltd
8. UNIKLINGER Ltd
9. HEM Engg. Corp.
10. Unique Industrial Packing Pvt. Ltd.

xviii) Fasteners

1. Nireka Engg. Co. (P) Ltd., Calcutta
2. Precision Taps & Dies, Bombay
3. AEP Company, Vithal Udyoug Nagar
4. Fix Fit Fasteners, Calcutta
5. Precision Engg. Industries, Baroda
6. Echjay Forgings Pvt. Ltd., Bombay
7. Capital Industries, Bombay
8. Boltmaster India Pvt Ltd, India
9. Deepak Fasteners Limited, India
10. Fasteners & Allied Products Pvt Ltd, India
11. Hardwin Fasteners Pvt Ltd, India
12. J.J. Industries, India
13. Multi Fasteners Pvt Ltd, India
14. Nexo Industries, India
15. Pacific Forging & Fasteners Pvt Ltd, India
16. Pioneer Nuts & Bolts Pvt Ltd, India
17. Precision Auto Engineers, India
18. President Engineering Works, India
19. Sandeep Engineering Works, India
20. Syndicate Engineering Industries, India

xix) Stud Bolts with Nuts

1. Multi Thread Fasteners, Baroda
2. Darukhanwala
3. Precision Engineers, Baroda
4. Unbrako
5. TVC

xx) Welding Electrodes

1. Lincon,
2. Böhler
3. D&H

xxi) Cold Applied Tapes

1. Denso GmbH
2. Raychem

xxii) Warning Mat

1. Sparco Multiplast Pvt. Ltd., Ahmedabad
2. Singhal Industries, Ahemdabad
3. Puja Packing, Mumbai
4. Bina Enterprises, Mumbai
5. Shree Vijay Wire & Cable Industries
6. Jay Corporation Pvt. Ltd.

xxiii) HDPE PIPES

1. Climax Synthetics (P) Ltd., Vadodra
2. Indian Poly Pipes, Calcutta
3. Jain Irrigation Systems Ltd., Jalgaon
4. Kirti Industries (India) Ltd., Indore
5. Ori Plast Limited, Calcutta
6. Phoel Industries Limited, Delhi
7. Sangir Plastics (P) Ltd., Mumbai
8. Veekay Plast, Jaipur
9. Kisan Irrigation
10. Dutron Polymers Ltd.
11. Manikya Plastichem (P) Ltd
12. Himalayan Pipe Industries
13. Dura Line India Pvt. Ltd.

xxiv) Heat Shrinkable Sleeve/Fibreglass Reinforce Sleeve

1. Seal for life
2. Canusa
3. CYG Changtong New Material Co. Ltd., China

xxv) Strainers

1. Bombay Chemical Equipments
2. Gujarat Auto filed

3. Multitex Filtration Engineering Limited
4. Grand Prix Engineering Limited

xxvi) DRY GAS FILTER & FILTER SEPERATOR

1. Grand Prix Fab (Pvt.) Ltd. (New Delhi)
2. Perry Equipment, USA
3. Faudi Filter, Germany
4. Forain S.r.l., Italy
5. ABB, Faridabad
6. Burgess Manning, USA
7. Multitex Filtration Engineers India
8. Triveni Plenty Engg. Ltd. (New Delhi)
9. Siirtec International Contractor S.P.A (Italy)
10. Flashpoint, Pune, India
11. Filteration Engineers (I) Pvt Ltd, India
12. Gujarat Otofilt, India
13. Tormene Gas Technology
14. Ultrafilter (India) Pvt Ltd, India
15. Ravi Techno Systems Pvt Ltd, India
16. Siirtec Nigi S.P.A
17. Filtan Filter Anlagenbau Gmbh
18. Fairley Arlon BV
19. PECO Facet
20. EPE Epenstenner GMBH
21. Filtrex srl
22. Petromar Engineered Soln
23. Plenty Filter
24. Eurofiltec
25. PTI Technologies Inc

xxvii) FILTER ELEMENT

1. Peco – Facet
2. Velcon
3. Pall – Filterite
4. Burgress Manning

xxviii) Brass Valves

1. Universal srl, Italy
2. Tiemme Raccorderie Sede, Italy
4. Enolgas Bonimu s.a.s., Italy
5. Fratelli Fortis s.r.l, Italy
6. Giacomo Climbrio, Italy
7. Parker Hannifin S.P.A., USA
8. Singapore Valve & Amp; Fittings Pte Limited, Singapore /Bengaluru
9. Rubinetterie Utensilerie Bonomi (RUB), Italy
10. Zhegiang Valogin Technology Co. Ltd., China,
11. Ningbo Zhiqing Industrial Co. Ltd., China,
12. Zhejiang Dunan Valve Co. Ltd.,
13. Ningbo Huaping, China.

xxix) List of Manufacturer/Vendor of CP Equipment/Material

A- Cable:
1. Netco cable industries pvt. Ltd,
2. Raychem-RPG Pvt. Ltd.
3. Cable corporation of India Ltd., New Delhi

B- Spark Gap Arrestor / Surge Diverter:
1. DHEN, Germany
2. Mc Miller
3. Dairy land electrical industries

C- Cu/CuSo4 Reference Cells
1. Mc Miller, USA
2. Borin, USA
3. Krick

D- Thermit Weld Material
1. Erico Europa

E- Petroleum Coke Breeze:
1. Goa Carbon, Goa
2. India carbon, Durgapur (WB)

F- Mg/Zn Anod:
1. Scientific Metal Engineers Karaikudi
2. Cortech International Pvt. Ltd.
3. Titanor Component Ltd., Goa

G- Pin brazing:
1. BAC
2. Safetrack

H- Cable Lugs:
1. Ismail, Ranchi
2. Dowels, Mumbai

I- Cable Glands:
1. Flexpro Electrical Pvt. Ltd., Mumbai
2. Flame proof Equipment Pvt. Ltd., Mumbai
3. Baliga Lighting Equipment Ltd., Chennai

J- BACKFIL:
1. India Carbon
2. Goa Carbon

K- Polarization cell:
1. Mc Miller
2. Krik Engineering

L- Junction Box:
1. Exprotecta
2. Flexpro
3. FELP Control Gears

M- Mixed Metal Oxide (MMO) Anodes:-
1. Titanor Components Ltd., Goa

xxx) Temporary/Permanent Cathodic Protection Agency

1. Raychem-RPG Pvt. Ltd.
2. Caltech Engineering Services
3. Universal Corrosion Prevention India
4. Cathodic Technology Ltd.
5. Cathodic Control Company Pvt. Ltd.
6. Corrtech International Pvt. Ltd.
7. MITCORR Cathodic Protection Pvt. Ltd.
8. Underground Pipeline & NDTS Pvt. Ltd.

xxxi) NDT Agency

1. NDT Services, Ahmedabad
2. GEECY Industrial Services Pvt. Ltd., Mumbai
3. Corrosion Control Services, Mumbai
4. Perfect Metal Testing & Inspection Agency, Calcutta
5. Inter Ocean Shipping Co., New Delhi
6. RTD, Mumbai
7. Sievert, Mumbai
8. X-Tech, Vizag

LIST OF MATERIALS OF RECOMMENDED BRAND AND/ OR MANUFACTURE (STRUCTURE)

Unless otherwise specifically mentioned in the Schedule of Items, Contractor has to use materials as listed below, of only these brand names/Company's names, which are mentioned in the RECOMMENDED list for structural items thereon.

1. STRUCTURE

Sl. No.	Items/Name of Products	Makes/Brands/Manufactures
1	Structural Steel	SAIL / TATA / RINL / IISCO / ESSAR / ISPAT
2	Structural Steel Tubes ISI Marked	TATA / JINDAL / SURYA / SWASTIK
3	Synthetic Enamel Paint Ist Quality only	ICI Paint (Deluxe), Asian Paint (Apcolite), Shalimar Paint (Superlac), Goodlass,Nerolac Paint(Nerolac), Berger Paints, Durolac (powder coating)

Any materials not fully specified in these specifications and which may be offered for use in the works shall be subject to approval of Engineer, without which it shall not be used anywhere in the construction works.

ELECTRICAL

LIST OF MATERIALS OF RECOMMENDED BRAND AND/ OR MANUFACTURE

Cable – LT Power and Control

1. Cords Cable Industries Ltd.
2. Universal Cable Ltd.
3. KEI Industries Ltd.
4. Havells.
5. Delton
6. Elkay Telelinks
7. Evershine Electricals
8. Ecko
9. Ravin
10. Rallison.
11. Suyog
12. Netco
13. Uniflex
14. Paramount
15. Gloster
16. Associated cables Pvt Ltd.
17. CMI
18. Gemscab
19. Industrial cables
20. NICCO
21. Polycab
22. Torrent

Cable – Gland

1. Baliga
2. Comet
3. Flexpro
4. Flameproof
5. FCG
6. Electro Werke
7. Dowels

8. CCI

Cable – Lugs

1. Dowels
2. Jainson
3. Ismal

Cable – Tray

1. Ercon Composites
2. Yamuna Power & Infrastructure Ltd.

Cable Termination and Jointing Kit

1. CCI
2. Raychem
3. M-Seal

Earthing Materials

1. Rukmani Electrical & Components Pvt Ltd.
2. Indiana Grating Pvt Ltd.
3. Jef Techno Solutions Pvt Ltd

Flame proof LDB's/ JB,s /Control Station/ switches

1. FCG
2. Sudhir
3. Prompt Engineering Works
4. Flame Proof equipments pvt. Ltd.
5. Baliga Lighting Equipments Pvt. Ltd.
6. Flexpro Electricals Pvt. Ltd.

Indicating Lamps

1. Alstom Ltd.
2. BCH
3. L&T Ltd.
4. Siemens Ltd.
5. Vaishno Electricals

Miniature Circuit Breakers (MCBs) and Lighting DB

1. ABB
2. Hagger
3. Havell's India Ltd.
4. Indo Asian Fusegear Ltd.
5. Legrand

6. MDS Switchgear Ltd.
7. Schneider
8. Siemens Ltd.
9. HPL

Moulded Case Circuit Breaker (MCCBs)

1. ABB
2. Andrew yule
3. Larsen & Toubro
4. Schneider
5. Siemens
6. Control and Switchgear

Push Buttons

1. BCH
2. Alstom Ltd.
3. L&T
4. Siemens Ltd.
5. Telemenchanique & Controls (India) Ltd.
6. Vaishno Electricals

Switches-Control

1. BCH
2. Easum Reyrolle Relays & Devices Ltd.
3. Alstom
4. Kaycee Industries Ltd.
5. L&T
6. Siemens Ltd.

Terminals Blocks

1. Connectwell
2. Controls & Switchgear Co. Ltd.
3. Elmex Controls Pvt. Ltd.
4. Essen Engineering Co. Pvt. Ltd.

NOTE :- Item/Vendor, which are not listed above, shall be subject to prior approval from Client/Consultant.

INSTRUMENTATION

LIST OF MATERIALS OF RECOMMENDED BRAND AND/ OR MANUFACTURE

1. PRESSURE GAUGES

1. AN Instruments Pvt Ltd
2. Badotherm Process Instruments B.V.
3. Baumer Bourdon Haenni S.A.S
4. British Rototherm Co Ltd
5. Budenberg Gauge Co Ltd
6. Dresser Inc
7. Forbes Marshall (Hyd) Pvt Ltd
8. General Instrument Consortium
9. H. Guru Instruments (South India) Pvt Ltd
10. Manometer (India) Pvt Ltd
11. Nagano Keiki Seisakusho Ltd
12. Hirlekar Precision, India
13. Waaree Instruments Ltd
14. Walchandnagar Industries Ltd (Tiwac Divn)
15. Wika Alexander Wiegand & Co GmbH
16. Wika Instruments India Pvt Ltd
17. Ashcroft India Pvt Ltd.

2. TEMPERATURE GAUGES

1. AN Instruments Pvt Ltd.
2. Badotherm Process Instruments B.V.
3. Bourdon Haenni S.A.
4. Dresser Inc.
5. General Instruments Consortium
6. H. Guru Instruments (South India) Pvt Ltd
7. Nagano Keiki Seisakusho Ltd
8. Solartron ISA
9. Walchandnagar Industries Ltd (Tiwac Divn)
10. Wika Alexander Wiegand & Co GmbH
11. Wika Instruments India Pvt Ltd
12. Pyro Electric, Goa

13. Ashcroft India Pvt Ltd.

3. TEMPERATURE ELEMENTS, THERMO-WELLS

1. ABB Automation Ltd
2. Altop Industries Ltd
3. Bourdon Haenni S.A.
4. Detriv Instrumentation & Electronics Ltd
5. General Instruments Consortium
6. Japan Thermowell Co Ltd
7. Tecnomatic S.P.A
8. Tempsen Instrument India Ltd
9. Thermo Electric Co. Inc.
10. Thermo-Couple Products Co
11. Thermo-Electra B.V.
12. Wika Alexander Wiegand & Co GmbH
13. Altop Industries Ltd., Baroda
14. Nagman Sensors (Pvt.) Ltd.
15. Pyro Electric, Goa

4. ELECTRONIC VOLUME CORRECTOR

1. Elgas
2. Itron
3. Plum
4. Pietro Fiorentini

5. FIELD INSTRUMENTS (P, DP, F, L, T)

1. ABB Ltd
2. Honeywell
3. Fuji Electric Instruments Co Ltd
4. Yokogawa
5. Invensys India Pvt.Ltd

6. PRESSURE REGULATOR AND SLAM SHUT VALVE

- Pietro Fiorentini S.P.A. (Italy)
- Emerson
- RMG-Regel Messtechnik (Germany

- Mokveld Valves BV (Netherlands)
- Schlumberger (USA)
- Gorter Controls B V (Netherlands)
- Instromet International NV
- Nirmal Industrial Controls Pvt Ltd. (up to 6" size only)
- ESME Valves Ltd

- Kaye & Macdonald Inc.
- Nuovo Pignone S.P.A (Italy) (GE Oil Co.)
- Richards Industries (Formerly Treloar)
- Samson AG Mess-und Regeltechnik
- Tormene Gas Technology
- Dresser Inc, USA (upto 8" size, 300# class only)

7. PRESSURE SAFETY VALVES

1. Keystone Valves (India) Pvt. Ltd.
2. Larson & Toubro Ltd.
3. Lesser GmbH & Co KG
4. Mekaster Engg Ltd.
5. Tyco Sanmar Ltd. (New Delhi)
6. Anderson Greenwood Crosby
7. BHEL (Trichy)
8. Curtiss Wright Flow Control Corporation
9. Dresser Inc.
10. Fukui Seisakusho

Co. Ltd 11.

12. Nakakita Seisakusho Co Ltd
13. Nuovo Pignone S.P.A (Italy) (GE Oil co)
14. Parcol S.P.A
15. Safety Systems UK Ltd
16. Tai Milano S.P.A
17. Weir Valves & Controls France
18. Bliss Anand Pvt Ltd.

8. CONTROL PANEL & ACCESSORIES

1. Keltron Controls Ltd., Kerala

2. Elechmec Corporation Ltd., Mumbai
3. Industrial Controls & Appliances Pvt. Ltd.,
4. Alstom System Ltd., Noida
5. Emerson Process Management (I) Pvt. Ltd.
6. ABB Instruments Ltd., New Delhi
7. Larsen & Toubro Ltd.
8. Control & Automation, New Delhi
9. GE Fanuc Systems Pvt. Ltd., New Delhi
10. Rockwell Automation (I) Ltd., Ghaziabad
11. Honeywell Automation Ltd.
12. Rittal
13. Pyrotech Elcronics Pvt Ltd.
14. Positronics Pvt Ltd.
15. Electronics Corporation of India Ltd.

9. JUNCTION BOXES AND CABLES GLANDS

1. Ex-Protecta
2. Flameproof Control Gears
3. Baliga
4. Flexpro Electricals

10. CONTROL AND SIGNAL CABLES

1. Associated Cables
2. Brook
3. Associated Flexibles & Wires (Pvt) Ltd
4. Universal Cables Ltd,India
5. Delton Cables Ltd, India
6. KEI Industries Ltd INDIA
7. CMI Limited
8. Cords Cable Industries Ltd, India
9. Elkay Telelinks (P) Ltd., India
10. Udey Pyrocables Pvt Ltd, India
11. Goyolene Fibres (I) Pvt Ltd, India
12. Netco Cable Industries Pvt Ltd, India
13. Nicco Corporation Ltd, India
14. Paramount Communications Ltd, India

15. Polycab Wires Pvt Ltd, India
16. Radiant Cables Pvt Ltd, India
17. Reliance Engineers Ltd., India
18. Suyog Electricals Ltd, India
19. Thermo Cables Ltd

11. SS FITTINGS, INSTRUMENT VALVES & MANIFOLDS

1. Parker
2. Swagelok Co
3. Aura Inc.
4. Hoke
5. Excelsior Engg Works, India
6. Swastic Engineering Works, India
7. Comfit & Valves Pvt.Ltd
8. Arya Crafts & Engg.Pvt. Ltd
9. DK lok

12. SS TUBES

1. Swagelok Co.
2. Parker
3. Sandvik
4. Heavy metal & tubes LTD
5. Nuclear Fuel Complex, India
6. Scorodite
7. Ratnamani Metal & Tube Ltd
8. Jindal Saw

SHOP & FIELD PAINTING

LIST OF MATERIALS OF RECOMMENDED BRAND AND/ OR MANUFACTURE

Indian Vendors

1. Asian Paints (I) Ltd.
2. Berger Paints Ltd.
3. Goodlass Nerlolac Paints Ltd.
4. Jenson And Nicholson Paint Ltd & chokuGu Jenson & Nicholson Ltd.

5. Shalimar Paints Ltd.
6. Sigma Coating, Mumabai
7. CDC Carboline Ltd.
8. Premier Products Ltd.
9. Coromandel Paints & Chemicals Ltd.
10. Anupam Enterprises
11. Grand Polycoats
12. Bombay Paints Ltd.
13. Vanaprabha Esters & Glycer, Mumbai
14. Sunil Paints and Varnishes Pvt. Ltd.
15. Courtaulds Coating & Sealants India (Pvt.) Ltd.
16. Mark-chem Incorporated, Mumbai (for phosphating chemicals only)
17. VCM Polyurethane Paint (for polyurethane Paint only)
18. M/s. Durolac Paints Inc. (For Powder Coating Paints)

Foreign Vendors For Overseas Products

1. Sigma Coating, Singapore
2. Ameron, USA
3. Kansai Paint, Japan
4. Hempel Paint, USA
5. Valspar Corporation, USA
6. Courtaulds Coating, UK.

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Notes:

1. Bidder can select equipment of two different makes, selected from this VENDOR LIST and mention the same in the checklist for technical evaluation attached with the tender. The offered bid must include filled datasheet indicating make, model, size, rating of offered instrument/ equipment duly supported by sizing calculation of offered equipment (wherever applicable).

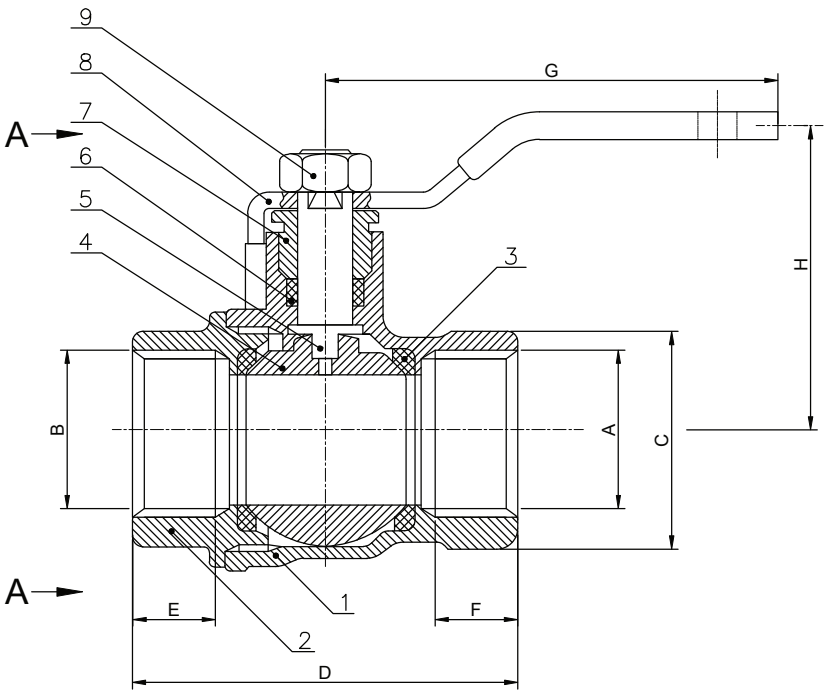
2. Vendors who have already supplied above equipment in other terminals of any CGD, shall also be considered qualified for this tender provided the supplied equipment are commissioned and running successfully and they have not been put on holiday.

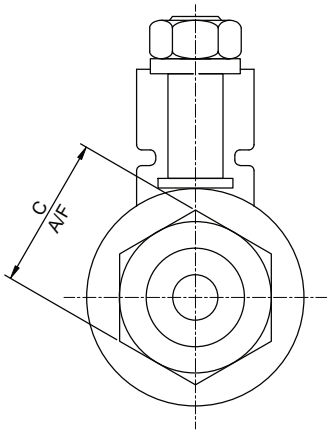
3. Equipment / Instruments of any make which is offered by one bidder and acceptable to any CGD shall be accepted for other bidder also. After placement of order, on request of the successful bidder list of other qualified makes for a particular item (for which successful bidder wants to change the vendor) shall be provided.

4. Bidder shall take prior approval of the make / model no of the offered item and it shall

be from the list given above. However additional vendors will be considered in exceptional cases, provided they have supplied for similar application to reputed gas transmission/distribution companies, in quantities at least half the numbers being supplied for this tender, and working satisfactorily for minimum 6 months. Documentary evidence substantiating above shall be submitted for taking approval.

Note : Above mentioned vendor list is tentative and further addition/deletion may be done as per discretion of OWNER/CONSULTANT.





VIEW A–A

TECHNICAL SPECIFICATIONS

MEDIUM	NATURAL GAS
END CONNECTION	1–1/2", 2" NPT(F) at both Inlet and Outlet
OPERATING PRESSURE	4 bar(g)
OPERATING TEMPERATURE	0 °C TO 45 °C
DESIGN PRESSURE	6 bar(g)
DESIGN TEMPERATURE	0 °C TO 65 °C
OPERATOR	Knob and Locking Arrangement with Lever type Handle
MATERIAL OF CONSTRUCTION (Refer Data Sheet of Isolation Valve attached in PTS)	Body : Forged Brass (ASTM B 283, Alloy UNSC37700) with Hard Nickel/ Chrome Plated. Ball : Forged Brass (ASTM B 283, Alloy UNSC37700) with Hard Nickel/ Chrome Plated.

MATERIAL LIST

Item	Part	Material
1	Body	Brass
2	End Cap	Brass
3	Ball Seat	PTFE
4	Ball	Brass
5	Stem	Brass
6	O–Ring	NBR
7	Packing Nut	Brass
8	Lever Handle	Steel, Nickel Plated
9	Stem Nut	Steel, Nickel Plated

DIMENSION TABLE

SIZE	A	B	C	D	E (Min.)	F (Min.)	G	H
1–1/2"	1–1/2"NPT(F) x 11.5 TPI	1–1/2"NPT(F) x 11.5 TPI	$53^{+1.0}_{0}$	$96^{\pm1.0}$	21.0	21.0	* (NOTE–3)	* (NOTE–3)
2"	2" NPT(F) x 11.5 TPI	2" NPT(F) x 11.5 TPI	$66^{+1.0}_{0}$	$110^{\pm1.0}$	22.0	22.0	* (NOTE–3)	* (NOTE–3)

NOTE:

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. ALL NPT THREADS SHALL BE AS PER ASME B1.20.1.
3. ALL DIMENSIONS MARKED "*" SHALL BE PROVIDED BY VENDOR.
4. DIMENSIONS MENTIONED IN TABLE ARE MINIMUM REQUIREMENT.
5. GA DRAWING AS SHOWN IS INDICATIVE ONLY. ACTUAL SHAPE / SIZE SHALL BE AS PER VENDOR'S OWN GA DRAWING.

REV	DATE	DESCRIPTION	PRED	CHKD	APPD
0	19.05.18	ISSUED FOR CONSTRUCTION	US	ADE	AD

SUBJECT OF REVISION

OWNER: INDRAPRASTHA GAS LIMITED, NEW DELHI

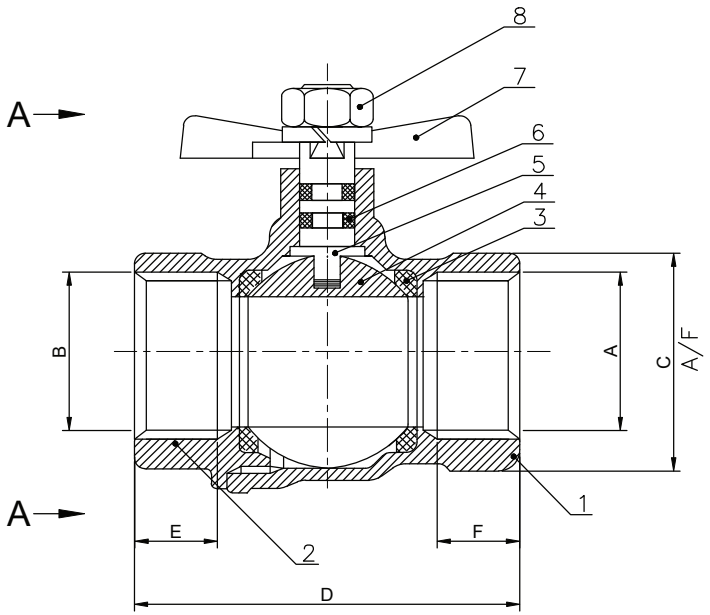
PMC: M/s. VCS QUALITY SERVICES PVT. LTD., NOIDA, U.P.

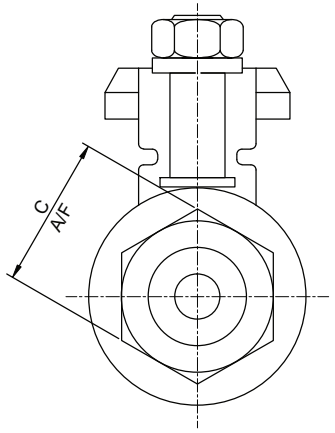
PROJECT: CITY GAS DISTRIBUTION PROJECT

TITLE: GA DRAWING OF ISOLATION VALVE

SCALE: NTS | CAD FILE: | DATE: | REV 0

DRG. NO. 15792 /03-CD-MC-DR-001 | SHEET 1 OF 1





VIEW A–A

TECHNICAL SPECIFICATIONS

MEDIUM	NATURAL GAS
END CONNECTION	1/2", 3/4", 1" NPT(F) at both Inlet and Outlet
OPERATING PRESSURE	4 bar(g)
OPERATING TEMPERATURE	0 °C TO 45 °C
DESIGN PRESSURE	6 bar(g)
DESIGN TEMPERATURE	0 °C TO 65 °C
OPERATOR	Knob and Locking Arrangement with Butterfly type Handle
MATERIAL OF CONSTRUCTION (Refer Data Sheet of Isolation Valve attached in PTS)	Body : Forged Brass (ASTM B 283, Alloy UNSC37700) with Hard Nickel/ Chrome Plated. Ball : Forged Brass (ASTM B 283, Alloy UNSC37700) with Hard Nickel/ Chrome Plated.

MATERIAL LIST

Item	Part	Material
1	Body	Brass
2	End Cap	Brass
3	Ball Seat	PTFE
4	Ball	Brass
5	Stem	Brass
6	O–Ring	NBR
7	Handle	Steel, Nickel Plated
8	Stem Nut	Steel, Nickel Plated

DIMENSION TABLE

SIZE	A	B	C	D	E (Min.)	F (Min.)
1/2"	1/2" NPT(F) x 14 TPI	1/2" NPT(F) x 14 TPI	$25^{+1.0}_{0}$	$56^{\pm 1.0}$	15.5	15.5
3/4"	3/4" NPT(F) x 14 TPI	3/4" NPT(F) x 14 TPI	$31^{+1.0}_{0}$	$62^{\pm 1.0}$	16.0	16.0
1"	1" NPT(F) x 11.5 TPI	1" NPT(F) x 11.5 TPI	$38^{+1.0}_{0}$	$76^{\pm 1.0}$	18.5	18.5

NOTE:

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. ALL NPT THREADS SHALL BE AS PER ASME B1.20.1.
3. ALL DIMENSIONS MARKED "*" SHALL BE PROVIDED BY VENDOR.
4. DIMENSIONS MENTIONED IN TABLE ARE MINIMUM REQUIREMENT.
5. GA DRAWING AS SHOWN IS INDICATIVE ONLY. ACTUAL SHAPE / SIZE SHALL BE AS PER VENDOR'S OWN GA DRAWING.

REV	DATE	DESCRIPTION	PRED	CHKD	APPD
0	19.05.18	ISSUED FOR CONSTRUCTION	US	ADE	AD

SUBJECT OF REVISION

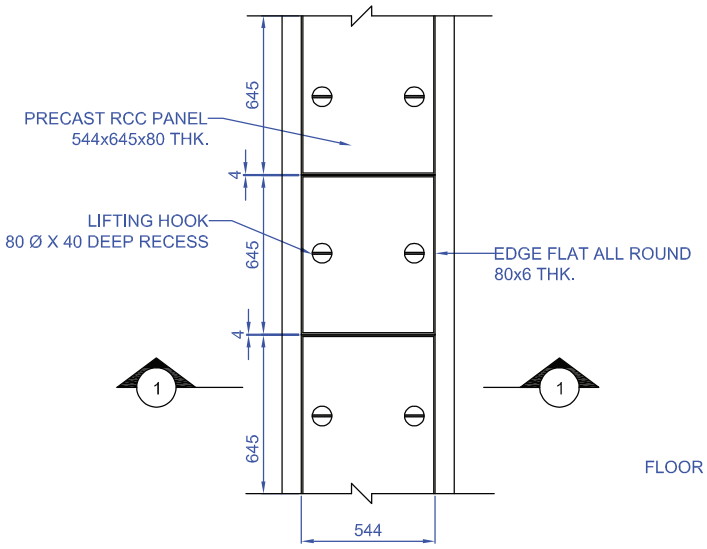
OWNER: INDRAPRASTHA GAS LIMITED, NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD., NOIDA, U.P.

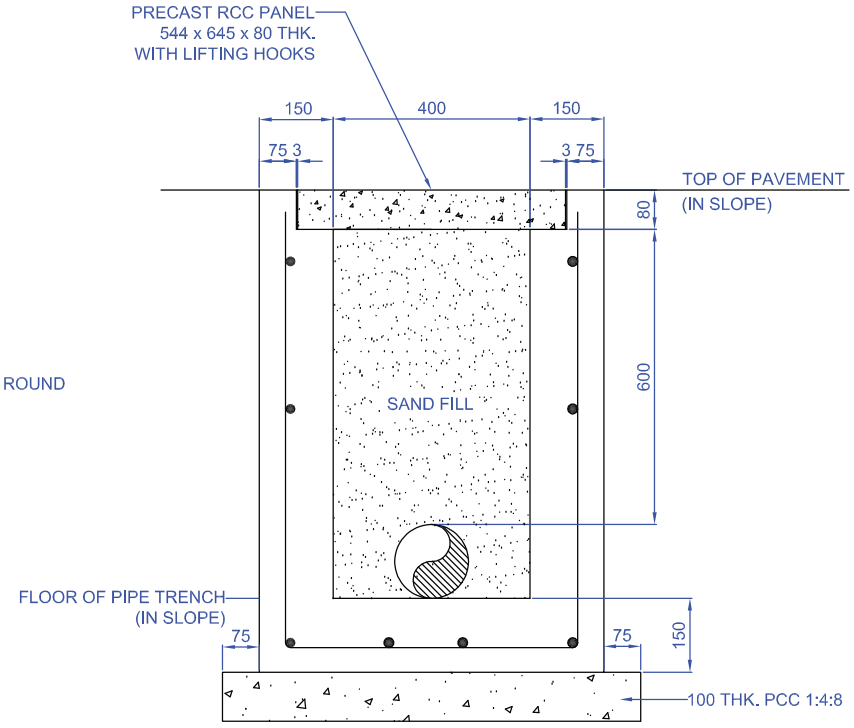
PROJECT: CITY GAS DISTRIBUTION PROJECT

TITLE: GA DRAWING OF ISOLATION VALVE

SCALE: NTS	CAD FILE:	REV	0
	DATE:		
DRG. NO.	15792 /03-CD-MC-DR-002	SHEET 1 OF 1	



G.A. PLAN OF COVER SLAB



SECTION 1-1 THRU PIPE TRENCH
(PIPE TRENCH BY OTHERS)
SCALE 1:10

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	DETAILS OF PIPE TRENCH
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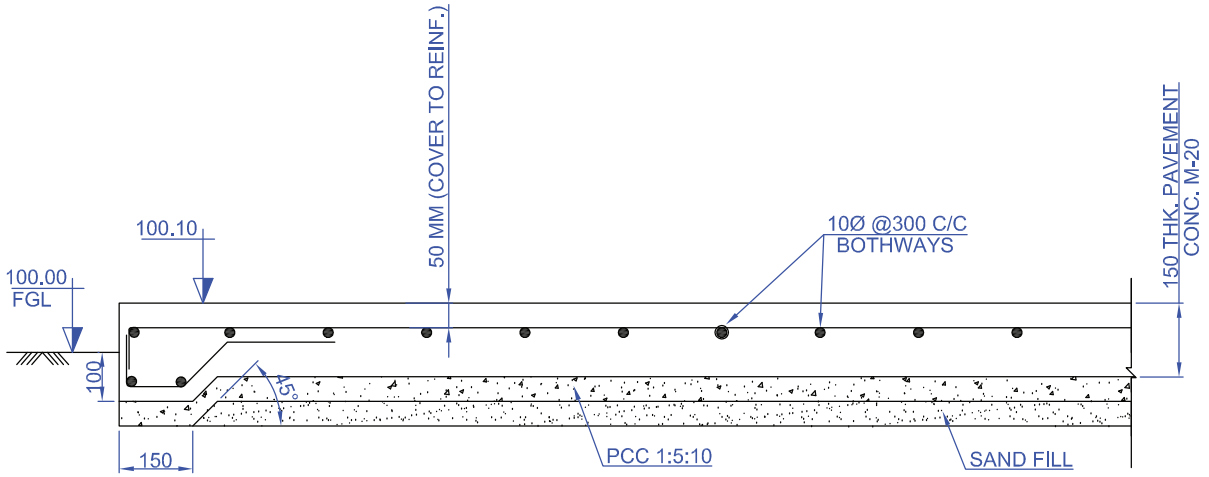
DRG. NO.15792-10-03-16 REV-0	



RCC PAVEMENT DETAIL

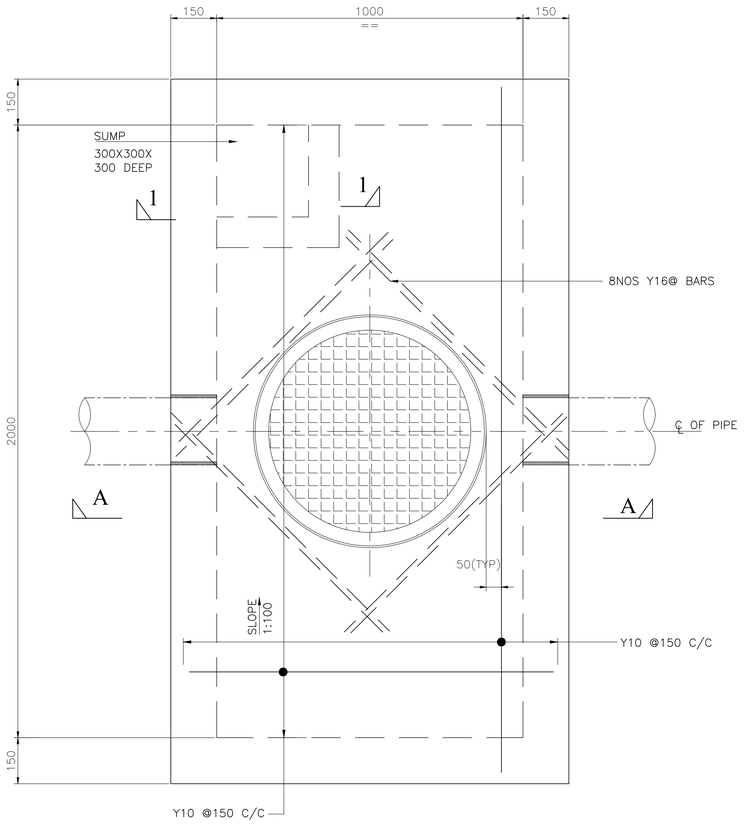
NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	STANDARD DETAIL OF RCC PAVEMENT

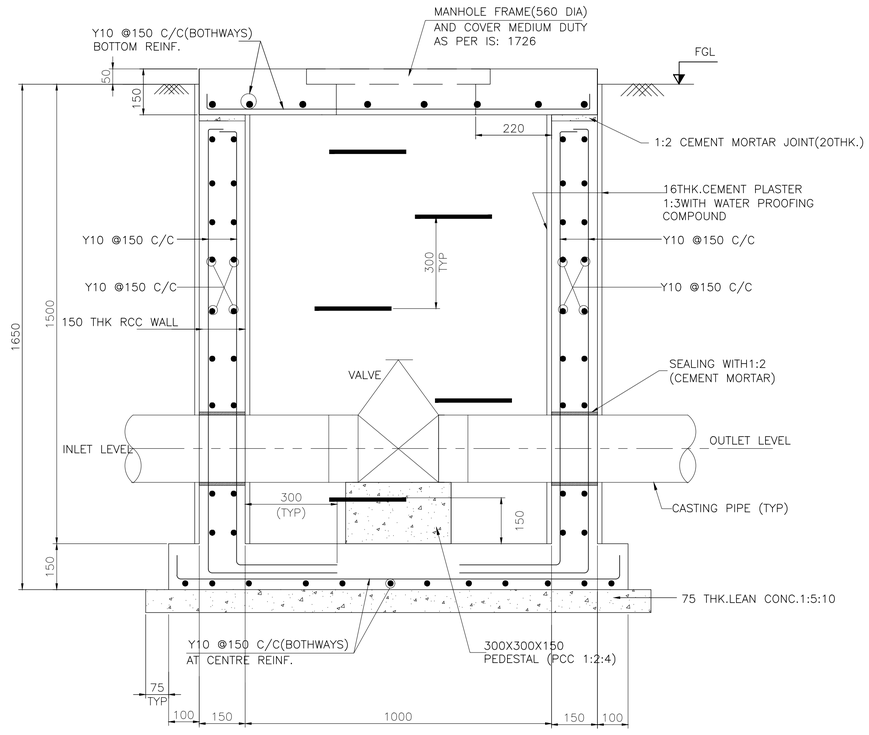
SCALE	DATE	CAD FILE: DATE		
1:10			CAD	A3

DRG. NO. 15792-10-03-17 REV-0

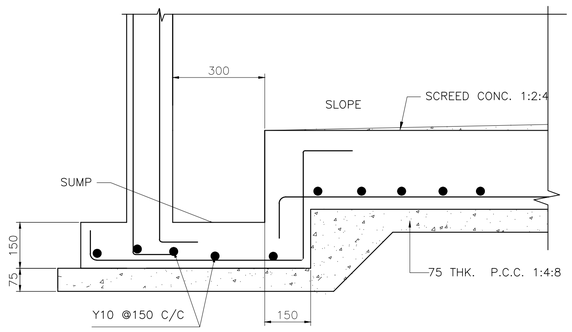


VALVE PIT PLAN

(SCALE 1:25)

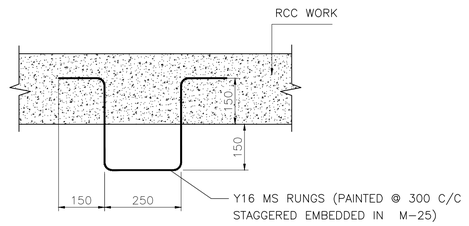


SECTION A - A



SECTION 1 - 1

(SCALE 1:25)



TYPICAL DETAILS OF MS RUNGS

(SCALE 1:10)

REFERENCE DRAWING / DOCUMENTS

S.NO	DRAWING TITLE	DRAWING NO.
–	–	–

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETER (MM) & LEVELS ARE IN METER (M)
2. FOLLOW WRITTEN DIMENSIONS ONLY.DONOT SCALE THE DRAWING.
3. CLEAR COVER TO MAIN REINFORCEMENT SHALL BE (a) SLAB 20mm.
4. GRADE OF CONCRETE USED SHALL BE M25 CONFORMING .
5. REINFORCEMENT SHALL BE HYSD BARS OF GRADE Fe415 CONFORMING TO IS–1786

ABBREVIATION:-

FGL = FINISHED GROUND LEVEL

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
D1	16.06.25	ISSUED FOR BID	RJS	HK	KBT

OWNER

INDRAPRASTHA GAS LIMITED (IGL)
NEW DELHI

PMC

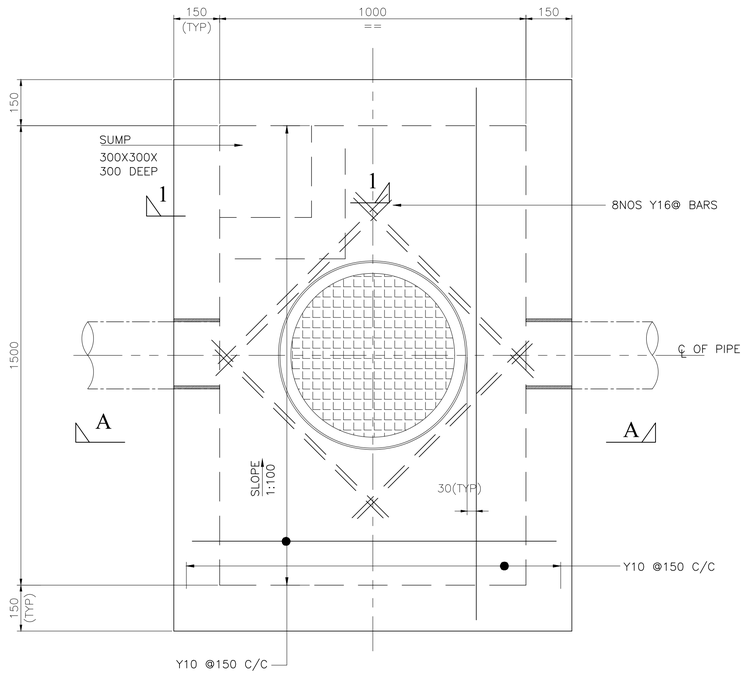
M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT

LAYING OF MDPE NETWORK AND GI / CU / MLC INSTALLATION AND MRS FABRICATION IN NCT OF DELHI, UP,HARYANA & RAJASTHAN G A

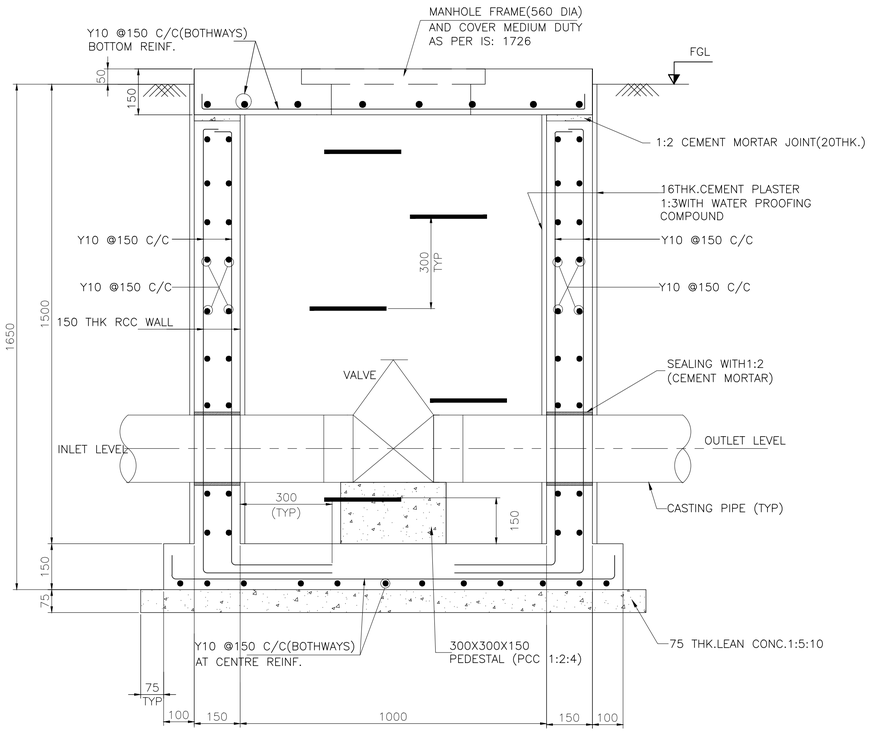
SCALE	TITLE
1:100	STANDARD DETAIL OF RCC VALVE CHAMBER (TYPE-1)

SIZE	CLIENT JOB NO.	DRAWING NUMBER	SHEET	REV.
A1	C261160	C261160-IGL-STR-6001	1 OF 1	D1

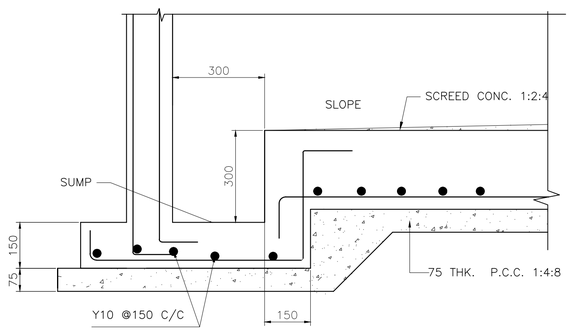


VALVE PIT PLAN

(SCALE 1:25)

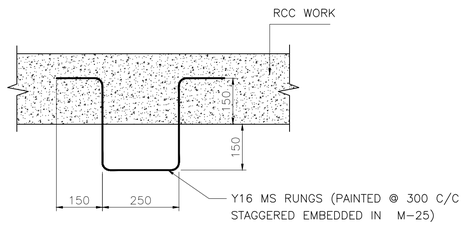


SECTION A - A



SECTION 1 - 1

(SCALE 1:25)



TYPICAL DETAILS OF MS RUNGS

(SCALE 1:10)

REFERENCE DRAWING / DOCUMENTS

S.NO	DRAWING TITLE	DRAWING NO.
–	–	–

NOTES:-

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2. FOLLOW WRITTEN DIMENSIONS ONLY.DONOT SCALE THE DRAWING.
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4. GRADE OF CONCRETE USED SHALL BE M25 CONFORMING .
5. REINFORCEMENT SHALL BE HYSD BARS OF GRADE Fe415 CONFORMING TO IS–1786

ABBREVIATION:-

FGL = FINISHED GROUND LEVEL

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
D1	16.06.25	ISSUED FOR BID	RJS	HK	KBT

OWNER

INDRAPRASTHA GAS LIMITED (IGL)
NEW DELHI

PMC

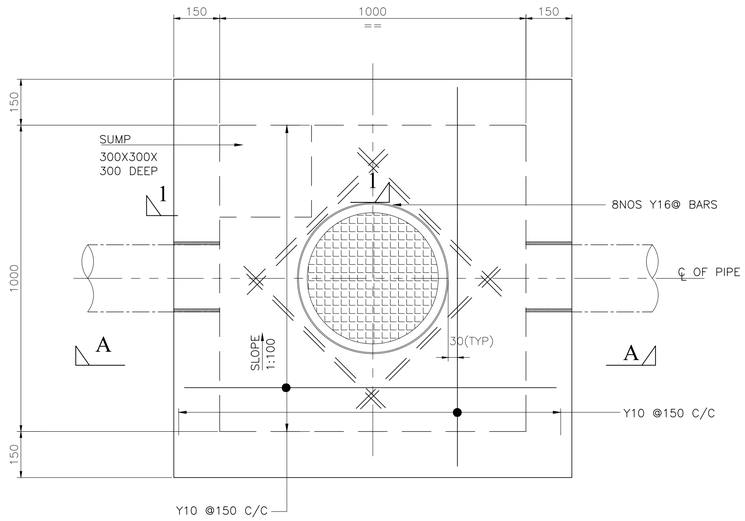
M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT

LAYING OF MDPE NETWORK AND GI / CU / MLC INSTALLATION AND MRS FABRICATION IN NCT OF DELHI, UP,HARYANA & RAJASTHAN G A

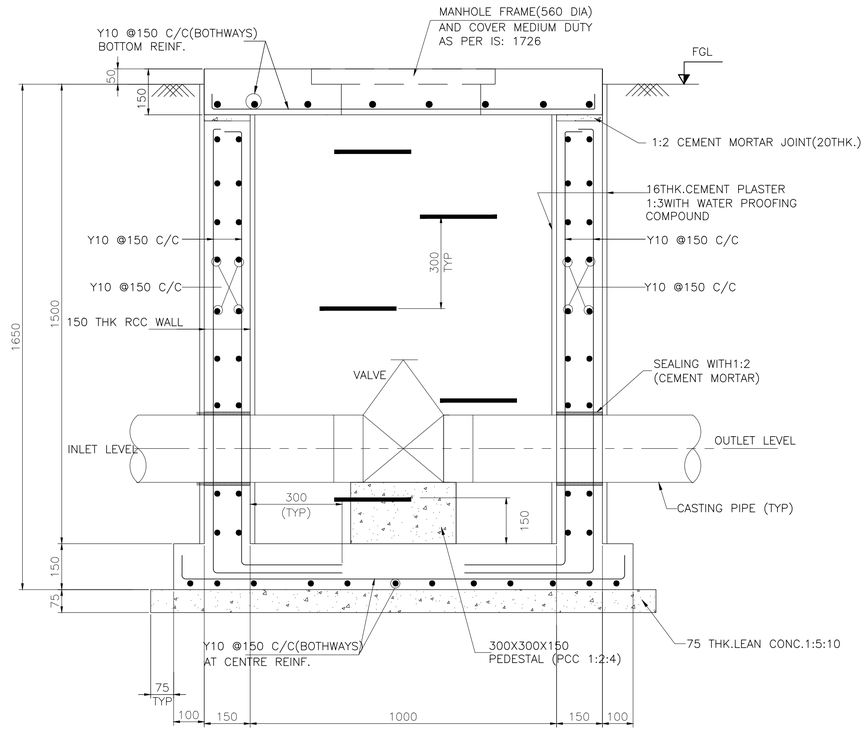
SCALE	TITLE
1:100	STANDARD DETAIL OF RCC VALVE CHAMBER (TYPE-2)

SIZE	CLIENT JOB NO.	DRAWING NUMBER	SHEET	REV.
A1	C261160	C261160-IGL-STR-6002	1 OF 1	D1

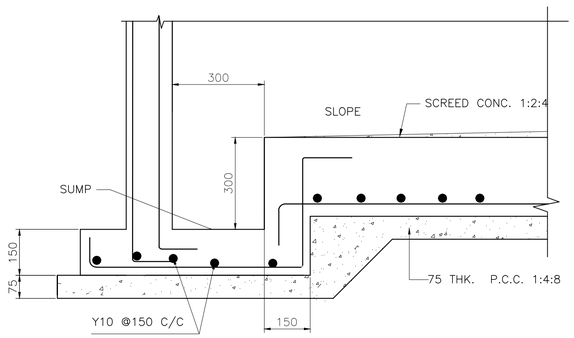


VALVE PIT PLAN

(SCALE 1:25)

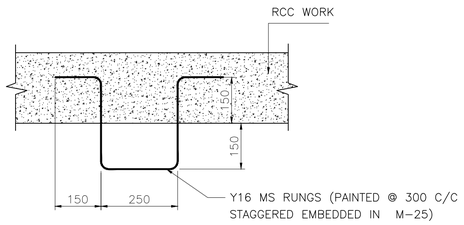


SECTION A - A



SECTION 1 - 1

(SCALE 1:25)



TYPICAL DETAILS OF MS RUNGS

(SCALE 1:10)

REFERENCE DRAWING / DOCUMENTS

S.NO	DRAWING TITLE	DRAWING NO.
–	–	–

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETER (MM) & LEVELS ARE IN METER (M)
2. FOLLOW WRITTEN DIMENSIONS ONLY.DONOT SCALE THE DRAWING.
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4. GRADE OF CONCRETE USED SHALL BE M25 CONFORMING .
5. REINFORCEMENT SHALL BE HYSD BARS OF GRADE Fe415 CONFORMING TO IS–1786

ABBREVIATION:-

FGL = FINISHED GROUND LEVEL

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
D1	16.06.25	ISSUED FOR BID	RJS	HK	KBT

OWNER

INDRAPRASTHA GAS LIMITED (IGL)
NEW DELHI

PMC

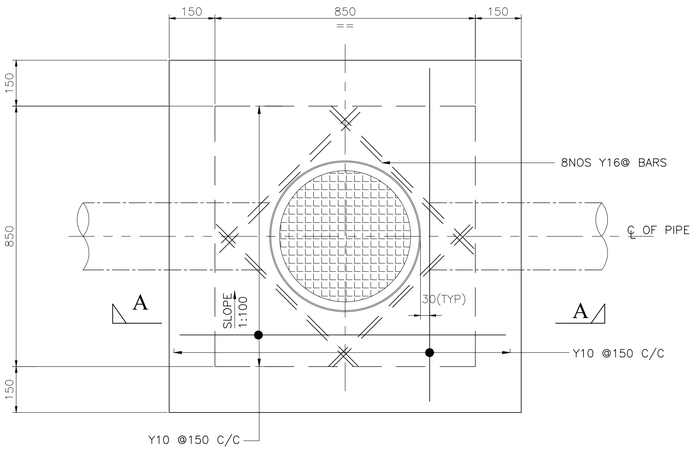
M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT

LAYING OF MDPE NETWORK AND GI / CU / MLC INSTALLATION AND MRS FABRICATION IN NCT OF DELHI, UP,HARYANA & RAJASTHAN G A

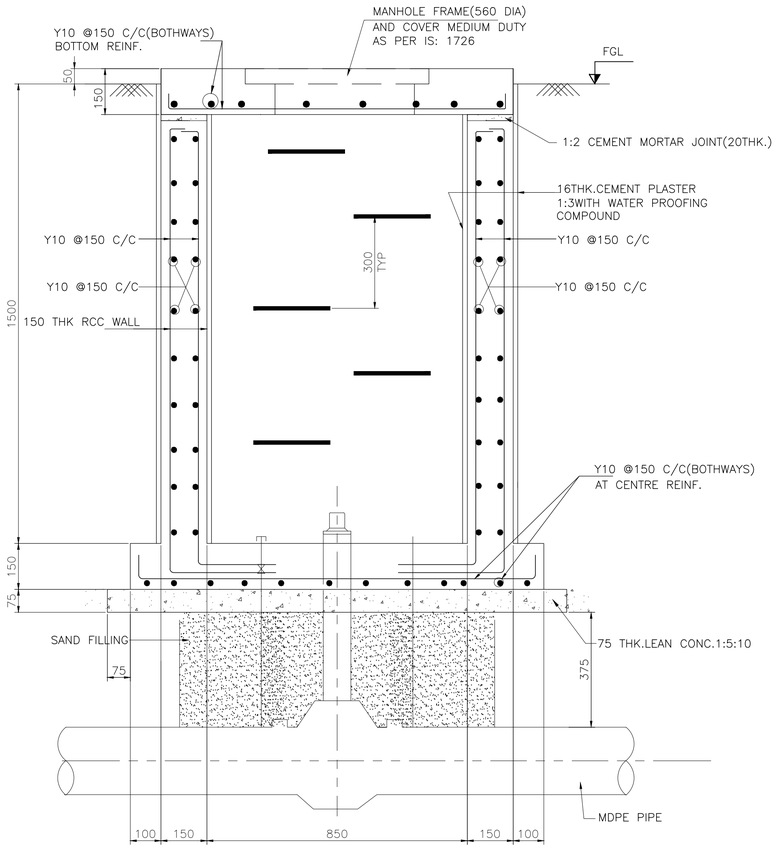
SCALE	TITLE
1:100	STANDARD DETAIL OF RCC VALVE CHAMBER (TYPE-1)

SIZE	CLIENT JOB NO.	DRAWING NUMBER	SHEET	REV.
A1	C261160	C261160-IGL-STR-6003	1 OF 1	D1

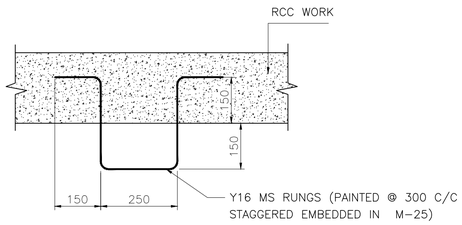


VALVE PIT PLAN

(SCALE 1:25)



SECTION A - A



TYPICAL DETAILS OF MS RUNGS

(SCALE 1:10)

REFERENCE DRAWING / DOCUMENTS

S.NO	DRAWING TITLE	DRAWING NO.
–	–	–

NOTES:-

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ABBREVIATION:-

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D1	16.06.25	ISSUED FOR BID	RJS	HK	KBT

OWNER

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PROJECT

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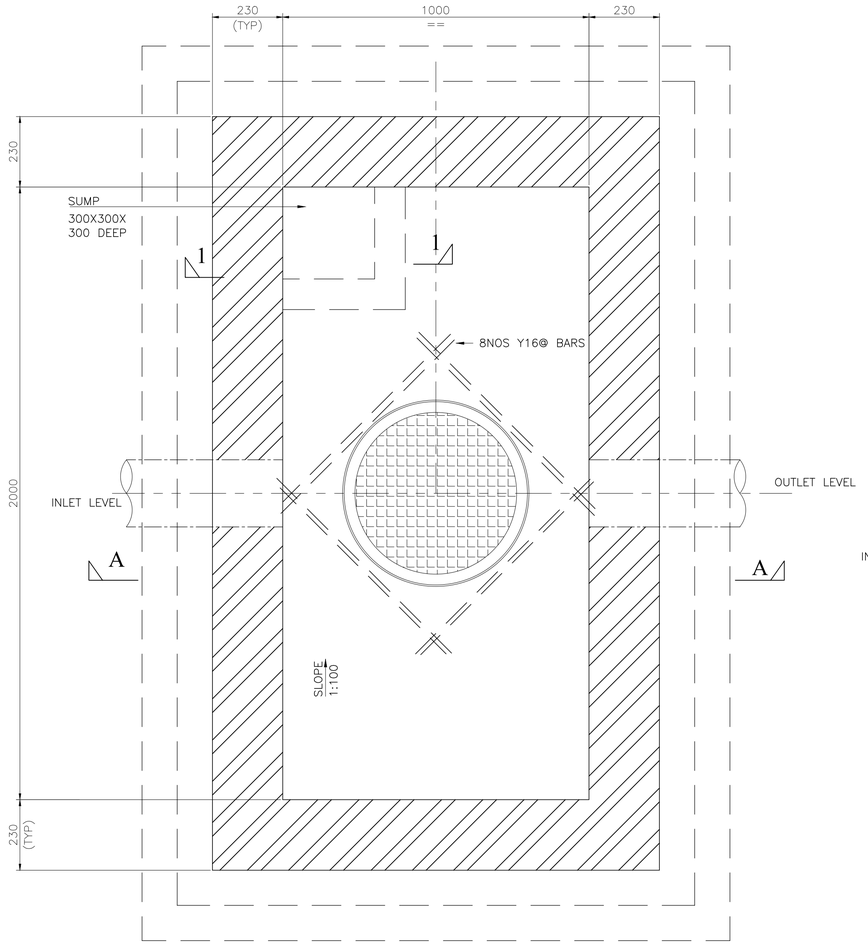
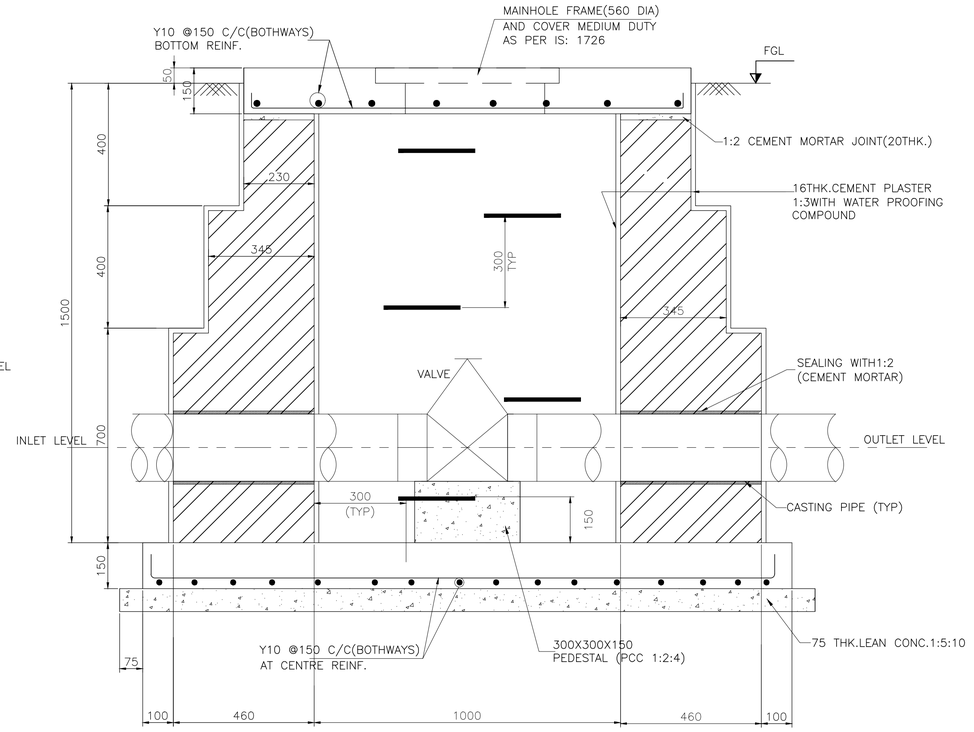
SCALE	TITLE
1:100	TYPICAL DETAIL OF RCC PRE-CAST VALVE CHAMBER WITH FRAME & COVER

SIZE	CLIENT JOB NO.	DRAWING NUMBER	SHEET	REV.
A1	C261160	C261160-IGL-STR-6004	1 OF 1	D1

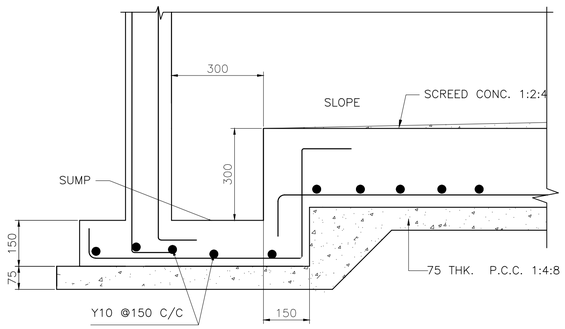


VALVE PIT PLAN

(SCALE 1:25)

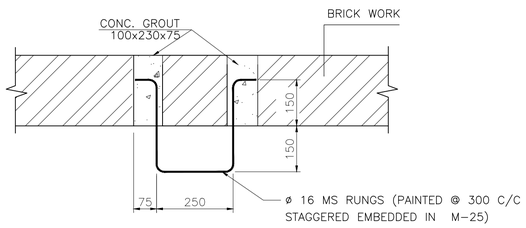


SECTION A - A



SECTION 1 - 1

(SCALE 1:25)



TYPICAL DETAILS OF MS RUNGS

(SCALE 1:10)

REFERENCE DRAWING / DOCUMENTS

S.NO	DRAWING TITLE	DRAWING NO.
–	–	–

NOTES:-

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5. REINFORCEMENT SHALL BE HYSD BARS OF GRADE Fe415 CONFORMING TO IS–1786

ABBREVIATION:-

FGL = FINISHED GROUND LEVEL

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
D1	16.06.25	ISSUED FOR BID	RJS	HK	KBT

OWNER

INDRAPRASTHA GAS LIMITED (IGL)
NEW DELHI

PMC

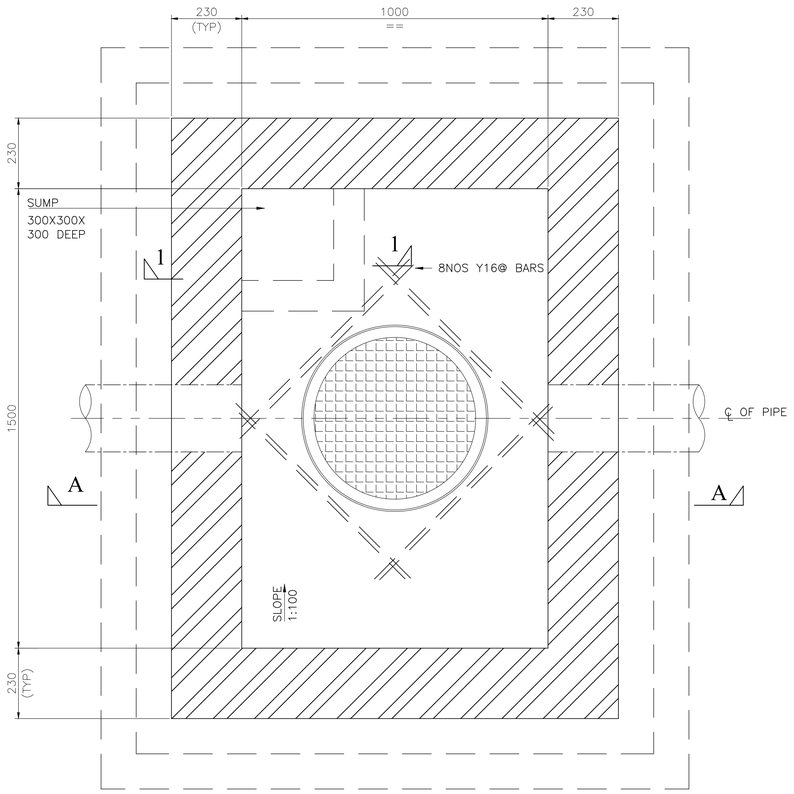
M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT

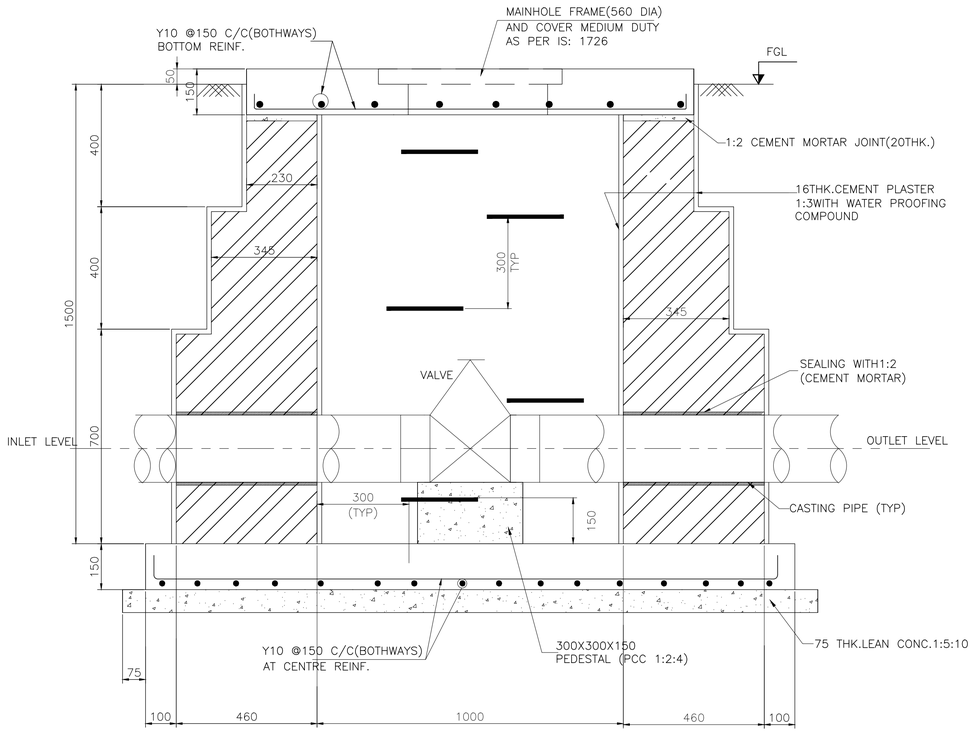
LAYING OF MDPE NETWORK AND GI / CU / MLC INSTALLATION AND MRS FABRICATION IN NCT OF DELHI, UP,HARYANA & RAJASTHAN G A

SCALE	TITLE
1:100	STANDARD DETAIL OF BRICK VALVE CHAMBER (TYPE-1)

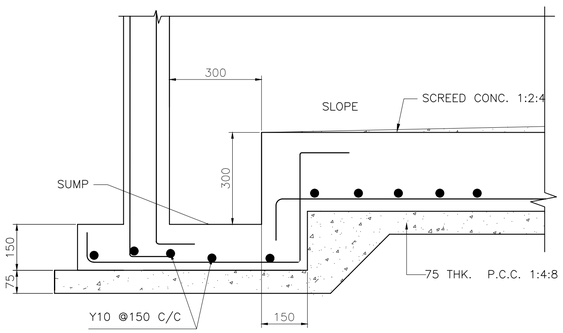
SIZE	CLIENT JOB NO.	DRAWING NUMBER	SHEET	REV.
A1	C261160	C261160-IGL-STR-6005	1 OF 1	D1



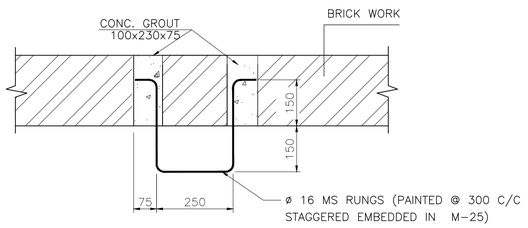
VALVE PIT PLAN
(SCALE 1:25)



SECTION A - A



SECTION 1 - 1
(SCALE 1:25)



TYPICAL DETAILS OF MS RUNGS
(SCALE 1:10)

REFERENCE DRAWING / DOCUMENTS

S.NO	DRAWING TITLE	DRAWING NO.
–	–	–

NOTES:-

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ABBREVIATION:-

FGL = FINISHED GROUND LEVEL

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
D1	16.06.25	ISSUED FOR BID	RJS	HK	KBT

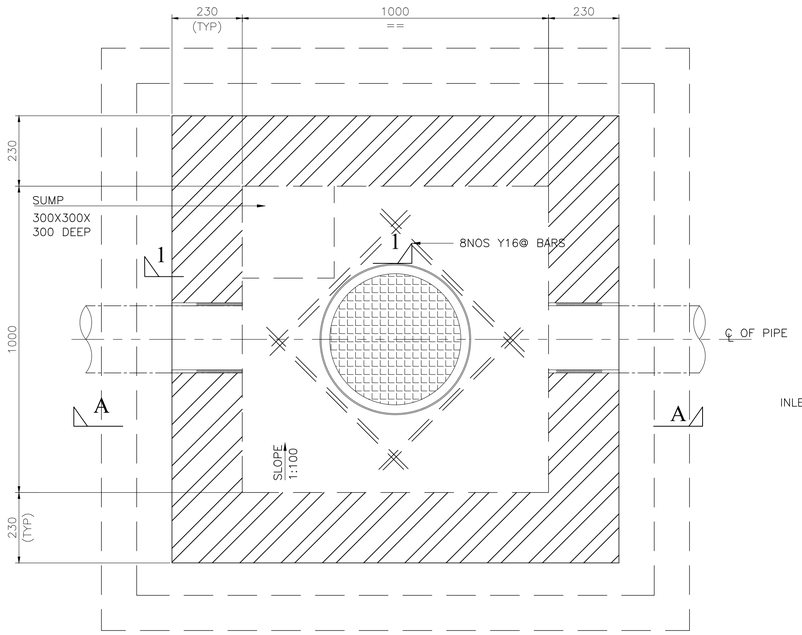
OWNER
INDRAPRASTHA GAS LIMITED (IGL)
NEW DELHI

PMC
M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT
LAYING OF MDPE NETWORK AND GI / CU / MLC INSTALLATION AND MRS FABRICATION IN NCT OF DELHI, UP,HARYANA & RAJASTHAN G A

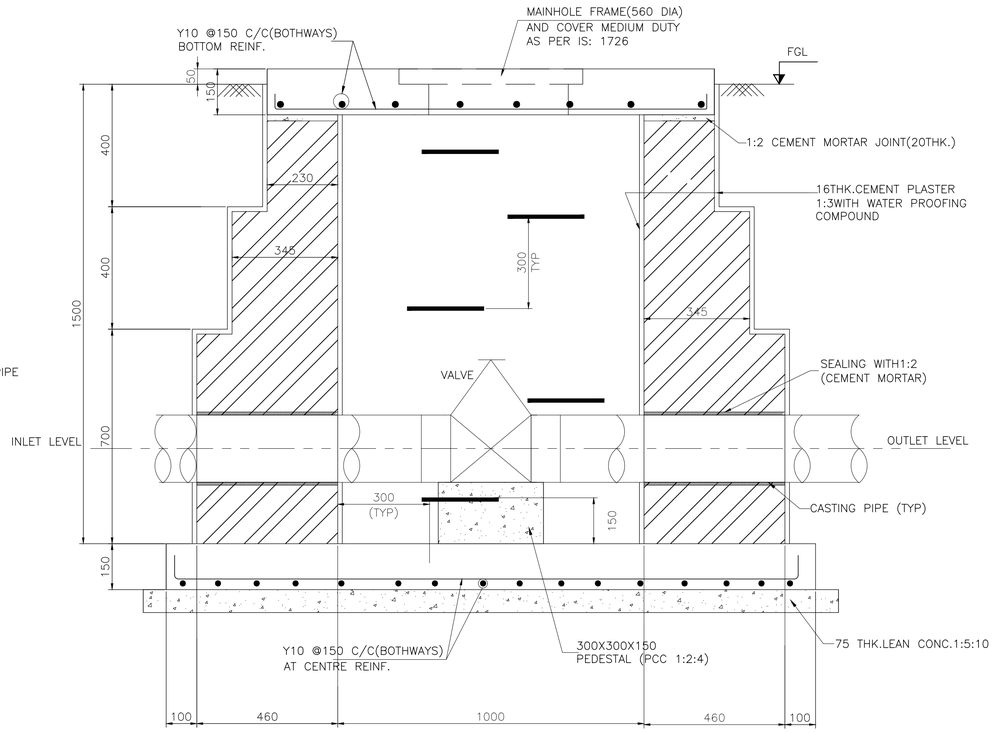
SCALE	TITLE
1:100	STANDARD DETAIL OF BRICK VALVE CHAMBER (TYPE -2)

SIZE	CLIENT JOB NO.	DRAWING NUMBER	SHEET	REV.
A1	C261160	C261160-IGL-STR-6006	1 OF 1	D1

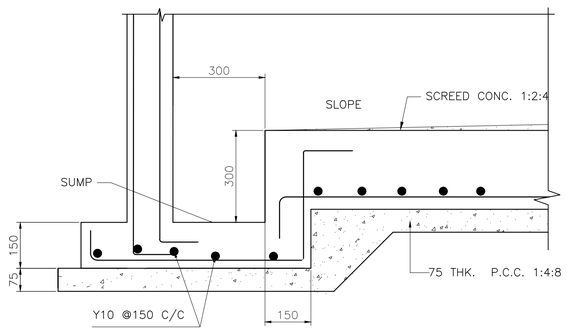


VALVE PIT PLAN

(SCALE 1:25)

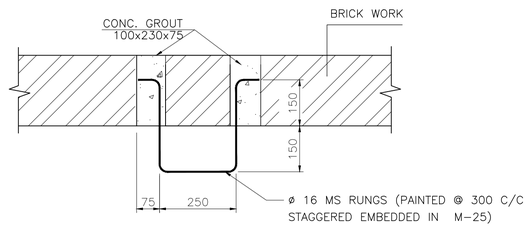


SECTION A - A



SECTION 1 - 1

(SCALE 1:25)



TYPICAL DETAILS OF MS RUNGS

(SCALE 1:10)

REFERENCE DRAWING / DOCUMENTS

S.NO	DRAWING TITLE	DRAWING NO.
–	–	–

NOTES:-

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5. REINFORCEMENT SHALL BE HYSD BARS OF GRADE Fe415 CONFORMING TO IS–1786

ABBREVIATION:-

FGL = FINISHED GROUND LEVEL

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
D1	16.06.25	ISSUED FOR BID	RJS	HK	KBT

OWNER

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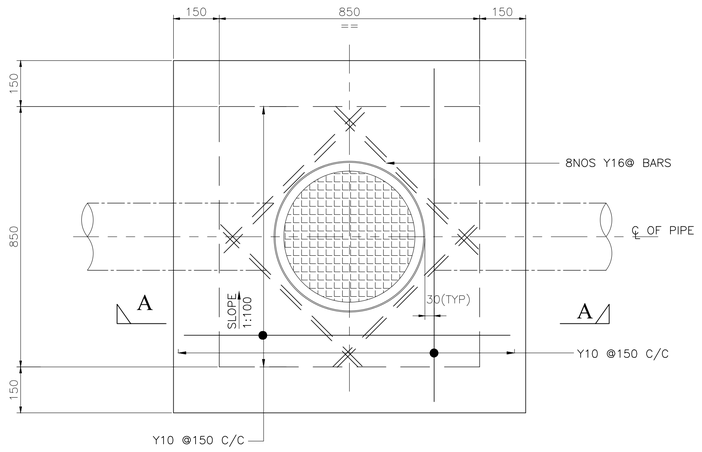
PROJECT

LAYING OF MDPE NETWORK AND GI / CU / MLC INSTALLATION AND MRS FABRICATION IN NCT OF DELHI, UP,HARYANA & RAJASTHAN G A

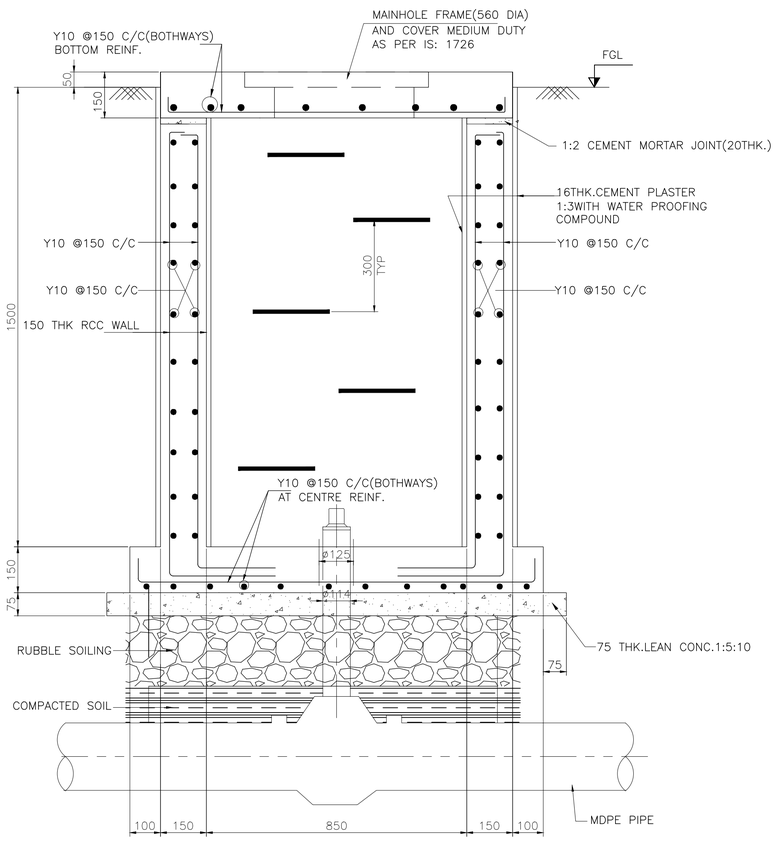
SCALE	TITLE
1:100	STANDARD DETAIL OF BRICK VALVE CHAMBER (TYPE -1)

SIZE	CLIENT JOB NO.	DRAWING NUMBER	SHEET	REV.
A1	C261160	C261160-IGL-STR-6007	1 OF 1	D1

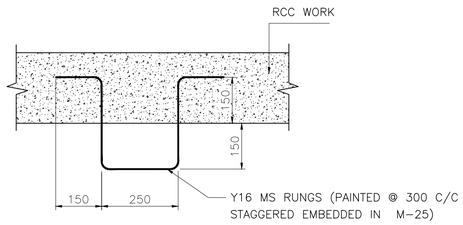


VALVE PIT PLAN

(SCALE 1:25)



SECTION A - A



TYPICAL DETAILS OF MS RUNGS

(SCALE 1:10)

REFERENCE DRAWING / DOCUMENTS

S.NO	DRAWING TITLE	DRAWING NO.
–	–	–

NOTES:-

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3. CLEAR COVER TO MAIN REINFORCEMENT SHALL BE (a) SLAB 20mm.
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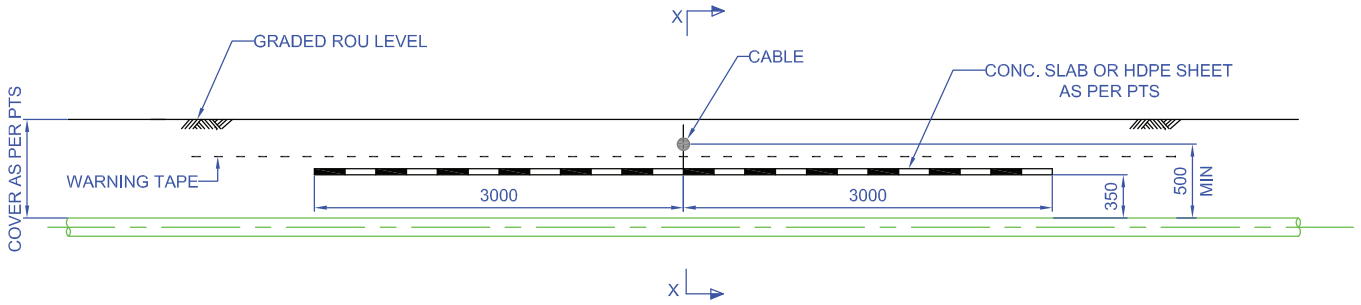
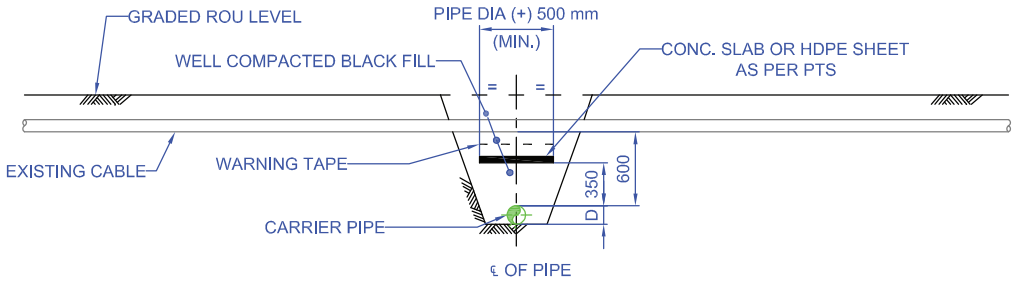
SCALE	TITLE
1:100	RCC PIT FOR PE STOP-OFF VALVE (Ø63 TO 125mm)

SIZE	CLIENT JOB NO.	DRAWING NUMBER	SHEET	REV.
A1	C261160	C261160-IGL-STR-6008	1 OF 1	D1



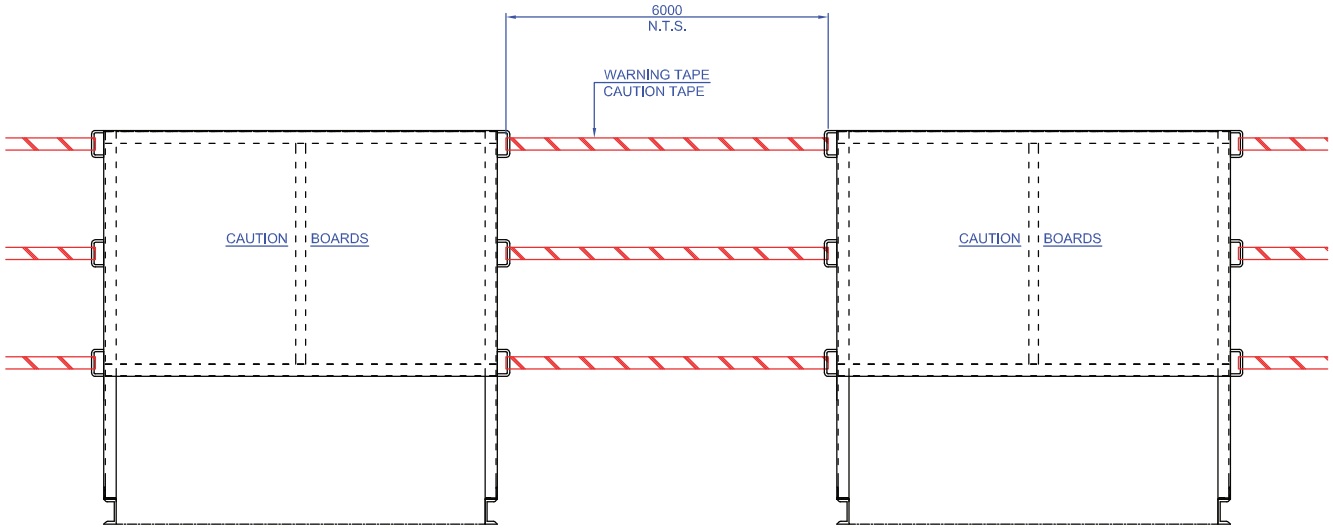


SECTION X-X

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWINGS.
3. A MODIFIED PIPELINE WARNING SIGN SHALL BE INSTALLED CLOSE TO THE CROSSING.
4. IN CASE OF ARMOURED OFC CABLE, C.P. BONDING IS TO BE PROVIDED BETWEEN PIPELINE AND CABLE ARMOUR. IN CASE OF UNARMOURED CABLE, ARRANGEMENT FOR SHIELDING (BY PROVIDING CASING ON EITHER SIDE OF THE PIPELINE OR CABLE) SHALL BE CONSIDERED.
5. APPROVAL OF THE CROSSING SHALL BE OBTAINED FROM CONCERNED AUTHORITIES.

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	TYPICAL UNDERGROUND CABLE CROSSING DETAILS
SCALE: 1:2 / DATE / CAD FILE: / DATE	CAD / A3
DRG. NO.15792-10-03-24 REV-0	



SCHEMATIC LAYOUT OF CAUTION BOARDS AND BARRICADING

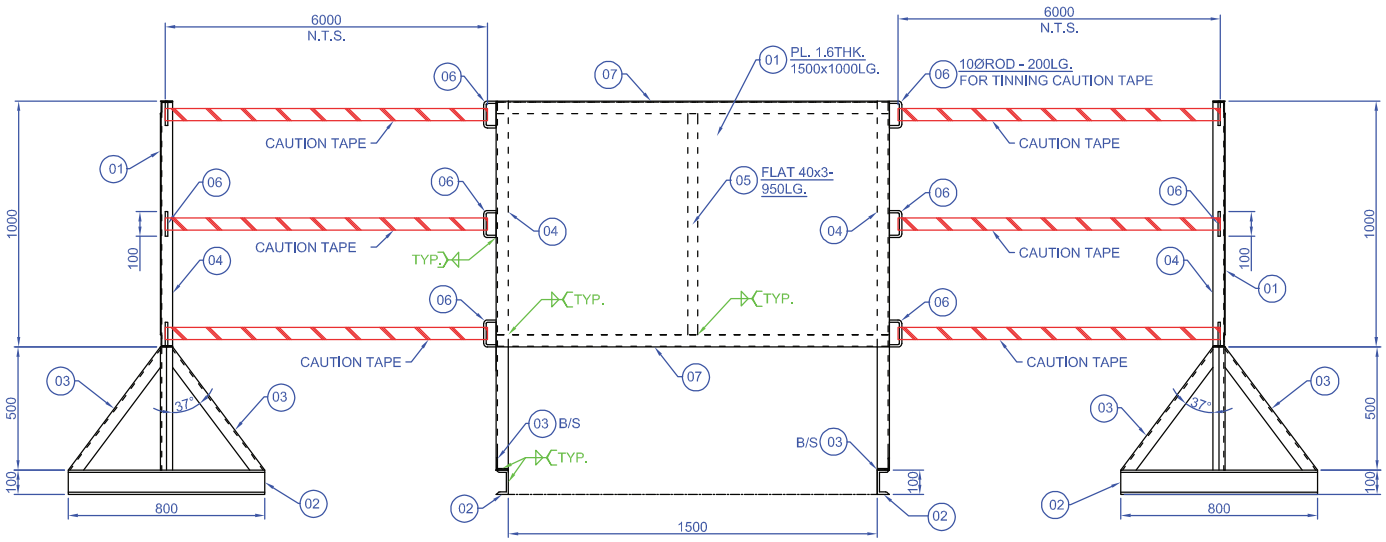
NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWINGS.

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	BARRICADING
SCALE / DATE / CAD FILE: / DATE	CAD A3
DRG. NO.	1579 2 -10-03-26 REV-0

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWINGS.



ELEVATION B-B | ELEVATION A-A | ELEVATION B-B

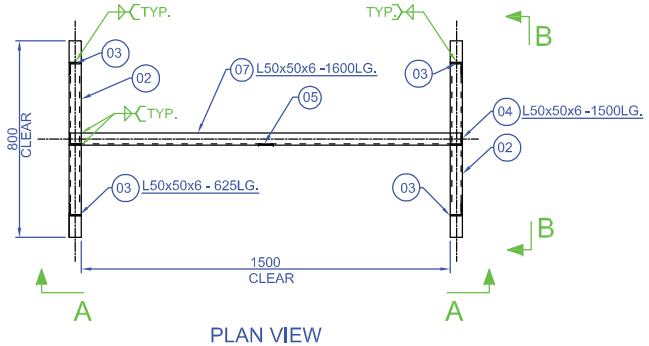
IN RED → **CAUTION** ← CLIENT LOGO

WORK IN PROGRESS

IN BLACK

LAYING OF NATURAL GAS PIPELINE
CLIENT : OWNER'S NAME
CONTRACTOR NAME:
DATE OF COMMENCEMENT:
DATE OF COMPLETION:
EMERGENCY PHONE NOS.:

TO BE PRINTED ON ITEM NO. 01



PLAN VIEW

BILL OF MATERIAL

Item Mkd.	Section	Width	Length	Item Qty. (All Marks)	Weight Kgs./M,M2	Total Weight In Kgs.
1.	PL. 1.6 THK.	1600	1000	1	12.56	20.10
2.	ISMC 100	--	800	2	9.20	14.72
3.	L50x50x6	--	625	4	4.50	11.25
4.	L50x50x6	--	1500	2	4.50	13.50
5.	Flat 3Thk.	900	40	1	0.94	0.03
6.	10Ø Rod	--	200	6	0.62	0.74
7.	L50x50x6	--	1600	2	4.50	14.40
				Grand Total (Kg)		74.74

OWNER: INDRAPRASTHA GAS LIMITED
NEW DELHI

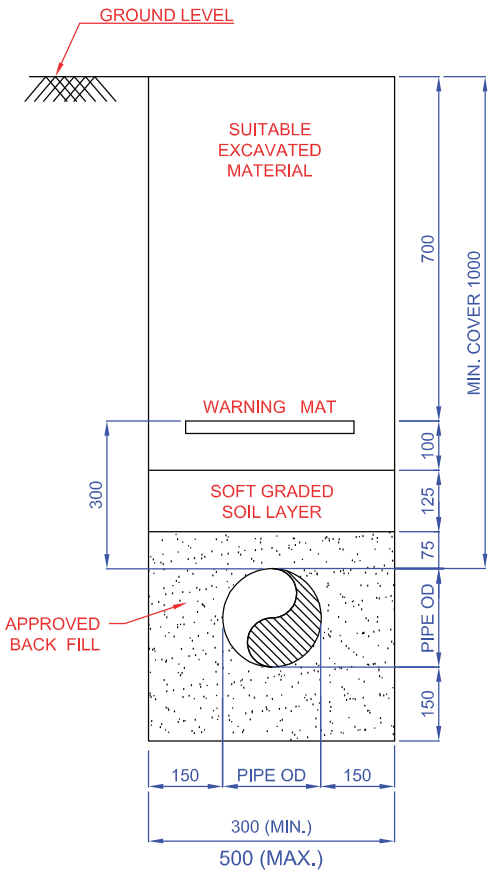
PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: CITY GAS DISTRIBUTION PROJECT

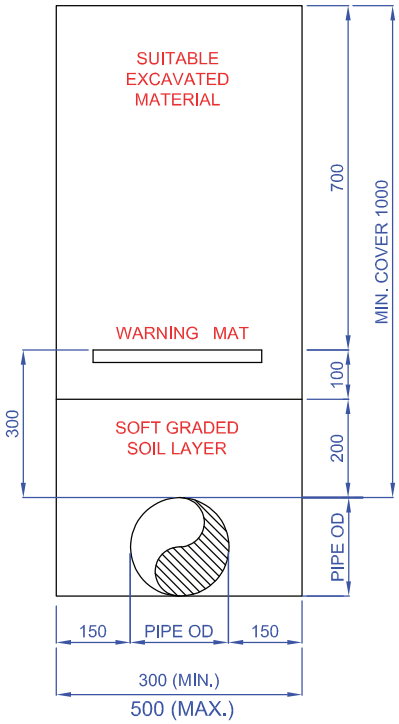
TITLE: CAUTION BOARD & TAPE ARRANGEMENT IN G.I. / RISER INSTALLATION

SCALE	DATE	CAD FILE: DATE	CAD	A3

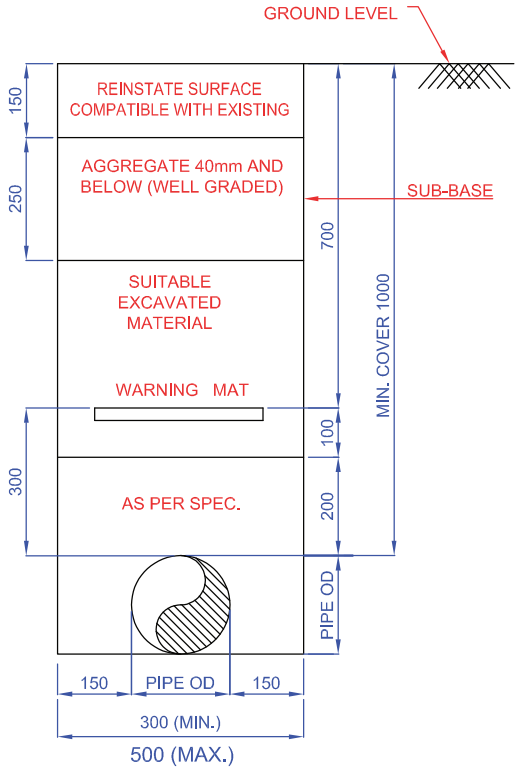
DRG. NO. 1579 -10-03-26A 2



TRENCH IN ROCKY STRATA
TYPICAL SECTION



TRENCH IN NORMAL SOIL
TYPICAL SECTION

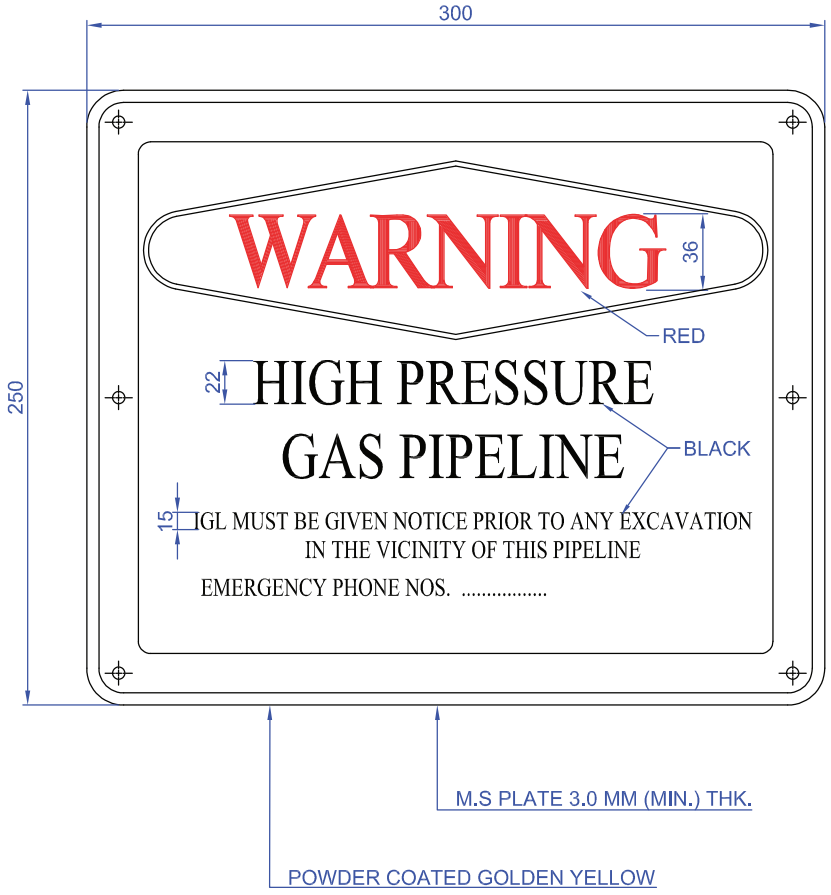


TRENCH RESTORATION DETAIL
TYPICAL SECTION

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.
3. FOR ALL PIPELINE TO BE CONSTRUCTED IN THE LAND UNDER JURISDICTION OF GOVT. OF INDIA, THE MIN COVER TO BE ADOPTED SHALL BE 1000MM IN ACCORDANCE WITH GOVT. OF INDIA PETROLEUM PIPELINE (ACQUISITION OF RIGHT OF USER IN LAND) ACT NO. 50, 1962 AND AMENDMENT ACT NO. 13 OF 1977. ANY EXTRA COVER REQUIREMENT SHALL BE IN ACCORDANCE WITH SPECIFICATIONS.
4. MIN. COVER REQUIREMENT SHALL BE SUBJECT TO APPROVAL OF CONCERNED AUTHORITIES WHEREVER REQUIRED.
5. EXTRA COVER REQUIREMENT SHALL BE ESTABLISHED AT ALL OVER BE NOS AND HORIZONTAL BE NOS WHEREVER NECESSARY.
6. FOR MINIMUM COVER REQUIREMENT AT PIPELINE CROSSING ROADS, RAILWAY TRACKS, RIVER MARSHY AREAS, ETC., REFER RELEVANT STANDARDS.

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	TYPICAL TRENCH DIMENSIONS FOR PIPELINE
SCALE 1:10 / DATE / CAD FILE: DATE	CAD / A3
DRG. NO 1579 -10-03-27 REV-0	



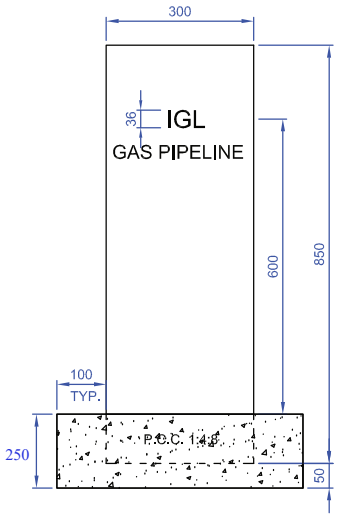
NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWINGS.

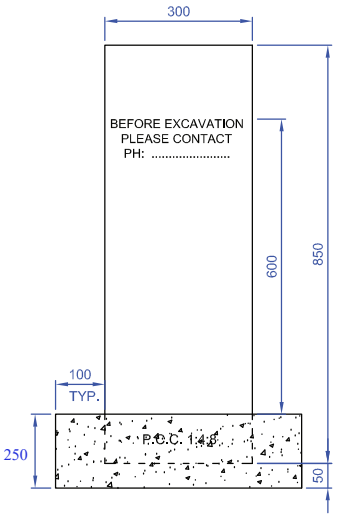
OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	PLATE MARKER

SCALE	DATE	CAD FILE: DATE		
1:2			CAD	A3

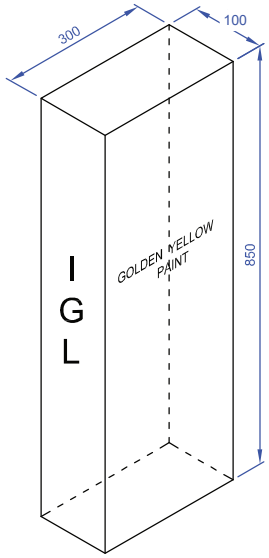
DRG. NO 1579 2 -10-03-28 REV-0



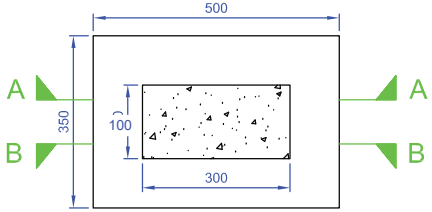
SECTION A-A



SECTION B-B



ISOMETRIC VIEW

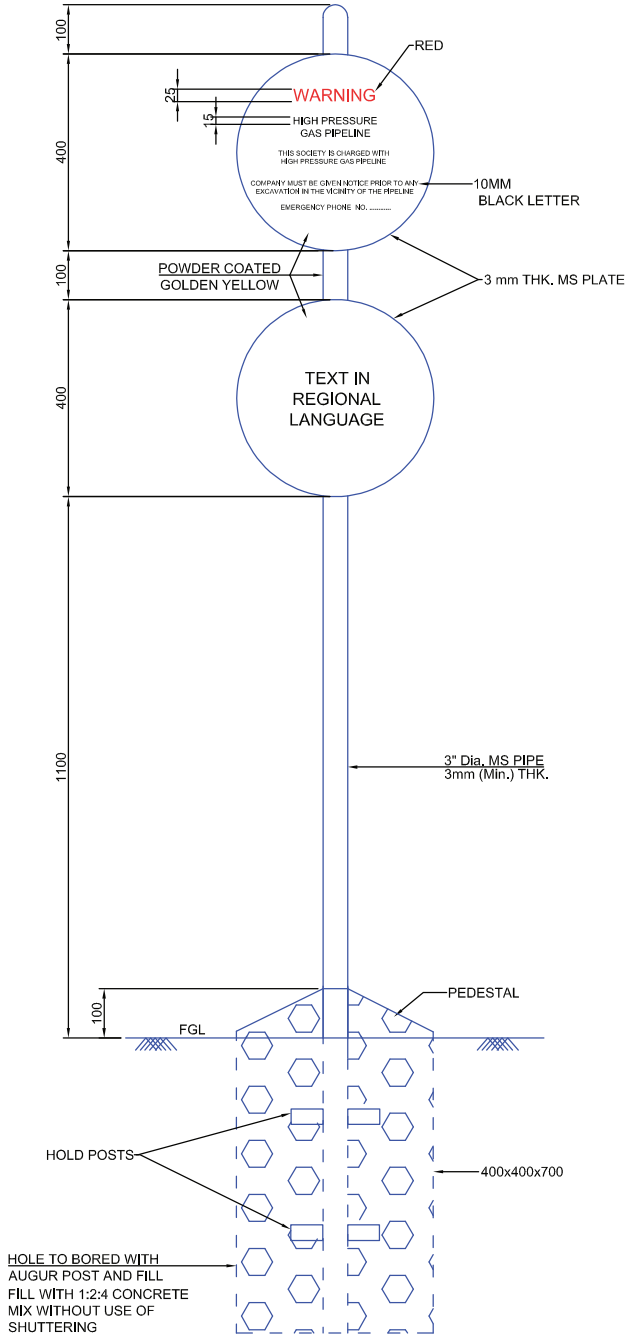


PLAIN VIEW

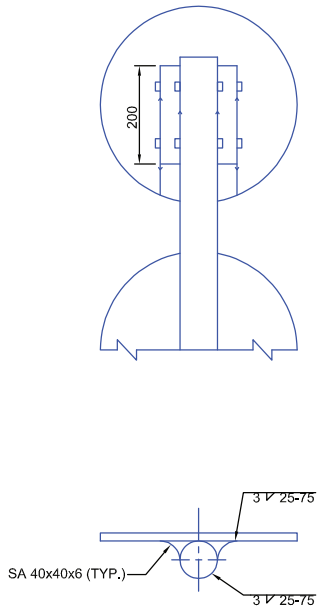
NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.
3. ALL TEXT SHOULD BE WRITTEN IN BLACK COLOR.

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	SKETCH FOR STONE MARKER
SCALE: 1:10 / DATE / CAD FILE: / DATE	CAD / A3
DRG. NO. 15792-10-03-29 REV-0	



FIXING DETAILS



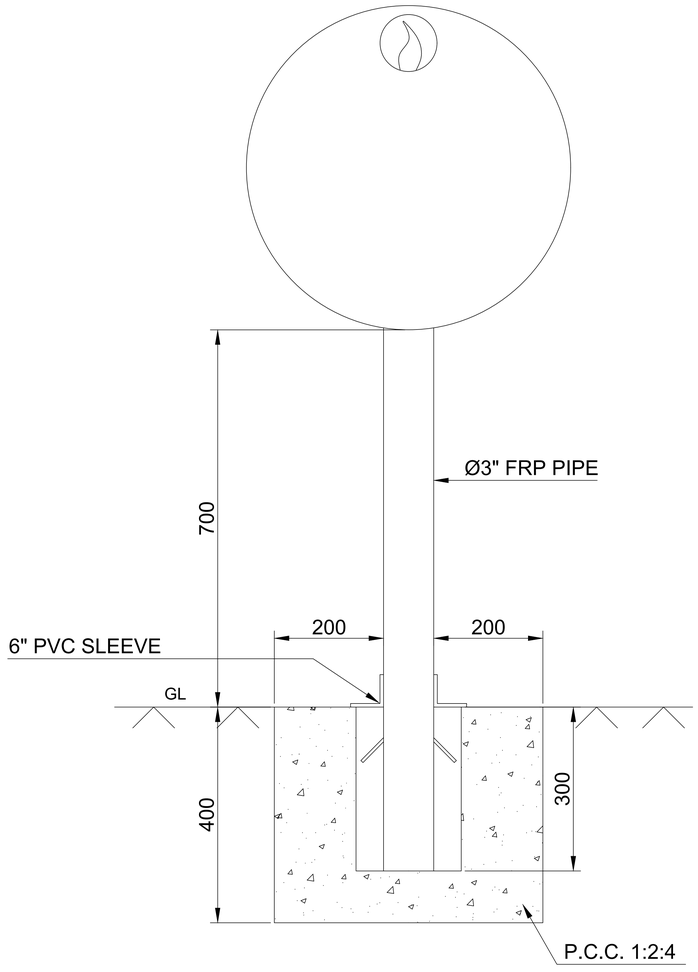
NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. WARNING TEXT AND MARKER SIZES ARE INDICATIVE AND ARE SUBJECT TO THE APPROVAL BY OWNER / OWNER'S REPRESENTATIVE BEFORE FABRICATION.
3. SCHEME FOR POWDER COATING AND COLORING : ONE COAT OF PRIMER & TWO COATS OF SPECIFIED PAINTS. ALL LETTERS EXCEPT 'WARNING' TO BE PAINTED BLACK.
4. APPROVAL OF WARNING MARKER DESIGN SHALL BE OBTAINED BEFORE THE COMMENCEMENT OF WORK.

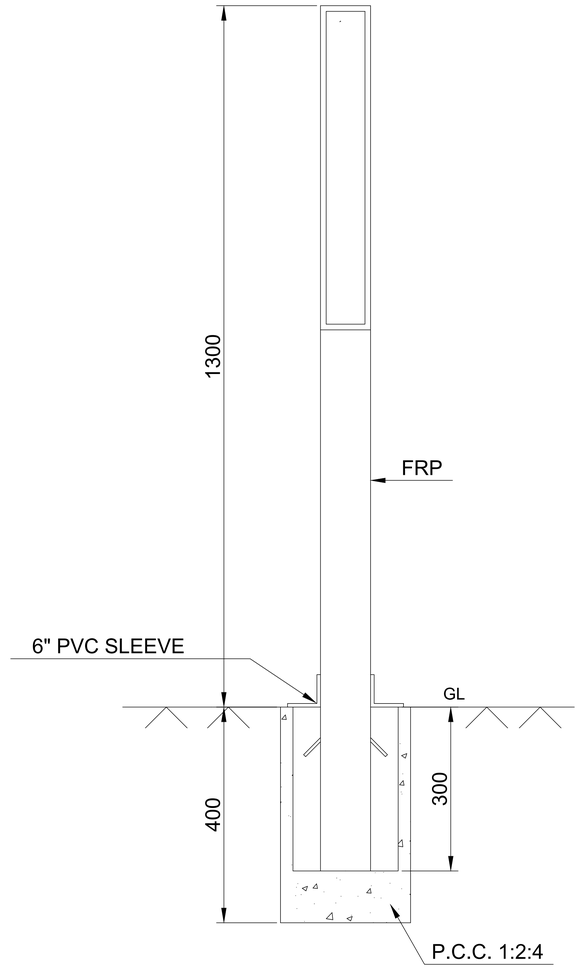
OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	POLE MARKER WITH FOUNDATION (INDIVIDUAL SOCIETIES / AREAS)

SCALE	DATE	CAD FILE: DATE		
1:10			CAD	A3

DRG. NO. 15792-10-03-30 REV-0



PIPELINE ROUTE MARKERS
(TO BE INSTALLED IN CONSULATION WITH EIC)



NOTES:

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FRP SIZES ARE INDICATIVE AND ARE SUBJECT TO THE APPROVAL BY OWNER/OWNER'S REPRESENTATIVE BEFORE FABRICATION.
3. SCHEME FOR POWDER COATING AND COLORING: SUBJECT TO THE APPROVAL BY OWNER/ OWNER'S REPRESENTATIVE BEFORE FABRICATION.
4. APPROVAL OF WARNING FRP DESIGN SHALL BE OBTAINED BEFORE THE COMMENCEMENT OF WORK.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	23.06.25	ISSUED FOR CLIENT REVIEW	AK	SR	DK

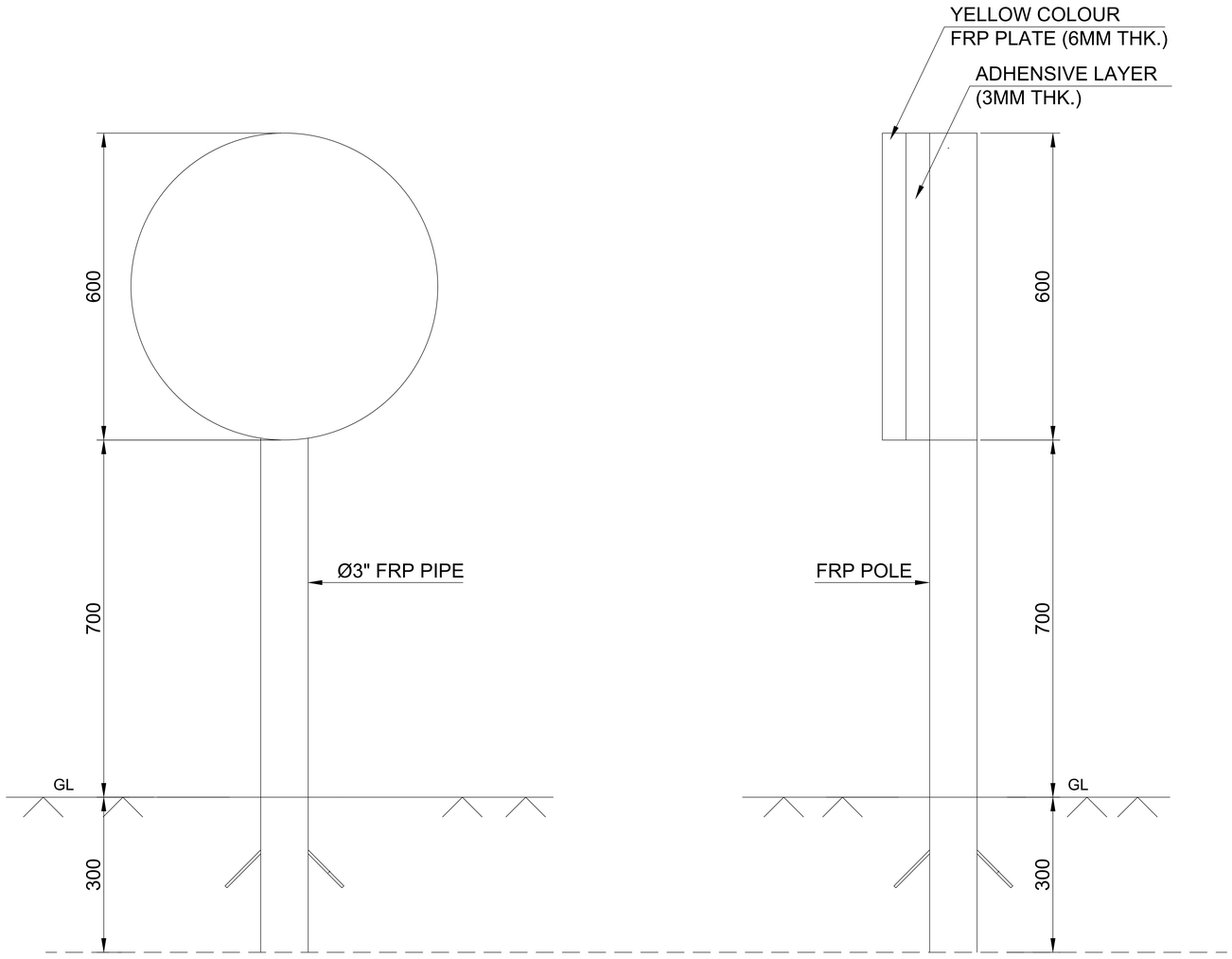
OWNER:
INDRAPRASTHA GAS LIMITED
NEW DELHI

PMC:
M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT:
CITY GAS DISTRIBUTION PROJECT

TITLE:
FRP MARKER WITH FOUNDATION

SCALE: 1:1000	TOTAL NO. OF SHTS: 1 OF 1	
SIZE	DRAWING NUMBER	REV.
A3	15792-10-03-30A	0



FRONT VIEW

SIDE VIEW

NOTES:

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FRP SIZES ARE INDICATIVE AND ARE SUBJECT TO THE APPROVAL BY OWNER/OWNER'S REPRESENTATIVE BEFORE FABRICATION.
3. SCHEME FOR POWDER COATING AND COLORING: SUBJECT TO THE APPROVAL BY OWNER/ OWNER'S REPRESENTATIVE BEFORE FABRICATION.
4. APPROVAL OF WARNING FRP DESIGN SHALL BE OBTAINED BEFORE THE COMMENCEMENT OF WORK.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	23.06.25	ISSUED FOR CLIENT REVIEW	AK	SR	DK

OWNER:
INDRAPRASTHA GAS LIMITED
NEW DELHI

PMC:
M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT:
CITY GAS DISTRIBUTION PROJECT

TITLE:
TYPICAL FRP MARKER

SCALE: 1:1000	TOTAL NO. OF SHTS: 1 OF 1	
SIZE	DRAWING NUMBER	REV.
A3	15792-10-03-30B	0

NOTE:

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	23.06.25	ISSUED FOR CLIENT REVIEW	AK	SR	DK

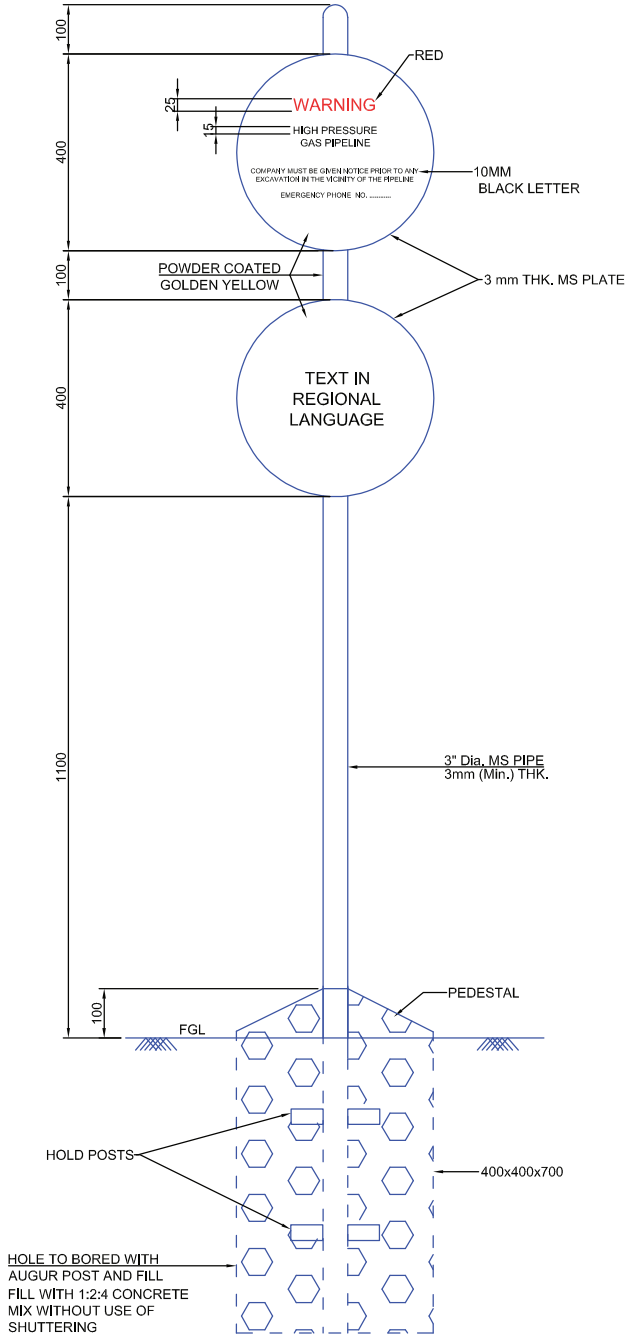
OWNER: INDRAPRASTHA GAS LIMITED
NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

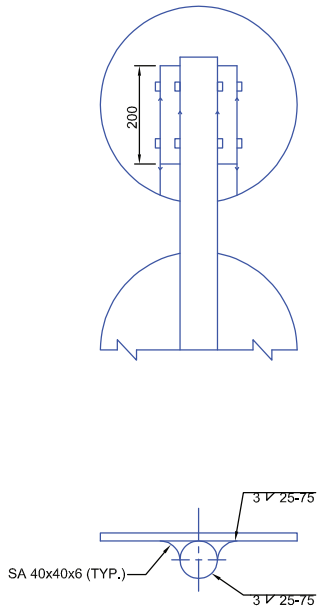
PROJECT: CITY GAS DISTRIBUTION PROJECT

TITLE: TYPICAL WARNING SIGN BOARD

SCALE: 1:1000	TOTAL NO. OF SHTS: 1 OF 1	
SIZE	DRAWING NUMBER	REV.
A3	15792-10-03-30C	0



FIXING DETAILS



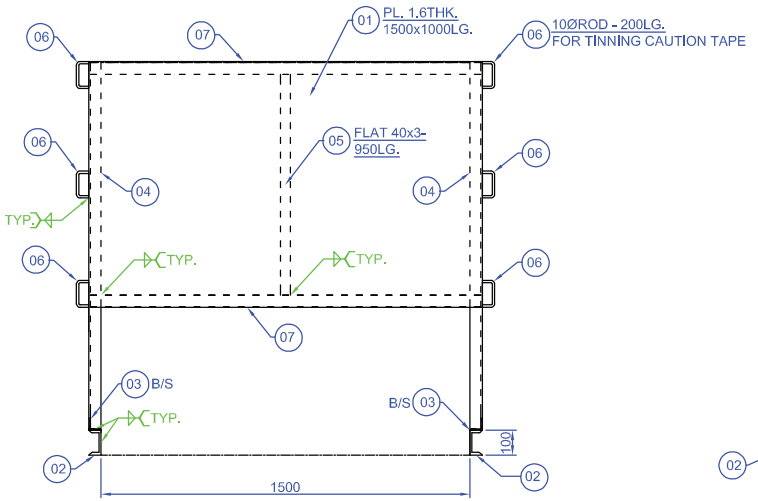
NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. WARNING TEXT AND MARKER SIZES ARE INDICATIVE AND ARE SUBJECT TO THE APPROVAL BY OWNER / OWNER'S REPRESENTATIVE BEFORE FABRICATION.
3. SCHEME FOR POWDER COATING AND COLORING : ONE COAT OF PRIMER & TWO COATS OF SPECIFIED PAINTS. ALL LETTERS EXCEPT 'WARNING' TO BE PAINTED BLACK.
4. APPROVAL OF WARNING MARKER DESIGN SHALL BE OBTAINED BEFORE THE COMMENCEMENT OF WORK.

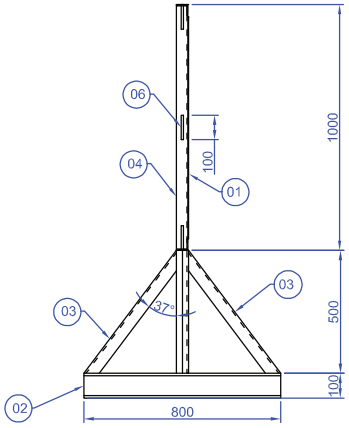
OWNER:	**INDRAPRASTHA GAS LIMITED** **NEW DELHI**
PMC:	**M/s. VCS QUALITY SERVICES PVT. LTD.**
PROJECT:	**CITY GAS DISTRIBUTION PROJECT**
TITLE:	**POLE MARKER WITH FOUNDATION**

SCALE	DATE	CAD FILE: DATE		
1:10			CAD	A3

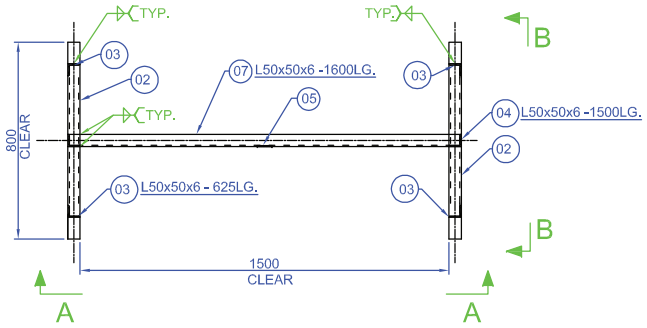
DRG. NO. 15792-10-03-31 REV-0



ELEVATION A-A



ELEVATION B-B



PLAN VIEW

IN RED → **CAUTION** ← CLIENT LOGO

WORK IN PROGRESS

IN BLACK

LAYING OF NATURAL GAS PIPELINE
CLIENT : OWNER'S NAME
CONTRACTOR NAME:
DATE OF COMMENCEMENT:
DATE OF COMPLETION:
EMERGENCY PHONE NOS.:

TO BE PRINTED ON ITEM NO. 01

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWINGS.

BILL OF MATERIAL

Item Mkd.	Section	Width	Length	Item Qty. (All Marks)	Weight Kgs./M,M2	Total Weight In Kgs.
1.	PL. 1.6 THK.	1600	1000	1	12.56	20.10
2.	ISMC 100	--	800	2	9.20	14.72
3.	L50x50x6	--	625	4	4.50	11.25
4.	L50x50x6	--	1500	2	4.50	13.50
5.	Flat 3Thk.	900	40	1	0.94	0.03
6.	10Ø Rod	--	200	6	0.62	0.74
7.	L50x50x6	--	1600	2	4.50	14.40
				Grand Total (Kg)		74.74

OWNER: INDRAPRASTHA GAS LIMITED
NEW DELHI

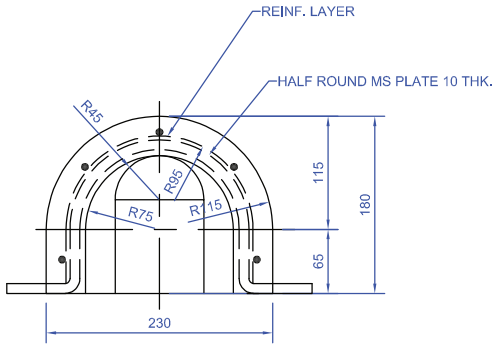
PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

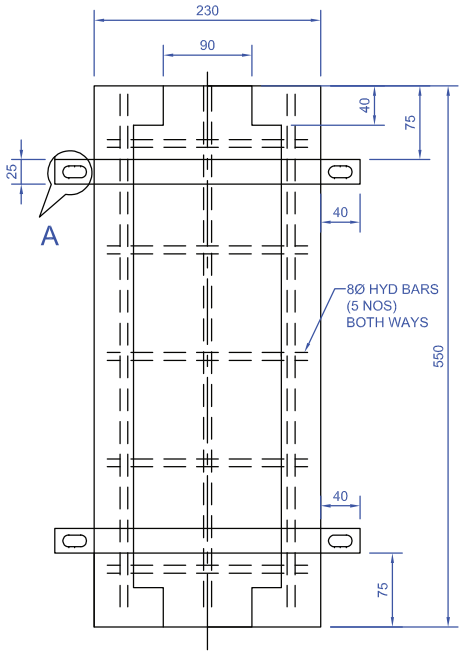
PROJECT: CITY GAS DISTRIBUTION PROJECT

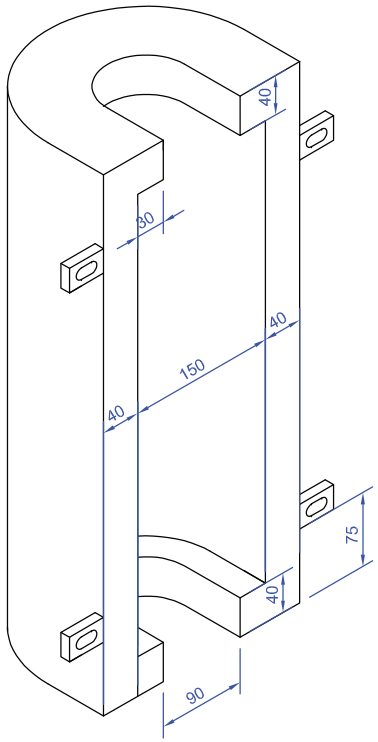
TITLE: CAUTION BOARD

SCALE | DATE | CAD FILE: DATE | CAD | A3

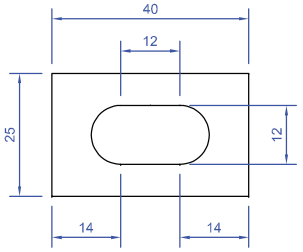
DRG. NO. 15792 -10-03-32 REV-0







ISOMETRIC VIEW



DETAIL-A
SCALE 1:1

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.
3. GRADE OF CONCRETE SHALL BE M25.
4. REINFORCEMENT IS HYD. TO IS:1786.
5. CONCRETE SLEEVE TO BE CLAMPED TO WALL WITH 10Ø ANCHOR BOLTS.

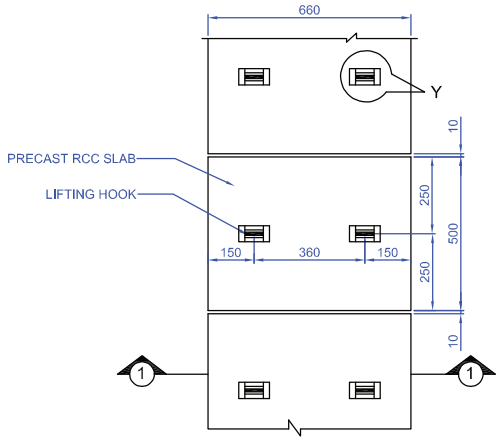
OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	HALF ROUND CONCRETE SLEEVE

SCALE	DATE	CAD FILE: DATE		
1:5			CAD	A3

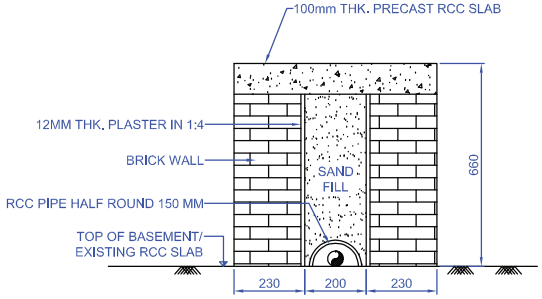
DRG. NO. 15792-10-03-33 REV-0

NOTES:-

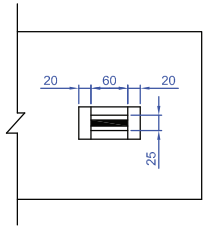
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.



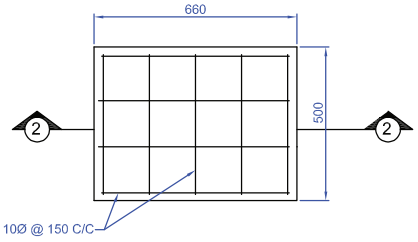
G.A PLAN OF COVER SLAB



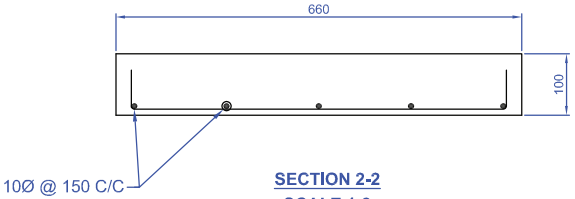
SECTION 1-1 THRU PIPE TRENCH



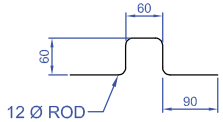
DETAIL - Y
SCALE 1:8



PRECAST RCC SLAB



SECTION 2-2
SCALE 1:8



LIFTING HOOK
SCALE 1:8

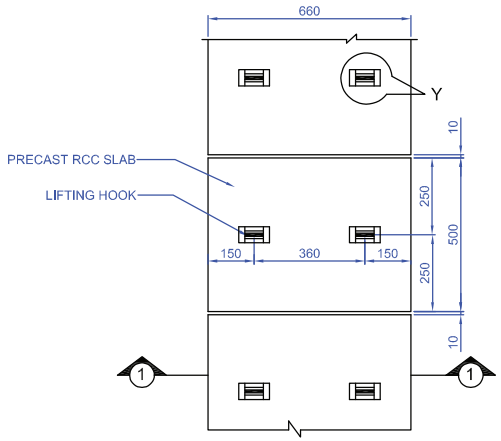
OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	TYPICAL BRICK WALL TRENCH (0.66 X 0.66 X 1.0)

SCALE	DATE	CAD FILE: DATE		
1:16			CAD	A3

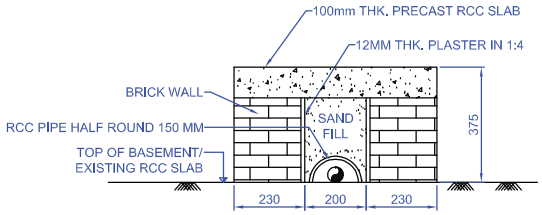
DRG. NO. 15792-10-03-34 REV-0

NOTES:-

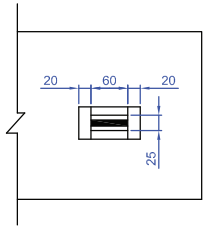
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.



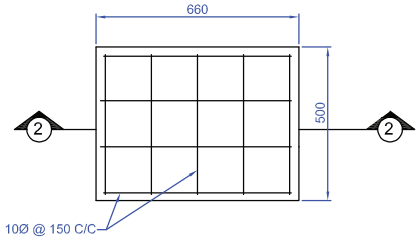
G.A PLAN OF COVER SLAB



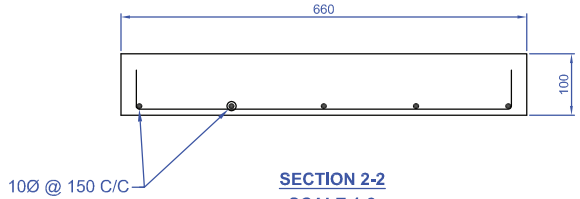
SECTION 1-1 THRU PIPE TRENCH



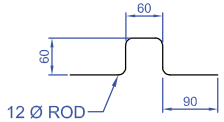
DETAIL - Y
SCALE 1:8



PRECAST RCC SLAB



SECTION 2-2
SCALE 1:8

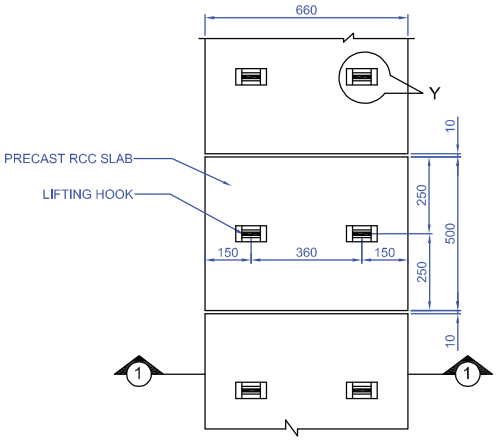


LIFTING HOOK
SCALE 1:8

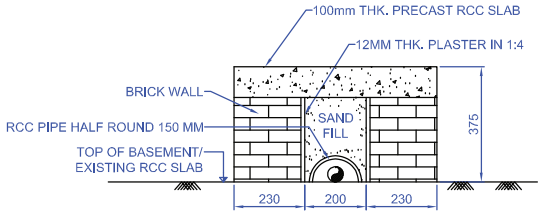
OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	TYPICAL BRICK WALL TRENCH (0.375 X 0.66 X 1.0)
SCALE: 1:16 / DATE / CAD FILE: DATE	CAD / A3
DRG. NO.	15792-10-03-35 REV-0

NOTES:-

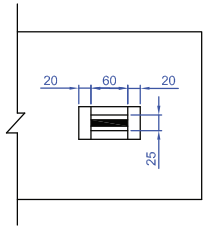
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.



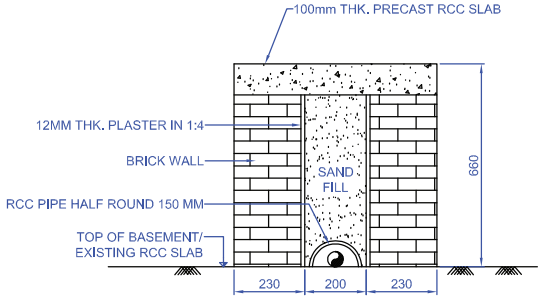
G.A PLAN OF COVER SLAB



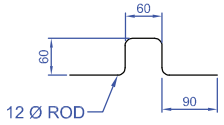
SECTION 1-1 THRU PIPE TRENCH



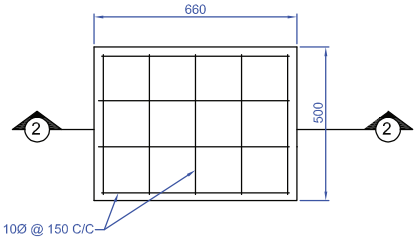
DETAIL - Y
SCALE 1:8



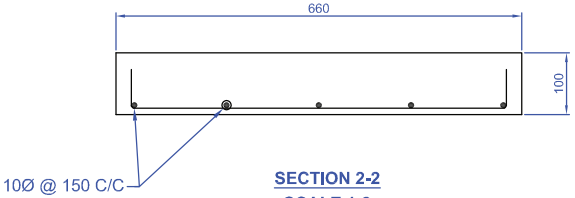
SECTION 1-1 THRU PIPE TRENCH



LIFTING HOOK
SCALE 1:8

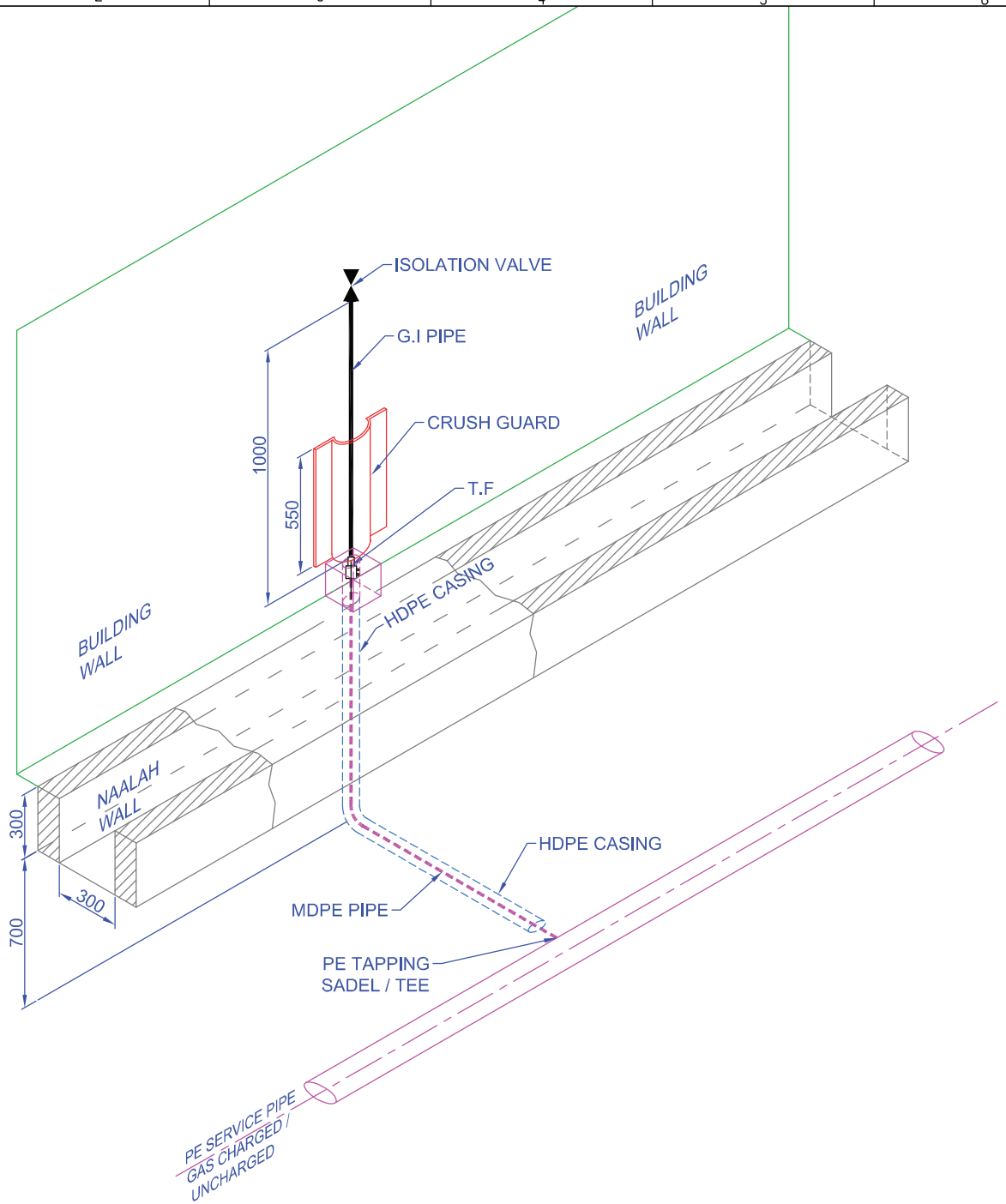


PRECAST RCC SLAB



SECTION 2-2
SCALE 1:8

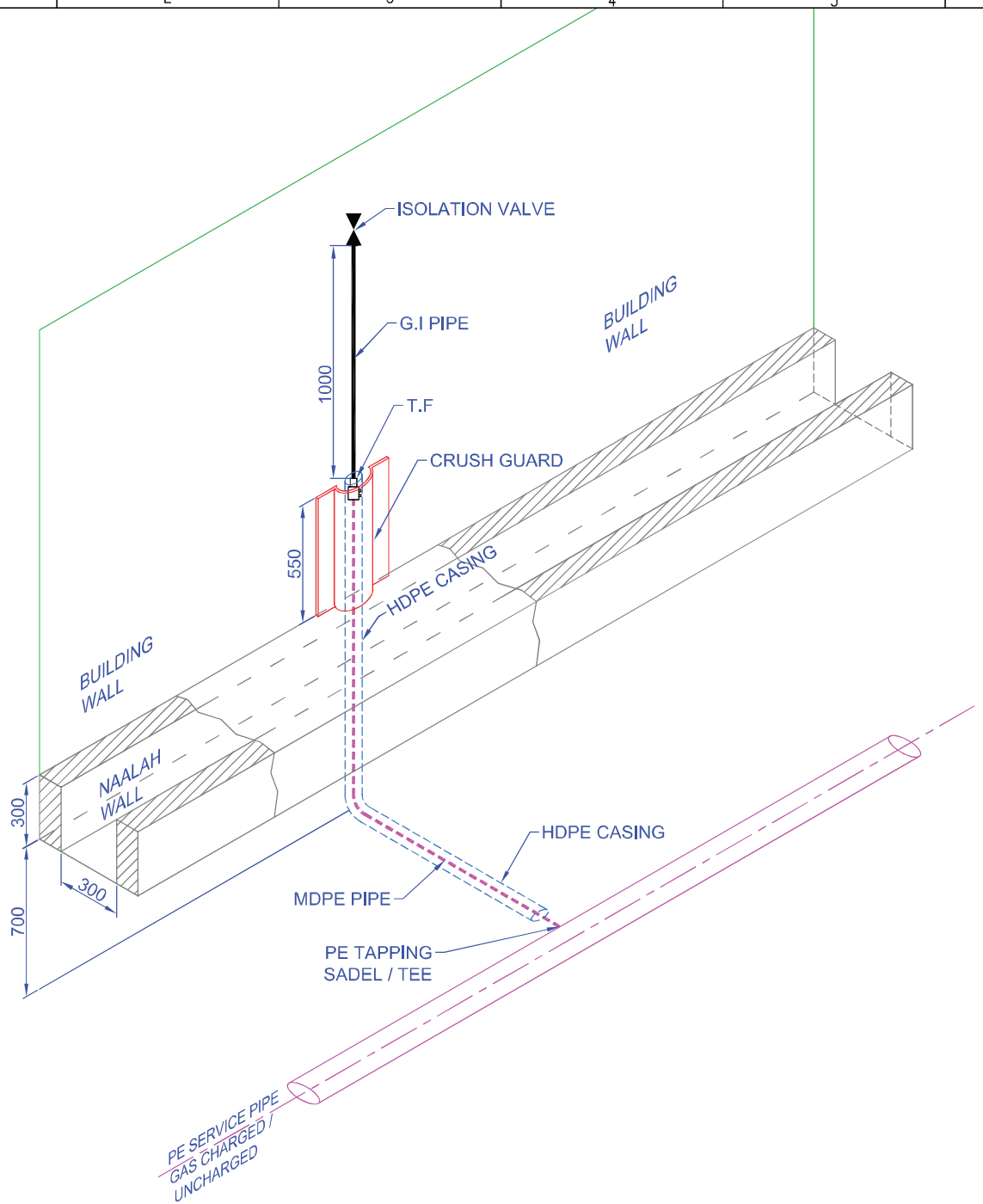
OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	TYPICAL BRICK WALL TRENCH UPTO 7M (ROAD CROSSING) INSIDE SOCIETY
SCALE 1:16 / DATE / CAD FILE: DATE	CAD / A3
DRG. NO.	15792-10-03-43 REV-0



NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.

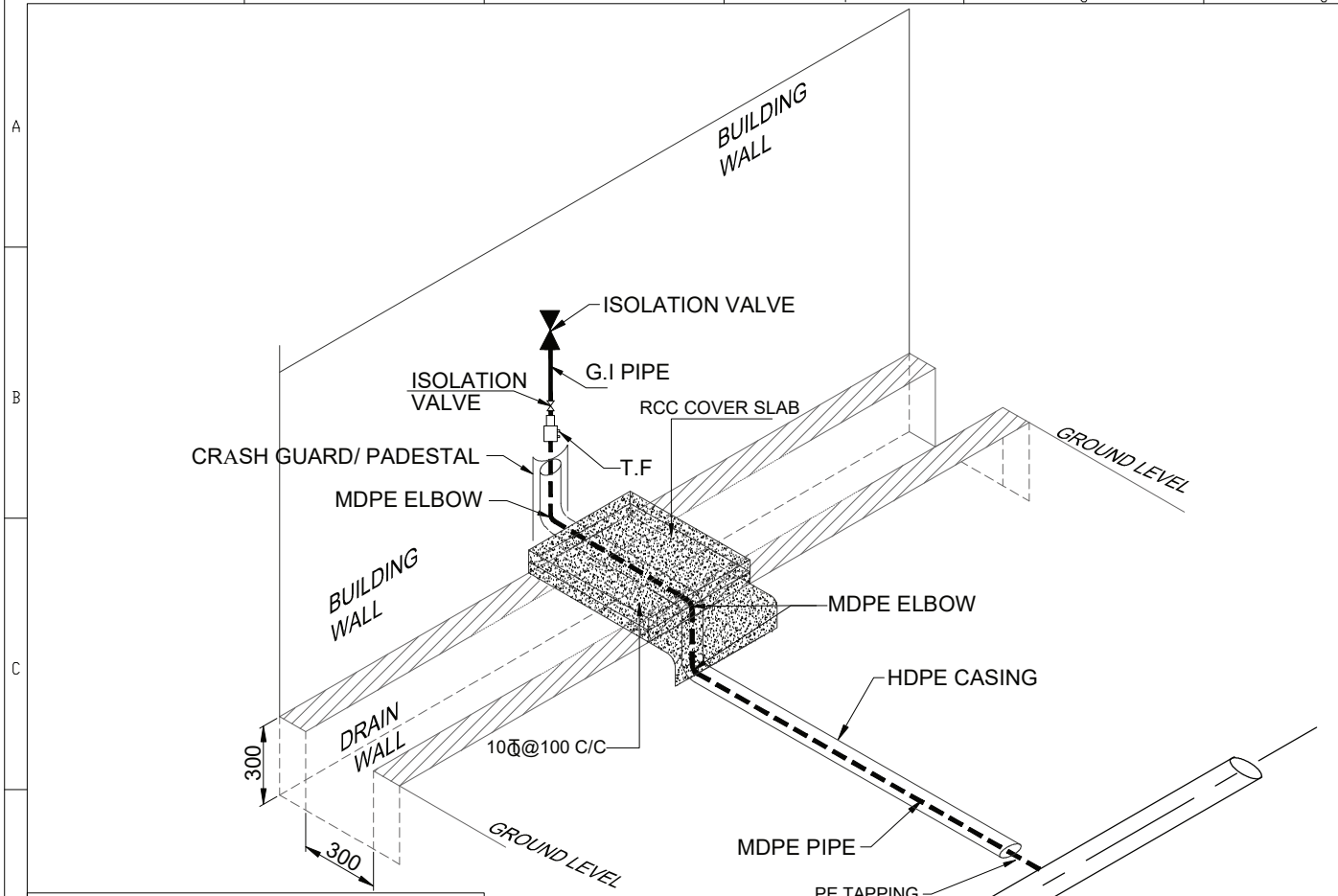
OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	DRAIN CROSSING FOR LAYING OF SERVICE LINES WHERE PEDESTAL IS POSSIBLE
SCALE: N.T.S. / DATE / CAD FILE: DATE	CAD / A3
DRG. NO. 15792 -10-03-44 REV-0	

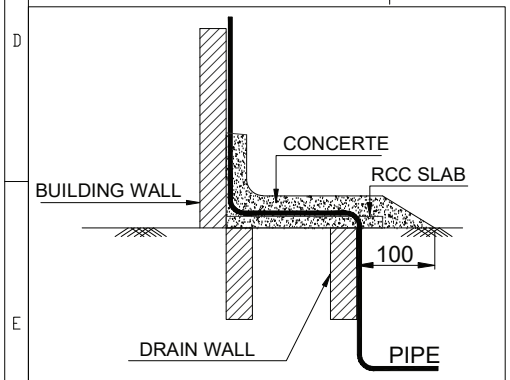


NOTES:-

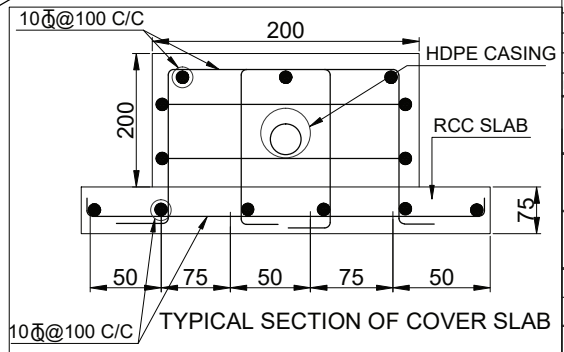
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	DRAIN CROSSING FOR LAYING OF SERVICE LINES WHERE PEDESTAL NOT POSSIBLE
SCALE: N.T.S. / DATE: / CAD FILE: / DATE:	CAD / A3
DRG. NO.	1579 -10-03-45 REV-0





SIDE VIEW SCHEME



TYPICAL SECTION OF COVER SLAB

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE GRADE OF CONCRETE FOR RCC WORKS SHALL BE M25 CONFORMING TO IS-456.
3. REINFORCEMENT SHALL BE HYSD BARS OF GRADE FE415 CONFORMING TO IS-1786.

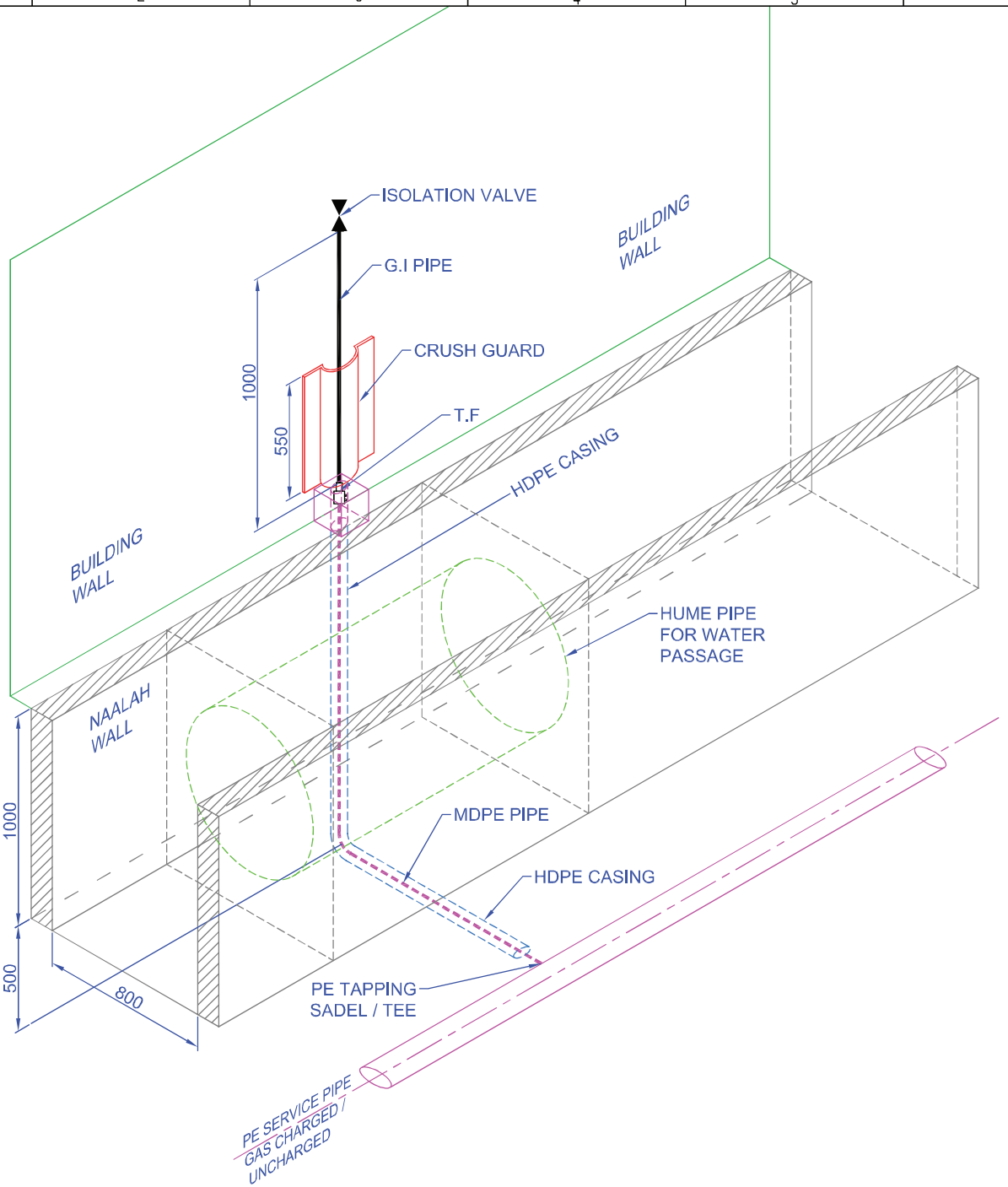
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
A	10.09.2018	REVISED AS PER NEW INPUT & ISSUED FOR REVIEW	KK	AN	MO/RKB
1	21.08.2018	ISSUED FOR CONSTRUCTION	US	AN	MO/RKB

CLIENT: INDRAPRASTHA GAS LIMITED (IGL) NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: CITY GAS DISTRIBUTION PROJECT

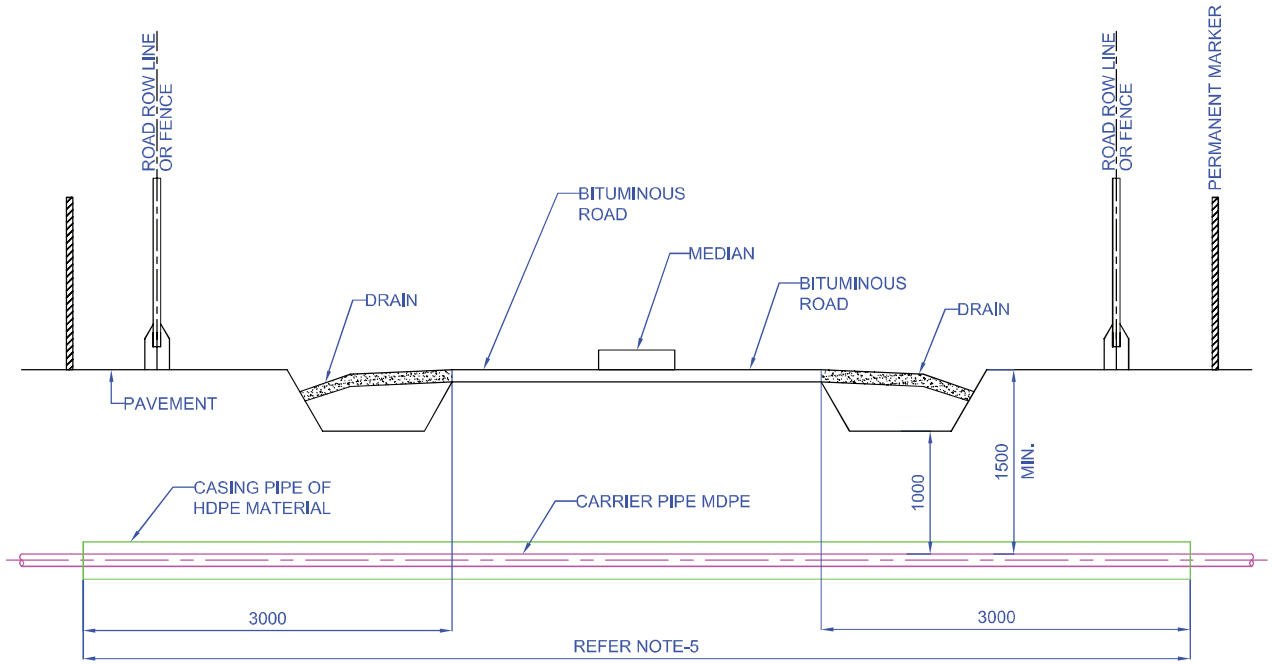
SCALE	TITLE			
NTS	DRAIN CROSSING FOR LAYING OF SERVICE LINES			
SIZE	CLIENT JOB NO.	DRAWING NUMBER	SHEET	REV.
A3	15792	15792 -10-03-46A	1 OF 1	1



NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	NALLAH CROSSING FOR LAYING OF SERVICE LINES
SCALE: N.T.S.	DATE:
CAD FILE:	DATE:
CAD	A3
DRG. NO. 1579 -10-03-46 REV-0 2	

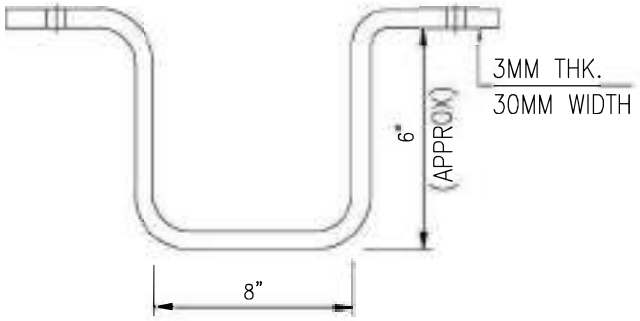


TYPICAL SECTION

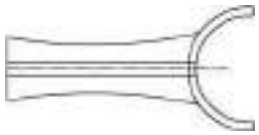
NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWINGS.
3. ROAD / HIGHWAY CROSSING SHALL BE RESTORED TO ORIGINAL CONDITION TO THE ENTIRE SATISFACTION OF OWNER AND CONCERNED AUTHORITIES HAVING JURISDICTION.
4. REFER API RP 1102 FOR OTHER DESIGN AND INSTALLATION REQUIREMENTS.
5. ANGLE OF INTERSECTION BETWEEN PIPELINE AND THE ROAD / HIGHWAY SHALL BE AS CLOSE TO 90° AS POSSIBLE BUT IN NO CASE LESS THAN 30°.
6. CONTRACTOR SHALL VERIFY THE ACTUAL DIMENSION WITH RESPECT TO SURVEY DETAILS OF EACH ROAD / HIGHWAY CROSSING AND PREPARE DETAILED DRAWINGS FOR INDIVIDUAL CROSSING TAKE ENGINEER-IN-CHARGE AND CLIENT'S APPROVAL BEFORE COMMENCEMENT OF CONSTRUCTION.
7. THE CASING PIPE SHALL BE OF SIZE MAINTAINED AS PER T.S. FOR PE LAYING.

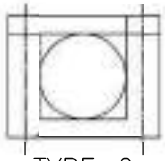
OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	ROAD / HIGHWAY CASED CROSSING FOR MDPE PIPE
SCALE 1:2 / DATE / CAD FILE: DATE	CAD A3
DRG. NO. 1579 -10-04-23 REV-0 2	



BRACKET FOR METERS
(DOMESTIC)

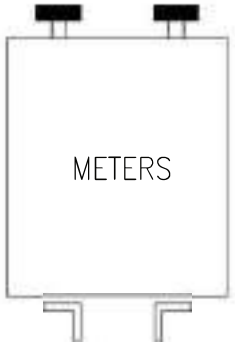


TYPE–1

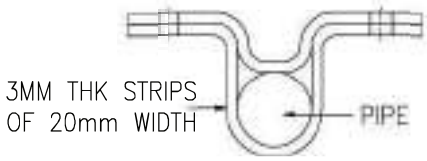


TYPE–2

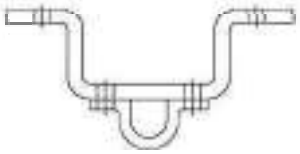
PE/PVC CLAMPS FOR COPPER PIPE



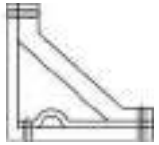
ANGLE BRACKETS 50x50mm
FOR NON DOMESTIC METERS



TYPE–1



TYPE–2



TYPE–3

MS CLAMPS FOR GI PIPE

NOTES

NOTES:–

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. CLAMP, REGULATOR BOX AND METER BRACKET ARE TO BE MADE AS PER DIRECTION AND APPROVAL OF EIC.
3. CLAMPS/BOXES BRACKETS TO BE TIGHTLY SECURED TO THE WALL WITH PROPER ROWEL PLUGS, SCREWS ETC. WOODEN BLOCK TO BE USED IN CASE ROWEL PLUGS DO NOT HOLD. PROPER THE AREA.
4. ALL CLAMPS SHOULD BE POWDER COATED AS PER STANDARD SPECIFICATION PROVIDED WITH TENDER DOCUMENTS.
5. CLAMPS ON PIPES TO BE FIXED AT MAXIMUM DISTANCE OF 1.5 mtrs AND AT BENDS.

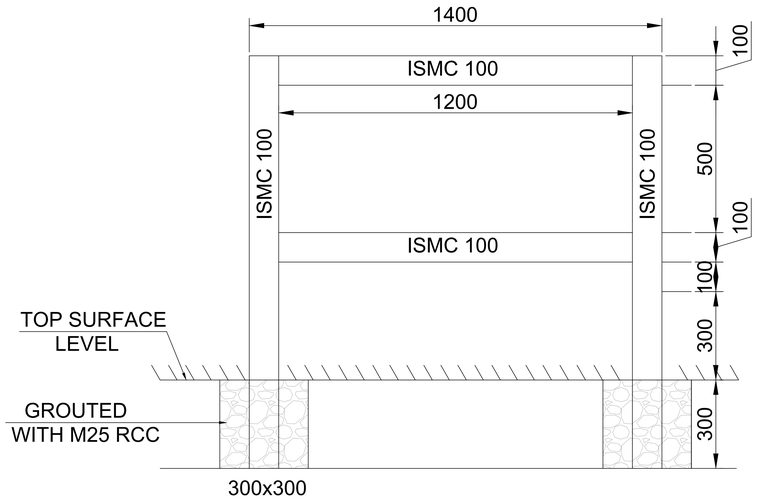
CLIENT: INDRAPRASTHA GAS LIMITED (IGL) NEW DELHI

PMC: VCS QUALITY SERVICES PVT. LTD.

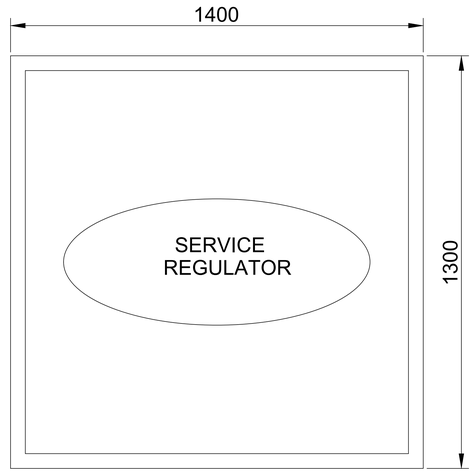
PROJECT: CITY GAS DISTRIBUTION PROJECT

TITLE: TYPICAL DRAWING FOR BRACKET & CLAMPS

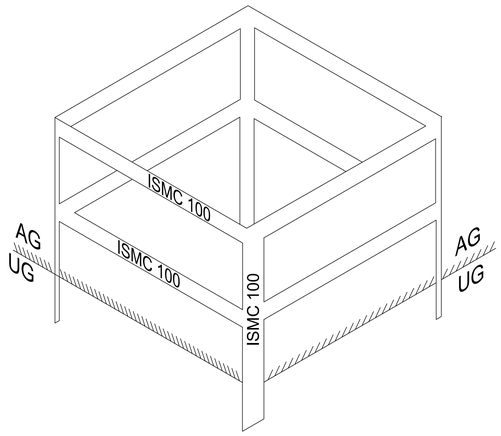
SIGN.	PMC	IGL	SCALE NTS	DATE	CAD FILE/ DATE	CAD	A4
			DRG. NO. 15792-20-05-05				



FRONT VIEW



TOP VIEW



ISOMETRIC VIEW

NOTES:

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. DO NOT SCALE DRAWING.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	23.06.25	ISSUED FOR CLIENT REVIEW	AK	SR	DK

OWNER:
INDRAPRASTHA GAS LIMITED
NEW DELHI

PMC:
M/s. VCS QUALITY SERVICES PVT. LTD.

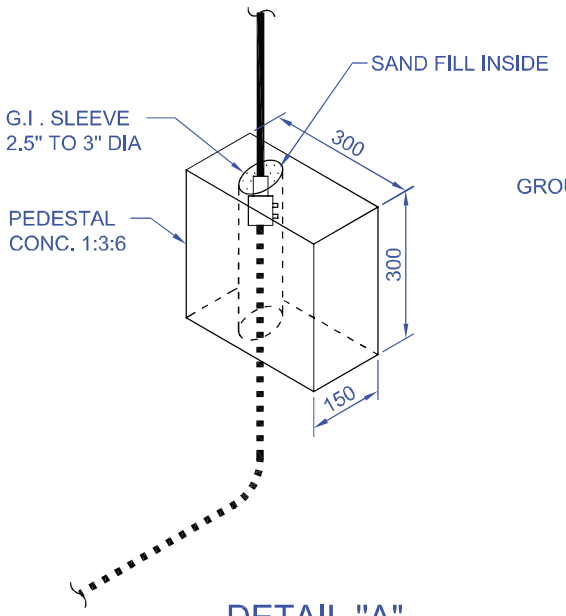
PROJECT:
CITY GAS DISTRIBUTION PROJECT

TITLE:
TYPICAL CRASH GUARD

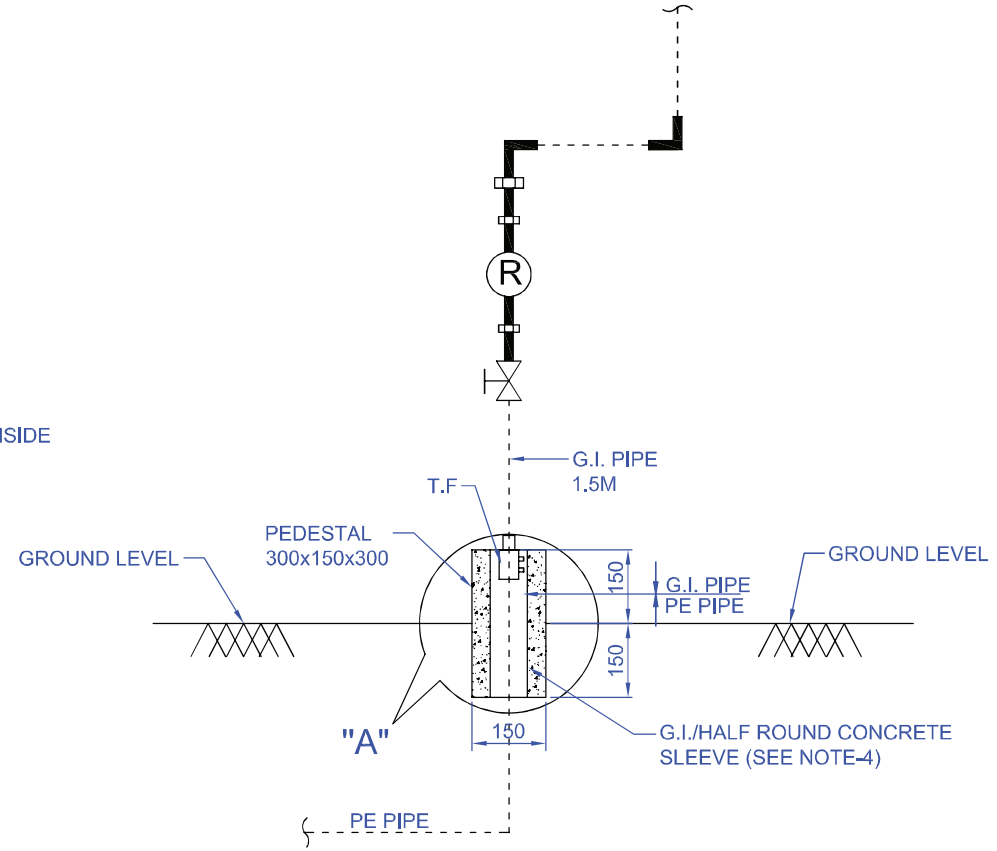
SCALE: 1:1000	TOTAL NO. OF SHTS: 1 OF 1	
SIZE	DRAWING NUMBER	REV.
A3	15792-20-05-06	0

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWINGS.
3. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED WHILE DETAIL ENGINEERING.
4. G.I. INSTALLATION / METER INSTALLATION SHALL BE DECIDED BY OWNER / OWNERS REPRESENTATIVE AS PER SITE CONDITION.



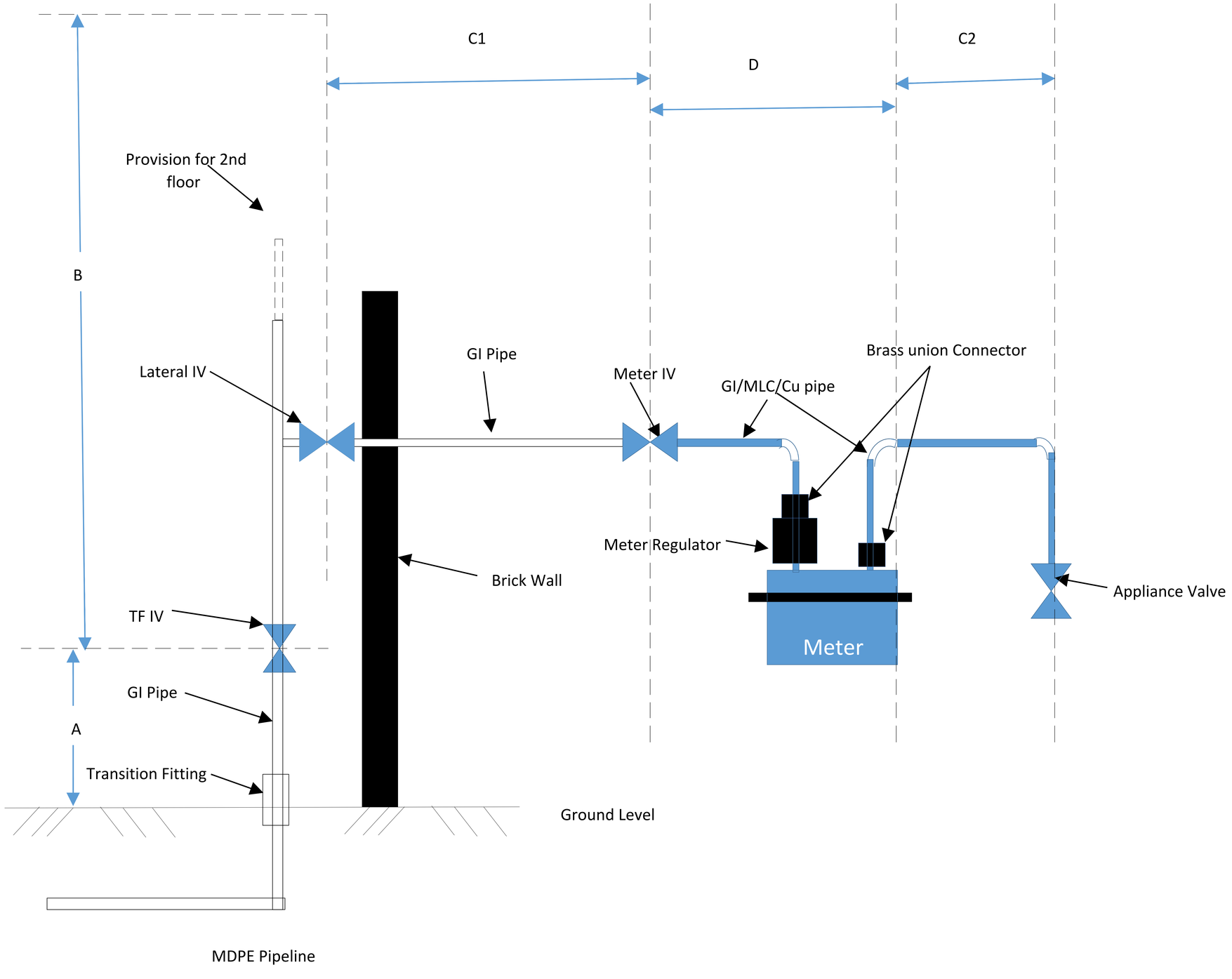
DETAIL "A"



PEDESTAL

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	G.I. PIPE SLEEVE
SCALE 1:10 / DATE / CAD FILE: / DATE	CAD / A3
DRG. NO. 1579 -20-03-18 REV-0	

A – Regulator Piece
B – NON LMC GI Installation
C1 + C2 - LMC GI/CU/MLC installation
D – Meter Installation with Fittings



NOTES:

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. TENTATIVE RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.5M. ANY CHANGES IN RISER LENGTH SHALL BE AFTER APPROVAL FROM EIC.
5. G.I. INSTALLATION/ METER INSTALLATION SHALL BE DECIDED BY OWNER/ OWNER'S REPRESENTATIVE AS PER SITE CONDITIONS.
6. IF COPPER PIPE GOES TO THE APPLIANCE VALVE THEN BRASS FITTING SHALL BE USED AT THE OULTET OF METER OR IF G.I. PIPE GOES TO THE APPLIANCE VALVE THEN G.I. FITTING SHALL BE USED AT THE OUTLET OF THE METER.
7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M WHEN PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING IS USED IN BETWEEN THE PIPE THEN CLAMP SHALL BE PLACED 150MM AWAY FROM CENTER LINE OF THE FITTING AT EVERY SIDE. HOWEVER, THE SAME MAY BE CHANGED AS PER SITE CONDITIONS AS DIRECTED BY EIC.
8. TAPPING SHALL BE LEFT NEAR OUTSIDE THE KITCHEN AS DIRECTED BY OWNER/ OWNER'S REPRESENTATIVE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	23.06.25	ISSUED FOR CLIENT REVIEW	AK	SR	DK

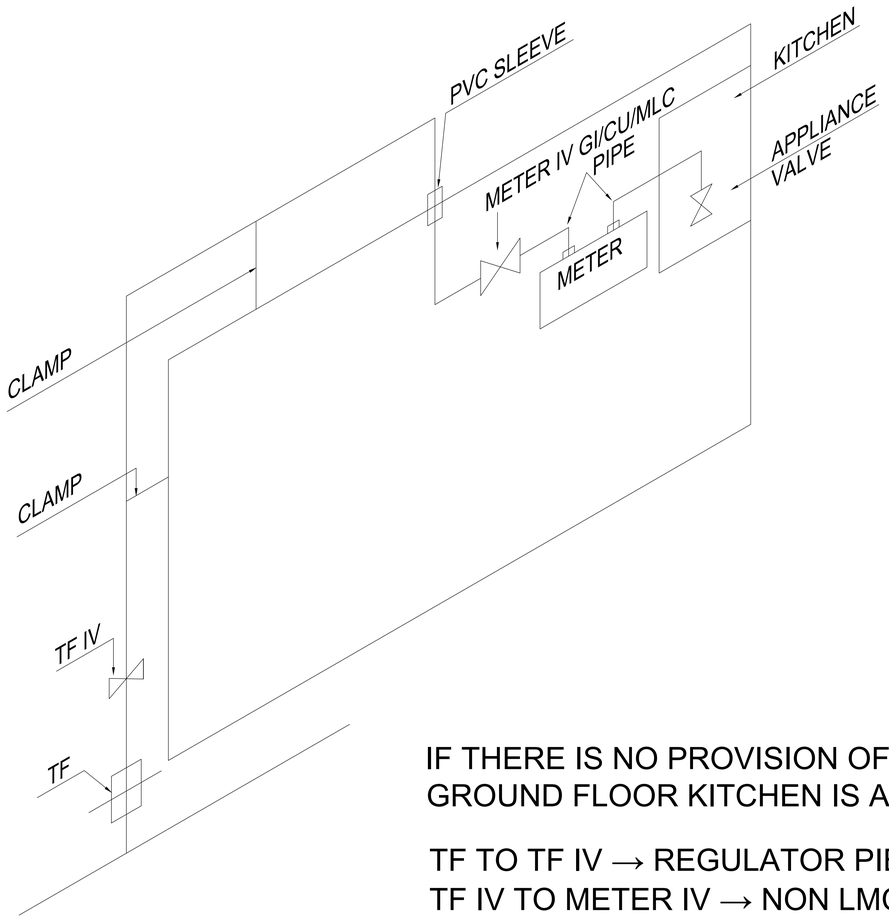
OWNER: INDRAPRASTHA GAS LIMITED, NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: CITY GAS DISTRIBUTION PROJECT

TITLE: TYPICAL PNG CONNECTION LAYOUT OF NG DISTRIBUTION (NON LMC & LMC)

SCALE: 1:1000	TOTAL NO. OF SHTS: 1 OF 1	
SIZE	DRAWING NUMBER	REV.
A3	15792-20-05-01	0



IF THERE IS NO PROVISION OF 1ST FLOOR ONLY
GROUND FLOOR KITCHEN IS AVAILABLE.

TF TO TF IV → REGULATOR PIECE
TF IV TO METER IV → NON LMC GI INSTALLATION
METER IV TO METER OULET → METER INSTALLATION WITH FITTINGS
METER OUTLET TO APPLIANCE VALVE → LMC GI/CU/MLC INSTALLATION

NOTES:

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. TENTATIVE RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.5M. ANY CHANGES IN RISER LENGTH SHALL BE AFTER APPROVAL FROM EIC.
5. G.I. INSTALLATION/ METER INSTALLATION SHALL BE DECIDED BY OWNER/ OWNER'S REPRESENTATIVE AS PER SITE CONDITIONS.
6. IF COPPER PIPE GOES TO THE APPLIANCE VALVE THEN BRASS FITTING SHALL BE USED AT THE OULTET OF METER OR IF G.I. PIPE GOES TO THE APPLIANCE VALVE THEN G.I. FITTING SHALL BE USED AT THE OUTLET OF THE METER.
7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M WHEN PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING IS USED IN BETWEEN THE PIPE THEN CLAMP SHALL BE PLACED 150MM AWAY FROM CENTER LINE OF THE FITTING AT EVERY SIDE. HOWEVER, THE SAME MAY BE CHANGED AS PER SITE CONDITIONS AS DIRECTED BY EIC.
8. METER CLAMP SHALL BE APPROVED FROM OWNER/ OWNER'S REPRESENTATIVE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	23.06.25	ISSUED FOR CLIENT REVIEW	AK	SR	DK

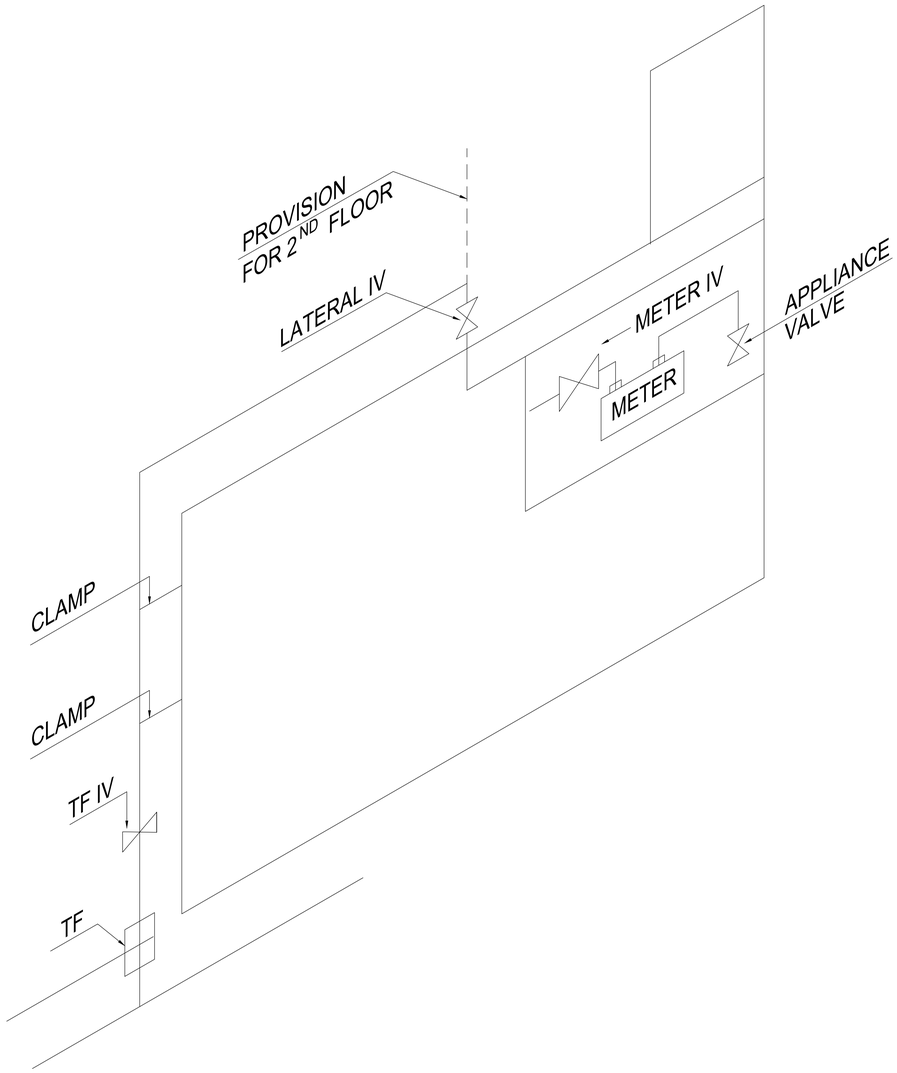
OWNER:
INDRAPRASTHA GAS LIMITED
NEW DELHI

PMC:
M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT:
CITY GAS DISTRIBUTION PROJECT

TITLE:
TYPICAL SCHEMATIC CONNECTION -
HAVING SINGLE KITCHEN AND NO FLOORS

SCALE: 1:1000	TOTAL NO. OF SHTS: 1 OF 1	
SIZE	DRAWING NUMBER	REV.
A3	15792-20-05-01A	0



TF TO TF IV → REGULATOR PIECE
TF IV TO LATERAL IV → NON LMC GI INSTALLATION
LATERAL IV TO METER IV
AND METER OUTLET TO APPLIANCE VALVE → LMC GI/CU/MLC INSTALLATION
METER IV TO METER OUTLET → METER INSTALLATION WITH FITTINGS

NOTES:

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
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8. METER CLAMP SHALL BE APPROVED FROM OWNER/ OWNER'S REPRESENTATIVE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	23.06.25	ISSUED FOR CLIENT REVIEW	AK	SR	DK

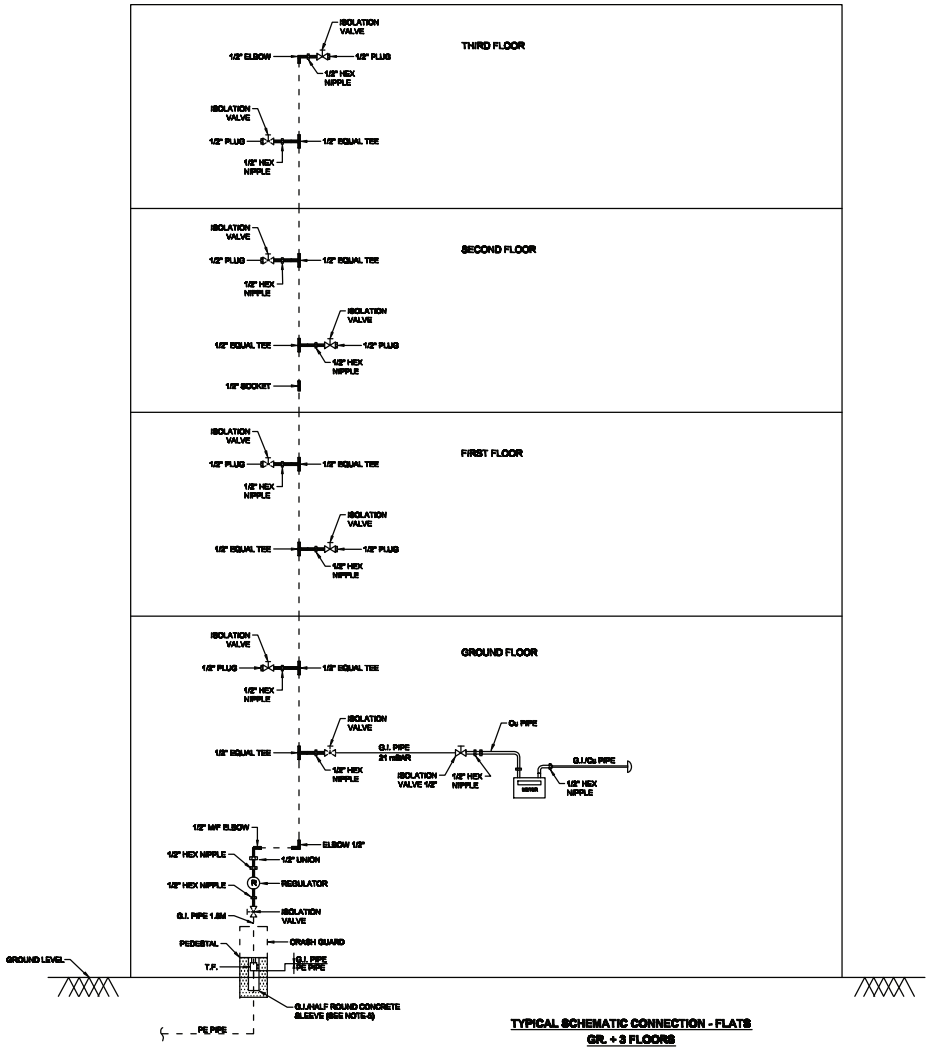
OWNER:
INDRAPRASTHA GAS LIMITED
NEW DELHI

PMC:
M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT:
CITY GAS DISTRIBUTION PROJECT

TITLE:
TYPICAL SCHEMATIC CONNECTION - HAVING GROUND FLOOR AND ABOVE

SCALE: 1:1000	TOTAL NO. OF SHTS: 1 OF 1	
SIZE	DRAWING NUMBER	REV.
A3	15792-20-05-01B	0



TYPICAL SCHEMATIC CONNECTION - FLATS
GR. + 3 FLOORS

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
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8. METER CLAMP SHALL BE APPROVED FROM OWNER / OWNER'S REPRESENTATIVE..

OWNER: INDRAPRASTHA GAS LIMITED
NEW DELHI

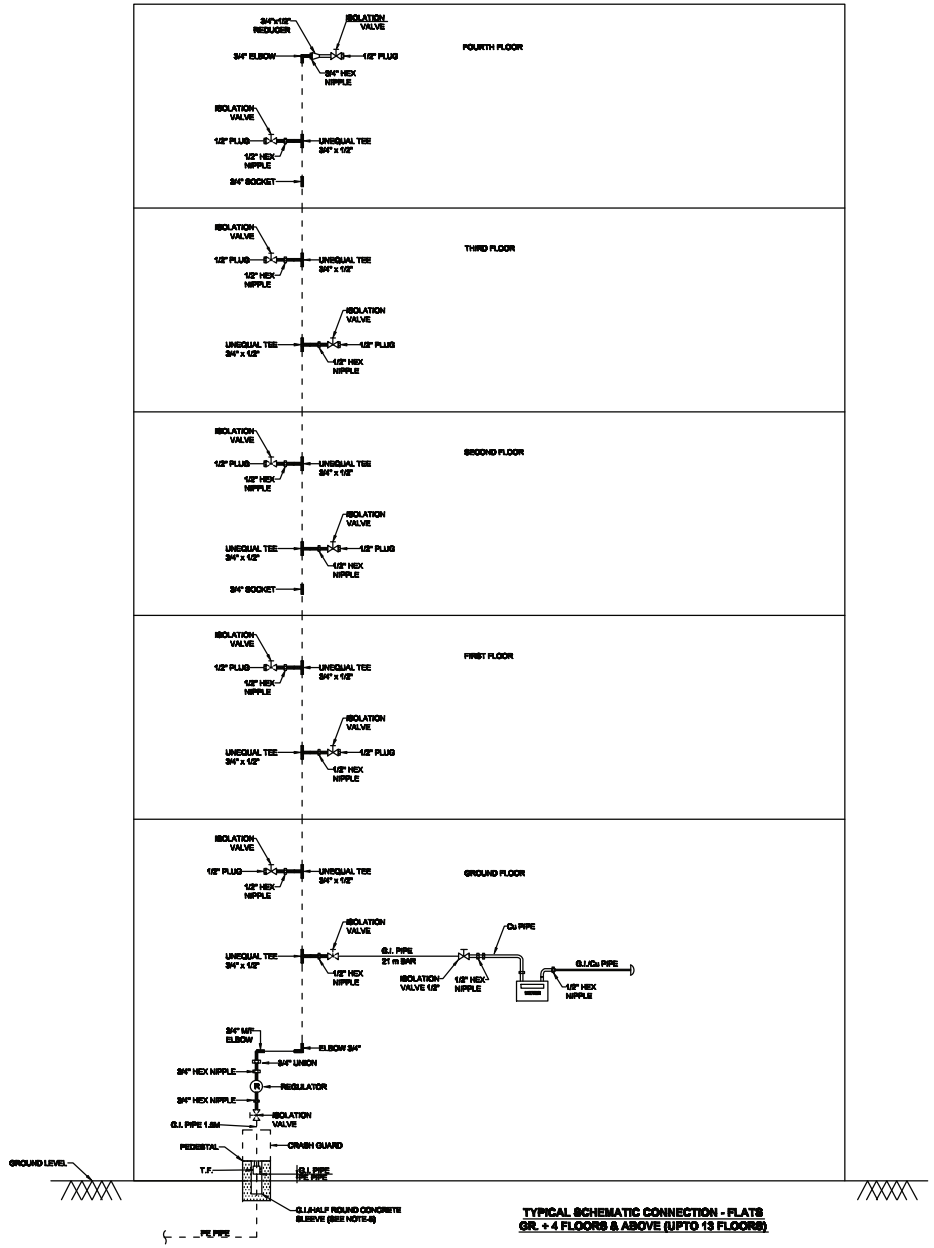
PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: CITY GAS DISTRIBUTION PROJECT

TITLE: TYPICAL SCHEMATIC CONNECTION - FLATS GR. + 3 FLOORS

SCALE	DATE	CAD FILE DATE	CAD	A3

DRG. NO.15792-20-05-02 REV-0



TYPICAL SCHEMATIC CONNECTION - FLATS
GR. + 4 FLOORS & ABOVE (UPTO 13 FLOORS)

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
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8. METER CLAMP SHALL BE APPROVED FROM OWNER / OWNER'S REPRESENTATIVE..

OWNER: INDRAPRASTHA GAS LIMITED
NEW DELHI

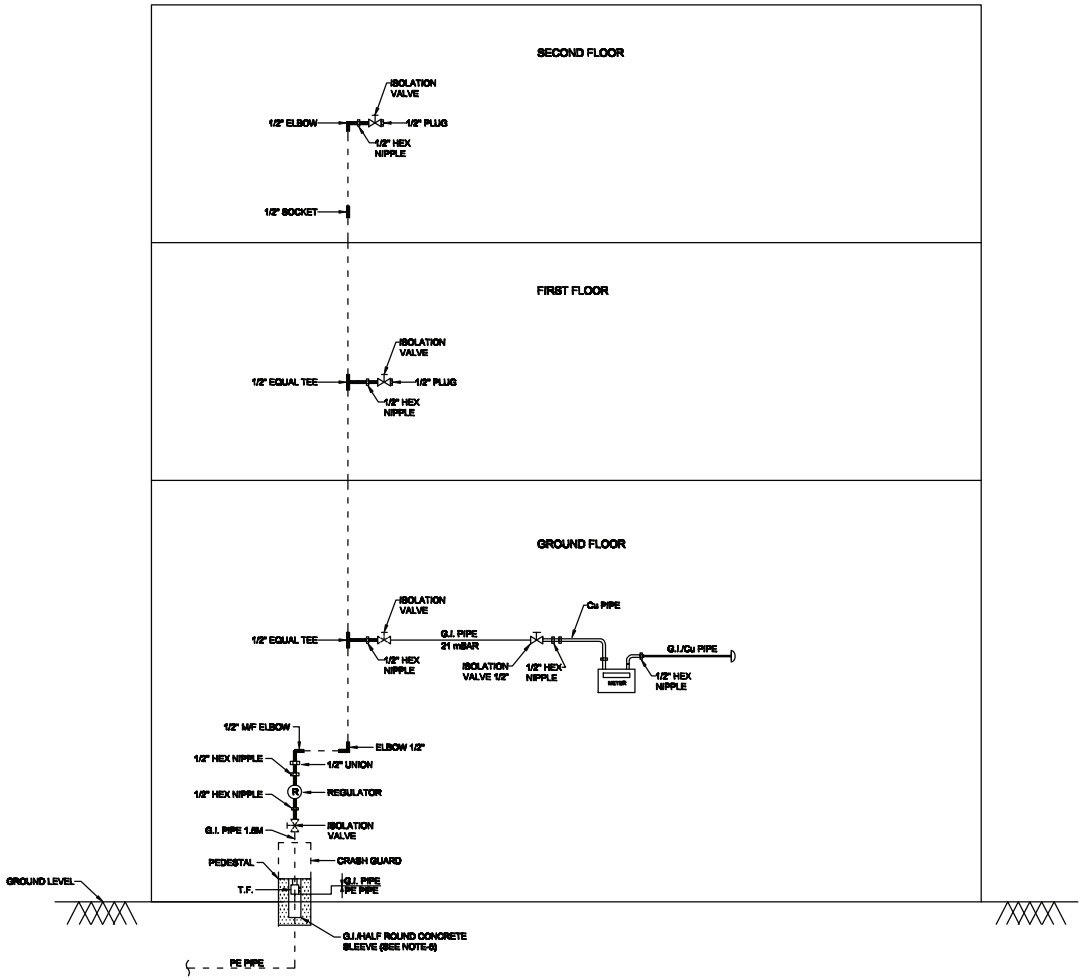
PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: CITY GAS DISTRIBUTION PROJECT

TITLE: TYPICAL SCHEMATIC CONNECTION - FLATS GR. + 4 FLOORS & ABOVE (UPTO 13 FLOORS)

SCALE	DATE	CAD FILE DATE	CAD	A3

DRG. NO. 15792 -20-05-03 REV-0



NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. TENTATIVE RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.5M. ANY CHANGES IN RISER LENGTH SHALL BE AFTER APPROVAL FROM EIC.
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8. METER CLAMP SHALL BE APPROVED FROM OWNER / OWNER'S REPRESENTATIVE..

OWNER: INDRAPRASTHA GAS LIMITED
NEW DELHI

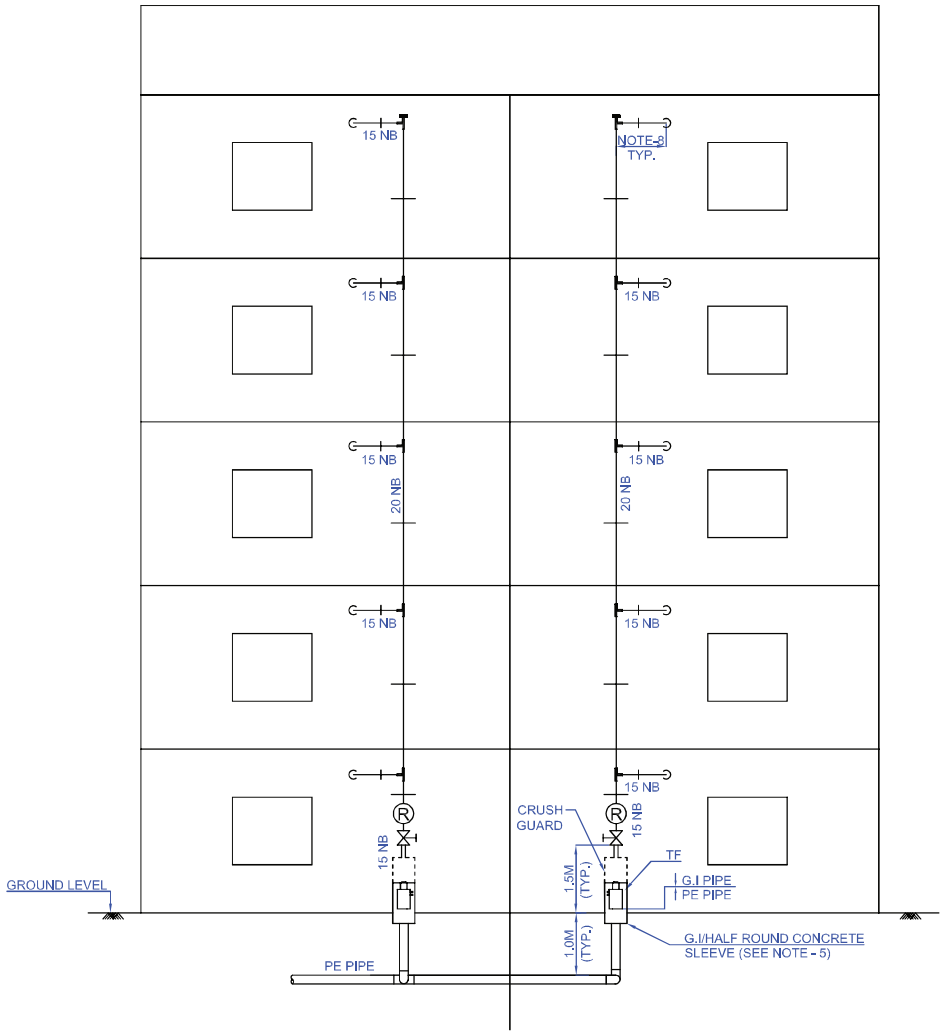
PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: CITY GAS DISTRIBUTION PROJECT

TITLE: TYPICAL SCHEMATIC CONNECTION - KOTHI

SCALE	DATE	CAD FILE DATE	CAD	A3

DRG. NO.15792-20-05-04 REV-0



INDICATIVE RISER ARRANGEMENT IN GR+4 & ABOVE BUILDING (METER INSTALLED INSIDE THE KITCHEN)

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
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8. TAPPING SHALL BE LEFT NEAR OUTSIDE THE KITCHEN AS DIRECTED BY OWNER / OWNER'S REPRESENTATIVE.
9. FROM TRANSITION FITTING TO THE ISOLATION VALVE, SHALL BE CONSIDERED IN THE OUTSIDE KITCHEN PIPING.

THIS IS THE GENERAL LAYOUT.
FOR LMC AND NON-LMC

OWNER: INDRAPRASTHA GAS LIMITED
NEW DELHI

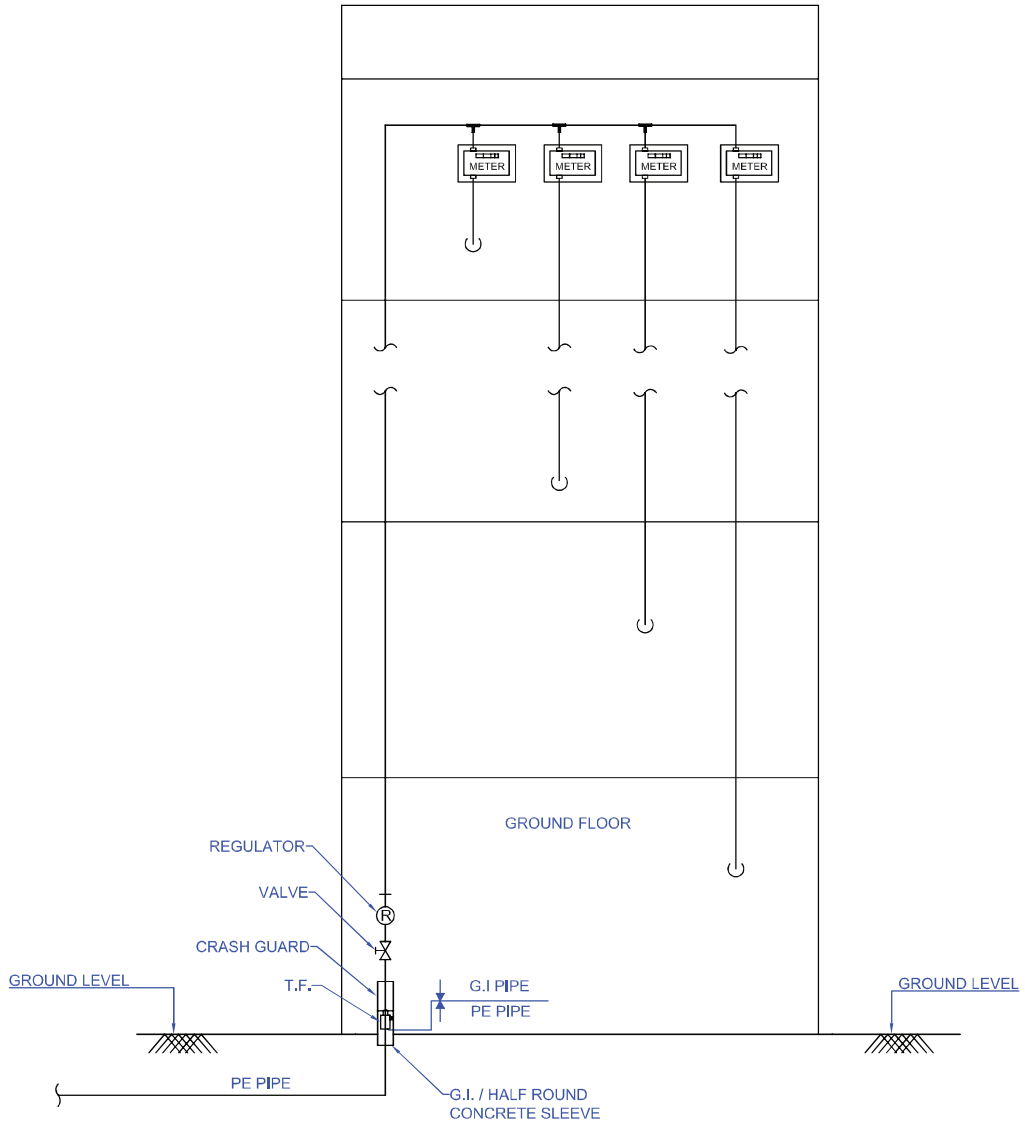
PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: CITY GAS DISTRIBUTION PROJECT

TITLE: TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION

SCALE	DATE	CAD FILE: DATE		
1:4			CAD	A3

DRG. NO. 15792 -20-05-06 REV-0



INDICATIVE RISER ARRANGEMENT IN BUILDING,
IF METER IS INSTALLED AT TOP OF FLOOR

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. TENTATIVE RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.5M. ANY CHANGES IN RISER LENGTH SHALL BE AFTER APPROVAL FROM EIC.
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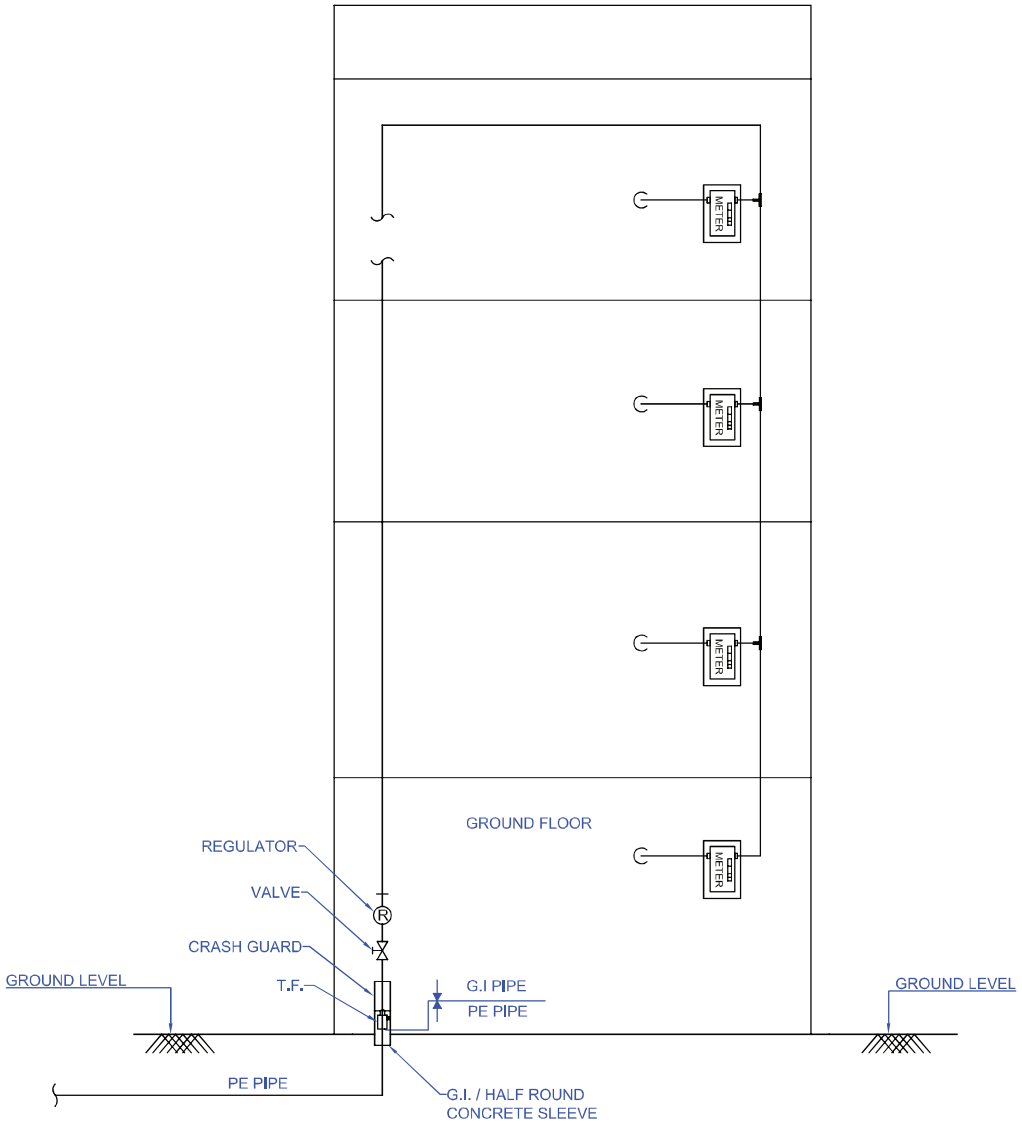
8. TAPPING SHALL BE LEFT NEAR OUTSIDE THE KITCHEN AS DIRECTED BY OWNER / OWNER'S REPRESENTATIVE.
9. FROM TRANSITION FITTING TO THE ISOLATION VALVE, SHALL BE CONSIDERED IN THE OUTSIDE KITCHEN PIPING.
10. AT THE TIME OF MEASURING LENGTH OF G.I./COPPER PIPE, G.I./COPPER FITTINGS SHALL BE COUNTED IN THE PIPE LENGTH.

THIS IS THE GENERAL LAYOUT.

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION
SCALE: N.T.S. / DATE: / CAD FILE: / DATE:	CAD / A3
DRG. NO. 15792 -20-05-07 REV-0	



INDICATIVE RISER ARRANGEMENT IN BUILDING,
IF METER IS INSTALLED AT EACH FLOOR

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
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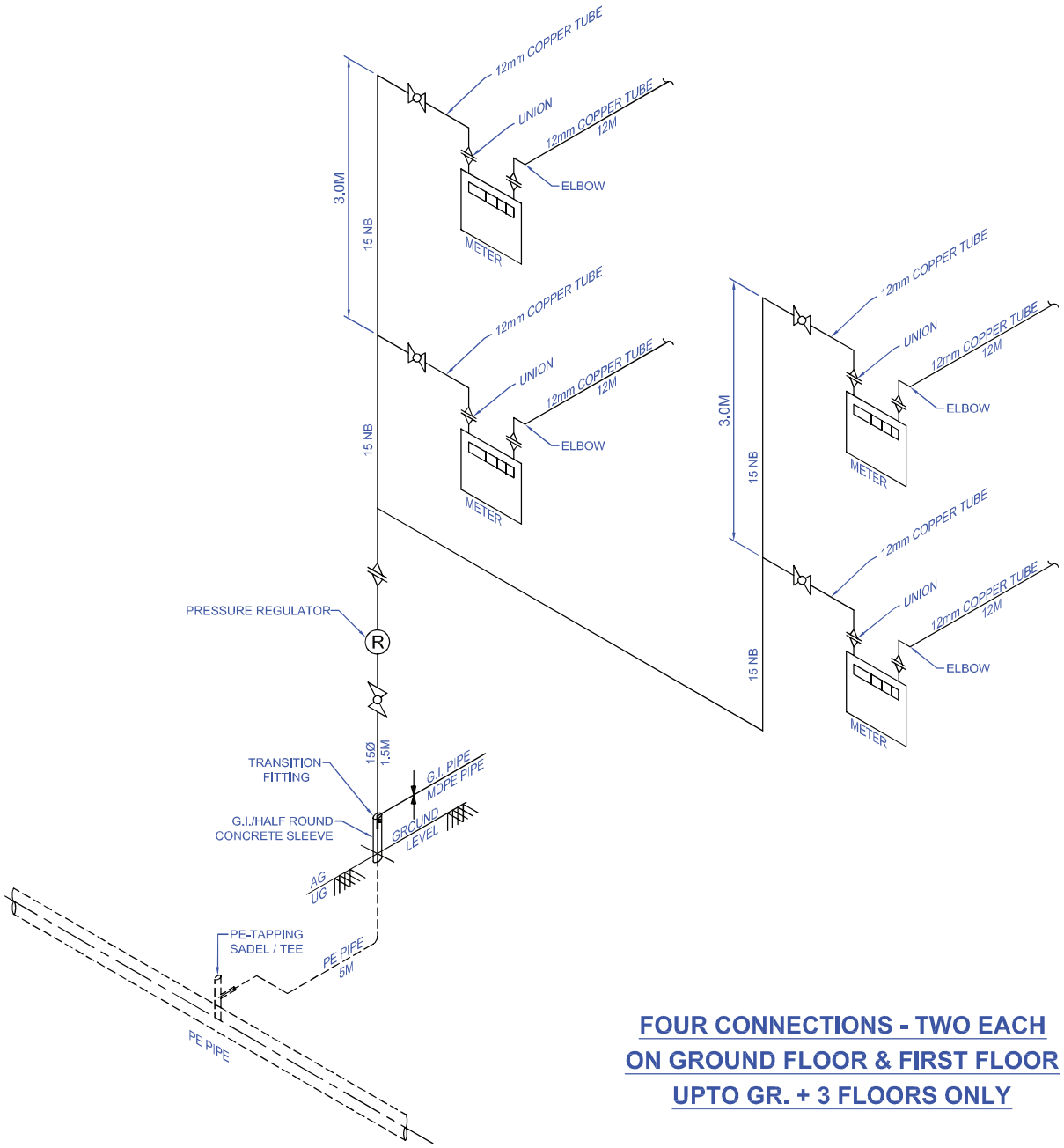
9. FROM TRANSITION FITTING TO THE ISOLATION VALVE, SHALL BE CONSIDERED IN THE OUTSIDE KITCHEN PIPING.
10. AT THE TIME OF MEASURING LENGTH OF G.I./COPPER PIPE, G.I./COPPER FITTINGS SHALL BE COUNTED IN THE PIPE LENGTH.

THIS IS THE GENERAL LAYOUT.

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION
SCALE: N.T.S. / DATE: / CAD FILE: / DATE:	CAD / A3
DRG. NO. 15792 -20-05-08 REV-0	



FOUR CONNECTIONS - TWO EACH ON GROUND FLOOR & FIRST FLOOR UPTO GR. + 3 FLOORS ONLY

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
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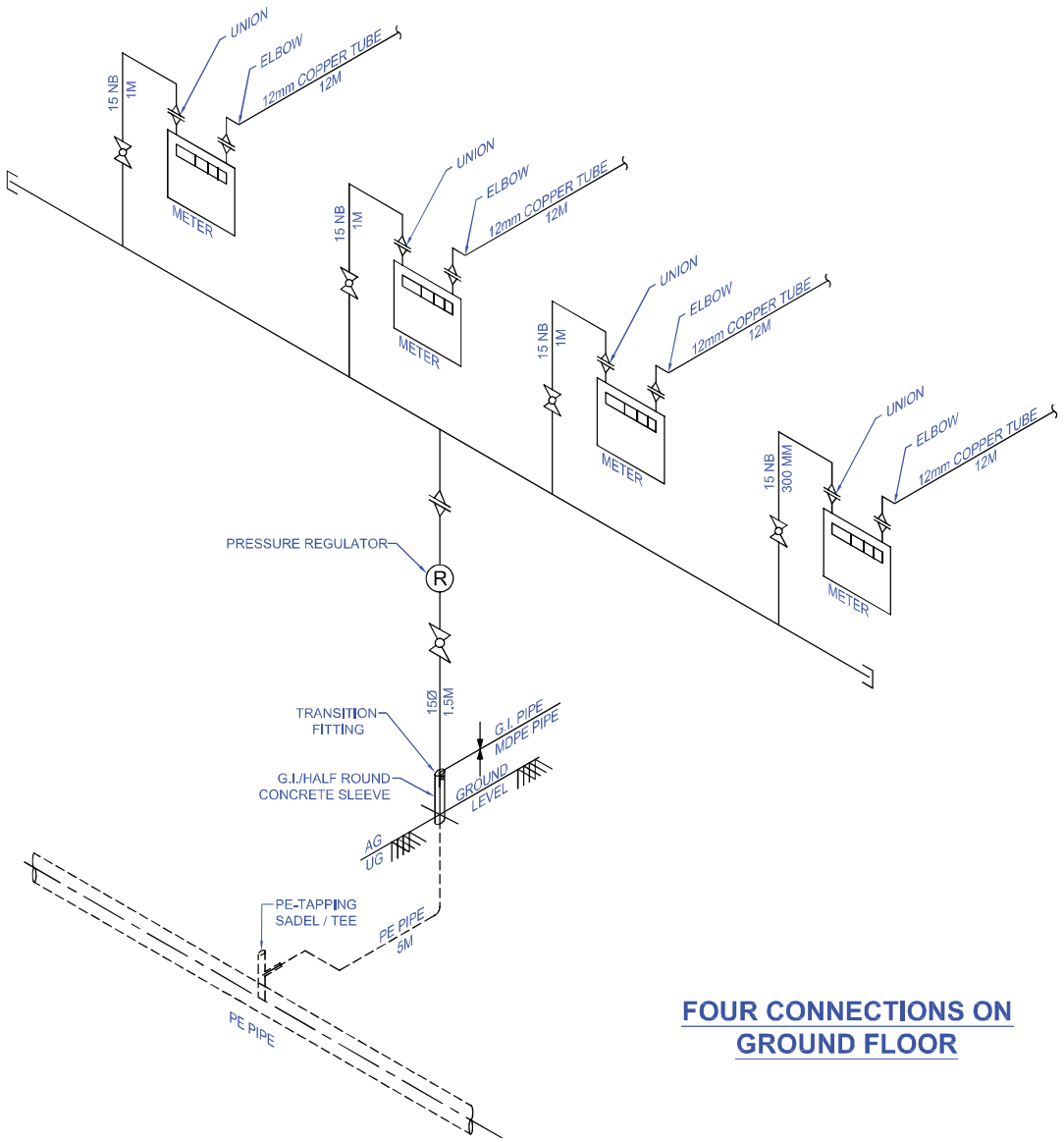
THIS IS THE GENERAL LAYOUT.
FOR LMC AND NON-LMC

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION
SCALE: N.T.S. / DATE: / CAD FILE: / DATE:	CAD A3
DRG. NO. 15792 -20-05-10 REV-0	



FOUR CONNECTIONS ON GROUND FLOOR

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
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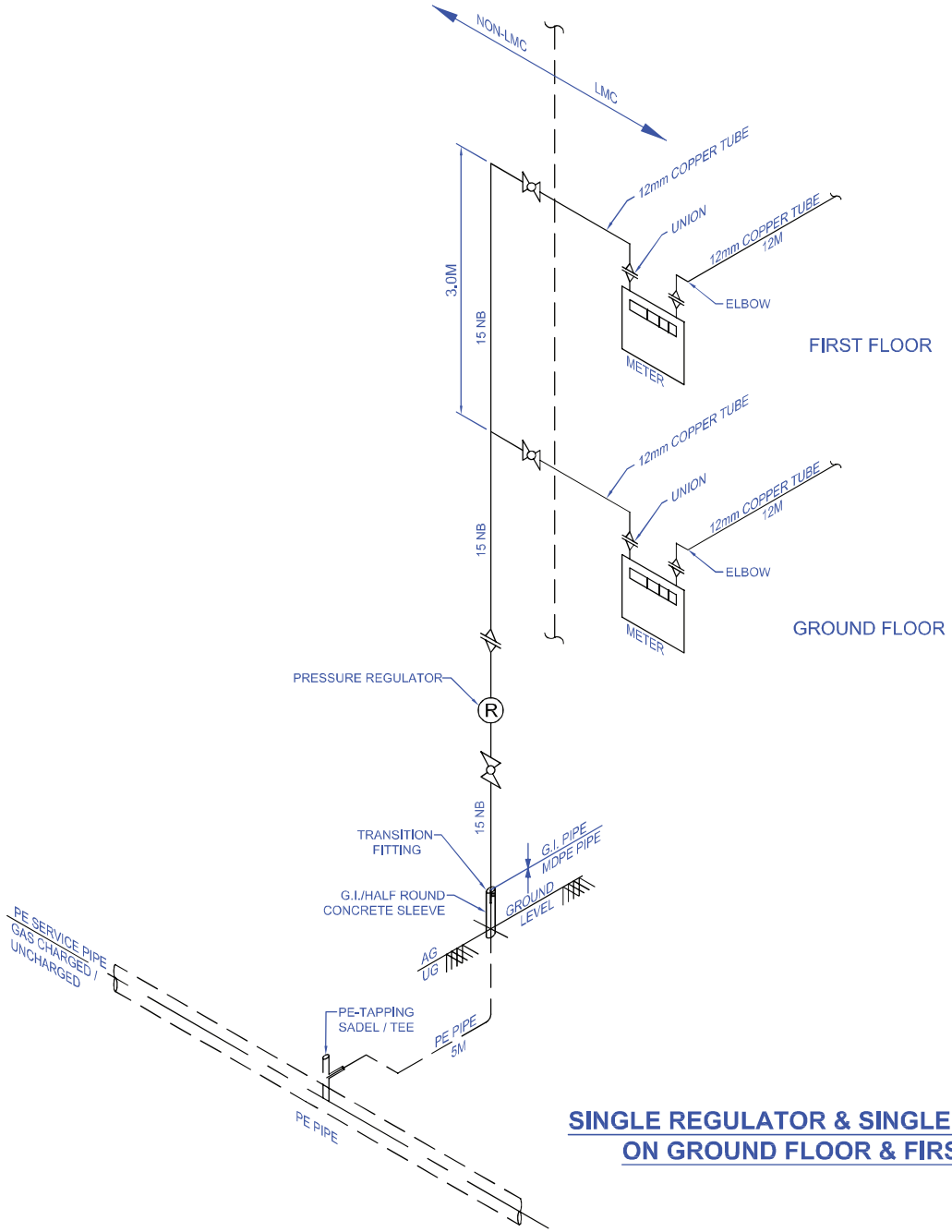
THIS IS THE GENERAL LAYOUT.
FOR LMC AND NON-LMC

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION
SCALE: N.T.S. / DATE: / CAD FILE: / DATE:	CAD / A3
DRG. NO. 15792 -20-05-11 REV-0	



SINGLE REGULATOR & SINGLE CONNECTION ON GROUND FLOOR & FIRST FLOOR

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
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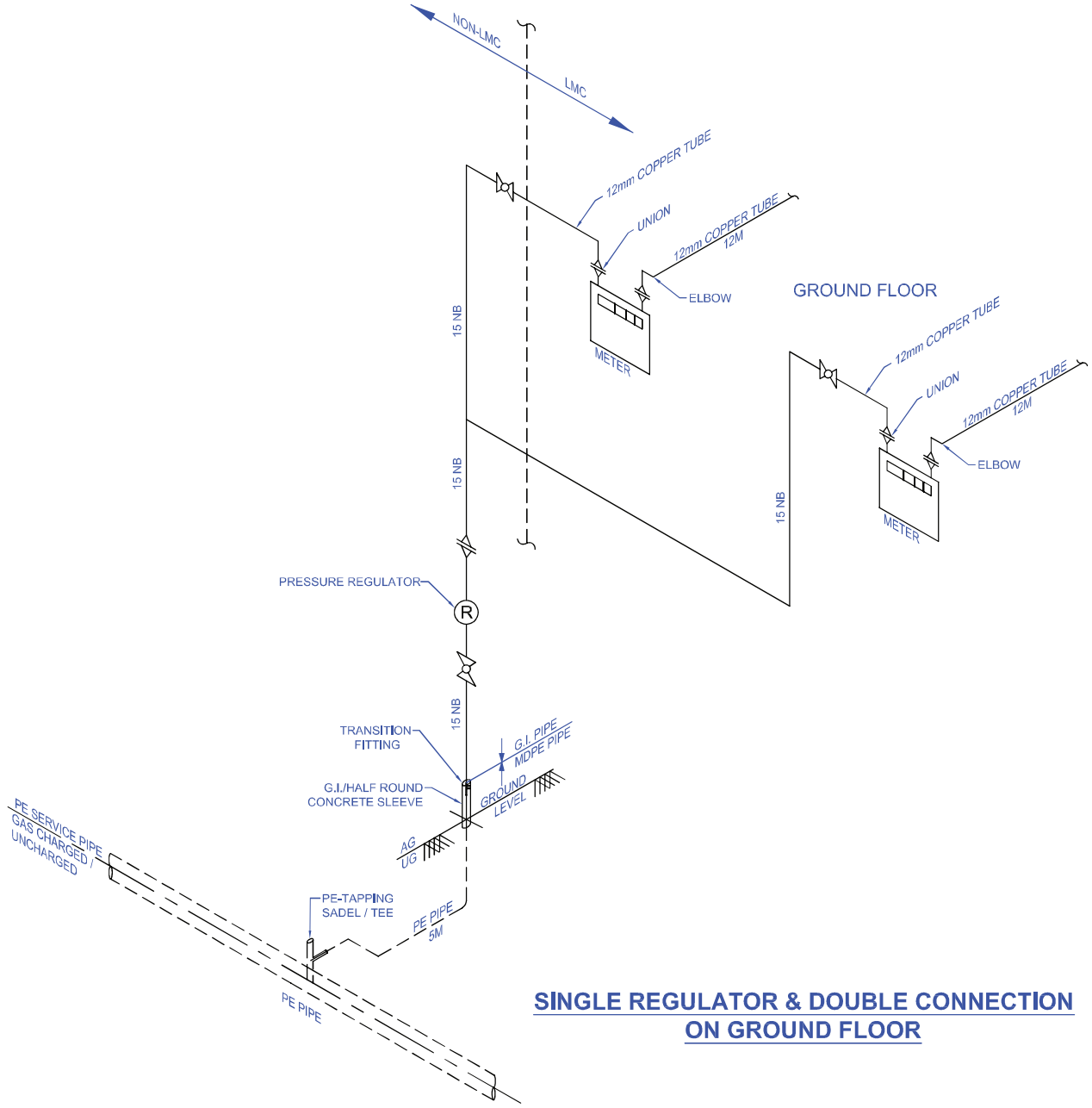
THIS IS THE GENERAL LAYOUT.
FOR LMC AND NON-LMC

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	TYPICAL DOMESTIC CONNECTION LAYOUT OF NG FOR FLAT
SCALE: N.T.S. / DATE: / CAD FILE: DATE:	CAD A3
DRG. NO. 15792 -20-05-12 REV-0	



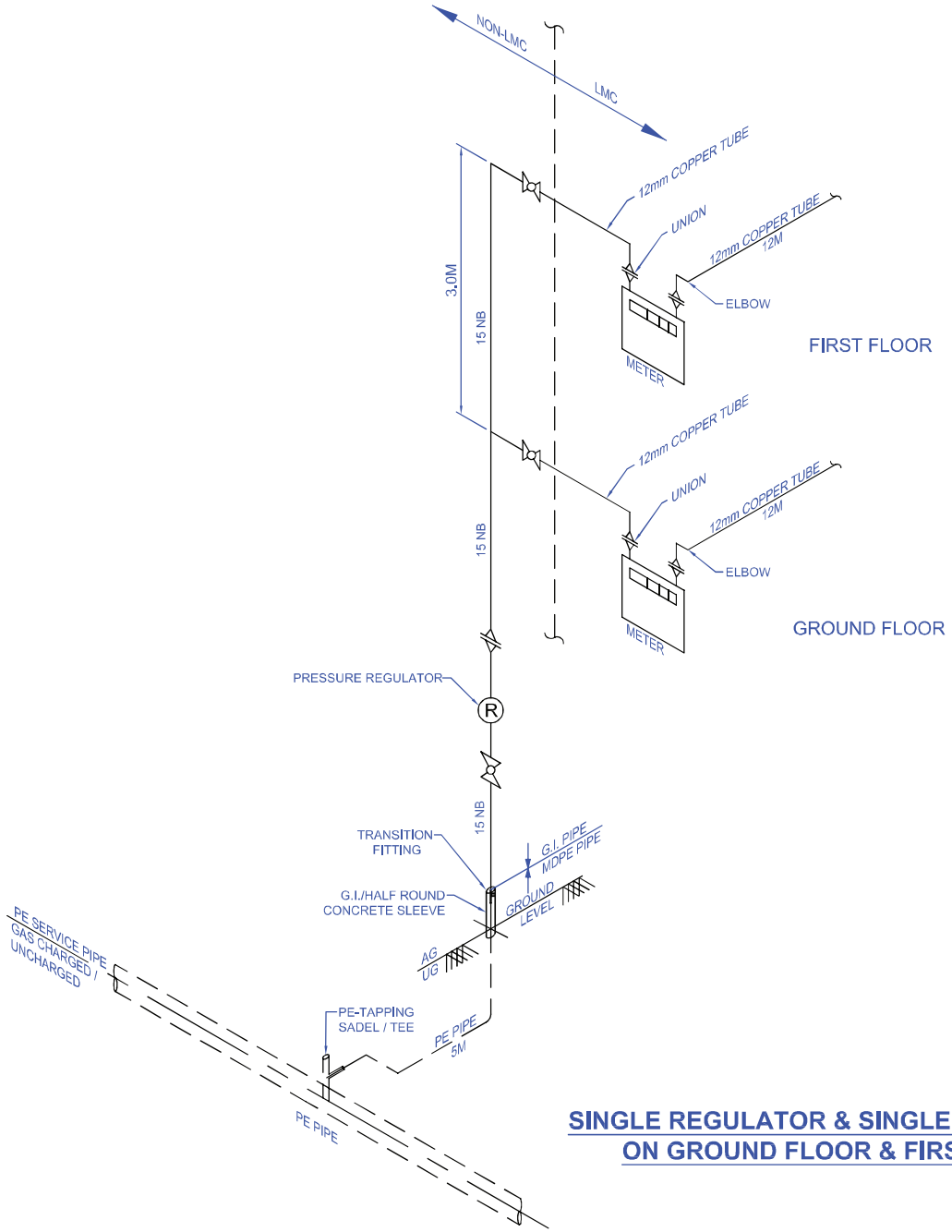
SINGLE REGULATOR & DOUBLE CONNECTION ON GROUND FLOOR

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. TENTATIVE RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.5M. ANY CHANGES IN RISER LENGTH SHALL BE AFTER APPROVAL FROM EIC.
5. G.I. INSTALLATION / METER INSTALLATION SHALL BE DECIDED BY OWNER / OWNER'S REPRESENTATIVE AS PER SITE CONDITIONS.
6. IF COPPER PIPE GOES TO THE APPLIANCE VALVE THEN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR IF G.I. PIPE GOES TO THE APPLIANCE VALVE THEN G.I. FITTING SHALL BE USED AT THE OUTLET OF THE METER.
7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M WHEN PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING IS USED IN BETWEEN THE PIPE THEN CLAMP SHALL BE PLACED 150 MM AWAY FROM CENTER LINE OF THE FITTING AT EVERY SIDE. HOWEVER, THE SAME MAY BE CHANGED AS PER SITE CONDITIONS / AS DIRECTED BY EIC.

THIS IS THE GENERAL LAYOUT.
FOR LMC AND NON-LMC

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION
SCALE: N.T.S. / DATE: / CAD FILE: / DATE:	CAD / A3
DRG. NO. 15792 -20-05-13 REV-0	



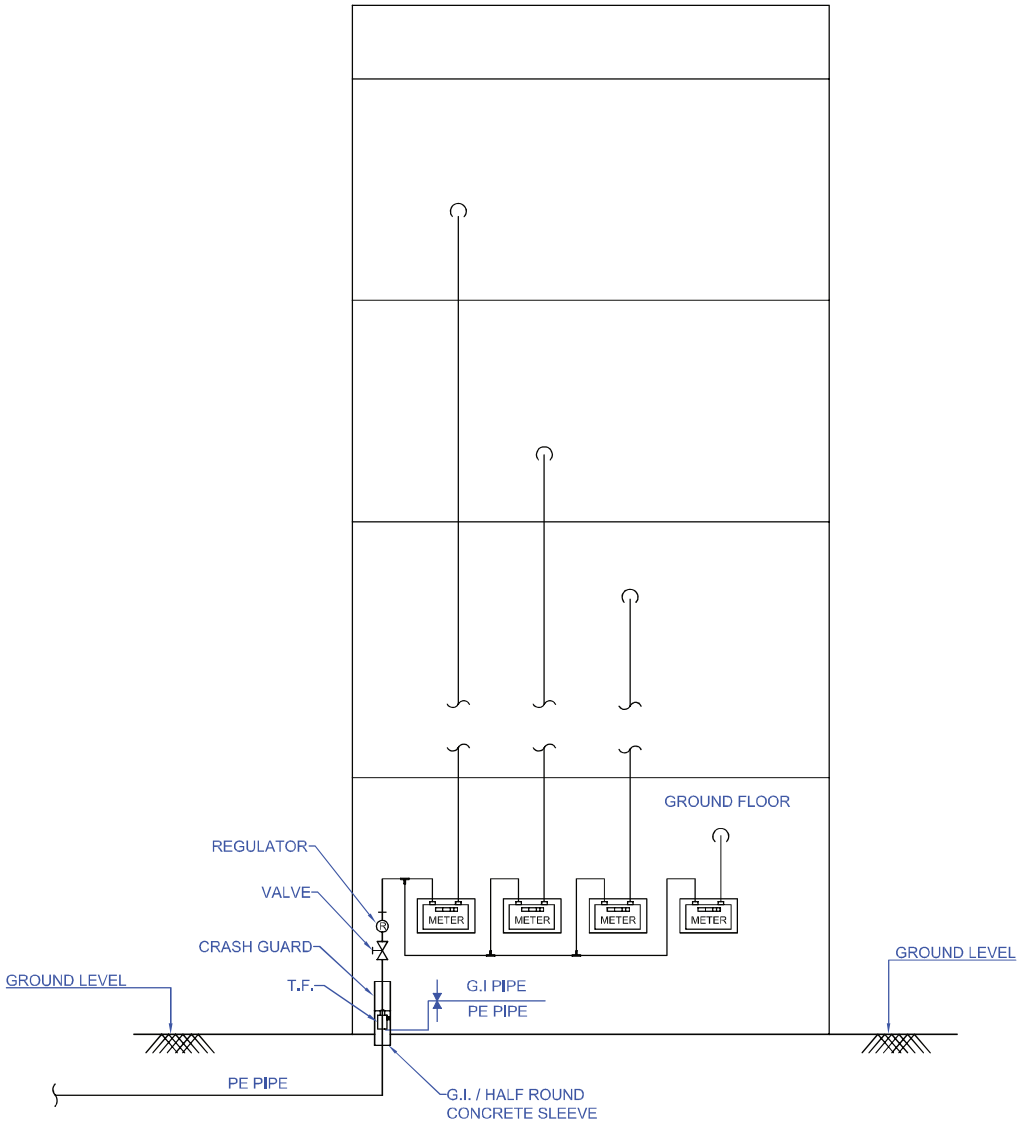
SINGLE REGULATOR & SINGLE CONNECTION ON GROUND FLOOR & FIRST FLOOR

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. TENTATIVE RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.5M. ANY CHANGES IN RISER LENGTH SHALL BE AFTER APPROVAL FROM EIC.
5. G.I. INSTALLATION / METER INSTALLATION SHALL BE DECIDED BY OWNER / OWNER'S REPRESENTATIVE AS PER SITE CONDITIONS.
6. IF COPPER PIPE GOES TO THE APPLIANCE VALVE THEN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR IF G.I. PIPE GOES TO THE APPLIANCE VALVE THEN G.I. FITTING SHALL BE USED AT THE OUTLET OF THE METER.
7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M WHEN PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING IS USED IN BETWEEN THE PIPE THEN CLAMP SHALL BE PLACED 150 MM AWAY FROM CENTER LINE OF THE FITTING AT EVERY SIDE. HOWEVER, THE SAME MAY BE CHANGED AS PER SITE CONDITIONS / AS DIRECTED BY EIC.

THIS IS THE GENERAL LAYOUT.
FOR LMC AND NON-LMC

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	TYPICAL DOMESTIC CONNECTION LAYOUT OF NG FOR KOTHI
SCALE: N.T.S. / DATE: / CAD FILE: / DATE:	CAD / A3
DRG. NO. 15792 -20-05-14 REV-0	



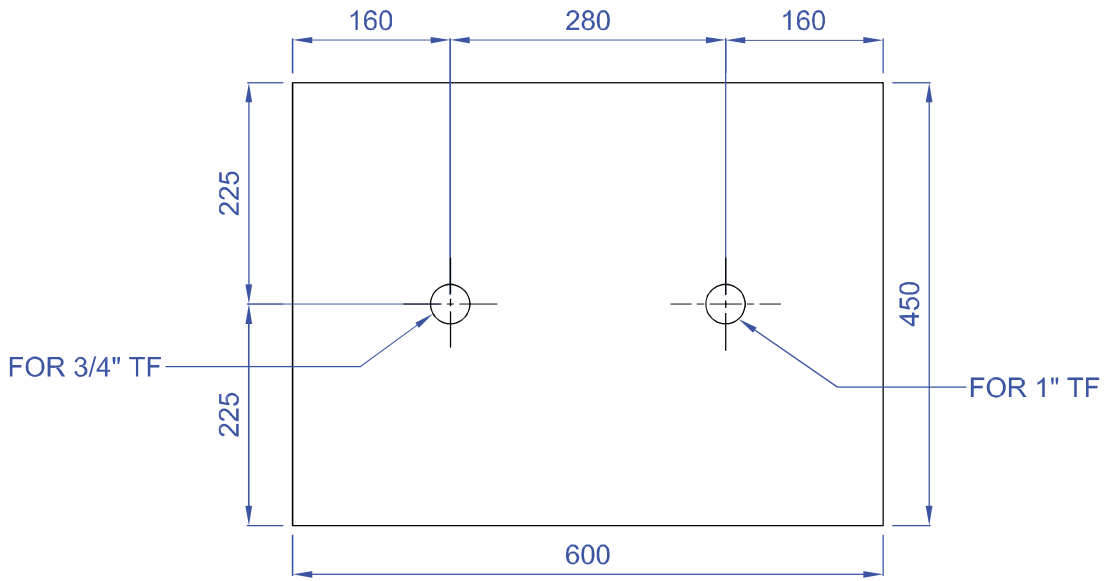
INDICATIVE RISER ARRANGEMENT IN BUILDING,
IF METER INSTALLED AT GROUND FLOOR

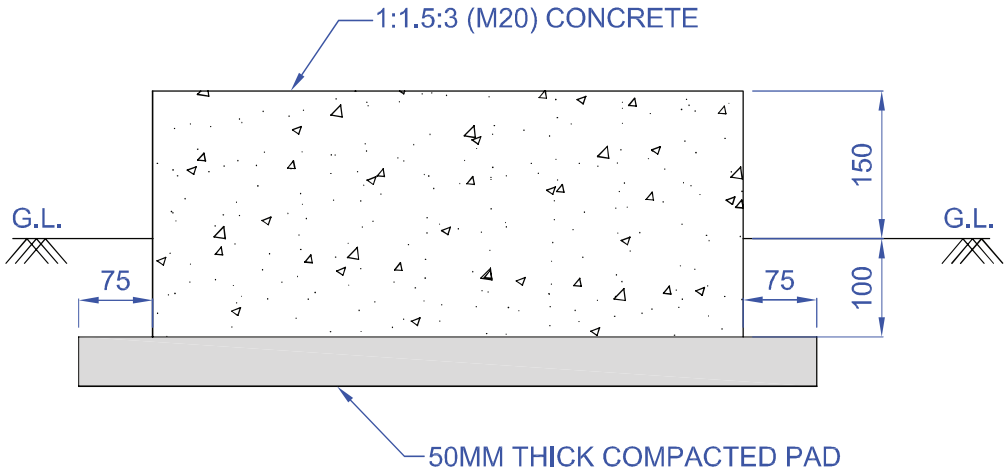
NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. TENTATIVE RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.5M. ANY CHANGES IN RISER LENGTH SHALL BE AFTER APPROVAL FROM EIC.
5. G.I. INSTALLATION / METER INSTALLATION SHALL BE DECIDED BY OWNER / OWNER'S REPRESENTATIVE AS PER SITE CONDITIONS.
6. IF COPPER PIPE GOES TO THE APPLIANCE VALVE THEN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR IF G.I. PIPE GOES TO THE APPLIANCE VALVE THEN G.I. FITTING SHALL BE USED AT THE OUTLET OF THE METER.
7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M WHEN PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING IS USED IN BETWEEN THE PIPE THEN CLAMP SHALL BE PLACED 150 MM AWAY FROM CENTER LINE OF THE FITTING AT EVERY SIDE. HOWEVER, THE SAME MAY BE CHANGED AS PER SITE CONDITIONS / AS DIRECTED BY EIC.
8. TAPPING SHALL BE LEFT NEAR OUTSIDE THE KITCHEN AS DIRECTED BY OWNER / OWNER'S REPRESENTATIVE.
9. FROM TRANSITION FITTING TO THE ISOLATION VALVE, SHALL BE CONSIDERED IN THE OUTSIDE KITCHEN PIPING.
10. AT THE TIME OF MEASURING LENGTH OF G.I./COPPER PIPE, G.I./COPPER FITTINGS SHALL BE COUNTED IN THE PIPE LENGTH.

THIS IS THE GENERAL LAYOUT.
FOR LMC AND NON-LMC

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION
SCALE: N.T.S. / DATE: / CAD FILE: / DATE:	CAD / A3
DRG. NO. 15792 -20-05-15 REV-0	

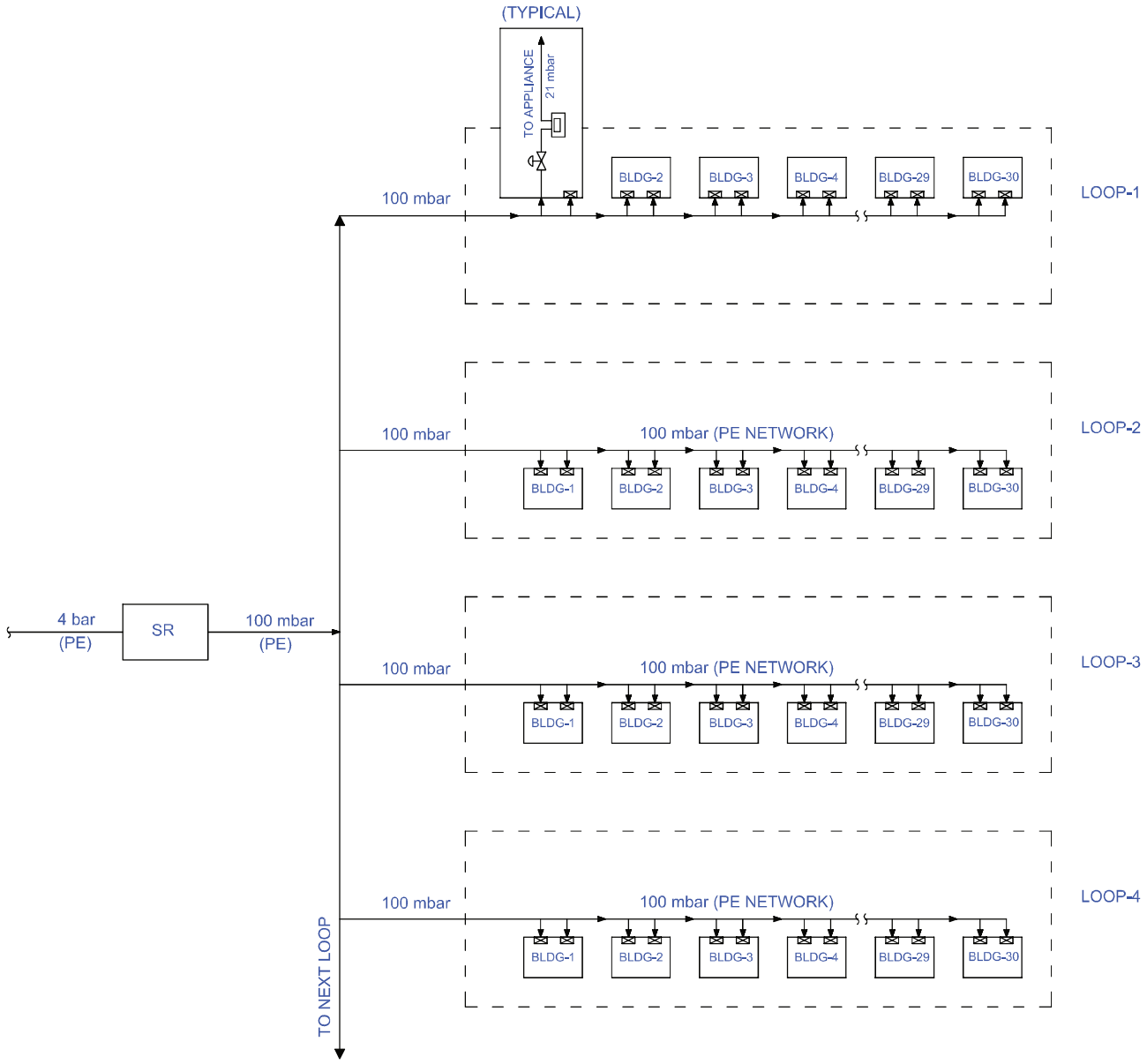




NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.

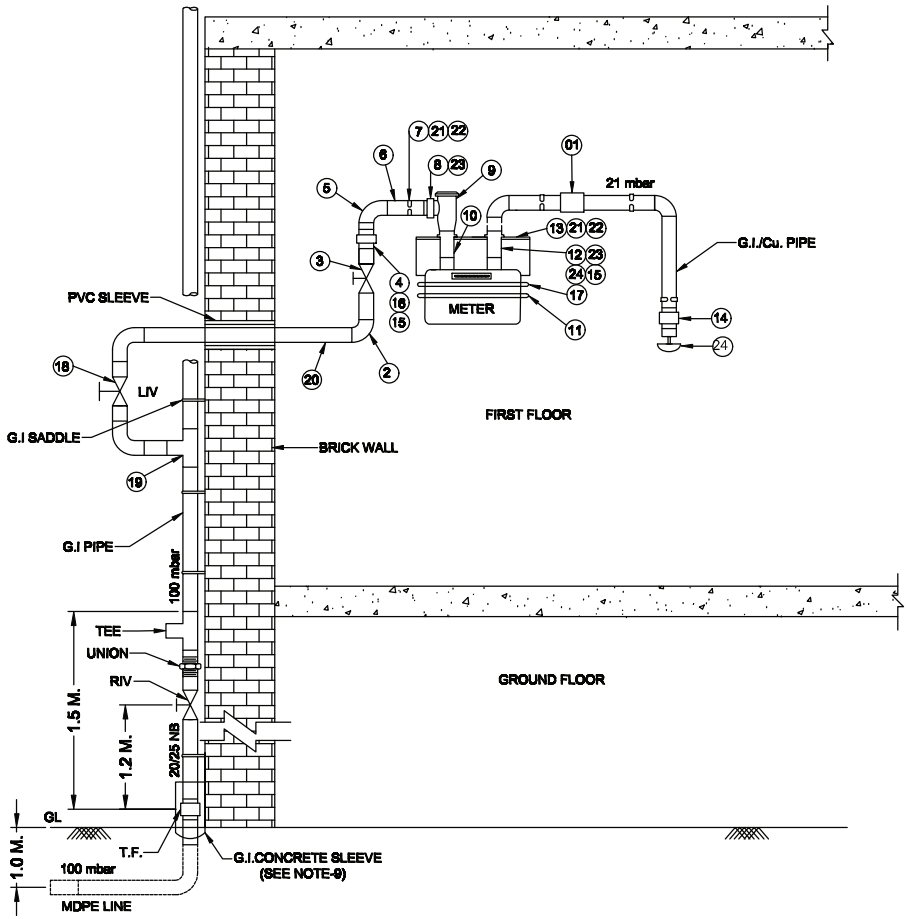
OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	SCHEMATIC DIAGRAM OF FOUNDATION FOR SINGLE STREAM SERVICE REGULATOR
SCALE 1:5 / DATE / CAD FILE: / DATE	CAD / A3
DRG. NO. 1579 -20-03-39 REV-0	
2	



NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.

OWNER:	INDRAPRASTHA GAS LIMITED NEW DELHI
PMC:	M/s. VCS QUALITY SERVICES PVT. LTD.
PROJECT:	CITY GAS DISTRIBUTION PROJECT
TITLE:	SCHEMATIC DIAGRAM DESCRIBING DIFFERENT PRESSURE SYSTEM (SR TO APPLIANCE IN KITCHEN)
SCALE: N.T.S. / DATE: / CAD FILE: DATE:	CAD / A3
DRG. NO. 15792 -20-05-40 REV-0	



NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
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8. TAPPING SHALL BE LEFT NEAR OUTSIDE THE KITCHEN AS DIRECTED BY OWNER / OWNER'S REPRESENTATIVE.
9. G.I CONCRETE SLEEVE INSTALLATION SHALL BE DECIDED BY OWNER / OWNER'S REPRESENTATIVE AS PER SITE CONDITIONS.
10. REGULATOR TO BE FIXED NEAR THE METER AS PER INSTRUMENT AS PER INSTRUCTION OF EIC.

BILL OF MATERIAL

SR. No.	MATERIAL DESCRIPTION	QTY.	REMARK
1.	COPPER COUPLER	01	
2.	90 DEG. ELBOW G.I.(1/2"-M/F END)	01	
3.	METER CONTROL VALVE (1/2")	01	
4.	BRASS DISCONNECTING UNION (1/2"x12mm)	01	
5.	G.I./Cu ELBOW (12mm)	02	
6.	G.I./Cu TUBE(12mm)	3m	INDICATIVE
7.	PVC. CLIP	05	
8.	BRASS DISCONNECTING UNION (3/4"x12mm)	01	
9.	METER REGULATOR	01	
10.	METER INLET UNION (3/4"x3/4")	01	
11.	GAS METER (2.5 m3/hr)	01	
12.	METER OUTLET UNION (3/4"x12mm)	01	
13.	METER BRACKET	01	
14.	BRASS ADAPTER(1/4"x12mm)	01	
15.	FLUX	15 gms	
16.	SOLDER WIRE	20 gms	
17.	METER CLAMP	01	
18.	LATERAL VALVE	01	
19.	COPPER EQUAL TEE	01	OPTIONAL
20.	25mm OD. PVC. PIPE AS PER IS - 4985	01	
21.	RAWAL PLUGS	07	
22.	WOOD SCREW	07	
23.	TEFLON TAPE	4m	INDICATIVE

THIS IS THE GENERAL LAYOUT.

OWNER: INDRAPRASTHA GAS LIMITED
NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

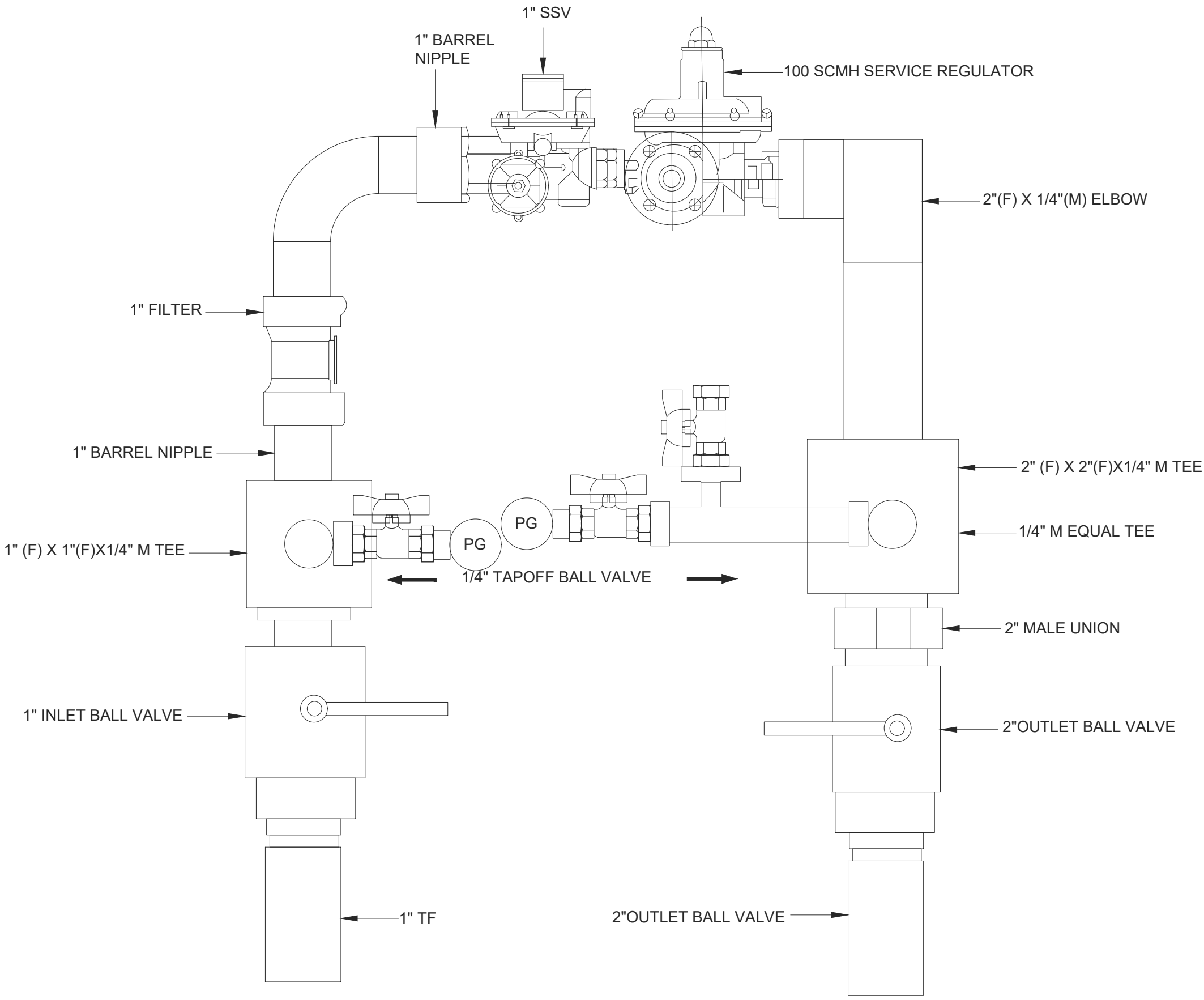
PROJECT: CITY GAS DISTRIBUTION PROJECT

TITLE: TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION

SCALE	DATE	CAD FILE DATE	CAD	A3
N.T.S.				

DRG. NO.15792-20-05-07 REV-0

INDRAPRASTHA GAS LIMITED
ASSEMBLY DRAWING OF SERVICE REGULATOR MODULE 100 SCMH



INDRAPRASTHA GAS LIMITED

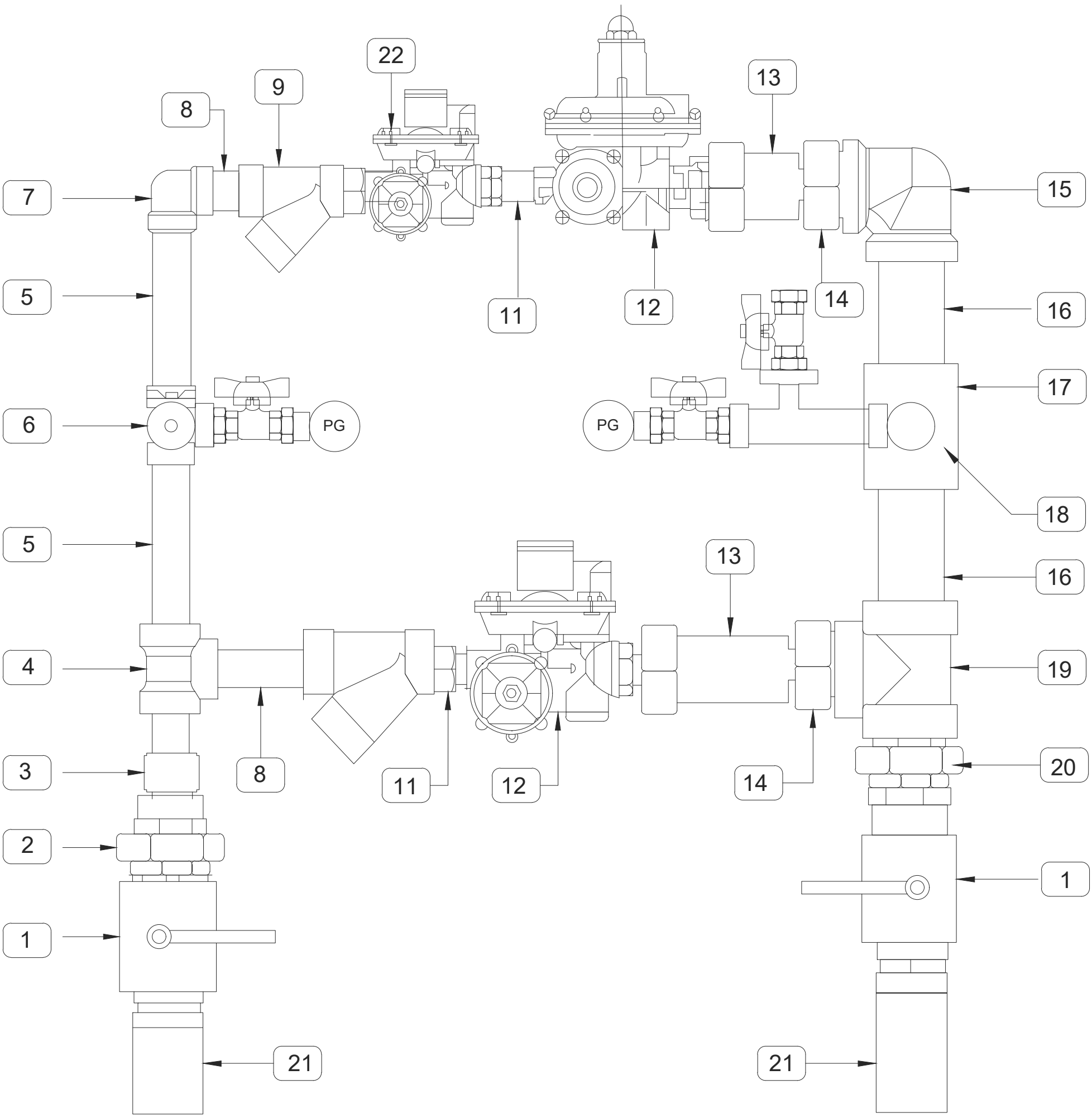
TITLE

SERVICE REGULATOR MODULE 100 SCMH

ALL DIMM. ARE IN MM.	DRAWING NO.-15792-20-05-37A	REV.-00

INDRAPRASTHA GAS LIMITED

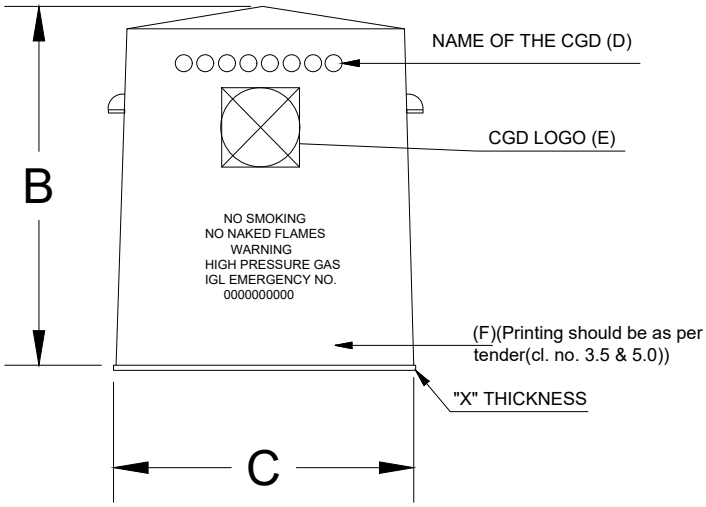
ASSEMBLY DRAWING OF SERVICE REGULATOR MODULE 200 SCMH

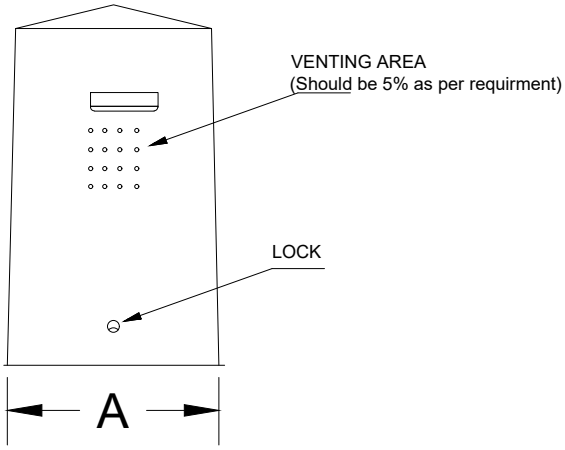


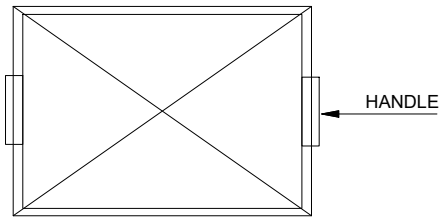
INDRAPRASTHA GAS LIMITED		
TITLE SERVICE REGULATOR MODULE 200 SCMH		
ALL DIMM. ARE IN MM.	DRAWING NO.-15792-20-05-37B	REV.-00

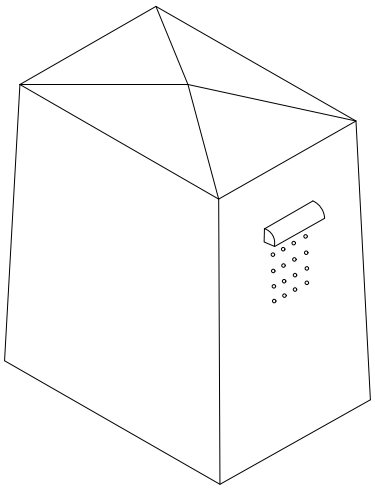
INDRAPRASTHA GAS LIMITED				
BILL OF MATERIAL - SERVICR REGULATOR MODULE 200 SCMH				
S.No.	**Material Description**	**Size**	**UoM**	**Qty**
1	Isolation valve	2" NPT (F)	NOS.	2
2	Union	1" (M)X 2" (M) NPT	NO.	1
3	Adaptor	1" (M) X1 " (F) NPT	NO.	1
4	Equal Tee	1" (F) NPT	NO.	1
5	Barrel Nipple	1 NPT X5" Length	NOS.	2
6	Unequal Tee	1 (F) X 1FYX 74-MY NPT	NO	1
7	Elbow	1* (F) X 1" (F) NPT	NO	1
8	Barrel Nipple	1" NPT X 5.5" Length	NOS.	2
9	Filter (Any Angle Type)	1"X1" (F) NPT	NOS	2
10	Ball valve (Butter Fly Type Handel)	1/4" NPT (F)	NOS.	3
11	Adaptor / Hex Nipple	1" (M) X 1" (M) NPT	NOS.	2
12	REGULATOR with Rated flow (100 SCMH)	1"× 1 1/2" NPT FLN (Orentation- Inline /180 Degree connection)	NOS	2
13	Barrel Nipple	1 1/2" NPT X 5 "Length	NOS	2
14	Reducer	2" (M) X1.5" (F) NPT	NOS	2
15	Elbow	2" (F) X 2" (F) NPT	NO.	1
16	Barrel Nipple	2" NPT X 5" Length	NOS	2
17	Unequal Tee	2" (F) X 2" (F) X 1/4" (F) NPT	NO.	1
18	Equal Tee	1/4" (F) NPT	NO.	1
19	Equal Tee	2" (F) NPT	NO.	1
20	Union	2" (M) NPT	NO.	1
21	TF	2" NPT X 63mm MDPE	NO.	1
22	Slam Shut Valve (SSV)	1"	NO.	1

INDRAPRASTHA GAS LIMITED
CANOPY FOR 100 SCMH SERVICE REGULATOR MODULE









Note:	
A	400 +/- 20 MM
B	605 +/- 20 MM
C	505 +/- 20 MM
D	INDRAPRASTHA GAS LIMITED
E	
F	IGL EMERGENCY CONTACT NO - 18001025109*, Embossed on CRC canopy for both side on same & text shall be CRC black colour & canary yellow for canopy
X	2.5 mm Thickness

*Emergency number may be chanaged and same needs to be incorporated at the time of documents of approval

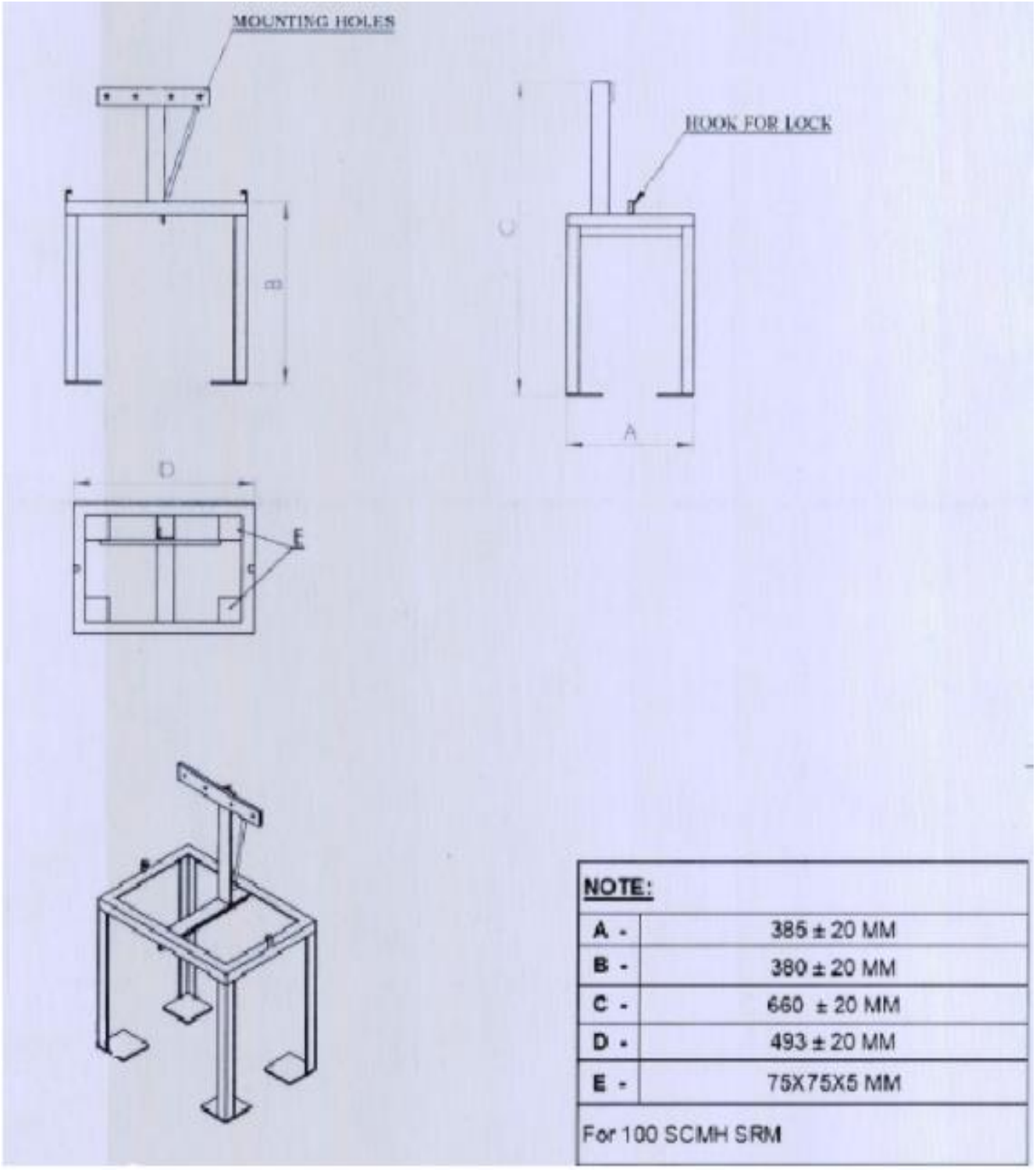
INDRAPRASTHA GAS LIMITED

TITLE

CANOPY FOR 100 SCMH SERVICE REGULATOR MODULE

All Dimn. are in mm. | DRG No. | REV-

INDRAPRASTHA GAS LIMITED
BASE STAND FRAME DRAWING FOR SRM 100 SCMH

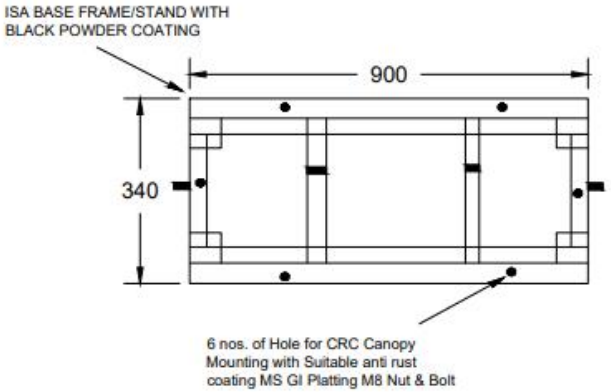


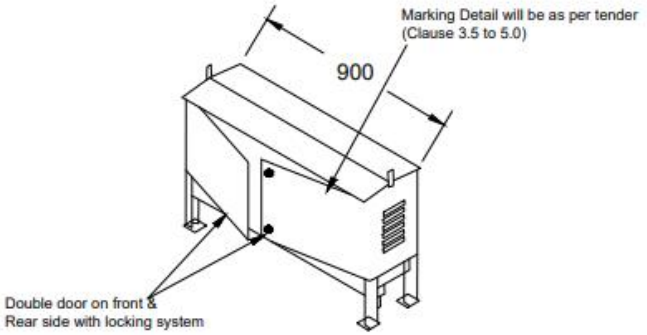
NOTE:	
A -	385 ± 20 MM
B -	380 ± 20 MM
C -	660 ± 20 MM
D -	493 ± 20 MM
E -	75X75X5 MM
For 100 SCMH SRM	

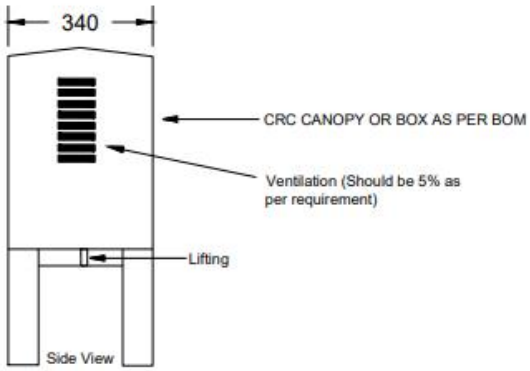
Note- All the tentative GAD provided for Assembly, Canopy, Base Stand, etc. are for reference of bidder. As the same needs to be amended as per the actual design of module.

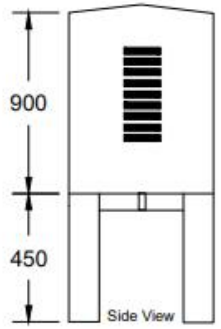
However, the bidder shall take prior approval of GAD at the time of QAP approval.

INDRAPRASTHA GAS LIMITED
BASE STAND & CANOPY FOR 200 SCMH TWIN STREAM SRM









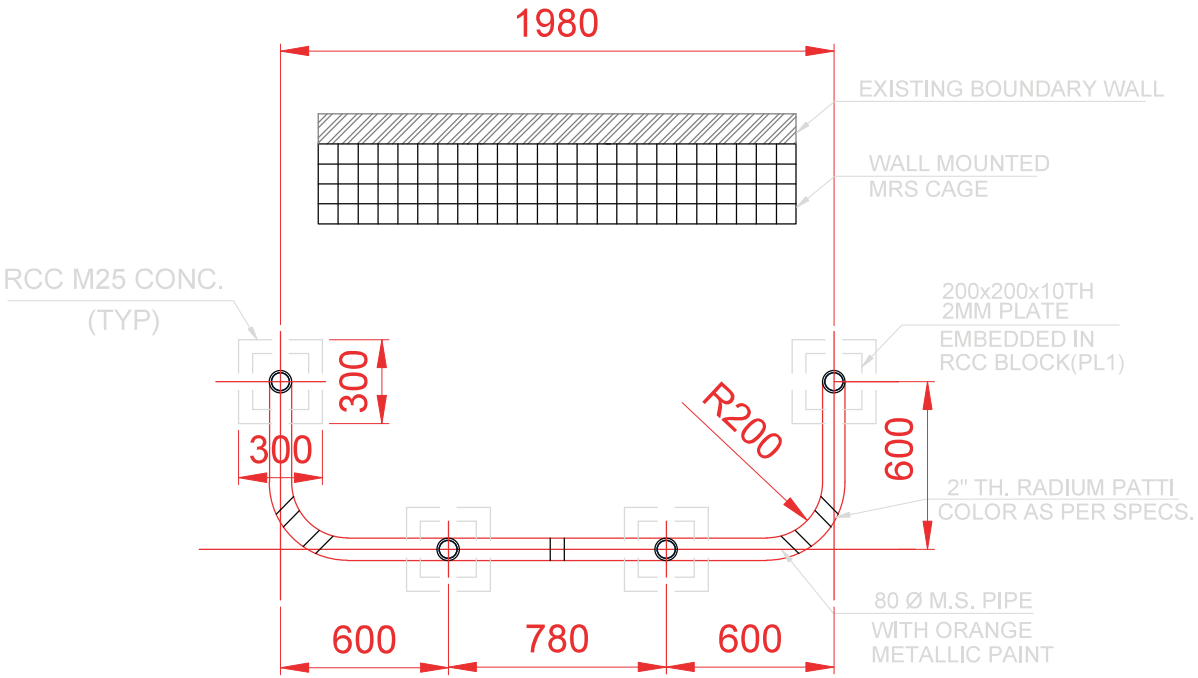
Note:	Canopy shall be constructed CRC with thickness minimum 2.5 mm
Material	Base Frame shall be constructed base, leg with support stand
	Canopy doors shall be foldable type with locking systems one side
	Canopy shall have door on front & rear side
	CRC Canopy shall be dully canary yellow and base frame of black colour

INDRAPRASTHA GAS LIMITED

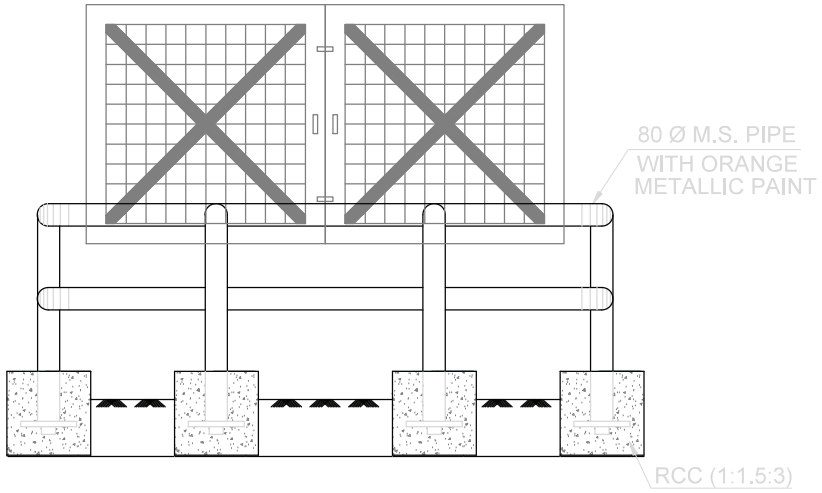
TITLE

BASE STAND & CANOPY FOR 200 SCMH
TWIN STREAM SRM

All Dimn. are in mm. | DRG No. | REV-



PLAN DETAIL OF CRASH GUARD



VIEW A-A

REFERENCE DRAWINGS

S.NO.	DRAWING TITLE	DRAWING NUMBER

NOTES :-

1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVEL ARE IN METERS.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.
3. REINFORCING BAR SHALL BE HIGH STRENGTH DEFORMED BARS OF GRADE Fe 500 CONFORMING TO IS:1786-2008.
4. THE CEMENT USED SHALL BE ORDINARY PORTLAND CEMENT (OPC) GRADE 43 OR 53 CONFORMING TO IS: 8112 AND IS: 12269.
5. ALL DIM TO BE CHECKED AND CORRELATED WITH SUPPLIER DRG. BEFORE EXECUTION.

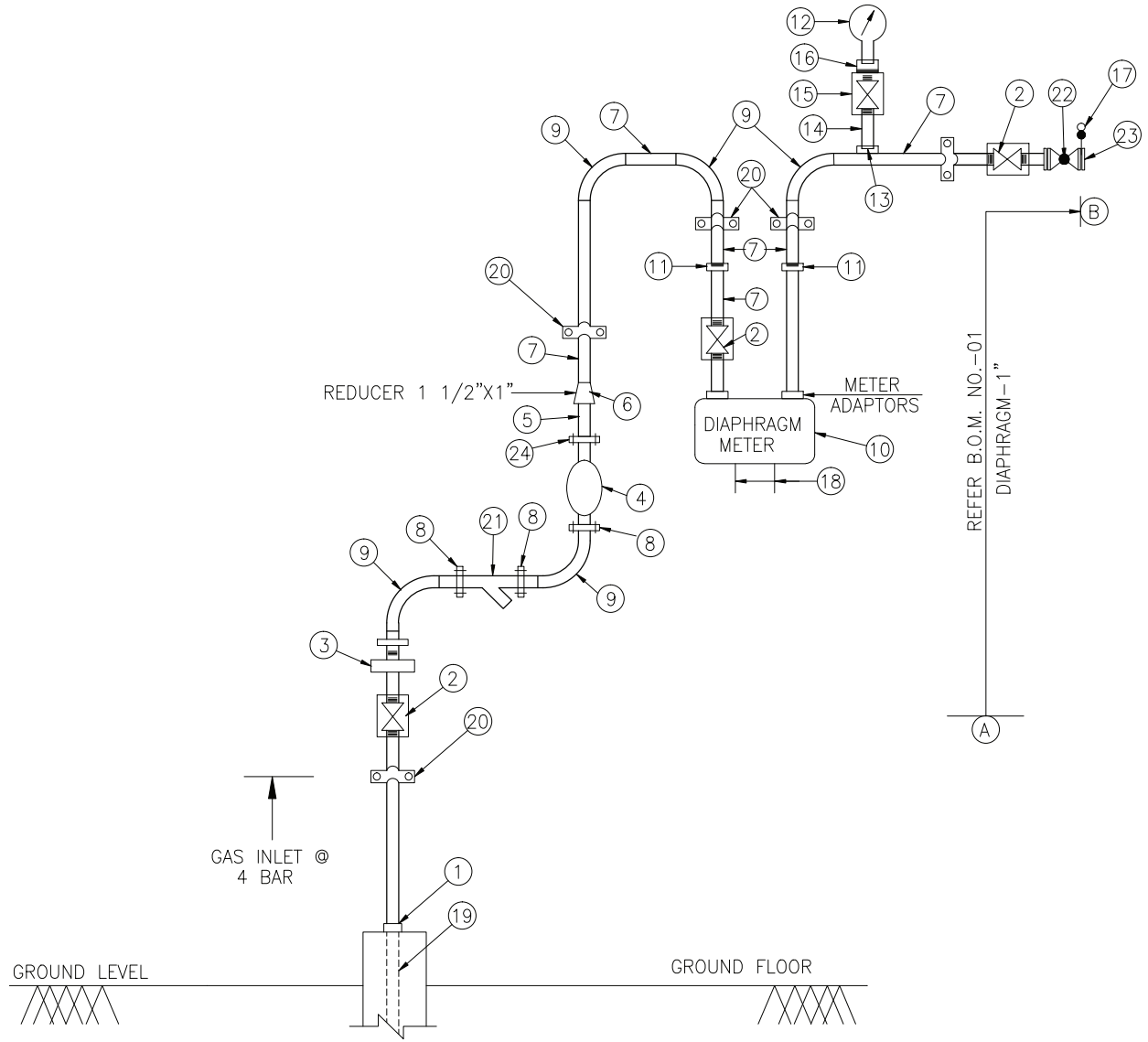
CLIENT: **INDRAPRASTHA GAS LIMITED**

PMC: **M/s. VCS QUALITY SERVICES PVT. LTD.**
B-10, II nd FLOOR, BAJAJ BHAWAN,
SECTOR-03, NOIDA - 201301

PROJECT: **PNG PROJECT DELHI**

TITLE: CRASH GUARD
FOR PROTECTION OF WALL MOUNTED MRS CAGE.

SCALE:		TOTAL NO. OF SHTS: 1OF1	
SIZE	JOB NO.	DRAWING NUMBER	REV.
A3		15792-21-04-16	0



NOTES:-

1. CS PIPE SHALL CONFIRM TO ASTM A106 Gr B.
2. CS FITTINGS SHALL CONFIRM TO ASTM A105.
3. NPT THREADS SHALL CONFIRM TO ANSI B1.20.1
4. WELDING OF PIPES & FITTINGS SHALL BE CARRIED OUT AS PER API 1104.
5. ALL MATERIALS EXCEPT BELOW MENTIONED IS IN CONTRACTOR' SCOPE.
6. ANY ADDITIONAL ITEM REQUIRED FOR COMPLETION OF WORK SHALL BE CONTRACTOR'S RESPONSIBILITY WITHOUT ANY COST/TIME IMPLICATION
7. ANY ADDITIONAL SUPPORT/CLAMPS REQUIRED AT THE TIME OF INSTALLATION OF MRS SKID SHALL BE CONTRACTOR'S RESPONSIBILITY.
8. GIVEN BOM IS INDICATIVE ONLY. INDICATIVE ITEM MAY VERY DURING ACTUAL CONSTRUCTION ON SITE.
9. APART FROM FREE ISSUE MATERIAL BALANCE MATERIAL SHALL BE SUPPLIED BY CONTRACTOR.
10. CONTRACTOR TO ENSURE PROVISION FOR LOCKING/SEALING ARRANGEMENT FOR METERS/VALVE TO AVOID MISUSE.
11. IN CASE OF SPACE CONSTRAINT, FLANGE END Y-TYPE STRAINER MAY BE INSTALLED VERTICALLY.

MATERIAL SUPPLIED BY IGL

1. METER
2. REGULATOR

1. DESIGN MAY BE CUSTOMIZED/ MODIFIED AS PER AVAILABLE SPACE AT SITE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
A	14.07.2018	ISSUED FOR APPROVAL	DK	MD	AD

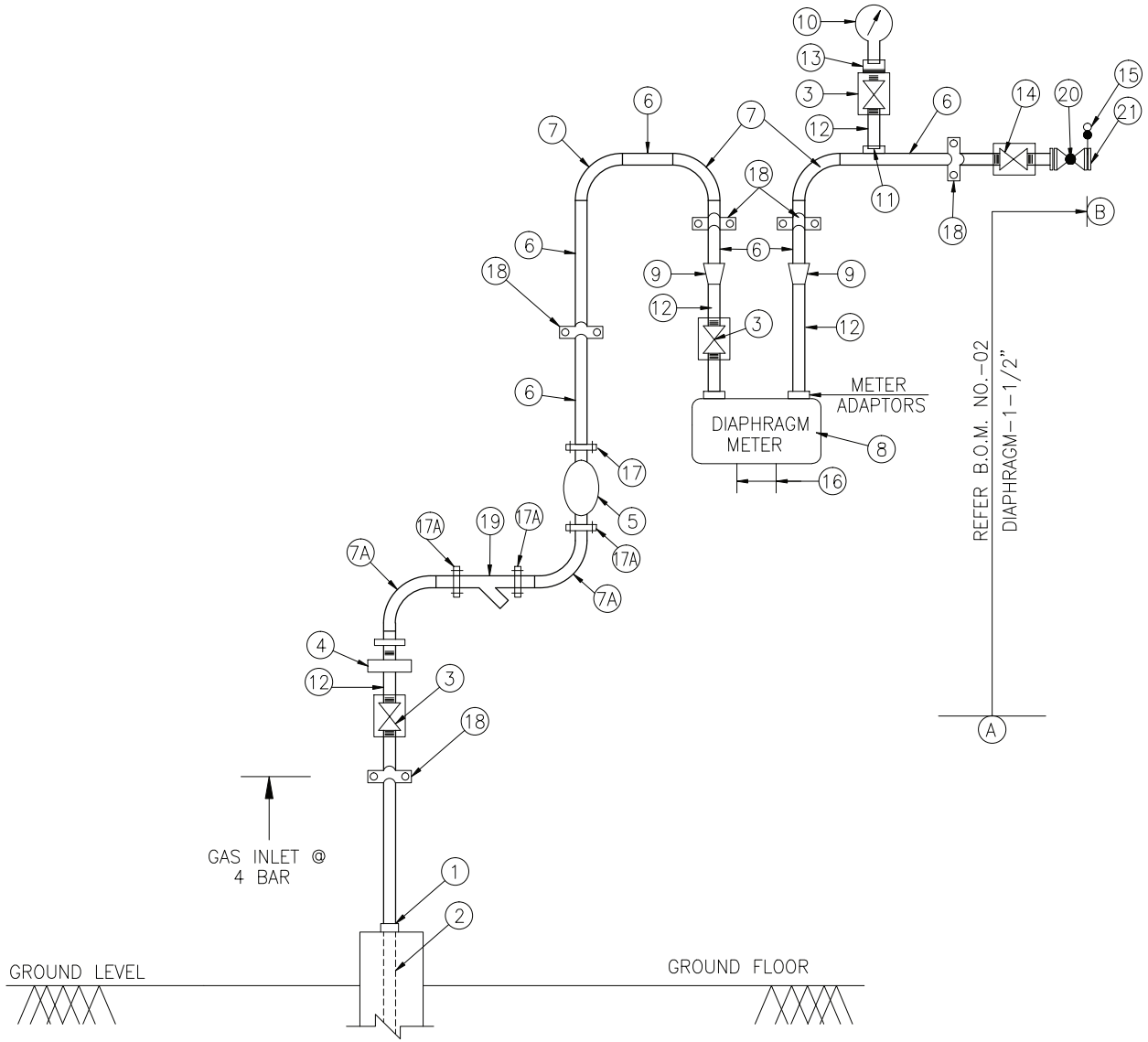
CLIENT: INDRAPRASTHA GAS LIMITED (IGL) NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: INSTALLATION OF INDUSTRIAL & COMMERCIAL CONNECTION IN NCT OF DELHI & NCR

TITLE: SCHEMATIC DIAGRAM METERING & REGULATING STATION

SIZE	SCALE	DRAWING NUMBER	SHEET	REV.
A3	NTS	15792-30-05-21	1 OF 1	A



NOTES:-

1. CS PIPE SHALL CONFIRM TO ASTM A106 Gr B.
2. CS FITTINGS SHALL CONFIRM TO ASTM A105.
3. NPT THREADS SHALL CONFIRM TO ANSI B1.20.1
4. WELDING OF PIPES & FITTINGS SHALL BE CARRIED OUT AS PER API 1104.
5. ALL MATERIALS EXCEPT BELOW MENTIONED IS IN CONTRACTOR' SCOPE.
6. ANY ADDITIONAL ITEM REQUIRED FOR COMPLETION OF WORK SHALL BE CONTRACTOR'S RESPONSIBILITY WITHOUT ANY COST/TIME IMPLICATION
7. ANY ADDITIONAL SUPPORT/CLAMPS REQUIRED AT THE TIME OF INSTALLATION OF MRS SKID SHALL BE CONTRACTOR'S RESPONSIBILITY.
8. GIVEN BOM IS INDICATIVE ONLY. INDICATIVE ITEM MAY VERY DURING ACTUAL CONSTRUCTION ON SITE.
9. APART FROM FREE ISSUE MATERIAL BALANCE MATERIAL SHALL BE SUPPLIED BY CONTRACTOR.
10. CONTRACTOR TO ENSURE PROVISION FOR LOCKING/SEALING ARRANGEMENT FOR METERS/VALVE TO AVOID MISUSE.
11. IN CASE OF SPACE CONSTRAINT, FLANGE END Y-TYPE STRAINER MAY BE INSTALLED VERTICALLY.

MATERIAL SUPPLIED BY IGL

1. METER
2. REGULATOR

1. DESIGN MAY BE CUSTOMIZED/ MODIFIED AS PER AVAILABLE SPACE AT SITE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
A	14.07.2018	ISSUED FOR APPROVAL	DK	MD	AD

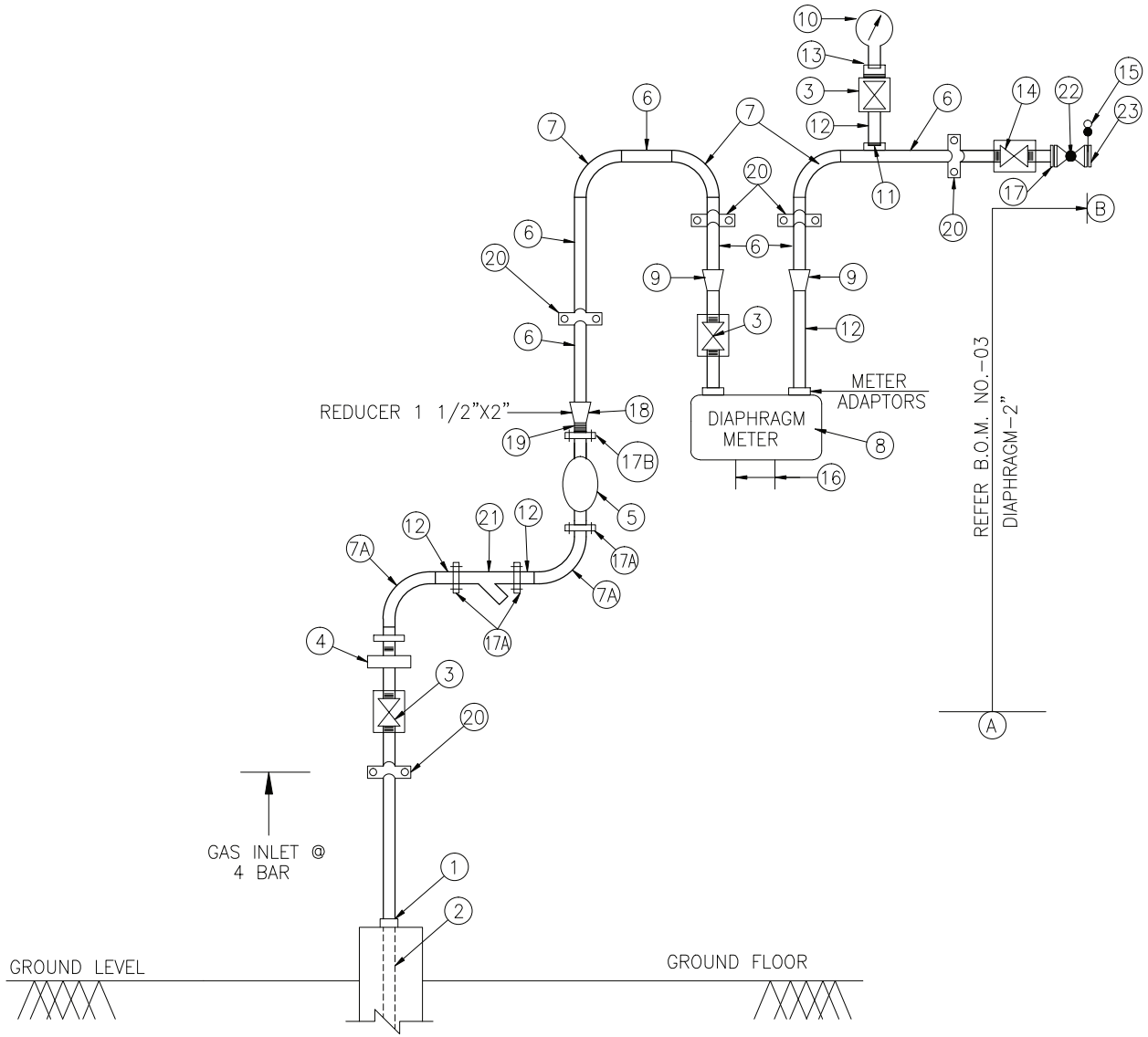
CLIENT: INDRAPRASTHA GAS LIMITED (IGL)
NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: INSTALLATION OF INDUSTRIAL & COMMERCIAL CONNECTION IN NCT OF DELHI & NCR

TITLE: SCHEMATIC DIAGRAM
METERING & REGULATING STATION

SIZE	SCALE	DRAWING NUMBER	SHEET	REV.
A3	NTS	15792-30-05-22	1 OF 1	A



NOTES:-

1. CS PIPE SHALL CONFIRM TO ASTM A106 Gr B.
2. CS FITTINGS SHALL CONFIRM TO ASTM A105.
3. NPT THREADS SHALL CONFIRM TO ANSI B1.20.1
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11. IN CASE OF SPACE CONSTRAINT, FLANGE END Y-TYPE STRAINER MAY BE INSTALLED VERTICALLY.

MATERIAL SUPPLIED BY IGL

1. METER
2. REGULATOR
3. ISOLATION VALVE

1. DESIGN MAY BE CUSTOMIZED/ MODIFIED AS PER AVAILABLE SPACE AT SITE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
A	14.07.2018	ISSUED FOR APPROVAL	DK	MD	AD

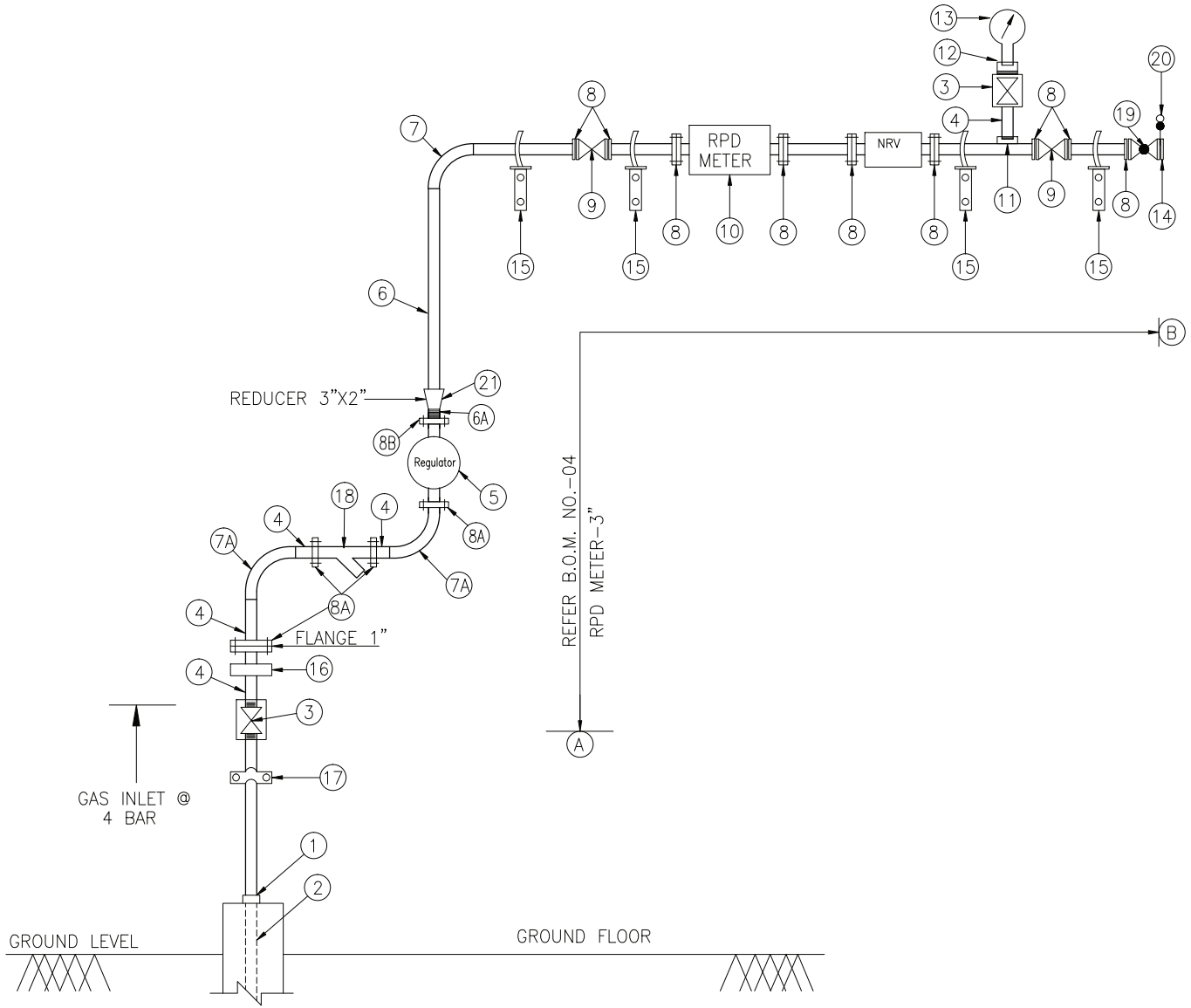
CLIENT: INDRAPRASTHA GAS LIMITED (IGL) NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: INSTALLATION OF INDUSTRIAL & COMMERCIAL CONNECTION IN NCT OF DELHI & NCR

TITLE: SCHEMATIC DIAGRAM METERING & REGULATING STATION

SIZE	SCALE	DRAWING NUMBER	SHEET	REV.
A3	NTS	15792-30-05-23	1 OF 1	A



NOTES:-

1. CS PIPE SHALL CONFIRM TO ASTM A106 Gr B.
2. CS FITTINGS SHALL CONFIRM TO ASTM A105.
3. NPT THREADS SHALL CONFIRM TO ANSI B1.20.1
4. WELDING OF PIPES & FITTINGS SHALL BE CARRIED OUT AS PER API 1104.
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11. IN CASE OF SPACE CONSTRAINT, FLANGE END Y-TYPE STRAINER MAY BE INSTALLED VERTICALLY.

MATERIAL SUPPLIED BY IGL

1. METER
2. REGULATOR

1. DESIGN MAY BE CUSTOMIZED/ MODIFIED AS PER AVAILABLE SPACE AT SITE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
A	14.07.2018	ISSUED FOR APPROVAL	DK	MD	AD

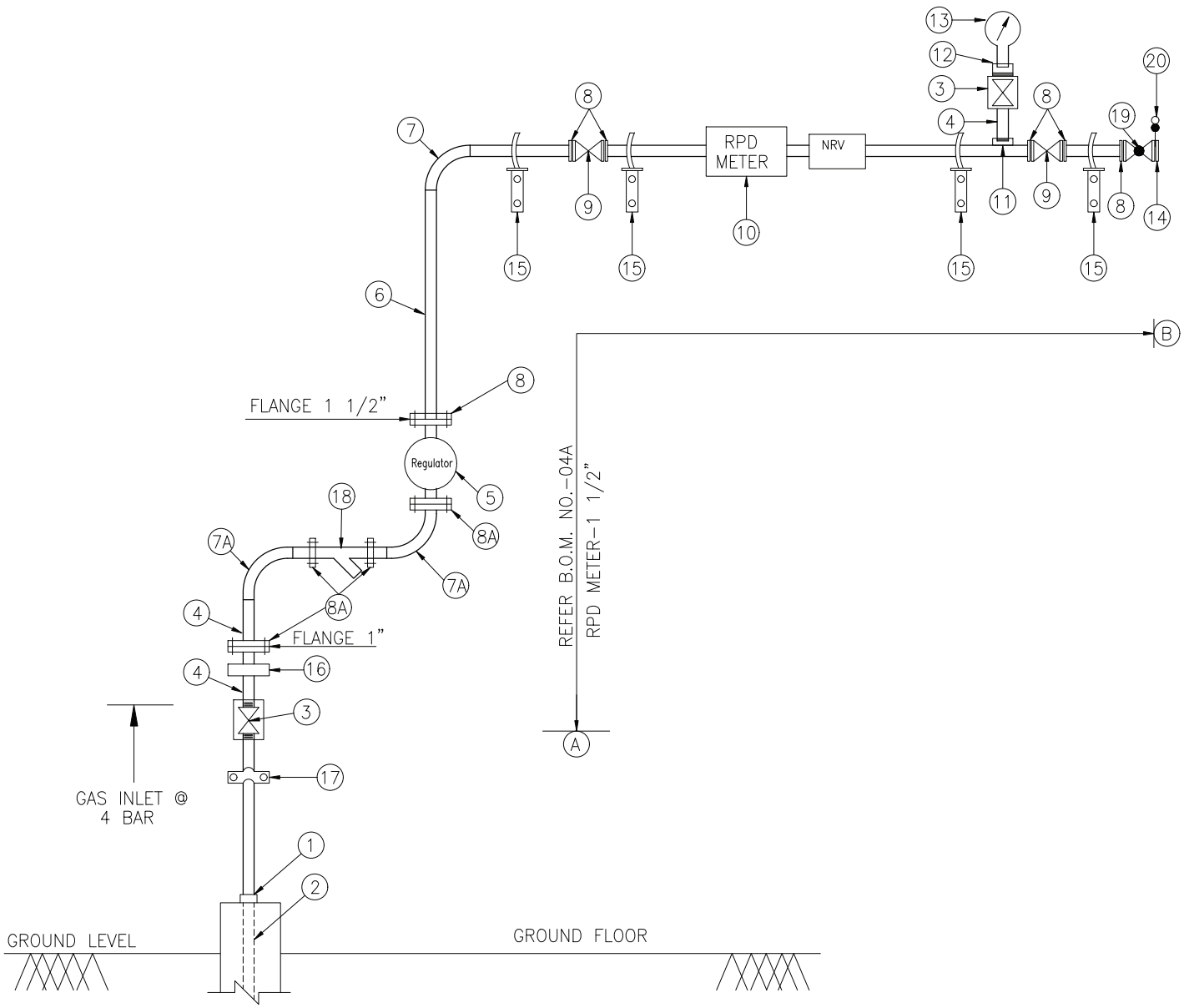
CLIENT: INDRAPRASTHA GAS LIMITED (IGL) NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: INSTALLATION OF INDUSTRIAL & COMMERCIAL CONNECTION IN NCT OF DELHI & NCR

TITLE: SCHEMATIC DIAGRAM METERING & REGULATING STATION

SIZE	SCALE	DRAWING NUMBER	SHEET	REV.
A3	NTS	15792-30-05-24	1 OF 1	A



NOTES:-

1. CS PIPE SHALL CONFIRM TO ASTM A106 Gr B.
2. CS FITTINGS SHALL CONFIRM TO ASTM A105.
3. NPT THREADS SHALL CONFIRM TO ANSI B1.20.1
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11. IN CASE OF SPACE CONSTRAINT, FLANGE END Y-TYPE STRAINER MAY BE INSTALLED VERTICALLY.

MATERIAL SUPPLIED BY IGL

1. METER
2. REGULATOR

1. DESIGN MAY BE CUSTOMIZED/ MODIFIED AS PER AVAILABLE SPACE AT SITE.

REV	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
A	01.08.2018	ISSUED FOR APPROVAL	DK	MD	AD

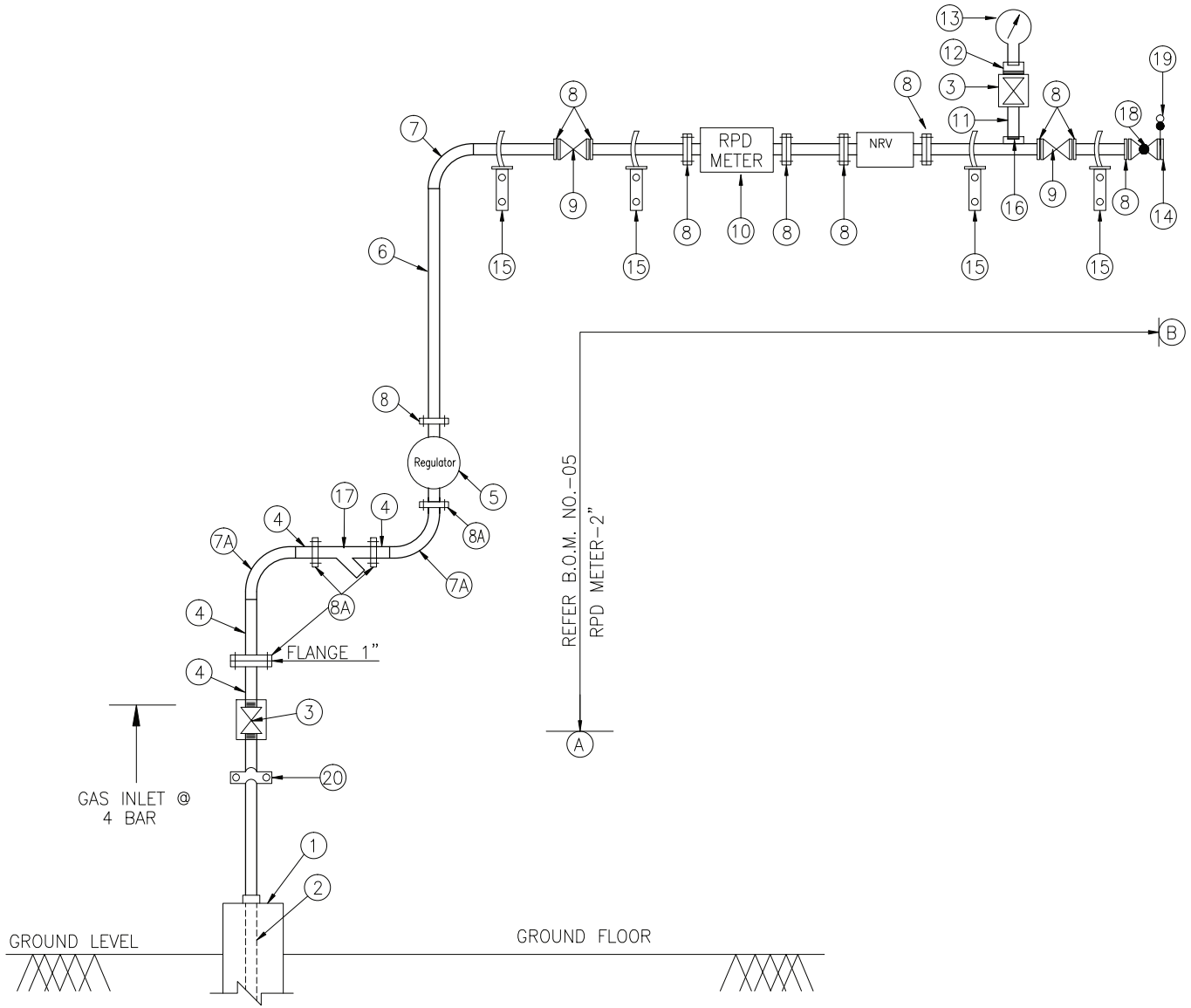
CLIENT: INDRAPRASTHA GAS LIMITED (IGL) NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: INSTALLATION OF INDUSTRIAL & COMMERCIAL CONNECTION IN NCT OF DELHI & NCR

TITLE: SCHEMATIC DIAGRAM METERING & REGULATING STATION

SIZE	SCALE	DRAWING NUMBER	SHEET	REV.
A3	NTS	15792 -30-05-24A	1 OF 1	A



NOTES:-

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2. CS FITTINGS SHALL CONFIRM TO ASTM A105.
3. NPT THREADS SHALL CONFIRM TO ANSI B1.20.1
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MATERIAL SUPPLIED BY IGL

1. METER
2. REGULATOR

1. DESIGN MAY BE CUSTOMIZED/ MODIFIED AS PER AVAILABLE SPACE AT SITE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
A	14.07.2018	ISSUED FOR APPROVAL	DK	MD	AD

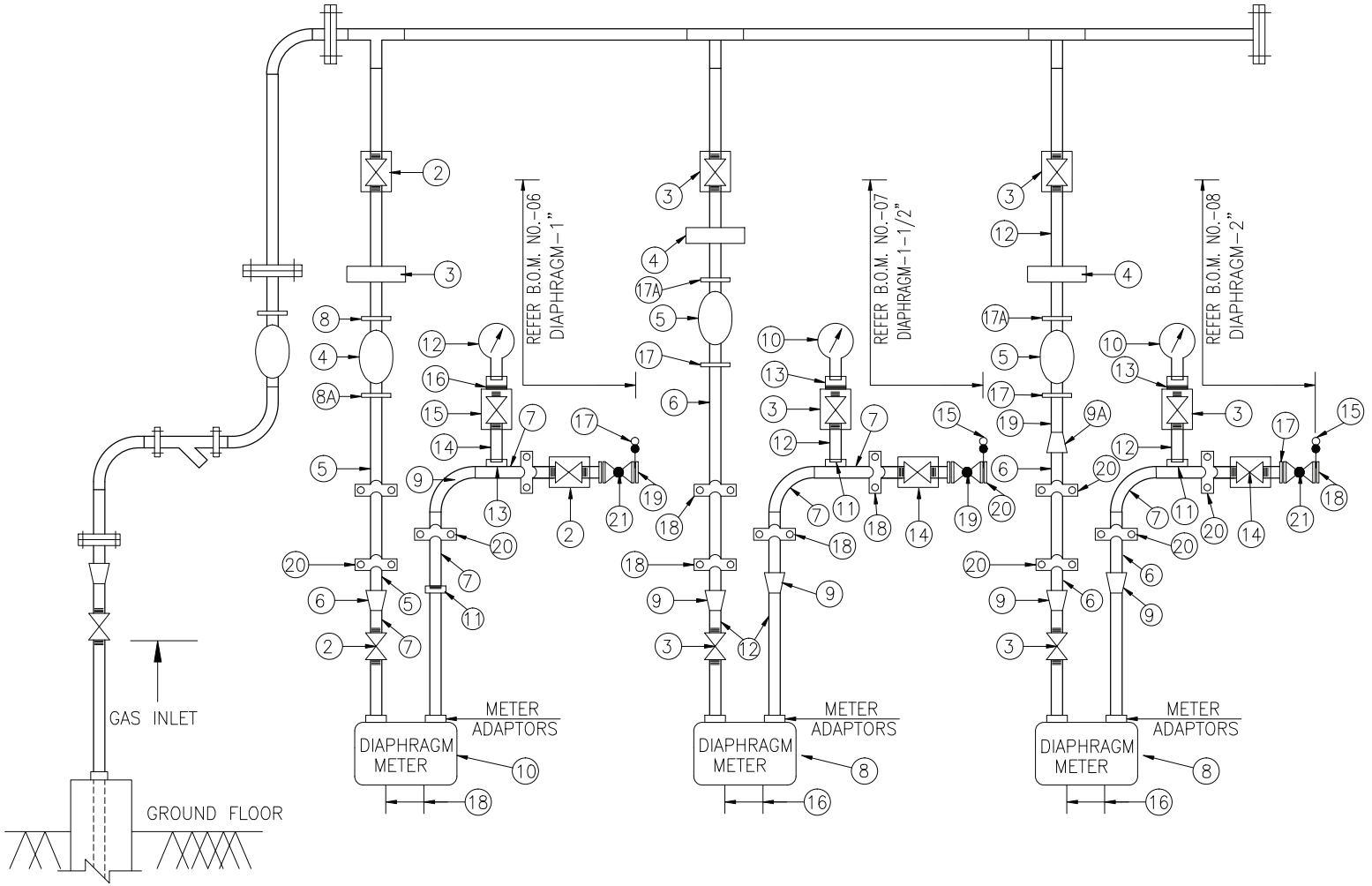
CLIENT: INDRAPRASTHA GAS LIMITED (IGL) NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: INSTALLATION OF INDUSTRIAL & COMMERCIAL CONNECTION IN NCT OF DELHI & NCR

TITLE: SCHEMATIC DIAGRAM METERING & REGULATING STATION

SIZE	SCALE	DRAWING NUMBER	SHEET	REV.
A3	NTS	15792-30-05-25	1 OF 1	A



NOTES:-

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MATERIAL SUPPLIED BY IGL

1. METER
2. REGULATOR

1. DESIGN MAY BE CUSTOMIZED/ MODIFIED AS PER AVAILABLE SPACE AT SITE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
A	14.07.2018	ISSUED FOR APPROVAL	DK	MD	AD

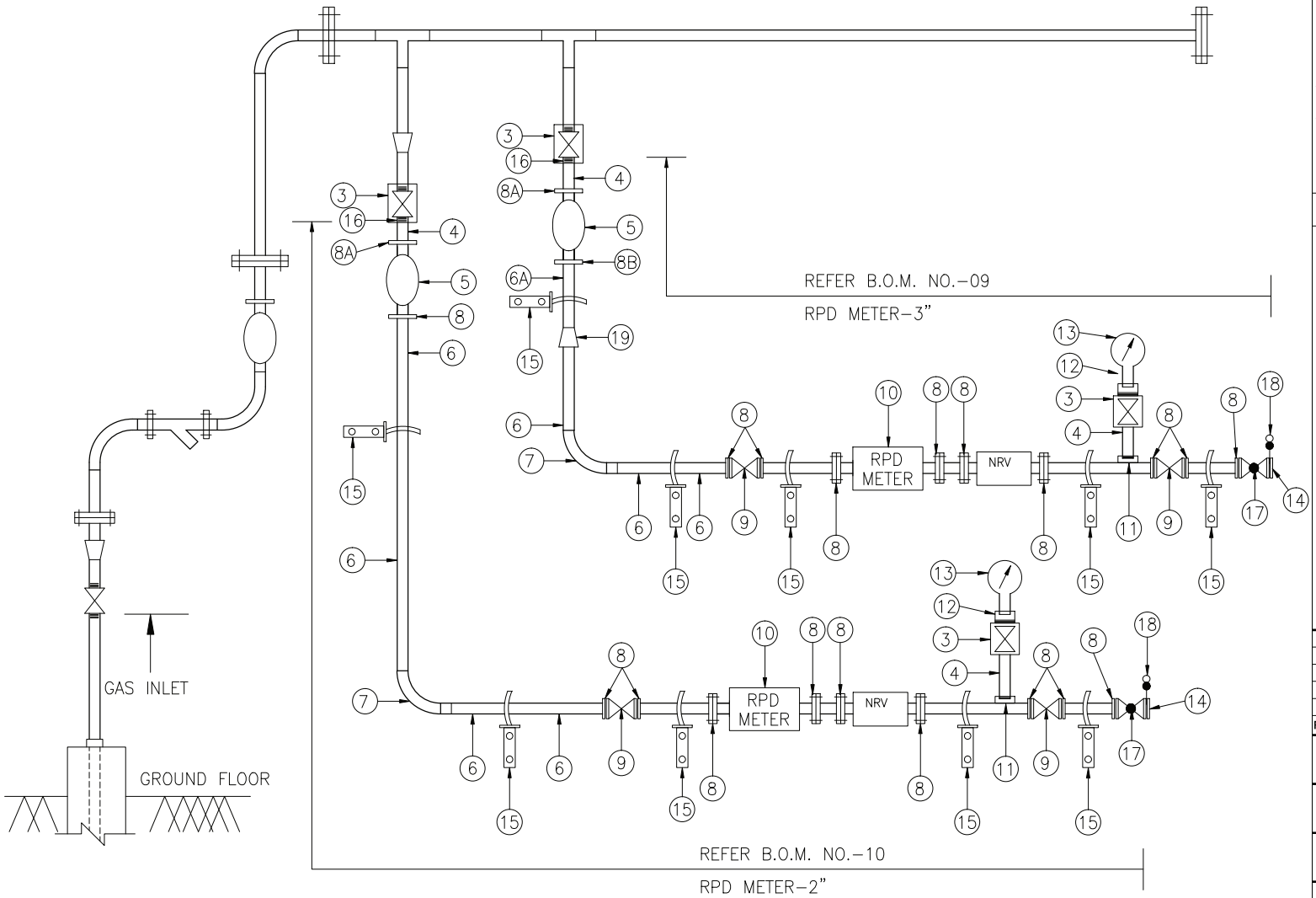
CLIENT: INDRAPRASTHA GAS LIMITED (IGL) NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: INSTALLATION OF INDUSTRIAL & COMMERCIAL CONNECTION IN NCT OF DELHI & NCR

TITLE: SCHEMATIC DIAGRAM METERING & REGULATING STATION

SIZE	SCALE	DRAWING NUMBER	SHEET	REV.
A3	NTS	15792-30-05-26	1 OF 1	A



NOTES:-

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MATERIAL SUPPLIED BY IGL

1. METER
2. REGULATOR

1. DESIGN MAY BE CUSTOMIZED/ MODIFIED AS PER AVAILABLE SPACE AT SITE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
A	14.07.2018	ISSUED FOR APPROVAL	DK	MD	AD

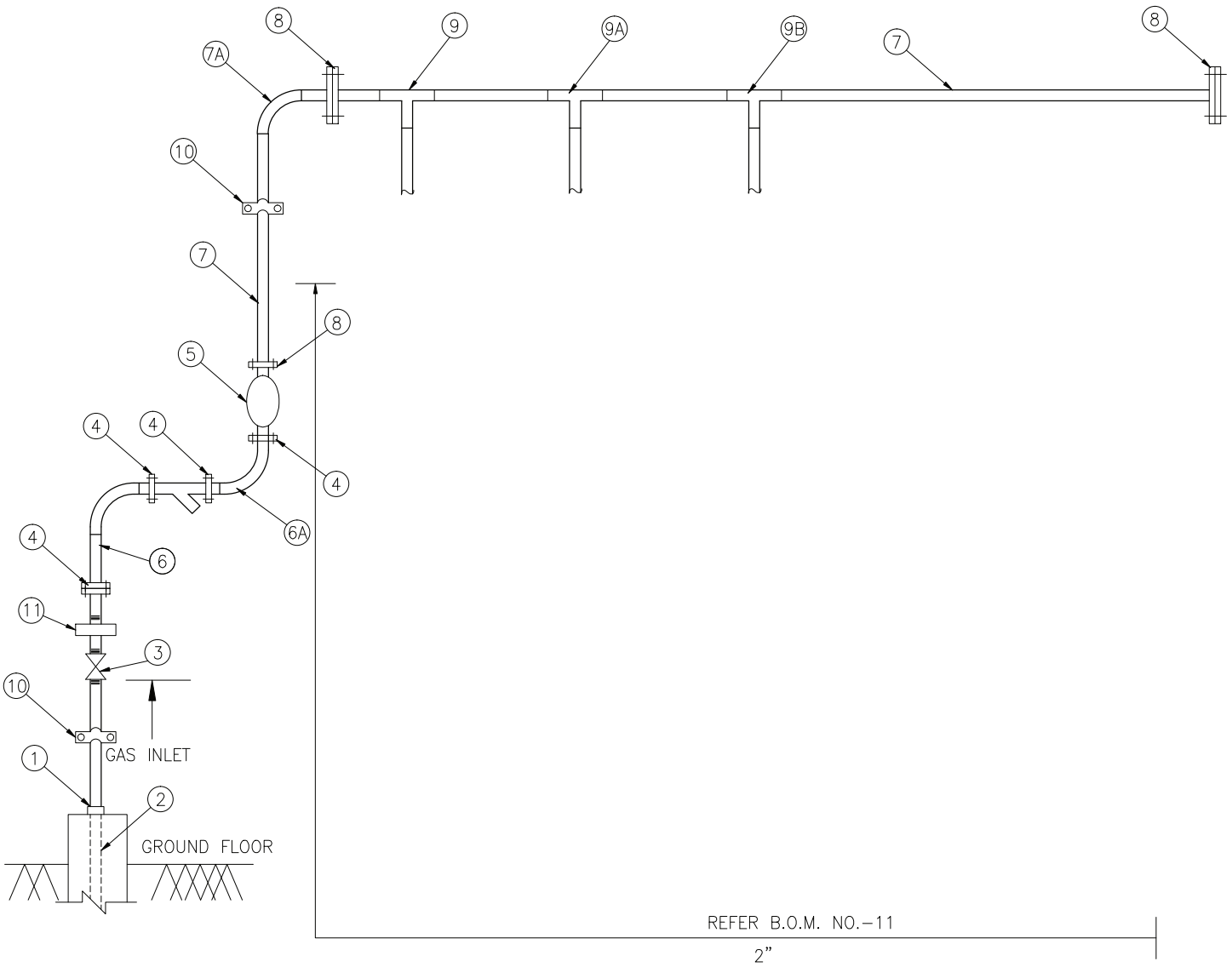
CLIENT: INDRAPRASTHA GAS LIMITED (IGL)
NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: INSTALLATION OF INDUSTRIAL & COMMERCIAL CONNECTION IN NCT OF DELHI & NCR

TITLE: SCHEMATIC DIAGRAM
METERING & REGULATING STATION

SIZE	SCALE	DRAWING NUMBER	SHEET	REV.
A3	NTS	15792 -30-05-27	1 OF 1	A



NOTES:-

1. CS PIPE SHALL CONFIRM TO ASTM A106 Gr B.
2. CS FITTINGS SHALL CONFIRM TO ASTM A105.
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MATERIAL SUPPLIED BY IGL

1. METER
2. REGULATOR

1. DESIGN MAY BE CUSTOMIZED/ MODIFIED AS PER AVAILABLE SPACE AT SITE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
A	17.07.2018	ISSUED FOR APPROVAL	DK	MD	AD

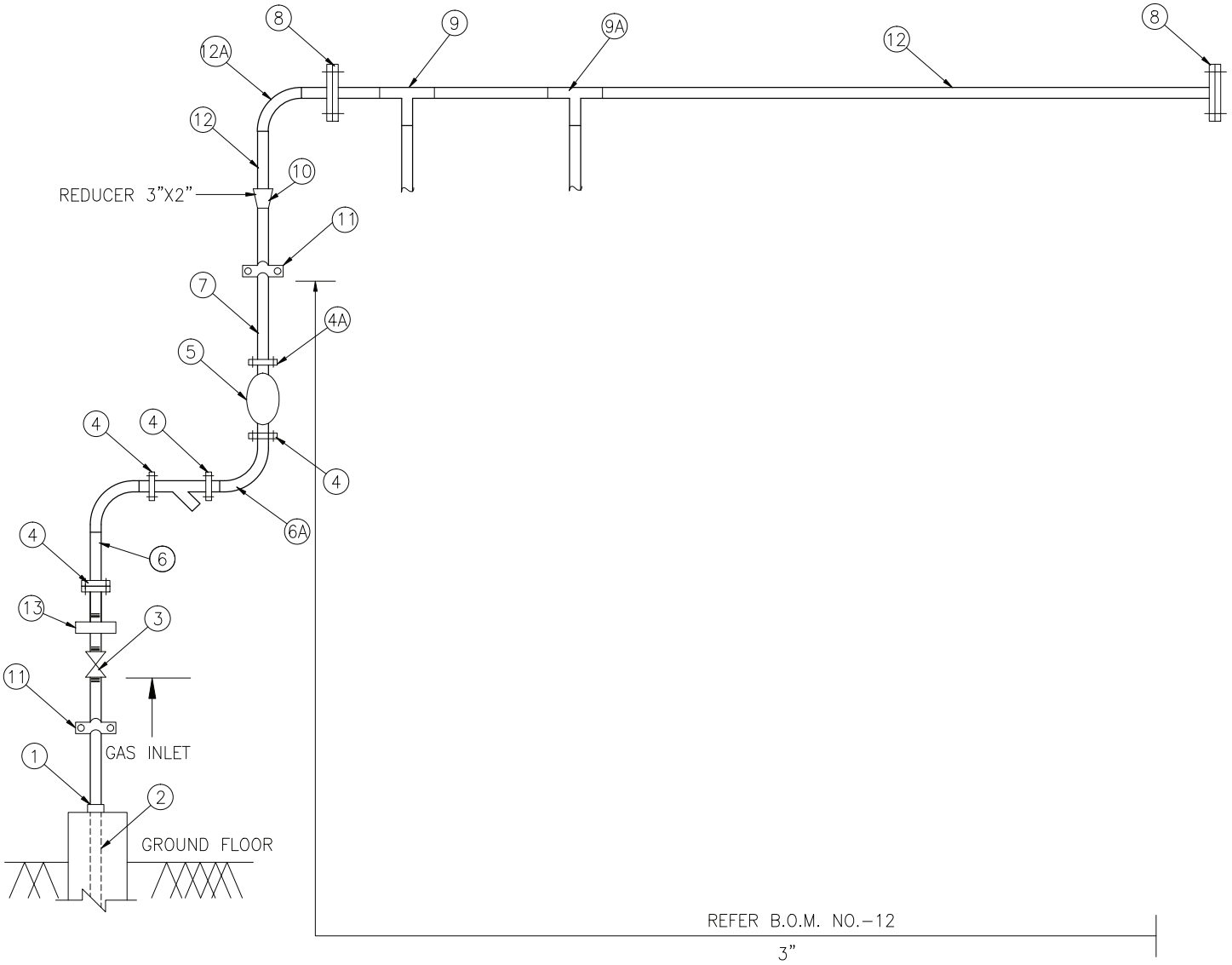
CLIENT: INDRAPRASTHA GAS LIMITED (IGL) NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: INSTALLATION OF INDUSTRIAL & COMMERCIAL CONNECTION IN NCT OF DELHI & NCR

TITLE: SCHEMATIC DIAGRAM METERING & REGULATING STATION

SIZE	SCALE	DRAWING NUMBER	SHEET	REV.
A3	NTS	15792 -30-05-28	1 OF 1	A



NOTES:-

1. CS PIPE SHALL CONFIRM TO ASTM A106 Gr B.
2. CS FITTINGS SHALL CONFIRM TO ASTM A105.
3. NPT THREADS SHALL CONFIRM TO ANSI B1.20.1
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MATERIAL SUPPLIED BY IGL

1. METER
2. REGULATOR

1. DESIGN MAY BE CUSTOMIZED/ MODIFIED AS PER AVAILABLE SPACE AT SITE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
A	17.07.2018	ISSUED FOR APPROVAL	DK	MD	AD

CLIENT: INDRAPRASTHA GAS LIMITED (IGL) NEW DELHI

PMC: M/s. VCS QUALITY SERVICES PVT. LTD.

PROJECT: INSTALLATION OF INDUSTRIAL & COMMERCIAL CONNECTION IN NCT OF DELHI & NCR

TITLE: SCHEMATIC DIAGRAM METERING & REGULATING STATION

SIZE	SCALE	DRAWING NUMBER	SHEET	REV.
A3	NTS	15792 -30-05-29	1 OF 1	A

BILL OF MATERIAL

FABRICATION OF DIFFERENT TYPES OF MRS

BOM No-01 MRS- Ref Drawing No.15792-30-05-21-Diaphragm 1"

S.no	Item Description	Size	Quantity	Procurement Scope	Length of fittings			
					1/2"	1"	1-1/2"	2"
1	TF	32mmx1"	1	IGL				
2	Brass Isolation Valve	1"(F)x1"(F)	3			225		
3	CS Hex Nipple /Pipe	1"(M)x1"(M)	1			150		
4	Regulator	Inlet 1" Outlet 1-1/2"	1	IGL		400		
5	CS Pipe	1-1/2"(Threaded on one end	1			150		
6	CS Reducer	1-1/2"x1"	1				100	
7	CS Pipe	1"	7			2100		
8	CS WNRF Flange	1"	4			325		
9	CS Elbow	1"	5			500		
10	Diaphragam Meter G-4,6,10,16,25		1	IGL		300		
11	CS Socket	1"(F)x1"(F)	2			150		
12	Pressure Gauge Dail 4" (range 0-1 Bar)	4"	1					
13	CS Socket	1/2"	1		25			
14	CS Hex Nipple Pipe	1/2"(M)x1/2"(M)	1		150			
15	Isolation Valve	1/2"NPT(F)End	1		50			
16	CS Reducing Bush	1/2"(M)x1/2"(F)	1			25		
17	Spectacle Blind	1"	1					
18	Angel Clamps		2					
19	GI Sleeve	1-1/2" x1FT	1					
20	MS Clamps		5					
21	Y - Type Strainer		1			127		
22	Globe Valve	1"NPT(F)End	1			127		
23	CS Blind Flange	1"	1					
24	CS WNRF Flange	1-1/2"	1					
	Total Supply Part				225	4579	100	0

BILL OF MATERIAL

BOM No-02 MRS- Ref Drawing No.15792-30-05-22-Diaphragm 1"-1/2"

S.no	Item Description	Size	Quantity	Procurement Scope	Length of fittings			
					1/2"	1"	1-1/2"	2"
1	TF	32mmx1"	1	IGL				
2	GI Sleeve	1-1/2"X1ft	1					
3	Brass Isolation Valve	1"(F)x1"(F)	3			225		
4	CS Hex Nipple /Pipe	1"(M)x1"(M)	1			150		
5	Regulator	Inlet 1" Outlet 1-1/2"	1	IGL		400		
6	CS Pipe	1-1/2"	7				2100	
7	CS Elbow	1-1/2"	3			200		
7A	CS Elbow	1"	2					
8	Diaphragam Meter G 4,6,10,16,25		1	IGL		300		
9	CS Reducing Socket/Socket	1-1/2"(F)x1"(F)	2				150	
10	Pressure Gauge Dail 4" (range 0-1 Bar)	4"	1					
11	CS Socket	1"	1			25		
12	CS Pipe	1"(M)	6			900		
13	CS Reducing Bush	1"(M)x1/2"(F)	1			25		
14	Isolation Valve	1-1/2"	1				150	
15	Spectacle Blind	1-1/2"	1				100	
16	Angel Clamps		2					
17	CS Flange	1-1/2"	3				325	
17A	CS Flange	1"	2			108		
18	MS Clamps		5					
19	Y-Type strainer		1				165	
20	Globe Valve	1-1/2"NPT(F)End	1				165	
21	CS Blind Flange	1-1/2" NPT(F) End	1				127	
	Total Supply Part				0	2333	3282	0

BILL OF MATERIAL

BOM No-03 MRS- Ref Drawing No.15792-30-05-23-Diaphragm 2"								
					Length of fittings			
S.no	Item Description	Size	Quantity	Procurement Scope	1/2"	1"	1-1/2"	2"
1	TF	32mmx1"	1	IGL				
2	GI Sleeve	1-1/2"X1ft	1					
3	Brass Isolation Valve	1"(F)x1"(F)	3			225		
4	CS Hex Nipple /Pipe	1"(M)x1"(M)	1			150		
5	Regulator	Inlet 1" Outlet 1-1/2"	1	IGL			400	
6	CS Pipe	2"	7					2100
7	CS Elbow	2"	3					300
7A	CS Elbow	1"	2			200		
8	Diaphragam Meter G 4,6,10,16,25		1	IGL		300		
9	CS Reducing Socket/Socket	2"(F)x1"(F)	2					150
10	Pressure Gauge Dail 4" (range 0-1 Bar)	4"	1					
11	CS Socket	1"	1			25		
12	CS Pipe	1"(M)	6			900		
13	CS Reducing Bush	1"(M)x1/2"(F)	1			25		
14	Isolation Valve	2"	1					200
15	Spectacle Blind	2"	1					120
16	Angel Clamps		2					
17	CS Flange	2"	1					152
17A	CS Flange	1"	3			324		
17B	CS Flange	1-1/2"	1				127	
18	Reducer	2" x 1-1/2"	1					
19	CS Pipe	1-1/2" (Thread on one End)	1				150	
20	MS Clamps		5					
21	Y-Type strainer		1					
22	Globe Valve	2"	1					203
23	CS Blind Flange	2"	1					152
	Total Supply Part				0	2149	677	3377

BILL OF MATERIAL

BOM No-04 MRS- Ref Drawing No.15792-30-05-24-RPD 3"								
					Length of fittings			
S.no	Item Description	Size	Quantity	Procurement Scope	1/2"	1"	3"	2"
1	TF	32mmx1"	1	IGL				
2	GI Sleeve	1-1/2"X1ft	1					
3	Brass Isolation Valve	1"(F)x1"(F)	2			150		
4	CS Pipe	1"(M)x1"(M)	4			300		
5	Regulator	Inlet 1" Outlet 2"	1	IGL			300	
6	CS Pipe	3"	6				1200	
6A	CS Pipe	2"	1					300
7	CS Elbow	3"	1				300	
7A	CS Elbow	1"	2					
8	CS WNRF FLANGE	3"	9				1719	
8A	CS WNRF FLANGE	1"	5			540		
8B	CS WNRF FLANGE	2"	1					152
9	CS Ball Valve	3"	2				356	
10	RPD Meter & NRV Assembly	3"	1	IGL			800	
11	Socolet	1"	1			25		
12	CS Reducing Bush	1"(M)x1/2"(F)	1			25		
13	Pressure Gauge Dial 4" (Range 0-4 bar)	4"	1					
14	CS Blind Flange	3"	1				191	
15	Angel Clamps		4					
16	CS Hex Nipple /Pipe	1"(M)x1"(M)	1			75		
17	MS Clamps		1					
18	Y-Type strainer		1					
19	Globe Valve	3"	1				241	
20	Spectacle Blind	3"	1				165	
21	Reducer	2 x 3"	1				150	
	Total Supply Part				0	1115	5422	452

BILL OF MATERIAL

BOM No-05 MRS- Ref Drawing No.15792-30-05-25- RPD 2"								
					Length of fittings			
S.no	Item Description	Size	Quantity	Procurement Scope	1/2"	1"	1-1/2"	2"
1	TF	32mmx1"	1	IGL				
2	GI Sleeve	1-1/2" x1FT	1					
3	Brass Isolation Valve	1"(F)x1"(F)	2			150		
4	CS Pipe	1"	3			300		
5	Regulator	Inlet 1" Outlet 2"	1	IGL				400
6	CS Pipe	2"	6					900
7	CS Elbow	2"	1					300
7A	CS Elbow	1"	2					
8	CS WNRF Flange	2"	10					1520
8A	CS WNRF Flange	1"	5					540
9	CS Ball valve	2"	2					584
10	RPD Meter & NRV Assembly	2"	1	IGL				800
11	CS Hex Nipple /Pipe	1"(M)x1"(M)	1			75		
12	CS Reducing Bush	1/2"(M)x1/2"(F)	1			25		
13	Pressure Gauge Dail 4" (range 0-4 Bar)	4"	1					
14	CS Blind Flange	2"	1					152
15	Angel Clamps		4					
16	Socolet	1"	1			25		
17	Y - Type Strainer		1					219
18	Globe Valve	2"	1					203
19	Spectacle Blind	2"	1					120
20	MS Clamps	2"	1					
	Total Supply Part				0	575	0	5738

BILL OF MATERIAL

BOM No-06 ONLY FOR MRS- REF Drawing No.15792-30-05-26-Diaphragm 1"								
					Length of fittings			
S.no	Item Description	Size	Quantity	Procurement Scope	1/2"	1"	1-1/2"	2"
1	D	D	D	D				
2	Brass Isolation Valve	1"(F)x1"(F)	3			150		
3	CS Hex Nipple /Pipe	1"(M)x1"(M)	1			150		
4	Regulator	Inlet 1" Outlet 1-1/2"	1	IGL		400		
5	CS Pipe	1-1/2"	1			150		
6	CS Reducer	1-1/2"x1"	1				64	
7	CS Pipe (Threaded)	1"	6			1800		
8	CS WNRF Flange	1"	2				216	
8A	CS WNRF Flange	1-1/2"	1				127	
9	CS Elbow	1"	1			500		
10	Diaphragam Meter G 1.6, 2.5		1	IGL		300		
11	CS Socket	1"(F)x1"(F)	2			150		
12	Pressure Gauge Dail 4" (range 0-1 Bar)	4"	1					
13	CS Socket	1/2"	1		25			
14	CS Hex Nipple Pipe	1/2"(M)x1/2"(M)	1		150			
15	Isolation Valve	1/2"NPT(F)End	1		50			
16	CS Reducing Bush	1"(M)x1/2"(F)	1			25		
17	Spectacle Blind	1"	1			80		
18	Angel Clamps		3					
19	CS Blind Flange	1"	1			108		
20	MS Clamps		1					
21	Globe Valve	1"NPT(F)End	1			127		
	Total Supply Part				225	3940	407	0

BILL OF MATERIAL

BOM No-07 MRS- Ref Drawing No.15792-30-05-26-Diaphragm 1-1/2"								
					Length of fittings			
S.no	Item Description	Size	Quantity	Procurement Scope	1/2"	1"	1-1/2"	2"
1	D	D	D	D				
1	D	D	D	D				
3	Brass Isolation Valve	1"(F)x1"(F)	2			150		
4	CS Hex Nipple /Pipe	1"(M)x1"(M)	1			150		
5	Regulator	Inlet 1" Outlet 1-1/2"	1	IGL		400		
6	CS Pipe	1-1/2"	6				1800	
7	CS Elbow	1-1/2"	1				300	
8	Diaphragam Meter G 4,6,10,16,25		1	IGL		300		
9	CS Reducing Socket/Socket	1-1/2"(F)x1"(F)	2				150	
10	Pressure Gauge Dail 4" (range 0-1 Bar)	4"	1					
11	CS Socket	1"	1			25		
12	CS Pipe	1"(M)	3			450		
13	CS Reducing Bush	1"(M)x1/2"(F)	1			25		
14	Isolation Valve	2"	1				150	
15	Spectacle Blind	2"	1					120
16	Angle Clamps		3					
17	CS Flange	1-1/2"	2				254	
17A	CS Flange	1"	1			108		
18	MS Clamps		2					
19	Globe Valve	1"NPT(F)End	1				165	
20	CS Blind Flange	1-1/2"	1				127	
	Total Supply Part				0	1608	2946	120

BILL OF MATERIAL

BOM No-08 MRS- Ref Drawing No.15792-30-05-26-Diaphragm 2"								
					Length of fittings			
S.no	Item Description	Size	Quantity	Procurement Scope	1/2"	1"	1-1/2"	2"
1	D	D	D	D				
1	D	D	D	D				
3	Brass Isolation Valve	1"(F)x1"(F)	3			225		
4	CS Hex Nipple /Pipe	1"(M)x1"(M)	1			150		
5	Regulator	Inlet 1" Outlet 1-1/2"	1	IGL			400	
6	CS Pipe	2"	6					1800
7	CS Elbow	2"	1					300
8	Diaphragam Meter G 4,6,10,16,25		1	IGL		300		
9	CS Reducing Socket/Socket	2"(F)x1"(F)	2					150
9A	CS Reducing Socket/Socket	1-1/2"(F)x2"(F)	1				150	
10	Pressure Gauge Dail 4" (range 0-1 Bar)	4"	1					
11	CS Socket	1"	1			25		
12	CS Pipe	1"(M)	3			450		
13	CS Reducing Bush	1"(M)x1/2"(F)	1			25		
14	Isolation Valve	2"	1					200
15	Spectacle Blind	2"	1					120
16	Angel Clamps		3					
17	CS Flange	1-1/2"	2					252
17A	CS Flange	1"	1			108		
18	CS Blind Flange	2"	1					152
19	CS Pipe	1-1/2"	1				150	
20	MS Clamps		2					
21	Globe Valve	2"	1				203	
	Total Supply Part				0	1283	903	2974

BILL OF MATERIAL

BOM No-09 MRS- Ref Drawing No.15792-30-05-27-RPD 3"								
					Length of fittings			
S.no	Item Description	Size	Quantity	Procurement Scope	1/2"	1"	3"	2"
1	D	D	D	D				
1	D	D	D	D				
3	Brass Isolation Valve	1"(F)x1"(F)	2			150		
4	CS Pipe	1"(M)x1"(M)	2			200		
5	Regulator	Inlet 1" Outlet 2"	1	IGL				300
6	CS Pipe	3"	4				600	
6A	CS Pipe	2"	1					150
7	CS Elbow	3"	1				100	
8	CS WNRF FLANGE	3"	9				1728	
8A	CS WNRF FLANGE	1"	1			108		
8B	CS WNRF FLANGE	2"	1					152
9	CS Ball Valve	3"	2				712	
10	RPD Meter & NRV Assembly	3"	1	IGL			800	
11	Socolet	1"	1			25		
12	CS Reducing Bush	1"(M)x1/2"(F)	1		25			
13	Pressure Gauge Dial 4" (Range 0-4 bar)	4"	1					
14	CS Blind Flange	3"	1				191	
15	Angel Clamps		4					
16	CS Hex Nipple /Pipe	1"(M)x1"(M)	3			75		
17	Globe Valve	3"	1				241	
18	Spectacle Blind	3"	1				165	
19	Reducer	3" x 2"	1				150	
	Total Supply Part				0	558	4687	602

BILL OF MATERIAL

BOM No-10 MRS- Ref Drawing No.15792-30-05-27- RPD 2"								
S.no	Item Description	Size	Quantity	Procurement Scope	Length of fittings			
					1/2"	1"	1-1/2"	2"
1	D	D	D	D				
1	D	D	D	D				
3	Brass Isolation Valve	1"(F)x1"(F)	2			150		
4	CS Hex Nipple /Pipe	1"	2			200		
5	Regulator	Inlet 1" Outlet 2"	1	IGL				300
6	CS Pipe	2"	6					900
7	CS Elbow	2"	1					100
8	CS WNRF Flange	2"	8					1520
8A	CS WNRF FLANGE	1"	1					
9	CS Ball valve	2"	2					584
10	RPD Meter & NRV Assembly	2"	1	IGL				800
11	CS Hex Nipple /Pipe	1"(M)x1"(M)	1			75		
12	CS Reducing Bush	1/2"(M)x1/2"(F)	1		25			
13	Pressure Gauge Dail 4" (range 0-4 Bar)	4"	1					
14	CS Blind Flange	2"	1					152
15	Angel Clamps		4					
16	Socolet	1"	1			25		
17	Globe Valve	2"	1					203
18	Spectacle Blind	2"	1					120
	Total Supply Part				25	450	0	4679

BILL OF MATERIAL

BOM No-11 MRS- Ref Drawing No.15792-30-05-28-Diaphragm Meter-2"								
S.no	Item Description	Size	Quantity	Procurement Scope	Length of fittings			
					1/2"	1"	1-1/2"	2"
1	TF	32mmx1"	1	IGL				
1	GI Sleeves	1-1/2"X1ft	1					
3	Brass Isolation Valve	1"(F)x1"(F)	1			150		
4	CS WNRF FLANGE	1"	5					
5	Regulator	Inlet 1" / Outlet 2"	1	IGL				300
6	CS Pipe	1"	3			450		
6A	CS Elbow	1"	2			200		
7	CS Pipe	2"	3					450
7A	CS Elbow	2"	1					100
8	CS WNRF FLANGE	2"	5					750
9	Tee	2" X 1"	1					
9A	Tee	2" X 1-1/2"	1					
9B	Tee	2" X 2"	1					
10	MS Clamps		3					
11	CS Hex Nipple /Pipe	1"(M)x1"(M)	1					
	Total Supply Part				0	800	0	1600

BILL OF MATERIAL

BOM No-12 MRS- Ref Drawing No.15792-30-05-29-RPD Meter-3"								
S.no	Item Description	Size	Quantity	Procurement Scope	Length of fittings			
					1"	1-1/2"	2"	3"
1	TF	32mmx1"	1	IGL				
2	GI Sleeves	1-1/2"X1ft	1					
3	Brass Isolation Valve	1"(F)x1"(F)	1		150			
4	CS WNRF FLANGE	1"	5					
4A	CS WNRF FLANGE	2"	1				152	
5	Regulator	Inlet 1" Outlet 2"	1	IGL			300	
6	CS Pipe	1"	3		450			
6A	CS Elbow	1"	2		200			
7	CS Pipe	2"	1				150	
8	CS WNRF FLANGE	3"	4				800	
9	Tee	3" X 2"	1					
9A	Tee	3" X 3"	1					
10	Reducer	3" X 2"	1					
11	MS Clamps		3					
12	CS Pipe	3"	6					900
12A	CS Elbow	3"	1					100
13	CS Hex Nipple /Pipe	1"(M)x1"(M)	1		75			
	Total Supply Part				875	0	1402	

INDRAPRASTHA GAS LIMITED

Dear IGL Customer,

Welcome to family of satisfied PNG users!!!

Indraprastha Gas Limited (IGL) thanks you for having opted for a PNG connection in your kitchen and we are sure that this smart decision will bring in a complete change in the way cooking happens in your home. Knowing fully well that Piped Natural Gas is the obvious choice for us to make, wouldn't it be apt if we called PNG as Positively Natural Gas!

By choosing PNG, you have already made a wise decision. After all, who doesn't want to enhance the comfort and improve one's lifestyle for the years to come? From today onwards, you will experience the versatility and performance of this reliable energy source.

At IGL, it will always be our endeavour to match up to your expectations and provide you all the services connected with your PNG connection at your doorstep.

The pipeline network of IGL is today spread across Delhi, Noida, Greater Noida, Ghaziabad, Rewari and Gurugram. Due to its inherent benefits, PNG has today become the most preferred cooking fuel across the region. Apart from domestic kitchens, we are also supplying gas to all the leading hotels, restaurants and hospitals in the region.

Benefits of PNG

As a formal introduction to the smart fuel that you will be using from now onwards, we would like to take you through its benefits. PNG has several distinctions to its credit- of being a pollution-free fuel, easily accessible minus storage troubles and being easily available at very competitive rates.

Uninterrupted supply

- The source of PNG supply in Delhi is the famous Hazira-Bijaipur-Jagdishpur (HBJ) pipeline of GAIL (India) Limited. PNG offers the convenience of ensuring continuous and adequate supply of PNG at all times, without any problem of storing gas in cylinders.

Unmatched convenience

- Over the years, you have been used to the task of booking an LPG cylinder refill, time and again. Then starts the wait for the deliveryman to deliver the cylinder. Switching over to PNG renders this entire exercise unnecessary. PNG also eliminates the tedious routine of checking LPG refill cylinder for any suspected leakage, or it being underweight, at the time of delivery. Moreover, you will be spared the inconvenience of connecting and disconnecting the LPG cylinder when out of gas. Precious space, occupied by LPG cylinders is also saved.

Safety

- The combustible mixture of natural gas and air does not ignite if the mixture is leaner than 5% and richer than 15% of the air-fuel ratio required for ignition. This narrow inflammability range makes PNG one of the safest fuels in the world.
- Natural gas is lighter than air. Therefore, in case of a leakage, it just rises and disperses into thin air given adequate ventilation. But LPG being heavier will settle at the bottom near the floor surface.
- A large quantity of LPG is stored in liquefied form in a cylinder. With PNG, it is safer since PNG installation inside your premises contains only a limited quantity of natural gas at low pressure i.e. 21 millibar (mbar).
- On leakage, LPG expands 250 times, which is not the case with PNG. Supply in PNG can be switched off through appliance valve (inside the kitchen) and isolation valve (outside kitchen premises), which fully cuts off the gas supply.

Billing

- You will be charged only for the quantity of PNG used with no possibility of any pilferage as the billing is done according to the meter. A unique feature is that the user gets to pay only after consumption of gas. The domestic consumer pays the PNG bill only once in every two months. The user pays the gas consumption charges based on the exact consumption reading provided by the meter installed at his premises, The bill will be delivered at your doorstep or customer can opt for e billing..

Customer support

- Round-the-clock customer support is assured through 24 hrs number 1800 102 5109(Toll Free) backed by control rooms, which are manned by engineers and trained technicians. Thus, complaints, if any, are promptly redressed.

A versatile fuel

- Natural gas is being used predominantly as a versatile fuel in many major cities catering to domestic and commercial applications, as a cooking fuel, for water heating, space heating, air conditioning, etc.

Environment friendly

- Natural gas is one of the cleanest burning fossil fuels, and helps improve the quality of air, especially when used in place of other more polluting energy sources. Its combustion results in virtually no atmospheric emissions of sulphur dioxide (So2), and far lower emissions of carbon monoxide (CO), reactive hydrocarbons and carbon dioxide, than combustion of other fossil fuels.
- In fact, when natural gas burns completely, it gives out carbon dioxide and water vapour. These are the very components that we exhale!

Points to note

As you join the family of PNG users, we also wish to bring a few important points to your kind notice for your safety regarding PNG installation in your area and your premises.

1. Always give prior information to IGL on below mentioned numbers before carrying out/ seeing any digging activities like water boring, underground electric, telecom cable laying work in your society or nearby area.
2. In case of any gas leakage or smell please inform IGL on emergency / control room numbers mentioned below.
3. As pipeline inside your kitchen is carrying highly inflammable gas hence you are hereby advised that under no circumstances it should be opened/ modified/ dismantled by any non-IGL technician as this may lead to fatal accident. Always call IGL PNG customer care for any defect/ modification work in your PNG installation and stove for your own safety.
4. Always check ID cards of persons entering your premises and ensure identity of IGL staff properly. In case of any doubt please contact on below mentioned number.
5. Always keep your kitchen, home and surrounding areas well ventilated for your own safety.
6. Do not allow activities which may lead to fire in your area like unauthorized tea stalls, cloth ironing shops garbage burning and smoking near IGL high pressure pipeline.
7. Also do not use IGL high pressure gas pipeline for chaining vehicles, tying pets, tying cloth drying ropes as this may lead to heavy gas leakage and fire.
8. Never install PNG gas geyser unit inside bathroom on in any confined space. It may result into fatal accident.

We wish you a happy and safe experience of using PNG.
Best wishes

Customer Care - 1800 102 5109/ 1800 180 5109 (24x7 Toll Free)
Emergency leakage no. - 1800 111 817 /155216

Please retain this helpful information for future references

इन्द्रप्रस्थ गैस लिमिटेड

प्रिय आईजीएल ग्राहक,

संतुष्ट पीएनजी उपयोगकर्ताओं के परिवार में आपका स्वागत है।

इंद्रप्रस्थ गैस लिमिटेड (आईजीएल) अपनी रसोई में पीएनजी कनेक्शन लगवाने के लिए आपको धन्यवाद देता है और हम इस बात को लेकर आश्वस्त हैं कि यह स्मार्ट निर्णय आपके घर में खाना पकाने के तरीके में पूरी तरह से बदलाव लेकर लाएगा। अच्छी तरह से यह ज्ञात तो है ही कि पाइप्ड नेचुरल गैस हमारे लिए उपयुक्त विकल्प है, इसलिए यदि हम पीएनजी को पॉजिटिवली नेचुरल गैस कहें तो क्या यह उपयुक्त नहीं होगा!

पीएनजी का चयन कर, आपने पहले ही एक बुद्धिमता पूर्ण निर्णय लिया है। आखिरकार, कौन आने वाले वर्षों के लिए आराम बढ़ाना और जीवनशैली में सुधार करना नहीं चाहता है? आज से ही, आप इस विश्वसनीय ऊर्जा स्रोत की बहुमुखी प्रतिभा और प्रदर्शन का अनुभव हासिल करेंगे।

आईजीएल में, हमारा हमेशा यह प्रयास रहेगा कि हम आपकी उम्मीदों पर खरा उतरें और आपके पीएनजी कनेक्शन से जुड़ी सभी सेवाओं को आपके दरवाजे पर उपलब्ध कराएं।

1998 में इसकी शुरुआत हुई और आज आईजीएल का पाइपलाइन नेटवर्क दिल्ली, नोएडा, ग्रेटर नोएडा, गाजियाबाद, रेवाड़ी और गुरुग्राम में फैला है। अपने अंतर्निहित लाभों के कारण, पीएनजी आज पूरे क्षेत्र में सबसे पसंदीदा खाना पकाने का ईंधन बन गया है। घरेलू किचन के अलावा, हम क्षेत्र में सभी प्रमुख होटलों, रेस्टॉरेंट्स और अस्पतालों में भी गैस की आपूर्ति करते हैं।

पीएनजी के लाभ

स्मार्ट ईंधन के औपचारिक परिचय के रूप में, जिसका आप अभी से उपयोग करना शुरू करेंगे, हम आपको इसके लाभों के बारे में बताना चाहते हैं। पीएनजी के बहुत सारे लाभ हैं, यह एक प्रदूषण मुक्त ईंधन है, आसानी से सुलभ, भंडारण की समस्या से मुक्ति और बहुत ही प्रतिस्पर्धी कीमतों पर आसानी से उपलब्ध।

निर्बाध आपूर्ति

- दिल्ली में पीएनजी आपूर्ति का स्रोत गेल (इंडिया) लिमिटेड की प्रसिद्ध हजीरा–बीजापुर–जगदीशपुर (एचबीजे) पाइपलाइन है। पीएनजी, सिलेंडर में गैस स्टोर करने की जरूरत के बिना हर समय पीएनजी की निरंतर और पर्याप्त आपूर्ति सुनिश्चित करने की सुविधा प्रदान करता है।

बेजोड़ सुविधा

- कई वर्षों से, आपको एलपीजी सिलेंडर रिफिल को समय पर और बार–बार बुक करना पड़ता है। इसके बाद शुरू होता है सिलेंडर की आपूर्ति के लिए आपूर्तिकर्ता व्यक्ति के लिए इंतजार। पीएनजी को अपनाने से यह सारी कवायद खत्म हो जाती है। पीएनजी आपूर्ति के समय एलपीजी रिफिल सिलेंडर से किसी भी संदिग्ध रिसाव और वजन जांचने की कठिन प्रक्रिया को भी समाप्त करती है। इसके अलावा गैस खत्म होने पर एलपीजी सिलेंडर को लगाना और हटाने की असुविधा से भी यह बचा लेगी। एलपीजी सिलेंडर द्वारा घेरे जाने वाले अनमोल स्थान को भी यह बचाती है।

सुरक्षा

- नेचुरल गैस और वायु का ज्वलनशील मिश्रण नहीं जलता है, यदि यह मिश्रण जलने के लए आवश्यक वायु–ईंधन अनुपात के 5 प्रतिशत से कम पतला और 15 प्रतिशत से अधिक गाढ़ा होता है। यह संकीर्ण प्रज्वलन सीमा पीएनजी को दुनिया में सबसे सुरक्षित ईंधन में से एक बनाती है।
- नेचुरल गैस हवा से भी हल्की होती है। इसलिए, रिसाव के मामले में, यह फैलती है और पर्याप्त हवादार माहौल में वायु में मिल जाती है। लेकिन एलपीजी भारी होने के कारण सतह के नजदीक नीचे ही रह जाएगी।
- एलपीजी की बहुत अधिक मात्रा को तरल रूप में एक सिलेंडर में भरा जाता है। पीएनजी के साथ, यह सुरक्षित है क्योंकि आपके परिसर में स्थापित पीएनजी निम्न दबाव यानि 21 मिलीबार (एमबार) पर केवल सीमित मात्रा में नेचुरल गैस की आपूर्ति करती है।
- रिसाव होने पर, एलपीजी 250 गुना तक बढ़ जाती है, जबकि पीएनजी के साथ ऐसा नहीं होता है। पीएनजी में आपूर्ति को एप्लाइंस वाल्व (रसोई के अंदर) और आइसोलेशन वाल्व (रसोई परिसर के बाहर) के जरिये बंद किया जा सकता है, जो पूरी तरह से गैस की आपूर्ति को बंद कर देती है।

बिलिंग

- आपसे केवल पीएनजी की मात्रा के लिए शुल्क लिया जाएगा, जिसमें किसी भी चोरी की कोई संभावना नहीं है, क्योंकि मीटर के अनुसार बिलिंग की जाती है। एक अनोखी विशेषता यह है कि उपयोगकर्ता को गैस की खपत के बाद भुगतान करना पड़ता है। घरेलू उपभोक्ताओं को प्रत्येक दो माह में पीएनजी बिल का भुगतान करना होता है।
- उपयोगकर्ता अपने परिसर में स्थापित मीटर द्वारा उपलब्ध कराए गए सटीक खपत आंकड़े के आधार पर गैस उपभोग के शुल्क का भुगतान करता है, बिल आपके दरवाजे पर उपलब्ध कराया जाएगा या ग्राहक ई–बिलिंग के लिए विकल्प चुन सकते हैं।

करटमर सपोर्ट

- नियंत्रण कक्ष द्वारा समर्थित 24 घंटे चालू रहने वाले नंबर 1800 102 5109/1800 180 5109 (24 X 7) टोल फ्री) द्वारा हमेशा उपभोक्ता सहायता का आश्वासन दिया जाता है, जहां इंजीनियर्स और प्रशिक्षित तकनीशियन मौजूद रहते हैं। इसलिए यदि कोई शिकायत है, तो उसे तुरंत निपटाया जाता है।

एक बहुमुखी ईंधन

- प्राकृतिक गैस का इस्तेमाल पूरी दुनिया में मुख्यत: एक बहुमुखी ईंधन के रूप में किया जाता है, जो घरेलू और वाणिज्यिक अनुप्रयोगों जैसे खाना पकाने वाले ईंधन के रूप में, पानी गर्म करने, स्थान को गर्म करने, एयर कंडीशनिंग आदि की जरूरतों में प्रयोग होती है।

पर्यावरण अनुकूल

- प्राकृतिक गैस एक साफ ज्वलनशील जीवाश्म ईंधन में से एक है, और हवा की गुणवत्ता को सुधारने में मदद करती है, विशेषकर तब जब अन्य प्रदूषणकारी ऊर्जा स्रोतों के स्थान पर इसका इस्तेमाल होता है। इसके दहन के परिणामस्वरूप सल्फर डाई ऑक्साइड (एसओ2) का लगभग कोई वायुमंडलीय उत्सर्जन नहीं होता है और अन्य जीवश्म ईंधनों के दहन की तुलना में इसमें कार्बन मोनोक्साइड (सीओ), क्रियाशील हाइड्रोकार्बन और कार्बन डाईऑक्साइड का बहुत कम उत्सर्जन होता है।
- वास्तव में, जब नेचुरल गैस पूर्ण रूप से जलती है, तो यह कार्बन डाईऑक्साइड और जल वाष्प छोड़ती है। यह वही घटक है जिन्हें हम सांस द्वारा बाहर छोड़ते हैं।

कृपया ध्यान दें

आप पीएनजी उपयोगकर्ताओं के परिवार में शामिल हो रहे हैं, हम आपके क्षेत्र और आपके परिसर में पीएनजी स्थापना के संबंध में आपकी सुरक्षा के लिए कुछ महत्वपूर्ण बिंदुओं को आपके ध्यान में लाना चाहते हैं।

1. अपनी सोसायटी या नजदीकी क्षेत्र में कोई भी खुदाई गतिविधि जैसे वाटर बोरिंग, अंडरग्राउंड इलेक्ट्रिक, टेलीकॉम केबल बिछाने का काम आदि करने से पहले या दिखाई देने पर हमेशा आईजीएल को नीचे बताए गए नंबरों पर पूर्व सूचना दें।
2. किसी भी गैस रिसाव या बदबू आने के मामले में कृपया आईजीएल को नीचे बताए गए आपतकालीन/कंट्रोल रूम नंबर पर सूचित करें।
3. आपकी रसोई के अंदर पाइप लाइन अत्यधिक ज्वलनशील गैस ले जा रही है, इसलिए आपको यह सलाह दी जाती है कि किसी भी परिस्थिति में किसी भी गैर आईजीएल तकनीशियन द्वारा इसे खोला जाना/संशोधित करना/तोड़ा नहीं जाना चाहिए, क्योंकि इससे घातक दुर्घटना हो सकती है। अपनी स्वयं की सुरक्षा के लिए अपनी पीएनजी स्थापना और स्टोव में किसी भी दोष/संशोधन कार्य के लिए हमेशा आईजीएल पीएनजी करटमर केयर को फोन करें।
4. हमेशा अपने परिसर में प्रवेश करने वाले व्यक्तियों के आईडी कार्ड की जांच करें और आईजीएल कर्मचारियों की पहचान ठीक से करें। किसी भी संदेह के मामले में कृपया नीचे बताए गए नंबर पर संपर्क करें।
5. अपनी स्वयं की सुरक्षा के लिए हमेशा अपनी रसोई, घर और आस–पास के इलाकों को अच्छी तरह हवादार बनाए रखें।
6. अपने क्षेत्र में ऐसी किसी गतिविधि की अनुमति न दें जो आग लगने का कारण हो सकती हैं, जैसे आईजीएल उच्च दबाव पाइपलाइन के नजदीक अनाधिकृत चाय की दुकान, कपड़े प्रेस करने की दुकान, कचड़ा जलाना या धूम्रपान करना।
7. आईजीएल उच्च दबाव गैस पाइपलाइन का उपयोग वाहनों को बांधने, जानवरों को बांधने, कपड़े सुखाने की रस्सी बांधने आदि के लिए न करें क्योंकि इससे भारी गैस रिसाव हो सकता है और आग लग सकती है।
8. बाथरूम में किसी भी सीमित स्थान पर पीएनजी गैस गीजर इकाई स्थापित न करें। इससे घातक दुर्घटना हो सकती है

पीएनजी के प्रसन्न और सुरक्षित अनुभव के लिए हम आपको शुभकामना देते हैं।

शुभकामनाएं

करटमर केयर - 1800 102 5109/ 1800 180 5109 (24x7 टोल फ्री)
आपतकालीन लीकेज नंबर - 1800 111 817/ 155216
कृपया भविष्य के संदर्भों के लिए यह उपयोगी जानकारी प्राप्त करें