



# **TRIPURA NATURAL GAS COMPANY LIMITED**

A Joint Venture Company of GAIL (India) Ltd., Govt. of Tripura & Govt. of Assam)

## **PROJECT FOR CITY GAS DISTRIBUTION FOR AGARTALA**

### **E - BID DOCUMENT FOR ARC FOR PNG SHIFTING WORK FOR EXISTING PNG CONSUMER OF TNGCL**

### **UNDER OPEN DOMESTIC COMPETITIVE E - BIDDING**

**E – Tender Document No.:** TNGCL/C&P/PNG Shifting/ MDPE – GI/SC(603)/2019-20

### **VOLUME – II OF III**

**PREPARED AND ISSUED BY**

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**TECHNICAL SPECIFICATION**

**FOR**

**LAYING OF MDPE MAIN PIPELINES**

**AND SERVICE PIPELINES**

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## **TECHNICAL SPECIFICATION**

### **1.0 GENERAL INFORMATION**

#### **1.1 INTRODUCTION**

M/s Tripura Natural Gas Co. Ltd. (TNGCL ) is a Joint Venture company between GAIL (India) Limited (GAIL), Govt. of Tripura and Govt. of Assam. TNGCL has been setup to provide CNG (Compressed Natural Gas) as fuel to commercial & private vehicles through filling stations and PNG (Piped Natural Gas) to Industrial, household and commercial sectors in Agartala.

For that, TNGCL plans to install a CNG & PNG Distribution network in the city of Agartala. TNGCL through this tender is seeking contractors to lay an underground Medium Density Polyethylene (PE) pipelines and provide Natural Gas connections to Commercial & Domestic consumers in Agartala city.

The main scope of this specification comprises of laying of underground Medium Density Polyethylene (MDPE) main pipelines and services pipelines from the PE to PE / GI transition Fitting (inclusive). All the materials shall be supplied by contractor. The scope covers the activities associated with supply laying, testing and commissioning of MDPE main pipelines and services pipelines of sizes ranging from 20 mm to 180 mm OD upto and including the PE / GI transition fitting above ground level.

In this connection refer the following enclosures:

Drawing.: MDPE Pipeline System for Agartala  
City (Scenario-I)

#### **1.2 Nature of Contract**

The contractor shall be paid on a Schedule of Rates basis. He shall execute the work and perform his obligations under the contract, and TNGCL 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 Schedule of Rates.

### **2.0 SCOPE OF WORK**

- Generally the following shall constitute the Contractor's scope of work :
- 2.1 Plan and prepare a schedule for execution and work implementation as per QA/QC plans to be issued by TNGCL. Contractor has to submit the Construction/ Execution procedures before commencement of work.

- 2.2 Assist in obtaining permissions from land owning agencies for road cutting for laying of pipelines. Liaisoning with concerned authorities during execution of the job.
- 2.3 Receipt of free issue items from TNGCL's designated stores, loading, transportation, unloading at Contractor's stores near project sites.
- 2.4 Proper storing, stacking, identification, providing security, and insurance, during storage, laying and upto handing over of pipelines.
- 2.5 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 route plans provided in the tender.
- 2.6 Obtaining the approval for optimum route and ROU from the concerned authority and EIC. Grading the ROU as per requirement for proper movement of workmen, equipment and QA/QC personnel.
- 2.7 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.
- 2.8 Supply & Installation of Safety/ Warning Signs, barricading of the entire route to be trenched. Pits to be similarly barricaded along the warning sign.
- 2.9 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;
- 2.10 Uncoiling/ stringing the PE pipes of required sizes (i.e. 20 to 180mm) pipes into trenches as per specification.
- 2.11 Joining the pipe ends with fittings and valves by approved electrofusion techniques as per specification.
- 2.12 Installation of pipe fittings/installation like elbow, tee, reducers, tapping saddles, joints, connectors, transition fittings, valves etc. including construction of supports, valves pits, inspection chambers etc. as per specification.
- 2.13 Laying pipeline using trench less technology methods with or without casing pipes as per specification and as directed by EIC.
- 2.14 Supply & Laying of HDPE duct as casing pipe wherever applicable, alongwith MDPE Pipe.
- 2.15 DELETED**

- 2.16 Supply of good quality GI sleeves, MS enamel coated sleeves, concrete casing pipes, sand and other material, fittings to be supplied by the Contractor as per provisions of tender.
- 2.17 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.
- 2.18 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.
- 2.19 Nitrogen purging (including supply), commissioning & gas charging of tested pipeline as per approved procedure.
- 2.20 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 upto the entire satisfaction of TNGCL any other third party agency designated by TNGCL 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.
- 2.21 Installing of permanent site markers, warning signs, valve chamber etc.
- 2.22 Returning surplus material to TNGCL stores, reconciliation of free issue material/ consumables and obtaining 'no objection certificates' from TNGCL
- 2.23 Handing over the completed works to TNGCL for their operation / use purposes.
- 2.24 Maintaining the completed pipelines/installation for any defect, failures during defect liability period.
- 2.25 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.
- 2.26 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 TNGCL.



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

#### **3.1 Supplied by the Contractor**

Unless otherwise specified contractor will supply all size of HDPE casing pipe GI fittings and other materials as per SOR & scope of supply necessary to complete the laying of gas main pipelines and service pipelines. However free issue item would be supplied to the contractor as per Owner's scope of supply mentioned in the tender documents.

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

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

20mm/32mm/63mm/90mm	100 Mtrs. coils
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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.

#### **3.1.1 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 following diameters 180mm, 63mm, 32mm & 20mm for this project. Contractor has to arrange his own all equipments for trenchless crossings such as HDD, Moling & rock cutting equipment, HDPE fusion equipment at the site whenever required.

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

### 3.1.2 **Imported Backfill and Material**

The Contractor shall be responsible to arrange the supply of any imported backfill including approved Sweet earth/ Coarse Sand and aggregate etc. Payment for the supply of sand only is included in Schedule of Rates. The other soils shall be supplied without any cost implication to Owner.

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.

### 3.1.3 **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.
- 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.
- Permanent markers as shown in the drawings enclosed in the tender.

## 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**

Contractor has to assist in getting permissions, obtain statutory approval/ clearances for laying of pipelines. However, TNGCL will pay the departmental charges and Bank Guarantees for getting the clearance s. 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, TNGCL's Engineering Standards; relevant Oil India Safety Directorate (OISD) norms, 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 TNGCL's approved procedures

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

## 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 metres 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 baricated 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.

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.

## **8.0 ROUTE SURVEY**

8.1 Plans detailing the size, operating pressure and approximate location of the proposed mains, connections and associated regulator installations will be issued to the contractor at the start of the works.

8.2 The final alignment of mains will be worked out at site in consultations with the site engineers after route survey and trial pits, at his cost, have been carried out. 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.

## **8.3 Service Lines**

8.3.1 A survey will be conducted jointly by TNGCL/third party inspection 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 regulator positions and estimates of material quantities. The contractor's representatives will make a sketch of the agreed pipe routes if necessary.

8.3.2 The contractor will be responsible for contacting the customer and making the necessary arrangements for access, and appointments to carry out the work. Contractor shall maintain job card and complaint books at site. TNGCL will not be responsible for any time lost due to broken appointments or disputes with customers.

## **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 TNGCL on site. All work will be issued and sanctioned through the EIC and site control exercised by Site Engineer TNGCL. 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 TNGCL is maintained.

9.2 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.

9.3 The contractor's supervisor shall have mobile telephones or pagers 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 TNGCL as is required. The normal day to day issue of work instructions,

communication between TNGCL 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.

## **10.0 STRUCTURES, SERVICES AND OTHER PROPERTY**

### **10.1 Location of Underground Utilities**

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

In addition, the contractor shall excavate trial pits as necessary to determine the pipe route. The number of trial pits will be agreed with the EIC in advance of any excavation. In any event, trial pits shall be made at intervals of a maximum of 30 meters. Restoration of the abandoned trial pits and trenches shall be the contractor's responsibility. No payments shall be made for such type of jobs.

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, leveled 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.

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 (eg oil leakage).

## **11.0**

### **TRENCHING**

The schematic diagram with the detail of trench is enclosed as Annexure.

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 over the ROU wherever necessary to permit general public, property owners or his tenants to cross or move stock or equipment from side of the trench or another.

Trenching shall be made with sufficient slopes on sides in order to minimize collapsing of the trench. On slopes wherever there is danger of land slides, the pipeline trench shall be maintained open only for the time strictly necessary. TNGCL 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 1.5 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 cases of Drain/ Culvert crossing through open cut where excavation cut is more than 1.5m, the extra excavation shall be paid in quantity basis. The rate shall include backfilling as specified.

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 TNGCL.

### 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 enclosed herewith.

### 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 1.5 m in length which cannot be removed other than by the use of pneumatic chisel/drill or sledge hammer and chisel. Additional Rates will be paid for hard rock excavation as per the SOR.

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.

1.4

#### **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.

- 150mm where the gas pipe crosses other assets, other than electric 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 TNGCL 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 TNGCL. 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 TNGCL.



## 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 TNGCL.

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 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 as deep trench is required at the approaches to crossings of roadways, railroads, rivers, streams, drainage ditches without any extra cost implication to TNGCL.

The Contractor shall excavate all such aforesaid depths as may be required at no extra cost of TNGCL.

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 TNGCL 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 TNGCL 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. The payment for supply of sand will be as per SOR item.

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 upto 150mm below underside of pipe and any other material which could lead of perforation/tearing of the pipe wall. After ensuring above the MDPE pipe coil shall be uncoiled smoothly through proper equipment's/ care 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 and MS sleeves material specification shall be confirming to IS 1239 (Heavy Duty) 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 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.

Service lines shall be installed in accordance with the drawing enclosed. Note that the service pipe rises out of the ground at the customer's premises within a GI sleeve pipe. The vertical portion of the sleeve shall be fixed to the wall of the premises in a secure manner. A bending tool shall be used to bend the GI sleeve pipe so that it has the appropriate curvature and is free of kinks. The bending of the sleeve, its fitting and clamping, and the installation of the transition fitting excluding service-isolating valve, is all included in the service connection rate. A rate is included in the SOR for the provision of sleeves for PE laying.

The installation of the GI sleeve for service lines shall be done by sealing the annulus, firm fixing of the GI sleeves with concrete mix, breaking through any obstructions & their subsequent restoration to the satisfaction of the EIC.

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 LAYING OF HDPE CONDUIT AND OPTICAL FIBER CABLE**

**DELETED**

### **14.0 JOINTING OF POLYETHYLENE PIPE**

The procedure for jointing of PE pipe and fittings is enclosed. Only Bar coded electro-fusion machine (Automatically Readable) that can read the bar code of the fittings automatically shall be used for jointing of MDPE pipe / fittings. Manual feeding electro-fusion machines are not acceptable for jointing purpose

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 plastic pipe cutting tool. Before fusion is attempted he shall remove the oxidised 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 polyethylene 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.

For electro-fusion jointing, the contractor must bring own tools, tackles and equipments.

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

### **15.0 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. 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 TNGCL 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 TNGCL 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 TNGCL.

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 TNGCL. 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 upto height of 150mm around the pipe and the same shall be paid as per SOR.

When the trench has been dug through drive ways or roads, all backfilling shall be executed with suitable material in layers as approved by TNGCL 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-upto.

PE Warning Grid/Mat 1mm thick and 200mm wide will be placed on distribution main and on service lines inside premises, after backfill of the trench upto a height of 300mm on the top of the carrier pipes. The warning grid is to be unrolled centrally over the pipe section and thereafter further backfilling will commence.

**Backfilling activity shall include proper compaction by jumping jack compactor and watering in layers of 150mm above the warning mat.**

Proper crowning of not more than 150mm 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/ PCC cutting has been done during excavation for laying, the area shall be back filled and compacted immediately so that no inconvenience is caused to the general public.

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.

The contractor shall not be entitled for 30% payment on laying & backfilling till the above activities are completed.

**16.0**

**MOLING:**

The Moling shall be carried out as per the requirement specified by TNGCL and approved procedures. The contractor has to carry out thorough survey of the under ground 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 TNGCL. 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 which ever 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 Item no. 1.4 & 1.5 respectively of Schedule of Rates. **No separate payment shall be made for pulling the carrier pipe.**

In case of Machine Moling a standard procedure is attached herewith in **Annexure** for reference.

The rate for such crossing work by using casing pipe shall be provided in Item 1.6 of Schedule of Rates. **No separate payment shall be made for**

**pulling the carrier pipe.** In case Casing pipe is not laid during Moling then rates payable shall be as per item 1.7 of Schedule of Rates.

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 pie.

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

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 will consider in the moling length.

## **17.0 BORING/RAMMING/DIRECTIONAL DRILLING**

One of 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 TNGCL. Execution of the work shall be based on the TNGCL approved drawings. The contractor has do the thorough survey of the under ground utilities before commencement of BORING/ RAMMING/ 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.

The type of HDD to be carried out i.e. conventional (with or without casing) shall be at the discretion of TNGCL. 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 pipe (SOR item no. 1.8) 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 TNGCL.

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

## **18.0 CASING PIPE**

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

**Size of MDPE pipe**

20 mm

32 mm

**Size of HDPE pipe**

50mm

75 mm

However, size of the casing pipe may vary according to length of the carrier pipe and requirement of laying of OFC Duct.

**19.0****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. To retard 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 sketch for restoration of Road, Footpath, Channel is enclosed herewith and is indicative. However, the restoration shall be done in accordance with the norms of concerned land owning agencies.

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 authorised on 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 restoration as per applicable standards, shall be born by the contractor.

## **20.0**      **TESTING**

Pressure testing will be carried out with compressed air. Compressed 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 6.0 bar(g), 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 be prepared & got approved by EIC.

For main line the test duration shall be 24 hrs . With these tests the pressure should be allowed to stabilise for a period of 30 minutes after pressurisation. 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.

## **21.0**      **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 labeled, 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.

## **22.0 VALVE PIT**

The valve pit shall be constructed in accordance with enclosed drawing & payment shall be as per item of SOR.

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

### **22.1 Workmanship**

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

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

Precast RC slab shall be placed as indicated in the drawing issued to the contractor. PCC to be placed below the pipe as indicated. Once PCC is set sand is to be filled and properly rammed so that pipe and precast concrete blocks are firmly placed.

Valve will be supplied without the operating stem. Contractor has to supply the operating stem with a handle for the valves of the different sizes. The Contractor has to take prior approval for design and material specification of the stem for installation. Approved quality sand is to be placed in between area.

Surrounding area to be properly cleared and PCC to be placed around the location where precast slab with CI Manhole cover is placed. The RC precast slab to be laid in level and finished smooth.

## **23.0 PERMANENT MARKERS**

23.1 Permanent Marker (As per typical Drawings Placed at Tender) shall be installed on the ROU at regular intervals as per the instructions of the EIC immediately after laying of the pipeline. The installation of the type of the Permanent Marker shall be decided by the EIC depending on the site condition. The 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. Separate payment for installation of the markers shall be paid to the Contractor as per the SOR item No 1.16.

- 23.2 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 TNGCL's logo and specify the location of the pipeline from the marker.

#### **24.0 ASSISTANCE IN COMMISSIONING**

Contractor shall provide the required personnel, Vehicles, labour, supervision, tools, equipment, instruments and technical assistance for performance tests and commissioning activities as per requirement of TNGCL

#### **25.0 STANDARD OF WORK**

- 25.1 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.
- 25.2 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.
- 25.3 Fusion operators and other skilled personnel shall be approved by TNGCL 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.

#### **26.0 RECORDING (AS-BUILT DRAWINGS)**

The Contractor will be required to submit computerized as-built drawings duly certified by EIC in A0/ A1 sheet form at 1:500 scale, and one set of tracing film with six sets of prints plus soft copy. 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 may use the route plans provided by TNGCL as the basis for recording mains installation. Soft copies of route plans shall be provided to the successful bidder. 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.

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.

**TECHNICAL SPECIFICATION**

**FOR**

**INSTALLATION OF ABOVE GROUND GI PIPING**

**FOR**

**DOMESTIC AND COMMERCIAL CONSUMERS**

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## **1.0 GENERAL INFORMATION**

### **1.1 INTRODUCTION**

The main intent of the specification is installation of above ground GI pipes, fittings, valves, meters and regulators, from the outlet of 'PE/GI transition fitting' up to the DOMESTIC consumers 'Appliance / stove/ oven valve' as per the Distribution Schedule enclosed herewith.

The scope for commercial consumer includes installation of above ground GI pipes and associated fittings, valves, regulator up to and including meter. However, the piping may have to be carried out up to Appliance valve, in case of some commercial customers.

In case of large commercials, 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 TNGCL.
- 2.2 Receipt of Appliance Valve, Isolation Valves from TNGCL's stores, providing security, and insurance, during and before installation and commissioning of pipelines. Obtaining the approval for optimum route and permission for work from the concerned authority and EIC.
- 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 Installation of GI pipes of 1/2" & 1" dia. between transition fittings (installed by PE contractor) and customer's kitchen appliances 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.
- 2.5 Supply & Installation of clamps for fixing pipes, box for regulator 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.

- 2.6 Conversion of all types of LPG kitchen appliances to NG based appliances inclusive of supply of nozzles. Signing of Joint Meter Records (JMRS).
- 2.7 To demonstrate to the customer regarding use, safety and maintenance related aspects of NG based appliances and installations.
- 2.8 Testing & Commissioning of installations including purging as per specification and handing over the installation of TNGCL / customer to the entire satisfaction of TNGCL.
- 2.9 Dismantling of scaffolding / temporary structures and cleaning of site.
- 2.10 Restoration of walls, flooring and other damages while executing the above ground installation.
- 2.11 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.
- 2.12 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 TNGCL.

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

#### **3.1 SUPPLIED BY TNGCL**

Unless otherwise specified TNGCL will supply to the contractor, free of charge, Appliance Valves ½" and 1" AND isolation Valves ½" & 1" only, necessary to complete the laying of above ground service pipes. The contractor shall not use the said material from any other source of supply other than TNGCL except with written approval from the EIC.

TNGCL would also supply metering skid as free issue materials to be installed in large commercials.

#### **3.2 SUPPLIED BY THE CONTRACTOR**

**The contractor to supply all GI pipes and Fittings, Valves, Regulators and Meters and other materials required for said works except supply of valves mentioned in clause 3.1.**

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.

The contractor is to be procure all bought out items from approved vendors and accordingly keep TNGCL informed. The inspection of bought out items would be carried out by TNGCL 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 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 ISSUE OF WORK INSTRUCTIONS**

- 4.1 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 multistoried flats. A general scheme of distribution to small commercial consumers is indicated in the sketch enclosed herewith for reference.

- 4.2 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.
- 4.3 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.
- 4.4 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.

## **5.0 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 TNGCL indicating broadly the laying, testing, RFC, conversions and extra piping.

Material consumption statement to be submitted at least once a month.

## **6.0 WORK SHEETS**

- 6.1 The quantities and other details will be checked by TNGCL'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.
- 6.2 Measurement sheets shall be prepared based on the measurement cards and checked and certified by the site engineers for billing purpose.
- 6.3 If measurement sheets submitted are illegible, incomplete or incorrectly booked, they will be returned to the contractor.

## **7.0 PERMISSIONS / APPROVALS**

Contractor shall be responsible for obtaining approval from authorities like ADA / municipal 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.



## **8.0 REFERENCE SPECIFICATION, CODES AND STANDARDS**

The contractor shall carry out the work in accordance with this specification, TNGCL'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) 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.

## **9.0 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.

## **10.0 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 approaches, pavements, gardens, rooms, walls, roof etc., at no extra cost to TNGCL.

A survey will be conducted jointly by TNGCL 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. TNGCL 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 carryout 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 MECON/ TNGCL necessary to protect the public.

#### **11.0 PROTECTION OF STRUCTURES AND UTILITIES**

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

#### **12.0 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 customers appliance, including the installation of appliance valve and insulated valves, except meters Regulator for which separate rate shall be paid as per SOR Item No. 2.2 of 2.3 of this document. 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 customers property, bending tools, clamps, sleeves to facilitate the pipe passing through floors and walls, paint for pipe marking etc. GI pipes, fittings, valves and regulator shall be provided by TNGCL.

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.

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 bevelled 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 rates are to be paid in bands as shown in SOR e.g., the ground floor to 2<sup>nd</sup> floor band covers pipe work laid from the ground floor level to ceiling level on the 2<sup>nd</sup> floor. Payment will be in incremental stages. e.g., if a pipe is laid from the ground floor to the 9<sup>th</sup> floor of a building, the length of pipe laid up to the 2<sup>nd</sup> floor will be paid in the first band, The length of pipe laid between 3<sup>rd</sup> and 5<sup>th</sup> floor will be paid in second band and the length of pipe from the 6<sup>th</sup> floor and above will be paid for in the third band. 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 first band. The Pipe installation includes all fittings, Flexible hoses, clamps, Regulators etc.

### **13.0 TESTING OF GI INSTALLATION**

- 13.1 The installation from PE/ GI transition fitting up to regulator shall be tested at the [pressure of 6.0 bar (g)].
- 13.2 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.
- 13.2 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.

Valves supplied by TNGCL, shall not be used for testing purpose.

- 13.3 The calibrated pressure gauges of suitable range shall be supplied by the contractor for testing.
- 13.4 The pressure gauges shall be calibrated from time-to-time as desired by Engineer In-charge but positively once in every six months.
- 13.5 The details of testing shall be properly recorded in the measurement cards

### **14.0 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.

## **15.0 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.

## **16.0 INSTALLATION OF METERS**

The work in this section includes :

- 16.1 Installation of domestic and non-domestic / small commercial meters with associated inlet and outlet connections, on the wall with approved meter brackets and angles. This work is payable under Item No. 2.2 .
- 16.2 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.
- 16.3 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.
- 16.4 The same rates of SOR Item 2.2 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.
- 16.5 The above activities along with restoration of the area to original shall be carried out to the complete satisfaction of consumer and EIC.

## **17.0 PAINTING OF GI PIPES**

The entire length of 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 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.

## **18.0 BOX FOR REGULATOR [NOT APPLICABLE FOR THIS CONTRACT]**

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 TNGCL .

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.

## **19.0 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 TNGCL '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.

## **20.0 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 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 piping will only be authorised on satisfactory restoration, and where the sites has been cleared of all surplus materials etc.,

## **21.0 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.

TECHNICAL SPECIFICATION  
FOR  
GI FITTINGS

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## **SPECIFICATION FOR THE GI FITTINGS**

Service	: Natural Gas
Standard/ Code	: Malleable Cast Iron Pipe Fittings as per IS: 1239 (Part - 2)
Working Pressure	: 4 bar (g)
Test Pressure	: 6 bar (g)
Working Temperature	: 0°C to 50°C
Material Description	: Malleable Cast Iron as per IS:2108-1977 or equivalent
Min. Tensile Strength	: 30 kgf/sq.mm
Min. Elongation	: 6%
End Threads	: NPT ANSI B.1.20.1
Alignment of Threads	: Variations not more than 0.5%
Protective Coating	: Galvanised uniformly to protect from corrosion both inside and outside except on Threaded portion as per standards/ codes for hot dipping IS:4759-1985 and for mass of Zinc coating IS:6745-1972 / EQ.
Minc. Zinc Coating	: 610 gms/ sq.m
Reinforcement	: Additional material at outside diameter of an internally threaded fitting
Inspection	: 100% Pressure Testing shall be carried out at factory

TECHNICAL SPECIFICATION  
FOR HDPE  
PIPES

## **Contents**

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## 1.0 **INTENT OF SPECIFICATION**

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 tenderer 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
- DN 75

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 sun light.

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 alongwith their credentials/ past records for carrying out all required test

**TRIPURA GAS COMPANY LIMITED (TNGCL)**

**CNG & CITY GAS DISTRIBUTION PROJECTS IN TRIPURA**

PTS - ELECTRO FUSION FOR PE PIPES & FITTINGS

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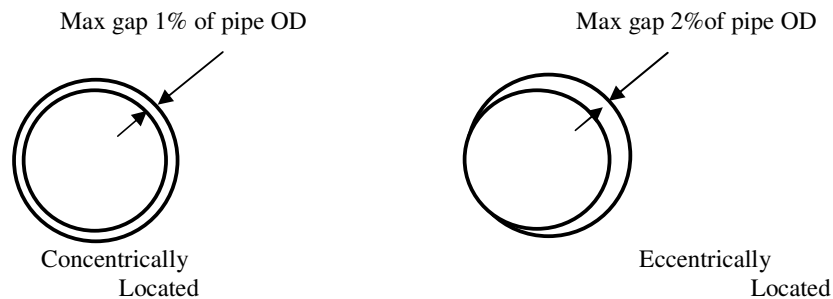
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# 1 ELECTRO FUSION FOR PE PIPE

## 1.1 Electro Fusion Fitting Jointing

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

1.1.2 The effectiveness of this technique depends on attention to the preparation of the jointing surfaces, in particular the removal of the oxidized surface of the pipe over the socket depth and ensuring the jointing surfaces area clean. Also, the pipe should be checked for ovality. If ovality causes a gap between concentrically located pipe and the fitting to exceed 1% of the pipe OD, the pipe must be re-rounded to ensure correct welding. If the gap still exceeds 1% of the pipe OD after re-rounding then a check should be made of the pipe OD dimensions to determine if it meets specification.



1.1.3 The maximum gap between eccentrically located pipe and fitting i.e. Pipe touching fitting at one point, must not exceed 2% of the pipe OD.

1.1.4 Sometimes coiled pipes may be too oval to fit into couplers, or the end of the pipe may make the alignment of the ends impossible. In such circumstances the use of a mechanical pipe straightener or rounding tool is necessary.

1.1.5 The equipment and procedures following relate to fittings with center stops. If fittings without center stops are used, the maximum insertion depth must be clearly marked on the pipe ends prior to jointing (felt tip pen).

### Equipment

- a. 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%, - 10% between no load and full load. Control boxes are to include safety devices to prevent excessive voltages being present at the control box output. The safety device shall operate in less than 0.5 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 into the trench.

- b. A mechanical pipe surface preparation tool is to be used before fusion is attempted. The tool is to be capable of removing the oxidized surface of the pipe in excess of the insertion depth. The tool is to remove a layer of surface material 0.2 – 0.4 mm thick from the outer surface of the pipe preferably in a continuous strip of swarf over that length and round of the pipe.
- c. Pipe clamps for restraining, aligning and re-rounding the pipes in the fusion process are to be used.
- d. Pipe cutters with saw and saw guide.
- e. Protection against adverse weather conditions.



## 1.2 Electro Fusion Jointing Method / Procedure

### Preparation

- a. Ensure there is sufficient space to permit access to the jointing area. In a trench, a minimum clearance of 150 mm is required.
- b. Check that the pipe ends to be jointed are cut square to the axis of the pipe and any burrs removed.
- c. Wipe pipe ends using clean lint-free material to remove traces of dirt or mud, etc...
- d. Mark the area over which the oxidized pipe surface is to be removed, i.e. In excess of the insertion depth, on each pipe to be jointed 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 be removed from the packaging at this stage.**

- e. Connect the electro fusion control box input leads to the generator.
- f. Check that the reset stop button, if fitted on the control box, is in the correct mode.
- g. Using the pipe end preparation tool, remove the entire surface of the pipe uniformly, preferably in continuous swarf over the area identified, i.e. In excess of the insertion depth.

A mechanical scraper could be used however; there is a considerable risk that the end preparation will not be adequate with the use of such a tool.

**Note that the prepared pipe surface should not be touched by hand.**

- h. Remove the fitting from its packing and clean the scraped area of the pipe surface and the bore of the fitting with a disposable wipe impregnated with Iso-propanol / Acetone. Ensure the prepared surfaces are completely dry before proceeding.

**Note that while Iso-propanol is a suitable cleaner, its use is subject to local Health and Safety Regulations.**

- i. Check that the pipe clamps are of the correct size for the pipes to be jointed.
- j. Insert the pipe ends into the fitting so that they are in contact with the center stop.
- k. Using the pipe clamps, secure the pipes so that they cannot move during the fusion cycle. Check that the pipe ends and the fitting are correctly aligned.
- l. Check that there is sufficient fuel for the generator to finish the joint. Start the generator and check that it is functioning correctly.
- m. Switch on the control box.
- n. Connect the control box output leads to the fitting terminals and check that they have been fully inserted.

If required by the control box enter the fusion jointing time into the control box timer. The jointing time is indicated on the fitting. Check the correct time is shown on the control box display.

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

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

- o. Press the start button on the control box and check that the heating cycle is proceeding as indicated on the display.

- p. On completion of the heating cycle, the melt indicators should have risen. If there is no apparent move in the melt indicators, the joint should be cut out and a fresh joint made (See note 3 below).
- q. If a satisfactory joint has been made, the joint is to be left in the clamps for the cooling time specified on the fitting or the automatic control box.

**Note 3:** If the fusion cycle terminates before completion of the countdown, check for faults as indicated by the control box warning lights and check that there is adequate fuel in the generator. DO NOT attempt a second fusion cycle within one hour / cooling of joint at Ambient Temperature of the first attempt.

### **1.3 RECORDS**

Records of appropriate servicing and calibration shall be kept.

### **1.4 TRAINING**

It is necessary that operators, inspection and supervisory personnel acquire the skills of electro fusion fitting fusion. The necessary training should be carried out by a qualified instructor with the objective of enabling participants to;

- Understand the principles of electro fusion fitting jointing.
- Identify pipe and appropriate fitting markings.
- Carry out pre-jointing machine and equipment checks.
- Make satisfactory electro fusion fitting joints from pipes and fittings of different sizes.
- Inspect for and identify joints of acceptable quality.

**Note that some form of assessment and certification should be associated with the training. The certificate should detail the pipe and fitting size range. And the equipment used. A register of successful participants should be kept.**

### **1.5 Electro Fusion Saddle Jointing**

- a. With electro fusion saddle jointing, an electrical resistance element is incorporated in the base of the saddle which, when connected to the appropriate power supply, melts and fuses the material of the fitting and the pipe together.
- b. The success of the technique depends on effective preparation of the jointing surfaces, in particular the removal of the oxidized surface of the pipe over the area equivalent to the area of the saddle base, and cleaning of the pipe surfaces.
- c. Methods of holding the tapping tee saddle during the fusion cycle are used namely, top loading and under clamping. The general parameters are similar. In some cases, if the manufacturer's procedure for holding the fitting is provided, then the same should be followed during the fusion cycle.

### **1.6 Electro Fusion Saddle Jointing Method / Procedure**

#### **Preparation**

- a. Expose the pipe onto which the tapping tee is to be assembled, ensuring there is sufficient clear space around the pipe. In a trench, a minimum clearance of 150 mm is required.
- b. Clean the pipe over the general area on which the saddle is to be assembled using clean, disposable lint-free material.
- c. Without removing the fitting from its packaging, place it over the required position on the main. Mark the pipe surface all around and clear of the saddle base area using a felt tip pen or similar.

- d. Remove the surface of the pipe to a depth of 0.2 to 0.4 mm over the full area marked using a suitable tool. Remove the swarf.
- e. Connect the electro fusion control box input leads to the generator.
- f. Check that the reset stop button, if fitted on the control box, is in the correct mode.
- g. Remove the two halves of fitting from its packing and clean the scraped area of the pipe surface and the bore of the fitting with a disposable wipe impregnated with Iso-propanol / Acetone. Ensure the prepared surfaces are completely dry before proceeding.

**Note again that while Iso-propanol is a suitable cleaner, its use is subject to local Health and Safety Regulations.**

- h. Position the fitting base onto the prepared pipe surface, and bring the lower saddle into position then gradually and evenly tighten the nuts until the upper saddle makes firm contact with the scraped pipe.
- i. Check that there is sufficient fuel for the generator to complete the joint. Start the generator and check that it is functioning correctly.
- j. Switch on the control box if applicable.
- k. Connect the control box output leads to the fitting terminals and check that they have been fully inserted.
- l. If required by the control box, enter the fusion jointing time into the control box timer. The jointing time is indicated on the fitting. Check the correct time is shown on the control box display.

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

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

- m. Press the start button on the control box and check that the heating cycle is proceeding as indicated on the display.
- n. On completion of the heating cycle, the melt indicators, where incorporated should have risen. If there is no apparent move in the melt indicators, a new saddle joint should be made. Cut the tee of the faulty joint from its base.
- o. If a satisfactory joint has been made, the joint is to be left in the clamps for the cooling time specified on the fitting label or by the automatic control box.

**Note 3:** If the fusion cycle terminates before completion of the countdown, check for faults as indicated by the control box warning lights and check that there is adequate fuel in the generator. **DO NOT attempt a second fusion cycle within one hour of the first attempt.**

**Note 4:** The connection of the service pipe to the fitting outlet should be carried out in accordance with the procedure of the appropriate section of this Item.

**Note 5:** DO NOT attempt to tap the main with the integral cutter for at least 10 minutes after completion of the cooling cycle.

## **1.7 Records**

Records of appropriate servicing and calibration of Electro Fusion machines/ joints shall be kept.

## **1.8 Training**

AS PER 1.6

**Note that some form of assessment and certification should be associated with the training. The certificate should detail the pipe and fitting size range and the equipment used. A register of successful participants should be kept.**

## **1.9 Stopping the gas flow**

In the operation of a distribution system there is a periodic need to stop the gas flow for either routine or emergency maintenance. The flow may be stopped through the use of installed fittings such as valves.

Where installed fittings are not available or the use of such would cause significant supply disruption, then one of the following methods may be employed.

### 1.10 Squeeze-off

- 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 the outside of the pipe. The bars are brought together, either manually or hydraulically, squeezing the pipe material together until a seal is formed where the upper and lower walls meet.
- 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 some reduction in the 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 then a second squeeze can be used, with an intermediate vent to remove the gas which passes the first squeeze from say the trench area. A second squeeze-off procedure should be a minimum of three pipe diameters and right angles to the initial squeeze.
- 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 a squeezing operation.

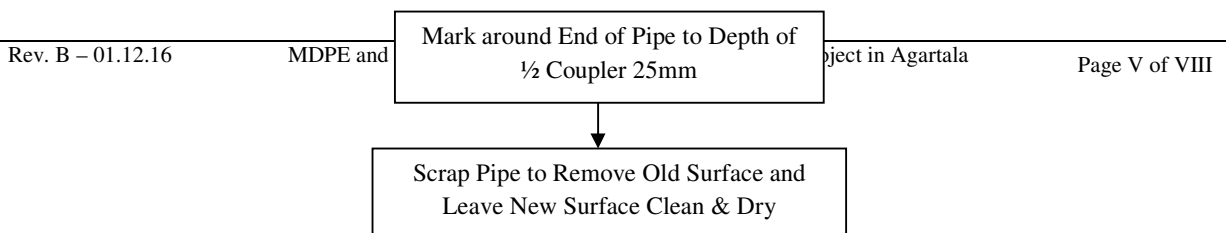
### 1.11 Bending-Back

Bending back of the pipe may be performed where the pipe has been severely damaged and stopping the gas flow is imperative. Its application is of a temporary nature, and will provide relief until a permanent repair can be affected. The section of pipe, which has been bent back, will have to be replaced because of the damage caused by the severeness of the bend back operation. The need for any bend back operation is most likely to occur as a consequence of damage caused to a PE service pipe.

While it is not the prime function of a saddle tee, controlling the flow in a service may be achieved by opening up on an installed saddle tee and winding down the internal tapping tool to shut off the flow into the service pipe.

## ANNEXURE # 1

### FUSION COUPLERS FROM 20MM TO 125MM





**TRIPURA GAS COMPANY LIMITED (TNGCL)**  
**CNG & CITY GAS DISTRIBUTION PROJECTS IN TRIPURA**  
PTS - BRASS FITTINGS

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\* \* \*

**1. SCOPE**

This specification covers the requirements for Brass Capillary fittings (End feed fittings). Unless modified by this specification, requirement of BS 864 / EN 1254 Part 1 shall be valid.

**2. MATERIAL**

- i. The material used for the manufacturer of Brass Capillary Fittings shall conform to EN 1254-1 (latest), Half Hard.
- ii 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.
- iii Threading on the Brass fittings shall be done as per BS 21.

**3. DIMENSIONAL TOLERANCES**

Dimensions tolerances of various types of brass capillary fittings (End feed fittings) shall be as per EN 1254 Part 1.

The tolerances at the end shall be as per EN 1254 Part I in nominal diameter which are as follows (Ref. table 2)

Nominal 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	+ 0.15	0.20	0.02
	-0.05	+0.06		

The minimum wall thickness of a fitting shall be in accordance as given below (Ref Table 3 of EN 1254 Part 1)

Nominal Dia mm, D

Minimum wall thickness (mm) Brass

12

1.1

**4. END CONNECTION**

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

**5. CHEMICAL PROPERTIES**

Chemical composition of Brass shall be as mentioned in EN 1254 PART I. Dezincification-resistant brass material CuZn36Pb2As or CW602N.

Cu 61.0-63.0 %



Pb 01.7-02.8 %

As 0.02 -0.15%

Remaining is zinc.

**6. 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> when tested in accordance with the specification. This test shall be carried out as per clause no. 5.4 of EN 1254 -1.

**7. RESISTANCE TO DEZINCIFICATION**

The fittings shall be manufactured from alloys containing more than 10% Zinc. So fittings shall be required to be resistant to dezincification. It shall be carried out as per Cl. 5.5 of EN 1254 -1.

**8. 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.

**9. 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. HYDROSTATIC PRESSURE TEST**

All fittings shall be leak tightness tested at 1.5x25 bars for a period of 15 minutes and no leakage is permitted. This test shall be performed on each size of the fittings.

**11. PNEUMATIC PRESSURE TEST**

All fittings shall be leak tested at 6 bars for a period of 10 seconds and no leakage is permitted.

**12. MARKING**

Each fittings shall be embossed with TNGCL's logo, manufacturers name and trade mark BS 864 / EN 1254 Part – I and designation of fittings.

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

- a) Manufacturer's name or trade mark.
- b) Designation of fittings.
- c) Month and year of manufacturing

**13. PACKAGING**

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

**14. INSPECTION / DOCUMENTS**

- i. Inspection shall be carried out as per design codes/standards, TNGCL Technical Specification and Inspection Plan/ Vendor's detailed QAP duly approved by owner/owner's representative.
- ii. TNGCL representative or third party inspection agency appointed by TNGCL shall carry out random 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 TNGCL Technical Specification, at the time of final inspection of each supply lot of material.
- iv. Even after third party inspection, TNGCL 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 TNGCL Technical specification, then TNGCL reserves the rights to reject all production supplied from the batch.
- v. Vendor shall prepare and submit the detail drawings of required brass fitting for approval by TNGCL /TECPL 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.

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**TRIPURA GAS COMPANY LIMITED (TNGCL)**  
**CNG & CITY GAS DISTRIBUTION PROJECTS IN TRIPURA**

PTS - PE FITTINGS, VALVES AND TRANSITION FITTINGS

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## 1. **INTRODUCTION & SCOPE**

Tripura Natural Gas Company Limited (TNGCL) plans to augment the PE Network. It supplies natural gas to domestic & commercial consumers in Agartala.

The present document covers the technical specifications for the procurement of PE Fittings.

## 2. **DEFINITIONS**

Owner	Shall means Tripura Natural Gas Company Limited (TNGCL)
Owner's Representative	Not Applicable
Manufacturer	Means the Manufacturer of the PE Fitting, Valves and Transition Fitting.
PTS	Means the present <<Particular Technical Specification<< and all its appendix, if any.
Third Party Inspection Agency	Means the Inspection Agency to be appointed by GGL.
GTS	Means the present <<General Technical Specification<< and all its appendix, if any.

## 3. **MATERIAL GRADE**

The material grade of polyethylene PE Fittings shall be PE100. The bidder shall submit the details by clearly indicating the make, country of origin, part nos. /Product codes and catalogue number along with catalogues written in English for the Items quoted, in the Unpriced Bid.

The bidder shall provide approvals of internationally recognized authorities for their products along with their un-priced bids.

## 4. **APPROVED MANUFACTURER FOR RAW MATERIAL**

1. SOLVAY
2. BOREALIS
3. TOTAL PETROCHEMICALS
4. DOW
5. ELENAC

## 5. **TRANSITION FITTINGS**

Transition fittings shall be supplied in accordance with "Plastic piping systems for supply of gases fuels – Part 3: Fitting" EN 1555-3.

Bidder shall provide catalogue for all the fittings including transition fittings.

1. **THE MATERIAL GRADE AND END CONNECTION SHALL BE AS PER MR. STEEL AND MDPE PIPE SHOULD BE SO JOINED IN FACTORY SO AS TO HAVE A MONOLITHIC JOINT, WHICH IS LEAK FREE AND SHOULD BE MECHANICALLY STRONGER THAN THE PE PIPE. ON PLACEMENT OF ORDER, THE BIDDER SHALL SUBMIT THE DRAWING WITH DIMENSIONS FOR APPROVAL OF GGL BEFORE STARTING PRODUCTION.**

2. **MDPE PIPE MATERIAL**

The raw material of MDPE pipe shall be PE 80, thick as per SDR11. The MDPE pipe shall confirm standards for polyethylene pipes for supply of gaseous fuels IS 14885 (latest edition).

3. **MATERIAL REQUISITION**

Not Applicable

4. **QUALITY ASSURANCE (QA)**

Manufacturer to submit their Quality Assurance Plan (QAP) for the approval of Owner.

5. **DEFECT LIABILITY PERIOD**

Defect liability period shall be as per the GCC, Cl. No. 15 & 16 of commercial volume I of II.

6. **PACKAGING**

All the MDPE fittings of more than one piece shall be kept in a single box/packets according to type and size during 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. The material for each SOR Item is essentially required to be packed in one case/packet /box.

**AMENDMENT TO GTS 70000/740/GTS/0011**

3.2 **ADD**

Branch piping/tapping saddle of all sizes, shall be supplied along with integral PE Clamp which is to ensure sufficient pressure welding and is to be left in place.

After the welding. Further, the upper shell of the tapping tee shall be a single piece to avoid dual welds.

5.2 **ADD**

The raw material PE, used for accessory production, is in compliance with all prescription in EN 1555-1 standards.

The raw material shall be virgin material belonging to class PE 100

The following are strictly forbidden:

- Use of recycled raw materials
- Mixing of different raw materials
- The addition of supplementary additives to the raw material.

### **5.2.1 ADD**

Material and end connection of transition fittings shall be as per PTS/GTS.

### **6.3 REPLACE**

All accessories shall be of black colour.

### **6.5.2 REPLACE**

Classification

Electro fusion accessories are divided into three classes according to the voltage and/or current characteristics.

**Class A** Electrical supply based on voltage set between 8V and 42 V

**Class B** Electrical supply based on voltage set between 42 V and 220 V

**Class C** Electrical supply based on power supply settings.

All supplies, unless otherwise stipulated in the order, concern Class A accessories.

Unless stipulated otherwise in the order, only “wrap-around” saddles can be supplied (refer to par. 3.2.)

Unless otherwise agreed between Tractebel and the supplier, all electrofusion

Accessories must be “single wire“ type.

### **6.5.3 REPLACE**

Connector (terminal pin) 4.0 mm/4.7mm shall be required.

### **6.6 REPLACE**

The support drilling equipment to be designed so that during drilling the maximum immediate leak flow will never exceed 200 litres per hour at 5 bar pressure, in the main pipe. According to this flow rate, the supports are divided into two categories:- models 1 and 2 (refer to par. 3.2.) The required model will be specified when ordered.

The bell drill is equipped with a maneuver opening for the insertion of a requisite (range may vary from 5 mm to 21mm) hexagonal spanner/Allen Key.

The bell drill path is limited at the top by a limit block.

The drill mechanism is designed so that no additional tools (except the hexagonal spanner/Allen Key) are required for carrying out drilling operations. On placement of order the proposed sizes of hexagonal spanner/Allen Key required for various sizes of Tapping Saddle shall be informed by the bidder along with drawing of particular saddle for approval of GGL.

## 6.7 REPLACE

Flow M3/hr	Saddle type	Maximum load loss Mbar
10	32x20	1.0
10	63x20	1.0
10	63x32	1.0
10	90x32	1.0
40	90x63	1.0
10	125x32	1.0
40	125x63	1.0
40	125x90	1.0

## 12 REPLACE

All electro fusion accessories must be printed with a bar code or bar code with an individual magnetic card (manual setting information for data transfer purposes must be supplied in bar code). The magnetic card contains the welding parameters that have been encoded in the magnetic track, as well as the bar code printed on the card. Coding must be carried out according to prescriptions included in ISO TR 13950 standards. The bar codes shall be laminated to ensure that the details are not damaged or erased.

### **AMENDMENT TO GTS 70000/740/GTS/0012**

#### 1 REPLACE

~~The Compounds that meet this specification must be PE 100.~~

~~The colour shall be black.~~

#### ~~3.2~~ **ADD**

~~Minimum Required Strength (MRS 10)~~

~~Standardized class of compounds for which the LCL is equal to 10~~

#### ~~3.3~~ **ADD**

~~PE 100~~

~~Standard designation for PE compounds in class MRS 10~~

#### ~~4.0~~ **ADD**

~~The PE compounds that are acceptable according to the requirements of this specification must conform to the requirements for PE 100 described in pr EN 1555-1.~~

### **AMENDMENT TO GTS 70000/740/GTS/0015**



**1.0 ADD**

It applies to bidirectional valves with spigot ends or electro fusion sockets intended to be fused with polyethylene pipes in accordance with the IS 14885 PE pipe specification and with spigot fittings in accordance with the TBL 70000/740/GTS/0011.

**3.7 ADD**

Base Plate

Model 2 is applicable for present project.

**6.2 ADD**

The valve will be designed for a maximum operating pressure (MOP) equal to 10 bar.

**6.3 ADD**

BULLET: 2

The colour of the PE valve shall be black/yellow.

**7.4 REPLACE**

**PRESSURE DROP AT LOW PRESSURE**

<b>Nominal diameter DN</b>	<b>Flow M3/hr</b>
32	10
63	60
90	180
125	450

**8.0 ADD**

Marking

- b) Material and designation (e.g. PE 80)

DELETE

- f) Traceability Code (Valve and Component as per standard ISO/FDIS 12176-4)

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