



## **Bengal Gas Company Limited**

{A joint venture of GAIL (India) Limited and Greater Calcutta Gas Supply Corporation Limited (GCGSCL)}  
KOLKATA, WEST BENGAL (INDIA)

### **TENDER DOCUMENT FOR**

## **MDPE LAYING AND LMC WORKS IN KOLKATA GA ON ARC BASIS FOR 2 YEARS**

### **OPEN DOMESTIC COMPETITIVE BIDDING**

**Tender No.:** 052-LEPL-BGCL-01

**Tender ID-** 2024\_BGCL\_211050

**VOLUME – II OF II**



**PREPARED AND ISSUED BY  
LYONS ENGINEERING PRIVATE LIMITED**

## **TABLE OF CONTENTS**

### **LIST OF SPECIFICATIONS / STANDARDS (VOLUME – II)**


<b><u>TECHNICAL SPECIFICATION</u></b>	<b><u>PAGE NOS.</u></b>
1) LAYING OF UNDERGROUND PE MAIN PIPELINES	3-28
2) INSTALLATION OF ABOVEGROUND GI PIPING FOR DOMESTIC & COMMERCIAL CONSUMERS	29-44
3) HDPE PIPES	45-48
4) PE FITTINGS AND ELECTRO-FUSION	49-73
5) POLYETHYLENE (PE) PIPES	74-77
6) GI PIPES	78-82
7) CU PIPE	83-86
8) GI FITTINGS FOR NATURAL GAS	87-90
9) COPPER FITTINGS	91-95
10) BRASS FITTINGS	96-100
11) PE ISOLATION VALVES	101-103
12) ISOLATION & APPLIANCE VALVES	104-108
13) WARNING MAT	109-110
14) WELDED CS/GI PIPING INSTALLATION	112-113
15) QUALITY ASSURANCE	114-122
16) HEALTH SAFETY AND ENVIRONMENT	123-164
17) STEEL RE-INFORCED RUBBER HOSE	165-171
18) FLEXIBLE METAL HOSE ANACONDA	172-193



**TECHNICAL SPECIFICATION  
FOR  
LAYING OF UNDERGROUND PE MAIN PIPELINES**



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi (India)**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 2 OF 229</b>	

## CONTENTS

1.0	GENERAL INFORMATION
2.0	SCOPE OF WORK
3.0	MATERIAL, LABOUR, PLANT AND EQUIPMENT
3.1	Supplied by Contractor
3.1.1	Plant and Equipment
3.1.2	Imported Backfill and Material
3.1.3	Other Materials
4.0	PROGRESS OF WORK
5.0	APPROVALS
6.0	REFERENCE SPECIFICATION, CODES AND STANDARDS
7.0	SAFETY
8.0	ROUTE SURVEY
9.0	ORGANISATION OF WORK
10.0	STRUCTURES, SERVICES AND OTHER PROPERTY
10.1	Location of underground Utilities
10.2	Protection of Structures and Utilities
10.3	Interference with Traffic, Street Drainage and General Public
11.0	TRENCHING
11.1	Depth of Trench
11.2	Width of Trench
11.3	Trench Base
11.4	Clearances
11.5	Underground Interference
11.6	Others
11.7	Bedding
12.0	LAYING
13.0	LAYING OF OPTICAL FIBER CABLES/ CONDUIT
14.0	JOINTING OF PE PIPE



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV


052-LEPL-BGCL-001

A

SHEET 3 OF 229



- 15.0 BACK FILLING
- 16.0 MOLING
- 17.0 BORING /RAMMING /DIRECTIONAL DRILLING
- 18.0 CASING PIPE
- 19.0 RESTORATION
- 20.0 TESTING
- 21.0 PURGING
- 22.0 VALVE PIT
- 23.0 PERMANENT MARKER
- 24.0 ASSISTANCE IN COMMISSIONING
- 25.0 STANDARD OF WORK
- 26.0 RECORDING (AS-BUILT DRAWINGS)
- 27.0 CIVIL AND STRUCTURAL WORKS
- 28.0 SERVICE REGULATOR MODEL SUPPLY AND INSTALLATION
- 29.0 LIASIONING
- 30.0 INSTALLATION OF DRS

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 4 OF 229	

## TECHNICAL SPECIFICATION

### 1.0 GENERAL INFORMATION

#### 1.1 Introduction

M/s. Bengal Gas Company Ltd. (BGCL) is a joint venture of M/s. GAIL (India) Ltd and M/s. Greater Calcutta Gas Supply Corporation Limited (GCGSCL) and operating CNG & City Gas Distribution in the state of West Bengal. PMC M/s. Lyons Engineering Pvt. Ltd. on behalf of M/s. Bengal Gas Company Ltd. (BGCL) intend to float an Open Domestic Tender for Laying of MDPE Pipe Line and Last Mile Connectivity Works in in Kolkata GA.

#### 1.2 Nature of Contract

The contractor shall be paid on a Price schedule basis. He shall execute the work and perform his obligations under the contract and BENGAL GAS COMPANY LIMITED shall pay the contractor for measured quantity of each item of work actually carried out under the contract. Payment shall be at the rate for the work set out in the agreed Price schedule.

### 2.0 SCOPE OF WORK

Generally, the following shall constitute the Contractor's scope of work:

- 2.1 The scope of work involves providing city gas connection (PNG) to domestic consumers distributed in the given Geographical Area GA).

Description	Unit	Kolkata
PNG Connections	Nos.	100000
MDPE Laying	Meter	1039200

- 2.2 The scope of work covers laying, testing and commissioning of underground medium density Polyethylene (MDPE) service pipelines of size 180/125/ 90 / 63 / 32 / 20 mm OD from the nearest branch line of various sizes MDPE line to various end point consumers of Piped Natural Gas (PNG) in Kolkata. The scope includes tapping or connecting to already laid / charged pipelines at some locations.

- 2.3 Further the scope of work also includes identification of existing structures, buildings, roads, pavements / by-lanes, nallahs, culverts, drains, utility lines, electric poles, type of ground surface, and marking on drawings along with location of all houses by their names and identification number along with preparation of drawings.

- 2.4 Plan and prepare a schedule for execution and work implementation as per QA / QC plans to be issued by BGCL/LEPL. Contractor has to submit the Construction/ Execution procedures before commencement of work.

- 2.5 In principle ROU permission for laying of the pipe line from the concerned land owning authority i.e. Local municipal authorities / Govt. Bodies / NHAI, R&B etc.) will be arranged by contractor. BGCL will hand over the application form to the contractor. Contractor shall be responsible for obtaining the permission. All liaisoning during pipe line laying execution with any authorities such as Local municipalities, R&B, local officials, traffic police, police, ESCOM, BSNL, Railways, RTO etc.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV


A

SHEET 5 OF 229

- and any other utility companies / agencies such as OFC operators etc. are in the scope of the contractor. The scope also includes liasioning with Society / individual land / Shop owners for smooth execution of pipeline laying. Repairing/replacement of all damaged utilities if any, and payment of any compensation (if claimed by owner / other utility agencies) is in scope of the contractor.
- 2.6 The route alignment drawings of main pipeline (180/125 / 90 / 63 / 32 mm) in streets / general areas shall be provided by BGCL / Consultant. However inside the premises for 32 mm / 20 mm dia pipeline, preparation of route map, as per site condition shall be prepared by contractor and submitted to BGCL/consultant for approval and execution shall start after due approval. Further, the scope also includes preparation of drawing, for any change in route due to site condition for mainline (180/125 / 90/ 63 / 32 mm), re- route alignment drawing shall also be prepared by contractor.
- 2.7 Receiving, loading, unloading and transporting and stacking of MDPE pipes / GI pipes issue by BGCL as free issue material from BGCL designated store yard within GA limit.
- 2.8 Proper storing, stacking, identification, providing security, and insurance during storage, laying and up-to handing over of pipelines.
- 2.9 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, and deciding optimum routes and depths for laying the pipelines based on the actual site condition / approved pipeline route by EIC/authorities.
- 2.10 Clearing the pipeline route as per requirement for proper movement of workmen, equipment and QA/QC personnel.
- 2.11 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.
- 2.12 Supply & Installation of Safety/ Warning Signs, barricading of the route to be trenched. Pits to be similarly barricaded with the warning sign.
- 2.13 To make trenches with stable slopes but restricting minimum disturbance to above ground/underground services/ installation as per specifications and approved route plans; keep the trenches free from water and soil till placement of pipes;
- 2.14 Uncoiling/ stringing the PE pipes of required sizes (i.e. 20, 32, 63, 90, 125, 180) pipes into trenches as per specification.
- 2.15 Joining the pipe ends with fittings and valves by approved electro-fusion techniques as per specification.
- 2.16 Installation of ipe fittings/installation like elbow, tee, reducers, tapping saddles, joints, connectors, transition fittings, valves, sleeves etc. including construction of supports, valves pits, inspection chambers etc. as per specification.



- 2.17 Laying pipeline using trench less technology methods with or without casing pipes as per specification and as directed by EIC.
- 2.18 Supply & Laying of HDPE duct as casing pipe wherever applicable, along with PE Pipe.
- 2.19 Supply of good quality GI sleeves, concrete casing pipes, sand and other material, fittings to be supplied by the Contractor as per provisions of tender.
- 2.20 Back filling and compaction by jumping jack compactor using approved 'good' soil or using excavated earth or borrow earth as per requirement and specification and replacement of tiles, slabs removed during the excavation. Cleaning all unserviceable material, debris, excess earth near trenches etc. to designated disposal area.
- 2.21 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.
- 2.22 Nitrogen purging (including supply), commissioning & gas charging of tested pipeline as per approved procedure.
- 2.23 Restoration of existing ground features such as grass/ turfing, paving, roads, drains, concrete, floral beds, fencing, tiles, flooring masonry etc. to original condition and to match with adjoining conditions-functionally and aesthetically up to the entire satisfaction of BENGAL GAS COMPANY LIMITED/ LEPL / any other third party agency designated by BENGAL GAS COMPANY LIMITED and local authorities, failing which, it will be done at the risk and cost of the contractor. Obtaining satisfactory completion certificates for the restoration work done from the concerned authorities.
- 2.24 Installation of permanent site markers, warning signs, valve chamber etc.
- 2.25 Returning surplus material to BENGAL GAS COMPANY LIMITED stores, reconciliation of free issue material / consumables if supplied by BENGAL GAS COMPANY LIMITED and obtaining 'no objection certificates' from BENGAL GAS COMPANY LIMITED/LEPL.
- 2.26 Handing over the completed works to BENGAL GAS COMPANY LIMITED for their operation / use purposes.
- 2.27 Maintaining the completed pipelines/installation for any defect, failures during defect liability period.
- 2.28 Preparation and submission of As-built drawings, details of crossings, utility graphs, measurement sheets and deviation statements on completion / commissioning of work by way of drawing, sketches and tables.
- 2.29 Any other activity (ies) 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 BGCL.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 7 OF 229	

2.30 The following pending works shall have to be carried out:

- a) To carry out pending GI, Regulator and Meter installation work of DPNG connections.
- b) To convert the DPNG connections already done by others.
- c) To test the GI Piping up to customer AV and to rectify the RFC.
- d) To find out the third party damages, pending joints of MDPE Pipelines already laid in patches and rectify / repair the damages and followed by flushing, testing and commissioning of the pipeline and associated works.
- e) To carry out the GC in already charged or laid network areas as per the instructions.

### 3.0 MATERIAL, LABOUR, PLANT AND EQUIPMENT

#### 3.1 Owner's Scope of Supply (Free Issue Item)

Free Issue Materials shall be issued to the Contractor from the designated store(s) of Bengal Gas Company Limited. Contractor shall be responsible for lifting the free issue materials from Owner's storage point(s) and transporting the same to work site(s) at his own cost.

In general PE pipe shall be of the following lengths indicated.

20mm/32mm	100 to 300 Mtrs. coils
63 mm	100 Mtrs. Coils
90 mm	50 Mtrs Coils
125 mm	50 Mtrs. Coils
180 mm	12 Mtrs. Coils

#### 3.2 Supplied by the Contractor

Contractor will supply all size HDPE casing pipe, GI / concrete sleeves, valves and PE fittings other materials as per SOR & scope of supply necessary to complete the laying of gas main pipelines and service pipelines.

The contractor is to procure all bought out items from approved vendors and accordingly keep BENGAL GAS COMPANY LIMITED/ LEPL informed. The inspection of bought out items would be carried out by BENGAL GAS COMPANY LIMITED/ LEPL / Third Party Inspection or as instruction by EIC.


The Contractor shall provide the skilled labour, tools, material and equipment necessary for the proper execution of the Work. This will include but not be limited to list of specialized items included in the enclosure furnished herewith.

##### 3.2.1 Equipment & Machinery

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.

In addition to above, the contractor must have dedicated bar coded electro-fusion (Automatically readable) machine with power generator (at any point of time minimum 2 nos.), Pipe Cutters (like circular guillotine), End Scrapers, Pipe Straightener, approved Top loading clamp for fusing saddle tapping tee, clamps of all sizes for Electro-fusion fittings, re- rounding tools and test ends etc. for pipes of diameters 180mm, 125mm, 90mm, 63mm, 32mm & 20mm for this project. Contractor has to arrange his own all equipments for trenchless crossings such as HDD, Molding & rock cutting equipment, HDPE fusion equipment at the site whenever required.

Contractor must also have to arrange his own equipment for restoration work like

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 8 OF 229	

water tanker and jumping jack compactor for compaction of backfilled trenches And roller and other required equipment/ machinery for asphaltting/ road works.

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

### 3.2.2 Imported Backfill and Material

The Contractor shall be responsible to arrange the supply of approved soft soil / Coarse Sand free from any impurities like clay, mica and soft flaky pieces as per the instruction of EIC/Owner.

For supply of sand in trench for rocky terrain, no separate charges are payable and is included in price schedule item for excavation of hard rock / Morrum. Also supply of sand in valve chambers, Normal chambers & Built up surface, if required, as per the instruction of EIC is not separately payable.

In case specified trench depths are not achieved & if directed by Engineer-in-charge Contractor to provide concrete casing pipes/ slabs or cement concrete, without any cost implication to Owner.

### 3.2.3 Other Materials

The Contractor shall supply the following items where required.

- All materials required for form work, trench support, temporary trench crossings.
- All sign boards, barricades, tin sheets, lights and protective equipment.
- Permanent markers as shown in the drawings enclosed in the tender.
- Material required for installation of valve chambers.
- GI & Concrete Sleeves
- 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.

### 3.2.4 Manpower

The contractor shall provide the skilled labour, tools, materials, and equipment necessary for the proper execution.

### 3.2.5 Acquisition, Receipt, & Storage of Materials

In case of material supplied by owner then the contractor shall collect all materials from BGCL store between working hours following all documentation procedures laid down and as directed by EIC. The contractor shall at the time of receipt of material physically examine all materials and notify the EIC immediately of any damage. Any damage not recorded at the time of inspection done by contractor will be deemed not to have existed at the time of receipt of material. Cost of repair, rectification, replacement will be borne by the contractor. Any defective material found during the time of installation will noted and forwarded to stores for replacement immediately with P.O reference and only with written approval of EIC. The contractor shall ensure that no defective material shall be returned to store at the time of closure of contract.

The contractor shall maintain permanent locked store preferably near site in so that all the material are stored in such a manner so as to prevent and damage to the materials from scratching, gouging, indentation, excessive heat or by contact with any sharp objects and



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV

A

SHEET 9 OF 229

Chemicals.

The contractor shall maintain log book at their respective stores stating issue and availability of free issue material as a given day. Further the contractor is required to undertake and submit an inventory of materials every month to Owners/Owners Representative (mandatory)

#### 4.0 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 etc.

#### 5.0 APPROVALS

It is the contractor's responsibility to inform and co-ordinate the concerned local authorities and also other utility agencies before commencement of work at site. To ensure smooth execution of the work on a day to day basis, the contractor has to liaison with respective authorities and obtains necessary approvals.

#### 6.0 REFERENCE SPECIFICATION, CODES AND STANDARDS

The contractor shall carry out the work in accordance with the requirement of latest relevant applicable standards, this specification, Engineering Standards; relevant Oil India Safety Directorate (OISD) norms, Latest PNGRB Guidelines, 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. ISO: 4437/ IS:14885 for underground polyethylene pipes and 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.

#### 7.0 SAFETY

The Contractor shall conform to the 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 all safety equipments like helmets, boots, 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.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCULDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV

A

SHEET 10 OF 229



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 is taken by the Contractor.

For further details refer Attached Health Safety and Environment (HSE) technical specification.

## 8.0 ROUTE SURVEY

- 8.1 Route Plans with pipe size of approved route shall be issued to the contractor at the start of the works.
- 8.2 The planned route drawings of main pipeline (180 / 125 / 90 / 63 / 32 mm) in streets / general areas shall be provided by BGCL / Consultant. However inside the premises for 32mm /20mm dia pipeline preparation of route map, as per site condition shall be prepared by contractor and submitted to BGCL/consultant for approval and execution shall start after due approval. Further, the scope also includes preparation of drawing, for any change in route due to site condition for mainline (180/ 125 / 90 / 63mm), re- route alignment drawing shall also be prepared by contractor. 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.

## 9.0 ORGANIZATION OF WORK

- 9.1 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 BENGAL GAS COMPANY LIMITED on site. All work will be issued and sanctioned through the EIC and site control exercised by Site Engineer BENGAL GAS COMPANY LIMITED/ LEPL. 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 of BENGAL GAS COMPANY LIMITED is maintained.
- 9.2 Contractor shall designate RCM who will be the single point coordinator to interact with EIC / Consultant / TPIA and authorized to attend review meetings, receive materials, authorized to sign documents, claims and receive payments etc.. Contractor shall submit the organization chart stating that in charge of projects, store, QA/QC and take approval from the owner.
- 9.3 The contractor will appoint his own supervisors of minimum number instructed by EIC. These personnel will be responsible to the SE for monitoring construction standards and for ensuring that all detailed technical requirements are met on each and every job which is undertaken. The contractor's supervisor (s) will have day to day liaison with the SE, and will provide the SE with technical reports and audits, and other management information as is required on work progress and construction quality standards.
- 9.4 The contractor's supervisor shall have mobile/phones to ensure that they can be contacted at all times. The contractor will also nominate one person who can be contacted if necessary out of 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 LEPL/ BENGAL GAS COMPANY LIMITED as is required. The normal day to day issue of work instructions, communication between LEPL / BENGAL GAS COMPANY LIMITED and the contractor's supervisor and the SE. No deviation from the approved technical specification / issued construction drawings shall be undertaken without written approval of EIC.
- 9.5 Contractor shall maintain a Project site office, Material store with following facilities: Telephone, Mobile phones, printers / Scanning / Xerox machines, Computer with e-mail facility, transportation facility

## 10.0 STRUCTURES, SERVICES AND OTHER PROPERTY

### 10.1 Location of Underground Utilities



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 11 OF 229



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 EIC in advance of any excavation. Restoration of the abandoned trial pits and trenches shall be the contractor's responsibility. No payments shall be made for such type of jobs.

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 lost time or delays.

**10.2 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, 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. Special care shall be taken while laying Pipelines near the trees.

**10.3 Interference with Traffic, Street Drainage and General Public**

The Work shall be executed in such a manner as to cause a minimum of inconvenience to persons requiring to use 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, levelled and extra earth 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, in any circumstance, use a private driveway, access track or entrance without the prior approval of the EIC.

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

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 deviate them where necessary and use all proper measures to provide for the free passage of water.

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

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 12 OF 229	

The contractor shall conduct his operations at all times, with a view to minimizing as far as practicable noise from plant and other objectionable nuisance (e.g. oil leakage).

## 11.0 TRENCHING

The schematic diagram with the detail of trench is enclosed. 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 on the Drawings, Specifications or as otherwise directed by the EIC.

Contractor shall excavate and maintain the pipeline trench on staked centerline as per approved alignment sheets 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 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. BENGAL GAS COMPANY LIMITED may require excavation by hand tools, local rerouting 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 from the bottom and sidewalls of the trench.

### 11.1 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.

The depth of the trench will be such as to provided minimum cover as stipulated below:

- a) For Distribution Main and Service Lines
- |      |                              |           |
|------|------------------------------|-----------|
| i.   | Minor Water Crossing/ Canal  | 2.5 meter |
| ii.  | Uncased/ Cased Road Crossing | 1.5 meter |
| iii. | Rail/ Road Cased Crossing    | 1.5 meter |
| iv.  | Normal Areas                 | 1.0 meter |

The minimum depth as mentioned above may be greater than 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.

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 without extra cost to BENGAL GAS COMPANY LIMITED.

### 11.2 Width of Trench

The width of the trench shall be wide enough to provide bedding around the pipe 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 Drawing. No payment will be made for extra width of trench for any reason.

### 11.3 Trench Base

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

Hard rock is defined as trench material with a single piece dimension exceeding 1.0 m in length which cannot be removed other than by the use of pneumatic chisel / drill or sledge hammer and chisel.

Excavation through soil mixed with boulders that have been used for a road base will not be considered as hard rock for the purposes of payment.

### 11.4 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 in the vicinity of the Works.

- 150-300 mm where the gas pipe crosses other assets, other than electrical cables, whereupon the clearance shall be 300 mm.
- 300mm where the gas pipe is on a similar alignment to the other assets

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.

### 11.5 Under Ground Interferences

The Contractor shall locate and expose manually all underground facilities if any during trenching. Safety barriers, if required shall be erected to prevent any damages or accident. On locations where pipeline is laid under the existing facilities and near the approaches to 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 BENGAL GAS COMPANY LIMITED to open cut paved road crossing, or where 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 BENGAL GAS COMPANY LIMITED. After laying the pipeline, backfilling shall be immediately performed and all the areas connected with the 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 satisfaction of concerned authorities, resident and LEPL / BENGAL GAS COMPANY LIMITED.

### 11.6 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 having jurisdiction and / or BENGAL GAS COMPANY LIMITED.

For all roads, paths, walkways etc. that are open-cut, the Contractor shall provided temporary diversions properly constructed to allow the passage of normal traffic with the minimum of



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 14 OF 229

inconvenience and interruptions. The paving shall be restored 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 a deep trench is required at the approaches to crossings of roadways, railroads, rivers, streams, drainage ditches without any extra cost implication to BENGAL GAS COMPANY LIMITED.

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

The Contractor shall take conducive measures to ensure the protection of underground utilities as per the instructions of BENGAL GAS COMPANY LIMITED or relevant authorities. Where the pipeline crosses underground utilities/ structures, Contractor shall first manually excavate to a depth and in a 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 maintain proper distances

And perform the work to the satisfaction of BENGAL GAS COMPANY LIMITED and other utility agencies. 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.

#### 11.7 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 EIC, the size distribution of the sand shall be the same as per soil. 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 & surrounding sand shall conform to specifications. There shall be no void space in packing sand around the pipe.

#### 12.0 LAYING

Laying of MDPE pipelines shall commence 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 150mm below underside of pipe and any other material which could lead of perforation / tearing of the pipe wall. After ensuring above the PE pipe coil shall be uncoiled smoothly through proper equipment's / care inside the trench ensuring no damage to pipe coil during laying. 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.

Where given specific approval by the EIC a pipe may pass through an open drain or nallah. Where this is permitted the pipe shall be installed inside a concrete or steel sleeve for protection. The sleeve material shall be procured and laid by the Contractor. In general the GI Sleeve / concrete sleeve material specification of reputed make. The payment for the length of pipe in the sleeve will be made as per SOR. All other work necessary to break through the walls of the obstruction, and to seal the annulus between the pipe and the sleeve and the sleeve and the wall, shall be deemed to be included in the rates.

Open ends of pipe placed in the trench shall be securely capped or plugged to prevent the



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 15 OF 229

ingress of water or other matter. The Contractor is to ensure that nothing enters the inside of the pipe during the laying process as this could cause a future blockage or regulator malfunction due to dust, etc.

Valves shall be installed at locations shown on the Design Plan or as directed by the EIC and joined with PE pipes by electro-fusion techniques. The valves shall be supported on a bed of fine fill of grit size not greater than 5mm to achieve equivalent support as the incoming and outgoing pipe work.

Laying graphs with details of depth, length, offsets from fixed references, other utility crossings, fittings, size of casing pipe used for the pipeline shall be prepared on daily basis and submitted to Site Engineers of the Owner for approval. These details will be further incorporated into As-Built Drawings.

### **13.0 JOINTING OF POLYETHYLENE PIPE**

Only Bar coded electro-fusion machine (Automatically Readable) with in-built memory to store the jointing data that can read the bar code of the fittings shall be used for jointing of MDPE pipe / 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 at fixed intervals as per the instruction of owner. Contractor shall ensure that the machine are always available at site, no stoppage of work due to the non availability of machines.

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. Alignment clamps with the correct size shells should be used to align the pipe during the electro-fusion cycle.

The Contractor shall ensure that polyethylene pipe is only cut with an approved PE pipe cutting tool. Before fusion is attempted, shall remove the oxidized surface of the pipe to be inserted into the electro-fusion coupling. The tool must remove a layer of 0.1 mm to 0.4 mm from the outer surface of the PE pipe. It may also be noted that no fusion will be allowed without clamping device and only the approved cutting tools (Hack Saw shall not be allowed for cutting the Pipe) shall be used.

The contractor has to supply all the consumables required for carrying fusion of the joints (like cloth/ 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 this work shall be borne by the Contractor.

Contractor shall arrange generator for power supply for fusion machine. Taking power connection from electric poles, connections or residential premises is strictly not permitted.

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 . All approved Jointers shall bear Identity cards signed by Owner/Owner's representative.

### **14.0 BACKFILLING**

Backfilling shall be done after ensuring that appurtenance have been properly fitted and the pipe is following the ditch 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.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

**DOCUMENT NO.**

**REV**

**052-LEPL-BGCL-001**

**A**

**SHEET 16 OF 229**



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 where required of compacted thickness 150mm is put over and around the pipe immediately after lowering.

Backfilling shall be carried out immediately after the post padding where required has been completed in the trench, inspected and approved by BGCL/ LEPL, 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 200mm 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.

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 BENGAL GAS COMPANY LIMITED/ LEPL 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 off to the satisfaction of land owner or authority having jurisdiction at no extra cost to BENGAL GAS COMPANY LIMITED.

Where small pieces of rock, gravel, lumps of hard soil or like materials are encountered at the time of trench excavation, sufficient earth or select backfill materials shall be placed around and over the pipe to form a protective cushion extending at least to a height of 150mm above the top of the pipe. Select backfill materials for padding that are acceptable shall be screened soil, containing no gravel. All these works shall be carried out by Contractor at no extra cost to BENGAL GAS COMPANY LIMITED. 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 sand padding is to be provided up to height of 150mm around the pipe.

When the trench has been dug through drive ways or roads, all backfilling shall be executed with suitable material in layers as approved by LEPL / BENGAL GAS COMPANY LIMITED 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.

After laying of PE pipe lines, back filling with available soft soil up to depth of minimum 300mm, placing brick as per given drawing or instruction of BENGAL GAS COMPANY LIMITED/ LEPL, back filling with available soil up to minimum depth of 200 mm above bricks, putting approved warning mat of 0.5mm thick and 250 mm wide with traceability provision (as per attached specification) and as indicated in the drawing. The warning mat 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 and watering in layers of 150mm above the warning mat.

Proper crowning of not more than 150 mm shall be done. All the excavated material required to be used during the Restoration process shall be stacked and kept separately and properly. Wherever Road cutting/ Tiles removal/ PC cutting has



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 17 OF 229

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.

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

## 15.0 MOLING

The Moling shall be carried out as per the requirement specified by BENGAL GAS COMPANY LIMITED/ LEPL, and approved procedures. The contractor has to carry out thorough survey of the underground utilities before going for the Moling, to avoid the damage to the other utilities.

No extra payment will be made for any trial / abandoned pits made during the survey. The supply of all equipment, power required for carrying out moling work, is in contractor's scope. The type of moling to be carried out i.e., Manual/ Machine with or without casing shall be at the discretion of BENGAL GAS COMPANY LIMITED/ LEPL. A prior approval is to be taken before starting the Moling.

For manual Moling the contractor shall ensure that the size of the hole shall not be more than 20% of the size of the casing / carrier pipe whichever is applicable. After completion of Manual Moling the hole shall be properly compacted / filled with soil by watering and by approved procedures, the pits shall be backfilled, compacted & restored. The rate for such crossing work by using casing pipe & carrier pipe or only carrier pipe shall be payable as per Schedule of Rates. No separate payment shall be made for pulling the carrier pipe.

The rates for Moling, as indicated in SOR, are payable as per the size of the casing / carrier pipe and are inclusive of excavation of pits, backfilling, compaction, restoration, jointing and insertion of carrier pipe.

Any damages occurred to other utilities during the Moling operation shall be immediately notified and rectified by the contractor without any cost implication to BENGAL GAS COMPANY LIMITED.

The length of the Hole (excluding the sizes of the pits on both ends) shall be considered for the measurement of Moling length. However, intermediate pits, if any, will consider in the moling length.

## 16.0 HORIZONTAL DIRECTIONAL DRILLING

The above techniques is required to be carried out by the Contractor where conventional trenching / Moling is not possible viz. railways, major waterways, highways, roads etc. Details of such crossings shall be obtained by the Contractor, and construction drawings shall be prepared by the Contractor in consultation with LEPL/ BGCL. Execution of the work shall be based on the LEPL / BGCL approved drawings. The contractor has to do the thorough survey of the underground utilities before commencement of HORIZONTAL DIRECTIONAL DRILLING to avoid the damage to the other utilities. No extra payment will be made for any trail / abandoned pits made during the survey. The supply of all equipments is in Contractors scope. Work to be carried out in accordance with API - 1102.

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 penalties on daily basis as per SCC.

The type of HDD to be carried out i.e. conventional (with or without casing) shall be at the discretion of BENGAL GAS COMPANY LIMITED/ LEPL. And prior approval is to be taken before starting the HDD.

The rates for HDD, as indicated in SOR, are payable as per the size of the carrier pipe and are inclusive of excavation of pits, backfilling, compaction, jointing and insertion of carrier pipe and restoration of pits. For HDD with casing



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 18 OF 229

pipe no separate payment shall be made for pulling of the carrier pipe, the rate quoted by the Contractor shall be inclusive of pulling carrier pipe.

Any damages occurred to other utilities during the HDD operation shall be immediately notified and rectified by the Contractor without any cost implications to BENGAL GAS COMPANY LIMITED.

The length of the HOLE (excluding the sizes of the pits on both ends) shall be considered of HDD length.

## 17.0 CASING PIPE

The tentative sizes of the HDPE casing pipe for Moling / HDD shall be as follows:-

Size of MDPE pipe	Size of HDPE pipe
20 / 32 mm	50/63 mm
63 mm	125 mm
90mm	180mm
125mm	250mm
180mm	315mm

## 18.0 RESTORATION

Wherever the restoration is required, the roads, footpaths (including roads and footpaths inside colonies) shall be restored to original condition, and the same shall be done as per concerned local authorities norms and to the satisfaction of the concerned local Authority. Curing of the installed concrete, wet sack cloth is to be placed on the finished surface and kept damp for a period of 36 hours.

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 laying.

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 restoration of roads shall be carried out as per specifications given by the concerned authority. Turf shall be replaced in highly developed grassed area. In lesser-developed grassed areas topsoil should be replaced during the restoration process.

Where permanent surface restorations 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 replace the defective restoration work.

Note that Payment for pipe laying will only be authorized on initial satisfactory restoration, and where the sites has been cleared of all surplus materials, etc.

Contractor has to obtain the clearance certificate from the concerned local authorities 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 latest version of the (PWD/ IRC) specification to its original condition and also to the entire satisfaction of land owner (Private/Public). The expenditure incurred towards testing of the material used for



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 19 OF 229



restoration as per applicable standards, shall be borne by the contractor.

## 19.0 TESTING

Pressure testing will be carried out with compressed air. Compressed dry air will be provided by Contractor for testing purposes and is to be included in the rates.

For main pipelines work the Contractor shall perform progressive pressure testing to avoid having to find leaks in long lengths of pipe. The test pressure shall be around 1.5 times of operating pressure / as per Instruction of EIC and there shall be no unaccountable pressure loss during the test period.

Test procedure with sketches showing the pipeline to be tested, vent points, gauge location, and inlet pressure print is to prepared & got approved by EIC.

For main line the test duration shall be 24 hrs. With these tests the pressure should be allowed to stabilize for a period of 30 minutes after pressurization. The holding period may then commence and continue for 24 hours. 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 Engineer-in-Charge. 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 in some cases testing will be carried out independently of the testing of the mains for which the test duration may be reduced to 4 hrs. The service testing in this case will be performed after the service installation is complete but before the service tee has been tapped. Also in some cases the tapping of the service tee will be delayed pending the completion and purging of the main pipelines.

## 20.0 PURGING

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

Nitrogen required for purging will also be provided by the Contractor. Nitrogen shall be supplied in labelled, tested and certified cylinders, and completed with all necessary regulators, hoses and connections, which will be in good condition and working order.

In addition the Contractor shall submit and get approved a Purging Plan 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 adapter, Purge stack with flame trap and gas sampling point, Gas sampling equipment (may be gas leak detector), squash-off tool, Polyethylene connecting pipe work.

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.

## 21.0 VALVE PIT

The valve pit shall be constructed in accordance with enclosed drawings.

The construction of valve chambers shall be taken up immediately after installation of valve.

### 21.1 Workmanship



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCULDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 20 OF 229

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.

## 22.0 POLE MARKERS

- 22.1 Pole Marker:(As per typical Drawings) shall be installed at regular intervals as per the instructions of the EIC immediately after laying of the pipeline. The installation of the type of the Pole Marker shall be decided by the EIC depending on the site condition. The Markers shall be painted before installation as per the approved procedure. The supply of the paint and painting as per the specification is in contractor's scope.
- 22.2 The artwork shown in the drawing is typical for all the markers. The contractor must take prior approval for the artwork from EIC before installation of Markers. The artwork must have BENGAL GAS COMPANY LIMITED's logo and specify the location of the pipeline from the marker.

Guidelines :

- Interval between any two RCC markers for mainline shall be as per instruction of Site in charge.
- Pole marker or RCC marker shall be installed near to valve chambers on mainline respectively for indication & as per instruction of EIC.
- The entry and exit pits for laying of pipeline by HDD/ Moiling for road crossings shall be marked by pole markers or RCC markers depending upon the site condition.
- In addition to the above , pole markers with shall be installed outside societies / Areas as per instruction of EIC.
- For the distribution network of 32 mm & 20 mm pipe, plate markers as per drawing and shall be installed as per the site condition and direction of the site in charge.


## 23.0 READY FOR COMMISSIONING/ASSISTANCE IN COMMISSIONING

Contractor has to install all the Valve/ Service Regulator modules and make the line ready for commissioning and pressurize the line with Nitrogen 4 bar positive pressure and hand over the line to BGCL if Gas is not available at that particular time. If gas is available, it is the duty of the contractor to commission the line and hand over the line to BGCL. Contractor shall provide the required personnel, Vehicles, labour, supervision, tools, equipment, instruments and technical assistance for performance tests and commissioning activities as per requirement of BENGAL GAS COMPANY LIMITED/ LEPL.

## 24.0 STANDARD OF WORK

- 24.1 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 specifications.
- 24.2 The manpower deployed on the respective work shall be adequately trained & shall have necessary skills to executive / supervise the work. However, the assessment on the qualification of the personal shall be at the discretion of EIC.
- 24.3 Fusion operators and other skilled personnel shall be approved by BGCL/ LEPL and identification cards duly signed by EIC shall be issued to them. Only those personnel who are approved by EIC shall be allowed to execute the critical activities like joining of PE Pipes.

## 25.0 RECORDING (AS-BUILT DRAWINGS)

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 21 OF 229	

The Contractor will be required to submit computerized as-built drawings duly certified by EIC in A0/ A1 sheet form at 1:200 scale with THREE sets of prints plus 3 sets soft copy (In CD). The as-built drawing shall be submitted on area wise as specified. The bill of materials used for the particular area shall be specified on the drawings. The Contractor shall use the area and crossing survey drawings prepared by them as reference. On-site sketches, picking up key reference points, shall be made during the installation of services. The lengths, depths of installed pipe work, changes in direction, major fittings, etc, shall be recorded together with appropriate references to other services crossed and in the proximity of the gas pipe .

Distance of pipeline from permanent property /structure should be provided at least every 50 meters. If there is any change in alignment/orientation and offset distance etc. of the pipeline in between the above said 50 meters, the same shall be clearly mentioned in the as laid.

Gas objects (off valve, tees, elbows, couplers, T.F, etc shall be shown as block objects (which from a single node to connect) with respect owners symbol and legend. The as built drawing shall be as per the legends provided by EIC.

Details & offset distances from other utilities present should be given in as laid drawing. If there is any change in the depth of pipeline , the same shall be clearly marked with details in the as laid drawings. The details of additional protection provided must be mentioned.

Details of the PE stop off valve and other fittings used should be shown with adequate information and orientation. Technical deviation (if any) should be provided with reference to the buildings and permanent structure around, and the same should be cited clearly with all relevant details. Complete details of nallah crossings should be shown in a separate sketch

Name of roads, major landmarks and buildings should be mentioned appropriately for reference.

Proper Chain age shall be mentioned on all the drawings to be referred with continuation reference.

Land based features shown on the drawing shall match the exact distance as they were on real ground with respect to scale ratio (1:200)


The details shall be prepared in standard format using Map Info/AUTOCAD Map and submitted in CD ROM. 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.

**26.0 CIVIL AND STRUCTURAL WORKS**

The contractor has to supply the adequate materials and skilled man power for the completion of all the civil & structural works. The contractors shall also ensure that the work carried out as per the detail mentioned in the schedule of rates.

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

The contractors has to ensure that sample of all the material 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 BENGAL GAS COMPANY LIMITED.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 22 OF 229	

## 27.0 SERVICE REGULATOR MODULE SUPPLY AND INSTALLATION

The contractors has to ensure that sample of all the material shall be

Contractor has to install the Service regulator module where ever required , in side the colonies/ for a group of societies as per the instruction of the EIC. After the line tested, before commissioning the network, these regulator modules are to be installed . All the necessary fittings including TF, Brass Fittings Filter should required for making the Service regulator module is in the scope of the contractor. Service regulator will be the Free issue material. Diagram showing the Service regulator module is given in the diagrams.

## 29.0 Liasioning

Contractor has to obtain the permission within 3 weeks from the date of award of the WO, BGCL will hand over the in principal application, all other necessary drawings/documents as per the Public bodies requirement is to be submitted contractor and permission has to be obtained within two weeks after email intimation of BGCL. Separate charges will be paid to the Contractor for obtaining the permission in the separate SOR head.

## 30.0 Installation of DRS:-

The contractor has to load on truck & unload the DRS on foundation wherever required within Kolkata GA for installation of DRS. Installation of DRS/MRS has to be done as per the foundation diagram issued by the BGCL. Transportation, installing is in the scope of the contractor, DRS will be provided by the BGCL. Foundation /Installation of DRS will be paid under the separate SOR head.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCULDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV

A

SHEET 23 OF 229

**TECHNICAL  
SPECIFICATION FOR  
INSTALLATION OF ABOVE GROUND GI /CU PIPING  
FO  
R  
DOMESTIC, COMMERCIAL AND INDUSTRIAL CONSUMERS**



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi (India)**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 24 OF 229</b>	

## CONTENTS

<u>Sl.No.</u>	<u>Description</u>
1.0	GENERAL INFORMATION
2.0	SCOPE OF WORK
3.0	MATERIAL, LABOUR, PLANT AND EQUIPMENT
4.0	ISSUE OF WORK INSTRUCTIONS
5.0	PROGRESS OF WORK
6.0	WORK SHEETS
7.0	PERMISSIONS / APPROVALS
8.0	REFERENCE SPECIFICATION, CODES AND STANDARDS
9.0	SAFETY
10.0	RIGHT-OF-USE SURVEY AND MARKING
11.0	PROTECTION OF STRUCTURES AND UTILITIES
12.0	G.I ABOVE GROUND SERVICE PIPE
13.0	COPPER ABOVE GROUND SERVICES PIPE
14.0	TESTING OF GI
15.0	INSPECTION
16.0	PURGING & COMMISSIONING
17.0	INSTALLATION OF METERS
18.0	PAINTING OF GI PIPES
19.0	BOX FOR REGULATOR
20.0	CONVERSION OF DOMESTIC APPLIANCES
21.0	RESTORATION
22.0	SUBMISSION OF FINAL RECORDS

## 1.0 **GENERAL INFORMATION**

### 1.1 **INTRODUCTION**

The main intent of the specification is installation of above ground GI pipes (free issue items), meters and regulators (free issue items) and supply and installation of all types of fittings, isolation valves, appliance valve, copper tubing from the outlet of 'PE/GI transition fitting' up to the DOMESTIC consumers 'Appliance / stove/ oven valve' as per the Distribution Schedule including the Suraksha hose.

In case of large commercials and industries completely assembled metering skids would be supplied to the contractor who would be required to install and provide inlet & outlet connection.

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 **SCOPE OF WORK**

Generally the following shall constitute the contractor's scope of work:

- 2.1 Plan and prepare a detailed execution schedule and procedure for implementation based on QA / QC formats plans issued by BENGAL GAS COMPANY LIMITED. / LEPL.
- 2.2 Contractor has to submit the Construction/Execution procedures before commencement of work to owner / owner's representative for approval.
- 2.3 Selection of route and marking 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. Providing safety equipment to workers / plumbers.
- 2.4 Receipt of regulators, domestic meters, as a free issue items from Owner's Stores, loading, transportation ,unloading at project site. Proper storing, stacking, identification, providing security and insurance during and before installation and commissioning of pipelines. Obtaining the approvals for optimum route and permission for work from the concerned authority and EIC.
- 2.5 Contractor shall procure all material, except free issue material from the outlet of PE/GI transition fitting upto the Domestic / Commercial customers Appliance / Stove / Oven valve for satisfactory completion to the owner/Owner's representative.
- 2.6 Installation of GI pipes of ½", ¾", 1" dia. Between transition fittings and customer's kitchen which would include NPT threading of pipes, and jointing of fittings such as elbows, tees, connectors, regulators, meters, isolation valves etc., as per laid procedures and specification including supply of GI fittings & Teflon tapes for sealing of joints. Painting of GI Pipes & fittings as per specification.
- 2.7 Supply & Installation of Copper pipes of ½" (12 mm) OD from the downstream of Meter up to the isolation valve prior to the customers appliance, including the installation of isolation valves, brass fitting at the downstream of meters and at the entry of isolation valves with application of lacquer paint etc. to the satisfaction of EIC.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 26 OF 229

- 2.8 Supply & Installation of clamps for fixing pipes, isolation valve, appliance valve, box for regulator, Sleeves wherever required, painting of steel pipes & fittings. Providing consumables grout material, repair / restoration of walls / floors / holes including the materials required for conversions along with tools and tackles etc., complete as per specification.
- 2.9 Conversion of all types of LPG kitchen appliances to NG based appliances inclusive of supply of nozzles. Signing of Joint Meter Records (JMRs).
- 2.10 To demonstrate to the customer regarding use, safety and maintenance related aspects of NG based appliances and installations.
- 2.11 Testing & Commissioning of installations including purging as per specification and handing over the installation of BGCL / customer to the entire satisfaction of BENGAL GAS COMPANY LIMITED. / LEPL.
- 2.12 Dismantling of scaffolding / temporary structures and cleaning of site.
- 2.13 Restoration of walls, flooring and other damages while executing the above ground installation.
- 2.14 Preparation and submission of above ground installation card for each house / commercial establishment indicating the list of materials used, reasons of not providing connections, testing pressure and date etc.. Deviation statements, if any, on completion / commissioning of work.
- 2.15 Any other activity 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 BGCL.
- 2.16 Following activities are also in contractor scope
- Receive customer's request and complaints logged
  - Carry out joint technical feasibility survey for request received.
  - Attend and resolve customer complaint

### **3.0 MATERIAL, LABOUR, PLANT AND EQUIPMENT**


#### **3.1 Owner's Scope of Supply (Free Issue Item)**

In order to speed up the project free Issue Materials (GI pipes, regulators and smart meters) shall be issued to the Contractor from the designated store(s) of BGCL. Contractor shall be responsible for lifting the free issue materials from Owner's storage point(s) and transporting the same to work site(s) at his own cost.

#### **3.2 Supplied by the Contractor**

The contractor has to supply all GI Fittings, PE valves, Isolation valve, appliance valve Suraksha hose, Fittings, Clamps, Cu pipes and fittings, sleeves, supports etc. and other materials required for said works.

The contractor shall provide the labour, tools (such as Hammer Drill, Piston Drill, Pipe cutters, Dies for threading, Pipe wrenches, spanners, all types of clamps, Plant and equipment necessary for the proper execution of the work. This will include but not be limited to list of specialized tools & tackles enclosed herewith. Contractor shall submit the specification of all the material to be supplied by him to EIC for approval and get the material checked & approved by him before commencement of execution.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 27 OF 229</b>	



- 2.8 Supply & Installation of clamps for fixing pipes, isolation valve, appliance valve, box for The contractor is to be procure all bought out items from approved vendors and accordingly keep BGCL / LEPL informed. The inspection of bought out items would be carried out by BENGAL GAS COMPANY LIMITED. / LEPL / Third Party Inspection or as instruction by EIC.

### 3.2.1 Plant and Equipment

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.

### 3.2.2 Sealant, grout

The contractor shall be responsible to arrange the supply of any consumable sealant or ready mix grout material required for execution of work. 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.

### 3.2.3 Clamps, Rawal Plugs, Screws, Nozzles etc.

The Clamps, Rawal Plugs, Screws, Nozzles, etc shall be approved lot wise by EIC prior to installation. Re-drilling of existing appliance nozzles is strictly not permitted. The indicative sketch of the Brackets for Meter and GI Pipe Clamps is enclosed herewith.

### 3.2.4 Consumable Items

Special consumables such as Teflon Tapes, Solder wire, Flux, lacquer, thinner, shall be supplied by the contractor and are included for within the rates. These consumables shall be of reputed companies and required grades / class and duly approved by EIC.

### 3.2.5. Other Materials

The contractor shall supply the following items where required.


All materials required for formwork, NPT threading, testing etc. All signs, barricades, lights and protective equipment.

All material required for working at higher floor levels (i.e., scaffolding, Ladder, safety belts etc.).Special consumable such as grease for maintenance of domestic appliances and all paints or painting of G.I pipes, clamps, sleeves, brackets for meters, consumables such as Teflon Tapes, Petrol, diesel, fuels and oils required are to be supplied by the contractor and are included for 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.

## 4.0 Acquisition, Receipt. & Storage Of Materials

In case of materials supplied by owner, than the contractor shall collect all materials from BGCL store between working hours following all documentation procedures laid down and as directed by EIC. The contractor shall at the time of receipt of material physically examine all materials and notify the EIC immediately of any damage. Any damage not recorded at the time of inspection done by contractor will be deemed not to have existed at the time of receipt of material . Cost of repair, rectification , replacement will be borne by the contractor. Any defective material found during the time of installation will noted and forwarded to stores for replacement immediately

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 28 OF 229	

no defective material shall be returned to store at the time of closure of contract .

The contractor shall maintain permanent locked store preferably near site in so that all the material are stored in such a manner so as to prevent and damage to the materials from scratching , gouging , indentation , excessive heat or by contact with any sharp objects and chemicals.

The contractor shall maintain log book at their respective stores stating issue and availability of free issue material as a given day. Further the contractor is required to undertake and submit an inventory of materials every month to Owners/Owners Representative (mandatory)

## **5.0 ISSUE OF WORK INSTRUCTIONS**

- 5.1 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 the sketch enclosed herewith, for reference. It may vary in case of individual and multi-storied flats. A general scheme of distribution to small commercials consumers is indicated in the sketch enclosed herewith for reference.
- 5.2 All skilled personnel like plumbers, conversion technicians shall be approved and certified by EIC. Those who are certified and possess the identify cards duly signed by EIC shall only be authorized to take up respective jobs. The contractor has to arrange the identify cards. 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.
- 5.3 The rates to be quoted by contractor shall be inclusive of all preparatory / bye works, platforms, materials, labour, skills , 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.
- 5.4 The schedule of items of SOR have been described in brief and shall be held to be complete in all respect including safety requirements as per clause 9.0, 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.
- 5.5 A general scheme of distribution to domestic consumer is indicated in enclosed drawing .It may vary in case of individual and multi-storied flats.


## **6.0 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.

Weekly progress reports shall be submitted in the formats approved by LEPL/ BGCL indicating broadly the laying, testing, RFC, conversions and extra piping.

Material consumption statement to be submitted once a month.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 29 OF 229</b>	

## **7.0 WORK SHEETS**

- 7.1 The quantities and other details will be checked by LEPL/ BENGAL GAS COMPANY LIMITED.'s site engineer and the same shall be incorporated in measurement cards, signed & dated as certified on site. The cards will then be approved by the EIC.
- 7.2 Measurement sheets shall be prepared based on the measurement cards and checked and certified by the site engineers for billing purpose.
- 7.3 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 approval from all applicable authorities and any other concerned authority, if required for completion of the work. Contractor must take the prior appointment from the resident for carrying out the work.

## **9.0 REFERENCE SPECIFICATION. CODES AND STANDARDS**

The contractor shall carry out the work in accordance with this specification, BGCL's Engineering Standards: ASME B31.8 - Gas Transmission and distribution piping systems; Australian standard 3723 - Installation and Maintenance of Plastics Pipe Systems for Gas; Oil India Safety Directorate Norms(OISD),Latest PNGRB guidelines and the American Gas Association Document - Purging Principles and Practice.

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.

## **10.0 SAFETY**

The contractor shall take care of all safety norms applicable for such works at site. Contractor shall provide all safety appliances e.g., safety helmets, gloves, safety belts, ladders, staging, shoes, goggles etc.

All necessary care shall be taken while working at heights and workmen with proper skills and work permits only shall be deployed. Proper barricading and warning signs shall be installed. Adequate care shall be taken while taking supports from balconies, chajjas / protection parapets and like structures to be sure of strength and adequacy of the same.


No night working shall be permitted, without proper lighting and prior approval of EIC.

## **11.0 RIGHT-OF-USE SURVEY AND MARKING**

The route of the pipeline to be installed shall be decided with consent of the consumer and SE / EIC. Contractor must ensure that the persons/ workers/ supervisors/workers 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 and 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 landowners and tenants and shall be responsible for all damages caused by the construction and use of such

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 30 OF 229	

approaches, pavements, gardens, rooms, walls, roof etc., at no extra cost to BENGAL GAS COMPANY LIMITED..

A survey will be conducted jointly by BENGAL GAS COMPANY LIMITED. / LEPL and the contractor at each premises or housing colony to be supplied. 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 a 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. BENGAL GAS COMPANY LIMITED. will not be responsible for any time lost due to broken appointments or disputes with customers.

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

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 LEPL/BGCL necessary to protect the public.

## **12.0 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.

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 is to immediately make good to original.

## **13.0 G.I ABOVE GROUND SERVICE PIPE**

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 customer's appliance, including the installation of appliance valve and isolation valves, Suraksha hose, Meters, Regulator. The contractor shall be required to provide all equipment, tools and materials necessary to execute the work in an efficient and effective manner. Amongst other things he will be required to provide ladders, scaffolding pipe, dies, tripods, vices, fittings and teflon tape, drills for concrete and other masonry, drills for timber and laminated surfaces inside customer's property, bending tools, clamps, sleeves to facilitate the pipe passing through floors and walls, paint for pipe marking etc. GI pipes and regulator shall be provided by BENGAL GAS COMPANY LIMITED.

All GI risers on the outside of buildings shall be fully supported to carry the weight of piping. Risers shall be supported by a flanged foot, or similar device, capable of supporting the total weight of the riser. The riser shall rise 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 ASME / ANSI B1. 20.1.

Contractor has to supply different types / sizes of approved clamps (Mild Steel) for fixing GI pipes suiting to the site conditions and the same shall be painted before fixing, as per the painting specifications. Every fresh lot of the clamps, brackets, regulators boxes and other consumables shall be approved by the EIC prior to start of installation. All riser and lateral pipe shall be clamped to the building at intervals not exceeding two meters.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 31 OF 229

All riser and lateral pipe shall be clamped to the building at intervals not exceeding 1.5 meter. 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 and wall shall be 25 mm. The joints/fittings of the GI installations shall be painted only after carrying out testing of the installation.

Where pipe passes through a balcony floor, the floor surface shall be made 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 are in contractor's scope. Contractor has to take prior approval for design of clamps, paintings etc.

Pipe shall preferably enter a building aboveground and remain in a ventilated location. The location for entry shall be such that it can be routed to the usage points by the shortest practicable route.

The contractor shall ensure that gas supply shall not be provided to the customer in any concealed piping.

#### **14.0 COPPER ABOVE GROUND SERVICES PIPE**

The Copper service pipe installation work includes all work necessary to connect from the downstream of Meter upto the isolation valve and flexible hose prior to the customers appliance, including the installation of valves, including application of lacquer paint etc. The contractor shall be required to provide all equipment, tools and material necessary to execute the work in an efficient and effective manner. Amongst other things he will be required to provide ladders, scaffolding pipe, drills for concrete and other masonry, drills for timber and laminated surfaces inside customers property, bending tools, clamps, sleeves to facilitate the pipe passing through floors and walls, etc.

During installation the COPPER pipe is to be cut to proper length with a 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 and lacquering.


Lacquer is to be applied to the copper tubes by mixing lacquer with thinner in approved proportions and applied by dipping method or with brush. It should be applied only once at a time and drying time of minimum one hr. is to be given.

Contractor has to supply different types / sizes of approved clamps for fixing COPPER pipes suiting to the site conditions and the same shall be painted, if required, before fixing, as per the painting specifications.

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.

All riser and lateral pipe shall be clamped to the building at intervals not exceeding one meter.

Where pipe passes through a balcony floor, the floor surface shall be made 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 COPPER pipes is in

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 32 OF 229	

contractor's scope. Contractor has to take prior approval for design of clamps, painting etc.

Pipe shall preferably enter a building aboveground and remain in a ventilated location. The location for entry shall be such that it can be routed to the usage points by the shortest practicable route.

The rates, mentioned in SOR are applicable from ground floor to 2nd floor. However, it may be noted that all the piping done inside the premises shall be considered as ground floor piping, the payment for such work shall be as per the SOR. After installation of the entire piping system, final painting shall be done to the satisfaction of EIC.


All copper piping shall be clamped to the building at intervals not exceeding 500mm. These solder wire shall be of reputed company, lead free as per BS 29453: 1994 (Soft solder alloys) and supplied in coils. Solder for use with Cu tube & fittings generally melt within the temperature range of 180°C to 250°C. The contractor has to furnish the certificate of confirmation of standards before start of work.

## **15.0 TESTING OF GI INSTALLATION**

- 15.1 The installation from PE/ GI transition fitting up to regulator shall be tested at the [pressure of 6.0 bar (g)].
- 15.2 The testing of GI riser pipe up to regulator shall be done with the isolation valve in open condition and open end plugged.
- 15.3 The GI pipe shall be painted with one coat prior to installation in riser, however the ends / joints shall be painted only after carrying out testing of the installation.
- 15.4 The GI installation from regulator outlet to appliance valve (except meter) shall be tested at a pressure of 2.0 bar (g) for a hold period of 4 hours and all the joints shall be checked with soap solution.
- 15.5 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 and got approved by EIC. For the installation to be tested by manometer or diaphragm gauge the meter shall not be dismantled/removed and testing shall be carried out at 100 m bar with holding period of 15 min with no pressure drop.
- 15.6 The calibrated pressure gauges of suitable range shall be supplied by the contractor for testing.
- 15.7 The pressure gauges shall be calibrated from time-to-time as desired by Engineer In-charge but positively once in every six months.
- 15.8 Valves supplied by BENGAL GAS COMPANY LIMITED., shall not be used for testing purpose.
- 15.9 The details of testing shall be properly recorded in the measurement cards.

## **16.0 INSPECTION**

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

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 33 OF 229	



## 17.0 **PURGING & COMMISSIONING**

Payment for the tapping of live mains and GI piping prior to the actual purge is included in normal laying & testing. The connection may involve the fitting of a temporary bypass, disconnection etc.

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

In addition the contractor shall submit and have approved Purging Plan 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 adapter, Purge stack with flame trap and gas sampling point, Gas sampling equipment (may be gas leak detector), squash-off tool, Polyethylene connecting pipe work etc.

The plan shall also include the purging process along with detail on the sequence of events. The process is to also specially / mention the need to lay a wet cloth over the GI pipe and in contact with the ground, to disperse static electricity during the purging work.

A purging 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.


The purging work 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 that all appliance connections are gas tight, all appliance gas valves are turned off and there are no open ends.
- Where possible, select an appliance with an open burner at which to commence the purge i.e., a hotplate burner.
- Ensure the area is well ventilated, and free from ignition sources.
- Ensure branches that do not have an appliance connected are fitted with a plug or cap.
- Turn on one burner control valve until the presence of gas is detected. A change in the audible tone and smell is a good indication that gas is at the burner. Let the gas flow for a few seconds longer, then turn off and allow sufficient time for any accumulated gas to disperse.
- Turn on one gas control valve again and keep a continuous flame at the burner until the gas is alight and the flame is stable.
- Continue to purge until gas is available at other appliances.

## 18.0 **INSTALLATION OF METERS**

The work in this section includes :

- 18.1 Installation of domestic and non-domestic / small commercial meters with associated inlet and outlet connections (GI/Brass fitting), on the wall with approved meter

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 34 OF 229	

brackets and angles.

- 18.2 Supply of approved meter brackets and angle brackets, properly painted with one coat of Zinc primer and two coats of synthetic enamel paint of approved make. A sketch of the brackets is enclosed herewith. It is required that one sample of each type of bracket is got approved beforehand.
- 18.3 Firmly securing the meters on the wall with good quality supply of proper rowel plugs, screws etc. In case the rowel plugs are not holding than wooden blocks or other fixing arrangements like cement etc. to be used for proper grouting.
- 18.4 The same rates of SOR Item 7.3 will apply irrespective of whether the meter is situated inside or outside the property. Where a bank of meters is constructed the rate shall be for each complete meter installed.
- 18.5 The above activities along with restoration of the area to original shall be carried out to the complete satisfaction of consumer and EIC.
- 18.6 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 installation will not be provided in any fixed enclosures, cabinets (below or above the slab) or confined space in the customer premises.
- 18.7 The contractor shall ensure that GI installation and rubber hose shall not be exposed to direct heat of Gas burners. The installation should have minimum clearance of about 1 m from electric [point mains and switches. Minimum distance between appliance valve and Gas Burners shall be 0.3 meters. The isolation valve shall be installed after entering the customer premises /kitchen but before the meter installation.

#### **19.0 PAINING OF GI PIPES**


The pipeline along with fittings and clamps are to be painted after proper surface preparation and painting as follows.

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, Nerolac.

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. Paint formulations without certificates are not acceptable.

Engineer-in-Charge at his discretion, may call for tests for paint formulations. Contractor shall arrange to have such tests performed including batch wise test of wet paints

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 35 OF 229	



for physical & 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.  
After installation of the entire piping system, final touching shall be done to the satisfaction of EIC.

## **20.0 BOX FOR REGULATOR**

Boxes will be supplied and installed outside for regulators after due approval of the sample. The boxes will be installed as per requirement and as per instructions of BENGAL GAS COMPANY LIMITED.

The box brackets are to tightly secured to the wall with good quality proper Rowel plugs, screws etc. Wooden blocks to be used in case rowel plugs, do not hold properly.

All the boxes shall be thoroughly cleaned, painted with approved colour code.  
As the boxes are installed outside it is to be ensured that they are painted properly to avoid rusting / weathering.

A sketch of regulator box is enclosed herewith.

## **21.0 CONVERSION OF DOMESTIC APPLIANCES**


The work in this section includes,

- The changing of nozzles and associated controls in accordance with manufactures instructions for both domestic and imported burners/ovens/grills/hotplate.
- The changing of old appliance connection hoses and nozzles and re-greasing taps as necessary.
- The contractor has to supply all types of nozzles / jets required for all types of appliances including imported burners, Grills, Ovens.
- Cleaning and performing minor maintenance of appliances.
- Testing for gas escapes and the soundness and performance of the appliance.
- Instructing the customer in the safe use of natural gas and for fixing of safety and conversion labels.
- Contractor must attend the complaints regarding appliances till the total area is handed over to BENGAL GAS COMPANY LIMITED.'s operation and maintenance.
- All consumables (Nozzles, greases etc.) are in contractor's scope.
- Changing or repairing of any items damaged during conversion.

It may be noted that the rates will apply to all appliance found in both domestic and commercial premises. The contractor will be required under the Rates to provide both Pin gauges and standard sized nozzles.

## **22.0 RESTORATION**

Contractor has to restore the area where ever 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 (PWD), contractor has to restore the area according to CPWD specifications. For government flats the contractor has to obtain a clearance certificate form the concerned authorities

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 36 OF 229	

maintaining the flats, after completion of the work.

Where slabs and brick work are to be reinstated, the level of the compacted sub base is to be adjusted according to the slab / block thickness. The slabs or brick work should be laid on moist bedding material, which should be graded sand, mortar or mortar mix. The slabs or brick work should be tapped into position.

The restored slabs or brick work 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 replaced 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 and proper. Where the required standards are not achieved the contractor will be required to replace the defective reinstatement work.

Note that Payment for GI / Copper piping will only be authorized on satisfactory restoration, and where the sites has been cleared of all surplus materials etc.,

### **23.0 SUBMISSION OF FINAL RECORDS**

Contractor shall submit the following documents in three sets each:

- a) Total list of houses & commercial establishments in the area allotted to him giving details of connections provided & reasons where connection could not be given / completed.
- b) The details recorded in measurement cards of every domestic house.
- c) Details of houses where extra piping done along with materials used.
- d) Total material consumption report.
- e) Material reconciliation with respect to the materials issued.
- f) Test reports & test certificates of gauges etc.
- g) Any other documents / records required.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.	REV
052-LEPL-BGCL-001	A
SHEET 37 OF 229	

# TECHNICAL SPECIFICATION FOR HDPE PIPES



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India  
CONTENTS**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 38 OF 229</b>	

Sl.No. Description

- 1.0 INTENT OF SPECIFICATION
- 2.0 SCOPE OF WORK
- 3.0 INSTRUCTION TO THE TENDERER

**1.0 INTENT OF SPECIFICATION**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 39 OF 229</b>	

The intent of this specification is to establish minimum requirements to manufacture and supply of HDPE Pipes used for casing purpose of carrier pipe, supplying natural gas.

## **2.0 SCOPE OF WORK**

- 2.1 The scope of the tendered will include manufacture/ supply, inspection / testing / marking/ packaging/ handling and despatch of HDPE Pipes of ratings and grades as indicated in the Material Requisition & Schedule of Rates, as per IS:4984 (Specification for HDPE Pipes for water supply).
- 2.2 All codes and standards for manufacture, testing, inspection etc. shall be of latest edition.
- 2.3 Purchaser 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 INSTRUCTION OF TENDERER**

- 3.1 Length of the Pipes and their supply will be as per following :-

DN 50 – In each coils of 100 mtrs. Length  
DN 63 – In each coils of 100 mtrs. length  
DN 125 – Each pipe of 12 mtrs. length minimum  
DN 180 – Each pipe of 12 mtrs. length minimum  
DN 250 – Each pipe of 12 mtrs. length minimum  
DN 315 – Each pipe of 12 mtrs. length minimum

- 3.2 Protection

- i) The ends shall be protected by proper end caps to prevent from shocks and ingress of the foreign body.
- ii) Coils shall be covered by black PVC/PE Film to prevent exposure to direct sunlight.

- 3.3 The successful bidder shall submit following for approval of Purchaser /Consultant after placement of order

- a) The Quality Assurance Plan (QAP & Sampling Plan)  
b) Material test report as per clause 5 of IS:4984.  
c) Performance Requirements (clause 8 of IS:4984)  
d) Type Test (clause 9.1 of IS:4984).

- 3.4 The bidder shall submit following documents at the time of bidding,

- a) BIS Certification  
b) List of current orders in hand for similar items with full details such as specification, name of purchaser etc.  
c) Details of the largest supply executed  
d) Name and address of proposed test laboratories along with their credentials/ past records for carrying out all required tests.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001


A

SHEET 40 OF 229

**TECHNICAL SPECIFICATION  
FOR  
MEDIUM DENSITY POLYETHYLENE FITTINGS  
AND  
ELECTRO-FUSION FOR NATURAL GAS DISTRIBUTION**




**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 41 OF 229</b>	

## CONTENTS

<u>Sl.No.</u>	<u>Description</u>
1.0	SCOPE AND FIELD OF APPLICATION
2.0	EQUIPMENT
3.0	SYMBOLS & DEFINITIONS
4.0	DESIGNATION
5.0	DESIGN
6.0	ELECTRICAL CHARACTERISTICS
7.0	DIMENSIONAL
8.0	PERFORMANCE REQUIREMENTS
9.0	MARKING
10.0	PACKAGING
<b>1.0</b>	<b><u>SCOPE AND FIELD OF APPLICATION</u></b>
2.0	This specification elaborates the requirements for Electro fusion fittings in the nominal size range 20 to 125 mm made from PE compound used with PE pipes for supply of natural gas and to be used at operating temperature not more than 40°C. The material grades to be used are PE 100. The fittings shall be black in colour.
	<b>Electro Fusion Fitting Jointing</b>
1.1	For Electro Fusion fitting jointing an electrical resistance element is incorporated in the socket of fitting which when connected to an appropriate power supply, melts and fuses the materials of the pipe and fitting together.
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 surface are clean. If ovality causes gap between concentrically located pipe and the fitting to exceed 1% of the pipe OD after re-rounding 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.
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.
1.4	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.
<b>2.0</b>	<b><u>EQUIPMENT</u></b>
2.1	The control box input supply is 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%, -

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 42 OF 229</b>	



10% between no load and full load . Control box are to include safety devices to prevent excessive voltages being present at the control box output. The safety devices shall operate in less than 0.5 s.

Note that extension leads are not to be used on the control box outlet connections.

Warning : Control boxes are not intrinsically safe and must therefore not be taken to trench.


A mechanical pipe surface preparation tool is to be used before fusion is attempted. The tool is 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 0.2-0.4 mm thick form 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.

## 2.2 Electro Fusion Jointing Method / Procedure Preparation

- Ensure there is sufficient space 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.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 43 OF 229	

- Wipe pipe ends clean lint free material to remove traces of dirt or mud
- Mark the area over which the oxidized pipe surface is to be removed i.e. by placing the socket of the bagged fitting along side 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.
- Check that 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 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 scrapped 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 that while Iso-propanol is a suitable cleaner , its use is subject to local health and safety regulation.**

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 centre stop

Using the pipe clamps , secure the pipes so that they cannot move during the fusion cycle .  
Check that the pipes ends and the fitting are correctly aligned.

Connect the control box 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 as shown on the control box display.

**Note 1 : Automatic control box are available which obviate the need to enter the fusion time**


**Note 2 : Gloves and goggles should be worn during the fusion process**

**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 / cooling of joint at Ambient temperature of the first attempt.**

**2.3.1 Records :** Records of appropriate servicing and calibration shall be kept.

**2.3.2 Training :** It is necessary that operators , inspection and supervisory personnel acquire the skills of Electro-fusion fitting .The necessary training should be carried out by qualified instructor with the objective of enabling participants to

- Understand the principles of electro-fusion fitting jointing
- Identify pipe and appropriate fitting markings

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 44 OF 229</b>	

- Carry out pre jointing machine and equipment checks
- Make satisfactory Electro-fusion joints from pipes and fittings of different sizes
- Inspect for and identify joints of acceptable

**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.**

## 2.4 Electro-Fusion Saddle Jointing

For Electro Fusion fitting jointing an electrical resistance element is incorporated in the socket of fitting which when connected to an appropriate power supply, melts and fuses the materials of the pipe and fitting together.

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 surface are clean.

Method of holding the tapping tee saddle during the fusion cycle are used namely top loading and under clamping space around the pipe . In a trench a minimum clearance of 150 mm is required.

## 2.5 Electro-Fusion Saddle Jointing Method / Procedure

### Preparation

Expose the pipe onto which the aping tee is to be assembled, ensuring there is sufficient clear space around the pipe . In a trench a minimum clearance of 150mm 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 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.

Remove the surface of the pipe to a depth of 0.2 to 0.4mm 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.

Check that reset stop button if fitted on the control box is in the correct mode.

Remove the fitting from its packing and clean the scrapped 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 that while Iso-propanol is a suitable cleaner , its use is subject to local health and safety regulation.**

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 scrapped pipe.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 45 OF 229	

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 have 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 as shown on the control box display.

**Note 1 : Automatic control box 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 proceedings 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 joints 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 any 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**

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.

Do Not attempt to tap the main with the integral cutter for at least 10 minutes after the completion of cooling cycle .

**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.**

## **2.6 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 fitting 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

## **2.7 SQUEEZE - OFF**

- a. 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.
- b. As will be seen the squeeze-off equipment comprises two bars to apply pressure to 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



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 46 OF 229

and lower walls meet.

- c. 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.
- d. 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 shape after squeezing but there will be reduction in some pressure bearing properties.
- e. A complete stop may not always be obtainable because of wrinkling of the inside of the pipe. If a complete stop is required than a second squeeze can be used, with an intermediate vent to remove the gas which passes the first squeeze from say the trench of three pipe diameters area. A second squeeze – off procedure should be a minimum of three pipe diameters and right angles to the squeeze.
- f. 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 squeezing operation.

## 2.8 BENDING – BACK

Bending back of the pipe may be performed where the pipe has been served damaged and stopping they gas flow is imperative. Its application is of a temporary nature and will provide a relief until a permanent repair can be affected. The section of pipe, which has been bent back, will to be replaced because of the damage caused by the serve ness of the band back operation. The need of 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 the service may be achieved by opening upon an installed saddle tee and winding down the internal tapping tool to shut off the flow to the service pipe.

## 3.0 SYMBOLS & DEFINITIONS

### 3.1 Symbols for Electro fusion Fittings

#### 3.1.1 Symbols for Electro fusion Socket Fittings

The dimensions and main symbols used in this part of ISO 8085 are shown in figure 1, where


D1 is the mean inside diameter in the fusion zone comprising the mean inside diameter measured in a plane parallel to the plane of the mouth at a distance of  $L3 + 0.5 L2$  from the plane at the mouth.

D2 is the minimum bore comprising the minimum diameter of the flow channel through the body of the fitting.L1 is the depth of penetration of the pipe or of the male end of a spigot fittings. L2 is the nominal length of the fusion zone corresponding to the heated length.

L3 is the nominal unheated entrance length of the fitting comprising the distance between the mouth of the fittings and the near end of the fusion zone.

#### 3.1.2. Symbols for Electrofusion Tapping Tees

The main symbols used for tapping tees are shown in Figure 2, where. **h** is the height of the service pipe and comprising the distance between the axis of the main pipe and the axis of the service pipe.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 47 OF 229	

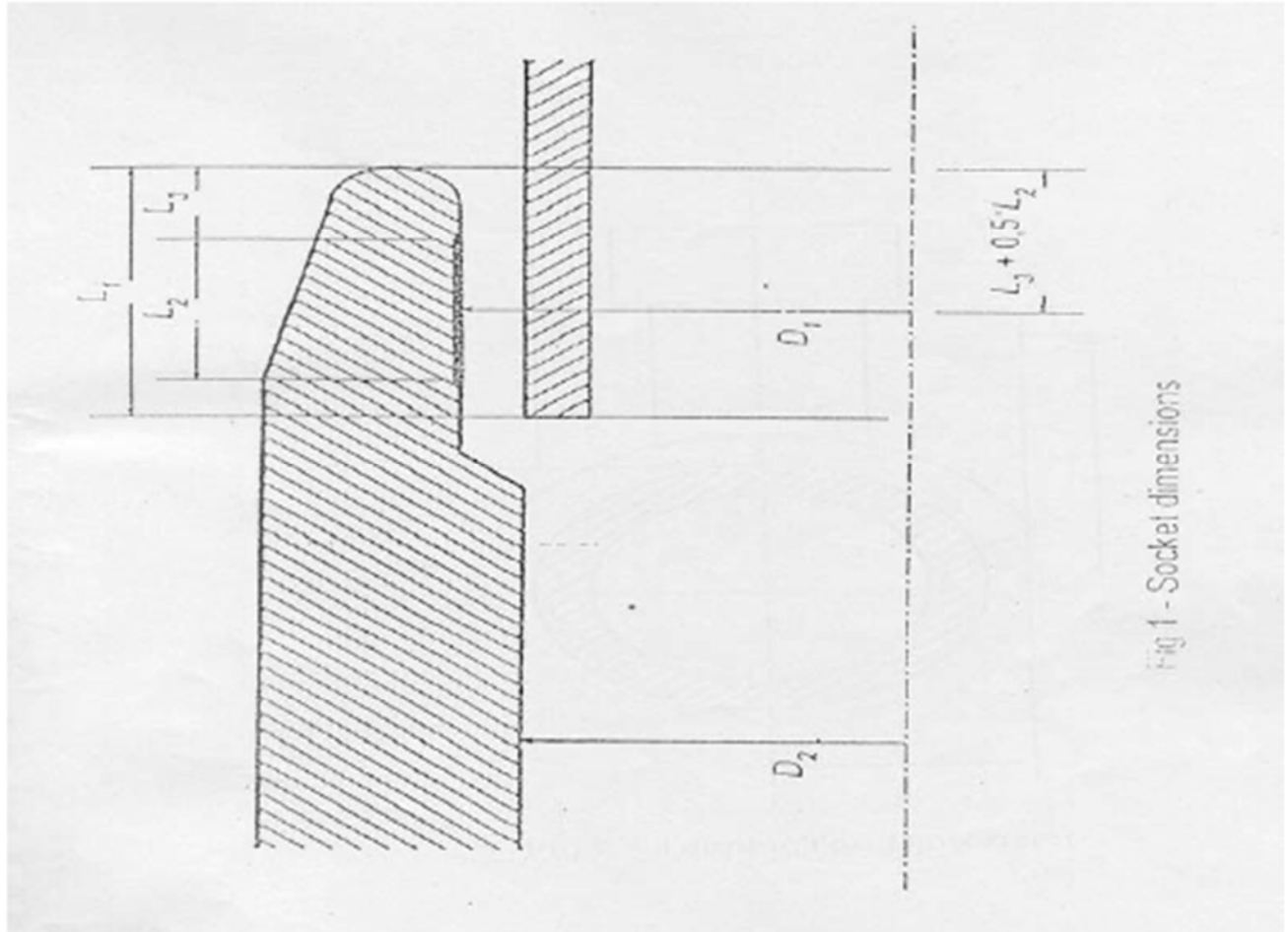


Fig 1 - Socket dimensions



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

DOCUMENT NO.	REV
052-LEPL-BGCL-001	A
SHEET 48 OF 229	

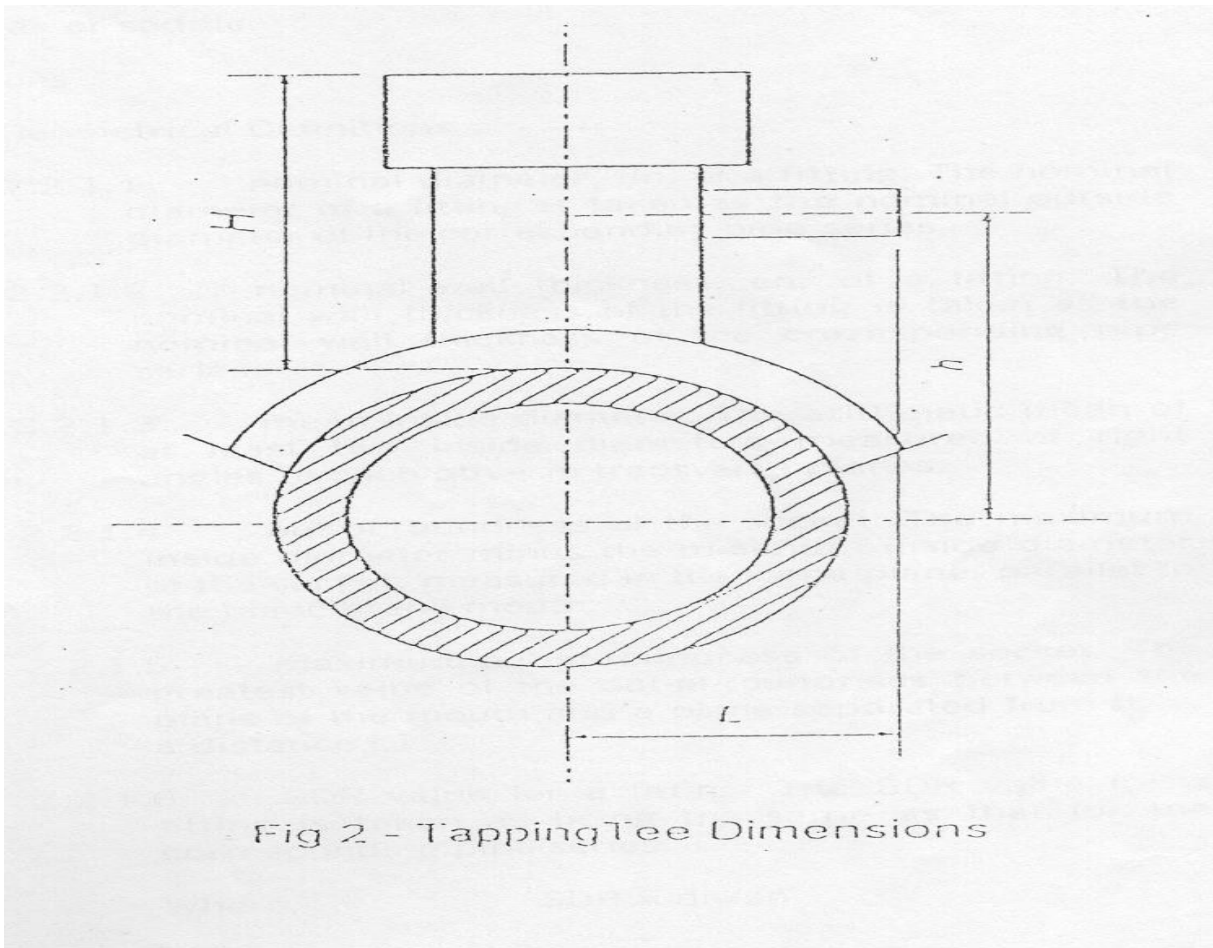


Fig 2 - Tapping Tee Dimensions

**L** is the width of the tapping tee and comprising the distance between the axis of the main pipe and the plane of the mouth of the service pipe.

**H** is the height of the saddle which comprises the distance from the top of the main to the top of the tapping tee or saddle.

### 3.2 Definitions

#### 3.2.1. Geometrical Definitions

##### 3.2.1.1 Nominal diameter, $d_n$ , of a fitting:


The nominal diameter of a fitting is taken as the nominal outside diameter of the corresponding pipe series

##### 3.2.1.2 Nominal wall thickness, $e_n$ , of a fitting:

The nominal wall thickness of the fittings is taken as the nominal wall thickness of the corresponding pipe series.

##### 3.2.1.3 Mean inside diameter:

The arithmetic mean of at least two inside diameter measured at right angles to each other in transverse planes.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 49 OF 229	



3.2.1.4 Out of roundness of the Socket:

The maximum inside diameter minus the minimum inside diameter of the socket, measured in the same plane, parallel to the plane of the mouth.

3.2.1.5 Maximum out of roundness of the socket:

The greatest value of the out of roundness between the plane of the mouth and a plane separated from it by a distance L1.

3.2.1.6 SDR value for a fitting:

The SDR value for a fittings is taken as being the same as that for the corresponding pipe series.

Where, SDR = dn/en

3.2.1.7 Wall thickness, E of a fitting:

The wall thickness of a fittings at any point of the body of the fitting which could be submitted to a stress induced by the pressure of the gas in the piping system.

**3.2.2 Material Definition**

3.2.2.1 Virgin Material :

Materials in form such as granules or powder that has not been subjected to use or processing other than that required for its manufacturer and to which no re-processable or recyclable materials have been added.

3.2.2.2 Own Reprocess able Material :

Material prepared from rejected unused pipes, fittings or valves, including trimmings from the production of pipes, fittings or valve, that will be reprocessed in a manufacturer's plant after having been previously processed by the same manufacturer by a process such as injection molding or extrusion.

3.2.2.3 Compound:

A homogenous mix of base polymer (PE) and additives, i.e. antioxidants, pigments, UV-stabilizers and others..., at a dosage level necessary for the processing and of components of this standards. The additives shall not have a negative influence on the performance with respect to feasibility. All additives shall be uniformly dispersed.

**3.2.3 Definition related to Material Characteristics**

3.2.3.1 Lower Confidence Limit (LCL):

A quantity with the unit in mega Pascals (MPs), which can be considered as a property of the material representing the 97.5% lower confidence limit of the predicted long-term hydrostatic strength at a temperature 20° C for 50 years in water.

3.2.3.2 Overall Service (Design) Coefficient (C):

An overall coefficient with a value larger than 1.0 which takes into consideration service conditions as well properties of the components of a piping system other than those represented in Icl. For gas applications, C can have any value equal to or greater than 2.0.

3.2.3.3 Minimum Required Strength (MRS):

The value of the Icl rounded down to the next lower value of the R 10 series when the Icl



is less than 10 Mpa, or to the next lower value of the R 20 series when the Icl is greater than or equal to 10 Mpa.

Note: R10 and R 20 series are the Renard number series according the ISO 3 and ISO 497.

3.2.3.4 Melt Mass Flow Rate (MFR): A value relating to the viscosity of the molten material at a specified temperature and rate of shear.

**3.2.4 Definitions Related to Service Conditions**

3.2.4.1 Gaseous Fuel:

Any fuel which is in the gaseous state at a temperature of + 15° C and a pressure of 1 bar.

3.2.4.2 Maximum Operating Pressure (MOP)

The maximum effective pressure of the gas in the piping system, expressed in bar, which is allowed in continuous use. It takes into account the physical and the mechanic characteristics of the components of a piping system.

$$20 * MRS$$

Note : It is given by the equation : MOP = -----

$$C*(SDR-1)$$

**3.2.5 Definition on Design of Electro fusion Fittings:**

3.2.5.1 Electrofusion Socket Fitting:

A polyethylene (PE) fittings which contains one or more integral heating elements, that are capable of transforming electrical energy into head to realise a fusion joint with a spigot – end or a pipe.

3.2.5.2 Electrofusion Saddle Fitting:

A polyethylene (PE) fitting (top loading or wrap around) which contains one or more integral heating elements, that are capable of transforming electrical energy into head to realise a fusion joint onto a pipe.

3.2.5.3 Tapping Tee:

An Electro fusion saddle fitting which contains an integral cutter, to cut through the pipe wall. The cutter remains in the body of the saddle after installation.

3.2.5.4 Branch Saddle:


An Electro fusion saddle fitting which requires an ancillary cutting tool for drilling a hole in the adjoining main pipe.

3.2.5.5 U Regulation :

Control of the energy supplied during the fusion process of an Electrofusion fitting, by means of the voltage parameter.

3.2.5.6 I Regulation:

Control of the energy supplied, during the fusion process of an electrofusion fitting by means of the current parameter.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 51 OF 229	

#### 4. **DESIGNATION**

4.1 Fittings shall be designed according to the grade of material, nominal diameter and Standard Dimension Ratio (SDR).

#### 4.2 **Grade of Material:**

4.2.1. Fittings shall be classified according to the grade of material as given in following table:

Table-1

Material	M.R.S. Mpa	1 cl (20° C, 50 Yrs 97.5%) Mpa	Maximum Allowable Operating Pressure
PE 80	8.0	$8.00 \leq 1 \text{ cl} \leq 9.99$	5.5 Bar
PE 100	10.0	$10.00 \leq 1 \text{ cl} \leq 11.19$	7.0 Bar

PE 100 grade shall be utilized in the project

#### 4.3 **Nominal Diameter**

The Nominal Diameter for fittings covered in this standard are 16, 20, 25, 32, 40, 63, 75, 90, 110, 125, 140, 160, 180 mm.

#### 4.4 **Material**

4.4.1 Polyethylene Compound:

The Polyethylene compound used in the manufacture of fitting shall be a cadmium free compound. It shall be free from visible water, shall comply with the requirements as specified in Table – 2.

Table-2 : Characteristics of PE Compound

Characteristics	Units	Requirements	Test Parameters	Test Method
Conventional Density	Kg/m <sup>3</sup>	≥ 930 (base polymer)	23 °C	ISO 1183 - ISO 1872/1
Melt Mass-flow Rate	g/10 min	± 20% of value nominated by compound producer	190 °C condition 18	ISO 1133
Thermal Stability	Minutes	> 20	200 °C (2)	ISO TR 10837
Volatile Content at Extrusion	mg/kg	≤ 350		ISO 4437 Annex. A
Water Content (3)	mg/kg	≤ 300		ASTM D 4019
Carbon Black Content	% (m/m)	2,0≤.....≤ 2,5		ISO 6964
Carbon Black Dispersion (4)	Grade	≤ 3		ISO DIS 11420
Pigment Dispersion (5)	Grade	≤ 3		ISO DIS 13949



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV

A

SHEET 52 OF 229

Resistance to Gas Constituents	h	≥ 20	80 °C 2 Mpa	ISO 4437 Annex. B
Resistance to rapid crack propagation (RCP) (6)	Mpa	The critical pressure in the FS test shall be greater than or equal to the value of the MOP of the system multiplied by 1:5	0°C	ISO DIS 13478
Full Scale (FS) test : d ≥ 250mm				
Or S4 Test : in principle according to all diameters (7)	Mpa	The critical pressure in the S4 test shall be equal to or greater than the value of the MOP of the system divided by 2,4 (8)	0°C	ISO DIS 13477
Resistance to slow crack growth en> 5mm	h	165	80 °C, 8,0 bar (f) (9) 80 °C, 9,2 bar (f) (10)	ISO DIS 13479


- 1) Non black compound shall conform to the weathering requirements to ISO 4437.
- 2) Test may be carried out at 210°C providing that there is a clear correlation to the results at 200°C, in case of dispute the reference temperature shall be 200°C
- 3) Only applicable if the compound does not conform to the requirement for volatile content. In case of dispute the requirements for water content shall apply
- 4) Carbon black dispersion for black compounds only.
- 5) Pigment dispersion method for non-black compounds only.
- 6) Only applicable for fittings which incorporate extruded pipe elements.
- 7) Shall be performed on pipe with a wall thickness of ≥15 mm.
- 8) This factor 2.4 is still under study and may be subject to change. If the requirement is not met, then retesting by using the Full Scale (FS) test shall be performed.
- 9) Test parameter for PE 80.
- 10) Test parameter for PE 100.

## 5.0 **DESIGN**

- Fittings shall be designed for system operation at the pressures given in Table – I.
- Fittings shall be free from cracks, voids, blisters, distortion, dent or other defects.
- Fittings shall be capable of being fusion jointed to pipes using control boxes. The fittings shall exhibit the strengths and fusion compatibility with, pipes of respective sizes.
- Each fitting shall be bar coated and shall have a permanent fusion indicator.
- Heating coil design shall be such that it should not be damaged during assembly leading to short circuit of heating coil.

### 5.1 **Electro-fusion Socket Fittings**

Electro-fusion Socket Fittings shall incorporate a method of controlling pipe penetration within each socket. The inner cold zone of each socket shall not be less than (0.1 d + 5) mm

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 53 OF 229</b>	

for sizes up to 125 mm & 0.1 d for sizes greater than 125 mm.

## 5.2 Tapping Tees

Tapping tees shall be capable of installation by a force between 1 kN and 1.5 kN applied from above and on the centerline of the tapping tees stack. The tapping tees shall provide a means of cutting through the pressurised main pipe and allowing the gas flow into the outlet pipe.

## 5.3 Transition Pieces

To make connection between steel pipe and MDPE pipe specially fabricated transition pieces consisting of steel and MDPE pipes should conform to the requirements mentioned herein.

### 5.3.1 MDPE Pipe:

The MDPE pipe with one end plain should conform to the specification (IS:14885/ SDR 11)

### 5.3.2 Jointing between Steel and MDPE Pipes:

Steel and MDPE pipes should be so jointed in the factory so as to have a monolithic joint which is leak free and should be mechanically as strong or stronger than the PE Pipe.

## 6.0 **ELECTRICAL CHARACTERISTICS**

For each size and type of fitting, the manufacturer shall declare the nominal resistance of the heating element and specify the production tolerances.

The manufacturer shall demonstrate that satisfactory joint can be made using the extremes of these tolerances.

All fittings shall have mechanically shrouded male electrical terminals. The fittings terminals connections shall be suitable for use with voltage less than or equal to 48 volts. Considerations should be given to the design of the shroud with respect to impact damage. When hollow terminal pins are used, the hole at the top of the pin shall be less than 1 mm diameter. The terminal pin material shall be corrosion resistant and the surface finish shall be N7.

Fittings incorporation two electro fusion sockets shall have both sockets fused in a single operation. The heating elements shall be suitable designed to prevent short circuiting or local overheating / under heating during the fusion operation. Protective coating applied to the heating element shall not have a detrimental effect on the joint.

The heating element wire shall not be disturbed during assembly.

## 7.0 **DIMENSIONS**


### 7.1 Measuring Temperature

Fittings shall not be measured within 24 hrs. of manufacturer to allow for normalization. The fittings shall be measured at an ambient temperature of  $23 \pm 2^{\circ}\text{C}$ , after a conditioning period of 5 Hrs.

Methods of measurements shall provided the appropriate degree of accuracy, and the reference conditions specified in this clause 6 apply in case of disputes in dimensional measurement.

### 7.2 Dimensional Stability

#### 7.2.1 Couplers (Including all forms of socket fittings)

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 54 OF 229	

All coupler dimensions shall conform to their specified value when the fitting has been stored for a period of 12 months at a temperature of  $30 \pm 2^{\circ}\text{C}$ .

### 7.2.2 Tapping Tees and Branch Saddles:

All tapping tee and branch saddle dimensions shall conform to their specified agreed values when the fitting has been stored for a period of 12 month at a temperature of  $30 \pm 2^{\circ}\text{C}$ .

**TABLE 3 : SOCKET DIMENSIONS**

Pipe Size d mm	Limits for average diameter d on each fitting measured over apparent fusion length L mm		Apparent fusion length L mm	Penetration depth L mm
	<i>Maximum</i>	Minimum	Minimum	Maximum
16	16.6	16.4	15	41
20	20.6	20.4	16	41
25	25.6	25.4	18	41
32	32.9	32.5	18	41
40	41.0	40.6	18	49
50	51.1	50.7	20	55
55	56.1	55.7	21	63
63	64.1	63.7	23	63
75	76.3	75.9	25	70
90	91.5	91.1	28	79
110	111.3	111.1	32	82
125	126.7	126.2	35	87
140	141.7	141.2	38	92
160	162.1	161.4	42	98
180	182.1	181.5	46	105



**Notes:**

1. The apparent fusion length, L, is the length of the integral heating elements, from the first regular section of the element to the end of the regular section, on one side of the fitting. This dimension to be measured from outside edge to outside edge of wire.
2. Any protrusions into the bore of the fitting (e.g. centralization ribs) shall not prevent easy assembly in the field.
3. The overall length of a straight coupler is equal to twice the quoted maximum penetration depth L.

**TABLE 4: OVERALL LENGTH OF REDUCERS**

Major Diameter	Maximum Length
25	90
32	90
63	120
90	180
125	215
180	280
200	245
225	260
250	280
280	300
315	320

**TABLE 5: BRANCH SADDLE ASSEMBLY OUTLET LENGTH**

Off-take Size Mm	Shut-off method	Dimension from flange face to crown of main		Dimension from pipe end to crown of main	
		Class B fitting mm	Class B fitting mm	Class B fitting mm	Class B fitting mm
63	Valve	-	-	-	-
63	Squeeze	-	260*	-	-
90	Valve	-	-	400	-
90	Squeeze	400	180**	-	-
125	Valve	-	-	550	-
125	Squeeze	360	180***	-	-
180	Valve	-	-	750	-
180	Squeeze	360	180+	-	-
250	Valve	-	-	-	-



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV

A

SHEET 56 OF 229



250	Squeeze	360	180++	-	-
* Flange size DN 50 ** Flange size DN 100 *** Flange size DN 150 + Flange size DN 250 ++ Flange size DN 250					

## 8 PERFORMANCE REQUIREMENTS

### 8.1 Mechanical Characteristics

Fittings shall be tested using pipes, which conform to ISO 4437, Test samples shall be assembled in accordance with ISO DIS11413, following the technical instruction of the manufacturer and using fusion equipment conforming ISO DIS 12176.2.

When tested in accordance with the test methods as specified in table – 6 using the indicated parameters, the fittings have mechanical characteristics confirming to the requirements given in Table 6.

**TABLE 6: MECHANICAL PROPERTIES**

Characteristics	Units	Requirements	Test	Parameters	Test Method
Hydrostatic strength at 20°C	H	Failure time $\geq$ 100	End caps orientation conditioning time. Type of test circumferential (hoop) stress pipe PE 80, PE 100, Test temperature.	Type a) free 1 h water-in-water 9 Mpa, 12.4 Mpa, 20°C	ISO DIS 9356
Hydrostatic strength at 80°C	H	Failure time $\geq$ 165	End caps orientation conditioning time. Type of test circumferential (hoop) stress pipe PE 80, PE 100, Test temperature.	Type a) free 12 h water-in-water 4.6 Mpa 5.5 Mpa 80°C	ISO DIS 9356
Hydrostatic strength at 80°C	H	Failure time $\geq$ 1000	End caps orientation conditioning time. Type of test circumferential (hoop) stress pipe PE 80, PE 100, Test temperature.	Type a) free 12 h water-in-water 4 Mpa, 5 Mpa, 80°C	ISO DIS 9356



Cohesive resistance	mm	Length of initiation of brittle fracture L/3	Test temperature of choice of method	23°C	ISO 13954 (A)
					ISO 13955 (A)
					ISO 13956

Characteristics	Units	Requirements	Test	Parameters	Test Method
					(B)
Impact strength (B)		No failure No leakage	Test temperature  Falling height Mass of the striker	20°C 23°C 5m 5kg	ISO DIS 13957
Pressure drop (B)	M <sup>3</sup> /h	0.5 mbar : dn ≤ 63 0.1 mbar : dn <sup>2</sup> > 63	Air flow rate  Test medium Test pressure	Indicated by the manufacturer  Air source 25 mbar	PrEN 12117

- (A) Electro fusion Socket Fittings  
(B) Tapping Tees

For hydrostatic strength test at 80°C only brittle failure shall be taken into account. If ductile failure occurs before the required time, a lower stress shall be selected and the minimum test time will be obtained from the line through the stress/ time points given in Table – 7.

**Hydrostatic strength (80°C) – Stress/ Minimum Failure Time Correlation**

**TABLE 7**

PE-80		PE-100	
Stress Mpa	Minimum Failure Time h	Stress Mpa	Minimum Failures Time h
4.6	165	5.5	165
4.5	219	5.4	233
4.4	293	5.3	332
4.3	394	5.2	476
4.2	533	5.1	688
4.1	727	5.0	1000
4.0	100	-	-

## 8.2 Physical Characteristics

When tested in accordance with the test methods as specified in Table 8 using the indicated parameters, the fittings shall have physical characteristics conforming to the requirements given in Table 8.

**TABLE 8 : Physical Characteristics of Fittings**

Property	Units	Requirements	Test Parameters	Test Method
Thermal Stability	Minutes	> 20	200 °C (1)	ISO TR 10837
Melt Mass-flow Rate (MFR)	g/10 min	$0.2 \leq \text{MFR} \leq 1.4$ and after processing maximum deviation of $\pm 20\%$ of the value measured on the batch compound	Condition 18	ISO 4440.1

- 1) Test may be carried out at 210 °C providing that there is a clear correlation to the results at 200 °C, in case of dispute the reference temperature shall be 200 °C.

## 8.3 Technical File

The manufacturer of the fittings shall make availability of a technical file (generally confidential) with all relevant data to prove the conformity of the fittings to this specification. It shall include all results of the type testing and shall conform to the specification relevant technical brochure (e.g. ISO 12093 for electro fusion fittings).

The technical description of the manufacturer shall include the following information:

1. Field of appliance (pipe and fitting temperature limits SDR's and out of roundness):
2. Assembly instructions:
3. Fusion instruction (fusion parameters with limits)
4. For saddles and tapping tee:
  - The means of attachment (tools and/ or under clamp).
  - The need to maintain the under clamp in position in order to ensure the performances of the assembly.

For electro fusion fitting, the format of the technical brochure shall conform to ISO DIS 12093.


In the event of modification of the fusion parameters, the manufacturer shall ensure that the joint conforms to this standard.

## 9. MARKING

Following information shall be embossed upto height of 0.15 mm onto the fitting and also in the form of bar code:

- a) The manufacturer's identity
- b) The size of the fitting in mm
- c) Material and Designation
- d) The date of manufacturer (code may be used)
- e) Fusion time in seconds
- f) Cooling time in minutes
- g) Fusion parameters in BAR code
- h) Lot Number.

The information may be printed on a label associated with the fitting.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 59 OF 229	

## 10. **PACKING**

The fittings shall be packaged in bulk or individually protected where necessary in order to prevent deterioration. Whenever possible, they shall be placed in airtight plastic bags in card board boxes or cartons.

The cartons and/or individual bags shall bear at least one label with the manufacturer's name, date of manufacturer, type and dimensions of the part, number of units in the box, and any special storage conditions and storage time limits.


### **Note:**

All the fittings required shall be bar coded electro - fusion fitting type. In case bidder is quoting for spigot fittings, the necessary electro - fusion coupler for all non electro fusion ends shall be included in the complete package.

The transition fittings shall also be bar coded electro - fusion type for PE connection, NPT Female threading conforming to ANSI B 20.1 for G.I connection & butt welded for carbon steel end.

The carbon steel material of transition fittings shall be conforming to APL 5L x 42 and thickness shall be of 4.8 mm.


All the fittings shall be used for the network operating at 4.0 Bar(g) Pressure.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 60 OF 229	

# TECHNICAL SPECIFICATION FOR POLYETHYLENE PIPES




PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 61 OF 229	

## C O N T E N T S

<b><u>Sl.No.</u></b>	<b><u>Description</u></b>
1.0	INTENT OF SPECIFICATION
2.0	INSTRUCTION TO THE TENDERER

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 62 OF 229</b>	

## 1.0 INTENT OF SPECIFICATION

The intent of this specification is to establish minimum requirements to manufacture and supply of Polyethylene Pipes used for supply of natural gas.

## 2.0 INSTRUCTION TO THE TENDERER

2.1 The PE pipes are to be supplied as per IS:14885.

2.2 The length of the Pipes and their supply will be as per following :-

- 20mm OD - In each Coils of 200 mtrs. length
- 32mm OD - In each Coils of 150 mtrs. length
- 63mm OD - In each Coils of 100 mtrs. Length
- 90mm OD - In each Coils of 50 mtrs, Length
- 125mm OD - In each Coils of 50 mtrs. Length
- 180mm OD – in each Coils of 12 Mtrs. Length

## 2.3 PROTECTION

- i) The ends shall be protected by proper end caps to prevent from shocks and ingress of the foreign body.
- ii) Coils shall be covered by black PVC/ PE Film to prevent exposure to direct sun light.

2.4 The successful bidder shall submit following for approval of Purchaser/ Consultant after placement of order

- a) The Quality Assurance Plan (QAP & Sampling Plan)
- b) Certified test result of PE Compound (clause 5 of IS:14885)
- c) Performance Requirements (clause 8 of IS:14885)
- d) Type Test (clause 9.1.2 of IS:14885).

2.5 The bidder shall submit following documents at the time of bidding,

- a) BIS/ ISO Certification if obtained already, or documentary evidence of applying for the same
- b) List of current orders in hand for similar items with full details such as specification, name of purchaser etc.
- c) Details of the largest supply executed
- d) Name and address of proposed test laboratories along with their credentials/ past records for carrying out all required tests.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCULDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A


SHEET 63 OF 229



- e) The names of standards/ codes being followed in manufacture and supply
- f) Any accreditation certificates obtained or applied for.

2.6 **MARKING**


The pipe shall be marked in continues length in addition to the requirement of the applicable code.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 64 OF 229</b>	

# TECHNICAL SPECIFICATION FOR GI PIPES



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India**


	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 65 OF 229</b>	

## **TECHNICAL SPECIFICATION FOR GI PIPES**

<b>Service</b>	: Natural Gas
<b>Working Pressure</b>	: 4 bar (g)
<b>Test Pressure</b>	: 6 bar (g)
<b>Working Temperature</b>	: 0°C to 50°C
<b>Material Description</b>	: IS:1239 (Part-I) Heavy Duty, Continuous Welded
<b>Min. Tensile Strength</b>	: 30 kgf / sq.mm
<b>Min. Elongation</b>	: 6%
<b>Tolerance</b>	: + Not limited, - 10%
<b>Protective Coating</b>	: Galvanized uniformly to protect from corrosion as per IS:4736/ ASTM A53 or by Electro Galvanizing
<b>Ends of Pipes</b>	: Plain End
<b>Inspection</b>	: Inspection shall be carried out as per applicable code & approved QAP and 100% Pressure Testing shall be carried out at factory.

### **1.0 GENERAL NOTES**

- 1.1 All pipes and their dimensions, tolerance, chemical composition, physical properties, heat treatment, hydro test and other testing and marking shall conform to the codes and standards.
- 1.2 Material test certificates (physical property chemical composition & heat treatment report) shall also be furnished for the pipes supplied.
- 1.3 All pipes shall be supplied with length between 5 to 7 mtr but average length of pipes supplied shall not be less than 6 meter. Overall length tolerance shall be (-) zero and (+) one length to


	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 66 OF 229</b>	

complete the ordered quantity.

- 1.4 Galvanised pipes shall be coated with zinc by hot DLF process conforming to IS:4736/ ASTM AS3 or by electro galvanising.
- 1.5 Zinc conforming to any grade specified in IS 13229-1991 with latest amendment shall be used for the purpose of galvanizing
- 1.6 Galvanizing bath : The molten metal in the galvanizing bath shall contain not less than 98.5 % by mass of zinc.
- 1.7 Mass of zinc coating : Minimum mass of zinc coating determined as per IS :6745 shall be 360 gms/m<sup>2</sup>
- 1.8 Uniformity of galvanized coating : The galvanized coating when determined on a 100mm long test piece in accordance with IS 2633 : 1986 with latest amendments shall withstand 5 one minute dips
- 1.9 Freedom from defect : The zinc coating on internal and external surfaces shall be uniform adhered reasonably smooth and free from such imperfection as flux, ash and drop inclusion , bare patches, black spots, lumpiness runs , rust stains, bulky white deposits and blisters. Rejection and acceptance of these defects shall be in accordance with Appendix A of IS 2629: 1985 with latest amendments.

## **2.0 MARKING AND DESPATCH**

- 2.1 All pipes shall be marked in accordance with the applicable codes, standards and specifications.
- 2.2 Paint or ink for marking shall not contain any harmful metal or metallic salts, such as zinc

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 67 OF 229	

lead or copper which causes corrosive attack in heat.

- 2.3 Pipes shall be dry, clean and free from moisture, dirt and loose foreign materials of any kind.
- 2.4 Pipes shall be protected from rust, corrosion and mechanical damage during transportation, shipment and storage.
- 2.5 Both ends of the pipe shall be protected with the following material.

Plain End : Plastic Cap  
Bevel End : Wood, Metal or Plastic Cover  
Threaded End : Metal or Plastic Threaded Cap


- 2.6 Steel end protectors to be used on galvanised pipes, shall be galvanised.

### 3.0 INSPECTION / DOCUMENTS

- i) Inspect shall be carried out as per Technical Specification and Inspection Plan / QAP.
- ii) Bengal Gas Company Limited representative or third party inspection agency appointed by BGCL shall carry out stage wise inspection during manufacturing / final inspection.
- iii) 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 Technical Specification and specified code for 100% material, at the time of final inspection of each supply lot of material.
- iv) Even after third party inspection, BGCL 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 Technical specification, then Bengal Gas Company Limited reserves the rights to reject all production supplied from the batch.
- v) For any control test the date and place of inspection shall be provided by the vendor in writing to the Owner / Owner representative along with Production Schedule.

### 4.0 PACKING


Packing size to be mentioned to ensure uniformity in delivery condition of the material being procured. Bidder shall submit the packaging details during QAP and also compiled with at the time delivery.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 68 OF 229	

**STANDARD TECHNICAL  
SPECIFICATION  
FOR  
SEAMLESS ROUND COPPER  
TUBES**



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 69 OF 229</b>	

**TABLE OF CONTENTS**

1.0 SCOPE ..... 4

2.0 MATERIAL.....4

3.0 DIMENSIONAL TOLERANCES .....4

4.0 PROCESSOF MANUFACTURE..... 5

5.0 INSPECTION AND TESTING.....5

6.0 RETEST ..... 6

7.0 MARKING... ..... 6

8.0 PACKAGING..... 7

9.0 DOCUMENTATION..... 7



## 1.0 SCOPE

This specification covers the requirements for Seamless Round Copper Tubes. Specific requirement of Copper Tubes shall be 12 mm OD X 0.6 mm WT, Half Hard, with Physical properties to ensure wrinkle free bend-ability. Unless modified by this specification, requirement of BS EN 1057:2006 shall prevail.

## 2.0 MATERIAL

The material used for the manufacture of Copper tube shall conform to BS EN 1057:2006, Grade Cu – DHP or CW024A or ASTM C 12200.

Each lot of copper tubes shall be tested in accordance with BS EN: 1057 to ensure the following properties.

### a. Mechanical Properties:

- i. Ultimate Tensile Strength – 250 N/ sq.mm (min)
- ii. Elongation – 30% ( min )
- iii. Hardness - 75 to 100 on HV scale.

### b. Chemical Properties:

Copper Percentage including silver (Cu+Ag):

Min 99.9% Phosphorus Percentage (P):

0.015 to 0.040%

## 3.0 DIMENSIONAL TOLERANCES:

The mean Outside Diameter of the tube shall not vary from the specified outside diameter of 12 mm by more than  $\pm 0.09$  mm. And also wall thickness of the tube shall not vary by more than  $\pm 0.06$  mm of specified wall thickness of 0.6 mm.

Copper Tubes shall be supplied in cut lengths of 3.0m



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV

A

SHEET 71 OF 229

**4.0 PROCESS OF MANUFACTURE:**

The tubes shall be so lid 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 INSPECTION AND TESTING:**

Inspection shall be carried out as per design codes/standards, Technical Specification and Inspection Plan/ Vendor's detailed QAP duly approved by owner/owner's representative.

Even after third party inspection, Client 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 Technical specification, then client reserves the rights to reject all production supplied from the batch.

**a. FREEDOM FROM DEFECT TEST**

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 the tubes shall be subject to one the following tests:

- i) **Eddy Current Test:** Tubes shall be Eddy Current tested as per Annex. C of BS EN 1057 and ASTM E243. 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 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
- ii) **Hydrostatic Test:** Hydrostatic test shall be carried out minimum 35 bar pressure for a period of 10 second as per BS EN 1057.
- iii) **Pneumatic Test:** The tube under test shall be connected to pressurized air. Air pressure of 4 bar shall be maintained in the tube. The tube shall be completely immersed in water for a minimum period of 10 sec. and inspected for the issue of bubbles from the tube. Tube shall be rejected in



case of occurrence of bubble, otherwise accepted.

**b. 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 Table-6 of BS EN 1057. Test shall be carried out as per reference method described in EN 723.

Sampling frequency shall be at least one sample per 5 Km of tube length. However, for small order quantities/ each batch of production, at least one sample shall be drawn.

**c. CARBON FILM TEST**

The detection and assessment of carbon film shall be carried out as per Annex. B of BS EN 1057. Sampling for this test shall be same as that for 5.0 (b) of this specification.

**6.0 RETEST:**

In case a sample fails to meet the test requirements of this specification, the whole batch of production represented by the sample shall be kept aside for further test.

Four times the number of samples as sampling criteria defined in 5.0 (b) shall be taken from that batch for the specific test, for which the earlier sample failed, for further testing. If any of these samples fail to meet the test requirements, whole batch shall be rejected. And if, all the samples pass the test, that batch of production shall be accepted.

**7.0 MARKING:**

Each tube shall be permanently marked every meter with Client's Logo, manufacturer's name, size (ODxWT) and specification (BS EN 1057) of the tube.

Each packing containing tubes shall carry the following, stamped or written in indelible ink.

- a) Manufacturer's name or trade mark
- b) Designation of tubes (OD x wall thk)
- c) Lot number.



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

DOCUMENT NO.	REV
052-LEPL-BGCL-001	A
SHEET 73 OF 229	


d) No. of the standard (EN 1057)

#### 8.0 PACKAGING:

Packing size shall be ensured for 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 comply with at the time of delivery.

#### 9.0 DOCUMENTATION:

- (i) Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, in technical inspection reports as per Technical Specification, at the time of final inspection of each supply lot of material.
- (ii) Vendor shall prepare and submit the detail drawings of required Copper Tubes and QAP for approval by Client/ consultant before starting production.
- (iii) 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.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 74 OF 229	

### **TECHNICAL SPECIFICATION FOR COPPER PIPES**

Service	: Natural Gas
Working Pressure	: 300 mbar (g)
Hydrostatic Test Pressure	: 35 bar (g) for 10 sec as per BS EN 1057(latest)
Working Temperature	: 0°C to 50°C
Material Description	: BS EN 1057 (latest) grade Cu - DHP or CW024A
Min. Tensile Strength	: 250 N/sq.mm
Min. Elongation	: 30%
Tolerance	: 1%
Chemical Composition	: Cu % including silver : Min 99.9 % Phosphorus % : 0.015 to 0.040%
Manufacture	: The tubes shall be solid drawn by the process of melting, extrusion and thereafter bright annealing. The ends shall be cut clean and square with the axis of the tube in no case shall tubes be redrawn from old or used tubes
Inspection	: 100% Pressure Testing shall be carried out at factory.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 75 OF 229

## 1.0 GENERAL NOTES


- 1.1. All pipes and their dimensions, tolerance, chemical composition, physical properties, heat treatment, hydro test and other testing and marking shall conform to the codes and standards.
- 1.2. Material test certificates (physical property chemical composition & heat treatment report) shall also be furnished for the pipes supplied.
- 1.3. Pipe shall be supplied in single length of 3 meters respectively.
- 1.4. Freedom from defect : The tubes shall be free from internal and external fins, flaws skin defects , blowholes, etc. or other irregularities which might restrict the free flow of fluid and shall b 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 tubes passes through a probe and an electromagnetic field is created around the peripheral of the tube to detect any flaw or blow hole which may not visible to the naked eye. The manufacturer must have in house Eddy current testing facilities to supply to BGCL. Bengal Gas Company Limited. reserve right to witness the Eddy current facility at the manufacture's factory premises.

- 1.5. Drift Expanding Test: Drift expanding test shall be carried out as per EN 1057. The OD of the tube end shall be expanded by 30% using a conical mandrel (at angle 45<sup>o</sup>) with no wrinkles, cracks, break, or any form of defect should occur on the tube during test & after the test.
- 1.6. Carbon Film Test : Cu tubes to be tested for carbon film test and the manufacture will certify that the tubes meet requirement of clause 8.5 of BS EN 1057.
- 1.7. Carbon Content Test: Cu tubes to be tested of 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 EN 1057.

## 2.0 MARKING AND DESPATCH

- 2.1. All pipes shall be marked in accordance with the applicable codes, standards and specifications.
- 2.2. Paint or ink for marking shall not contain any harmful metal or metallic salts, such as zinc lead or copper which causes corrosive attack in heat.
- 2.3. Pipes shall be dry, clean and free from moisture, dirt and loose foreign materials of any kind.
- 2.4. Pipes shall be protected from corrosion and mechanical damage during transportation, shipment and storage.


	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 76 OF 229	

### 3.0 INSPECTION / DOCUMENTS

- i) Inspection shall be carried out as per Technical Specification and Inspection Plan / QAP.
- ii) BGCL representative or third party inspection agency appointed by Bengal Gas Company Limited shall carry out stage wise inspection during manufacturing / final inspection.
- iii) 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 Technical Specification and specified code for 100% material, at the time of final inspection of each supply lot of material.
- iv) Even after third party inspection, BGCL 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 Technical specification, then Bengal Gas Company Limited reserves the rights to reject all production supplied from the batch.
- v) For any control test the date and place of inspection shall be provided by the vendor in writing to the Owner / Owner representative along with Production Schedule.

### 4.0 PACKING

Packing size to be mentioned to ensure uniformity in delivery condition of the material being procured. Bidder shall submit the packaging details during QAP and also compiled with at the time delivery.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 77 OF 229	

**QAP**  
**Copper Tubes**

Sr. No.	INSPECTION AND TESTING	QUANTUM OF CHECK	PROCEDURE	ACCEPTANCE CRITERIA AND CERTIFICATE	FORMAT OF RECORD	INSPECTION			
						Vendor	TPIA	MECON/ Client	REMARKS
1	Metallic materials (Chemical & Physical Requirements- Composition, Tensile & Hardness)	As per Sampling Plan in TS	As per BS EN 1057:2007	Clause 2.0 (a) & (b) of Technical <del>Specification</del>	Material Test certificate type 3.1	P	W	R	
2	Freedom From Defects Test One of the following three tests shall be <u>performed</u> :								
2.1	Eddy Current Test	100%	As per BS EN 1057:2007 and Technical Specification	As per BS EN 1057:2007 and Technical Specification	INSPECTION TEST REPORT	P	W	R	
2.2	Hydrostatic Test	100%	As per BS EN 1057:2007 and Technical Specification	As per BS EN 1057:2007 and Technical Specification	INSPECTION TEST REPORT	P	W	R	
2.3	Pneumatic Test	100%	As per BS EN 1057:2007 and Technical Specification	As per BS EN 1057:2007 and Technical Specification	INSPECTION TEST REPORT	P	W	R	
3	Surface Quality Test One of the following two tests shall be <u>performed</u> :								
3.1	Carbon Content Test	As per Sampling Plan in TS	As per BS EN 1057:2007 and Technical Specification	As per BS EN 1057:2007 and Technical Specification	INSPECTION TEST REPORT	P	W	R	
3.2	Carbon Film Test	As per Sampling Plan in TS	As per BS EN 1057:2007 and Technical Specification	As per BS EN 1057:2007 and Technical Specification	INSPECTION TEST REPORT	P	W	R	
4	Visual	1%	–	As per BS EN 1057:2007 and Technical Specification	–	P	W	R	
5	Dimensional	1%	–	As per BS EN 1057:2007 and Technical Specification	–	P	W	R	
6	Marking	100%	As per Technical Specification		INSPECTION TEST REPORT	P	W	R	
7	Packaging		As per Technical Specification		INSPECTION TEST REPORT	P	R	R	
8	Final Documentation		Document pertaining to all tests specified in this QAP	Document pertaining to all tests specified in this QAP	EN 10204 3.1 <del>Certificate</del>	P	H	H	

LEGENDS: R - REVIEW, W - Witness, H-Hold, P - Perform, TPIA - Third Party Agency  
(Owner / Owner's Representative)

Note:-

- 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 TS and Design Standard.
- 2 The supplier shall submit their own details ITP prepared on the basis of above/ 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 location to facilitate Owner/Owner's representative and TPIA to organize inspection.
- 6 Owner / Owner's representative including TPIA will have to 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/LEPL/CLIENT 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.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

SHEET 78 OF 229

REV

A



**TECHNICAL SPECIFICATION  
FOR  
GI FITTINGS**



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 79 OF 229</b>	

## TECHNICAL SPECIFICATION FOR GI FITTINGS

Sr. No.	INSPECTION AND TESTING	QUANTUM OF CHECK	PROCEDURE	ACCEPTANCE CRITERIA AND CERTIFICATE	FORMAT OF RECORD	INSPECTION			REMARKS
						Vendor	TPIA	MECON	
1	Materials (Chemical Properties)	IS:14329	IS:14329	IS:14329	Material Test certificate	P	R	R	
2	Materials (Mechanical Properties)	IS:14329	IS:14329	IS:14329	Material Test certificate	P	R	R	
3	Galvanizing								
3a	Visual inspection (Free from defects)	As per IS 4759-1996	As per IS 4759-1996	As per IS 4759-1996	INSPECTION TEST REPORT	P	W	R	
3b	Mass of Zinc Coating	As per IS 4759-1996	As per IS 4759-1996	As per IS 4759-1996	INSPECTION TEST REPORT	P	W	R	
4	Pneumatic Pressure Test	As per TS	As per IS 1879-1987	As per IS 1879-1987	INSPECTION TEST REPORT	P	W	R	
5	Compression Test	As per TS	As per IS 1879-1987	As per IS 1879-1987	INSPECTION TEST REPORT	P	W	R	
6	Weight of the Fittings	As per TS	As per IS 1879-1987	As per IS 1879-1987	INSPECTION TEST REPORT	P	W	R	
7	Dimension tolerances (Min. length of engagement. OD. Wall <del>tbk</del> )	1%	As per IS 1879-1987	As per IS 1879-1987	INSPECTION TEST REPORT	P	W	R	
8	Marking	1%	As per IS 1879-1987	As per IS 1879-1987	INSPECTION TEST REPORT	P	W	R	
9	Final Documentation		Document pertaining to all tests specified in this QAP	Document pertaining to all tests specified in this QAP		P	H	R	

LEGENDS: R - REVIEW, W - Witness, H-Hold, P - Perform, TPIA - Third Party Agency (Owner / Owner's Representative)

Note:

- 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 TS.
- 2 The supplier shall submit their own details ITP prepared on the basis of above/ Technical specification for approval of Owner/Owner's representative.
- 3 Owner/Owner representative shall review/approve all the documents related to ITP/Quality ~~requirements~~ Drawings etc. submitted by supplier.
- 4 Owner / Owner's representative including TPIA will have to 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/LEPL/Client 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.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCULDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

**DOCUMENT NO.**

**052-LEPL-BGCL-001**

**REV**

**A**


**SHEET 80 OF 229**

## 1.0 **GENERAL NOTES**

- 1.1. All fittings and their dimensions, tolerance, chemical composition, physical properties, heat treatment, hydro test and other testing and marking shall conform to the codes and standards.
- 1.2. Material test certificates (physical property chemical composition & heat treatment report) shall also be furnished for the fittings supplied.
- 1.3. Zinc conforming to any grade specified in IS 13229-1991 with latest amendment shall be used for the purpose of galvanizing
- 1.4. **Galvanizing bath** : The molten metal in the galvanizing bath shall contain not less than 98.5 % by mass of zinc.
- 1.5. **Mass of zinc coating** : Minimum mass of zinc coating determined as per IS :6745 shall be 610 - 700 gms/m<sup>2</sup>
- 1.6. **Freedom from defect** : The zinc coating on internal and external surfaces shall be uniform adhered reasonably smooth and free from such imperfection as flux, ash and drop inclusion , bare patches, black spots, lumpiness runs , rust stains, bulky white deposits and blisters. Rejection and acceptance of these defects shall be in accordance with Appendix A of IS 2629: 1985 with latest amendments.
- 1.7. **Pressure Test**: Vendor shall carry out pneumatic pressure test as per clause 11.1b of 1879 -1987 with latest amendments on each and every fitting. Vendor to submit the internal quality control certificate for the same. Owner shall witness pneumatic testing as per the sampling procedure specified in 1879 with latest amendments.
- 1.8. **Compression Test** : The test shall be conducted to judge the malleability of the pipe fittings and shall be carried out as per clause 12 of 1879-1987 with latest amendments.
- 1.9. **Sampling**: Owners representative of third party agency inspection agency appointed by owner shall witness the test as per clause 14 of 1879 -1987 with latest amendments. However vendor to 100% inspection of visual ,dimensional and pressure test. Vendor shall furnish Internal test certificate at the time of final inspection to the owner.

## 2.0 **MARKING AND DESPATCH**

- 2.1. All fittings shall be marked in accordance with the applicable codes, standards and specifications.
- 2.2. Paint or ink for marking shall not contain any harmful metal or metallic salts such as zinc lead or copper which causes corrosive attack in heat.
- 2.3. All fittings shall be dry, clean and free from moisture, dirt and loose foreign materials of any kind.
- 2.4. All fittings shall be protected from rust, corrosion and mechanical damage during

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 81 OF 229	


transportation, shipment and storage.

### 3.0 INSPECTION / DOCUMENTS

- i) Inspection shall be carried out as per Technical Specification and Inspection Plan / QAP.
- ii) BGCL representative or third party inspection agency appointed by BGCL shall carry out stage wise inspection during manufacturing / final inspection.
- iii) 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 Technical Specification and specified code for 100% material at the time of final inspection of each supply lot of material.
- iv) Even after third party inspection, BGCL 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 Technical specification, then BGCL reserves the rights to reject all production supplied from the batch.
- v) For any control test the date and place of inspection shall be provided by the vendor in writing to the Owner/Owner representative along with Production Schedule.

### 4.0 PACKING


Packing size to be mentioned to ensure uniformity in delivery condition of the material being procured. Bidder shall submit the packaging details during QAP and also compiled with at the time delivery.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 82 OF 229	

**TECHNICAL SPECIFICATION  
FOR  
COPPER FITTINGS**



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 83 OF 229</b>	

## Table of Contents

1.0	SCOPE
2.0	MATERIAL
3.0	DIMENTIOAL TOLERANCES
4.0	CARBON IN BORE
5.0	CHEMICAL PROPERTIES
6.0	FREEDOM FROM DEFECT
7.0	PRESSURE TEST
8.0	MARKING
9.0	INSPECTION / DOCUMENTS
10.0	DRAWINGS

### 1.0 SCOPE

This specification covers the requirements for Copper Capillary fittings (End feed). Unless modified by this specification requirement European EN 1254 Part-I shall be valid.

### 2.0 MATERIAL


- i) The material used for the manufacturer of Copper Capillary Fittings shall confirm to BS EN 1254 - 1: latest Half hard
- ii) Material used for the solder should conform to BS 219 & BS EN 29453 or equivalent and should be lead free.

### 3.0 DIMENSIONAL TOLERANCES

Dimensions tolerances of various types of copper capillary fittings (End feed) shall be as per BS 864 Part-2 (latest) & EN 1254 (Open tolerances on dimensions shall be +/-0.1 mm). The tolerances as specified in EN 1254 in nominal diameter are as follows (Ref Table 2).

Nominal Diameter	Tolerance on the mean diameter with respect to the nominal diameter		Resulting Difference	Diametrical
	Outside Dia of male end (mm)	Inside Dia of Socket (mm)		
D			Max. (mm)	Min. (mm)
12 mm	+ .04 - .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 5 of EN 1254).

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 84 OF 229	

Nominal Dia mm D	Minimum wall thickness (mm) Wrought Coppers
12	0.6

End connection of the Fitting must be capable of end feeding. Internal solder ring type fitting is not acceptable.

#### 4.0 CARBON IN BORE

The internal surface of copper 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<sup>2</sup> when tested in accordance with the specification.

#### 5.0 CHEMICAL PROPERTIES

Each heat no. of the copper fitting will be tested for chemical properties to conform to non-arsenical copper DHP grade C 106 as per BS EN 1057 & BS 2871 to have the following chemical composition:

Copper Percentage : Min 99.9%

Phosphorus Percentage : 0.015 to 0.040%

#### 6.0 FREEDOM FROM DEFECTS

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.

#### 7.0 PRESSURE TEST

All fittings shall be leak tested at the option of BGCL at a pressure of 1 bar(g) for a period of 2 minutes and no leakage is permitted during this period Manufacturer's Test Certificate is necessary with supply.

#### STRESS CORROSION RESISTANCE TEST

A Stress Corrosion Resistance is to be carried out as per method defined in ISO 6957 using test solution of pH 9.5 but without pickling

#### 8.0 MARKING

Each tube shall be embossed with manufacturers name or trade mark BS 864 or EN 1254. Each packing containing fittings shall carry the following stamped or written in indelible ink.

- a) Manufacturers name or trade mark
- b) Designation of tubes
- c) BS Symbol mentioning as 864 or EN 1254 to be used.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCULDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 85 OF 229

## 9.0 INSPECTION / DOCUMENTS

- i) Inspection shall be carried out as per Technical Specification and Inspection Plan / QAP.
- ii) Bengal Gas Company Limited representative or third party inspection agency appointed by Bengal Gas Company Limited shall carry out stage wise inspection during manufacturing final inspection.
- iii) 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 Technical Specification and specified code for 100% material, at the time of final inspection of each supply lot of material.
- iv) Even after third party inspection, BGCL 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 Technical specification, then BGCL reserves the rights to reject all production supplied from the batch.
- v) Vendor shall prepare and submit the detail drawing of required copper fittings for approval by BGCL Before starting production
- vi) For any control test the date and place of inspection shall be provided by the vendor in writing to the Owner /Owner representative along with Production Schedule.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A


SHEET 86 OF 229



**STANDARD TECHNICAL  
SPECIFICATION  
FOR BRASS  
FITTINGS**



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 87 OF 229</b>	

**TABLE OF CONTENTS**

1.0	SCOPE .....	4
2.0	MATERIAL .....	4
3.0	DIMENSIONAL TOLERANCES .....	4
4.0	END CONNECTION .....	5
5.0	CHEMICAL PROPERTIES .....	5
6.0	CARBON IN BORE .....	5
7.0	RESISTANCE TO DEZINCIFICATION .....	5
8.0	STRESS CORROSION RESISTANCE TEST .....	5
9.0	FREEDOM FROM DEFECT .....	5
10.0	HYDROSTATIC PRESSURE TEST .....	5
11.0	PNEUMATIC PRESSURE TEST .....	6
12.0	MARKING .....	6
13.0	PACKAGING .....	6
14.0	INSPECTION / DOCUMENTS .....	6



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 88 OF 229

## 1.0 SCOPE

This specification covers the requirements for Brass Capillary fittings (End feed fittings). Unless modified by this specification, requirement of EN 1254 Part 1 shall be valid.

## 2.0 MATERIAL

- a. The material used for the manufacturer of Brass Capillary Fittings shall conform to IS 319 Grade-2 or CW 602N as per EN12164.
- b. 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.
- c. Threading on the Brass fittings shall be done as per NPT (ASME 1.20.1).

## 3.0 DIMENSIONS

- I. 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 are as follows (Ref. table 2)

Diameter	Tolerance on the mean diameter with respect to the nominal diameter		Resulting Diametrical difference	
	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	0.0

The minimum wall thickness of a fitting shall be in accordance as given below (Ref table 5 of EN 1254 Part 1)

Nominal Dia mm, D

Minimum wall thickness (mm) Brass

12

1.1

- II. Minimum length of engagement shall be as per table-3 of BS EN 1254-1.
- III. Minimum bore area of fittings shall be corresponding to minimum bore as per



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 89 OF 229

- IV. table-4 of BS EN 1254-1.  
Tube abutment shall be shown in the drawing submitted for approval as per guidelines of BS EN 1254-1.

#### 4.0 END CONNECTION

End connection of the fitting must be capable of end feeding to the NPT x 12 mm. Integral solder ring type fitting is not acceptable.

#### 5.0 CHEMICAL PROPERTIES

Chemical composition & mechanical properties of Brass shall be as mentioned in IS:319 Grade-2/ CuZn36Pb2As or CW602N as per EN12164. The material shall be Dezincification- resistant.

#### 6.0 CARBON IN BORE

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<sup>2</sup>. The test shall be carried out as per clause no. 5.4 and Annexure- A of EN 1254 -1.

#### 7.0 RESISTANCE TO DEZINCIFICATION

The fittings shall be manufactured from alloys containing more than 10% Zinc. Accordingly resistance to dezincification test shall be carried out as per Cl. 5.5 of EN 1254 -1. The acceptance criteria shall be as per Clause 4.5.3.


#### 8.0 STRESS CORROSION RESISTANCE TEST

A stress corrosion resistance is to be carried out on fittings as per method defined in ISO 6957 using test solution of pH 9.5 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

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 90 OF 229	

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 e mbossed with client's lo go, manufacturers name and trade mark EN 1 254 P art – I an d designation of fittings. Each packing containing fittings shall carry the following stamped or written in indelible ink.


- a) Manufactu  
rer's name or  
trade mark. b)  
Desig nation of  
fittings.
- c) Mo nth and year of manufacturing

**13.0 PACKAGING**


Packing size to be mentioned to the e nsure uniformity in de livery conditions of t he material being procured. Bidder shall su bmit th e packaging details d uring QAP and also complied with at the time of delivery.

**14.0 INSPECTION / DOCUMENTS**

- (i) Inspection shall be carried out as per design codes/standards, Technical Specification and Inspection Plan/ Vendor's detailed Q AP d uly approved by owner/owner's representative.
- (ii) Client's representative or third party in spection a gency a ppointed by client/ vendor shall carry out random inspection during manufacturing/ final inspection.
- (iii) Vendor shall furnish all the material test certificates, proof o f approval/ license from specified authority as per specified sta ndard, if relevant, in ternal te st/ inspection reports as per Technical Specification, at the time of final inspection of each supply lot of material.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 91 OF 229	

- (iv) Even after third party inspection, Client 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 Technical specification, then client reserves the rights to reject all production supplied from the batch.
- (v) Vendor shall prepare and submit the detail drawings of required brass fitting and QAP for approval by Client/consultant before starting production.
- (vi) 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.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 92 OF 229</b>	

**QAP  
BRASS FITTINGS**

Sr. No.	INSPECTION AND TESTING	QUANTUM OF CHECK	PROCEDURE	ACCEPTANCE CRITERIA AND CERTIFICATE	FORMAT OF RECORD	INSPECTION			
						Vendor	TPIA	LEPL/ Client	REMARKS
1	Raw Material Testing.								
1.1	Metallic materials (Chemical / Physical Requirement)	One sample in each heat	As per EN12164 for Gr. CW602N/ IS:319 Gr. 2)	As per EN12164 for Gr. CW602N/ IS:319 Gr. 2)	Material Test certificate type 3.1	P	R	R	
2	Leak tightness under Internal Hydrostatic Pressure Test	1%	BS EN 1254-1	BS EN 1254-1	INSPECTION TEST REPORT	P	W	R	
3	Gas Tightness Test (Pneumatic test)	1%	BS EN 1254-1	BS EN 1254-1	INSPECTION TEST REPORT	P	W	R	
4	Carbon in Bore	1%	BS EN 1254-1	BS EN 1254-1	INSPECTION TEST REPORT	P	W	R	
5	Dezincification Resistance Test	1%	BS EN 1254-1	BS EN 1254-1	INSPECTION TEST REPORT	P	W	R	
6	Stress Corrosion Resistance Test	1%	BS EN 1254-1	BS EN 1254-1	INSPECTION TEST REPORT	P	W	R	
8	Visual inspection (Free from defects)	10%	BS EN 1254-1	BS EN 1254-1	INSPECTION TEST REPORT	P	W	R	
9	Dimension tolerances (Min. length of engagement. OD. Wall thk.)	10%	As per Approved Drawing/ BS EN 1254-1	As per Approved Drawing/ BS EN 1254-1	INSPECTION TEST REPORT	P	W	R	
10	Marking	10%	BS EN 1254-1	BS EN 1254-1	INSPECTION TEST REPORT	P	W	R	
11	Final Documentation		Document pertaining to all tests specified in this QAP	Document pertaining to all tests specified in this QAP	EN 10204 3.1 CERTIFICATES	P	H	H	

LEGENDS: R - REVIEW, W - Witness, H-Hold, P - Perform, TPIA - Third Party Agency  
(Owner / Owner's Representative)

Note:-

- 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 TS.
- 2 The supplier shall submit their own details ITP prepared on the basis of above/ Technical specification for approval of Owner/Owner's representative.
- 3 Owner/Owner representative shall review/approve all the documents related to ITP/Quality Control/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 location to facilitate Owner/Owner's representative and TPIA to organize Inspection.
- 6 Owner / Owner's representative including TPIA will have to 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/LEPL/CLIENT 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.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCULDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

**DOCUMENT NO.**

**052-LEPL-BGCL-001**

**REV**


**A**

**SHEET 93 OF 229**

**TECHNICAL SPECIFICATION  
FOR  
PE BALL VALVES**



**PREPARED AND ISSUED BY Lyons  
Engineering Pvt. Ltd. Delhi  
India**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 94 OF 229</b>	



## CONTENTS

- 1.0 INTENT OF SPECIFICATION
- 2.0 MATERIAL SPECIFICATION FOR ISOLATION VALVE



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 95 OF 229

<b>Item</b>	: <b>PE BALL VALVE</b>
<b>Application</b>	: Natural Gas Distribution Services
<b>Code</b>	: ASME B16.40 / EN 1555-4
<b>Rating</b>	: PE100 SDR 11
<b>Operating Pressure</b>	: 4 - 6 bar (g)
<b>Operating Temp.</b>	: 0°C to 60°C
<b>End Connection</b>	: PE materials (Spigot Type)
<b>Stem Extension</b>	: Not Required
<b>Valve Design</b>	: Full Bore
<b>Ball position Indicator</b>	: Open/Close Limits required

### **INSPECTION / DOCUMENT**


Inspection shall be carried out as per client/consultant's approved Inspection Plan / QAP.

Third party inspection agency appointed by vendor on prior approval of owner shall carry out stage wise inspection during manufacturing / final inspection.

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 Technical Specification and specified code for 100% material, at the time of final inspection of each supply lot of material.

### **PACKING**


Packing size to be mentioned to ensure uniformity in delivery condition of the material being procured. Bidder shall submit the packaging details during QAP and also compiled with at the time delivery.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 96 OF 229</b>	

**TECHNICAL SPECIFICATION  
FOR  
ISOLATION & APPLIANCE BALL VALVES**



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 97 OF 229</b>	

## **TECHNICAL SPECIFICATION FOR ISOLATION & APPLIANCE BALL VALVES**

### **CONTENTS**

<b><u>Sl.No.</u></b>	<b><u>Description</u></b>	<b><u>Page No.</u></b>
1.0	INTENT OF SPECIFICATION	1
2.0	SCOPE OF WORK	1
3.0	MATERIAL SPECIFICATION	1
4.0	DESIGN AND CONSTRUCTION	1
5.0	INSPECTION AND TESTING	2
6.0	PACKING AND MARKING	2



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

**DOCUMENT NO.**

**052-LEPL-BGCL-001**

**REV**

**A**

**SHEET 98 OF 229**

1.0 **INTENT OF SPECIFICATION**

The intent of this specification is to establish minimum requirements to manufacture and supply of Isolation & Appliance Ball Valves used for supply of natural gas.

2.0 **SCOPE OF WORK**

2.1 The scope of the tenderer will include manufacture/ supply, inspection/ testing/ marking/ packaging/ handling and despatch of Isolation & Appliance Ball Valves, as indicated in the Material Requisition & Schedule of Rates, meeting all the requirements as laid down in ASME B16.33 and should be approved by any certified agency for Gas application.

2.2 All codes and standards for manufacture, testing, inspection etc. shall be of latest edition.

3.0 **MATERIAL SPECIFICATION**

3.1 Metallic parts of Valves shall be manufactured as per material specified in respective datasheets.

3.2 Lubricants and Sealants. Lubricants and/or sealants shall be resistant to the action of fuel gases such as natural, manufactured, and LP gases. The valve manufacturer is responsible for the selection of lubricants and sealants, and for the determination of their suitability for the service conditions specified in the scope of this Standard.

3.3 Seating and Stem Seal Materials. The valve manufacturer is responsible for selection of seating and stem seal materials and for determination of their suitability for the service conditions specified in the scope of this Standard.

3.4 Air Aging Tests. Elastomer parts that are exposed to fuel gas shall be made from materials that, following 70-hr air aging in accordance with ASTM D573 at 212°F (100°C), meet elongation, tensile, and hardness property requirements as per ASME B16.33.

3.5 Elastomeric components' material shall qualify swell test and compression set tests as per requirement of ASME B16.33.


4.0 **DESIGN AND CONSTRUCTION**

4.1 DESIGN QUALIFICATION: Manufacturer shall qualify the design of the valves as per clauses mentioned below. Relevant documents for establishment of design qualification shall be submitted along with bid.

4.1.1 Each basic valve design shall be qualified and demonstrated as suitable for the service by testing randomly selected production valves of each size, type, and pressure shell material.

4.1.2 Following tests shall be carried out for design qualification as per ASME B 16.33 a) Gas tightness

b) Temperature resistance

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 99 OF 229	

- c) Structural tests viz. Strength test, Twist test, Bend Test, Tensile Test, Turning Torque test
- d) Flow Capacity

- 4.2 Production Testing  
Each Valve shall be tested to a test pressure of 1.5 times the pressure rating of the valve according to test method of gas tightness. No leakage is permitted during production testing.
- 4.3 Valve ends shall be as specified in respective datasheets.

5.0 **Inspection and Testing**

- 5.1 Each valve shall be tested for leakage as specified in cl. 4.2 above. Test certificate shall be provided for production testing.
- 5.2 Test certificates for physical and chemical properties of all the components of valves shall be provided as per agreed QA/QC requirements.
- 5.3 Test certificates of all the tests conducted for design qualification as per ASME B16.33 shall be submitted for review.
- 5.4 Type of inspection documents as per EN 10204 shall be as defined in respective QAP/ Datasheet.

6.0 **Packing and Marking**

- 6.1 Valves shall be marked as mentioned below.
- 6.1.1 The manufacturer's name or trademark and, where space permits, the designation "B16.33." The B16.33 mark is the manufacturer's acknowledgement that the valve was manufactured in conformance with ASME B16.33.
- 6.1.2 Pressure Rating.
- 6.1.3. Open and close indication. when a 1/4 turn valve is in the open or closed position (if flat head, longitudinal axis of the head shall be perpendicular to the longitudinal axis of the valve when valve is in the closed position)
- 6.2 Each Valve shall be packed in individual card board boxes so as to avoid wear and tear during transport.
- 6.3 For threaded end valves, end caps shall be provided.

Data Sheet - Isolation Ball Valve		
S.NO	Description	Details
1	<b>Process Data</b>	
1.01	Fluid	Natural Gas
2	<b>Operating Condition</b>	
2.01	Pressure	4 Bar (g)
2.02	Temperature (°C)	0-48
3	<b>Design Condition</b>	
3.01	Pressure	-
3.02	Temperature (°C)	-29 to 65
4	<b>Valve Data</b>	
4.01	Size	1/2" and 3/4"
4.02	Type	Isolation Ball Valve of Full Bore with NPT Female (Confirming to ANSI B1.20.1) as an inlet with operating Knob and locking arrangement with provision for sealing wire and lead seal (without Key).metallic operating Knob for full open/close at 90° position.
4.03	Rating	125#
4.04	End Connections	NPT Female (Confirming to ANSI B1.20.1)
4.05	Body Material	Total Body including the Nozzle shall be of forged Brass (ASTM B 283, Alloy UNSC37700) with Nickel/ Chrome plated.
4.06	Ball Material	Hard Chrome/ Nickel Plated, ASTM B 283
4.07	Stem	ASTM B283
4.08	Seat	Teflon
4.12	Extension Stem	Not required
4.13	Operator	Butterfly Arrangement
5	<b>Painting</b>	
5.01	Surface Preparation	Not Required
5.02	primer	Not Required
5.03	finish	Not Required
5.04	insulation	Not Required
6	<b>Test</b>	
	<b>Production Test</b>	-
6.01	Production Test Pressure	1.5 times of design class pressure
6.02	Test Medium	As per ASME B16.33
6.05	Test duration	15 seconds
Note	1. Lever type handle not acceptable.	
	2. Minimum Nickel/ Chrome Plated on the ball & body of Isolation ball valve shall be 25 micron	
	3. The above specified tests in TS/ Data sheet are minimum however, the other remaining/ specified test shall be done as per ASME B.16.33	



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV

A

SHEET 101 OF 229

Data Sheet - Appliance Ball Valve		
S.NO	Description	Details
1	<b>Process Data</b>	
1.01	Fluid	Natural Gas
2	<b>Operating Condition</b>	
2.01	Pressure	4 Bar (g)
2.02	Temperature (°C)	0-48
3	<b>Design Condition</b>	
3.01	Pressure	-
3.02	Temperature (°C)	-29 to 65
4	<b>Valve Data</b>	
4.01	Size	1/2"
4.02	Type	Appliance Ball Valve of Full Bore with ½" NPT (Confirming to ANSI B1.20.1) Female as an inlet and the outlet shall be having Ni/ Cr plated brass or steel a nozzle (Serrated to suit ¼" rubber tubing/ hose connection) and the material is required for Domestic Natural Gas Service with a metallic operating Knob for full open/close at 90° position.
4.03	Rating	125#
4.04	End Connections	Female as an inlet and the outlet shall be having Ni/ Cr plated brass or steel as nozzle
4.05	Body Material	Total Body including the Nozzle shall be of forged Brass (ASTM B 283, Alloy UNSC37700) with Nickel/ Chrome plated.
4.06	Ball Material	Hard Chrome/ Nickel Plated, ASTM B 283
4.07	Stem	ASTM B283
4.08	Seat	Teflon
4.12	Extension Stem	Not required
4.13	Operator	Knob Arrangement.
5	<b>Painting</b>	
5.01	Surface Preparation	Not Required
5.02	primer	Not Required
5.03	finish	Not Required
5.04	insulation	Not Required
6	<b>Test</b>	
	<b>Production Test</b>	-
6.01	Production Test Pressure	1.5 times of design class pressure
6.02	Test Medium	As per ASME B16.33
6.05	Test duration	15 seconds
Note	1. Minimum Nickel/ Chrome Plated on the ball & body of Isolation ball valve shall be 25 micron	
	2. The above specified tests in TS/ Data sheet are minimum however, the other remaining/ specified test shall be done as per ASME B.16.33	



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV

A

SHEET 102 OF 229



**QAP**  
**ISOLATION VALVE AND APPLIANCE VALVE**

Sr. No.	INSPECTION AND TESTING	QUANTUM OF CHECK	PROCEDURE	ACCEPTANCE CRITERIA AND CERTIFICATE	FORMAT OF RECORD	INSPECTION		
						Vendor	TPIA	REMARKS
1	Raw Material Testing:							
1.1	Metallic materials (Chemical / Physical Requirement)	One in each heat	As per ASTM B 283 (ALLOY UNS C37700)	As per ASTM B 283 (ALLOY UNS C37700)	Material Test certificate	P	R	EN10204-3.1 certificate
1.2	Seat & Stem Seal Material	One in each heat	As per TS/ B16.33	As per TS/ B16.33	Material Test certificate	P	R	EN10204-3.1 certificate
2	Final Product:							
2.1	Gas Tightness Test	1%	ASME B 16.33	ASME B 16.33	INSPECTION TEST REPORT	P	W	
	Twist (Torque) Test	1%	ASME B 16.33	ASME B 16.33	INSPECTION TEST REPORT	P	W	
	Bending Test	1%	ASME B 16.33	ASME B 16.33	INSPECTION TEST REPORT	P	W	
	Tensile Test	One in each heat	ASME B 16.33	ASME B 16.33	INSPECTION TEST REPORT	P	W	
	Turning Torque Test	1%	ASME B 16.33	ASME B 16.33	INSPECTION TEST REPORT	P	W	
2.2	Temperature Resistance test	1%	ASME B 16.33	ASME B 16.33	INSPECTION TEST REPORT	P	W	
2.3	Flow Capacity Test	1%	ASME B 16.33	ASME B 16.33	INSPECTION TEST REPORT	P	W	
2.4	Production pressure test	100%	ASME B 16.33	ASME B 16.33	INSPECTION TEST REPORT	P	RW	
2.5	Visual inspection (Free from defects)	100%	ASME B 16.33	ASME B 16.33	INSPECTION TEST REPORT	P	RW	
2.6	Dimension tolerances (Min. length of engagement. OD. Wall thk.)	100%	As per Approved Drawing	As per Approved Drawing	INSPECTION TEST REPORT	P	RW	
2.7	Marking	100%	ASME B 16.33	ASME B 16.33	INSPECTION TEST REPORT	P	RW	
3	Final Documentation		Document pertaining to all tests specified in this QAP	Document pertaining to all tests specified in this QAP	EN 10204 3.1 CERTIFICATES for raw material	P	H	

LEGENDS: R - REVIEW, W - Witness, RW - Random Witness (Minimum 0.5% of lot size) H-Hold, P - Perform, TPIA - Third Party Agency, CA- Control Authority  
(Owner / Owner's Representative)

Note:-

- 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 TS.
- 2 The supplier shall submit their own details ITP prepared on the basis of above/ Technical specification for approval of Owner/Owner's representative.
- 3 Owner/Owner representative shall review/approve all the documents related to ITP/Quality records/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 location 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.
- 6 Owner / Owner's representative including TPIA will have to 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/LEPL/GGL 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.




LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCULDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

<b>DOCUMENT NO.</b>	<b>REV</b>
<b>052-LEPL-BGCL-001</b>	<b>A</b>
<b>SHEET 103 OF 229</b>	

# TECHNICAL SPECIFICATION FOR WARNING MATS



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 104 OF 229</b>	

## **SPECIFICATION FOR THE WARNING MATS**

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Purpose	:	For using as a warning sign for Under Ground Natural Gas Pipeline and HDPE Duct/ OFC
Width	:	300mm for Underground Gas Pipeline
Thickness	:	0.25mm thk. for HDPE Duct/ OFC 1.00mm thk. for Underground Gas Pipeline
Material of the mat	:	The material shall be of high density Polyethylene
Colour of the mat	:	Red for HDPE Duct/ OFC Golden Yellow for Underground Gas Pipeline
Art Work	:	A sample piece of 30mm wide and 200mm long of every batch shall be checked by immersing in 20% solution of Ammonium Sulphide for period of 2 weeks at a temperature of 15°C for colour intactness of the strip.  Art work would be finalized after placement of order.
Mechanical Properties of HDPE		
Tensile Strength	:	Minimum 1.8 kg/cm <sup>2</sup>
Elongation at Break	:	Minimum 125%
Bundle Length	:	1.0mm thick warning mat shall be supplied as 50 mtrs. bundle. 0.25mm thick warning mat shall be supplied as 100 mtrs. each bundle.
Test Certificates	:	Vendor has to submit the all test certificates to Purchaser
Inspection	:	The manufacturer has to submit the QAP and get the sample approved before commencement of production



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

**DOCUMENT NO.**

**REV**


**052-LEPL-BGCL-001**

**A**

**SHEET 105 OF 229**

# HIGHLY INFLAMMABLE GAS PIPELINE BELOW BGCL

**IN EMERGENCY PLEASE CONTACT  
PHONE NOS. ....**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 106 OF 229</b>	

**SPECIFICATION FOR WELDED CS/GI  
PIPE INSTALLATION**



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 107 OF 229</b>	

## 1.0 INTENT OF SPECIFICATION

- 1.1 Contractor has to install the welded CS/GI Pipes for domestic/commercial /industrial customers wherever GI Work is not feasible. Especially for various floors at high rise building/ Malls/restaurant, big societies, basements, tunnels etc.

## 2.0 MATERIAL SUPPLY INSTALLATION

- 2.1 CS/GI Pipe will be supplied by the BGCL.
- 2.2 supply and installation of all the necessary fittings, Flanges ,nipples, barrels, reducer, tees, couplings, CS Ball Valves etc required during the installation of CS/GI Pipeline is in the scope of the contractor. Fittings to be procured are of M.S Sch40 and seamless/SA150 as per T4S specifications.
- 2.3 Supply and installation of all supports like MS Angles, Brackets, clamps etc shall be in the scope of contractor
- 2.4 All the consumables, electrodes and other necessary tools tackles required for conducting the welding is in the scope of the contractor. For welding of GI items, proper scrubbing to be done to remove the GI coating for 75 mm length prior to take up the welding.
- 2.5 Contractor scope includes supply and installation of the CS to GI Fittings threaded fittings for domestic connections for riser.

## 3.0 Testing:-The installation from PE/ CS transition fitting up to regulator shall be tested at the [pressure of 1.5 x (MAOP) bar (g)]

- 3.1 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 and got approved by EIC. For the installation to be tested by manometer or diaphragm gauge the meter shall not be dismantled/removed and testing shall be carried out at 100 m bar with holding period of 15 min with no pressure drop.
- 3.2 The calibrated pressure gauges of suitable range shall be supplied by the contractor for testing.
- 3.3 The pressure gauges shall be calibrated from time-to-time as desired by Engineer In-charge but positively once in every six months.
- 3.4 The details of testing shall be properly recorded in the measurement cards.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV

A

SHEET 108 OF 229

**SPECIFICATION FOR  
CS BALL VALVE**



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 109 OF 229</b>	

## 1.0 **INTENT OF SPECIFICATION**

The intent of this specification is to establish minimum requirements to manufacturing of CS Ball Valves used for isolation purpose for supply of natural gas.

## 2.0 **MATERIAL SPECIFICATION FOR ISOLATION VALVES**

2.1 Technical Data Sheet

2.1.1 Item- CS Ball valves conforming to BS EN ISO 17292/ API 6D, Floating Type, Full bore with Socket Weld end, class 800, lever operated fire safe design (Confirming to API 607) for natural gas application.

2.1.2 **Sizes** : 1", 1½", 2".

2.1.3 **Body** : Forged Steel ASTM A 105, **Body Seat ring**: 13% Cr Steel

2.1.4 **Ball** : 13% Cr Steel

2.1.6 **Body Seat/seal**: RPTFE/ VITON

2.1.7 **Stem**: AISI 4140 + 75 microns ENP Coating)/ AISI 410/ 13% Cr Steel (No Casting)  
**Stem Seal**: Grafoil

2.1.8 **Studs Bolts & Nuts**: ASTM A193 Gr. B7/ A194 Gr. 7

2.1.9 **Corrosion Allowance**: 1.5mm

2.1.10 **End Connections**: Socket Welded

2.1.11 **Maximum Operating Pressure** : 4.0 - 6.0 Bar (g)

2.1.12 **Hydrostatic Test Pressure** : 10.5 Bar (g)

2.1.13 **Markings** : Markings shall be provided & shall include Manufacturer's name or trade mark Model designation. Rate working pressure in Bar. Direction of flow, if necessary.


2.1.14 **Fire Resistant Design Requirement**: API 607/ BS:6755 (Part-II)

2.1.15 **Testing standard**: BS EN ISO 17292 / BS 6755 Part 1.

2.1.10 **Operation**: With operating lever and locking arrangement (Without Key). Valve full open/ close position shall be at 90°.

2.1.16 **Connecting Pipe** :


- i) Material : ASTM A106 Gr.B.
- ii) Diameter : 1, 1½ & 2 inch
- iii) Schedule : Sch.80

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 110 OF 229	



**2.1.17 Painting specification**


- i) Surface preparation by Short Blasting as per grade SA 2 1/2, Swedish Standard SIS-05-5900-1967.
  - ii) 1 Coat of Inorganic Zinc Silicate primer with 65-75 $\mu$  DFT/coat +2 coats of Chlorinated rubber zinc Phosphate primer @40  $\mu$  DFT/coat + 2 coats of Chlorinated rubber based finish paint @40  $\mu$  DFT/coat. Total DFT - 225 $\mu$  (min.)
- 3.0 Inspection and Testing shall be as per QAP, this Data Sheet, LEPL's T.S., BS EN ISO 17292 and other relevant standards.
- 4.0 Stops shall be provided to ensure positive alignment of ball with ports and ensure proper installation of handle.
- 6.0 For welding end, the out of roundness (i. e. difference between maximum and minimum ID at pipe end) shall not be more than 0.5% of pipe OD.
- 8.0 Detailed dimensional drawings showing cross-section with part numbers and materials shall be submitted for Purchaser's approval prior to manufacture of the valves.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 111 OF 229</b>	

**SPECIFICATION  
FOR  
QUALITY ASSURANCE SYSTEMS  
REQUIREMENTS**



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 112 OF 229</b>	

## CONTENTS

<b><u>SL No.</u></b>	<b><u>DESCRIPTION</u></b>
1.0	INTRODUCTION
2.0	DEFINITIONS
3.0	CONTRACTORS SCOPE OF WORK
4.0	QUALITY ASSURANCE REQUIREMENTS

### **ATTACHMENTS**

<b><u>TITLE</u></b>	<b><u>NUMBER</u></b>
FORMAT FOR QUALITY PLAN	FORMAT 00001
FORMAT FOR OBSERVATION ON	FORMAT 00002

## 1.0 **INTRODUCTION**

This specification establishes the Quality Assurance Requirements to be met by the sub-contractors (including turnkey Contractors) and their sub-vendors.

In case of any conflict between this specification and other provisions of the contract/ purchase order, the same shall be brought to the notice of LEPL, at the stage of bidding and shall be resolved with LEPL, prior to the placement of order.

## 2.0 **DEFINITION**

### **Bidder**

For the purpose of this specification, the word "Bidder" means the person(s), firm, company or organisation who is under the process of being contracted by LEPL / Owner for delivery of some products (including service). The word is considered synonymous to supplier, contractor or vendor.

### **Correction**

Action taken to eliminate the detected non-conformity.

Refers to repair, rework or adjustment and relates to the disposition of an existing non-conformity.

### **Corrective Action**

Action taken to eliminate the causes of an existing non-conformity, defect or other undesirable situation in order to prevent recurrence.

### **Preventive Action**

Action taken to eliminate the causes of a potential non-conformity, defect or other undesirable situation in order to prevent its recurrence.

### **Process**

Set of interrelated resources and activities which transforms inputs into outputs

### **Special Process**

Processes requiring pre-qualification of their process capability.


## 3.0 **CONTRACTORS SCOPE OF WORK**

### 3.1 **Prior to award of contract**

The bidder shall understand scope of work, drawings, specifications and standards etc., attached to the tender/ enquiry document, before he makes an offer.

The bidder shall submit milestone chart showing the time required for each milestone activity and linkages between different milestone activities along with overall time period required to complete the entire scope of work.

The bidder shall develop and submit manpower and resource deployment chart.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 114 OF 229	

The bidder shall submit, along with the bid, a manual or equivalent document describing/ indicating/ addressing various control/ check points for the purpose of quality assurance and the responsibilities of various functions responsible for quality assurance.

### 3.2 After the award of contract

The bidder shall submit the schedule for submission of following documents in the kick-off meeting or within two weeks of the placement of order, whichever is earlier.

- Detailed Bar Chart
- Quality plan for all activities, required to be done by the bidder, to accomplish offered scope of work
- Inspection and test plans, covering various control aspects
- Job procedures as required by LEPL/ Owner
- Procurement schedule for items to be supplied by contractor covering inspection of the same.

Various documents submitted by the bidder shall be finalized in consultation with LEPL. Here it shall be presumed that once a bidder has made an offer, he has understood the requirements given in the specification and agrees to comply with them in totality unless otherwise categorically so indicated during pre-award stage through agreed deviation/ exception request. All Quality Assurance Plan (QAP) documents shall be reviewed by concerned functional groups of LEPL and the bidder shall be required to incorporate all comments within the framework of this specification at this stage of the contract. It is also obligatory on the part of the bidder that obtains approval on every Quality Assurance Plan (QAP) documents, before he starts using a particular document for delivery of contracted scope of work. Participation of LEPL/ Owner in review/ approval of quality plan/ QAP documents does not absolve the contractor of his contractual obligations towards specified and intended use of the product (or service) provided/ to be provided by him under the contract.

### 3.3 During job execution


During job execution, the bidder shall fully comply with all quality document submitted and finalised/ agreed against the requirements of this specification. Approval of LEPL on all these documents shall be sought before start of work.

Bidder shall produce sufficient quality records on controlled/ agreed forms such that requirements given in this specification are objectively/ demonstrable

Bidder shall facilitate LEPL/ Owner during quality / technical audits at his works/ sites.

Bidder shall discharge all responsibilities towards enforcement of this specification on all his sub-contractors for any part of the scope which is sub-contracted.

## 4.0 QUALITY ASSURANCE SYSTEM REQUIREMENTS

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 115 OF 229</b>	

4.1. The bidder shall nominate an overall in-charge of the contract titled as “Project Manager” for the scope of work of agreed contract. The name of this person shall be duly intimated to LEPL including all subsequent changes, if any. LEPL shall correspond only with the project manager of the bidder on all matters of the project. The project manager of the bidder shall be responsible for co-ordination and management of activities with bidder’s organisation and all sub-vendors appointed by the bidder.

After award of work, the bidder may review augmentation of manpower and resources deployment chart (submitted earlier), detail it out, if so consented by LEPL / Owner and resubmit the same as “issued for effective implementation of the project”.

4.2. The bidder shall plan the contract scope of work on quality plan format such that no major variation is expected during delivery of contract scope of work. These quality plan shall be made on enclosed format complete in all respect. The quality plan shall be assumed to be detailing bidder’s understanding and planning for the contract / offered scope of work. The bidder shall plan the type of resources including various work methodology which he agrees to utilize for delivery of contract scope of work.

4.3. The bidder is required to review the contract at all appropriate stages to evaluate his capabilities with respect to timely and quality completion of all activities pertaining to contracted scope of work and shall report for constraints, if any to LEPL/ Owner.

4.4. The design activities, if any, performed during delivery of contract scope of work shall be so controlled that the outputs is reliable enough. It is expected that during development of design, the bidder shall take recourse to detailed checking, inter departmental reviews and documented verification methods.


4.5. For all documents which the bidder is likely to utilise for delivery of contract scope of work, a system must exist which assures that latest / required version(s) of the document(s) is available at all location/ point of use.

4.6. In case the bidder decides to sub-contract any part/ full of the contract scope of work (without prejudice to main Contractual condition), the bidder shall:


- Evaluate the technical and financial capabilities and past performance of the sub-contractor(s) and their products and / or services before awarding them with the sub-contracted scope of work. Selection of a sub-contractor should meet LEPL approval in documented form.
- Requirement of this specification shall be enforced on sub- contracted agency also. The bidder shall choose sub-contractor based on their capability to meet requirements of this specification also.

Note: It may so happen that, in a given situation, a sub-contractor may not have a system meeting the requirements of this specification. In all such eventualities, bidder may lend his system to sub-contractor for the contract such that sub-contractor effectively meets the requirements of this specification. In all such cases LEPL shall be duly informed.

4.7. Bidder shall establish adequate methodology such that the materials supplied by the Owner / LEPL shall be adequately preserved, handled and made use of for the purpose for which they are provided.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 116 OF 229</b>	

- 4.8. All output delivered against contract scope of work shall be suitably identified in such a manner that either through identification or some other means, sufficient traceability is maintained which permits effective resolution of any problem reported in the outputs.
- 4.9. Critical activities shall be identified and the bidder is required to have documented methodologies which he is going to utilize for carrying out such activities under the contract scope of work. Wherever it is difficult to fully inspect or verify the output (special process), bidder shall pre-qualify, the performers and methodologies.
- 4.10. All inspections carried out by the bidder's surveillance/ inspection staff shall be conformity to quality plans and/ or inspection and test plans. All inspection results shall be duly documented on controlled/ agreed forms such that results can be co-related to specific product, that was inspected/ tested.
- 4.11. All inspection, measuring & test equipments (IMTEs) shall be duly calibrated as per National/ International standards/ codes and only calibrated and certified IMTEs shall be utilized for delivery of contract scope of work.
- 4.12. All outputs / products delivered against contract scope of work shall be duly marked such that their inspection status is clearly evident during all stages / period of the contract.
- 4.13. All non-conformities (NCs) found by the contractor's inspection / surveillance staff shall be duly recorded, including their disposal action. The deficiencies observed during stage of the product, shall be recorded and resolved suitably. Effective corrective and preventive action shall be implemented by the bidder for all repetitive NCs, including deficiencies.
- 4.14. All deficiencies noticed by LEPL / Owner representative (s) shall be recorded on a controlled form (Format No. 00002). Such deficiencies shall be analyzed by the bidder and effective and appropriate correction, corrective and preventive actions shall be implemented. Bidder shall intimate LEPL / Owner of all such corrective and preventive action implemented by him.
- 4.15. Bidder shall establish appropriate methodologies for safe and effective handling, storage, preservation of various materials / inputs encountered during delivery of contract scope of work.
- 4.16. Bidder shall prepare sufficient records for various processes carried out by him for delivery of contract scope of work such that requirements of this specification are objectively demonstrable. In case LEPL / Owner finds that enough objective evidence / recording is not available for any particular process, bidder shall be obliged to make additional records so as to provide sufficient objective evidence. The decision of LEPL / Owner shall be final and binding on such issues.
- 4.17. The bidder shall arrange internal quality audits at quarterly intervals, to independently assess the conformance by various performers to the requirements of this specification. The findings of such assessment shall be duly recorded and a copy shall be sent to LEPL/ Owner for review.
- 4.18. For all special processes, bidder shall deploy only qualified performers. Wherever LEPL/ Owner observes any deficiency, the bidder shall arrange the adequate training to the performer(s) before any further delivery of work.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 117 OF 229	

## **OBSERVATION OF QUALITY ASPECTS**

**FORMAT - 00002**


Job No. and Description Issued to : M/s		No. : Date :	
Location of Work : Item of Work :			
Details of Observation(Deficiency)	Recommended Course of Action		
	Time Allowed for Correction :		
Issued by : _____ Name of Signature of RCM, LEPL Site			
Corrective Action taken report by Contractor/ Vendor :			
Date :	Name and Signature		
Distribution (before resolution) :			
Project Manager Owner	Chief Business Executive LEPL	LEPL Inspection Delhi	Resident Construction Manager, LEPL Site
Verification of Resolution by LEPL :			
Date :	Name of Signature		
Distribution (before resolution) :			
Project Manager Owner	Chief Business Executive LEPL	LEPL Inspection Delhi	Resident Construction Manager, LEPL Site



<b>Bidder's Quality Plan</b>			<b>Project Name :</b>				<b>PO/ Contract Ref:</b>				
General			Performing Functions					Inspection Functions Audit Function			
Activity Description	Procedure Number	Code of Conformance	Performer	Checker	Reviewer/ Approver	Sampling Plan	Testing and Inspection Code	Type of (Approval) Surveillance	Audit Scope	Owner's/ LEPL Review/ Audit Requirement	

**Note:**


- 1) The Bidder ensures that the filled up format conforms to minimum requirements on Quality Plan/ Quality Assurance, specified by LEPL on drawings/ standards/ specifications/ write-up.
- 2) The bidder confirms that document is issued for information/approval of owner / LEPL for the project implementation.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 119 OF 229</b>	

**SPECIFICATION  
FOR  
HEALTH, SAFETY AND  
ENVIRONMENT (HSE)  
MANAGEMENT**



**PREPARED AND ISSUED  
BY  
Lyons Engineering Pvt. Ltd.  
New Delhi, India**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 120 OF 229</b>	

## **CONTENTS**

### **DESCRIPTION**

- 1.0 SCOPE
- 2.0 REFERENCES
- 3.0 REQUIREMENT OF HEALTH, SAFETY & ENVIRONMENT (HSE) MANAGEMENT SYSTEM TO BE COMPLETED BY BIDDERS.
- 4.0 DETAILS OF HSE MANAGEMENT SYSTEM BY CONTRACTOR RECORDS

### **ANNEXURES:**

ANNEXURE-A

ANNEXURE-B

ANNEXURE-C

ANNEXURE-D

ANNEXURE-E



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

**DOCUMENT NO.**

**REV**

**052-LEPL-BGCL-001**

**A**

**SHEET 121 OF 229**

**AMENDMENT STATUS**

	<b>Clause / Paragraph / Annexure / Exhibit / Drawing Amended</b>	<b>Page No.</b>	<b>Revision</b>	<b>Date</b>	<b>By (Name)</b>	<b>Verified (Name)</b>

## 1.0 SCOPE

This specification establishes the Healthy, Safety and Environment (HSE) management requirement to be compiled with by the Contractors during construction.

This specification is not intended to replace the necessary professional judgement needed to design & implement an effective HSE system for construction activities and the contractor is expected to exceed requirements given in this specification.

Requirement stipulated in this specification shall supplement the requirement of HSE management given in relevant Act (S)/ legislations. General Condition of Contract (GCC) Special Condition of Contract (SCC) and Job Specifications. Where different documents stipulate different requirements, the most stringent shall be adopted.

## 2.0 REFERENCES

This document should be read in conjunction with following:

- General Conditions of Contract (GCC)
- Special Conditions of Contract (SCC)
- Building and other construction workers (condition of service) Act, 1996
- Job Specifications
- Relevant IS Codes (Refer Annexure-A)
- Reporting Formats (Refer Annexure-B)
- Statutory requirements

## 3.0 REQUIREMENT OF HEALTH, SAFETY & ENVIRONMENT (HSE) MANAGEMENT SYSTEM TO BE COMPLETED BY BIDDERS.

### Management Responsibility

The Contract should have a document HSE policy to cover commitment of the organization to ensure health, safety and environment aspects in their line of operations The HSE management system of the Contractor shall cover HSE requirement including but not limited to what specified under clause 1.0 & 2.0 mentioned above

Contractor shall be fully responsible for planning and implementing HSE requirement to the satisfaction of the company. Contractor as a minimum requirement shall designate / deploy the following to co-ordinate the above:

No. of workers deployed Up to 250	Designate one safety supervisor who will guide the workers from time to time, as well as impart training basic guidelines at least weekly once.
Above 250 & upto 500	Deploy one qualified and experienced safety Engineer/ Officer who will guide the workers from time to time as well as impart basic guideline & raining at least weekly once. He/ She shall possess a recognized Degree in any branch of engineering or technology or architecture and had a post qualification construction experience of minimum two years or possess a recognized Diploma in any branch of engineering or technology or Graduate in Science stream and had a post qualification construction experience of minimum five years.
Above 500 (for every 500 or less)	One additional safety engineer/Officer whose function will be as mentioned above

Contractor shall identify and hold harmless OWNER / LEPL & their representatives from any and all liabilities arising out of non fulfilment of HSE requirements.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 123 OF 229

Above is the minimum requirement and the Contractor shall ensure physical presence of a safety personnel at each place where Hot work permit is required. No work shall be started at site until above safety personnel are physically present at site. The contractor shall submit a safety organogram clearly indicating the lines of responsibility and reporting system. He shall furnish Bio- Data/Resume/Curriculum Vitae of the safety personnel he intends to mobilize, at least 1 month before the intended mobilization, for LEPL/Owner's approval.

The Contractor shall ensure that the Health, Safety and Environment (HSE) requirements are clearly understood & faithfully implemented at all levels, at each and every site/ work place.

The Contractor shall promote and develop consciousness for Health, Safety and Environment among all personnel working for the Contractor. Regular awareness programs and fabrication shop/work site meeting shall be arranged on HSE activities to cover hazards involved in various operations during construction.

Arrange suitable first aid measures such as First Aid Box, trained personnel to give First Aid, Stand by Ambulance or Vehicle and install fire protection measures such as: adequate number of steel buckets with sand and water and adequate fire extinguishers to the satisfaction of OWNER / LEPL. In case the number of workers exceeds 500, the Contractor shall position an ambulance / vehicle on full time basis very close to the worksite.

The Contractor shall evolve a comprehensive planned and documented system for implementation and monitoring of the HSE requirements. This shall be submitted to OWNER & LEPL for approval well in advance, prior to start of work. The monitoring for implementation shall be done by regular inspection and compliance to the observations there of. The Contractor shall get similar HSE requirements implemented at his sub-contractor (s) work site / Office. However, compliance of HSE requirement shall be the sole responsibility of the Contractor. Any review / approval by OWNER / LEPL shall not absolve the Contractor of his responsibility / liability in relation to all HSE requirements.

Non-Conformance on HSE by the Contractor (including his Sub-contractors) as brought out during review / audit by LEPL / OWNER representative shall be resolved forth with by Contractor. Compliance report shall be possibly submitted to LEPL/ OWNER at the earliest.

The Contractor shall ensure participation of his Resident Engineer / Site-in-Charge in the Safety Committee / HSE Committee meetings arranged by OWNER / LEPL. The compliance of any observation shall be arranged urgently. Contractor shall assist OWNER/LEPL to achieve the targets set by them on HSE during the project implementation.

The contractor shall ensure that his staff members & workers (permanent as well casual) shall not be in a state of intoxication during working hours and shall abide by any law relating to consumption & possession of intoxicating drinks or drugs in force. Awareness about local laws on this issue shall form part of the Induction Training.

The contractor shall ensure that all personnel working for him comply with No smoking requirements of the owner as notified from time to time. Cigarettes, lighters, auto ignition tools or appliances shall not be allowed inside the plant complex. Smoking shall be permitted only inside smoking booths expressly designated & authorized by the Owner/LEPL.

The Contractor shall adhere consistently to all provisions of HSE requirements. In case of non-compliance or continuous failure in implementation of any of HSE provisions; OWNER/ LEPL may impose stoppage of work without any Cost & Time implication to Owner and/or impose a suitable penalty for non-compliance with a notice of suitable period, upto a cumulative limit of 1.0% (one percent) of Contract value with a ceiling of Rs. 10 lakhs.

0.2% (Zero decimal two percent) of the contract value for LSTK, EPC, EPCC or Package contracts with an overall ceiling of Rs. 1,00,00,000/- (Rupees one crore).



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 124 OF 229

Sl. No.	Violation or HSE norms	Penalty Amount
1	For not using personal protective equipment (Helmet, Shoes, Goggles, Gloves, Full body harness, Face shield, Boiler suit, etc.)	Rs 250/- per day / Item / Person
2	Working without work permit	Rs 5000/-per occasion
3	Unsafe electrical practices (not installing ELCB, using poor joints of cables, using naked wire without top plug into socket, laying wire / cables on the roads, electrical jobs by incompetent person, etc.)	Rs.3,000/-per item per day.
4	Working at height without full body harness, using non-standard / rejected scaffolding and not arranging fall protection arrangement as required like Safety Nets.	Rs.1,000/ per case per day
5	Unsafe handling of compressed gas cylinders (No trolley, jubilee clips double gauge regulator, improper storage / handling).	Rs. 100/- per item per day
6	Use of domestic LPG for cutting purpose	Rs.1,000/-per occasion
7	No fencing / barricading of excavated areas	Rs.1,000/- per occasion
8	Not providing shoring / strutting / proper slope and not keeping the excavated earth at least 1.5 M away from excavated area.	Rs.5000/-per occasion
9	Non display of caution boards, list of hospitals, emergency services available at work locations	Rs.500/-per occasion
10	Traffic rules violations like over speeding of vehicles, rash driving, wrong parking, not using seat belts, vehicles not fitted with reverse warning alarms.	Rs.1,000/- per occasion
11	Absence of Contractor's top most executive at site in the safety meetings whenever called by LEPL / Owner	Rs.1,000/-per occasion
12	Failure to maintain safety records by Contractor safety personnel.	Rs.1,000/-per month
13	Failure to conduct daily safety site inspection, HSE meeting and HSE audit at predefined frequencies.	Rs.1,000/-per occasion
14	Failure to submit the monthly HSE report by 5 <sup>th</sup> of subsequent month to Engineer-in-Charge.	Rs.1,000/- per day for further delay.
15	Poor House Keeping	Rs.1,000/-per occasion
16	Failure to report & follow up accident (including near miss) reporting system.	Rs.1,0000/-per occasion
17	Degradation of environment (not confining toxic spills oil / lubricants onto ground)	Rs.1,000/-per occasion
18	Not medically examining the workers before allowing them to work at height, not providing ear muffs while allowing them to work in noise polluted areas, made them to work in air polluted areas without respiratory protective devices, etc.	Rs.1,000/-per occasion
19	Violation of any other safety condition as per job HSE plan, work permit and HSE conditions of contract (using crowbar on cable trenches, improper welding booth, not keeping fire extinguisher ready at hot work site, unsafe rigging practices, non-availability of First-Aid box, etc.)	Rs.1,000/-per occasion
20	Any violation not covered above	To be decided by BGCL



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV

A

SHEET 125 OF 229

This penalty shall be in addition to all other penalties specified elsewhere in the contract. The decision of imposing stoppage of work, its extent & monetary penalty shall rest with LEPL/OWNER & binding on the Contractor.

All fatal accidents and other personnel accidents shall be investigated by a team of Contractor's senior personnel for root cause and recommend corrective and preventive actions. Findings shall be documented and suitable actions taken to avoid recurrences shall be communicated to OWNER / LEPL. OWNER / LEPL shall have the liberty to independently investigate such occurrences and Contractor shall extend all necessary help and co-operation in this regard. LEPL / Owner shall have the right to share the content of this report with the outside world.


### House Keeping

Contractor shall ensure that a high degree of housekeeping is maintained and shall ensure the followings:

- a) All surplus earth and debris are removed / disposed off from the working site to identified location (s).
- b) Unused/Surplus Cables Steel items and steel scrap lying scattered at different places within the working areas are removed to identified location(s).
- c) All wooden scrap, empty wooden cable drums and other combustible packing materials shall be removed from work place to identified location(s).
- d) Roads shall be kept clear and materials like pipes, steel, sand, boulders, concrete chips and bricks, etc. shall not be allowed in the roads to obstruct free movement of men & machineries.
- e) Fabricated steel structurals, pipes & piping materials shall be stacked properly for erection.
- f) Water logging on roads shall not be allowed.
- g) No parking of trucks/ trolleys, cranes and trailers etc. shall be allowed on roads, which may obstruct the traffic movements.
- h) Utmost care shall be taken to ensure overall cleanliness and proper upkeep of the working areas.
- i) Trucks carrying sand, earth and pulverized materials etc. shall be covered while moving within the plant areas.
- j) The contractor shall ensure that the atmosphere in plant area and on roads is free from particulate matter like dust, sand, etc. by keeping the top surface wet for ease in breathing.
- k) At least two exits for any unit area shall be assured at all times.

### Healthy, Safety and Environment

- a) The Contractor shall provide safe means of access to any working place including provision of suitable and sufficient scaffolding at various stages during all operations of the work for the

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 126 OF 229	



safety of his workmen, and OWNER/ LEPL. Contractor shall ensure deployment of appropriate equipment and appliances for adequate safety and healthy of the workmen and protection of surrounding areas.

Contractor shall ensure identification of all Occupational Health, Safety & Environmental hazards in the type of work he is going to undertake and enlist mitigation measures. Contractor shall carry out Job Safety Analysis (JSA) specifically for high risk jobs like working at height & in confined space, deep excavations, radiography jobs, electrical installations, blasting operations, demolishing / dismantling activities, welding / gas cutting jobs and submit the findings to LEPL / Owner. The necessary HSE measures devised shall be in place prior to start of an activity by the contractor.

- b) The Contractor shall ensure that all their staff workers including their sub-Contractor (s) shall wear Safety Helmet and Safety shoes. Contractor shall also ensure use of safety belt, protective goggles, gloves etc. by the personnel as per jobs requirements. All these gadgets shall conform to relevant IS specification equivalent.

The Contractor shall ensure that all their staff, workers and visitors including their sub-contractor (s) have been issued (records to be kept) & wear appropriate PPEs like nape strap type safety helmets preferably with head & sweat band with 3/4" cotton chin strap (made of industrial HDPE), safety shoes with steel toe cap and antiskid sole, full body harness (CE marked and conforming to EN361), protective goggles, gloves, ear muffs, respiratory protective devices, etc. All these gadgets shall conform to applicable IS Specifications / CE or other applicable international standards.

Owner may issue a comprehensive color scheme for helmets to be used by various agencies. The Contractor shall follow the scheme issued by the owner. All Safety / Fire personnel shall preferably wear red colour helmet so that workmen can approach them for guidance during emergencies.

For shot blasting, the usage of protective face shield and helmets, gauntlet and protective clothing is mandatory.


For offshore jobs/contracts, contractor shall provide PPEs (new) to LEPL & Owner's personnel, at his (contractor's) cost. All personnel shall wear life jacket at all time.

An indicative list of HSE standards/codes is given under Appendix-A.

- c) The contractor shall issue height permit for working at height after verifying and certifying the checkpoints as specified in the attached permit (Format No. HSE-6). He shall also undertake to ensure compliance to the conditions of the permit during the currency of the permit including adherence to personal protective equipments.

The permit shall be issued initially for one week or expected duration of an activity and extended further for the balance duration. This permit shall be applicable in areas where specific clearance from Owner's operation Deptt. / Safety Deptt. is not required. LEPL field Engineers / Safety Officers / Area Coordinators may verify and counter sign this permit (as an evidence of verification) during the execution of the job.

In case work is undertaken without taking sufficient precautions as given in the permit, LEPL Engineers may cancel the permit and stop the work till satisfactory compliance is

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 127 OF 229	

arranged. Contractors are expected to maintain a register for issuance of permit and extensions thereof including preserving the used permits for verification during audits etc.

- d) Contractor shall arrange (at his cost) and ensure use of Fall Arrester Systems by his workers. Fall arresters are to be used while climbing / descending tall structures. These arresters should lock automatically against the anchorage line, restricting free fall of the user. The device is to be provided with a double security opening system to ensure safe attachment or release of the user at any point of rope. In order to avoid shock, the system should be capable of keeping the person in vertical position in case of a fall.

Contractor shall ensure that Full body harnesses conforming N361 and having authorized CC marking is used by all personnel while working at height. The lanyards and life lines should have enough tensile strength to take the load of the worker in case of a fall. One end of the lanyard shall be firmly tied with the harnesses and the other end with life line. The harness should be capable of keeping the workman vertical in case of a fall, enabling him to rescue himself.

Contractor shall provide Roof Top Walk Ladders for carrying out activities on sloping roofs in order to reduce the chances of slippages and falls.


Contractor shall ensure that a proper Safety Net System shall be used at appropriate locations. The safety net shall be located not more than 30 feet (9.0 meters) below the working surface at site to arrest or to reduce the consequences of possible fall of persons working at different heights.

Contractor shall ensure that flash back arrestors conforming to BS:6158 or equivalent are installed on all gas cylinders as well as at the torch end of the gas hose, while in use. All cylinders shall be mounted on trolleys and provided with a closing key. The burner and the hose placed downstream of pressure reducer shall be equipped with Flash Back Arrester / Non Return Valve device. The hoses for acetylene and oxygen cylinders must be of different colours. Their connections to cylinders and burners shall be made with a safety collar. At end of work, the cylinders in use shall be closed and hoses depressurized. All welding machines shall have effective earthing. In order to help maintain good house keeping, and to reduce fire hazard, live electrode bits shall be contained safely and shall not be thrown directly on the ground.

- e) The Contractor shall assign to his workmen, tasks commensurate with their qualification, experience and state of health for driving of vehicles, handling and erections of materials and equipment's. All lifting equipments shall be tested certified for its capacity before use. Adequate and suitable lighting at every work place and approach there to shall be provided by the contractor before starting the actual work / operation at night use) to minimize overloading risk. SLI shall have capability to continuously monitor and display the load on the hook, and automatically compare it with the rated crane capacity at the operating condition of the crane. The system shall also provide visual and audible warnings at set capacity levels to alert the operator in case of violations.

The contractor shall be responsible for safe operations of different equipments mobilized and used by him at the workplace like transport vehicles, engines, cranes, mobile ladders, scaffoldings, work tools, etc.

- f) Hazardous and / or toxic material such as solvent coating or thinners shall be stored in appropriate containers.
- g) All hazardous materials shall be labeled with the name of the materials, the hazards associated with its use and necessary precautions to be taken.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 128 OF 229</b>	

The work place shall be checked prior to start of activities to identify the location, type and condition of any asbestos materials which could be disturbed during the work. In case asbestos material is detected, usage of appropriate PPEs by all personnel shall be ensured and the matter shall be reported immediately to LEPL / Owner.

- h) Contractor shall ensure that during the performance of the work all hazards to the health of personnel have been identified assessed and eliminated.
- i) Chemical spills shall be contained & cleaned up immediately to prevent further contamination.
- j) All personnel exposed to physical agents such as ionizing or non-ionizing radiation ultraviolet rays or similar other physical agents shall be provided with adequate shielding or protection commensurate with type of exposure involved. For ionizing radiation, requirements of Bhabha Atomic Research Centre (BARC) / Atomic Energy Regulatory Board (AERB) shall be followed.
- k) Where contract or exposure of hazardous materials could exceed limits or could otherwise have harmful affects, appropriate personal protective equipment's such as gloves, goggles, aprons, chemical resistant clothing and respirator shall be used.
- l) Contractor shall ensure the following facilities at work sites:  
 A Crèche where 10 or more female workers are having children below the age of 6 years.  
 Contractor shall ensure installation of Safe Load Indicator (SLI) on all cranes (while in  
 Contractor shall ensure installation of Safe Load Indicator (SLI) on all cranes (while in  
 Contractor shall ensure installation of Safe Load Indicator (SLI) on all cranes (while in

Reasonable Canteen facilities are made available at appropriate location depending upon site conditions.


- m) Suitable facilities for toilet, drinking water, proper lighting shall be provided at site and labor camps, commensurate with applicable Laws/Legislation.
- n) Contractor shall ensure storage and utilization methodology of material that are not detrimental to the environment. Wherever required Contractor shall ensure that only the environment friendly material are selected.

Emphasize on recycling of waste materials such as metals, plastics, glass, paper, oil & solvents. The waste that cannot be minimized, reused or recovered shall be stored and disposed of safely. In no way, toxic spills shall be allowed to percolate into the ground. The contractor shall not use the empty areas for dumping the wastes.

All person deployed at site shall be knowledgeable of and comply with the environmental laws, rules & regulation relating to the hazardous materials substance and wastes. Contractor shall not dump, release or otherwise discharge or dispose off any such materials without the authorization of OWNER/ LEPL.

Suitable scaffoldings shall be provided to workmen for all works that cannot be safely done from the ground or from solid construction except such short period work that can be safely done using ladders. When a ladder is used, an extra workman shall be engaged for holding the ladder.

The contractor shall ensure that the scaffolds used during construction activities shall be strong enough to take the designed load. Owner / LEPL reserves the right to ask the contractor to submit certification and or design calculations from his Engineering regarding load carrying capacity of the scaffoldings.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 129 OF 229	

All scaffolds shall be inspected by a Scaffolding Inspector of the contractor. He shall paste a GREEN tag on each scaffold found safe and a RED tag on each scaffold found unsafe. Scaffolds with GREEN tag only shall be permitted to be used and RED ones shall immediately be removed from the site.

All electrical installations / connections shall be carried out as per the provisions of latest revision of following codes/standards, in addition to the requirements of Statutory Authorities and IE / applicable international rules & regulations:


- OISO SID 173: Fire prevention & protection system for electrical installations
- SP 30 (BIS) : National Electric Code

All electrical installations shall be approved by the concerned statutory authorities he contractor shall meet the following requirements:

- i. Ensure that electrical systems and equipment including tools & tackles used during construction phase are properly selected, installed, used and maintained as per provisions of the latest revision of the Indian Electrical / applicable international regulations.
- ii. Shall deploy qualified & licensed electricians for proper & safe installation and for regular inspection of construction power distribution system / points including their earthing. A copy of the license shall be submitted to LEPL / Owner for records. Availability of at least one competent licensed electrician shall be ensured at site round the clock to attend to the normal / emergency jobs.
- iii. All switchboards / welding machines shall be kept in well-ventilated & covered shed. The shed shall be elevated to avoid water logging. No flammable materials shall be used for constructing the shed. Also flammable materials shall not be stored in and around electrical equipment / switchboard. Adequate clearances and operational space shall be provided around the equipment.
- iv. Fire extinguishers and insulating mats shall be provided in all power distribution centers.
- v. Temporary electrical equipment shall not be employed in hazardous area without obtaining safety permit.
- vi. Proper house keeping shall be done around the electrical installations.
- vii. All temporary installations shall be tested before energising, to ensure proper earthing, bonding, suitability of protection system, adequacy of feeders/cables etc.
- viii. All welders shall use hand gloves irrespective of holder voltage.
- ix. Multilingual (Hindi, English and local language) caution boards, shock treatment charts and instruction plate containing location of isolation point for incoming supply, name & telephone No. of contact person in emergency shall be provided in substations and near all distribution boards / local panels.
- x. Operation of earth leakage device shall be checked regularly by temporarily connecting series test lamp (2 bulbs of equal rating connected in series) between phase and earth.
- xi. Regular inspection of all installations (at least once in a month)


The following features shall also be ensured for all electrical installations during construction phase by the contractor:

- i) Each installation shall have a main switch with a protective device, installed in an

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 130 OF 229</b>	

enclosure adjacent to the metering point. The operating height of the main switch shall not exceed 1.5 M. The main switch shall be connected to the point of supply by means of armoured cable.

- ii) The outgoing feeders shall be double or triple pole switches with fuses / MCBs. Loads in a three phase circuit shall be balanced as far as possible and load on neutral should not exceed 20% of load in the phase.
- iii) The installation shall be adequately protected against overload, short circuit and earth leakage by the use of suitable protective devices. Fuses wherever used shall be HRC type. Use of rewirable fuses shall be strictly prohibited. The earth leakage device shall have an operating current not exceeding 30 mA.
- iv) All connections to the hand tools / welding receptacles shall be taken through proper switches, sockets and plugs.
- v) All single phase sockets shall be minimum 3 pin type only. All unused sockets shall be provided with socket caps.
- vi) Only 3 core (P+N+E) overall sheathed flexible cables with minimum conductor size of 1.5 mm<sup>2</sup> copper shall be used for all single phase hand tools.
- vii) Only metallic distribution boxes with double earthing shall be used at site. No wooden boxes shall be used.
- viii) All power cables shall be terminated with compression type cable glands. Tinned copper lugs shall be used for multi-strand wires / cables.
- ix) Cables shall be free from any insulation damage.
- x) Minimum depth of cable trench shall be 750 mm for MV & control cables and 900 mm for HV cables. These cables shall be laid over a sand layer and covered with sand, brick & soil for ensuring mechanical protection. Cables shall not be laid in waterlogged area as far as practicable. Cable route markers shall be provided at every 25M of buried trench route. When laid above ground, cables shall be properly cleated or supported on rigid poles of at least 2 M high. Minimum head clearance of 6 meters shall be provided at road crossings.
- xi) Underground road crossings for cables shall be avoided to the extent feasible. In any case no underground power cable shall be allowed to cross the roads without pipe sleeve.
- xii) All cable joints shall be done with proper jointing kit. No taped /temporary joints shall be used.
- xiii) An independent earthing facility should preferably be established within the temporary installation premises. All appliances and equipment shall be adequately earthed. In case of armoured cables, the armour shall be bonded to the earthing system.
- xiv) All cables and wire rope used for earth connections shall be terminated through tinned copper lugs.
- xv) In case of local earthing, earth electrodes shall be buried near the supply point and earth continuity wire shall be connected to local earth plate for further distribution to various appliances. All insulated wires for earth connection shall have insulation of green colour.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 131 OF 229	

- xvi) Separate core shall be provided for neutral. Earth / Structures shall not be used as a neutral in any case.
- xvii) ON/OFF position of all switches shall be clearly designated / painted for easy isolation in emergency.

The contractor shall identify all operations that can adversely affect the health of its workers and issue & implement mitigation measures.

For surface cleaning operations, sand blasting shall not be permitted even if not explicitly stated elsewhere in the contract.

To eliminate radiation hazard, Tungsten electrodes used for Gas Tungsten Arc Welding shall not contain Thorium.

Appropriate respiratory protective devices shall be used to protect workmen from inhalation of air borne contaminants like silica, asbestos, gases, fumes, etc.

Workmen shall be made aware of correct methods for lifting, carrying, pushing & pulling of heavy loads. Wherever possible, manual handling shall be replaced by mechanical lifting equipments.

For jobs like drilling / demolishing / dismantling where noise pollution exceeds the specified limit of 85 decibels, ear muffs shall be provided to the workers.

To avoid upper limb disorders and backaches, Display Screen Equipments' workplace stations shall be carefully designed & used with proper sitting postures. Power driven hand-held tools shall be maintained in good working condition to minimize their vibrating effects and personnel using these tools shall be taught how to operate them safely & how to maintain good circulation in hands.

The contractor shall arrange health checkup for all the workers at the time of induction. Health check may have to be repeated if the nature of duty assigned to him is changed necessitating health check or doubt arises about his wellness. LEPL / Owner reserve the right to ask the contractor to submit test reports.

#### **Weather Protection**

Contractor shall take appropriate measures to protect workers from severe storms, solar radiations, poisonous gases, dust, etc. by ensuring proper usage of PPEs like Sun glasses, Sun screen lotions, respirators, dust masks, etc. and rearranging / planning the construction activities to suit the weather conditions.


#### **Communication**

All persons deployed at the work site shall have access to effective means of communication so that any untoward incident can be reported immediately and assistance sought by them. All health & safety information shall be communicated in a simple & clear language easily understood by the local workforce.

#### **Unsuitable Land Conditions**

Contractor shall take appropriate measures and necessary work permits / clearances if work is to be done in or around marshy areas, river crossings, mountains, monuments, etc.

#### **Under Water Inspection**

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 132 OF 229	



Contractor shall ensure that boats and other means used for transportation, surveying & investigation works shall be certified seaworthy by a recognized classification society. It shall be equipped with all life saving devices like life jackets, adequate fire protection arrangements and shall possess communication facilities like cellular phones, wireless, walkie-talkie. All divers used for seabed surveys, under water inspections shall have required authorized license, suitable life saving kit. Number of hours of work by divers shall be limited as per regulations. LEPL/Owner shall have the right to inspect the boat and scrutinize documents in this regard.

**TOOL BOX MEETING (TBM)**

Contractor shall conduct daily TBM with workers prior to start of work and shall maintain proper record of the meeting. A suggested format is given below. The TBM is to be conducted by the immediate supervisor of the workers.

**TOOLBOX MEETING RECORDING SHEET**

**Date & Time**

**Subject Presenter**

**Hazards involved**

**Precautions to be taken**

**Worker's Name**

**Signature**

**Section**

Remarks, if any

The topics during TBM shall include

- Hazards related to work assigned on that day and precautions to be taken.
- Any forthcoming HSE hazards / events / instruction / orders, etc.

The above record can be kept in local language, which workers can read. These records shall be made available to LEPL / Owner whenever demanded.

**TRAINING**


Contractor shall ensure that all his personnel possess appropriate training to carry out the assigned job safely. The training should be imparted in a language understood by them and should specifically be trained about

- Potential hazards to which they may be exposed at their workplace
- Measures available for prevention and elimination of these hazards

The topics during training shall cover, at the minimum;

- Education about hazards and precautions required
- Emergency and evacuation plan
- HSE requirements
- Fire fighting and First-Aid
- Use of PPEs
- Local laws on intoxicating drinks, drugs, smoking in force

Records of the training shall be kept and submitted to LEPL / Owner whenever demanded.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 133 OF 229</b>	

For offshore and jetty jobs, contractor shall ensure that all personnel deployed have undergone a structured sea survival training including use of lifeboats, basket landing, use of radio communication etc. from an agency acceptable to Owner / LEPL.


## **INSPECTION**

The contractor shall carryout daily HSE inspection and record observations at a central location. These inspection records shall be freely accessible to Owner/LEPL representatives. The contractor shall also assist Owner / LEPL representatives during the HSE inspections conducted by them.

## **ADDITIONAL SAFETY REQUIREMENTS FOR WORKING INSIDE A RUNNING PLANT**

As a minimum, the contractor shall ensure adherence to following safety requirements while working in or in the close vicinity of an operating plant:

- a. Contractor shall obtain permits for Hot work, Cold work, Excavation and Confined Space from Owner in the prescribed format.
- b. The contractor shall monitor, record and compile list of his workers entering the operational plant/unit each day and ensure & record their return after completing the job.
- c. Contractor's workers and staff members shall use designated entrances and proceed by designated routes to work areas only assigned to them. The workers shall not be allowed to enter units' area, tanks area, pump rooms, etc. without work authorization permit.
- d. Work activities shall be planned in such a way so as to minimize the disruption of other activities being carried out in an operational plant / unit and activities of other contractors.
- e. The contractor shall submit a list of all chemicals / toxic substances that are intended to be used at site and shall take prior approval of the Owner.
- f. Specific training on working in a hydrocarbon plant shall be imparted to the work force and mock drills shall be carried out for Rescue operations / First-Aid measures.
- g. Proper barricading / cordoning of the operational units / plants shall be done before starting the construction activities. No unauthorized person shall be allowed to trespass. The height and overall design of the barricading structure shall be finalized in consultation with the Owner and shall be got approved from the Owner.
- h. Care shall be taken to prevent hitting underground facilities such as electrical cables, hydrocarbon piping during execution of work.
- i. Barricading with water curtain shall be arranged in specific/critical areas where hydrocarbon vapours are likely to be present such as near horton spheres or tanks. Positioning of fire tenders (from owner) shall also be ensured during execution of

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 134 OF 229	



- j. Emergency evacuation plan shall be worked out and all workmen shall be apprised about evacuation routes. Mock drill operations may also be conducted.
- k. Flammable gas test shall be conducted prior to any hot work using appropriate measuring instruments. Sewers, drains, vents or any other gas escaping points shall be covered with flame retardant tarpaulin.
- l. Respiratory devices shall be kept handy while working in confined zones where there is a danger of inhalation of poisonous gases. Constant monitoring of presence of Gas / Hydrocarbon shall be done.
- m. Clearance shall be obtained from all parties before starting hot tapping, patch work on live lines and work on corroded tank roof.
- n. Positive isolation of line/equipment by blinding for welding/cutting/grinding shall be done. Closing of valve will not be considered sufficient for isolation.
- o. Welding spatters shall be contained properly and in no case shall be allowed to fall on the ground containing oil. Similar care shall be taken during cutting operations.
- p. The vehicles, cranes, engines, etc. shall be fitted with spark arresters on the exhaust pipe and got it approved from Safety Department of the Owner.
- q. Plant air should not be used to clean any part of the body or clothing or use to blow off dirt on the floor.
- r. Gas detectors should be installed in gas leakage prone areas as per requirement of Owner's plant operation personnel.
- s. An experienced full time safety personnel shall be exclusively deployed to monitor safety aspects in running plants.

**HSE PROMOTION**


The contractor shall encourage his workforce to promote HSE efforts at workplace by way of organizing workshops / seminars / training programmes, celebrating HSE awareness weeks & National Safety Day, conducting quizzes & essay competitions, distributing pamphlets, posters & material on HSE, providing incentives for maintaining good HSE practices and granting bonus for completing the job without any lost time accident.

**4.0 DETAILS OF HSE MANAGEMENT SYSTEM BY CONTRACTOR**

**On Award of Contract**


The Contractor shall prior to start of work submit his Health, Safety and Environment Manual of procedure and HSE Plans for approval by OWNER/LEPL. The Contractor shall participate in the pre-start meeting with OWNER/LEPL to finalize HSE plans including the following.

- Job procedure to be followed by Contractor for activities covering Handling of equipment's, Scaffolding, Electric Installation, describing the risks involved, actions to be taken and methodology for monitoring each.
- Organizations structure along with responsibility and authority records/ reports etc. on HSE activities.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 135 OF 229</b>	

**During job execution** Implement approved Health, Safety and Environment management procedure including but not limited to as brought our under para 3.0. Contractor shall also ensure to:

- Arrange workmen compensation insurance, registration under ESI Act, third party liability insurance etc. as applicable.
- Arrange all HSE permits before start of activities (as applicable) like her work, confined space, work at heights, storage of Chemicals/explosives materials and its use and implement all precautions mentioned therein
- Submit timely the completed check list on HSE activities, Monthly HSE report, accident report, investigation report, etc. as per OWNER/LEPL requirements. Compliance of instructions on HSE shall be done by Contractor and informed urgently to OWNER/LEPL.
- Ensure that resident Engineers/Site-In-Charge of the Contractor shall amend all the Safety Committee/HSE meeting arranged by OWNER/ LEPL only in case of his absence from site, a seconds senior most person shall be nominated by him in advance and communicated to OWNER/LEPL.
- Display at site office and work locations caution boards, list of hospitals for emergency services available.
- Provided posters, banners, for safe working to promote safety consciousness.
- Carryout audits/inspection at sub Contractor work as per approved HSE documents & submit the reports for OWNER/LEPL review
- Assist in HSE audits by OWNER/ MECON and submit compliance report.
- Generate & submit HSE records/ reports as per HSE Plan.
- Appraise OWNER/LEPL on HSE activities at site.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 136 OF 229	

## 5.0

## RECORDS

At the minimum, the contractor shall maintain/ submit HSE records in the following reporting formats:

1.	Monthly HSE Checklist cum compliance report	HSE-1
2.	Accident / Incident Report	HSE-2
3.	Supplementary Accident / Incident Investigation report	HSE-3
4.	Near Miss Incident Report	HSE-4
5.	Monthly HSE Report	HSE-5
6.	Permit for working at height	HSE-6
7.	Permit for working in confined space	HSE-7
8.	Permit for radiation work	HSE-8
9.	Permit for demolishing / dismantling	HSE-9



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 137 OF 229

## ANNEXURE-A

### A. I.S. CODES ON HSE

SP:53	Safety code for the use, Care and protection of hand operated tools.
IS: 818	Code of practice for safety and health requirements in electric and gas welding and cutting operations
IS: 1179	Eye and Face precautions during welding, equipment etc.
IS: 1860	Safety requirements for use, care and protection of abrasive grinding wheels.
IS: 1989(Part-I & II)	Leather safety boots and shoes
IS: 2925	Industrial Safety Helmets
IS: 3016	Code of practice for fire safety precautions in welding and cutting
IS: 3043	Code of practice for earthing.
IS: 3764	Code of safety for excavation work.
IS: 3786	Methods for computation of frequency and severity rates for industrial injuries and classification of industrial accidents.
IS: 3996	Safety Code of scaffolds and ladders.
IS: 4082	Recommendation on stacking and storage of construction materials and components at site.
IS: 4770	Rubber gloves for electrical purposes.
IS: 5121	Safety code for piling and other deep foundations.
IS: 5216 (Part-I)	Recommendations on Safety procedures and practices in electrical works.
IS: 5557	Industrial and Safety rubber lined boots.
IS: 5983	Eye protectors.
IS:6519	Selection, care and repair of Safety footwear.
IS: 6994 (Part-I)	Industrial Safety Gloves (Leather & Cotton Gloves).



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001


A

SHEET 138 OF 229

IS: 7293	Safety Code for working with construction Machinery.
IS: 8519	Guide for selection of industrial safety equipment for body protection.
IS: 9167	Ear protectors.
IS: 11006	Flash back arrestor (Flame arrestor).
IS:11016	General and safety requirements for machine tools and their operation.
IS: 11057	Specification for Industrial safety nets.
IS: 11226	Leather safety footwear having direct moulded rubber sole.
IS: 11972	Code of practice for safety precaution to be taken when entering a sewerage system.
IS: 13367	Code of practice-safe use of cranes.
IS: 13416	Recommendations for preventive measures against hazards at working place.


#### B. INTERNATIONAL STANDARDS ON HSE

<b>Safety Glasses</b>	:	<b>ANSI Z 87.1, ANSI ZZ 87.1, AS 1337, BS 2092, BS 1542, BS 679, DIN 4646 / 58211</b>
<b>Safety Shoes</b>	:	<b>ANSI Z 41.1, AS 2210, EN 345</b>
<b>Hand Gloves</b>	:	<b>BS 1651</b>
<b>Ear Muffs</b>	:	<b>BS 6344, ANSI S 31.9</b>
<b>Hard Hat</b>	:	<b>ANSI Z 89.1 / 89.2, AS 1808, BS 5240, DIN 4840</b>
<b>Goggles</b>	:	<b>ANSI Z 87.1</b>
<b>Face Shield</b>	:	<b>ANSI Z 89.1</b>
<b>Breathing Apparatus</b>	:	<b>BS 4667, NIOSH</b>
<b>Welding &amp; Cutting</b>	:	<b>ANSI Z 49.1</b>
<b>Safe handling of compressed Gases cylinders</b>	:	<b>P-1 (Compressed Gas Association 1235 Jefferson Davis Highway, Arlington VA 22202 – USA) in</b>

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 139 OF 229</b>	

SL.NO	DESCRIPTION	QUANTITY
1.	Small size Roller Bandages, 1 inch wide (Finger Dressing small)	6 Pcs.
2.	Medium size Roller Bandages, 2 inch wide (Hand and Foot Dressing)	6 Pcs.
3.	Large size Roller Bandages, 4 inch wide (Body Dressing Large)	6 Pcs.
4.	Large size Burn Dressing (Burn Dressing Large)	4 Pkts.
5.	Cotton wool (20 gms packing)	4 Pkts.
6.	Antiseptic Solution Dettol (100 ml.) or Savlon	1 Bottle
7.	Mercurochrome Solution (100 ml.) 2% in water	1 Bottle
8.	Ammonia Solution (20 ml.)	1 Bottle
9.	A Pair of Scissors	1 Piece
10.	Adhesive Plaster (1.25 cm x 5 m)	1 Spool
11.	Eye pads in Separate Sealed Packet	4 Pcs.
12.	Tourniquet	1 No.
13.	Safety Pins	1 Dozen
14.	Tinc. Iodine / Betadin (100 ml.)	1 Bottles
15.	Ointment for burns (Burnol 20 gms.)	1 Bottole
16.	Polythene Wash cup for washing eyes	1 No.
17.	Potassium Permanganate (20 gms.)	1 Pkt.
18.	Tinc. Benzoine (100 ml.)	1 Bottole
19.	Triangular Bandages	2 Nos.
20.	Band Aid Dressing	5 Pcs.
21.	Iodex / Moov (25 gms.)	1 Bottole
22.	Tongue Depressor	1 No.
23.	Boric Acid Powder (20 gms.)	2 Pkt.
24.	Sodium Bicarbonate (20 gms.)	1 Pkt.
25.	Dressing Powder (Nebasulf) (10 gms.)	1 Bottole
26.	Medicinal Glass	1 No.
27.	Duster	1 No.
28.	Booklet (English & Local Language)	1 No. each
29.	Soap	1 No.
30.	Toothache Solution	1 No.
31.	Eye Ointment	1 Bottle
32.	Vicks (22 gms.)	1 Bottle
33.	Forceps	1 No.
34.	Cotton Buds (5 nos.)	1 Pkt.
35.	Note Book	1 No.
36.	Splints	4 Nos.
37.	Lock	1 Piece
38.	Life Saving/Emergency/Over-the Counter Drugs	As decided at site
Box size : 14" x 12" x 4"		

**Note :The medicines prescribed above are only indicative. Equivalent medicines can also be used. A prescription, in this regard, shall be required from a qualified Physician.**

	Laying of Underground PE Pipe Line and Above GI Installation including LMC Consumer End at Bengal Gas Company Limited	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 140 OF 229	

**ANNEXURE - C**

**TYPE OF FIRES VIS-À-VIS FIRE EXTINGUISHERS**

Fire	Fire Extinguishers				
	Water	Foam	CO <sub>2</sub>	Dry Powder	Multi Purpose ((ABC)
Originated from paper, clothes, wood	√	√	Can control minor surface fires	Can control minor surface fires	√
Inflammable liquids like alcohol, diesel, petrol, edible oils, bitumen	x	√	√	√	√
Originated from gases like LPG, CNG, H <sub>2</sub>	x	x	√	√	√
Electrical Fires	x	x	√	√	√

**Legend :** √ Can be used  
X Not to be used

**Note :** Fire extinguishing equipment must be checked at least once a year and after every use by an authorized person. The equipment must have an inspection label on which the next inspection date is given. Type of extinguisher shall clearly be marked on it.

## ANNEXURE - D

### Indicative List of Statutory Acts & Rules Relating to HSE

The Indian Explosives Act and Rules.

The Motor Vehicle Act and Central Motor Vehicle Rules.

The Factories Act and concerned Factory Rules.

The Petroleum Act and Petroleum Rules.

The Workmen Compensation Act.

The Gas Cylinder Rules and the Static & Mobile Pressure Vessels Rules.

The Indian Electricity Act and Rules.

The Indian Boiler Act and Regulations.

The Water (Prevention & Control & Pollution) Act.

The Water (Prevention & Control of Pollution) Cess Act.

The Mines & Minerals (Regulation & Development) Act.

The Air (Prevention & Control of Pollution) Act.

The Atomic Energy Act.

The Radiation Protection Rules The Indian Fisheries Act.

The Indian Forest Act.

The Wild Life (Protection) Act.

The Environment (Protection) Act and Rules.

The Hazardous Wastes (Management & Handling) Rules.

The Manufacturing, Storage & import of Hazardous Chemicals Rules.

The Public Liability Act.

The Building and Other Construction Workers (Regulation of Employment and Condition of service) Act.

Other statutory acts Like EPF, ESIS, Minimum Wage Act.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 142 OF 229



## CONSTRUCTION HAZARDS, THEIR EFFECTS &amp; PREVENTIVE MEASURES

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
(A) EXCAVATION  Pit Excavation up to 3.0m	➤ Falling into pit	➤ Personal injury	<ul style="list-style-type: none"> <li>➤ Provide guard rails/barricade with warning signal.</li> <li>➤ Provide at least two entries/exits.</li> <li>➤ Provide escape ladders.</li> </ul>
	➤ Earth Collapse	<ul style="list-style-type: none"> <li>➤ Suffocation / Breathlessness</li> <li>➤ Buried</li> </ul>	<ul style="list-style-type: none"> <li>➤ Provide suitable size of shoring and strutting, if required.</li> <li>➤ Keep soil heaps away from the edge equivalent to 1.5m or depth of pit whichever is more.</li> <li>➤ Don't allow vehicles to operate too close to excavated areas. Maintain at least 2m distance from edge of cut.</li> <li>➤ Maintain sufficient angle of repose. Provide slope not less than 1:1 and suitable bench of 0.5m width at every 1.5m depth of excavation in all soils except hard rock.</li> <li>➤ Battering/benching the sides.</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Contact with buried electric cables</li> <li>➤ Gas/ Oil Pipelines</li> </ul>	<ul style="list-style-type: none"> <li>➤ Electrocutation</li> <li>➤ Explosion</li> </ul>	<ul style="list-style-type: none"> <li>➤ Obtain permission from competent authorities, prior to excavation, if required.</li> <li>➤ Locate the position of buried utilities by referring to plant drawings.</li> <li>➤ Start digging manually to locate the exact position of buried utilities and thereafter use</li> </ul>



<b>ACTIVITY</b>	<b>TYPE OF HAZARD</b>	<b>EFFECT OF HAZARD</b>	<b>PREVENTIVE MEASURES</b>
			mechanical means.
Pit Excavation beyond 3.0m	<ul style="list-style-type: none"> <li>➤ Same as above plus</li> <li>➤ Flooding due to excessive rain/ underground water</li> </ul>	<ul style="list-style-type: none"> <li>➤ Can cause drowning situation</li> </ul>	<ul style="list-style-type: none"> <li>➤ Prevent ingress of water</li> <li>➤ Provide ring buoys</li> <li>➤ Identify and provide suitable size dewatering pump or well point system</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Digging in the vicinity of existing Building/ Structure</li> </ul>	<ul style="list-style-type: none"> <li>➤ Building/ Structure may collapse</li> <li>➤ Loss of health &amp; wealth</li> </ul>	<ul style="list-style-type: none"> <li>➤ Obtain prior approval of excavation method from local authorities</li> <li>➤ Use under-pining method</li> <li>➤ Construct retaining wall side by side</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Movement of vehicles / equipments close to the edge of cut.</li> </ul>	<ul style="list-style-type: none"> <li>➤ May cause cave-in or slides</li> <li>➤ Persons may get buried</li> </ul>	<ul style="list-style-type: none"> <li>➤ Barricade the excavated area with proper lighting arrangements</li> <li>➤ Maintain at least 2m distance from edge of cut and use stop block to prevent over-run.</li> <li>➤ Strengthen shoring and strutting</li> </ul>
Narrow deep excavations for pipelines, etc.	<ul style="list-style-type: none"> <li>➤ Same as above plus</li> <li>➤ Frequent cave-in or slides</li> </ul>	<ul style="list-style-type: none"> <li>➤ May cause severe injuries or prove fatal</li> </ul>	<ul style="list-style-type: none"> <li>➤ Battering/benching of sides</li> <li>➤ Provide escape ladders</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Flooding due to Hydrostatic testing</li> </ul>	<ul style="list-style-type: none"> <li>➤ May arise drowning situation</li> </ul>	<ul style="list-style-type: none"> <li>➤ Same as above plus</li> <li>➤ Bail out accumulated water</li> <li>➤ Maintain adequate ventilation</li> </ul>
Rock excavation by blasting	<ul style="list-style-type: none"> <li>➤ Improper handling of explosives</li> </ul>	<ul style="list-style-type: none"> <li>➤ May prove fatal</li> </ul>	<ul style="list-style-type: none"> <li>➤ Ensure proper storage, handling &amp; carrying of explosives by trained personnel.</li> <li>➤ Comply with the applicable explosive acts &amp; rules.</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Uncontrolled explosion</li> </ul>	<ul style="list-style-type: none"> <li>➤ May cause severe injuries or prove fatal</li> </ul>	<ul style="list-style-type: none"> <li>➤ Allow only authorized persons to perform blasting operations.</li> <li>➤ Smoking and open</li> </ul>

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			flames are to be strictly prohibited.
	➤ Scattering of stone pieces in atmosphere	➤ Can hurt people	➤ Use PPE like goggles, face mask, helmets etc.
Rock excavating by blasting (Contd)	➤ Entrapping of persons/ animals.	➤ May cause severe injuries or prove fatal	➤ Barricade the area with red flags and blow siren before blasting.
	➤ Misfire	➤ May explode suddenly	➤ Do not return to site for at least 20 minutes or unless announced safe by designated person.
Piling Work	➤ Failure of pile-driving equipment	➤ Can hurt people	➤ Inspect Piling rigs and pulley blocks before the beginning of each shift.
	➤ Noise pollution	➤ Can cause deafness and psychological imbalance	➤ Use personal protective equipments like ear plugs, muffs, etc.
	➤ Extruding rods / casing	➤ Can hurt people	➤ Barricade the area an install sign boards ➤ Provide first-aid
	➤ Working in the vicinity of 'Live-Electricity'	➤ Can cause electrocution / asphyxiation	➤ Keep sufficient distance from Live-Electricity as per IS code. ➤ Shut off the supply, if possible ➤ Provide artificial/rescue breathing to he injured.
(B) CONCRETING	➤ Air pollution by cement	➤ May affect Respiratory System	➤ Wear respirators or cover mouth and nose with wet cloth.
	➤ Handling of ingredients	➤ Hands may get injured	➤ Use gloves and other PPE.
	➤ Protruding reinforcement rods.	➤ Feet may get injured	➤ Use Safety shoes. ➤ Provide platform above reinforcement for movement of workers.
	➤ Earthing of electrical mixers,	➤ Can cause electrocution / asphyxiation	➤ Ensure earthing of equipments and proper functioning of



<b>ACTIVITY</b>	<b>TYPE OF HAZARD</b>	<b>EFFECT OF HAZARD</b>	<b>PREVENTIVE MEASURES</b>
	vibrators, etc. not done		electrical circuit before commencement of work.
	➤ Falling of materials from height	➤ Persons may get injured	➤ Use hard hats ➤ Remove surplus material immediately from work place ➤ Ensure lighting arrangements during night hours.
	➤ Continuous pouring by same gang	➤ Cause tiredness of workers and may lead to accident.	➤ Insist on shift pattern ➤ Provide adequate rest to workers between subsequent pours.
	➤ Revolving or concrete mixer/ vibrators	➤ Parts of body or clothes may get entrapped.	➤ Allow only mixers with hopper ➤ Provide safety cages around moving motors ➤ Ensure proper mechanical locking of vibrator
Super-structure	➤ Same as above plus ➤ Deflection in props or shuttering material	➤ Shuttering / props may collapse and prove fatal	➤ Avoid excessive stacking on shuttering material ➤ Check the design and strength of shuttering material before commencement of work ➤ Rectify immediately the deflection noted during concreting
	➤ Passage to work place	➤ Improperly tied and designed props / planks may collapse	➤ Ensure the stability and strength of passage before commencement of work ➤ Do not overload and under the passage.
(C) REINFORCEMENT	➤ Curtailment and binding of rods	➤ Persons may get injured	➤ Use PPE like gloves, shoes, helmets, etc. ➤ Avoid usage of shift tools
	➤ Carrying of rods for short distance/ at	➤ Workers may injure their hands and shoulders	➤ Provide suitable pads on shoulders and use safety



ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	heights		<ul style="list-style-type: none"> <li>➤ gloves.</li> <li>➤ Tie up rods in easily liftable bundles</li> <li>➤ Ensure proper staging.</li> </ul>
	➤ Checking of clear distance/ cover with hands	➤ Rods may cut or injure the finger	➤ Use measuring devices tape, measuring rods, etc.
	➤ Hitting projected rods and standing on cantilever rods	➤ Persons may get injured and fall down	<ul style="list-style-type: none"> <li>➤ Use safety shoes and avoid standing unnecessarily on cantilever rods</li> <li>➤ Avoid wearing loose clothes</li> </ul>
	➤ Falling of material from height	➤ May prove fatal	<ul style="list-style-type: none"> <li>➤ Use helmets</li> <li>➤ Provide safety nets</li> </ul>
	➤ Transportation of rods by trucks / trailers	➤ Protruded rods may hit the persons	<ul style="list-style-type: none"> <li>➤ Use red flags/lights at the ends</li> <li>➤ Do not protrude the rods in front of or by the side of driver's cabin.</li> <li>➤ Do not extend the rods 1/3rd of deck length or 1.5 m which is less</li> </ul>
(D) WELDING AND GAS CUTTING	➤ Welding radiates invisible ultraviolet and infrared rays	➤ Radiation can damage eyes and skin.	<ul style="list-style-type: none"> <li>➤ Use specified shielding devices and other PPE of correct specifications</li> <li>➤ Avoid throated tungsten electrodes for GTAW.</li> </ul>
	➤ Improper placement of oxygen and acetylene cylinders	➤ Explosion may occur	<ul style="list-style-type: none"> <li>➤ Move out any leaking cylinder</li> <li>➤ Keep cylinder in vertical position</li> <li>➤ Use trolley for transportation of cylinders and chain them</li> <li>➤ Use flash back arrestors</li> </ul>
	➤ Leakage / cuts in hoses	➤ May cause fire	<ul style="list-style-type: none"> <li>➤ Purge regulators immediately and then turn off</li> <li>➤ Never use grease or</li> </ul>



ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<p>oil on oxygen line connections and copper fittings on acetylene lines</p> <ul style="list-style-type: none"> <li>➤ Inspect regularly gas carrying hoses</li> <li>➤ Always use red hose for acetylene &amp; other fuel gases and black for oxygen.</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Opening-up of cylinder</li> </ul>	<ul style="list-style-type: none"> <li>➤ Cylinder may burst</li> </ul>	<ul style="list-style-type: none"> <li>➤ Always stand back from the regulator while opening the cylinder</li> <li>➤ Turn valve slowly to avoid bursting</li> <li>➤ Cover the lug terminals to prevent short circuiting.</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Welding of tanks, container or pipes storing flammable liquids</li> </ul>	<ul style="list-style-type: none"> <li>➤ Explosion may occur</li> </ul>	<ul style="list-style-type: none"> <li>➤ Empty &amp; purge them before welding</li> <li>➤ Never attach the ground cable to tanks, container or pipe storing flammable liquids</li> <li>➤ Never use LPG for gas cutting</li> </ul>
(E) RADIOGRAPHY	<ul style="list-style-type: none"> <li>➤ Ionizing Radiation</li> </ul>	<ul style="list-style-type: none"> <li>➤ Radiations may react with the skin and can cause cancer, skin irritation, dermatitis, etc.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Ensure safety regulations as per BARC/AERB before commencement of job.</li> <li>➤ Cordon off the area and install Radiation warning symbols</li> <li>➤ Restrict the entry of unauthorized persons</li> <li>➤ Wear appropriate PPE and film badges issued by BARC/AERB</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Transportation and Storage of Radiography source</li> </ul>	<ul style="list-style-type: none"> <li>➤ Same as above</li> </ul>	<ul style="list-style-type: none"> <li>➤ Never touch or handle radiography source with hands</li> <li>➤ Store radiography source inside a pit in an exclusive isolated</li> </ul>



ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<ul style="list-style-type: none"> <li>➤ storage room with lock and key arrangement. The pit should be approved by BARC/AERB</li> <li>➤ Radiography source should never be carried either in passenger bus or in a passenger compartment of trains.</li> <li>➤ BARC/AERB have to be informed before source movement.</li> <li>➤ Permission from Director General of Civil Aviation is required for booking radio isotopes with airlines.</li> </ul>
	➤ Loss of Radio isotope	➤ Same as above	<ul style="list-style-type: none"> <li>➤ Try to locate with the help of Survey Meter.</li> <li>➤ Inform BARC/AERB(*)</li> </ul> <p>(*) Atomic Energy Regulatory Board (AERB), Bhabha Atomic Research Centre (BARC) Anushaktinagar, Mumbai – 400 094</p>
(F) ELECTRICAL INSTALLATION AND USAGE	➤ Short circuiting	➤ Can cause Electrocutation or Fire	<ul style="list-style-type: none"> <li>➤ Use rubberized hand gloves and other PPE</li> <li>➤ Don't lay wires under carpets, mats or door ways.</li> <li>➤ Allow only licensed electricians to perform on electrical facilities</li> <li>➤ Use one socket for one appliance</li> <li>➤ Ensure usage of only fully insulated wires or cables</li> <li>➤ Don't place bare wire ends in a socket</li> </ul>

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<ul style="list-style-type: none"> <li>➤ Ensure earthing of machineries and equipments</li> <li>➤ Do not use damaged cords and avoid temporary connections</li> <li>➤ Use spark-proof/flame proof type field distribution boxes.</li> <li>➤ Do not allow open/bare connections</li> <li>➤ Provide all connections through ELCB</li> <li>➤ Protect electrical cables / equipment's from water and naked flames</li> <li>➤ Check all connections before energizing.</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Overloading of Electrical System</li> </ul>	<ul style="list-style-type: none"> <li>➤ Bursting of system can occur which leads to fire</li> </ul>	<ul style="list-style-type: none"> <li>➤ Display voltage and current ratings prominently with 'Danger' signs.</li> <li>➤ Ensure approved cable size, voltage grade and type.</li> <li>➤ Switch off the electrical utilities when not in use.</li> <li>➤ Do not allow unauthorized connections.</li> <li>➤ Ensure proper grid wise distribution of Power.</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Improper laying of overhead and underground transmission lines / cables</li> </ul>	<ul style="list-style-type: none"> <li>➤ Can cause electrocution and prove fatal</li> </ul>	<ul style="list-style-type: none"> <li>➤ Do not lay unarmored cable directly on ground, wall, roof of trees</li> <li>➤ Maintain at least 3m distance from HT cables</li> <li>➤ All temporary cables should be laid at least 750 mm below ground on 100 mm</li> </ul>



ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<ul style="list-style-type: none"> <li>➤ fine sand overlying by brick soling</li> <li>➤ Provide proper sleeves at crossings/ intersections</li> <li>➤ Provide cable route markers indicating the type and depth of cables at intervals not exceeding 30m and at the diversions / termination.</li> </ul>
(G) FIRE PREVENTION AND PROTECTION	<ul style="list-style-type: none"> <li>➤ Small fires can become big ones and may spread to the surrounding areas</li> </ul>	<ul style="list-style-type: none"> <li>➤ Cause burn injuries and may prove fatal.</li> </ul>	<ul style="list-style-type: none"> <li>➤ In case a fire breaks out, press fire alarm system and shout "Fire, Fire"</li> <li>➤ Keep buckets full of sand &amp; water/fire extinguishing equipment near hazardous locations</li> <li>➤ Confine smoking to 'Smoking Zones' only</li> <li>➤ Train people for using specific type of fire equipments under different classes of fire</li> <li>➤ Keep fire doors/ shutters, passages and exit doors unobstructed</li> <li>➤ Maintain good house keeping and first-aid boxes (for detail refer Annex-2)</li> <li>➤ Don't obstruct access to Fire extinguishers</li> <li>➤ Do not use elevators for evacuation during fire</li> <li>➤ Maintain lightening arrestors for elevated structures</li> <li>➤ Stop all electrical motors with internal combustion.</li> <li>➤ Move the vehicles from dangerous</li> </ul>

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<ul style="list-style-type: none"> <li>➤ locations.</li> <li>➤ Remove the load hanging from the crane booms.</li> <li>➤ Remain out of the danger areas.</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Improper selection of Fire Extinguisher</li> </ul>	<ul style="list-style-type: none"> <li>➤ It may not extinguish the fire</li> </ul>	<ul style="list-style-type: none"> <li>➤ Ensure usage of correct fire extinguisher meant for the specified fire (for details refer Appendix-C)</li> <li>➤ Do not attempt to extinguish Oil and electric fires with water. Use foam cylinders/CO<sub>2</sub>/sand or earth.</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Improper storage of highly inflammable substances</li> </ul>	<ul style="list-style-type: none"> <li>➤ Same as above</li> </ul>	<ul style="list-style-type: none"> <li>➤ Maintain safe distance of flammable substances from source of ignition</li> <li>➤ Restrict the distribution of flammable materials to only min. necessary amount</li> <li>➤ Construct specifically designed fuel storage facilities</li> <li>➤ Keep chemicals in cool and dry place away from hat. Ensure adequate ventilation</li> <li>➤ Before welding operation, remove or shield the flammable material properly</li> <li>➤ Store flammable materials in stable racks, correctly labeled preferably with catchments trays.</li> <li>➤ Wipe off the spills immediately</li> </ul>

<b>ACTIVITY</b>	<b>TYPE OF HAZARD</b>	<b>EFFECT OF HAZARD</b>	<b>PREVENTIVE MEASURES</b>
	➤ Short circuiting of electrical system	➤ Same as above ➤ Can cause Electrocution	➤ Don't lay wires under carpets, mats or door ways ➤ Use one socket for one appliance ➤ Use only fully insulated wires or cables ➤ Do not allow open/bare connections ➤ Provide all connections through ELCB ➤ Ensure earthing of machineries and equipments
(H) VEHICULAR MOVEMENT	➤ Crossing the Speed Limits (Rash driving)	➤ Personal injury	➤ Obey speed limits and traffic rules strictly ➤ Always expect the unexpected and be a defensive drive ➤ Use seat belts/helmets ➤ Blow horn at intersections and during overtaking operations. ➤ Maintain the vehicle in good condition ➤ Do not overtake on curves, bridges and slopes
	➤ Adverse weather condition	➤ Same as above	➤ Read the road ahead and ride to the left ➤ Keep the wind screen and lights clean ➤ Do not turn at speed ➤ Recognize the hazard, understand the defense and act correctly in time.
	➤ Consuming alcohol before and during he	➤ Same as above	➤ Alcohol and driving do not mix well. Either choose

<b>ACTIVITY</b>	<b>TYPE OF HAZARD</b>	<b>EFFECT OF HAZARD</b>	<b>PREVENTIVE MEASURES</b>
	driving operation		<ul style="list-style-type: none"> <li>➤ alcohol or driving.</li> <li>➤ If you have a choice between hitting a fixed object or an oncoming vehicle, hit the fixed object</li> <li>➤ Quit the steering at once and become a passenger. Otherwise take sufficient rest and then drive.</li> <li>➤ Do not force the driver to drive fast and round the clock</li> <li>➤ Do not day dram while driving</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Falling objects / Mechanical failure</li> </ul>	<ul style="list-style-type: none"> <li>➤ May prove fatal</li> </ul>	<ul style="list-style-type: none"> <li>➤ Ensure effective braking system, adequate visibility for the drives, reverse warning alarm.</li> <li>➤ Proper maintenance of the vehicle as per manufacturer instructions</li> </ul>
(I) PROOF TESTING (HYDROSTATIC/ PNEUMATIC TESTING)	<ul style="list-style-type: none"> <li>➤ Bursting of piping</li> <li>➤ Collapse of tanks</li> <li>➤ Tanks flying off</li> </ul>	<ul style="list-style-type: none"> <li>➤ May cause injury and prove fatal</li> </ul>	<ul style="list-style-type: none"> <li>➤ Prepare test procedure &amp; obtain CONSULTANT/ Owner's approval</li> <li>➤ Provide separate gauge for pressurizing pump and piping/equipment</li> <li>➤ Check the calibration status of all pressure gauges, dead weight testers and temperature recorders</li> <li>➤ Take dial readings at suitable defined intervals and ensure most of them fall between 40-60% of the gauge scale range</li> <li>➤ Provide safety relief valve (set at</li> </ul>

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<p>pressure slightly higher than test pressure) while testing with air/nitrogen</p> <ul style="list-style-type: none"> <li>➤ Ensure necessary precautions, stepwise increase in pressure, tightening of bolts/ nuts, grouting, etc. before and during testing</li> <li>➤ Keep the vents open before opening any valve while draining out of water used for hydro testing of tanks</li> <li>➤ Pneumatic testing involves the hazard of released energy stored in compressed gas. Specific care must therefore be taken to minimize the chance of brittle failure during a pneumatic leak test. Test temperature is important in this regard and must be considered when the designer chooses the material of construction</li> <li>➤ A pressure relief device shall be provided, having a set pressure not higher than the test pressure plus the lesser of 345 KPa (50 psi) or 10% of the test pressure. The gas used as test fluid, if not air, shall be nonflammable and nontoxic.</li> </ul>
(J) WORKING AT HEIGHTS	➤ Person can fall down	➤ May sustain severe injuries or	➤ Provide guard rails/barricade at the

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
		prove fatal	<ul style="list-style-type: none"> <li>➤ work place</li> <li>➤ Use PPE like safety belts, full body harness, life line, helmets, safety shoes, etc.</li> <li>➤ Obtain a permit before starting the work at height above 3 meters</li> <li>➤ Fall arrest systems like safety nets, etc. must be installed</li> <li>➤ Provide adequate working space (min. 0.6 m)</li> <li>➤ Tie/weld working platform with fixed support</li> <li>➤ Use roof top walk ladder while working on a slopping roofs</li> <li>➤ Avoid movement on beams</li> </ul>
		➤ May hit the scrap / material stacked at the ground or in between	<ul style="list-style-type: none"> <li>➤ Keep the work place neat and clean</li> <li>➤ Remove the scrap immediately</li> </ul>
	➤ Material can fall down	➤ May hit the workers working at lower levels and prove fatal.	<ul style="list-style-type: none"> <li>➤ Same as above plus</li> <li>➤ Do not throw or drop material or equipment from height</li> <li>➤ All tools to be carried in a toolkit bags or on working uniform</li> <li>➤ Remove scrap from the planks</li> <li>➤ Ensure wearing of helmet by the workers at low level</li> </ul>
(K) CONFINED SPACES	➤ Suffocation / drowning	➤ Unconsciousness, death	<ul style="list-style-type: none"> <li>➤ Use respiratory devices, if required</li> <li>➤ Avoid over crowding inside a confined space</li> <li>➤ Provide Exhaust Fans for ventilation</li> <li>➤ Do not wear loose clothes, neck ties,</li> </ul>

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<ul style="list-style-type: none"> <li>➤ etc.</li> <li>➤ Fulfill conditions of the permit.</li> <li>➤ Check for presence of hydrocarbons, O<sub>2</sub> level</li> <li>➤ Obtain work permit before entering a confined space</li> <li>➤ Ensure that the connected piping of the equipment which is to be opened is pressure free, fluid has been drained, vents are open and piping is positively isolated by a blind flange</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Presence of foul smell and toxic substances</li> </ul>	<ul style="list-style-type: none"> <li>➤ Inhalation can pose threat to life.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Same as above plus</li> <li>➤ Check for hydrocarbon and Aromatic compounds before entering a confined space</li> <li>➤ Depute one person outside the confined space for continuous monitoring and for extending help in case of an emergency</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Ignition / flame can cause fire</li> </ul>	<ul style="list-style-type: none"> <li>➤ Person may sustain burn injuries or explosion may occur</li> </ul>	<ul style="list-style-type: none"> <li>➤ Keep fire extinguishers at a hand distance</li> <li>➤ Remove surplus material and scrap immediately</li> <li>➤ Do not smoke inside a confined space</li> <li>➤ Do not allow gas cylinders inside a confined space</li> <li>➤ Use low voltage (24V) lamps for lighting</li> <li>➤ Use tools with air motors or electric tools with max.</li> </ul>

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<ul style="list-style-type: none"> <li>➤ voltage of 24V</li> <li>➤ Remove all equipments at the end of the day</li> </ul>
(L) HANDLING AND LIFTING EQUIPMENTS	<ul style="list-style-type: none"> <li>➤ Failure of load lifting and moving equipments</li> </ul>	<ul style="list-style-type: none"> <li>➤ Can cause accident and prove fatal</li> </ul>	<ul style="list-style-type: none"> <li>➤ Avoid standing under the lifted load and within the operating radius of cranes</li> <li>➤ Check periodically oil, brakes, gears, horns and tyre pressure of all moving machinery</li> <li>➤ Check quality, size and condition of all chain pulley blocks, slings, U-clamps, D-shackles, wire ropes, etc.</li> <li>➤ Allow crane to move only on hard, firm and leveled ground</li> <li>➤ Allow lifting slings as short as possible and check gunny packings at the friction points</li> <li>➤ Do not allow crane to tilt its boom while moving</li> <li>➤ Install Safe Load Indicator</li> <li>➤ Ensure certification by applicable authority.</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Overloading of lifting equipments</li> </ul>	<ul style="list-style-type: none"> <li>➤ Can cause electrocution and fire</li> </ul>	<ul style="list-style-type: none"> <li>➤ Safe lifting capacity of derricks and winches written on them shall be got verified.</li> <li>➤ The max safe working load shall be marked on all lifting equipments</li> <li>➤ Check the weight of columns and other heavy items painted on them and accordingly decide about the crane</li> </ul>





ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<ul style="list-style-type: none"> <li>➤ capacity, boom and angle of erection</li> <li>➤ Allow only trained operators and riggers during crane operation</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Overhead electrical wires</li> </ul>	<ul style="list-style-type: none"> <li>➤ Can cause electrocution and fire</li> </ul>	<ul style="list-style-type: none"> <li>➤ Do not allow boom or other parts of crane to come within 3 m reach of overhead HT cables</li> <li>➤ Hook and load being lifted shall preferably remain in full visibility of crane operator.</li> </ul>
(M) SCAFFOLDING, FORMWORK AND LADDERS	<ul style="list-style-type: none"> <li>➤ Person can fall down</li> </ul>	<ul style="list-style-type: none"> <li>➤ Person may sustain severe injuries and prove fatal</li> </ul>	<ul style="list-style-type: none"> <li>➤ Provide guard rails for working at height</li> <li>➤ Face ladder while climbing and use both hands</li> <li>➤ Ladders shall extend about 1m above landing for easy access and tying up purpose</li> <li>➤ Do not place ladders against movable objects and maintain base at ¼ unit of the working length of the ladder</li> <li>➤ Suspended scaffolds shall not be less than 500 mm wide and tied properly with ropes</li> <li>➤ No loose planks shall be allowed</li> <li>➤ Use PPE, like helmets, safety shoes, etc.</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Failure of scaffolding material</li> </ul>	<ul style="list-style-type: none"> <li>➤ Same as above</li> </ul>	<ul style="list-style-type: none"> <li>➤ Inspect visually all scaffolding materials for stability and anchoring with permanent structures.</li> <li>➤ Design scaffolding</li> </ul>



ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<ul style="list-style-type: none"> <li>➤ for max. load carrying capacity</li> <li>➤ Scaffolding planks shall not be less than 50x250 mm full thickness lumber or equivalent. These shall be cleared or secured and must extend over the end supports by at least 150mm and not more that 300 mm</li> <li>➤ Don't overload the scaffolds</li> <li>➤ Do not splice short ladders to make a longer one. Vertical ladders shall not exceed 6m.</li> </ul>
	➤ Material can fall down	➤ Persons working at lower level gets injured.	<ul style="list-style-type: none"> <li>➤ Remove excess material and scrap immediately</li> <li>➤ Carry the tools in a tool-kit bag only</li> <li>➤ Provide safety nets</li> </ul>
(N) STRUCTURAL WORKS	➤ Personal negligence and danger of fall	➤ Can cause injury or casualty	<ul style="list-style-type: none"> <li>➤ Do not take rest inside rooms built for welding machines or electrical distribution system</li> <li>➤ Avoid walking on beams at height</li> <li>➤ Wear helmet with chin strap and safety belts when working at height</li> <li>➤ Use hand gloves and goggles during grinding operations</li> <li>➤ Cover or mark the sharp and projected edges</li> <li>➤ Do not stand within the operating radius of cranes</li> </ul>
	➤ Lifting / slipping of	➤ Same as above	➤ Do not stand under the lifted load



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV

A

SHEET 160 OF 229

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	material		<ul style="list-style-type: none"> <li>➤ Stack properly all the materials. Avoid slippage during handling</li> <li>➤ Control longer pieces lifted up by cranes from both ends</li> <li>➤ Remove loose materials from height</li> <li>➤ Ensure tightening of all nuts and bolts</li> </ul>
(O) PIPELINE WORKS	➤ Erection / lowering failure	➤ Can cause injury	<ul style="list-style-type: none"> <li>➤ Do not stand under the lifted Load</li> <li>➤ Do not allow any person to come within the radii of the side boom handling pipes</li> <li>➤ Check the load carrying capacity of the lifting tools and tackles</li> <li>➤ Use safe Load Indicators</li> <li>➤ Use appropriate PPEs</li> </ul>
	➤ Other	➤ Same as above	<ul style="list-style-type: none"> <li>➤ Wear gum boots in marshy areas</li> <li>➤ Allow only one person to perform signaling operations while lowering of pipes</li> <li>➤ Provide night caps on pipes</li> <li>➤ Provide end covers on pipes for stoppage of pigs while testing/cleaning operations.</li> </ul>

**HSE CHECKLIST CUM COMPLIANCE REPORT (1/6)**

Project: \_\_\_\_\_  
 Date: \_\_\_\_\_  
 Inspection By: \_\_\_\_\_  
 Frequency : Fortnightly

Contractor : \_\_\_\_\_  
 Owner : \_\_\_\_\_  
 Report No. : \_\_\_\_\_  
 Job No : \_\_\_\_\_

SL. NO.	ITEM	YES	NO	REMARKS	ACTION
<b>1</b>	<b>HOUSEKEEPING</b>				
a)	Waste containers provided and used				
b)	Sanitary facilities adequate and clean				
c)	Passageways and Walkways clear				
d)	General neatness of working areas				
e)	Others				
<b>2</b>	<b>PERSONNEL PROTECTIVE EQUIPMENT</b>				
a)	Goggles; Shields				
b)	Face protection				
c)	Hearing protection				
d)	Safety shoes				
e)	Hand protection				
f)	Respiratory Masks etc.				
g)	Safety Belts				
h)	Safety Helmet/Hard Hat				
i)	Others				
<b>3</b>	<b>EXCAVATIONS/OPENINGS</b>				
a)	Openings properly covered or barricaded				
b)	Excavations shored				
c)	Excavations barricaded				
d)	Overnight lighting provided				
e)	Others				
<b>4</b>	<b>WELDING &amp; GAS CUTTING</b>				
a)	Gas cylinders chained upright				
b)	Cables and hoses not obstructing				
c)	Screens or shields used				
d)	Flammable materials protected				



SL. NO.	ITEM	YES	NO	REMARKS	ACTION
e)	Fire extinguisher(s) accessible				
f)	Others				
<b>5</b>	<b>SCAFFOLDING</b>				
a)	Fully decked platforms				
b)	Guard and intermediate rails in place				
c)	Toe boards in place				
d)	Adequate shoring				
e)	Adequate access				
f)	Others				
<b>6</b>	<b>LADDERS</b>				
a)	Extension side rails 1m above				
b)	Top of landing				
c)	Properly secured				
d)	Angle + 70 from horizontal				
e)	Others				
<b>7</b>	<b>HOISTS, CRANES AND DERRICKS</b>				
a)	Condition of cables and sheaves OK				
b)	Condition of slings, chains, hooks and eyes OK				
c)	Inspection and maintenance logs maintained				
d)	Outriggers used				
e)	Signs/barricades provided				
f)	Signals observed and understood				
g)	Qualified operators				
h)	Others				
<b>8</b>	<b>MACHINERY, TOOLS AND EQUIPMENT</b>				
a)	Proper instruction				
b)	Safety devices				
c)	Proper cords				
d)	Inspection and maintenance				
e)	Others				
<b>9</b>	<b>VEHICLE AND TRAFFIC</b>				
a)	Rules and regulations observed				
b)	Inspection and maintenance				
c)	Licensed drivers				
d)	Others				
<b>10</b>	<b>TEMPORARY FACILITIES</b>				
a)	Emergency instructions posted				
b)	Fire extinguishers provided				
c)	Fire-aid equipment available				



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV

A

SHEET 163 OF 229

SL. NO.	ITEM	YES	NO	REMARKS	ACTION
d)	Secured against storm damage				
e)	General neatness				
f)	In accordance with electrical requirements				
g)	Others				
<b>11</b>	<b>FIRE PREVENTION</b>				
a)	Personnel instructed				
b)	Fire extinguishers checked				
c)	No smoking in Prohibited Areas				
d)					
e)	Others				
<b>12</b>	<b>ELECTRICAL</b>				
a)	Use of 3-core armoured cables				
b)	Usage of 'All insulated' or 'double insulated' electrical tools				
c)	All electrical connection are routed through ELCB				
d)	Natural Earthing at the source of power (main DB)				
e)	Continuity and tightness of earth conductor				
f)	Covering of junction boxes, panels and other energized wiring places				
g)	Ground fault circuit interrupters provided				
h)	Prevention of tripping hazards				
i)	Others				
<b>13</b>	<b>HANDLING AND STORAGE OF MATERIALS</b>				
a)	Properly stored or stacked				
b)	Passageways clear				
c)	Others				
<b>14</b>	<b>FLAMMABLE GASES AND LIQUIDS</b>				
a)	Containers clearly identified				
b)	Proper storage				
d)	Fire extinguishers nearby				
e)	Others				
<b>15</b>	<b>WORKING AT HEIGHT</b>				
a)	Erection plan and work permit obtained				
b)	Safety nets				
c)	Full body harness and lanyards; chute lines				
d)	Health Check record available for workers going up?				



SL. NO.	ITEM	YES	NO	REMARKS	ACTION
e)	Others				
<b>16</b>	<b>CONFINED SPACE</b>				
a)	Work permit obtained				
b)	Test for toxic gas and sufficient availability of oxygen conducted				
c)	At least one person outside the confined space for monitoring deputed				
d)	Availability of sufficient means of entry, exit and ventilation				
e)	Fire extinguishers and first-aid facility ensured				
f)	Lighting provision made by using 24V lamps				
g)	Proper usage of PPEs ensured				
<b>17</b>	<b>RADIOGRAPHY</b>				
a)	Proper storage and handling of source as per BARC / AREB guidelines				
b)	Working permit obtained				
c)	Cordoning of the area done				
d)	Use of appropriate PPE's ensured				
e)	Proper training to workers/supervisors imparted				
f)	Minimum occupancy of workplace ensured				
<b>18</b>	<b>HEALTH CHECKS</b>				
a)	Workers medically examined and found to fit for working : i) At heights ii) In confined space.				
b)	Availability of First-aid facilities				
c)	Proper sanitation at site, office and labour camps				
d)	Arrangement of medical facilities				
e)	Measures for dealing with illness				
f)	Availability of Portable drinking water for workmen & staff				
g)	Provision of crèches for children				
h)	Stand by vehicle available for evacuation of				



SL. NO.	ITEM	YES	NO	REMARKS	ACTION
	injured.				
<b>19</b>	<b>ENVIRONMENT</b>				
a)	Chemical and other effluents properly disposed				
b)	Cleaning liquid of pipes disposed off properly				
c)	Seawater used for hydro-testing disposed off as per agreed procedure				
d)	Lubricant Waste/Engine oils properly disposed				
e)	Waste from Canteen, offices, sanitation etc. disposed properly				
f)	Disposal of surplus earth, stripping materials, oily rags and combustible materials done properly				
g)	Green belt protection				

Signature of Resident  
Engineer with Seal

\_\_\_\_\_



**ACCIDENT / INCIDENT REPORT**

**(To be submitted by Contractor after every Accident / Incident within 24 hours)**

Report No: \_\_\_\_\_

Date: \_\_\_\_\_

Name of Site:- \_\_\_\_\_

CONTRACTOR \_\_\_\_\_

Type of Accident / Incident :  Fatal  Other Lost Time  Non Loss Time  First-Aid case

NAME OF THE INJURED.....

AGE .....

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 (IF APPLICABLE)

DATE:

SIGNATURE OF CONTRACTOR  
WITH SEAL

To : OWNER .....  
: RCM/SITE-IN-CHARGE, LEPL .....

1 COPY  
3 COPIES

- Divisional Head (Constn.) through RCM
- Project Manager LEPL, through RCM



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCULDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 167 OF 229

**SUPPLEMENTARY ACCIDENT / INCIDENT INVESTIGATION REPORT**

Supplementary to Report No: \_\_\_\_\_(Copy enclosed)

Project: \_\_\_\_\_  
Name of Work : \_\_\_\_\_  
Contractor: \_\_\_\_\_

Site: \_\_\_\_\_ Date: \_\_\_\_\_  
Work Order / LOI No. : \_\_\_\_\_

NAME OF THE INJURED.....

AGE .....

FATHER'S NAME.....

SUB-CONTRACTOR M/S.....

DATE & TIME OF ACCIDENT.....

LOCATION .....

BRIEF DESCRIPTION & CAUSE OF A ACCIDENT/ INCIDENT

NATURAL OF INJURY/DAMAGE

COMMENTS FROM MEDICAL PRACTITIONER WHO ATTENDED THE VICTIM/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, LEPL ..... 3 COPIES

- Divisional Head (Constn.) through RCM
- Project Manager LEPL, through RCM

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 168 OF 229	

**NEAR MISS INCIDENT - SUGGESTED PROFORMA**

Name of Site : \_\_\_\_\_ Report No : \_\_\_\_\_  
Name of Work : \_\_\_\_\_ Date : \_\_\_\_\_  
Contractor : \_\_\_\_\_

INCIDENT REPORTED BY : \_\_\_\_\_

DATE & TIME OF INCIDENT : \_\_\_\_\_

LOCATION : \_\_\_\_\_

BRIEF DESCRIPTION OF INCIDENT  
\_\_\_\_\_

PROBABLE CAUSE OF INCIDENT  
\_\_\_\_\_

SUGGESTED CORRECTIVE ACTION  
\_\_\_\_\_

STEPS TAKEN TO AVOID RECURRENCE  
YES  NO

DATE: \_\_\_\_\_ SIGNATURE OF CONTRACTOR WITH SEAL

To : OWNER ..... 1 COPY  
RCM/SITE-IN-CHARGE, LEPL ..... 3 COPIES  
    → Divisional Head (Constn.) through RCM  
    → Project Manager LEPL, through RCM

## MONTHLY HEALTH, SAFETY & ENVIRONMENT (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		UPTO PREVIOUS MONTH	THIS MONTH	CUMU-LATIVE
a) Average number of Staff & Workmen (average daily headcount, not man days)				
b) Man hours Worked				
c) Number of HSE meeting organized at site				
d) Number of HSE awareness programmes conducted at site				
e) Number of Lost Time Accidents (LTA)	Fatal			
	Other LTA			
f) Number of Loss time Injuries (LTI)	Fatalities			
	Other LTI			
g) Number of Loss Time Accidents				
h) Number of First Aid Cases				
i) Number of Near Miss Incidents				
j) Man-days lost due to accidents				
k) LTA Free Manhours i.e. Number of LTA free manhours from the Lst LTA				
l) Compensation cases raised with Insurance				
m) Compensation case resolved and paid to workmen				
n) Whether workmen compensation policy taken		Y/N		
o) Whether workmen compensation policy valid		Y/N		
p) Whether workmen registered under ESI Act		Y/N		
<b>Remark</b>				

DATE:

Safety Officer /Resident Engineer  
(Signature and Name)

To : OWNER  
: RCM/, LEPL (2 COPIES)



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 170 OF 229

**PERMIT FOR WORKING AT HEIGHT (ABOVE 2 METER)**

Project Site : .....  
 Name of the work: .....  
 Name of Contractor : .....  
 Total No.of Workers: .....  
 Duration of work: from ..... to .....

Sr. No.: .....  
 Date: .....  
 Nature of Work : .....  
 Exact location of work : .....

The following items have been checked and compliance shall be ensured during the currency of the permit:

SI.	ITEM	DONE	NOT REQD.
1.	Equipment/Work Area inspected	<input type="checkbox"/>	<input type="checkbox"/>
2.	Considered hazard from other routine/non-routine operations and concerned person alerted	<input type="checkbox"/>	<input type="checkbox"/>
3.	ELCB provided	<input type="checkbox"/>	<input type="checkbox"/>
4.	Proper lighting provided	<input type="checkbox"/>	<input type="checkbox"/>
5.	Area cordoned off.	<input type="checkbox"/>	<input type="checkbox"/>
6.	Precautions against public traffic taken	<input type="checkbox"/>	<input type="checkbox"/>
7.	Sound Scaffolding provided	<input type="checkbox"/>	<input type="checkbox"/>
8.	Adequate protected Platform provided	<input type="checkbox"/>	<input type="checkbox"/>
9.	Acces and Exit to the area (Ladder properly fixed)	<input type="checkbox"/>	<input type="checkbox"/>
10.	Floor Openings covered	<input type="checkbox"/>	<input type="checkbox"/>
11.	Safety Net provided	<input type="checkbox"/>	<input type="checkbox"/>
12.	Heath check of personnel	<input type="checkbox"/>	<input type="checkbox"/>

- A. Following personal protective equipment are provided (mark) and used as relevant Safety helmet/Gloves/Goggles/Shoes/Face Shield/Life Line/Safety Belt/Safety Harness.
- B. This permit shall be available at the work site at all times
- C. Permit shall be issued for maximum one week only (Monday to Sunday).
- D. This permit shall be applicable in non-operational areas.

E. After completion of the work, used permits shall be preserved for record purposes.

F. Additional precautions, if any.....

Permission is granted to work (See overleaf) = Yes/No

Name of Contractor's Supervisor  
(Initiator)

Name of Contractor's Safety Officer  
(Issuing Authority)

**GRANT OF PERMIT AND EXTENSIONS**

Sl. No.	Validity Period From ..... To .....	Work time From .....Hrs. To .....Hrs.	Initiator (Supervisor of Contractor)	Issuing Authority (Safety Officer) of Contractor	Verification by CONSULTANT with date

Additional safety instructions, if any.

**CONFINED SPACE ENTRY PERMIT**

Project Site : .....  
 Name of the work : .....  
 Name of Contractor : .....  
 Exact location of work : .....

Sr. No.: .....  
 Date: .....  
 Nature of Work : .....

**Safety Requirements** : POSITIVE ISOLATION OF THE VESSEL IS MANDATORY

<b>(A) Has the equipment been ?</b>					
Y	NR		Y	NR	
<input type="checkbox"/>	<input type="checkbox"/>	isolated from power / steam / air	<input type="checkbox"/>	<input type="checkbox"/>	water flushed &/or steamed
<input type="checkbox"/>	<input type="checkbox"/>	isolated from liquid or gases	<input type="checkbox"/>	<input type="checkbox"/>	Manways open & ventilated
<input type="checkbox"/>	<input type="checkbox"/>	depressurized &/or drained	<input type="checkbox"/>	<input type="checkbox"/>	cont. inset gas flow arranged
<input type="checkbox"/>	<input type="checkbox"/>	blanked / blinded / disconnected	<input type="checkbox"/>	<input type="checkbox"/>	adequately cooled
					radiation sources removed
					Proper lighting provided

<b>(B) Expected Residual Hazards</b>					
Y	NR		Y	NR	
<input type="checkbox"/>	<input type="checkbox"/>	lack of O <sub>2</sub>	<input type="checkbox"/>	<input type="checkbox"/>	combustible gas / liquid
<input type="checkbox"/>	<input type="checkbox"/>	corrosive chemicals	<input type="checkbox"/>	<input type="checkbox"/>	pyrophoric iron / scales
<input type="checkbox"/>	<input type="checkbox"/>	Heat / steam / frost	<input type="checkbox"/>	<input type="checkbox"/>	high humidity
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	
					H <sub>2</sub> S / toxic gases
					electricity / static
					ionizing radiation

<b>(C) Protective Measures</b>					
Y	NR		Y	NR	
<input type="checkbox"/>	<input type="checkbox"/>	gloves	<input type="checkbox"/>	<input type="checkbox"/>	ear plug / muff
<input type="checkbox"/>	<input type="checkbox"/>	protective clothing	<input type="checkbox"/>	<input type="checkbox"/>	dust / gas / air line mask
<input type="checkbox"/>	<input type="checkbox"/>	Grounded air educater / blower / AC	<input type="checkbox"/>	<input type="checkbox"/>	attendant with SCBA / air mask
<input type="checkbox"/>	<input type="checkbox"/>	Fire fighting arrangements	<input type="checkbox"/>	<input type="checkbox"/>	safety harness & lifeline
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	
					goggles / face shield
					personal gas alarm
					rescue equipment / team
					communication equipment

Authorization / Renewal (It is safe to enter the confirmed space)

Date	No. of Persons Allowed	Name of Persons allowed	Signature		Time		Signature e Workman
			Contractor's Supervisor	Contractor's Safety Officer	From	To	

Permit Closure :

- (A) Entry       was closed                       stopped                       will continue on
- (B)     Site left in a safe condition  
           Housekeeping done
- (C)    Multi lock     removed                       key transferred  
           Ensured all men have come out     Manways barricaded

Remarks, if any :



FORMAT NO. : HSE-7, REV. 0

FORMAT NO. : HSE-8, REV. 0

**RADIATION WORK PERMIT**

Project : Sr. No.:  
Name of the work : Date:  
Name of Contractor : Job No. :

Location of work :

Source Strength :

Cordoned distance (m) :

Name of Radiographing agency : Approved by Owner / LEPL

The following items have been checked & compliance shall be ensured during currency of the permit :

S. No.	Item Description	Done
1.	Safety regulations as per BARC/AERB ensured while source in use/ in transit & during storage.	
2.	Area cordoned off.	
3.	Lighting arrangements for working during nights ensured.	
4.	Warning signs / flash lights installed.	
5.	Cold work permit taken (if applicable)	
6.	PPEs like film badges, dosimeters used.	

Additional precautions, if any  
.....

(Radiography Agency's BARC / AREB authorized Supervisor) (Contractor's Safety Officer)

**Permission is granted.**

Permit is valid from \_\_\_\_\_AM/PM \_\_\_\_\_ Date to \_\_\_\_\_AM/PM \_\_\_\_\_  
Date

(Signature of permit issuing authority)

Name : Designation : Date :

Permit renewal:

Permit extended upto		Additional Precautions required, if any.	Sign of issuing authority with date
Date	Time		

Work completed / stopped / area cleared at \_\_\_\_\_Hrs. of Date \_\_\_\_\_

(Sign of permit issuing authority)

Name

**RADIATION WORK PERMIT**

Project :

Sr. No.:

Name of the work :

Date:

Name of Contractor :

Job No. :

Name of Contractor :

Line No. / Equipment No. /Structure to be dismantled:

Location details of dismantling / demolition with sketch : (Clearly indicate the area)

The following items have been checked & compliance shall be ensured during currency of the permit :

S. No.	Item Description	Done	Not Applicable
1.	Services like power, gas supply, water, etc. disconnected.	<input type="checkbox"/>	<input type="checkbox"/>
2.	Dismantling / Demolishing method reviewed & approved.	<input type="checkbox"/>	<input type="checkbox"/>
3.	Usage of appropriate PPEs ensured.	<input type="checkbox"/>	<input type="checkbox"/>
4.	Precautions taken for neighboring structures		
5.	First-Aid arrangements made	<input type="checkbox"/>	<input type="checkbox"/>
6.	Fire fighting arrangements ensured	<input type="checkbox"/>	<input type="checkbox"/>
7.	Precautions taken for blasting	<input type="checkbox"/>	<input type="checkbox"/>

(Contractor's Supervisor)


(Contractor's Safety Officer)

**Permission is granted.**

(Permit issuing authority)

Name :

Date

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 177 OF 229	

**COMPLETION REPORT :**


Dismantling / Demolishing is completed on \_\_\_\_\_ Date at \_\_\_\_\_ Hrs.

Materials / debris transported to identified location

Tagging completed (as applicable)

Services like power, gas supply, water, etc. restored

(Permit issuing authority)

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 178 OF 229	

STANDARD TECHNICAL  
SPECIFICATION  
FOR  
CORRUGATED FLEXIBLE METAL  
HOSE (ANACONDA)



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 179 OF 229

AMENDMENT STATUS

Sl. No.	Clause / Paragraph / Annexure / Exhibit / Drawing Amended	Page No.	Rev.	Date	BY		Verified	
					Name	Sig.	Name	Sig.



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

**DOCUMENT NO.**

**REV**


**052-LEPL-BGCL-001**

**A**

**SHEET 180 OF 229**

## CONTENTS

Sl. No.	DESCRIPTION
1.0	INTENT OF SPECIFICATION
2.0	SCOPE OF WORKS
3.0	TECHNICAL SPECIFICATIONS
4.0	TESTING, CLEANING & PACKAGING
5.0	MARKING
6.0	PACKAGING
7.0	INSPECTION / DOCUMENTS

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 181 OF 229</b>	

## 1.0 INTENT OF SPECIFICATION

The intent of this specification is to establish minimum requirements to manufacture and supply of corrugated flexible metal hose used for supply of domestic natural gas.

## 2.0 SCOPE OF WORKS

The scope of the tender will include manufacture/ supply, inspection, testing, marking, packaging handling and dispatch of corrugated flexible metal hose assembly, as indicated in the Material Requisition & Schedule of Rates, meeting all the requirements as laid down in manufacturing standard BS: 6501 Part 1(latest)/ ISO 10380.

All codes and standard for manufacture, testing, inspection etc. shall be of latest edition.

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 TECHNICAL SPECIFICATIONS

Item	:	Corrugated Flexible metal Hose Assembly (Type-A flexibility) for Natural Gas Service
Applicable Code	:	BS: 6501 Part-I: (latest)/ ISO 10380 Specification for Corrugated Hose Assemblies
Nominal Size	:	DN 12
Total Length of Hose Assembly	:	350mm end to end
Movement Required	:	Static
Medium Flowing through Hose assembly	:	Natural gas (PNG)
Nominal Pressure/Design Pressure	:	0.25 bar (g) at 20°C
Temperature Range	:	0–65°C



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 182 OF 229



Cyclic Life : 30 Bends minimum when tested in accordance with Cl.14.2 Of BS: 6501 Part-I (latest)/ ISO 10380.

Static Bend Radius : 25mm

Type & Material of End Fitting with Flat Seat : ¾" NPT SS316L Female Swivel Nut  
Nipple with Rubber Gasket / 'O' Ring (and second end shall be SS Male ¾" NPT and threads shall be conforming to ANSI B1.20.1 . Fittings shall be conforming to SS316L.

Note: TIG welding shall be carried out for welding SS fittings to corrugated hose.

Material of rubber gasket mm : Polymer NBR / nitrile with thickness 3-4 mm

Material of Hose : SS316L, 0.3 mm thickness

Braiding : Not required

Product to be conveyed : Natural Gas

Heat Treatment Requirement undergo : Parent sheet or the finished hose must undergo annealing. The purpose of this is to relieve stress due to cold working.


Surface Coating : No zinc plating is required on SS hose, SS fittings & welded portion. At the welded portion suitable anti rusting provision shall be made. .

4.0 TESTING, CLEANING & PACKAGING

Tests : Pneumatic Test at a pressure of 1.5 kg/cm<sup>2</sup>(g) & Type testing as per Cl.Nos. 14.1, 14.2, 14.5 & 14.6 of BS: 6501 Part-I (latest)/ ISO 10380

Cleaning & Packaging (latest)/ ISO 10380 : As per Cl.No. 17.0 of BS:6501 Part-I

Test Certificate : As per Cl.No. 18.0 of BS:6501 Part-I (latest)/ ISO 10380

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 183 OF 229	

## 5.0 MARKING

Each corrugated flexible metal hose and SS316 fittings shall be embossed with owner's logo, manufacturers name or trade mark BS: 6501 part I (latest)/ ISO 10380 and designation of fittings.

Each packing containing corrugated flexible metal hose shall carry the following stamped or written in indelible ink.

- Indication of the source of manufacture/Trade mark/Type
- Designation of fittings
- Maximum working pressure
- Nominal bore
- Month and year of manufacture


## 6.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Bidder shall submit the packaging details like numbering of pieces per package, along with QAP and also complied with at the time of delivery. One package will consist of one corrugated flexible metal hose assembly (metal hose + end fitting on both sides) & two gaskets for each end.

## 7.0 INSPECTION / DOCUMENTS

- a) Inspection shall be carried out as per design code/standard, Technical Specification and Inspection Plan/ Vendor's detailed QAP duly approved by Owner/Owner's representative.
- b) Owner representative or third party inspection agency appointed by owner shall carry out random inspection during manufacturing/ final inspection.
- c) 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 Technical Specification and specified code for 100% material, at the time of final inspection of each supply lot of material.
- d) Even after third party inspection, owner reserves the right to select a sample of flexible metal hose randomly from each manufacturing batch and have these independently tested. If the results of these tests fall outside the limits specified in Technical specification, then owner reserves the rights to reject all production supplied from the batch.
- e) 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.

Vendor shall submit the dimensional drawing for Hose, end fittings and Rubber Gasket along with the technical bid.

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 184 OF 229	

**QAP  
FLEXIBLE HOSES (ANACONDA)**

Sr. No.	INSPECTION AND TESTING	QUANTUM OF CHECK	PROCEDURE	ACCEPTANCE CRITERIA AND CERTIFICATE	FORMAT OF RECORD	INSPECTION			
						Vendor	TPIA	LEPL	REMARKS
1	Materials (Chemical Properties)	One sample each heat	Material code	Material code	Material Test certificate	P	R	R	
2	Materials (Mechanical Properties)	One sample each heat	Material code	Material code	Material Test certificate	P	R	R	
3	TIG welding (End fitting to hose)	100%	Approved WPS	ASME Section IX	Welding report	P	R	R	
4	Cyclic Test (Type test)	One sample each lot	As per ISO 10380	As per ISO 10380	INSPECTION TEST REPORT	P	W	R	
5	Pliable Test (Type Test)	One sample each lot	As per ISO 10380	As per ISO 10380	INSPECTION TEST REPORT	P	W	R	
6	Pneumatic test (Production test)	100%	As per Technical specification	As per Technical specification	INSPECTION TEST REPORT	P	W	R	
7	Leakage Test	1%	As per ISO:10380	As per ISO:10380	INSPECTION TEST REPORT	P	W	R	
8	Dimensional Check	1%	-	As per approved Drawing	INSPECTION TEST REPORT	P	W	R	
9	Marking	1%	As per TS	As per TS	INSPECTION TEST REPORT	P	W	R	
10	Final Documentation		Document pertaining to all tests specified in this QAP	Document pertaining to all tests specified in this QAP		P	H	R	

LEGENDS: R - REVIEW, W - Witness, H-Hold, P - Perform, TPIA - Third Party Agency

(Owner / Owner's Representative)

Note:

- 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 TS.
- 2 The supplier shall submit their own details ITP prepared on the basis of above/ Technical specification for approval of Owner/Owner's representative.
- 3 Owner/Owner representative shall review/approve all the documents related to ITP/Quality records/Drawings etc. submitted by supplier.
- 4 Owner / Owner's representative including TPIA will have to 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/LEPL/Client 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.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

**DOCUMENT NO.**

**052-LEPL-BGCL-001**

**REV**

**A**

**SHEET 185 OF 229**

**STANDARD TECHNICAL  
SPECIFICATION  
FOR  
STEEL REINFORCED RUBBER HOSE**



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCULDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

**DOCUMENT NO.**

**REV**

**052-LEPL-BGCL-001**

**A**

**SHEET 186 OF 229**

## AMENDMENT STATUS

Sl. No.	Clause / Paragraph / Annexure / Exhibit / Drawing Amended	Page No.	Rev.	Date	BY		Verified	
					Name	Sig.	Name	Sig.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 187 OF 229

## CONTENTS

**DESCRIPTION**

**SCOPE**

**MATERIAL**

**DIMENSIONS & TOLERANCES**

**FEATURES**

**MARKING**

**PACKAGING**

**INSPECTION / DOCUMENTS**



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

**DOCUMENT NO.**

**REV**

**052-LEPL-BGCL-001**

**A**

**SHEET 188 OF 229**

## 1.0 SCOPE

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 MATERIAL


- i. 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.
- ii. Reinforcement material :- It shall have wire reinforcement in braided form in between the lining & cover.
- iii. Cover :- It shall be manufactured out of synthetic rubber compound resistant to abrasion, weather and natural gas. The cover color shall be orange.
- iv. 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.

## 3.0 DIMENSIONS & TOLERANCES

- i. Bore size

Nominal size ( mm )	Minimum base diameter ( mm )	Minimum bend radius ( mm )
8 mm	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

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 189 OF 229	

- i. The Minimum thickness of lining & cover shall be 2 mm & 1 mm respectively.
- ii. Length of hose shall be as defined in M.R. & the tolerances on length shall be permitted  $\pm 1\%$ .

#### 4.0 FEATURES

#### 4.1 Mechanical properties

Tensile strength (Lining & cover) at break - 10 MPa (minimum)

Elongation (Lining & cover) in at break (%) (minimum) - 200 & 250 respectively

#### 4.2 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.

#### 4.3 Adhesion

The minimum adhesion between rubber lining & reinforcement, between layers of reinforcement and between reinforcement & cover shall be 2KN/m.

#### 4.4 Low temperature flexibility

Flexible hose is conditioned at  $-40^{\circ}\text{C}$  for at least 5 hrs. and then bent at  $180^{\circ}$  around a mandrel with a diameter 12 times the nominal bore diameter of the hose, no cracks or breaks shall be shown.

#### 4.5 Flexibility of Hose

The hose shall be capable of being bent empty to the radius 95 mm without flattening and suffering structural damages.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

052-LEPL-BGCL-001

REV

A

SHEET 190 OF 229



#### 4.6 Ozone resistance

It shall be carried out as per clause no. 5.5.of IS 9573: 1978

#### 4.7 Hydrostatic 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.

#### 4.8 Bursting pressure

It shall be carried out as per Clause 5.5.2 of IS 9573. The minimum burst pressure shall be 5 Mpa.

#### 4.9 Grip strength test

The hose shall comply to the requirement of Clause no. 5.5.7 of IS 9573.


#### 4.10 Burning behaviour

The burning test shall be carried out on hose as per clause no. 5.5.8 of IS 9573. The hose at least shall not burn till 45 second.

### 5.0 MARKING

Each hose shall be indelibly marked as follows:

- a) Manufacturer's name or trade mark., if any
- b) Nominal bore
- c) Batch no. / Lot no.
- d) Month and year of manufacturer
- e) Type of hose i.e Type 4
- f) BIS marking

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	DOCUMENT NO.	REV
		052-LEPL-BGCL-001	A
		SHEET 191 OF 229	

## 6.0 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.

## 7.0 INSPECTION / DOCUMENTS

- i. Inspection shall be carried out as per design codes/standards, Technical Specification and Inspection Plan/ Vendor's detailed QAP duly approved by owner/owner's representative.
- ii. For all tests purposes, the minimum time between vulcanization & testing shall be 16 h.
- iii. Owner representative or third party inspection agency appointed by Owner shall carry out random inspection during manufacturing/ final inspection.
- iv. 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 Technical Specification, at the time of final inspection of each supply lot of material.
- v. Even after third party inspection, Owner 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 Technical specification, then Owner reserves the rights to reject all production supplied from the batch.
- vi. Vendor shall prepare and submit the detail drawings of required steel reinforced rubber hose for approval by Owner before starting production.
- vii. 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.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCULDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

DOCUMENT NO.

REV

052-LEPL-BGCL-001

A

SHEET 192 OF 229

**QAP**  
**STEEL REINFORCED RUBBER HOSES**

Sr. No.	INSPECTION AND TESTING	QUANTUM OF CHECK	PROCEDURE	ACCEPTANCE CRITERIA AND CERTIFICATE	FORMAT OF RECORD	INSPECTION			REMARKS
						Vendor	TPIA	LEPL	
1	Materials (Chemical Properties)	IS: 9573	Manufacturer Std	IS: 9573	Material Test certificate	P	R	R	
2	Dimensional check	IS: 9573	-	IS: 9573	INSPECTION TEST REPORT	P	W	R	
3	Physical Properties (Tensile Strength and Elongation)	IS: 9573	IS: 9573	IS: 9573	INSPECTION TEST REPORT	P	W	R	
4	Accelerated aging test	IS: 9573	IS: 9573	IS: 9573	INSPECTION TEST REPORT	P	W	R	
5	Resistance of lining to N-Pentane	IS: 9573	IS: 9573	IS: 9573	INSPECTION TEST REPORT	P	W	R	
6	Adhesion	IS: 9573	IS: 9573	IS: 9573	INSPECTION TEST REPORT	P	W	R	
7	Low Temperature Flexibility	IS: 9573	IS: 9573	IS: 9573	INSPECTION TEST REPORT	P	W	R	
8	Flexibility	IS: 9573	IS: 9573	IS: 9573	INSPECTION TEST REPORT	P	W	R	
9	Ozone Resistance	IS: 9573	IS: 9573	IS: 9573	INSPECTION TEST REPORT	P	W	R	
10	Hydrostatic Test	IS: 9573	IS: 9573	IS: 9573	INSPECTION TEST REPORT	P	W	R	
11	Bursting Pressure Test	IS: 9573	IS: 9573	IS: 9573	INSPECTION TEST REPORT	P	W	R	
12	Grip Strength Test	IS: 9573	IS: 9573	IS: 9573	INSPECTION TEST REPORT	P	W	R	
13	Burning Behaviour test	IS: 9573	IS: 9573	IS: 9573	INSPECTION TEST REPORT	P	W	R	
14	Marking	IS: 9573	IS: 9573	IS: 9573	INSPECTION TEST REPORT	P	W	R	
15	Final Documentation		Document pertaining to all tests specified in this QAP	Document pertaining to all tests specified in this QAP		P	H	R	

LEGENDS: R - REVIEW, W - Witness, H-Hold, P - Perform, TPJA - Third Party Agency  
(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 TS.
- 2 The supplier shall submit their own details ITP prepared on the basis of above/ Technical specification for approval of Owner/Owner's representative.
- 3 Owner/Owner representative shall review/approve all the documents related to ITP/Quality (QA/QC) Drawings etc. submitted by supplier.
- 4 Owner / Owner's representative including TPJA will have to 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 TPJA/LEPL/Client 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.



LAYING OF UNDERGROUND PE PIPE LINE AND  
ABOVE GI INSTALLATION INCLUDING LMC  
CONSUMER END AT BENGAL GAS COMPANY  
LIMITED

**DOCUMENT NO.**


**052-LEPL-BGCL-001**

**SHEET 193 OF 229**

**REV**

**A**

# TENDER DRAWINGS

	LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCULDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED	<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>052-LEPL-BGCL-001</b>	<b>A</b>
		<b>SHEET 194 OF 229</b>	

<b>DRAWING INDEX</b>		
<b>S.NO</b>	<b>DESCRIPTION</b>	<b>DRAWING NO</b>
1	Schematic drawing for domestic PNG Consumer connections	LEPL-STD-MDPE-003
2	Standard details of Restoration of Asphalt Roads	LEPL-STD-MDPE-043
3	Standard details of RCC Valve Chamber - Type-1	LEPL-STD-MDPE-012
4	Standard details of RCC Valve Chamber - Type-2	LEPL-STD-MDPE-013
5	Sketch for RCC Route Marker	LEPL-STD-MDPE-014
6	Drawing of Plate Marker	LEPL-STD-MDPE-015
7	Typical Trench Details for pipeline	LEPL-STD-MDPE-016
8	Typical domestic connections layout of NG distribution	LEPL-STD-MDPE-002
09	Typical Domestic GI Connection Scheme Single Regulator for Ground, First, Second & Third Floor.	LEPL-STD-MDPE-001
10	Half round Concrete Sleeve	LEPL-STD-MDPE-009
11	Typical Natural gas installation inside kitchen	LEPL-STD-MDPE-004
12	Scheme of gas supply to small/large/domestic consumers	LEPL-STD-MDPE-006
13	Sketch for Regulator, box, brackets & clamps	LEPL-STD-MDPE-007
14	Scheme for high pressure service installation	LEPL-STD-MDPE-008
15	Hose Assembly for Natural Gas Service	LEPL-STD-MDPE-017
16	Copper fittings for Natural Gas Service	LEPL-STD-MDPE-018
17	Brass disconnecting union ¾" NPT x 12 mm (straight)	LEPL-STD-MDPE-019
18	Brass disconnecting union 1/2" NPT x 12 mm (straight)	LEPL-STD-MDPE-020
19	Brass adopter ¼" BSPT x 12 mm (straight)	LEPL-STD-MDPE-021
20	Meter inlet union ¾" x ¾"	LEPL-STD-MDPE-022
21	Meter outlet union ¾" x 12mm	LEPL-STD-MDPE-023
22	Schematic diagram of housing for single service regulator	LEPL-STD-MDPE-044
23	Schematic diagram for single stream service regulator	LEPL-STD-MDPE-045
24	Road / Highway cased crossing for MDPE pipe	LEPL-STD-MDPE-005
25	Details of Hard Barricading	LEPL-STD-MDPE-041
26	Details of Shuttering & RCC Details	LEPL-STD-MDPE-042



LAYING OF UNDERGROUND PE PIPE LINE AND ABOVE GI INSTALLATION INCLUDING LMC CONSUMER END AT BENGAL GAS COMPANY LIMITED

**DOCUMENT NO.**

**052-LEPL-BGCL-001**

**REV**

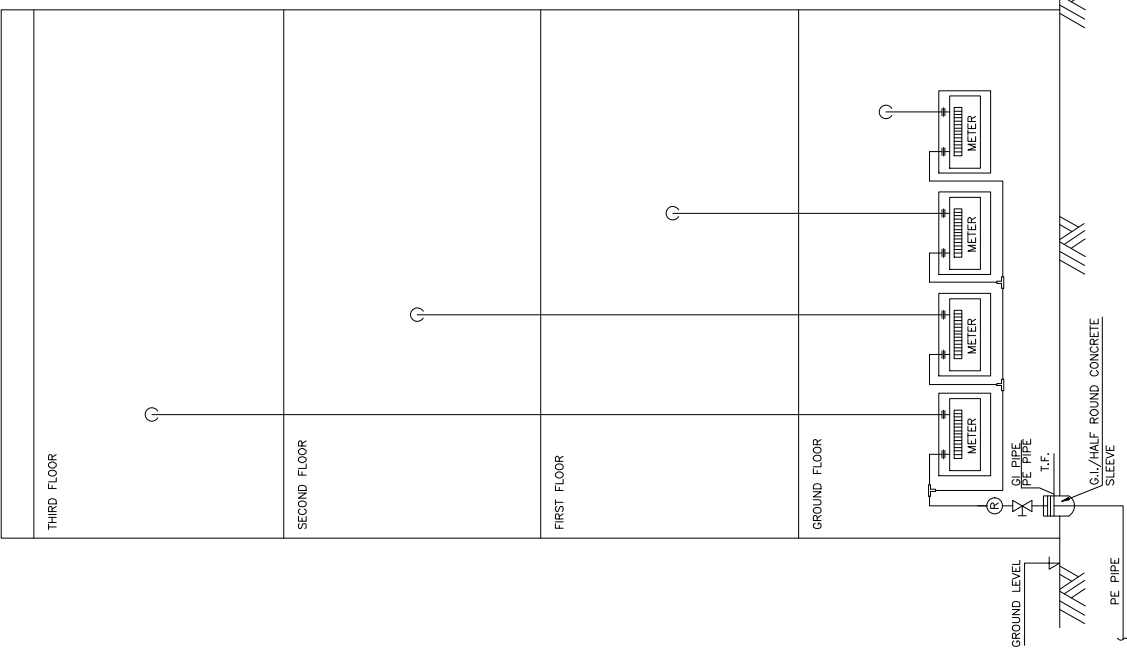
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**SHEET 195 OF 229**

12 11 10 9 8 7 6 5 4 3 2 1


**NOTES:-**

1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE. IT SHALL BE DECIDED DURING DETAILS ENGINEERING.
3. PIPING DOWN STREAM METER SHALL BE OF COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.5m. HOWEVER IT SHALL BE TAKEN APPROVAL FROM OWNER BEFORE STARTING THE EXECUTION.
5. IT SHALL BE DECIDED BY OWNER/OWNER'S REPRESENTATIVE AS PER SITE CONDITIONS.
6. IF COPPER PIPE GOES TO THE APPLIANCE VALVE THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR GI PIPE GOES TO THE APPLIANCE VALVE THAN GRITTING SHALL BE USED AT THE OUTLET THE METER.
7. TAPPING SHALL BE LEFT NEAR THE OUTSIDE KITCHEN AS DIRECTED BY OWNER/OWNER'S REPRESENTATIVE.
8. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING USE IN BETWEEN THE PIPE THAN CLAMP SHALL BE PLACED 150MM FAR AWAY FROM CENTER LINE OF FITTINGS AT EVERY SIDE. HOW EVER THE SAME MAY BE CHANGES AS PER SITE CONDITIONS/AS DIRECTED BY EIC.
9. FROM THE TRANSITION FITTING TO THE ISOLATION VALVE SHALL BE CONSIDERED IN THE OUTSIDE KITCHEN PIPING.
10. AT THE TIME OF MEASURING LENGTH OG GI/COPPER PIPE, GI/CU FITTINGS SHALL BE COUNTED IN THE PIPE LENGTH.



**INDICATIVE RISER ARRANGEMENT IN BUILDING. IF METER IS INSTALLED AT GROUND FLOOR**

0	16.11.2023	ISSUED FOR TENDER	VKS	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD

**PMO:**  **LYONS ENGINEERING PVT. LTD.**  
**NEW DELHI**

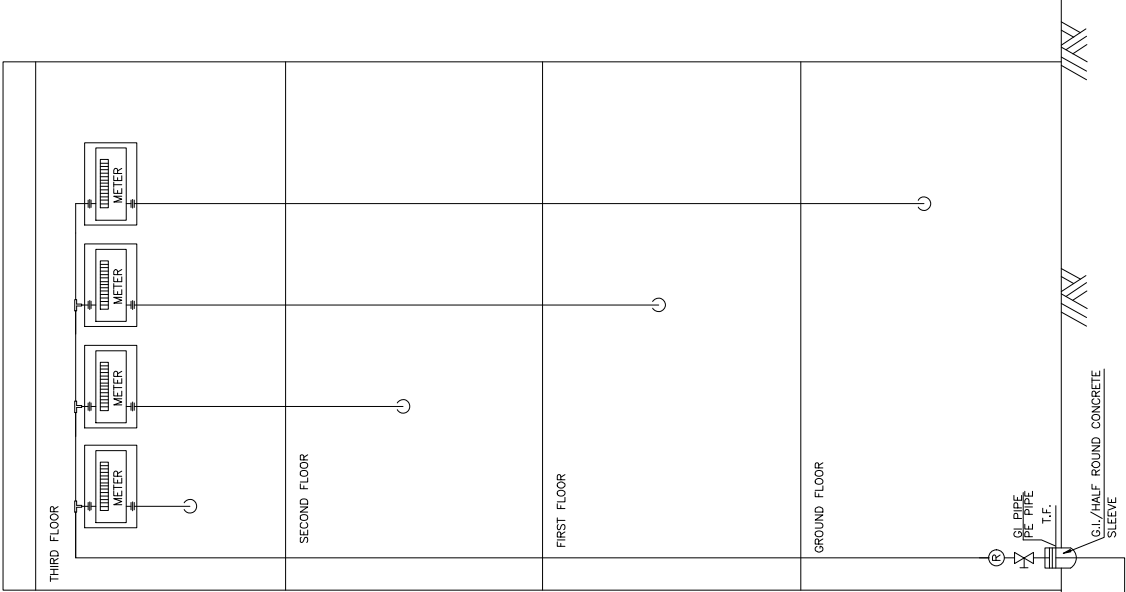
<b>SCALE</b>		<b>TITLE:</b>	
AS SHOWN		TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION	
<b>SIZE</b>	<b>JOB NO.</b>	<b>DRAWING NUMBER</b>	<b>SHEET</b>
A3		LEPL-STD-MDPE-001	1 OF 1

12 11 10 9 8 7 6 5 4 3 2 1

12 11 10 9 8 7 6 5 4 3 2 1

**NOTES:-**

1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE. IT SHALL BE DECIDED DURING DETAILS ENGINEERING.
3. PIPING DOWN STREAM METER SHALL BE OF COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.5m. HOWEVER IT SHALL BE TAKEN APPROVAL FROM OWNER BEFORE STARTING THE EXECUTION.
5. IT SHALL BE DECIDED BY OWNER/OWNER'S REPRESENTATIVE AS PER SITE CONDITIONS.
6. IF COPPER PIPE GOES TO THE APPLIANCE VALVE THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR GI PIPE GOES TO THE APPLIANCE VALVE THAN GRITTING SHALL BE USED AT THE OUTLET THE METER.
7. TAPPING SHALL BE LEFT NEAR THE OUTSIDE KITCHEN AS DIRECTED BY OWNER/OWNER'S REPRESENTATIVE.
8. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING USE IN BETWEEN THE PIPE THAN CLAMP SHALL BE PLACED 150MM FAR AWAY FROM CENTER LINE OF FITTINGS AT EVERY SIDE. HOW EVER THE SAME MAY BE CHANGES AS PER SITE CONDITIONS/AS DIRECTED BY EIC.
9. FROM THE TRANSITION FITTING TO THE ISOLATION VALVE SHALL BE CONSIDERED IN THE OUTSIDE KITCHEN PIPING.
10. AT THE TIME OF MEASURING LENGTH OG GI/COPPER PIPE, GI/CU FITTINGS SHALL BE COUNTED IN THE PIPE LENGTH.



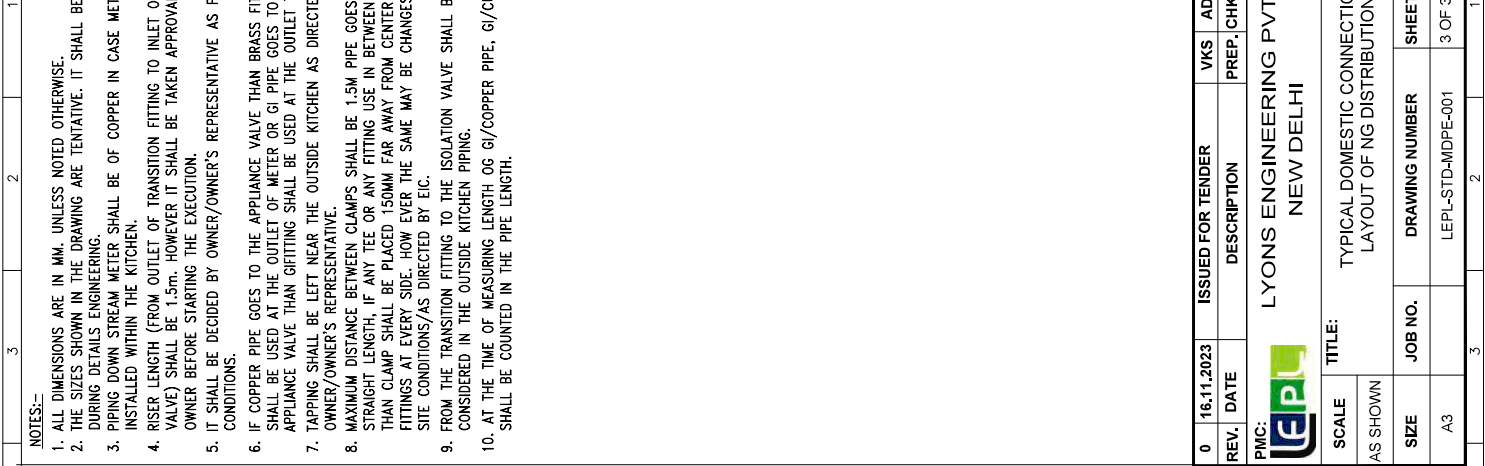
**INDICATIVE RISER ARRANGEMENT IN BUILDING, IF METER IS INSTALLED AT TOP OF FLOOR**

REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	16.11.2023				

PMC: **LEPLU** LYONS ENGINEERING PVT. LTD.  
NEW DELHI

SCALE		TITLE:	
AS SHOWN		TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION	
SIZE	JOB NO.	DRAWING NUMBER	SHEET
A3		LEPL-STD-MDPE-001	2 OF 3

12 11 10 9 8 7 6 5 4 3 2 1



**NOTES:-**

1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE. IT SHALL BE DECIDED DURING DETAILS ENGINEERING.
3. PIPING DOWN STREAM METER SHALL BE OF COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.5m. HOWEVER IT SHALL BE TAKEN APPROVAL FROM OWNER BEFORE STARTING THE EXECUTION.
5. IT SHALL BE DECIDED BY OWNER/OWNER'S REPRESENTATIVE AS PER SITE CONDITIONS.
6. IF COPPER PIPE GOES TO THE APPLIANCE VALVE THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR GI PIPE GOES TO THE APPLIANCE VALVE THAN GRITTING SHALL BE USED AT THE OUTLET THE METER.
7. TAPPING SHALL BE LEFT NEAR THE OUTSIDE KITCHEN AS DIRECTED BY OWNER/OWNER'S REPRESENTATIVE.
8. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING USE IN BETWEEN THE PIPE THAN CLAMP SHALL BE PLACED 150MM FAR AWAY FROM CENTER LINE OF FITTINGS AT EVERY SIDE. HOW EVER THE SAME MAY BE CHANGES AS PER SITE CONDITIONS/AS DIRECTED BY EIC.
9. FROM THE TRANSITION FITTING TO THE ISOLATION VALVE SHALL BE CONSIDERED IN THE OUTSIDE KITCHEN PIPING.
10. AT THE TIME OF MEASURING LENGTH OG GI/COPPER PIPE, GI/CU FITTINGS SHALL BE COUNTED IN THE PIPE LENGTH.

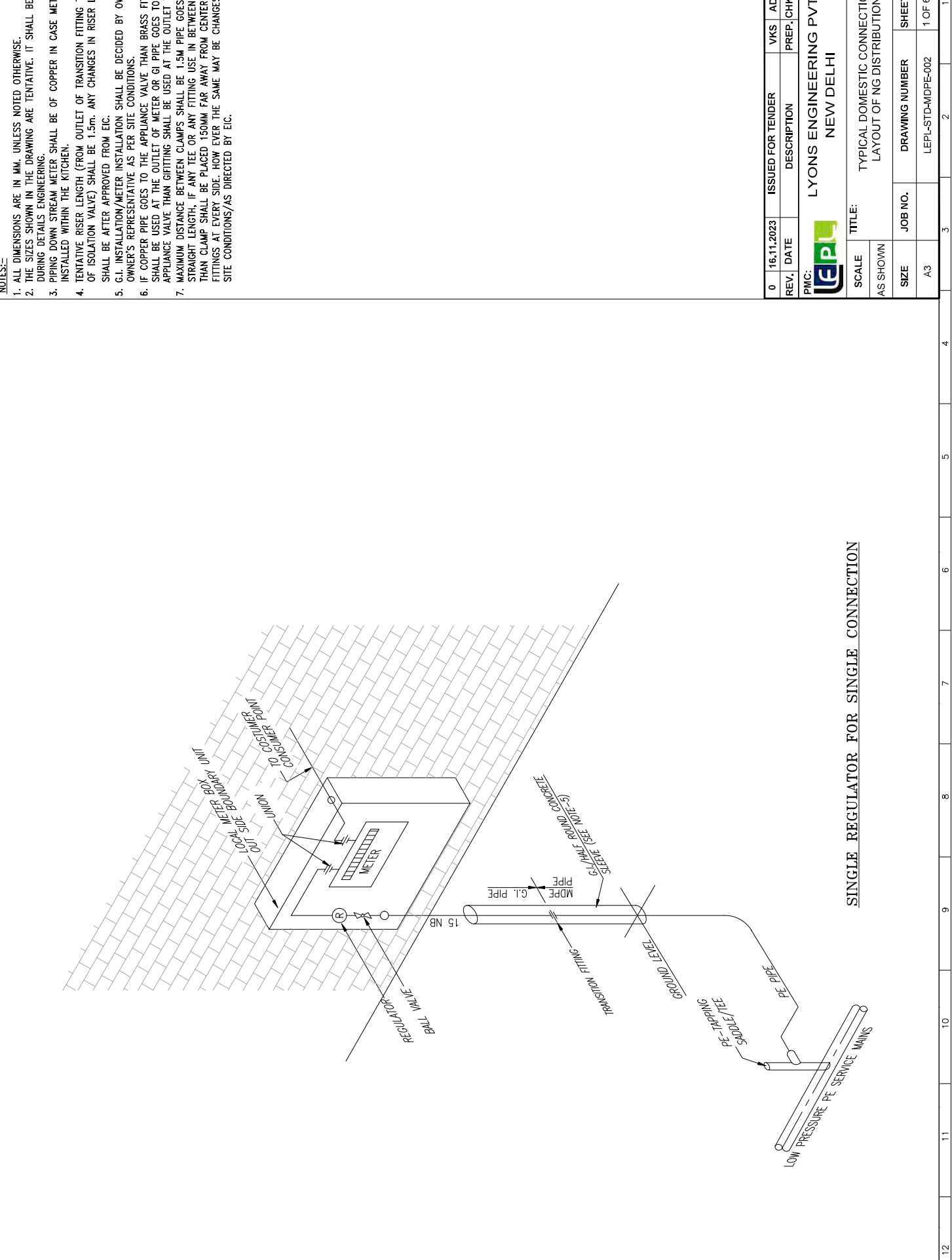
REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	16.11.2023				

PMC: **LEPLU** LYONS ENGINEERING PVT. LTD. NEW DELHI

SCALE		TITLE:	
AS SHOWN		TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION	
SIZE	JOB NO.	DRAWING NUMBER	SHEET
A3		LEPL-STD-MDPE-001	3 OF 3



1  
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12



NOTES:-  
 1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.  
 2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE. IT SHALL BE DECIDED DURING DETAILS ENGINEERING.  
 3. PIPING DOWN STREAM METER SHALL BE OF 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 APPROVED 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 THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR GI PIPE GOES TO THE APPLIANCE VALVE THAN BRASS FITTING SHALL BE USED AT THE OUTLET THE METER.  
 7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M PIPE GOES IN THE STRAIGHT LENGTH. IF ANY TEE OR ANY FITTING USE IN BETWEEN THE PIPE THAN CLAMP SHALL BE PLACED 150MM FAR AWAY FROM CENTER LINE OF FITTINGS AT EVERY SIDE. HOW EVER THE SAME MAY BE CHANGES AS PER SITE CONDITIONS/AS DIRECTED BY EIC.

**SINGLE REGULATOR FOR SINGLE CONNECTION**

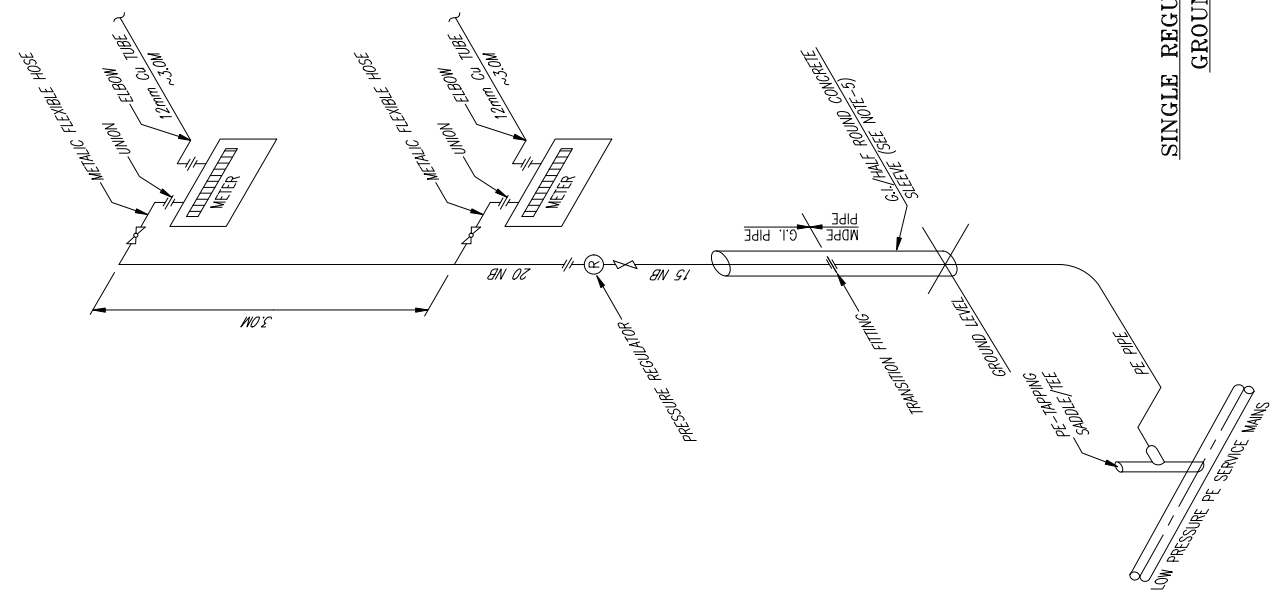
REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
0	16.11.2023	DESCRIPTION	PREP.	CHKD.	APPD.

PMC: **LEPL** **LYONS ENGINEERING PVT. LTD.**  
NEW DELHI

SCALE	TITLE:
AS SHOWN	TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION

SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3		LEPL-STD-MDPE-002	1 OF 6	0

1  
2  
3  
4  
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6  
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12

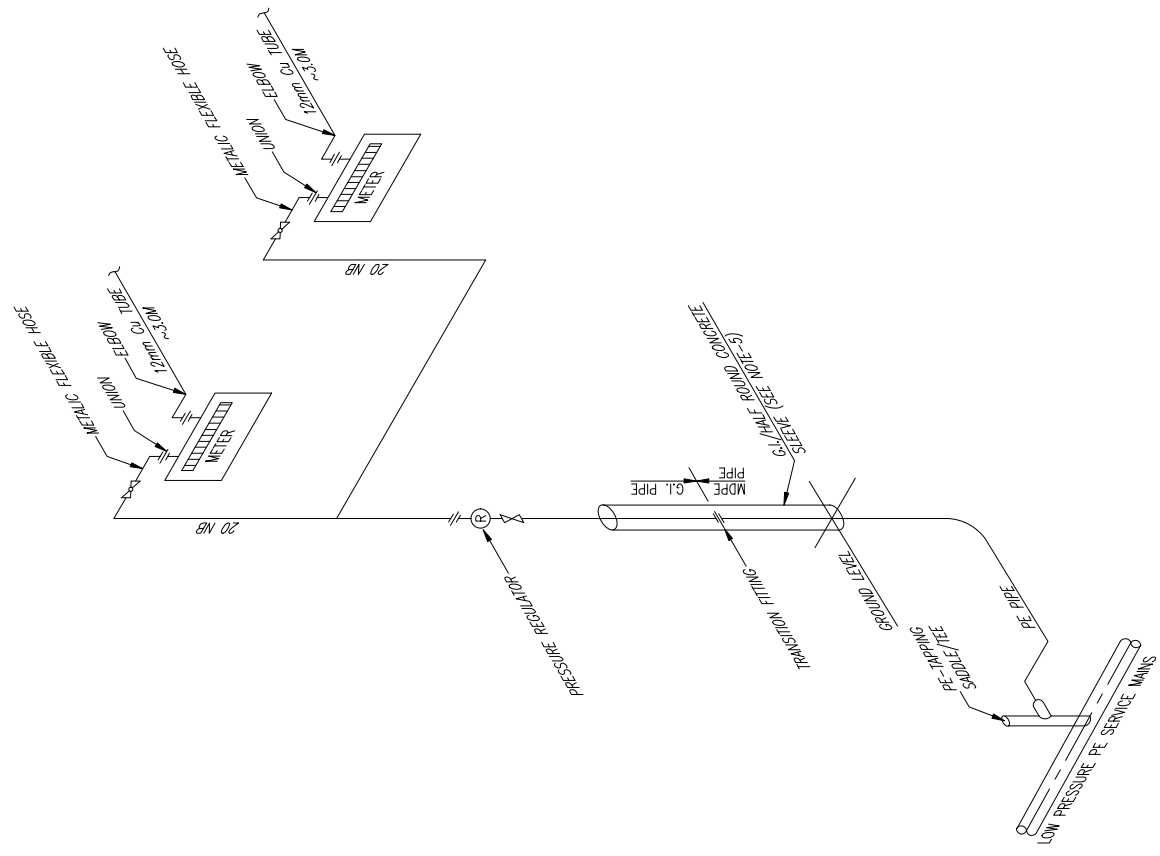


**SINGLE REGULATOR & SINGLE CONNECTION ON  
GROUND FLOOR & FIRST FLOOR**

- NOTES:-**
1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.
  2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE. IT SHALL BE DECIDED DURING DETAILS ENGINEERING.
  3. PIPING DOWN STREAM METER SHALL BE OF 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 APPROVED 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 THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR G.I PIPE GOES TO THE APPLIANCE VALVE THAN GRITTING SHALL BE USED AT THE OUTLET THE METER.
  7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M PIPE GOES IN THE STRAIGHT LENGTH. IF ANY TEE OR ANY FITTING USE IN BETWEEN THE PIPE THAN CLAMP SHALL BE PLACED 150MM FAR AWAY FROM CENTER LINE OF FITTINGS AT EVERY SIDE. HOW EVER THE SAME MAY BE CHANGES AS PER SITE CONDITIONS/AS DIRECTED BY EIC.

0	16.11.2023	ISSUED FOR TENDER	VKS	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
PMC: <b>LEPL</b> <b>LYONS ENGINEERING PVT. LTD.</b> <b>NEW DELHI</b>					
SCALE		TITLE:			
AS SHOWN		TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION			
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.	
A3		LEPL-STD-MDPE-002	2 OF 6	0	

12 11 10 9 8 7 6 5 4 3 2 1



**NOTES:-**

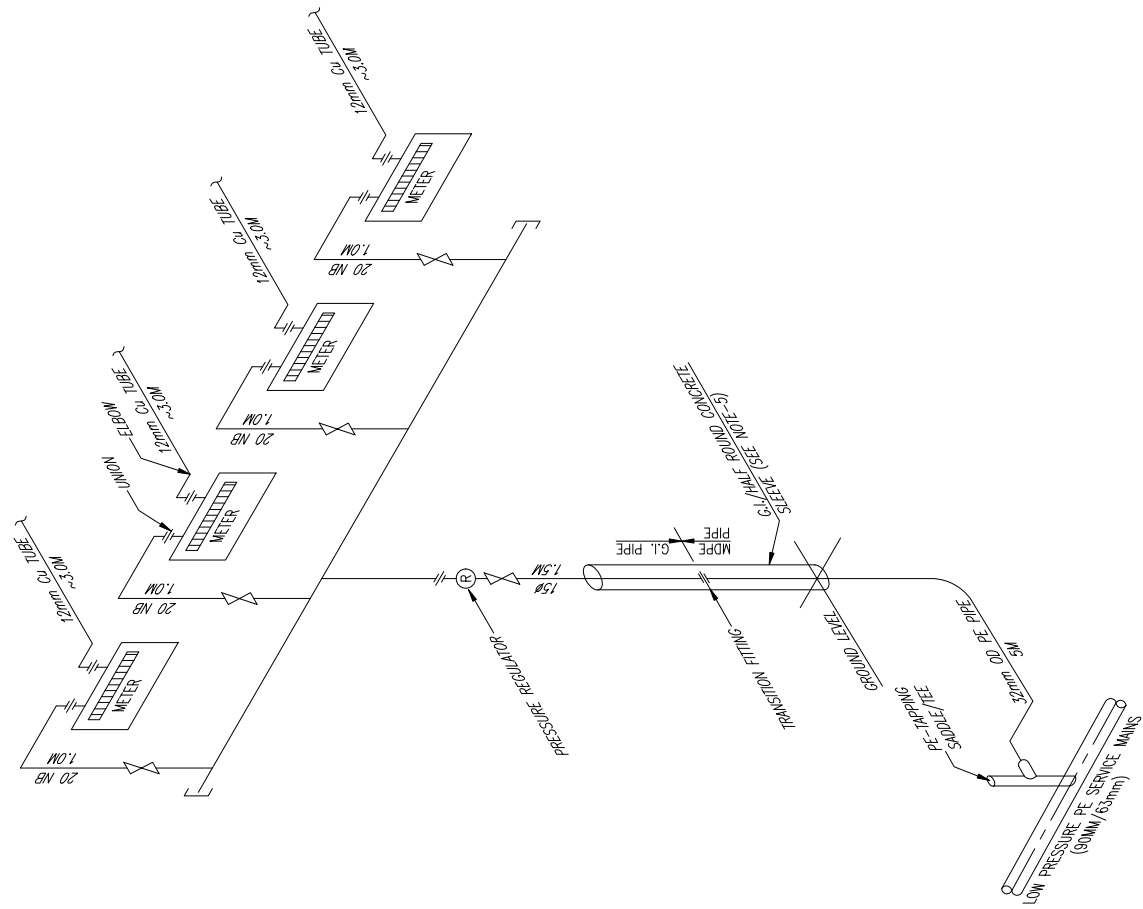
1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE. IT SHALL BE DECIDED DURING DETAILS ENGINEERING.
3. PIPING DOWN STREAM METER SHALL BE OF COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. TENTATIVE RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.5m. ANY CHANGES IN RISER LENGTH SHALL BE AFTER APPROVED 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 THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR GI PIPE GOES TO THE APPLIANCE VALVE THAN GRITTING SHALL BE USED AT THE OUTLET THE METER.
7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M PIPE GOES IN THE STRAIGHT LENGTH. IF ANY TEE OR ANY FITTING USE IN BETWEEN THE PIPE THAN CLAMP SHALL BE PLACED 150MM FAR AWAY FROM CENTER LINE OF FITTINGS AT EVERY SIDE. HOW EVER THE SAME MAY BE CHANGES AS PER SITE CONDITIONS/AS DIRECTED BY EIC.

0	16.11.2023	ISSUED FOR TENDER	VKS	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
PMC: <b>LEPL</b> LYONS ENGINEERING PVT. LTD. NEW DELHI					
SCALE		TITLE:			
AS SHOWN		TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION			
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.	
A3		LEPL-STD-MDPE-002	3 OF 6	0	


**SINGLE REGULATOR & DOUBLE CONNECTION ON GROUND FLOOR**

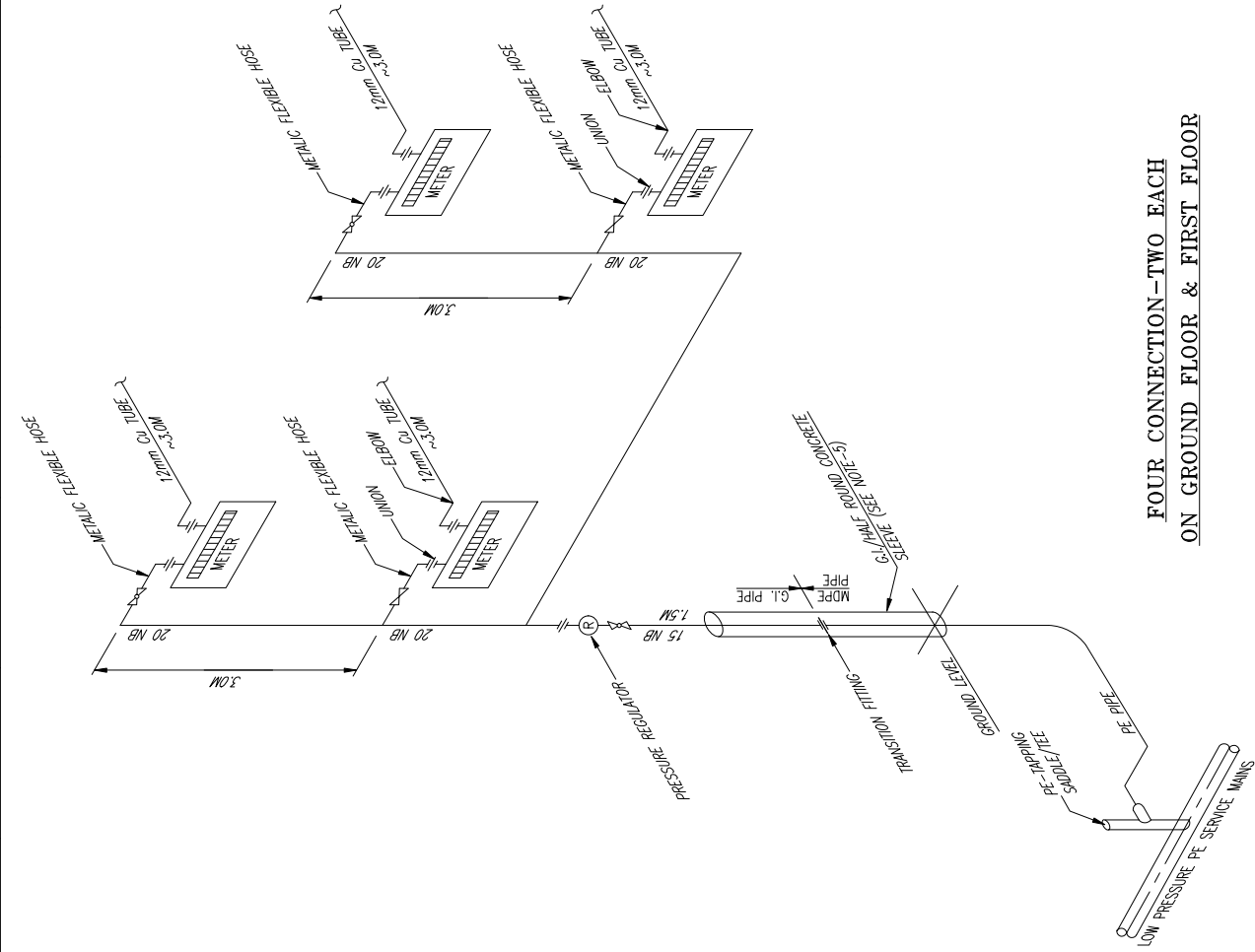
12 11 10 9 8 7 6 5 4 3 2 1

- NOTES:-
1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.
  2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE. IT SHALL BE DECIDED DURING DETAILS ENGINEERING.
  3. PIPING DOWN STREAM METER SHALL BE OF 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 APPROVED 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 THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR GI PIPE GOES TO THE APPLIANCE VALVE THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF THE METER.
  7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M PIPE GOES IN THE STRAIGHT LENGTH. IF ANY TEE OR ANY FITTING USE IN BETWEEN THE PIPE THAN CLAMP SHALL BE PLACED 150MM FAR AWAY FROM CENTER LINE OF FITTINGS AT EVERY SIDE. HOW EVER THE SAME MAY BE CHANGES AS PER SITE CONDITIONS/AS DIRECTED BY EIC.



**FOUR CONNECTION ON GROUND FLOOR**

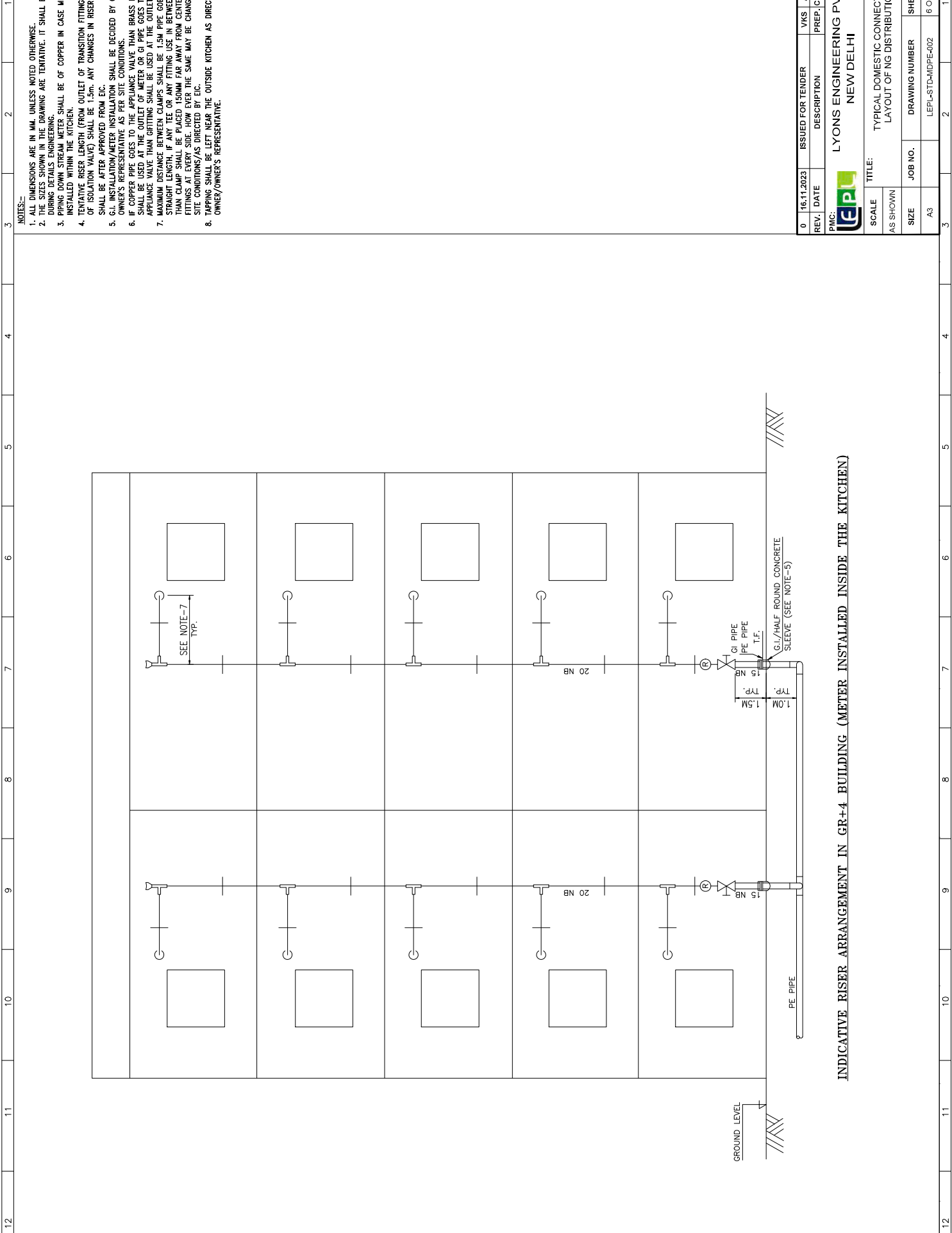
REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
0	16.11.2023	DESCRIPTION	PREP.	CHKD.	APPD.
PMG:  <b>LYONS ENGINEERING PVT. LTD.</b> <b>NEW DELHI</b>					
SCALE		TITLE:			
AS SHOWN		TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION			
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.	
A3		LEPL-STD-MDPE-002	4 OF 6	0	



**FOUR CONNECTION - TWO EACH  
ON GROUND FLOOR & FIRST FLOOR**

- NOTES:-**
1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.
  2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE. IT SHALL BE DECIDED DURING DETAILS ENGINEERING.
  3. PIPING DOWN STREAM METER SHALL BE OF 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 APPROVED 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 THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR GI PIPE GOES TO THE APPLIANCE VALVE THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF THE METER.
  7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M PIPE GOES IN THE STRAIGHT LENGTH. IF ANY TEE OR ANY FITTING USE IN BETWEEN THE PIPE THAN CLAMP SHALL BE PLACED 150MM FAR AWAY FROM CENTER LINE OF FITTINGS AT EVERY SIDE. HOW EVER THE SAME MAY BE CHANGES AS PER SITE CONDITIONS/AS DIRECTED BY EIC.

0	16.11.2023	ISSUED FOR TENDER	VKS	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
PMC: <b>LEPL</b> LYONS ENGINEERING PVT. LTD. NEW DELHI					
SCALE: TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION AS SHOWN			TITLE: TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION		
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.	
A3		LEPL-STD-MDPE-002	5 OF 6	0	



- NOTES:-
1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.
  2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE. IT SHALL BE DECIDED DURING DETAILS ENGINEERING.
  3. PIPING DOWN STREAM METER SHALL BE OF 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 APPROVED FROM ETC.
  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 THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR GI PIPE GOES TO THE APPLIANCE VALVE THAN BRITISH SHALL BE USED AT THE OUTLET THE METER.
  7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M PIPE GOES IN THE HORIZONTAL POSITION. THE DISTANCE BETWEEN THE CLAMPS IN THE HORIZONTAL POSITION SHALL BE 1.5M. (SEE NOTE FOR MAXIMUM CLAMPING OF FITTINGS AT EVERY SIDE, HOW EVER THE SAME MAY BE CHANGES AS PER SITE CONDITIONS/AS DIRECTED BY ETC.
  8. TAPPING SHALL BE LEFT NEAR THE OUTSIDE KITCHEN AS DIRECTED BY OWNER/OWNER'S REPRESENTATIVE.

REV.	DATE	ISSUED FOR TENDER	V/S	AD	VK
0	16.11.2023				
		DESCRIPTION	PREP./CHKD.	APPD	

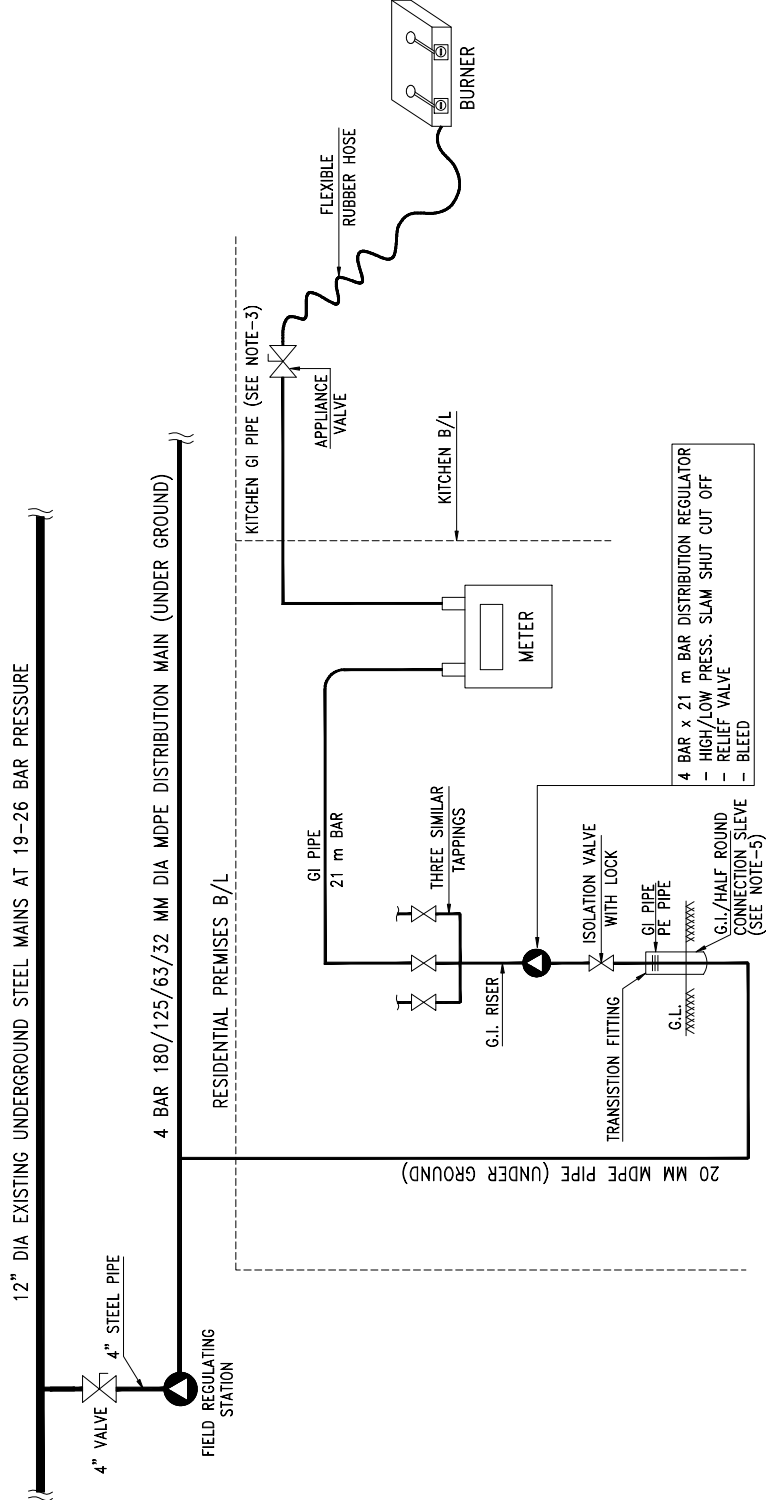
PMC: **LEPL** LYONS ENGINEERING PVT. LTD. NEW DELHI

TITLE: TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION	
SCALE AS SHOWN	
SIZE A3	
JOB NO.	DRAWING NUMBER
	LEPL-STD-MDPE-002
SHEET 6 OF 6	REV. 0

INDICATIVE RISER ARRANGEMENT IN GR+4 BUILDING (METER INSTALLED INSIDE THE KITCHEN)

# SCHEMATIC DRAWING FOR DOMESTIC CONNECTION

- NOTES:-
1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.
  2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE. IT SHALL BE DECIDED DURING DETAILS ENGINEERING.
  3. PIPING DOWN STREAM METER SHALL BE OF 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 APPROVED 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 THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR GI PIPE GOES TO THE APPLIANCE VALVE THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF THE METER.
  7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING USE IN BETWEEN THE PIPE THAN CLAMP SHALL BE PLACED 150MM FAR AWAY FROM CENTER LINE OF FITTINGS AT EVERY SIDE. HOW EVER THE SAME MAY BE CHANGES AS PER SITE CONDITIONS/AS DIRECTED BY EIC.



4 BAR x 21 m BAR DISTRIBUTION REGULATOR  
 - HIGH/LOW PRESS. SLAM SHUT CUT OFF  
 - RELIEF VALVE  
 - BLEED

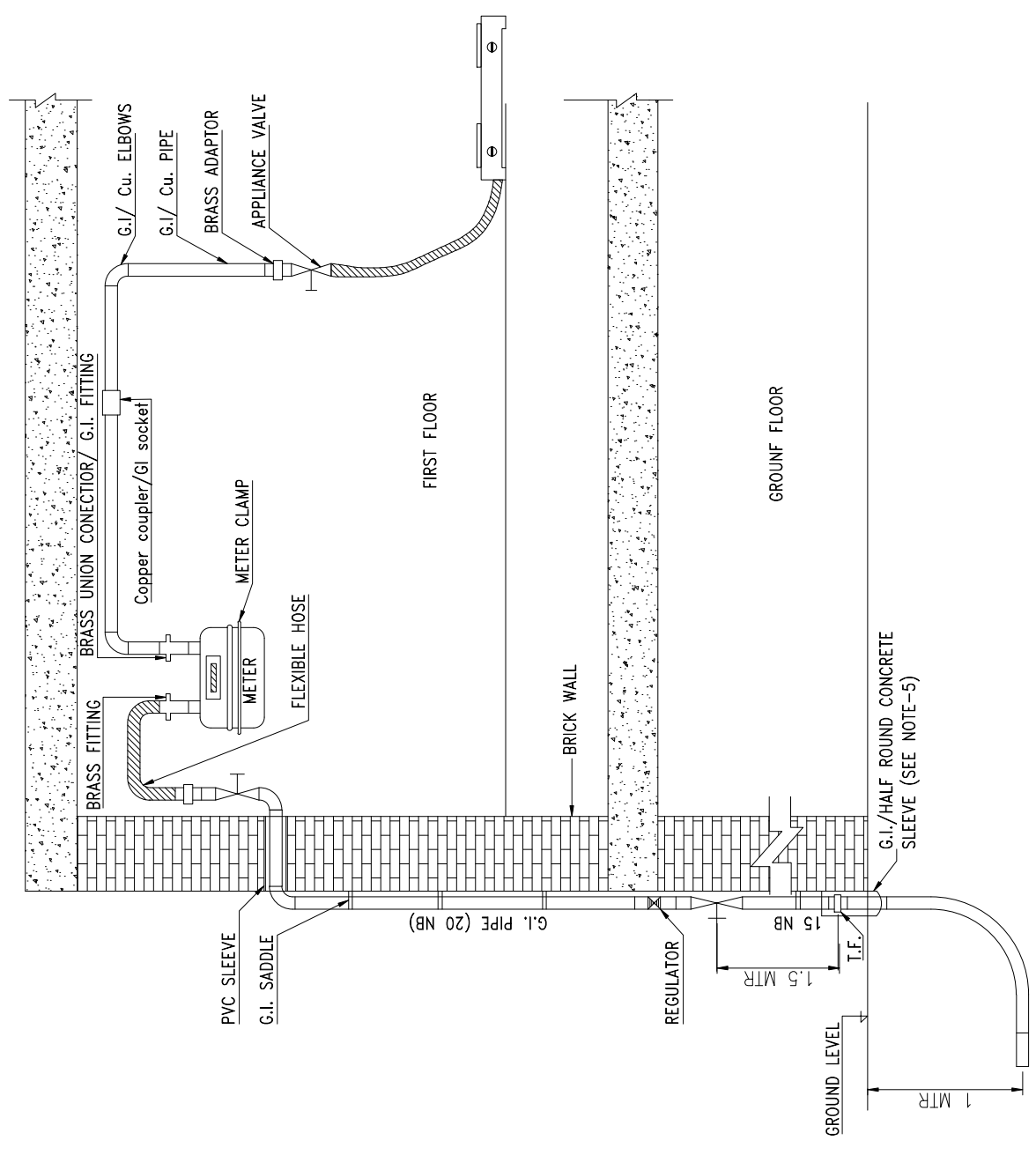
0	16.11.2023	ISSUED FOR TENDER	VKS	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD

PMC: **LEPL** LYONS ENGINEERING PVT. LTD. NEW DELHI

SCALE	TITLE:
AS SHOWN	SCHEMATIC DIAGRAM FOR DOMESTIC PNG CONSUMER CONNECTION

SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3		LEPL-STD-MDPE-003	1 OF 1	0

- NOTES:-
1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.
  2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE. IT SHALL BE DECIDED DURING DETAILS ENGINEERING.
  3. PIPING DOWN STREAM METER SHALL BE OF 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 APPROVED 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 THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR GI PIPE GOES TO THE APPLIANCE VALVE THAN BRASS FITTING SHALL BE USED AT THE OUTLET OF THE METER.
  7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M PIPE GOES IN THE STRAIGHT LENGTH. IF ANY TEE OR ANY FITTING USE IN BETWEEN THE PIPE THAN CLAMP SHALL BE PLACED 150MM FAR AWAY FROM CENTER LINE OF FITTINGS AT EVERY SIDE. HOW EVER THE SAME MAY BE CHANGES AS PER SITE CONDITIONS/AS DIRECTED BY EIC.
  8. METER CLAMP SHALL BE APPROVED FROM OWNER/OWNER'S REPRESENTATIVE



0	16.11.2023	ISSUED FOR TENDER	VKS	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.

PMC: **LEPL** LYONS ENGINEERING PVT. LTD. NEW DELHI

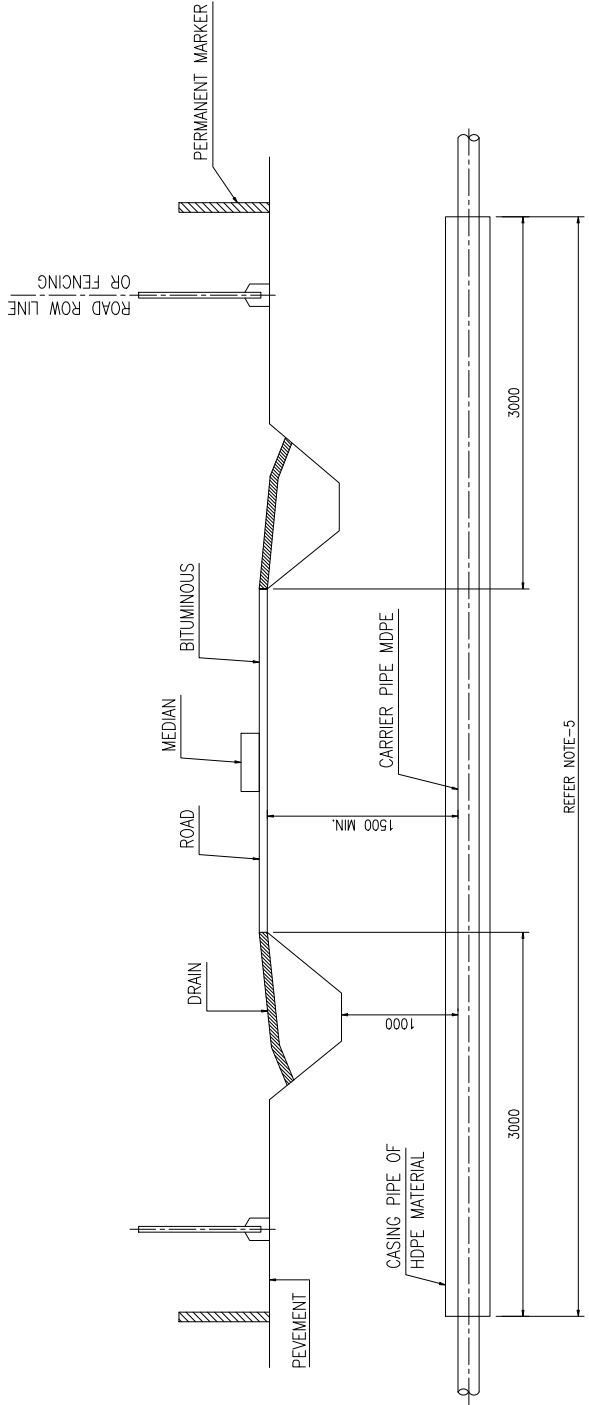
SCALE	TITLE:	
AS SHOWN	TYPICAL NATURAL GAS INSTALLATION INSIDE KITCHEN	
SIZE	JOB NO.	DRAWING NUMBER
A3		LEPL-STD-MDPE-004
	SHEET	REV.
	1 OF 1	0



12 11 10 9 8 7 6 5 4 3 2 1

**NOTES:-**

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. ROAD HIGHWAY CROSSING SHALL BE RESTORED TO ORIGINAL CONDITION TO THE ENTIRE SATISFACTION OF OWNER AND CONCERNED AUTHORITIES HAVING JURISDICTION.
3. REFER API RP 1102 FOR OTHER DESIGN AND INSTALLATION REQUIREMENTS.
4. ANGLE OF INTERSECTION BETWEEN PIPELINE AND THE ROAD/ HIGHWAY SHALL BE AS CLOSED TO 90° AS POSSIBLE BUT IN NO CASE LESS THAN 30°.
5. CONTRACTOR SHALL VERIFY THE ACTUAL DIMENSIONS 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.
6. THE CASING PIPE SHALL BE OF SIZE MAINTAINED AT CLAUSE NO.19 OF TECHNICAL SPECIFICATION FOR PE LAYING.



**TYPICAL SECTION**

REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
		DESCRIPTION	PREP.	CHKD.	APPD.
0	16.11.2023				

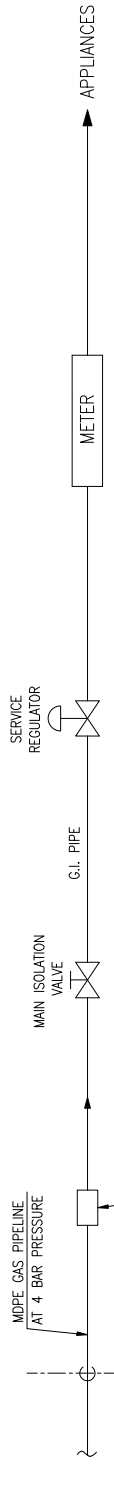
PMC: **LEPL** LYONS ENGINEERING PVT. LTD. NEW DELHI

SCALE	TITLE:
AS SHOWN	ROAD/HIGHWAY CASSED. CROSSING FOR MDPE PIPE

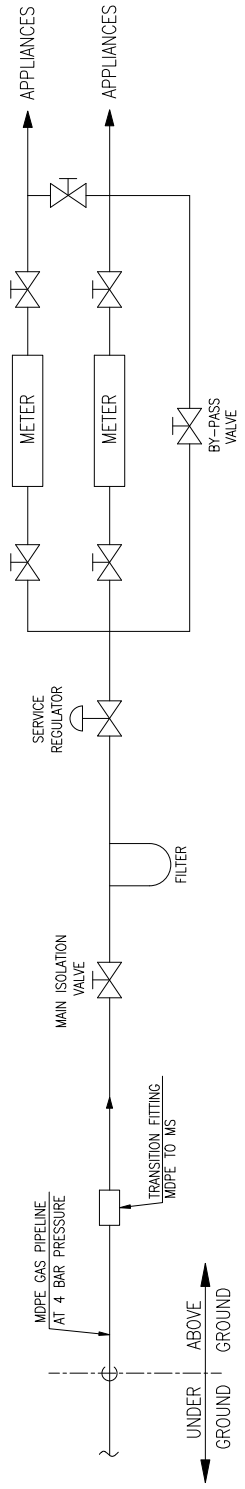
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3		LEPL-STD-MDPE-005	1 OF 1	0

12 11 10 9 8 7 6 5 4 3 2 1

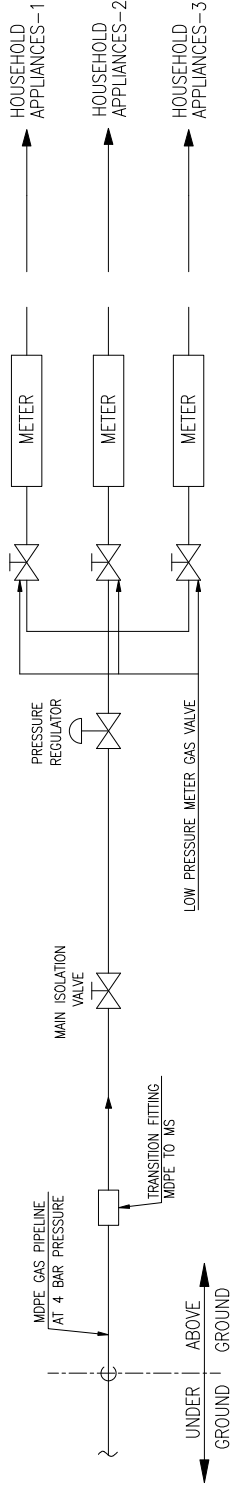
NOTES:-  
 1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.  
 2. SIZE OF LINE, VALVE ETC. SHALL BE DECIDED AT THE TIME OF EXECUTION AS PER THE INSTRUCTIONS OF OWNER/OWNER'S REPRESENTATIVE.



SCHEME OF NATURAL GAS SUPPLY TO SMALL COMMERCIAL CONSUMERS



SCHEME OF NATURAL GAS SUPPLY TO LARGE COMMERCIAL CONSUMERS



SCHEME OF NATURAL GAS SUPPLY TO DOMESTIC CONSUMERS

0	16.11.2023	ISSUED FOR TENDER	VKS	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD

PMC: **LEPL** LYONS ENGINEERING PVT. LTD. NEW DELHI

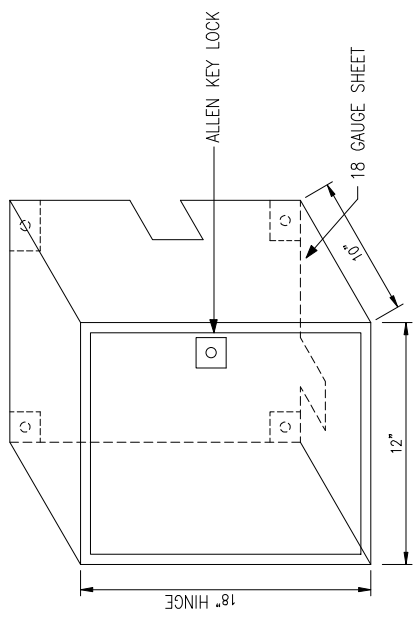
TITLE: SCHEME OF GAS SUPPLY TO SMALL/LARGE/DOMESTIC CONSUMERS

SCALE AS SHOWN	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3		LEPL-STD-MDPE-006	1 OF 1	0

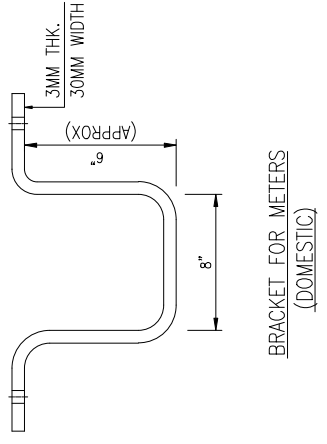
12 11 10 9 8 7 6 5 4 3 2 1

**NOTES:-**

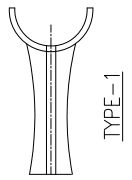
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. CLAMP, REGULATOR BOX AND METER BRACKET ARE TO BE MADE AS PER DIRECTION AND APPROVAL OF EIC.
3. CLAMPS/BOXES BRACKETS TO BE TIGHTLY SECURED TO THE WALL WITH PROPER ROWEL PLUGS, SCREWS ETC. WOODEN BLOCK TO BE USED IN CASE ROWEL PLUGS DO NOT HOLD. PROPER THE AREA.
4. PAINTING WITH ONE COAT OF ZINC PRIMER AND THREE COATS OF SYNTHETIC ENAMEL PAINT OF REPUTED MAKE (ASIAN PAINT, BERGER, NEROLAC) TO BE USED.
5. CLAMPS ON PIPES TO BE FIXED AT MAXIMUM DISTANCE OF 1.5 METERS AND AT BENDS.



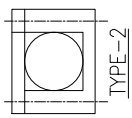
**REGULATOR BOX**



**BRACKET FOR METERS (DOMESTIC)**



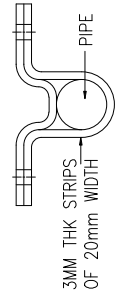
**TYPE-1**



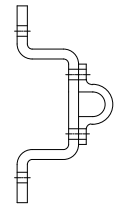
**TYPE-2**



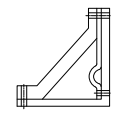
**ANGLE BRACKETS 50x50mm FOR NON DOMESTIC METERS**



**TYPE-1**



**TYPE-2**



**TYPE-3**

**MS CLAMPS FOR GI PIPE**

REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
		DESCRIPTION	PREP.	CHKD.	APPD
0	16.11.2023				

PMC: **LEPL** LYONS ENGINEERING PVT. LTD. NEW DELHI

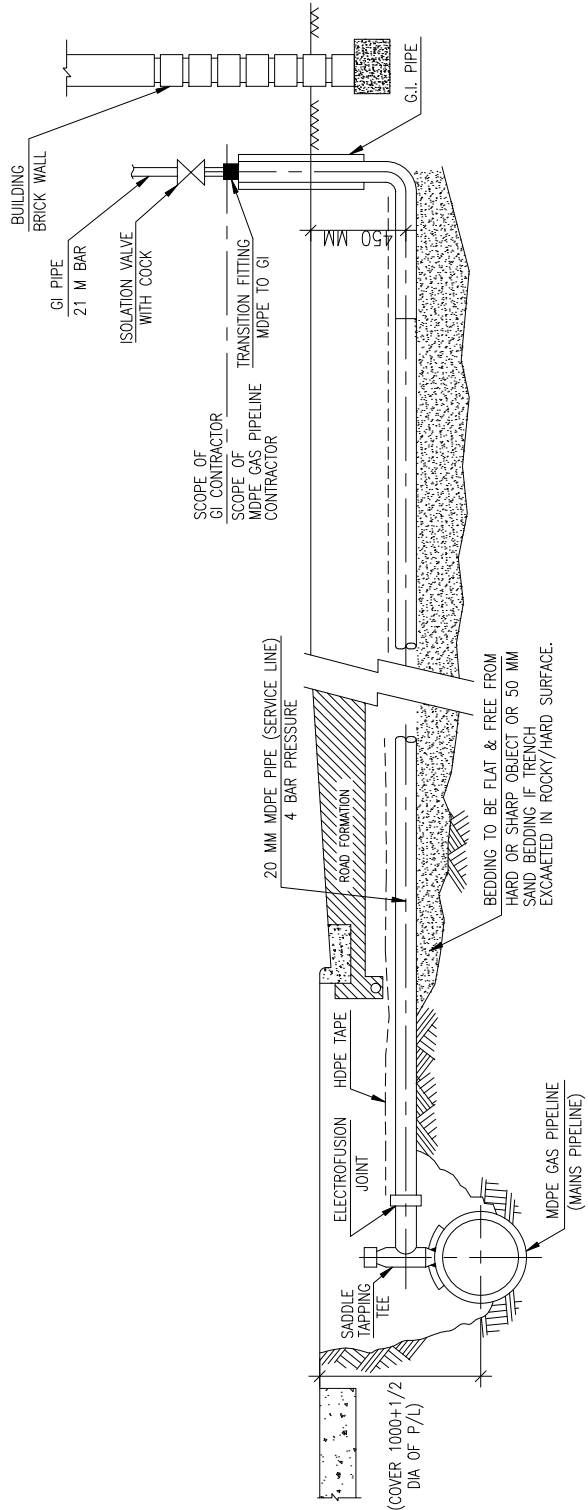
SCALE	TITLE:
AS SHOWN	SKETCH FOR REGULATOR BOX, BRACKETS & CLAMPS

SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3		LEPL-STD-MDPE-007	1 OF 1	0

12 11 10 9 8 7 6 5 4 3 2 1

**GENERAL NOTES**

1. FOR CLAMPING TO BRICK WALL USE SUITABLE WALL BRACKETS.
2. TRENCH BACK FILL TO BE FREE FROM STONES OR SHARP OBJECTS. CARE TO BE EXERCISED WHEN CONSOLIDATING BACK FILL TO AVOID DAMAGING PLASTIC PIPE.
3. THIS SKETCH IS INDICATIVE AND FINAL LAYING WILL BE DECIDED BY ENGINEER-IN-CHARGE.

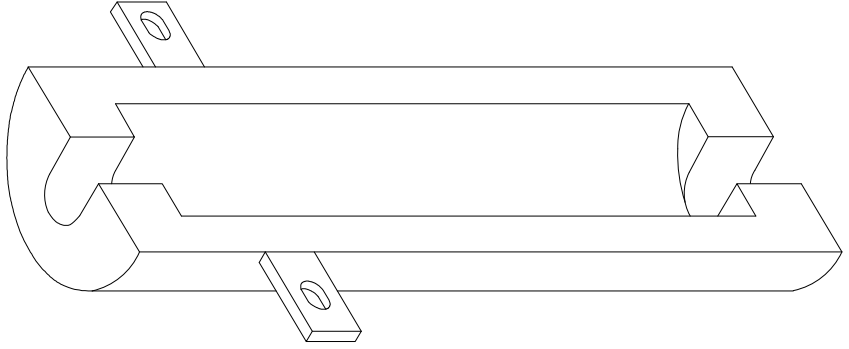
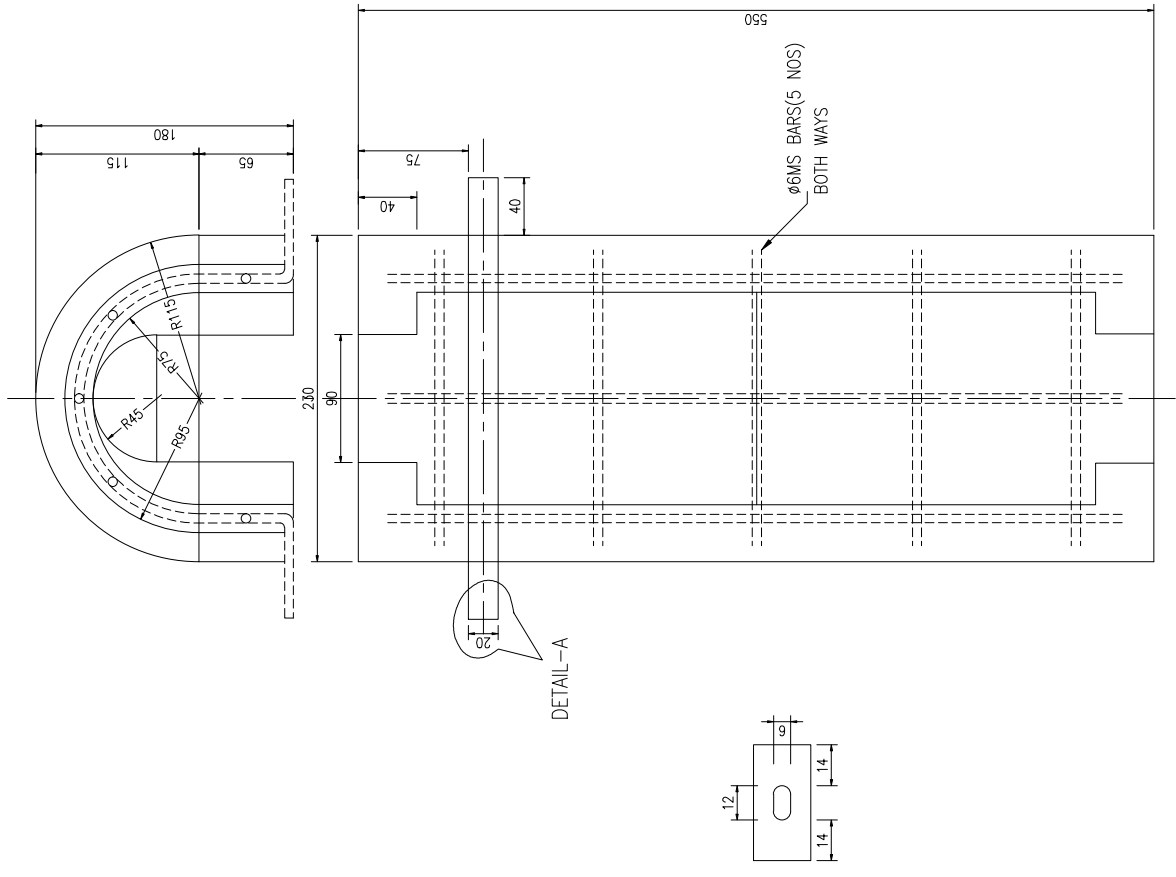


REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
0	16.11.2023	DESCRIPTION	PREP.	CHKD.	APPD.
PWC: <b>LEPLU</b> LYONS ENGINEERING PVT. LTD. NEW DELHI					
SCALE		TITLE: SCHEME OF HIGH PRESSURE SERVICE INSTALLATION			
AS SHOWN		JOB NO.	DRAWING NUMBER	SHEET	REV.
		A3	LEPL-STD-MDPE-008	1 OF 1	0

12 11 10 9 8 7 6 5 4 3 2 1

**NOTES:-**

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. IT SHALL BE TAKEN APPROVAL FROM OWNER/OWNER'S REPRESENTATIVE. BEFORE STARTING THE PROCUREMENT.
3. SIZES ARE SHOWN AS A TENTATIVE ONLY.



ISOMETRIC VIEW

REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
		DESCRIPTION	PREP.	CHKD.	APPD.
0	16.11.2023				

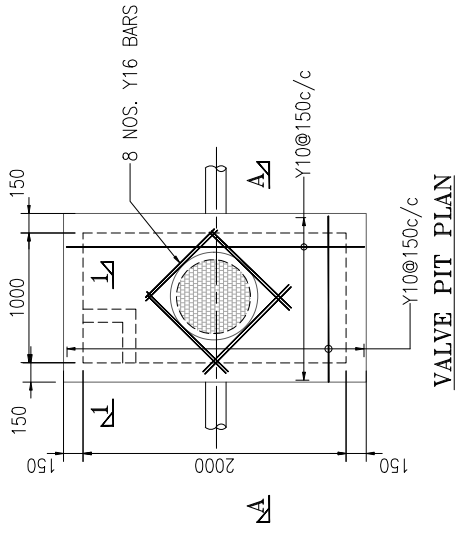
PMC: **LEPL** LYONS ENGINEERING PVT. LTD. NEW DELHI

SCALE	TITLE:	
AS SHOWN	HALF ROUND CONCRETE SLEEVE	
SIZE	JOB NO.	DRAWING NUMBER
A3		LEPL-STD-MDPE-009
	SHEET	REV.
	1 OF 1	0

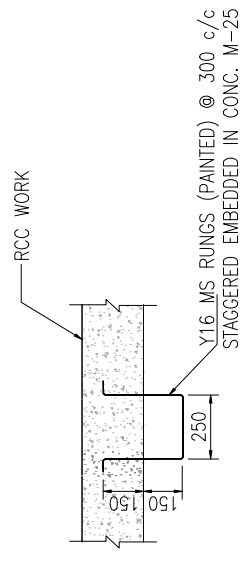
12 11 10 9 8 7 6 5 4 3 2 1

NOTES:-

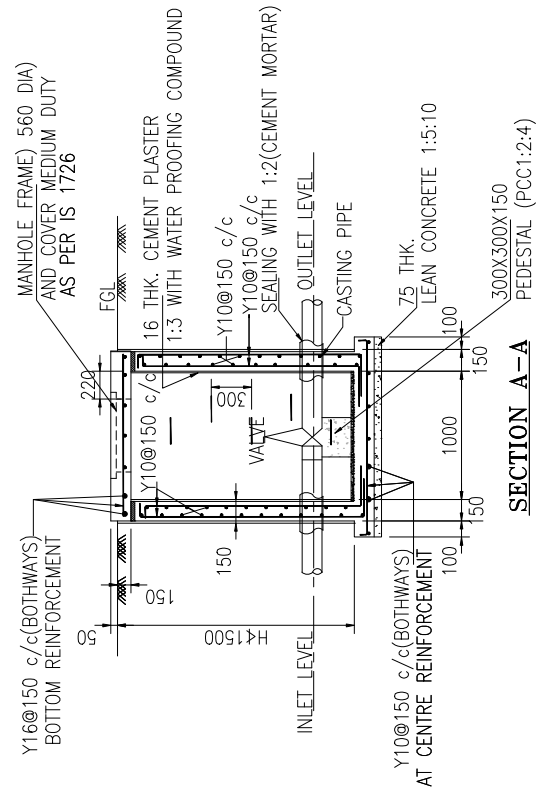
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DIMENSIONS.
3. CLEAR COVER TO MAIN REINFORCEMENT SHALL BE (a) SLAB = 20mm.
4. GRADE OF CONCRETE BE M-25
5. REINFORCEMENT SHALL BE OF HYSD (GRADE Fe 415) CONFORMING IS:1786.



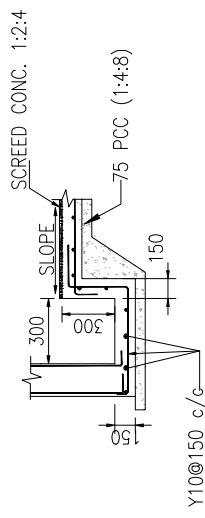
**VALVE PIT PLAN**



**TYPICAL DETAIL OF MS RUNGS**



**SECTION A-A**



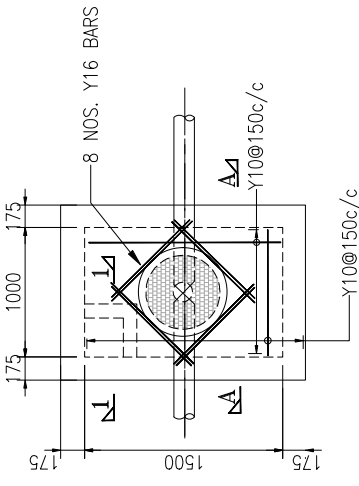
**SECTION 1-1**

REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
0	16.11.2023	DESCRIPTION	PREP.	CHKD.	APPD.

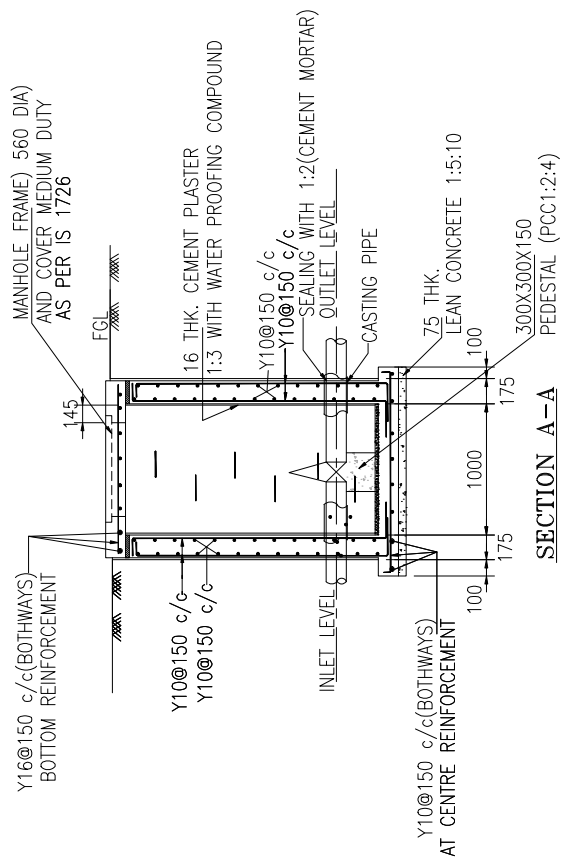
PMC: **LEPL** LYONS ENGINEERING PVT. LTD. NEW DELHI

SCALE	TITLE:
AS SHOWN	STANDARD DETAILS OF RCC VALVE CHAMBER (TYPE-1)

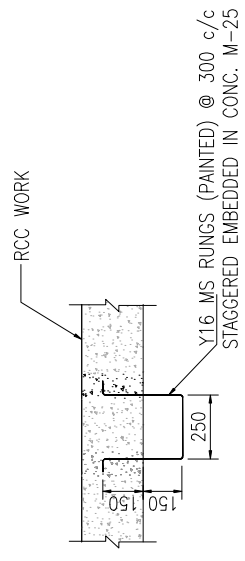
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3		LEPL-STD-MDPE-012	1 OF 1	0



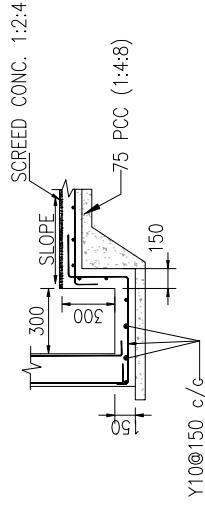
**VALVE PIT PLAN**



**SECTION A-A**



**TYPICAL DETAIL OF MS RUNGS**

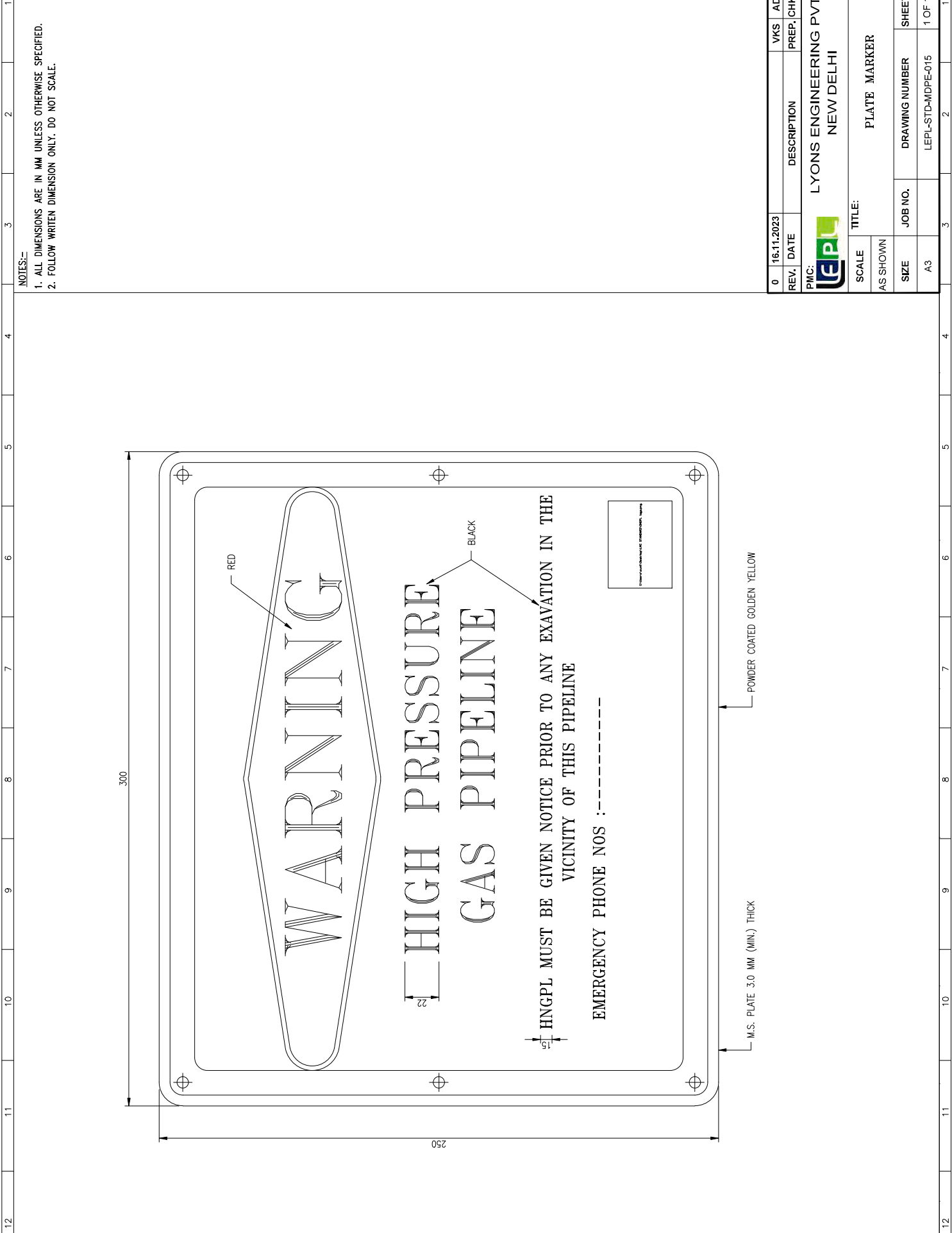


**SECTION 1-1**

**NOTES:-**

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DIMENSIONS.
3. CLEAT COVER TO MAIN REINFORCEMENT SHALL BE (a) SLAB = 20mm.
4. GRADE OF CONCRETE BE M-25
5. REINFORCEMENT SHALL BE OF HYSD (GRADE Fe 415) CONFORMING IS:1786.

REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
0	16.11.2023	DESCRIPTION	PREP.	CHKD.	APPD.
PMC: <b>LEPL</b> LYONS ENGINEERING PVT. LTD. NEW DELHI					
SCALE		TITLE: STANDARD DETAILS OF BRICK			
AS SHOWN		RCC CHAMBER (TYPE-II)			
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.	
A3		LEPL-STD-MDPE-013	1 OF 1	0	



**NOTES:-**

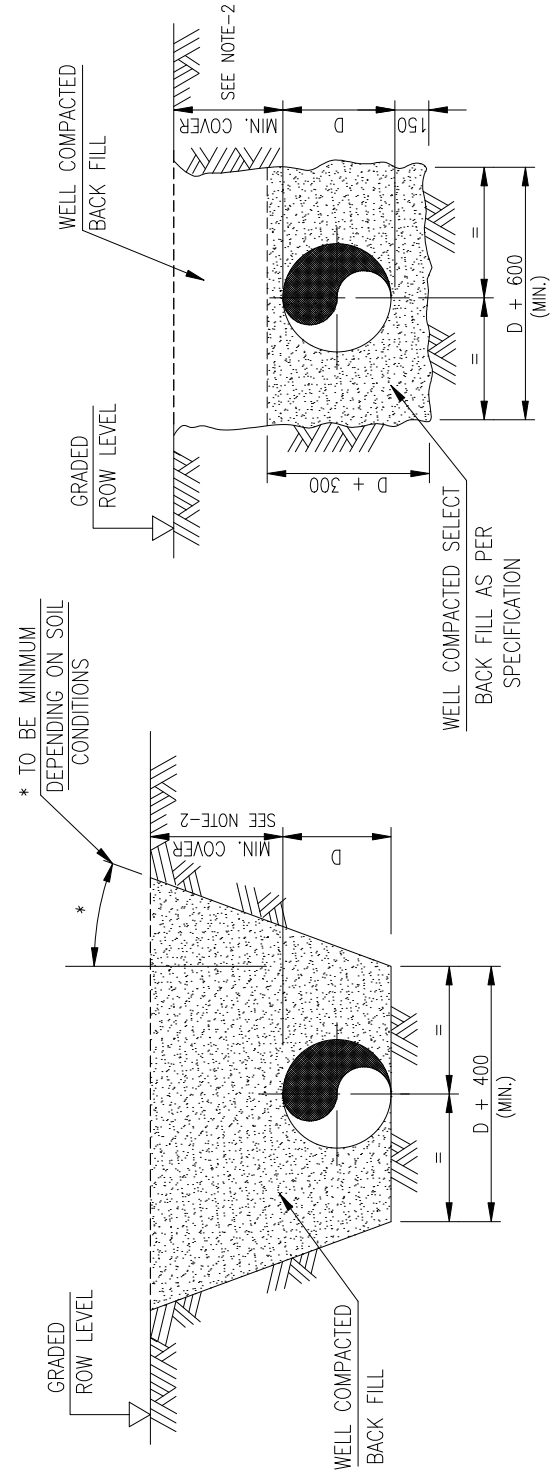
1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. FOLLOW WRITTEN DIMENSION ONLY. DO NOT SCALE.

REV.	DATE	DESCRIPTION	VKS	AD	VK
0	16.11.2023				
PREP. CHKD. APPD.					
PMC: <b>LEPL</b> LYONS ENGINEERING PVT. LTD. NEW DELHI					
SCALE		TITLE:			
AS SHOWN		PLATE MARKER			
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.	
A3		LEPL-STD-MDPE-015	1 OF 1	0	



NOTES:-

1. ALL DIMENSIONS ARE IN MM. UNLESS SPECIFIED OTHERWISE.
2. FOR ALL PIPELINES TO BE CONSTRUCTED IN THE LAND UNDER JURISDICTION OF GOVT. OF INDIA THE MINIMUM COVER TO BE ADOPTED SHALL BE 1000 MM. IN ACCORDANCE WITH GOVT. OF INDIA PETROLEUM PIPELINES (ACQUISITION OF RIGHT OF USER IN LAND) ACT NO. 50,1962 AND AMENDMENT ACT NO. 13,1977. ANY EXTRA REQUIREMENT SHALL BE IN ACCORDANCE WITH SPECIFICATIONS.
3. MINIMUM COVER REQUIREMENT SHALL BE SUBJECTED TO APPROVAL OF CONCERNED AUTHORITIES WHEREVER REQUIRED.
4. EXTRA COVER REQUIREMENT SHALL BE ESTABLISHED AT ALL COVER BENDS, SAG BENDS AND HORIZONTAL BENDS WHEREVER REQUIRED.
5. FOR MINIMUM COVER REQUIREMENT AT PIPELINES CROSSING ROADS, RAILWAY TRACKS, RIVERS, MARSHY AREAS ETC, REFER RELEVANT STANDARDS.



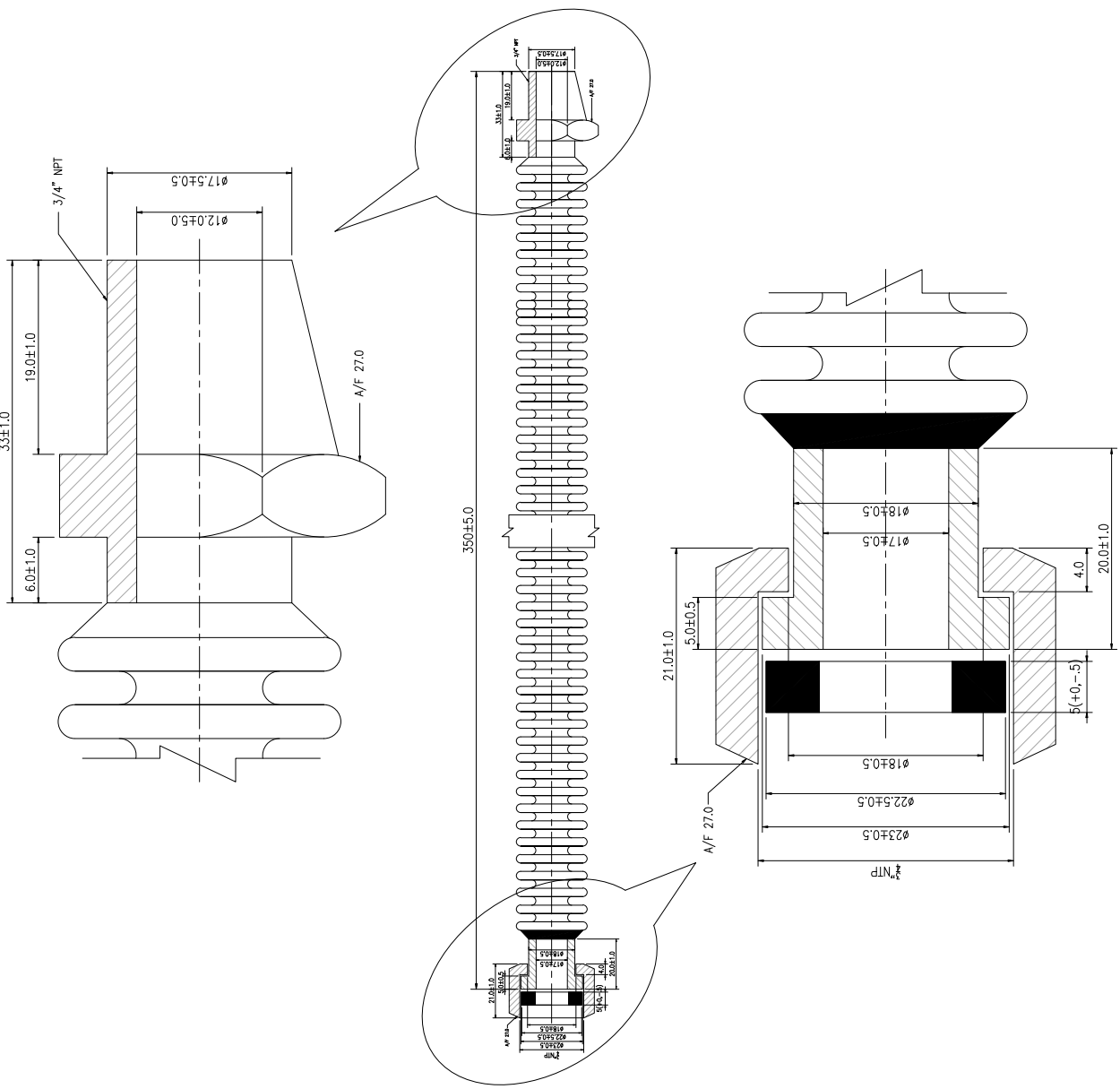
**TRENCH IN NORMAL SOIL  
TYPICAL SECTION**

**TRENCH IN CONSOLIDATED ROCK  
TYPICAL SECTION**

REV.	DATE	ISSUED FOR TENDER	VK	AD	VK	AD
0	16.11.2023	DESCRIPTION	PREP.	CHKD.	APPD	
PWC: <b>LEPL</b> LYONS ENGINEERING PVT. LTD. NEW DELHI						
SCALE		TITLE: TYPICAL TRENCH DIMENSIONS FOR PIPE LINE				
AS SHOWN		JOB NO.		DRAWING NUMBER		REV.
A3				LEPL-STD-MDPE-016		1 OF 1
						0

H 1 2 3 4 5 6 7 8 9 10 11 12

NOTES:-  
 1. ALL DIMENSIONS ARE IN MM.  
 2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE.



REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
0	16.11.2023	DESCRIPTION	PREP.	CHKD.	APPD.

PMC: **LEPL** LYONS ENGINEERING PVT. LTD. NEW DELHI

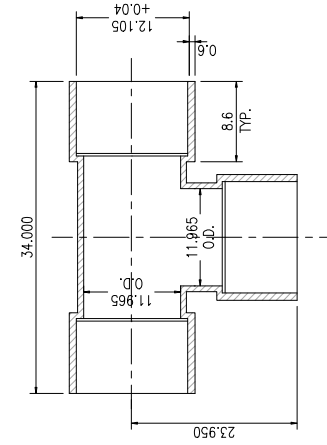
TITLE: HOSE ASSEMBLY FOR NATURAL GAS SERVICE

SCALE	JOB NO.	DRAWING NUMBER	SHEET	REV.
AS SHOWN		LEPL-STD-MDPE-017	1 OF 1	0

A B C D E F G H 1 2 3 4 5 6 7 8 9 10 11 12

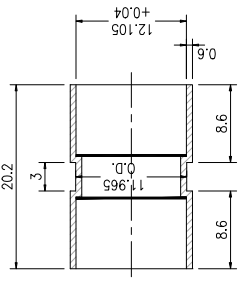
12 11 10 9 8 7 6 5 4 3 2 1

NOTES:-  
 1. ALL DIMENSIONS ARE IN MM.  
 2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE.  
 3. OPEN TOLERANCES ON DIMENSIONS SHALL BE AS PER EN 1254.  
 4. FOR DETAIL REFER SPEC NO.  
 5. THESE DRAWINGS ARE INDICATIVE ONLY. DETAIL DRAWING TO BE PREPARED BY THE VENDOR AS PER DESIGN CODE/MANUFACTURING STANDARD.

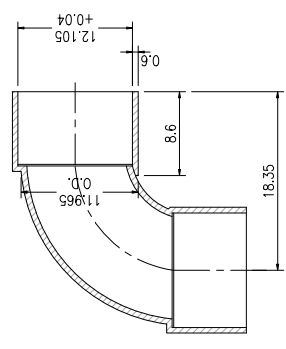


TEE

FITTING AS PER EN 1254 PART-1



COUPLER



90° ELBOW

FITTING AS PER EN 1254 PART-1

REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
		DESCRIPTION	PREP.	CHKD.	APPD
0	16.11.2023				

PMC: **LEPL** LYONS ENGINEERING PVT. LTD. NEW DELHI

SCALE	TITLE:
AS SHOWN	COPPER FITTING FOR NATURAL GAS SERVICE

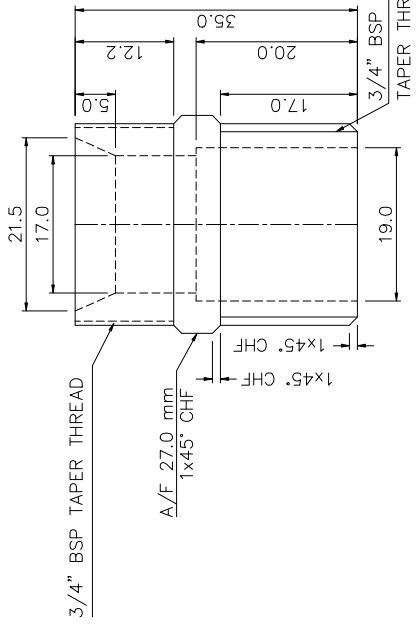
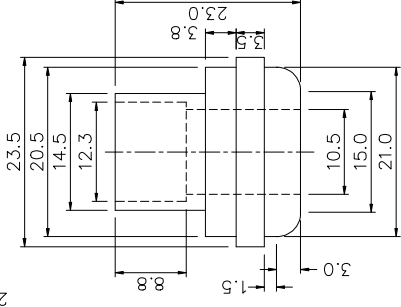
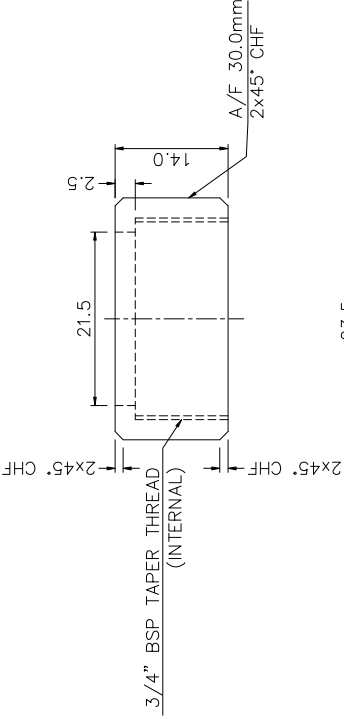
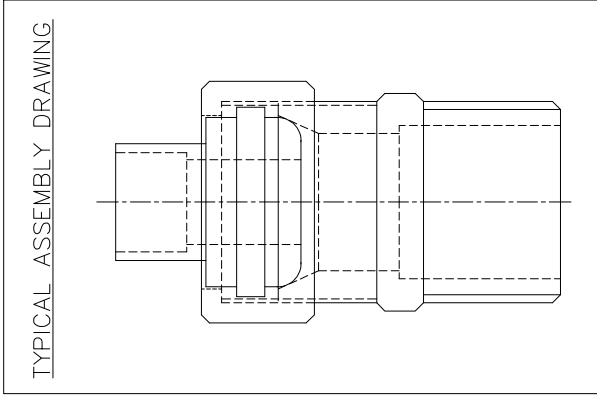
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3		LEPL-STD-MDPE-018	1 OF 1	0

12 11 10 9 8 7 6 5 4 3 2 1

1 2 3 4 5 6 7 8 9 10 11 12

**NOTES:-**

1. MATERIAL SHALL CONFORM TO 319 : FREE CUTTING EXTRUDED BRASS ROD.
2. DIMENSIONS TOLERANCES SHALL BE AS PER BS 864 AND BS 21.
3. OPEN TOLERANCES ON DIMENSIONS SHALL BE +/- 0.1 mm.
4. THREADING SHALL BE DONE AS PER BS 21.
5. ALL UNIONS BE LEAK TESTED AT 1 BAR.
6. ALL DIMENSIONS ARE IN MM.



REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
0	16.11.2023	DESCRIPTION	PREP.	CHKD.	APPD.

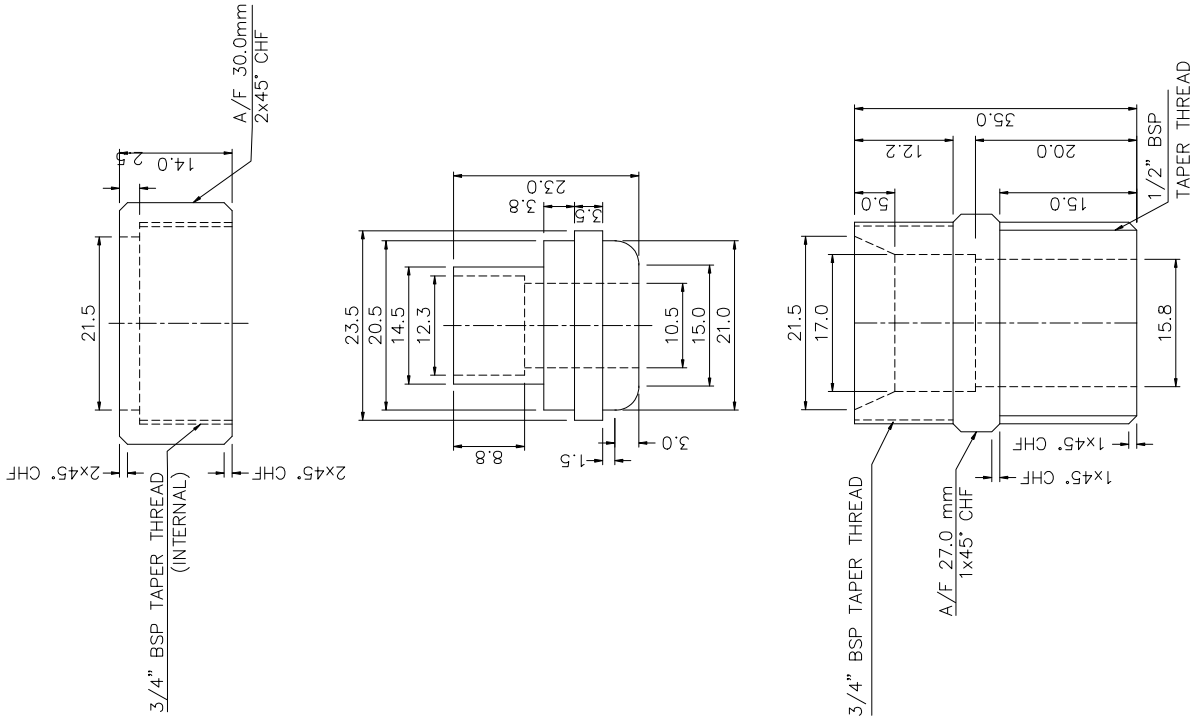
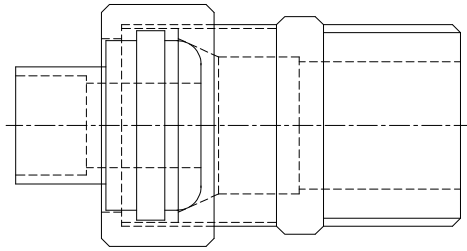
PMC: **LEPL** LYONS ENGINEERING PVT. LTD. NEW DELHI

SCALE	TITLE:
AS SHOWN	BRASS DISCONNECTING UNION 3/4" BSPT x 12mm (STRAIGHT)

SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3		LEPL-STD-MDPE-019	1 OF 1	0


1 2 3 4 5 6 7 8 9 10 11 12

TYPICAL ASSEMBLY DRAWING



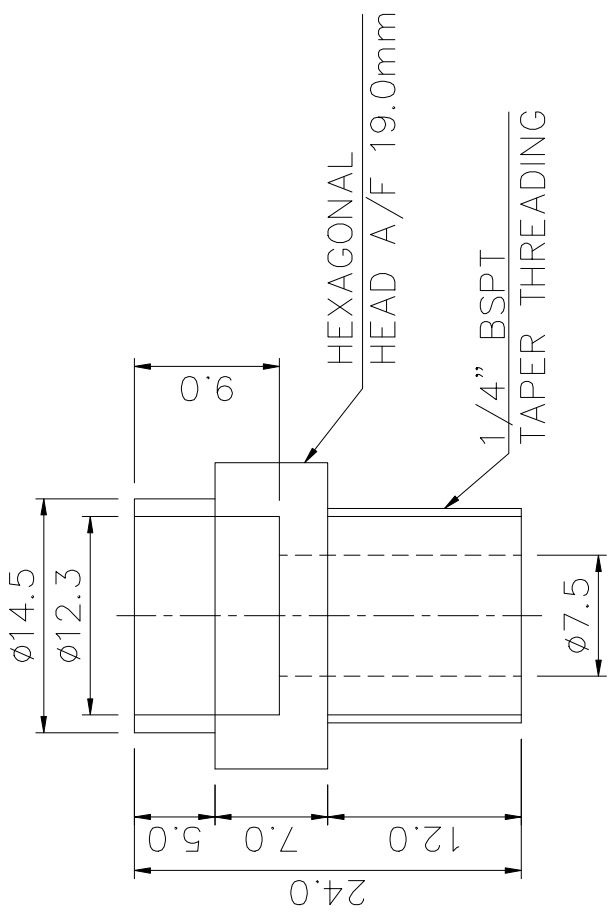
NOTES:-

1. MATERIAL SHALL CONFORM TO 319 : FREE CUTTING EXTRUDED BRASS ROD.
2. DIMENSIONS TOLERANCES SHALL BE AS PER BS 864 AND BS 21.
3. OPEN TOLERANCES ON DIMENSIONS SHALL BE +/- 0.1 mm.
4. THREADING SHALL BE DONE AS PER BS 21.
5. ALL UNIONS BE LEAK TESTED AT 1 BAR.
6. ALL DIMENSIONS ARE IN MM.

REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
0	16.11.2023	DESCRIPTION	PREP.	CHKD.	APPD.
PMC:  LYONS ENGINEERING PVT. LTD. NEW DELHI					
SCALE		TITLE:			
AS SHOWN		BRASS DISCONNECTING UNION			
SIZE		1/2" BSPT x 12mm (STRAIGHT)			
JOB NO.		DRAWING NUMBER		REV.	
A3		LEPL-STD-MDPE-020		1 OF 1 0	

12 11 10 9 8 7 6 5 4 3 2 1

- NOTES:-**
1. MATERIAL SHALL CONFORM TO IS : 319 FREE CUTTING EXTRUDED BRASS RODS.
  2. DIMENSIONS TOLERANCES SHALL BE AS PER BS 864 AND BS 21.
  3. OPEN TOLERANCES ON DIMENSIONS SHALL BE +/- 0.1 mm.
  4. THREADING SHALL BE DONE AS PER BS 21.
  5. ALL UNIONS BE LEAK TESTED AT 1.1 BAR.
  6. ALL DIMENSIONS ARE IN MM.



REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
0	16.11.2023				
		DESCRIPTION	PREP.	CHKD.	APPD.
PMC: <b>LEPL</b> LYONS ENGINEERING PVT. LTD. NEW DELHI					
TITLE: BRASS ADAPTER 1/4" BSPT x 12mm (STRAIGHT).					
SCALE	AS SHOWN				
SHEET	JOB NO.	DRAWING NUMBER	SHEET	REV.	
A3		LEPL-STD-MDPE-021	1 OF 1	0	

12 11 10 9 8 7 6 5 4 3 2 1

12 11 10 9 8 7 6 5 4 3 2 1

REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
0	16.11.2023				
		DESCRIPTION	PREP.	CHKD.	APPD.

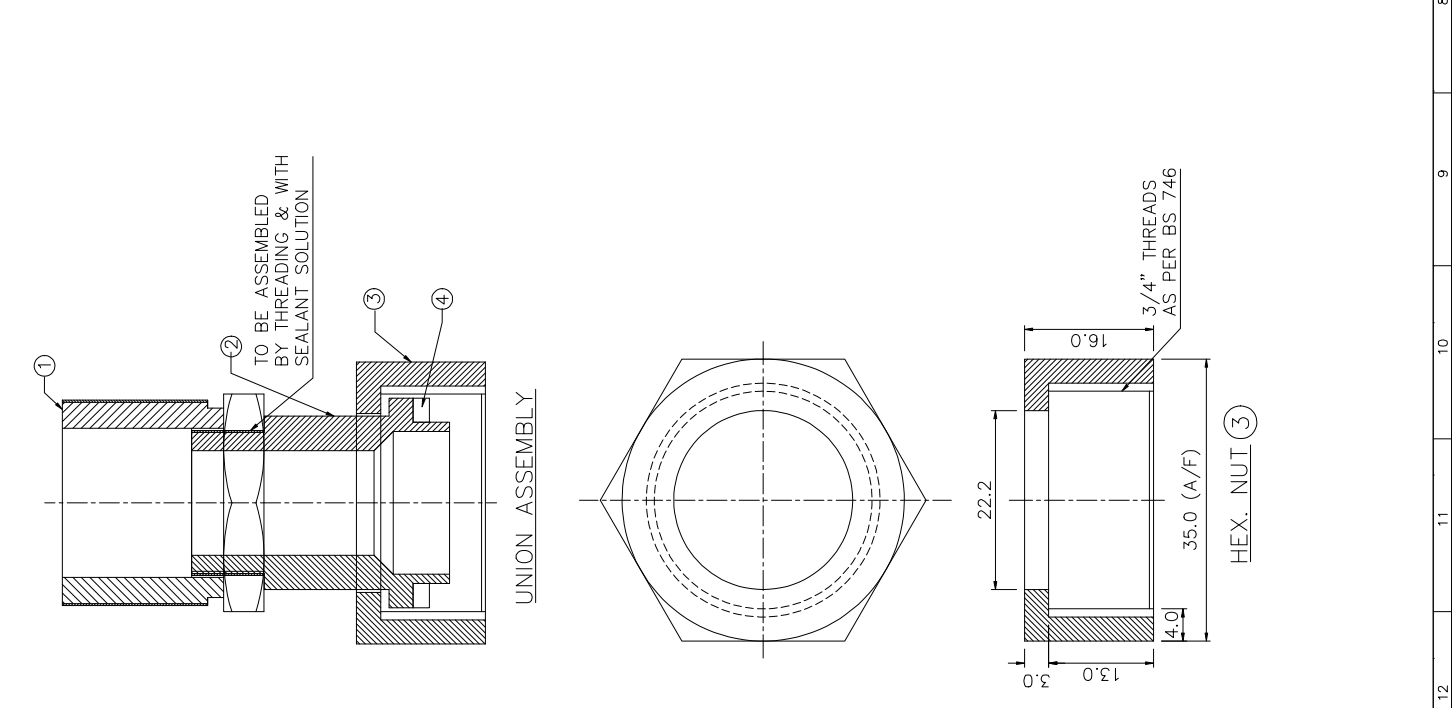
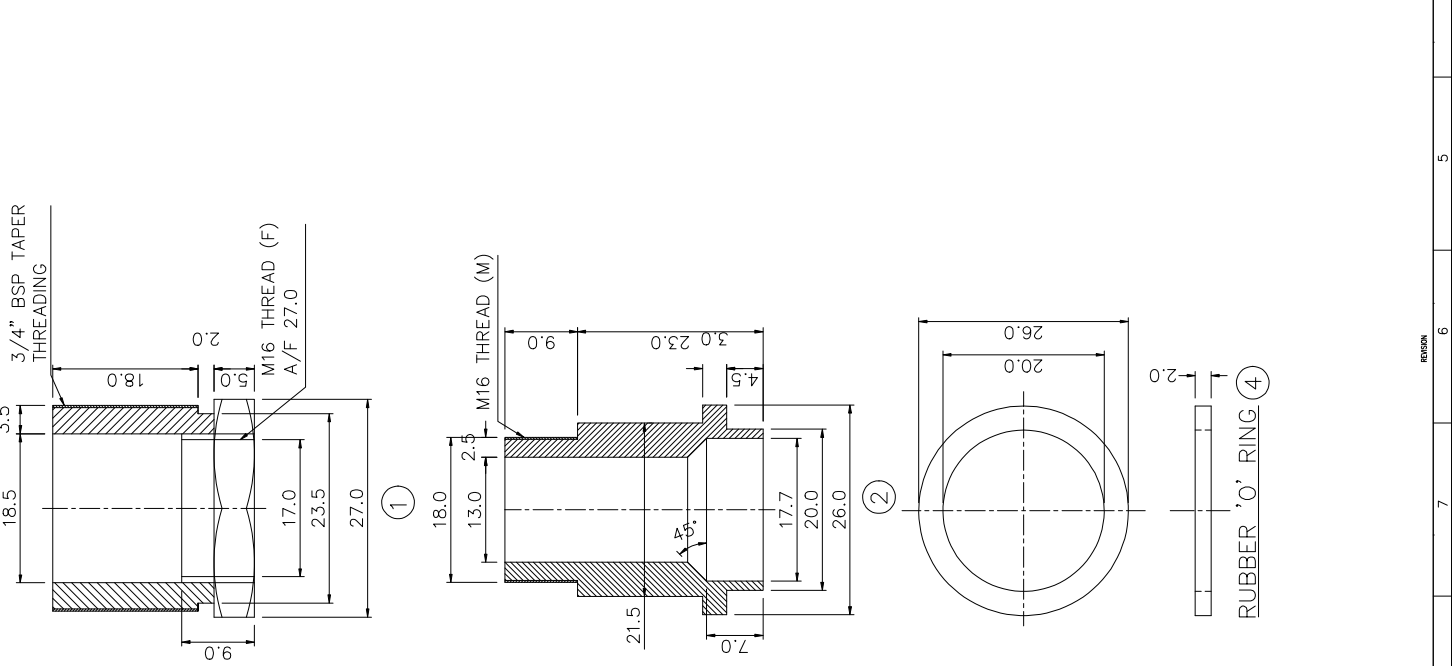
PMC: **LEPL** LYONS ENGINEERING PVT. LTD. NEW DELHI

SCALE	TITLE:
AS SHOWN	METER INLET UNION 3/4" x 3/4"

SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3		LEPL-STD-MDPE-022	1 OF 1	0

NOTES:-

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL SHALL BE EXTRUDED FREE CUTTING BRASS ROD AS PER IS 319/BS EQUIVALENT.
3. RUBBER O RING MATERIAL WILL BE NITRAEL.
4. FOR DETAILS REFER TECHNICAL SPECIFICATION NO. MEC/TJS/05/62/020B
5. O RING MATERIAL & SEALANT SOLUTION SHOULD BE SUITABLE FOR NATURAL GAS SERVICE.

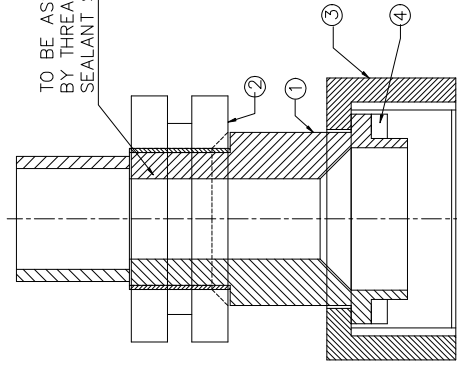


REVISION

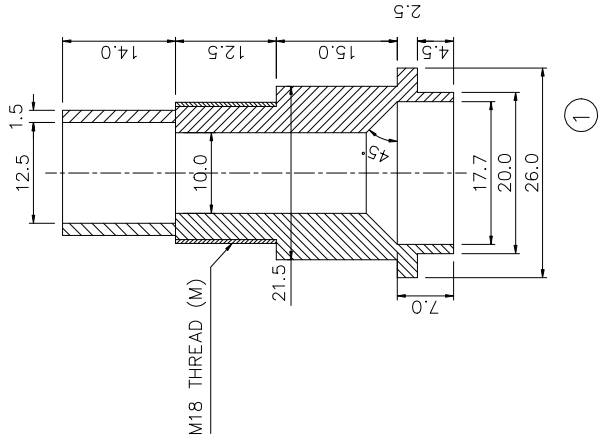
12 11 10 9 8 7 6 5 4 3 2 1

**NOTES:-**

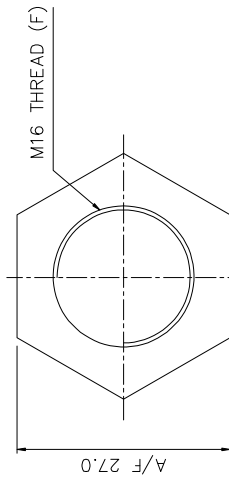
1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL SHALL BE EXTRUDED FREE CUTTING BRASS ROD AS PER IS 319/BS EQUIVALENT.
3. RUBBER O RING MATERIAL WILL BE NITRAEL.
4. FOR DETAILS REFER TECHNICAL SPECIFICATION NO. MEC/TS/05/62/020B
5. O RING MATERIAL & SEALANT SOLUTION SHOULD BE SUITABLE FOR NATURAL GAS SERVICE.



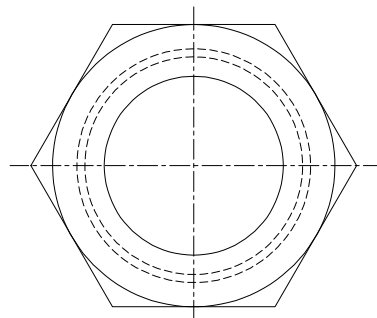
**UNION ASSEMBLY**



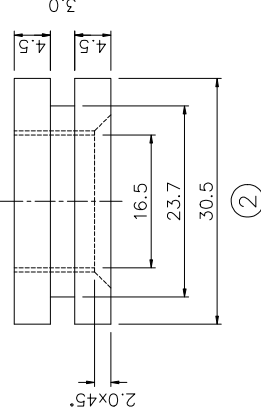
①



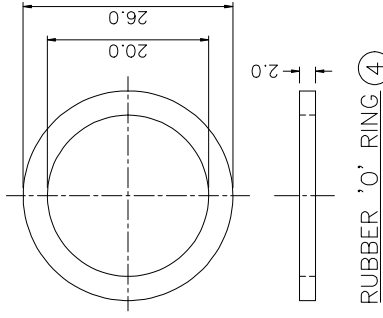
M16 THREAD (F)



HEX. NUT ③



②



RUBBER 'O' RING ④

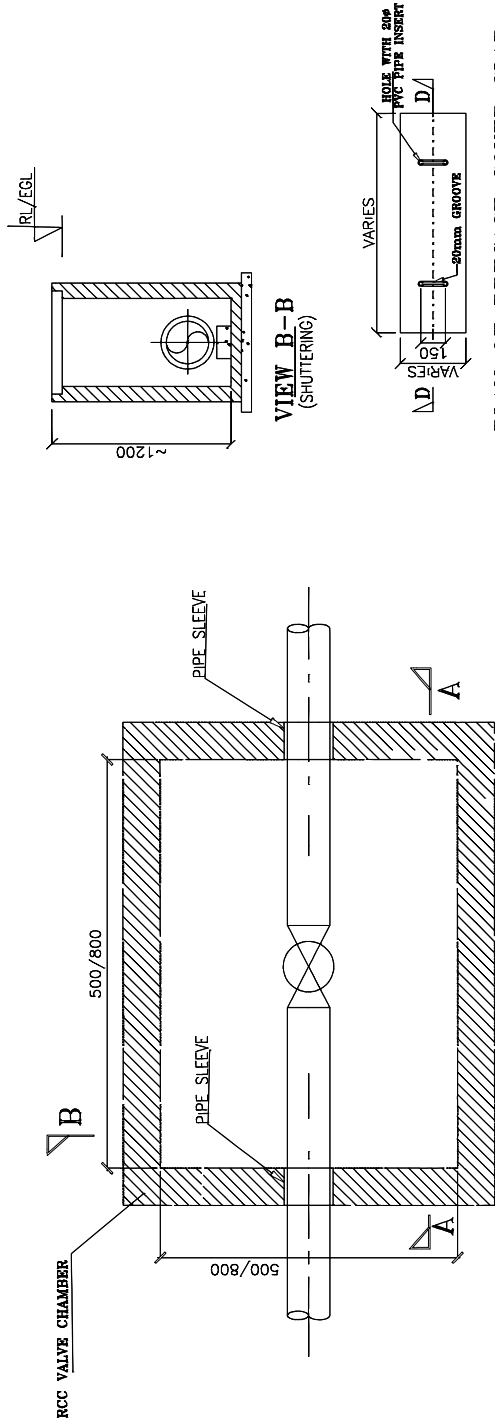
REV.	DATE	ISSUED FOR TENDER	VKS	AD	VK
		DESCRIPTION	PREP.	CHKD.	APPD.
0	16.11.2023				

PMC: **LEPL** LYONS ENGINEERING PVT. LTD. NEW DELHI

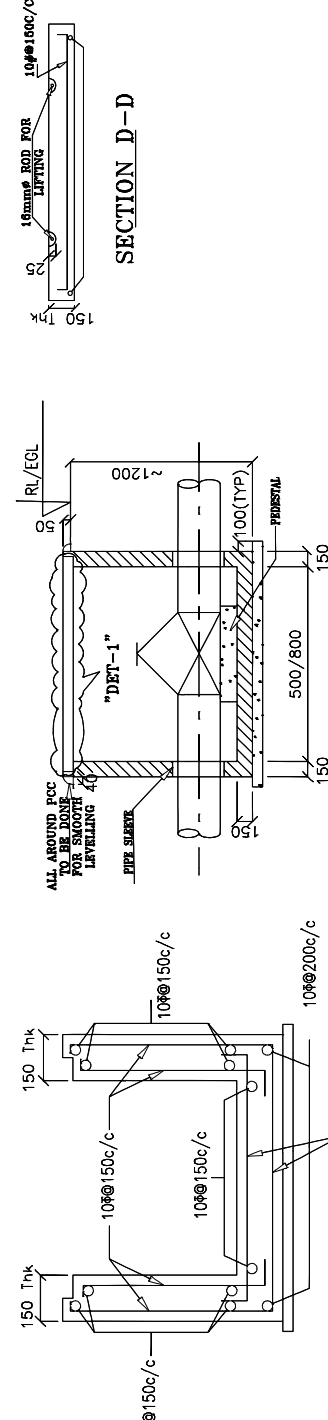
SCALE	TITLE:	
AS SHOWN	METER OUTLET UNION	
SIZE	JOB NO.	DRAWING NUMBER
A3		LEPL-STD-MDPE-023
	SHEET	REV.
	1 OF 1	0



- NOTES.**
- ALL DIMENSIONS ARE IN MM. UNLESS OTHERWISE SPECIFIED.
  - CLEAR COVER TO MAIN REINFORCEMENT SHALL BE 20 FOR SLAB=20MM.
  - INSIDE WALLS SHALL BE PLASTERED USING CM 1:4 OF 6mm THK.

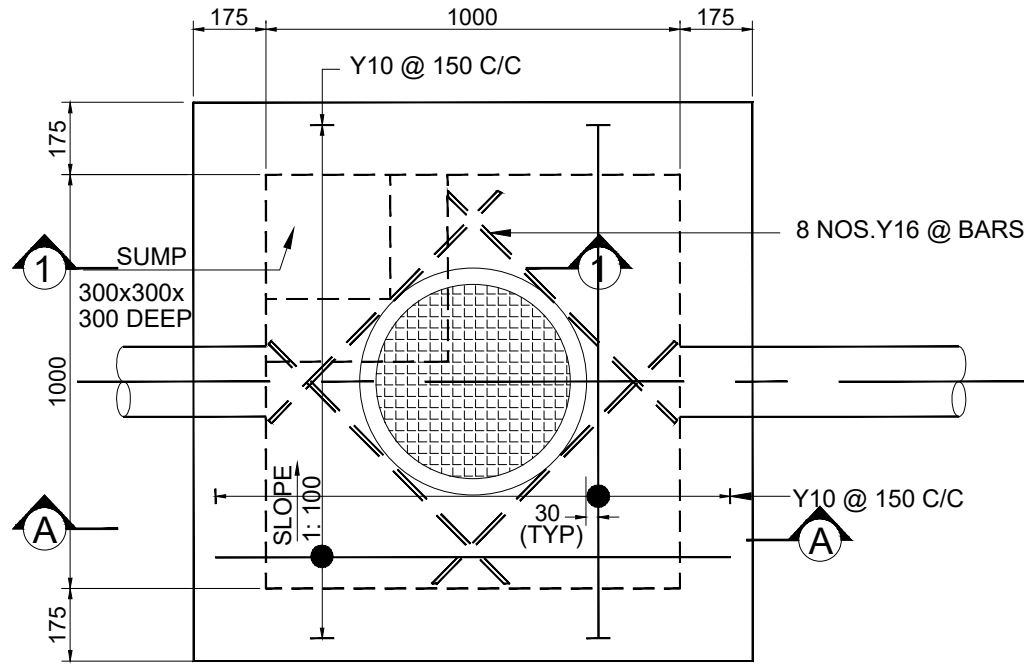


**PLAN OF PRECAST COVER SLAB**

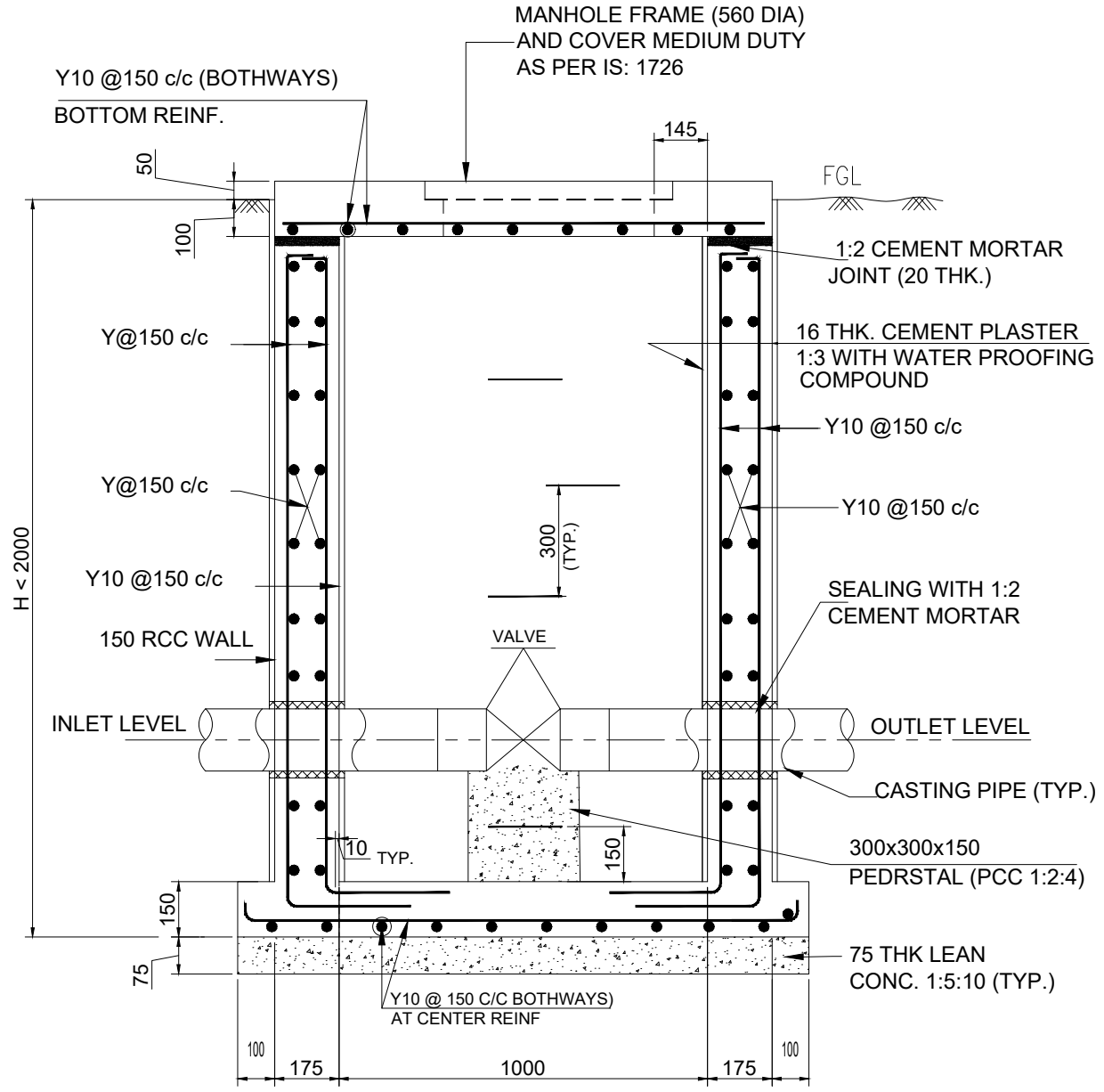


**SECTION D-D**

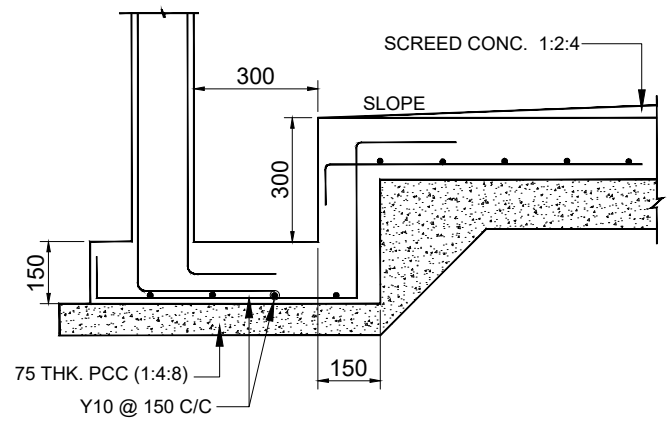
REV.	15.12.2023	ISSUED FOR TENDER	VKS	AD	VK
	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
PMC:	<b>LYONS ENGINEERING PVT. LTD.</b> NEW DELHI				
SCALE	TITLE:				
AS SHOWN	DETAILS(SUTTERING & RCC DETAILS)				
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.	
A3	043	LEPL-STD-MDPE-042	1 OF 1	0	



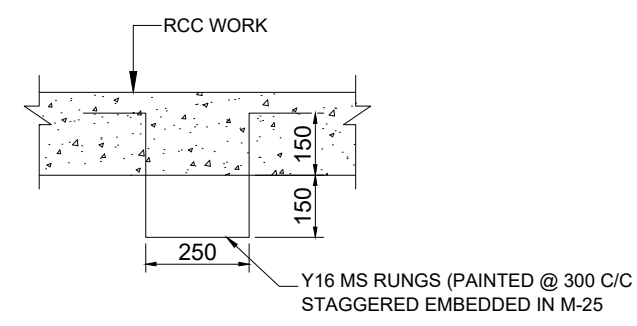
**VALVE PIT PLAN**



**SECTION A-A**



**SECTION 1-1**

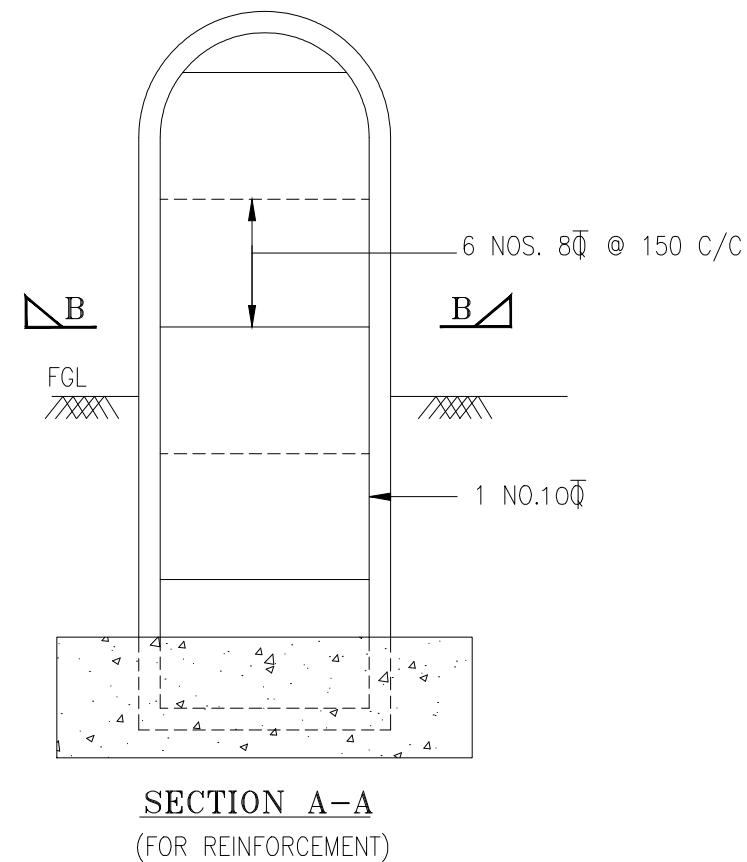
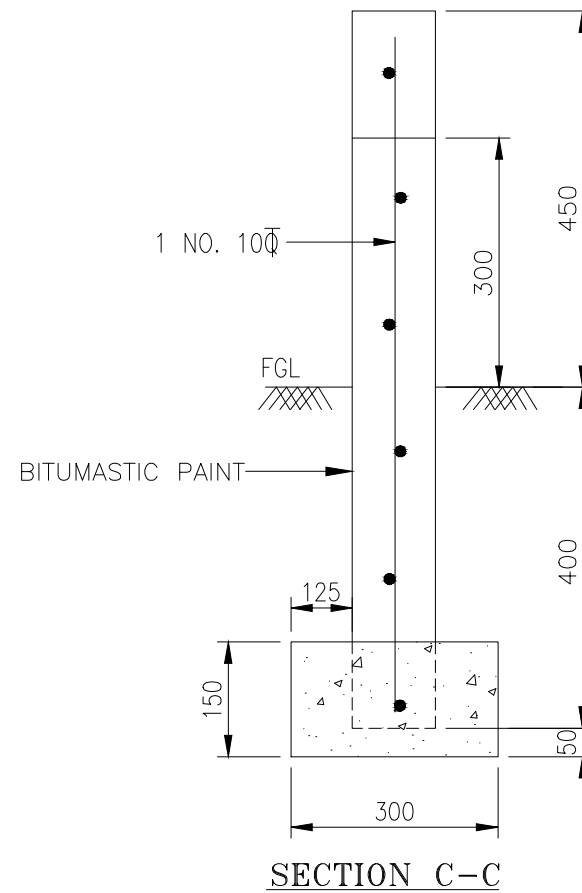
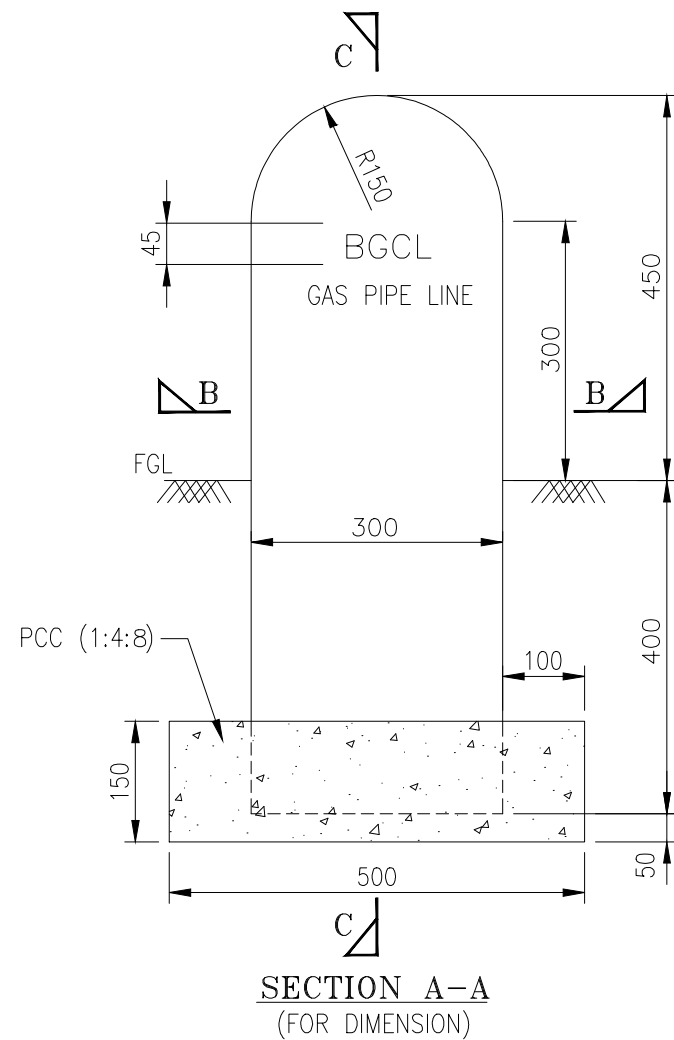
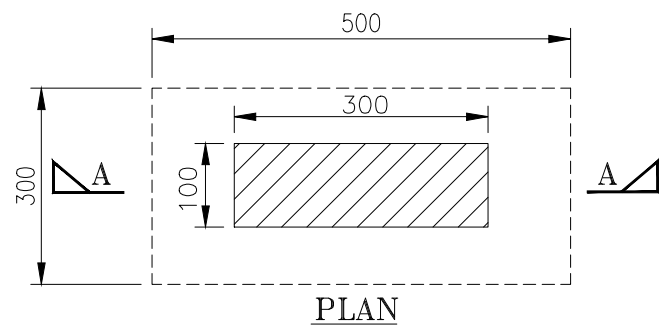
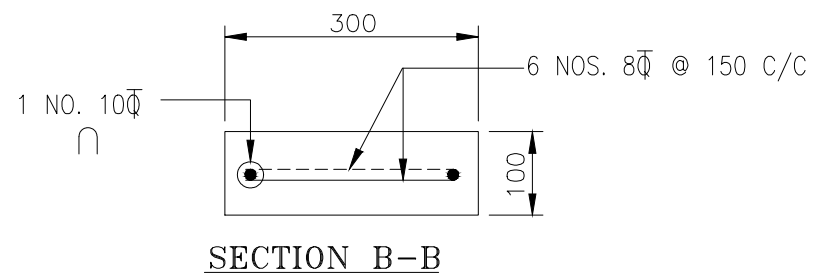


**TYPICAL DETAIL OF MS RUNGS**

**RCC VALVE CHAMBERS SIZES 1M x 1M**

- NOTES:-
1. ALL DIMENSIONS ARE IN (mm) UNLESS NOTED OTHERWISE.
  2. FLOW WRITTEN DIMENSIONS ONLY.DO NOT SCALE THE DRAWING
  3. CLEAR COVER TO MAIN REINFORCEMENT SHALL BE (a) slab 20mm
  4. GRADE OF CONCRETE USED SHALL BE M-25 CONFORMING.
  5. REINFORCEMENT SHALL BE HYSD BARS OF (GRADE FE 415)CONFORMING TO IS: 1786

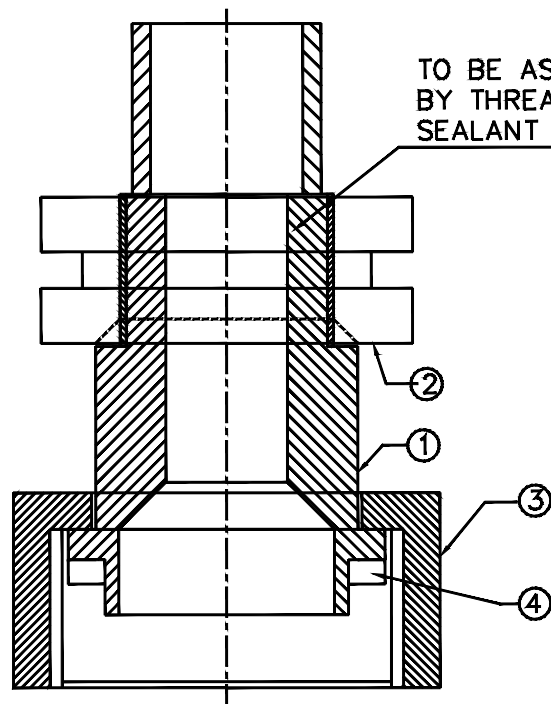
0	16.11.23	ISSUED FOR TENDER	SK	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
PMC:					
LEPL		LYONS ENGINEERING PVT. LTD.			
SCALE	TITLE: STANDARD DETAIL OF RCC VALVE CHAMBER (TYPE-1)				
NTS					
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.	
A3		LEPL-STD-MDPE-012	1 OF 1	0	



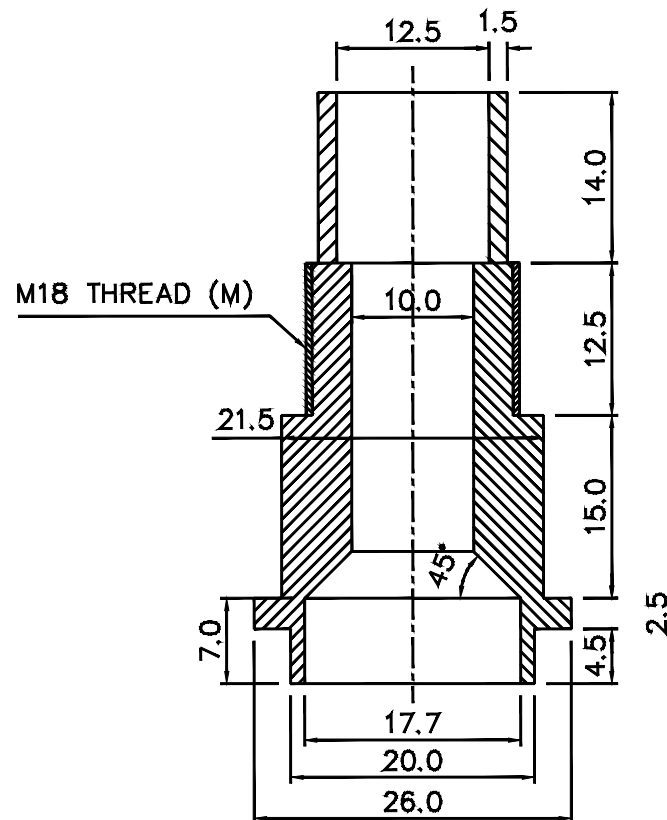
NOTES:-

1. DRAWING IS NOT TO SCALE.
2. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED
3. MARKERS SHALL BE INSTALLED IN EVERY 50M INTERVAL AS PER INSTRUCTION OF ENGINEER-IN-CHARGE
4. ALL BOUNDARY MARKERS SHALL BE PRECAST AND INSCRIPTIONS SHALL BE ENGRAVED 5mm DEEP IN THE MOULD ON BOTH FACE.
5. CONCRETE FOR BOUNDARY MARKER SHALL BE M20.

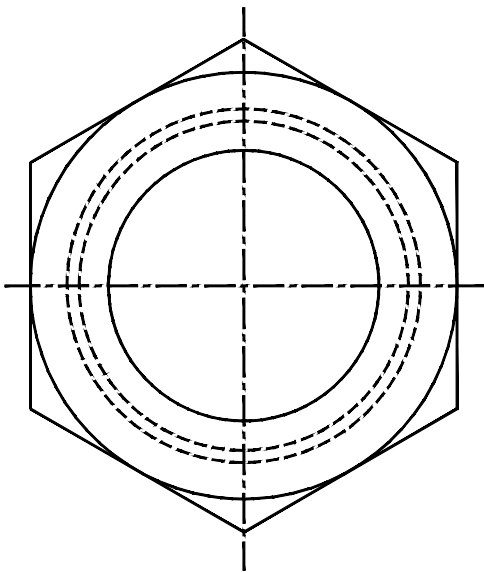
0	16.11.23	ISSUED FOR TENDER	SK	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
PMC: <b>LEPL</b> LYONS ENGINEERING PVT. LTD.					
SCALE	TITLE:				
AS SHOWN	SKETCH FOR RCC ROUTE MARKER				
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.	
A3		LEPL-STD-MDPE-014	1 OF 1	0	



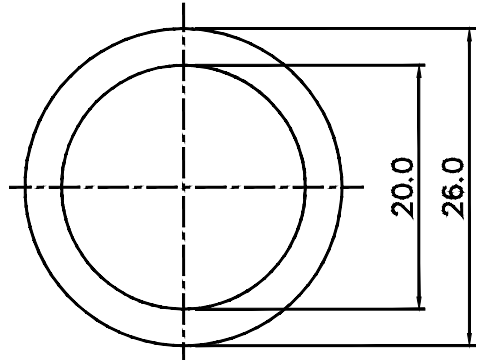
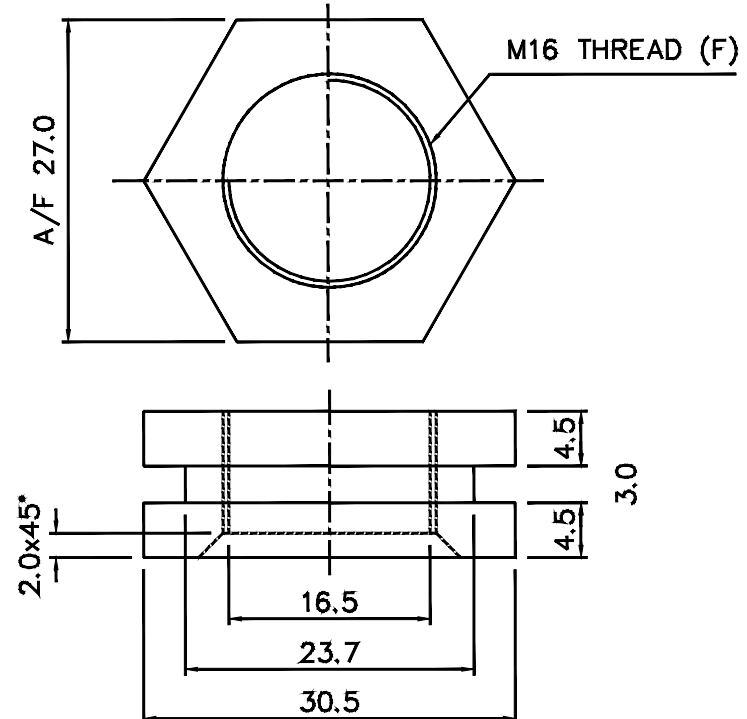
UNION ASSEMBLY



(1)



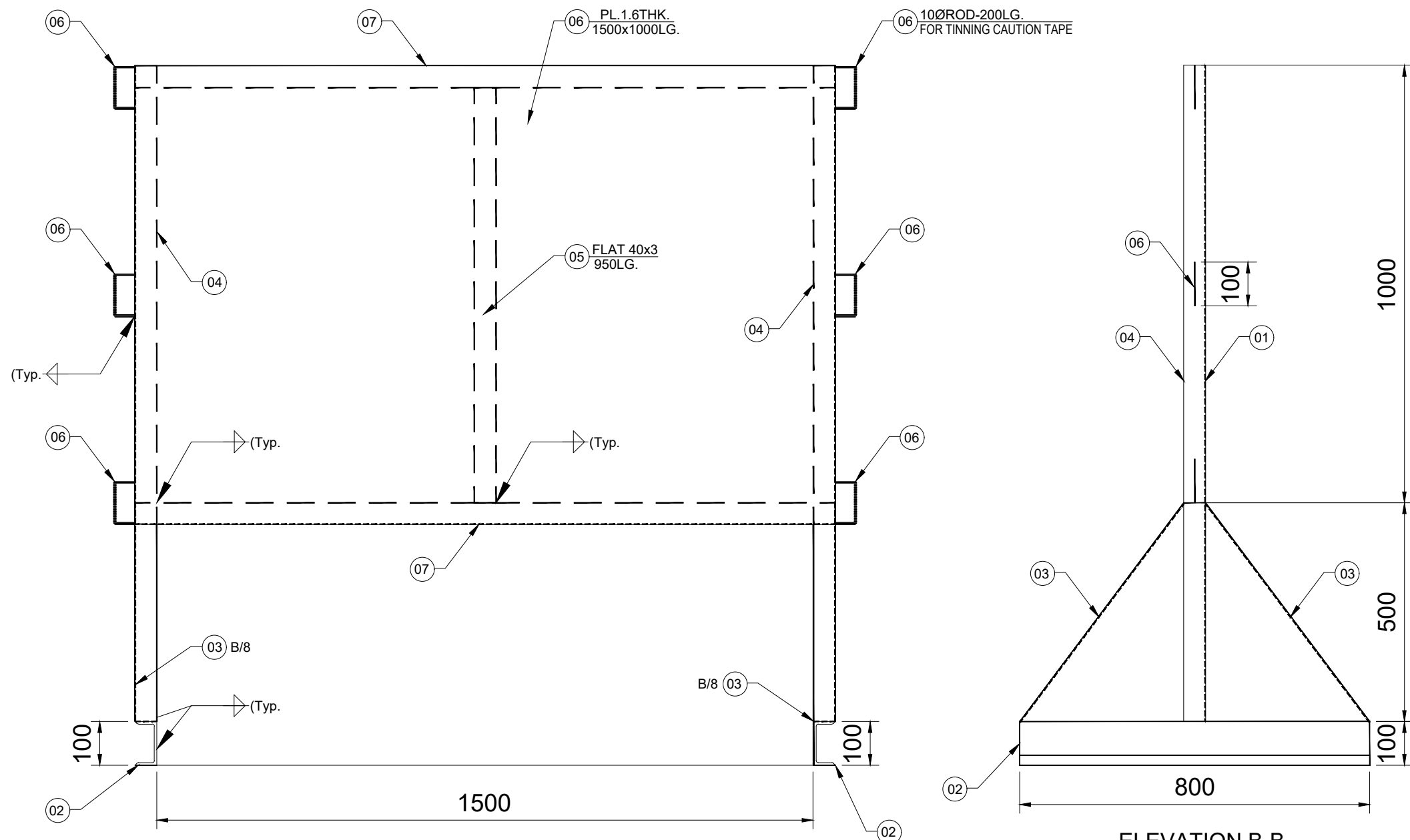
HEX. NUT (3)



RUBBER 'O' RING (4)

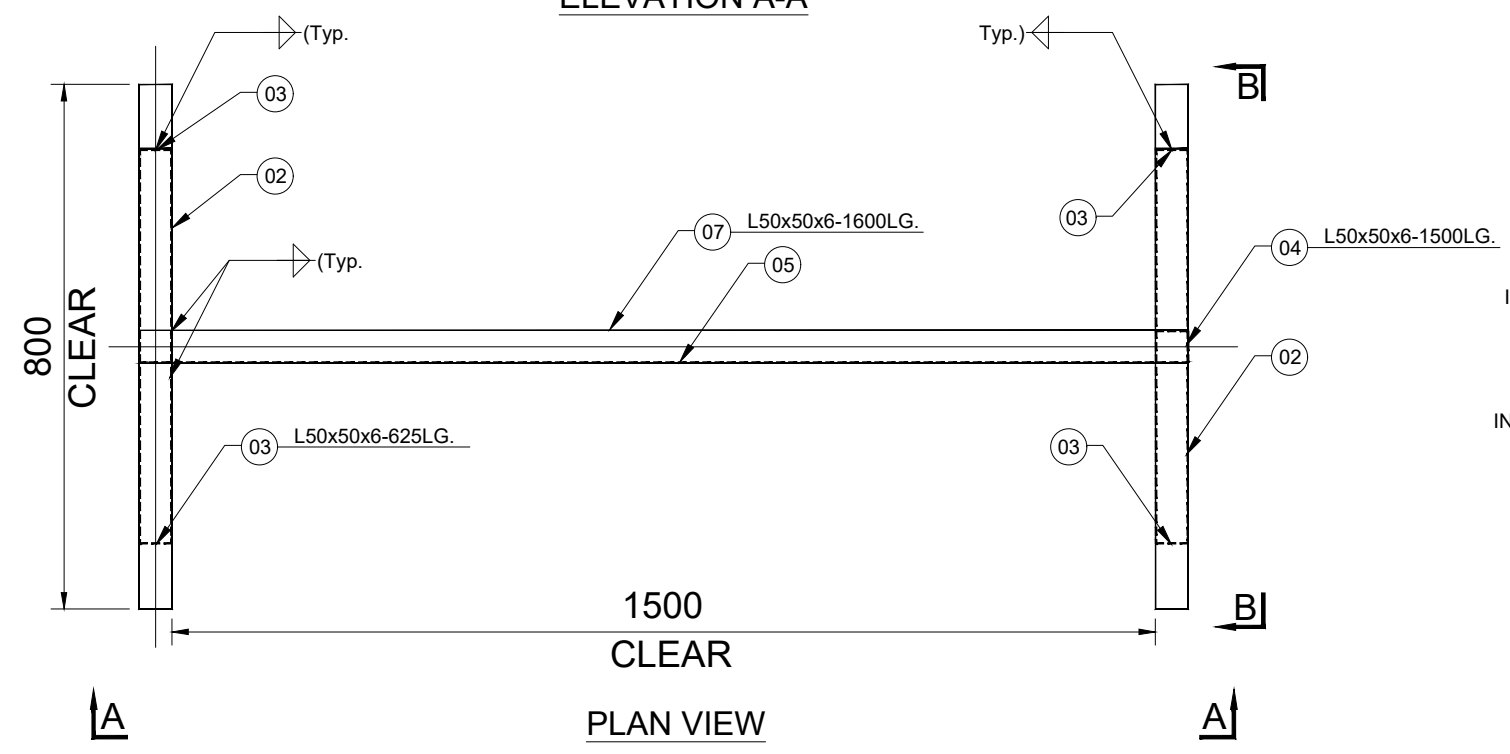
- NOTES:-
1. ALL DIMENSIONS ARE IN MM.
  2. MATERIAL SHALL BE EXTRUDED FREE CUTTING BRASS ROD AS PER IS 319/BS EQUIVALENT.
  3. RUBBER O RING MATERIAL WILL BE NITRAEL.
  4. FOR DETAILS REFER TECHNICAL SPECIFICATION NO.MEC/TS/05/62/020B
  5. O RING MATERIAL & SEALANT SOLUTION SHOULD BE SUITABLE FOR NATURAL GAS SERVICE.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
A	16.11.23	ISSUED FOR TENDER	SK	AD	VK
PMC: <b>LEPL</b> LYONS ENGINEERING PVT. LTD.					
SCALE	TITLE: METER OUTLET UNION				
AS SHOWN	3/4"x12mm (STRAIGHT)				
SIZE	DRAWING NUMBER			SHEET	REV.
A3	LEPL-STD-MDPE-023			1 OF 1	A



ELEVATION A-A

ELEVATION B-B



PLAN VIEW

IN RED → **CAUTION** ← CLIENT LOGO

IN BLACK {

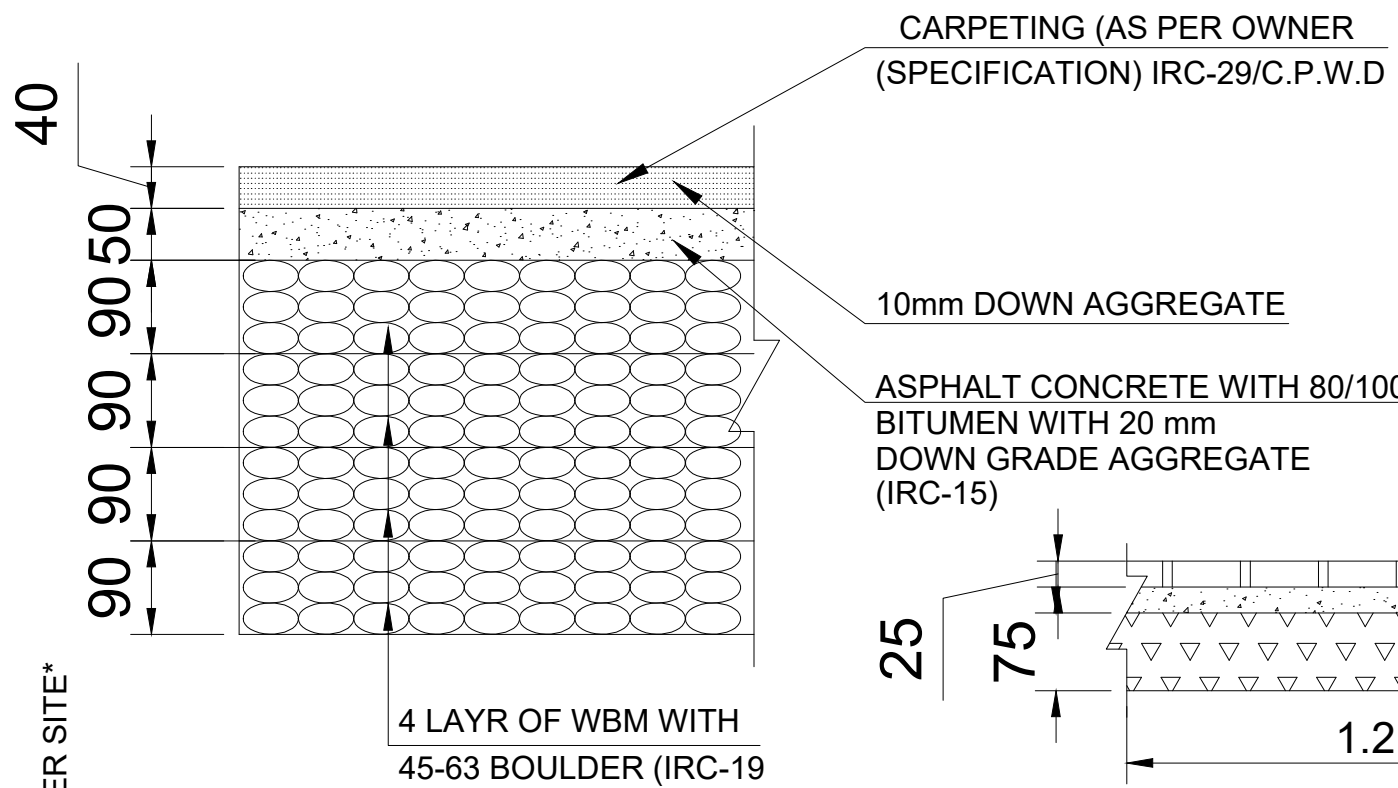
WORK IN PROGRESS  
 LAYING OF NATURAL GAS PIPELINE  
 CLIENT: OWNERS NAME  
 CONTRACT NAME:  
 DATE OF COMMENCEMENT:  
 DATE OF COMPLETION  
 EMERGENCY PHONE NCS:

NOTES:-  
 1. ALL DIMENSIONS ARE IN (mm) & UNLESS NOTED OTHERWISE.  
 2. OTHER SIDE OF BARRICADE SHALL BE WRITTEN IN KANADA LANGUAGE AS INDICATED BELOW.

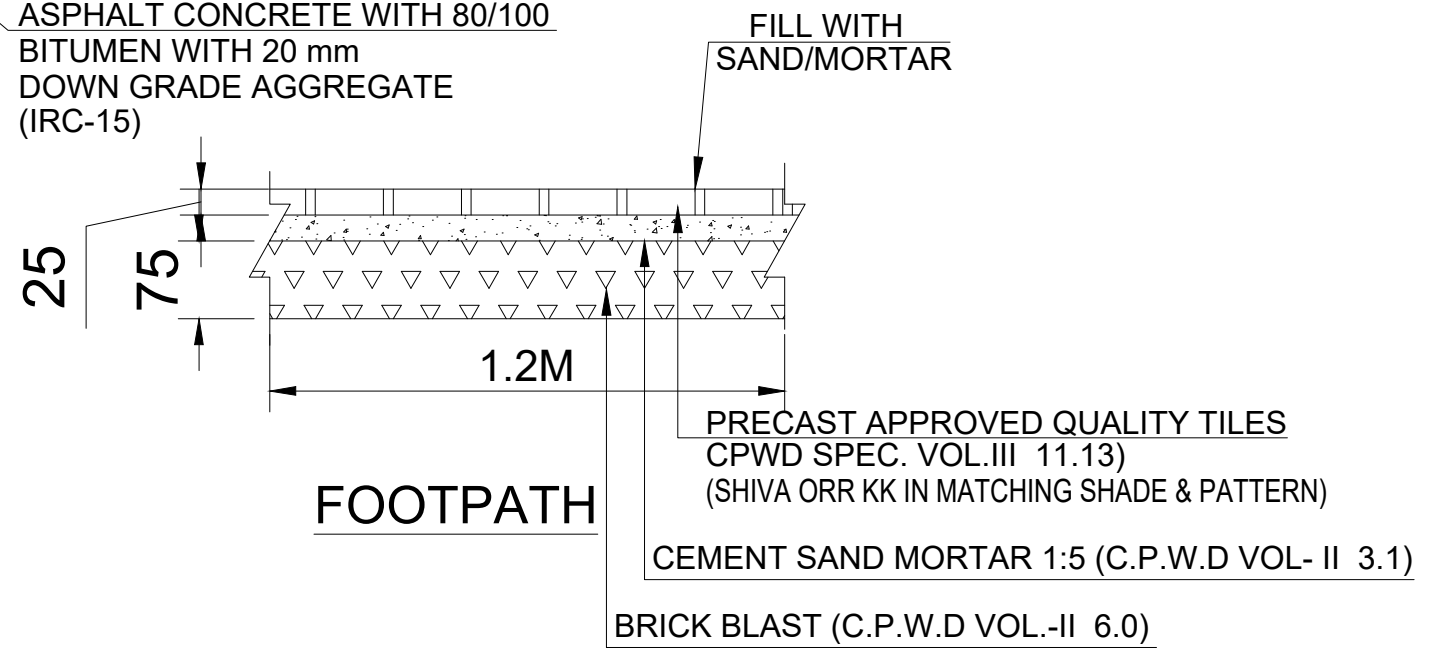
BILL OF MATERIAL						
Item Mkd	Section	Width	Length	Item Qty.	Weight	Total Weight
				(All Marks)	Kgs./M,M2	In Kgs.
1.	PL.1.6 THK	1600	1000	1	12.56	20.10
2.	ISMC 100	--	800	2	9.20	14.72
3.	L50x50x6	--	625	4	4.50	11.25
4.	L50x50x6	--	1500	2	4.50	13.50
5.	Flat 3 Thk.	900	40	1	0.94	0.03
6.	10Ø Rod	--	200	6	0.62	0.74
7.	L50x50x6	--	1600	2	4.50	14.40
Grand Total (Kg)						74.74

0	15.12.23	ISSUED FOR TENDER	SK	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
PMC:					
		LYONS ENGINEERING PVT. LTD.			
SCALE	TITLE:				
NTS	TYPICAL DRAWING FOR HARD BARRICADING				
SIZE	JOB NO.	DRAWING NUMBER	SHEET		REV.
A3	043	LEPL-STD-MDPE-041	1 OF 1		0

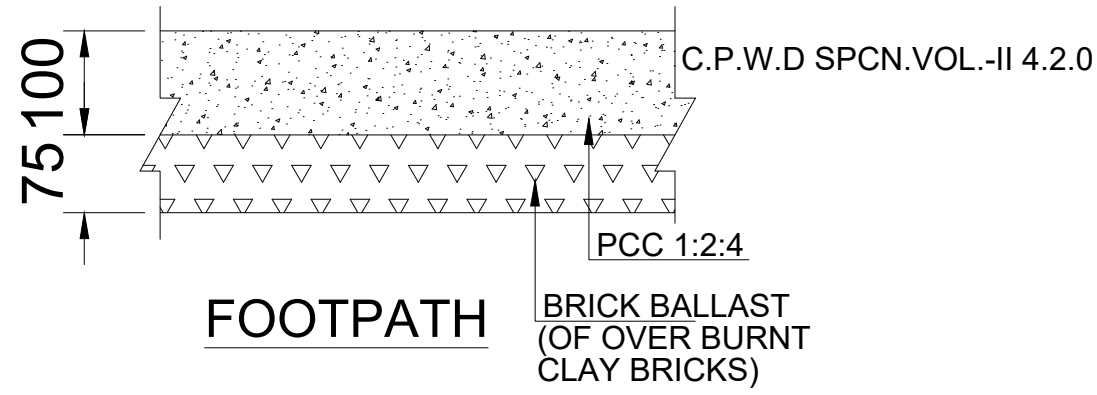
- NOTES:-
1. ALL DIMENSIONS ARE IN (mm) & LEVEL ARE IN METERS.
  2. ONLY FIGURED DIMENSIONS ARE TO BE FOLLOWED.
  3. THESE ARE INDICATIVE SCHEME ONLY. ACTUAL WORK TO FOLLOW AS PER CPWD/PWD CONCERNED AUTHORITIES REQUIREMENT IN RESPECTIVE



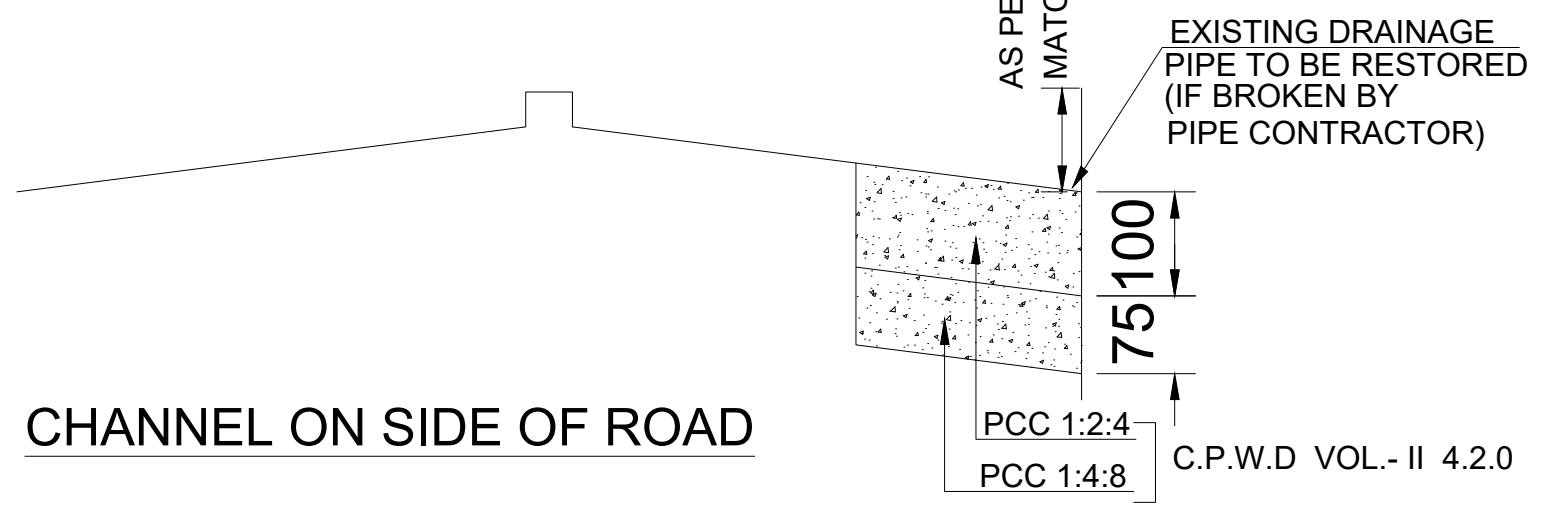
**CONCRETE ROAD**



**FOOTPATH**



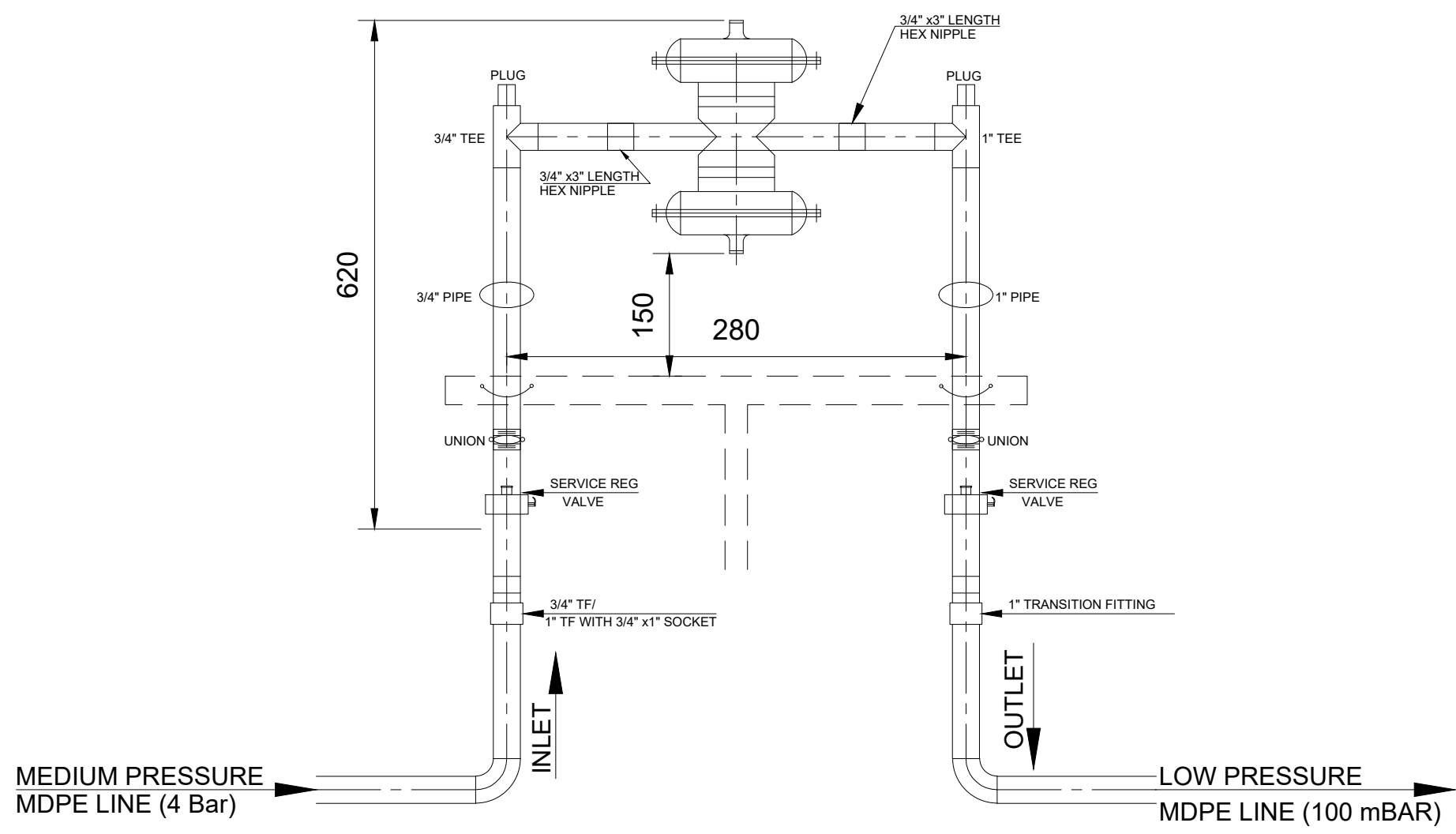
**FOOTPATH**




**CHANNEL ON SIDE OF ROAD**

0	15.12.23	ISSUED FOR TENDER	SK	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
PMC:  LYONS ENGINEERING PVT. LTD.					
SCALE	TITLE:				
NTS	RESTORATION OF ASPHALT ROADS				
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.	
A3	043	LEPL-STD-MDPE-043	1 OF 1	0	

- NOTES:-
1. ALL DIMENSIONS ARE IN (mm) & LEVEL ARE IN METERS.
  2. STRUCTURAL FRAME AND PEDESTAL TO BE PROVIDED AS PER SITE CONDITION



0	15.12.23	ISSUED FOR TENDER	SK	AD	VK
REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
PMC:					
		LYONS ENGINEERING PVT. LTD.			
SCALE	TITLE:				
NTS	SCHEMATIC DIAGRAM FOR SINGLE STREAM SERVICE REGULATOR				
SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.	
A3	043	LEPL-STD-MDPE-045	1 OF 1	0	