CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR AND BAREILLY

PTS - LAYING OF POLYETHYLENE MAIN PIPELINES AND SERVICE PIPELINE FOR KANPUR AND BAREILLY

HIRING OF ADDITIONAL CONTRACTORS FOR CONNECTING PNG DOMESTIC CONNECTION IN KANPUR (INCLUDING UNNAO) & BAREILLY

BID DOCUMENT NO.: CUGL/C&P/TEN2021/20,219,042

TECHNICAL TENDER (VOLUME II OF II)

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1.0 GENERAL INFORMATION

Central UP Gas Limited (CUGL), a joint venture of Bharat Petrolium Corporation Limited (BPCL) and GAIL (India). CUGL plans to install an underground Natural Gas Distribution network in Kanpur, Unnao & Bareilly. The objective is to supply Natural Gas to both Domestic & Commercial customers, and to provide compressed gas as a fuel for Automobiles. CUGL is seeking Contractors to assist in meeting the above objective.

The main scope of this Specification comprises of laying of underground Medium Density Polyethylene (MDPE) main pipelines and service pipeline. The scope covers all the activities associated with the purchasing (specified items only), laying, testing and commissioning of MDPE main pipelines and service pipelines in new & existing gas charged areas of sizes ranging from 20mm upto 125 mm OD, which includes PE/GI transition fitting above ground level.

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

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

2.0 DEFINITIONS

Owner	Central UP Gas Limited (CUGL),
PMC	Tractebel Engineering Pvt Ltd.
PTS	Present <<Particular Technical Specification>>and its entire appendix, if any.
TPIA	Third Party Inspection Agency to be appointed by CUGL.
EIC	Engineer – in – charge

3.0 SCOPE OF WORK

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

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

3.2 Prior to start of construction activity, contractor shall prepare route survey drawing marked for proposed gas pipe line laying and submit to CUGL/PMC for approval.

3.3 Co-ordination /Liaison from respective land owning agencies such as CPWD, Development Authority, NHAI, Nagar Nigam, Railways, Forest, AAI, Irrigation etc. for road cutting for laying of the pipelines, Liaison with the concerned authorities during execution of the job, obtaining NOC from concerned authorities once the work is completed. Getting back/Refund of Bank Guarantee/security deposits made to the agencies for laying of the pipelines.

3.4 Obtaining clearances and coordination with concerned RWA of the allotted area for internal network laying.

3.5 Proper storing, stacking, providing security, insurance cover during storage, laying, commissioning and handing over the pipelines to Owner.

3.6 Making trial pits to determine the underground utilities/services such as existing pipelines, Cables (Electrical/Communication), Conduits, U/G drainage, Sewers, tunnels, Subways foundations etc. for deciding optimum feasible route and depths for laying the pipelines based on the route plans indicated by Owner.

3.7 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.

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

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

3.10 Unloading/stringing the MDPE pipes of required sizes (i.e. 125, 90, 63, 32 & 20 mm) pipes into trenches as per approved procedure.

3.11 Joining the pipe ends with fittings & valves by approved automated electro-fusion techniques only as per Tender Specification.

3.12 Supply & Installation of pipe fittings like elbow, tees, reducers, couplers, tapping saddles, transition fittings, valves etc., including construction of supports, valves pits, inspection chambers etc. as per specification & satisfaction to the EIC.

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

3.14 Fabrication, Supply and Inspection of good quality of GI sleeve and half concrete sleeves and other materials, fittings to be supplied by the contractors as per the provisions of tender.

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

3.16 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.

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

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

3.19 Restoration of existing ground features such as grass/turfing, paving, roads, drains, concrete, floral beds, fencing, tiles, marbles, flooring masonary etc. to original condition and to match with adjoining conditions, functionally and aesthetically up to the entire satisfaction of Owner / Owner's representative /any other Third Party agency designated by Owner and local authorities, failing which, it will be done at the risk and cost of the contractor. Obtaining satisfactory completion certificates form the restoration work done from the concerned authorities.

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

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

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

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

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

4.0 MATERIAL, MANPOWER, EQUIPMENT AND MACHINERY

4.1 Material, Procurement and Supply

Material to be Supplied by Owner as Free Issue

4.2 Unless otherwise specified, Owner will supply following material such as MDPE pipes & MDPE Fittings, MDPE valves (of all sizes) and all materials other than mentioned above shall be supplied by contractor as per attached technical specification to complete the laying of gas main pipelines and service pipelines.

4.3 The free issue material shall not be procured from any other source by contractor.

Material reconciliation statement of free issue material duly certified by Owner and PMC shall be submitted to CUGL on monthly basis.

4.4 **Material to be supplied by the contractor**: The supply of items as indicated in **SOR** shall be strictly as per relevant Technical Specifications enclosed with the Tender and as per guidelines of various clauses of SCC and **SOR**. All materials shall be handled safely and stored in a permanent, covered, lockable store/ ware house preferably near site in such a manner as to prevent any damage to the

materials from scratching, gouging, indentation, excessive heat or by contact with any sharp objects or chemicals. The MDPE pipes and fittings shall be stored in covered storage to protect material from sunshine, rain etc.

4.5 Backfilling material

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

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

4.7 **Other Materials** :The Contractor shall supply the following items wherever required:

- All materials required for framework, trench support and temporary trench crossings.
- All sign boards, barricades, tin sheets, lighting arrangement and protective equipment.
- All minor items not mentioned in the Contract but necessary for the satisfactory completion and performance of the Work under this Contract.
- Material required for installation of valve chambers.
- GI/ Half Round Concrete Sleeves. (Refer enclosed drawing)
- Permanent markers with foundation (Refer enclosed drawing)

4.8 Manpower

The Contractor shall provide the skilled labour, tools, material and equipment necessary for the proper execution of the Work.

4.9 Equipment, Machinery & Tools

This will include but is not limited to the list of specialized items included in Annexure # 1.

4.10 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.

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

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

4.12 Acquisition, Receipt & Storage of Materials

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

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

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

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

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

In case of non-submission of material reconciliation on first week of every month, applicable penalties shall be levied as per SCC from the running bills.

5.0 PROGRESS OF WORK

The contractor shall proceed with the work under the contract with due expedition and without delay. The EIC may direct in what order and at what time, the various stages or parts of the work under the Contract shall be performed. Contractor has to regularly submit daily progress reports, weekly

progress reports, graphs with utilities, testing reports, material consumption and inventory reports, deviation statements, completion schedule etc.

6.0 CO-ORDINATION/LIAISON FOR PIPELINE LAYING

Contractor has to CO-ORDINATE from statutory bodies for laying of pipelines. Statutory bodies in this case are NHAI, CPWD, Indian Railways, Development Authorities, Nagar Nigam, AAI, Forest, Irrigation and any other Government Agencies who maintains the public lands and accord permissions for laying of the utilities. The contractor shall obtain demand note (Road Restoration charges / Departmental charges / security deposit / Bank guarantees) from these statutory bodies. Contractor shall ensure that the Road Restoration Charges / Departmental charges / security deposit / Bank guarantees are to the minimum against the work to be carried out. CUGL may return back the demand note, if the Road Restoration charges are not found reasonable then CUGL shall not be liable to pay any Road Restoration Charges against the same to Concern Authority.

However, CUGL will pay the road restoration / Departmental charges / security deposit / Bank guarantees for getting the clearances from statutory bodies. It is the contractor's responsibility to inform and co-ordinate the concerned local authorities and also other utility agencies before and after the commencement of work at site. To ensure smooth execution of the work on a day-do-day basis, the contractor has to liaison with respective authorities. The contractor shall plan and ensure that work taken up under a single permission shall be completed within the stipulated time period and revalidation process is avoided. No separate Road Restoration Charges are liable to CUGL for revalidation cases.

It is the responsibility of the contractor to obtain "No Objection Certificate" (NOC) from land owing agencies/Statutory bodies after completion of the restoration to their satisfaction and getting released the security deposit / bank guarantees submitted by CUGL for obtaining permissions on production of documentary evidence.

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

In case contractor delays laying of pipeline work under a single permission, the work or part of work may be offloaded to some other contractor on his risk and cost.

Any change / addition required to be made to meet the requirements of the statutory authorities shall be carried out by the contractor without any extra cost to CUGL. The inspection and acceptance of the work by statutory authorities shall however, not absolve the contract from any of his responsibilities under this contract

7.0 REFERENCE SPECIFICATION, CODES AND STANDARD

The contractor shall carry out the work in accordance with the requirement of latest relevant applicable standards, this specification, Owner's Engineering Standards; relevant Oil Indian Safety

Directorate (OISD) norms, PNGRB Regulations, ASME B31.8-Gas Transmission and Distribution Piping Systems; Australian Standard 3723-Installation and Maintenance of Plastics Pipe Systems for Gas; and the American Gas Association Document – Purging Principles and Practice. ISO-4437/IS: 14885 for underground polyethylene pipes and OWNER's approved procedures.

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

8.0 QUALITY OF WORK

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

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

Fusion operators and other skilled personnel shall be approved by Owner / Owner's representative 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 Electro fusion jointing of MDPE Pipes & Fittings. CUGL may provide Training and certification on chargeable basis where the cost shall be borne by contractor.

9.0 SAFETY

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

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

9.3 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.

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

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

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

9.7 For further details Refer "Special Terms and conditions of Contract" and attached PTS.

10.0 ROUTE SURVEY

10.1 Planning, detailing the size, underground utilities, foreign pipelines, crossings, and location of valve chamber, FRS / DRS / MRS as well as service line location.

10.2 Main lines

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

10.3 Service lines

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

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

11.0 ORGANISATION STRUCTURE

11.1 Contractor shall designate Project Manager / Coordinator who will be responsible to interact with EIC/Consultant/TPIA and authorized to attend review meetings, receive material, authorized to sign documents, claims and receive payments etc. Contractor shall employ a Project Manager / Coordinator on company roll. The Project Manager / Coordinator must have qualification of BE / Diploma in Engg. with min. 5 - 8 years of work experience in gas pipeline job respectively. He shall be single point of contact for all the works and must represent company in the review meetings.

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

11.3 The contractor will deploy his own supervisors as directed by site engineers/EIC. These personnel will be reporting to the Site Engineer for monitoring construction standards and for ensuring that all technical requirements are met for the job being carried out. The contractor's supervisor(s) will have

day-to-day liaison with the Site Engineer, and will provide the Site Engineer with technical reports and audits, and other management information as is required on work progress and construction quality standards.

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

12.0 STRUCTURES, SERVICES AND OTHER PROPERTY

12.1 Location of Underground Utilities

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

In addition, the contractor shall excavate trial pits as necessary to determine the pipe route. The number of trial pits will be agreed with the Site Engineer in advance of any excavation. In any event, trial pits shall be made at intervals of a maximum of 30 meters. Restoration of the abandoned trial pits and trenches shall be the contractor's responsibility. No payments shall be made for such type of jobs. The trial pits shall be excavated to minimum depth of 1.5 meters so as to locate any utilities present in the trench.

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

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

12.2 Protection of Structures and Utilities

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

particular operations or kind of work. Special care shall be taken while laying of pipelines near the trees.

12.3 Interference with Traffic, Street Drainage and General Public

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

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

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

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

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

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

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

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

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

13.0 TRENCHING

The schematic drawing with the details of trench is enclosed in the tender as per.

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

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

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

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

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

13.1 Depth of Trench

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

In case of crossing of water bodies the minimum depth shall be measured from the top of the pipe to the bottom of Scour level.

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

For Distribution and service lines

- Minor Water Crossing/Canal 2.5 meter

- Uncased/Cased Road Crossing 1.5 meter
- Rail/Road Cased Crossing 1.5 meter
- Normal Areas 1.0 meter

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

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

In case, the depth could not be achieved due to practical problems and the same is demonstrated, EIC after examining thoroughly and considering the codes and standards may allow the contractor to provide suitable protection by way of concrete casing pipes or slabs without any extra cost to Owner.

13.2 Width of Trench

The width of the trench shall be wide enough to provide bedding around the pipe as specified and to prevent damage to the pipe inside the trench. Unless otherwise directed by the EIC and where ground conditions permit, the minimum distance from the inside edge of the trench wall to the outside of the pipe shall be as per the Drawing.

13.3 Trench Base

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

In case trenching is done in rocky terrain, a bedding of soft soil or sand shall be provided in the trench base to the satisfaction of EIC.

Hard Rock:

Hard rock is defined as trench material with a single piece of rock, dimension exceeding 1.0 m in any direction, which requires cutting only by use of chisel / pneumatic chisel / drill or sledge hammer or removal of the same by additional excavation. Additional rates shall be payable for hard rock excavation as per the **SOR item no. 04** over and above the pipeline laying rates. Excavation through soil mixed with small boulders that have been used for a road base will not be considered as hard rock for the purpose of payment.

13.4 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/utilities in the vicinity of the Works.

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

- 300mm where the gas pipe is on a similar alignment to the other assets/utilities.

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

13.5 Under Ground Interferences

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

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

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

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

13.6 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' jurisdiction and/or Owner.

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

The paving shall be 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 trenches is required at the approaches to crossings of roadways, railroads, rivers, streams, drainage and ditches without any extra cost implication to Owner.

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

The trench shall be cut to a grade that will provide a firm, uniform and continuous support for the pipe.

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

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

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

13.7 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 Site Engineer. The packing sand shall be placed to a minimum thickness of 150mm around the pipe in case of rocky terrain.

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

14.0 LAYING

Main line

Laying of MDPE pipelines shall be commenced only after ensuring proper dimensions and clean surface of the trench. The trench bottom shall be free from the presence of cuts, stones, roots, debris, stakes, rock projections up to 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.

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

In case of open cuts where two pipes are to be laid parallel in same trench or same pits, 30% of the respective SOR of the lower pipe size for the laid length shall be paid in additionally to the rates applicable to the higher pipe size.

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

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

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

Contractor to ensure majority (up to 70% of the available potential) of service lines for connecting houses shall be laid at first instance of internal network laying, however any slippage / deviation shall be submitted with consents for approval from EIC/PMC

In case of service lines, EIC shall decide either half round concrete sleeve or GI pipe sleeve shall be installed at any particular site depending upon site condition. The half round concrete sleeve shall be preferred over GI Sleeve, however in case where the installation of half round Concrete Sleeve is not possible due to technical feasibility and site conditions, GI sleeves shall be installed only after written approval from EIC. The rate of GI Sleeve / half round concrete sleeve shall be included in laying of 20/32 mm dia., depending upon surface conditions. The details are mentioned below:

GI Sleeve:

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

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

Half Round Concrete Sleeve:

The installation of Half Round Concrete sleeve for service lines shall be done by sealing the annulus between pipe and sleeve, firm fixing of the Concrete sleeves by concrete mix pedestal, clamping, sand filling, etc. Half round concrete sleeve shall be made as per attached drawing. The dimensions shown are tentative and may vary depending upon the site conditions. The material shall be inspected by TPIA / PMC at the fabrication stage & prior to final dispatch at site for installation. The material test certificates/ inspection reports shall be submitted at the time of submission of bill.

15.0 JOINTING OF POLYETHYLENE PIPE

The procedure for jointing of PE pipes and fittings shall be as per PTS. Only Bar coded electro-fusion machine (Automatically Readable) that can read the bar code of the fittings automatically shall be used for joining of the MDPE pipes/fittings. Manual feeding Electro-fusion machines are not acceptable for jointing purpose. **The contractor has to submit the certificate of calibration of Fusion machine at the time of start of work and at fixed intervals as per the instructions of Owner. Contractor shall ensure that the machines are always available at site. No stoppage of work due to the non availability of machines shall be allowed.**

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

The Contractor shall ensure that polyethylene pipe is only cut with an approved plastic pipe-cutting tool (Rotary Cutter up to 63mm/Guillotine Cutter for 63mm and above). Before fusion is attempted, the contractor shall remove the oxidised surface of the pipe using Universal Scrapper up to 63mm/Rotary Peeler for 63 mm and above before inserting into the electro-fusion coupler. The tool must remove a layer of 0.1mm to 0.4mm from the outer surface of the polyethylene pipe. No fusion will be allowed without clamping device and the approved cutting tools (Hack saw shall not be allowed for cutting the pipe).

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

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

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

Only, approved Jointers shall carry out fusion of all joints. Contractors shall provide the list of jointers to be used on the job and make arrangements for Qualification Testing of the jointers in presence of Owner / Owner's representative as per the standard procedures. All approved Jointers shall bear identity cards signed by Owner / Owner's representative during fusion job and shall furnish the same on demand by Owner / Owner's representative.

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

16.0 BACKFILLING

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

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

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

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

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

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

backfill material has been placed, provided the rock placed in the ditch will not interfere with the use of the land by landowner, or tenant.

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

When the trench has been dug through driveways or roads, all backfilling shall be executed with sand/suitable material in layers as approved by Owner /Owner's representative and shall be thoroughly compacted. Special compaction methods as specified may be adopted. All costs incurred there upon shall be borne by the Contractor.

Trenches excavated in dikes which are the properties of railways or which are parts of main roads shall be graded and backfilled in their original profile and condition. If necessary, new and/or special backfill materials shall be supplied and worked-up to.

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

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

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

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

17.0 TRENCHLESS LAYING (ONLY FOR 63 MM)

Both Manual Moling and HDD are to be considered as methods of trenchless laying and are payable under 1.C for 63mm diameter pipeline only.

Manual Moling

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

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

The length of the Hole (excluding the sizes of the pits on both ends) shall be considered for the measurement of Moling length.

The usage of casing pipe will be decided by EIC at the time of final approval for crossing/laying.

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

HDD (Horizontal Directional Drilling)

HDD is required to be carried out where conventional trenching/Moling is not possible viz. major waterways, highways, roads, congested areas etc. The Contractor shall obtain details of such crossings and the Contractor in consultation with Owner shall prepare construction drawings.

Execution of the work shall be based on the Owner / Owner's representative approved drawings. The contractor has to do the thorough survey of the underground utilities before commencement of HDD to avoid the damage to the other utilities. No other extra payment will be made for any trail/abandoned pits made during the survey. The supply of all equipment required for carrying out the HDD is in contractor's scope. The HDD operation shall be carried out in accordance with API-1102. The type and availability of machines is sole responsibility of the contractor and as per the site conditions & requirements to entire satisfaction of EIC.

Once the work is allotted, any delay in mobilising / non – availability of HDD machines as per site requirement and conditions shall result in levying of penalties on daily basis as per contract. However, in such cases, owner may mobilise HDD machines and carry out execution of work on the contractor's risk and cost.

The length of the Hole (excluding the sizes of the pits on both ends) shall be considered for the measurement of HDD length and is payable as per **SOR item no. 1** The type of HDD to be carried out with or without casing shall be at the discretion of Owner and prior approval is to be taken from EIC before starting. The rates are inclusive of excavation of pits, jointing, pilot boring, bentonite cleaning, reaming, insertion of carrier pipe, backfilling, compaction, etc.

As per the specification, HDD to be carried out with or without casing pipe depends on the type of crossing. Any damages occurred to other utilities during the HDD operation shall be immediately notified and rectified by the contractor without any cost implication to OWNER.

HDD profiles should be properly marked/ recorded in graphs as per scale before it is drafted in the as built drawing.

Casing Pipe

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

S. No.	MDPE Carrier Pipe Dia. size (mm)	Min. Dia. of HDPE Casing Pipe (mm)	Max. Dia. of HDPE Casing Pipe (mm)
1	32	50	90
2	63	110	160
4	125	200	250

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

18.0 RESTORATION

Wherever the restoration to the original surface condition is in the scope of Owner or as directed by EIC, all roads, footpaths (including roads and footpaths inside colonies) shall be restored to its original condition and the same shall be done as per CPWD/IRC/Nagar Nigam norms and to the satisfaction of the concerned local Authority/Third Party Agencies designated by Owner. To retard curing of the installed concrete, wet sackcloth is to be placed on the finished surface and kept damp for a period of 7 days.

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

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

The procedure for restoration of Road/Footpath, placed at Annexure # 2, is only indicative. However, the restoration shall be done in accordance with the norms of the concerned Land owning agencies i.e. PWD/Nagar Nigam/ Land owing authorities.

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

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

Payment of restoration shall be paid as per **SOR item no. 12**. Further, the rate of restoration includes any types of surface excluding Kaccha portion etc.

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

Contractor has to obtain the No Objection Certificate (NOC) from the concerned local authorities/RWA/Nagar Nigam/ PWD/Land Owing 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 the latest version CPWD/IRC specification to its original condition and also to the entire satisfaction of landowner (Private/Public).

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

19.0 TESTING

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

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

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

For main line, the test duration shall be 24 hrs. with stabilization period of 30 minutes after pressurization. Then only the holding period may commence and continue for 24 hours. Measuring instruments shall have been calibrated and their accuracy and sensitivity confirmed before the start of testing, where in, calibrated pressure gauges of suitable range shall be supplied by the contractor. The pressure gauges shall be calibrated from time to time as desired by EIC.

All testing shall be witnessed and approved by the EIC or his delegated representative. Tie-in joints may be tested at working pressure following commissioning.

In special cases, where the mainline or service line length is less than 500 mtrs. holding period for testing may be reduced to 4 hrs with stabilisation period of 15 minutes.

For service lines, in some cases, testing shall be carried out independently than of mains for which the test duration may be reduced to 4 hrs. The service line testing in this case will be performed after the service line installation is complete but before the service line tee has been tapped for gas charging.

20.0 PURGING

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

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

In addition, the Contractor shall submit purging plan and get approval from Owner / Owner representative before commencing any purging work. The Plan shall include, but not be limited to the provision of the following materials and equipment: Personal Safety Equipment, Fire Extinguisher, Purging Adaptor, Purge stack with flame trap and gas sampling point, Gas sampling equipment (may be gas leak detector), squash-off tool, Polyethylene connecting pipe.

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

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

21.0 VALVE CHAMBERS

Valve Chambers (RCC/Brick Wall) shall be constructed as per drawing. Pre-fabricated valve chambers with same dimensions are also allowed however the final designing and specifications shall be approved by EIC/PMC before start of production, without any extra cost to owner.

Payment for the construction of valve chamber (Brick or RCC) shall be as per **SOR item No. 10.** The construction of the valve chambers shall be taken up immediately after installation of valve, before commissioning of the pipeline network.

If required, it may also be instructed for construction of new valve chambers on existing gas charged pipeline before or after Gas charging for extensions or new pipeline network.

The location for construction of valve chamber shall be proposed by contractor and approved by EIC/PMC before start extension / new MDPE network.

Materials for Valve Pit

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

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 laid pipe. Gunny bags and Sand should be of approved quality.
- PCC to be placed below the pipe as indicated. Once PCC is set sand is to be filled and properly rammed so that pipe and pre-cast concrete blocks are firmly place.
- Valve will be supplied without the operating stem. Approved quality sand is to be placed in between area. The supply of sand is included in the rates.
- Surrounding area to be properly cleared and PCC to be placed around the location where pre-cast slab with RCC Manhole cover is placed. The RCC pre-cast slab to be laid in level and finished smooth.

22.0 PERMANENT MARKERS

22.1 Permanent Markers (As per Drawings enclosed with the tender document) shall be Fabricated, supplied and 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 contractor shall also ensure that a sample of all type of markers shall be inspected and approved by Owner / Owner representative before shipment of the lot at site and prior to installation at the site. The inspection of all types of markers shall be carried out lot wise.

22.2 The RCC Markers shall be painted before installation as per the approved procedure. Whereas the Pole marker (Markers with foundation) are to be supplied with powder coated Golden Yellow paint. The supply of the paint and application as per the specification is in contractor's scope. Payment

shall be paid as per relevant **SOR item no. 05 a, b, c**. Contractor shall obtain the approval lot wise & before installation at site from the PMC / TPIA.

22.3 **Guidelines for Marker installation:**

- The installation of these markers shall be such that in between two Pole markers two RCC markers are installed with equal spacing of 50 mtrs. on either sides. However, Pole markers shall be installed at all the Tapping /Branching points in the mainline.

- Interval between any two markers for mainline (for 32 mm up to 125 mm) shall not be more than 50m.

- A Pole marker shall be installed next to valve chamber on Mainline & internal network for apartments/pockets respectively for indication.

- Pole markers with foundations (Drawing Attached) shall be installed after every two RCC route marker (Drawing attached)

- Every entry and exit pits for laying of pipeline by HDD

- Road crossings shall be marked by Pole markers or RCC markers depending upon the site conditions.

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

- For the distribution network, 32mm & 20mm pipe, plate markers shall be installed as per the site conditions and directions of the Site-in-Charge.

22.4 The artwork is typical for all the markers, with Owner's logo on it. The contractor must take prior approval for the artwork from EIC before installation of Markers. The lot wise approval shall be attached with bills.

23.0 ASSISTANCE IN COMMISSIONING

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

24.0 STANDARD OF WORK

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

manpower deployed on the respective work shall be adequately trained and 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.

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

25.0 RECORDING (AS-BUILT DRAWINGS)

The following points shall be taken care to the preparation of as built drawings.

a) The as laid drawings should be in the scale and shall be submitted in an sheet in A-0/A-1. The drawings shall be in layers according the AUTOCAD features category.

b) Pipeline feature shall be shown as a continuous line, breaks only at joints, fittings, valves, tee point, etc. Diameter, Pipe material, length, and location of pipeline whether on the road or footpath, should be clearly indicated.

c) Distance of pipeline from permanent property/structure should be provided at least every 20 metres. If there is any change in alignment / orientation and offset distances etc. Of the pipeline in between the above said 20 mtr, the same shall be dearly mentioned in the as laids. Gas objects (off valves, tees, elbows, couplers, transition fittings etc.,) shall be shown as block objects (which form a single node to connect) with respect to Owner symbols / legend. The As laid drawings shall be as per the approved legends provided by EIC.

d) Details & offset distances from other utilities present (e.g. BSES, DJB etc.) should be given in as laid drawing. If there is any change in depth of the pipeline, the same shall be clearly marked with details in the as laids drawings. The details (material, size &.Length) of additional protection provided to pipeline shall also be clearly indicated.

e) Details of the PE stop off valves &. Other fittings used (i.e. tees, elbows, couplers, transition fittings, etc.) should be shown with adequate information orientation &. Offsets from permanent structures in the immediate vicinity.

f) Technical deviations (if any) should be provided with reference to the buildings permanent structures around, and the same should be cited clearly with all the relevant details, including separate sketches/Blowups / sectioned drawings / exploded view.

g) Total as laid-length (size wise), bill of materials should be mentioned in each sheet.

h) Complete details of nallah crossings should be shown in a separate sketch.

i) Names of roads, major landmarks and buildings should be mentioned appropriately for reference.

j) Proper chainage shall be mentioned on all the drawings to be referred with continuation reference.

k) Direction of gas flow shall be indicated in each of the drawings.

l) Text on the as laid drawing should be clearly visible.

m) Land base features shown on the drawing shall match the exact distance as they were on real ground with respect to scale.

n) As laid drawings shall be duly signed & stamped by area TPIA / PMC.

o) The details shall be prepared in standard format using MAP INFO/AUTOCAD MAP and submitted CD RAM. Contractor shall also make the item wise material consumption report for the respective areas in a soft copy and to be submitted along with the as-built drawings

26.0 CIVIL WORKS

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

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

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

ANNEXURE # 1

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

Sl. No.	Equipment Details	Indicative Requirement (In Nos.)
1	Automated Electro Fusion Machine	2
2	Voltage Stabilizer	2
3	Generator (5.5 KVA)	2
4	Moling Equipment (for all sizes)	As and when required
5	HDD Machines & Equipment (for all types & sizes)	As and when required
6	Squeeze Tools (Manual) upto 90 mm	4
7	Squeeze Tools (Hydraulic) from 63 mm upto 125 mm	2
8	Rotary Peelers	2
9	Universal Scrapers	2
10	Tapping Tools/Allen Keys	Three sets of all sizes
11	Pipe Cutter (Round)	2
12	Pipe Cutter (Guillotine)	2
13	Gas Detection Unit	As and when required
14	Cable and Pipe Locator	As and when required
16	Pipe Alignment Clamps	2
17	Joining Clamps for Coupler (All sizes)	2
18	Joining Clamps for Saddle (All sizes)	2
19	Pipe Straightener	2

20	Re-rounding Tools (All sizes)	2
21	Jumping Jack Compactor	As and when required
22	Roller for Asphalting	As and when required
23	Calibrated Pressure Gauges (0-10 Bar)*	10
24	Water Tankers	As and when required
25	Heating Element for HDPE Butt Joint along with clamping, roller and other accessories.	As and when required

Note: * All Pressure Gauges (0-10 Bar) shall be calibrated at every Six months

ANNEXURE # 2

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

1.0 PURPOSE AND OBJECTIVE

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

2.0 DOCUMENTS/FILES TO BE MAINTAINED:

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

- Copy of permission letter obtained from LMC & AMC.
- Drawing/Sketch showing the details of stretch to be cut, highlighting the type of surfaces and its chainage/length (area).
- Stage wise Photographs of the stretch.
- Test Certificates of the Construction materials to be used.
- Routine Test Certificates for construction materials during progress of job.

3.0 RESTORATION OF TRENCHES/PITS

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

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

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

Sl. No.	Surface Types	Specification Recommended
1	Cement Concrete Surface	Top Surface – PCC 1:2:4, 100 mm Thick Compacted with Plate Vibrator shall be laid over base course. Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth.
2	Brick Soiling	Top Surface – Brick Soiling (as per original type) shall be laid over base course. Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth.
3	Interlocking CC Paver Block	Top Surface – Interlocking CC Paver Blocks (as per original type) shall be laid over compacted fine sand 50 mm Thick over base course. Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth.
4	Chequered Cement Concrete Tiles/Pre-cast CC Tiles/Kota Stone Floor/Red Stone Floor	Top Surface – Tiles/Floor (as per original type) shall be laid over Cement Sand Mortar 1:6, 20mm Thick over base course, Joints shall be pointed/finished to match colour.

		Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth.
5	Bituminous Surface (for Category D Roads i.e.; Roads less than 13.70 M width)	Top Surface – 40mm Thick Bituminous Concrete (as per original type) shall be laid over PCC 1:2:4, 100 mm Thick over base course. Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth.
6	Bituminous Surface (for Category C Roads i.e.; Roads less than 18 M width but greater than 13.70 M width.)	Top Surface – 40mm Thick Bituminous Concrete (as per original type) shall be laid over PCC 1:2:4, 150mm Thick over base course. Base Course – PCC 1:5:10, 150 mm Thick laid over compacted backfilled earth.

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

NOTE:

Wherever the Bituminous portion is cut in small patches or isolated locations where area of Bituminous portion is very less due to constraints like other utilities, the surface shall be restored, same as specified for the cement concrete surface, with prior approval of EIC/TPI.

4.0 TESTING OF CONSTRUCTION MATERIALS

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

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

		organic impurities, moisture contents and specific gravity		regularly as directed
4	Fine Aggregates	Sieve analysis, clay silt and moisture contents and specific gravity	As per IS: 2386	One test per source of supply and routine test regularly as directed

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

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

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

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

5.0 INSPECTION BY THIRD PARTY INSPECTION AGENCIES (TPIA) NOMINATED BY LAND OWNING AGENCIES

It is the responsibility of the contractor to give inspection call, at least one week in advance to OWNER/PMC, to arrange for inspection by TPI nominated by land owning agencies along with the file containing all documents mentioned in Clause No. 2 of this document. Before inspection by TPI nominated by land owning agencies, contractor has to arrange for the inspection of the restored area by OWNER/PMC/TPI and get the work certified. Contractor has to arrange for all necessary equipment, tools & tackles, labour for carrying out the inspection of the restored area. It is the responsibility of the contractor to obtain "No Objection Certificate" (NOC) from the TPI nominated by the land owning agencies and further NOC from Land Owning Agencies and to get the securities/Bank Guarantees paid to them, for obtaining the permissions

CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR & BAREILLY

INTRODUCTION

1.0 INTRODUCTION

Central UP Gas Limited (CUGL) is a joint venture company of Gail and BPCL is responsible for distribution of Natural Gas for household, commercial & Industrial sectors including setting up CNG refuelling stations for vehicles etc. in Kanpur (including Unnao) and Bareilly.

Central UP Gas Limited (CUGL) (hereinafter referred as Owner), is supplying Piped Natural Gas (PNG) to Domestic, Commercial and Industrial consumers and Compressed Natural Gas (CNG) to automobiles in Kanpur, Unnao and Bareilly cities of Uttar Pradesh through its CGD and CNG networks. CUGL intends to develop its CGD and CNG network in KANPUR, UNNAO & BAREILLY to supply Natural gas to Domestic, Commercial consumers through PE network and to new CNG stations through Steel pipeline network by setting up new facilities.

CUGL is now inviting tenders on Competitive Bidding basis for MDPE laying and GI/Cu installation with associated works for the connectivity of PNG customers.

CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR & BAREILLY

PTS - INSTALLATION OF ABOVE GROUND GI/COPPER PIPING & FITTINGS– THREADED FOR KANPUR & BAREILLY

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27.0 GENERAL INFORMATION

1.1 Introduction

CENTRAL UP GAS LIMITED (CUGL) plans to augment PNG network. It supplies natural gas to domestic & commercial consumers in the city of Kanpur, Unnao& Bareilly

The main scope of this contract comprises the installation of above ground pipes from the outlet of 'PE/GI transition fitting' up to the domestic/commercial Customers 'Appliance/stove/oven valve' as per the Distribution schedule placed in enclosed drawing in New as well as in Existing Gas charged areas.

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

Except domestic meter, regulator, Isolation and appliance valve, Contractor shall procure the each material (GI pipe, GI fittings, Cu pipe, Cu/Brass fittings, Corrugated Flexible metal Hose (Anaconda) Steel Reinforced Rubber Hose etc.) which is required from the outlet of PE / GI transition fitting up to the Domestic / commercial customers " Appliance / stove / oven valve.

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

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

28.0 DEFINITIONS

OWNER	Central UP Gas Ltd., CUGL
PMC	Tractebel Engineering Private Ltd.,
PTS	Present <<Particular Technical Specification>>and its entire appendix, if any.
TPIA	Third Party Inspection Agency
EIC	Engineer – in – charge

29.0 SCOPE OF WORK

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

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

29.2 **Contractor shall liaison with house owner /RWA / society and takes the registrations from house owner /RWA / society and submits the complete registration form to CUGL and generate the Business partner no before conversion. For the registration payments shall be made according to relevant SOR**

29.3 Contractor shall submit the QCT/procedure/drawing etc. of all the material to be procured by him for approval before procuring the items. If, QCT/procedure/drawing etc. are not approved from client/consultant then owner has the authority to refuse /reject the same lot material.

29.4 Receipt of regulators, domestic meters, Isolation and Appliance Valve as a free issue items from Owner's stores, loading, transportation, unloads at project site. Proper storing, stacking, identification, providing security and insurance during and before installation and commissioning of pipelines. Obtaining the approval for optimum route and permission for work from the concerned authority and EIC.

29.5 Selection of route with the EIC / Consultant and marking the same on walls/floors between 'transition fitting' to 'cooking oven/stove/appliance', making openings and making provisions for fixing clamps. Makingtemporary but stable platforms/scaffolding/rope ladder etc., required for installation of pipes/fittings at all heights/multi storied flats and locations.

29.6 Contractor shall procure all material except free issue items for installation at the outlet of PE/ GI transition fitting up to the Domestic customers "Appliance /stove / oven for satisfactory completion to the owner/owner's representative.

29.7 **Supply and Installation of powder coated GI pipes of ½", ¾", 1" & 1.5" dia. between transition fittings to customer's kitchen appliances including NPT threading of GI pipes, supply of proper seal outs for threads to join fittings such as elbows, tees, connectors, regulators, meters, appliance & isolation valves etc., as per laid procedures and specification including clamping and sealing etc. The scratched powder coated GI pipe and fittings shall be painted after the testing of the GI installation.**

29.8 **Supply & Installation of 12 mm Copper tube including supply of solder wire and flux to join fittings such as elbows, tees, connectors, meters, valves etc., complete as per procedures and specifications including clamping and sealing etc.**

29.9 Supply of clamps for fixing pipes, Meters wherever required, painting of scratched powder coated pipes and fittings. Providing consumables grout material, repair/restoration of walls/floors changes for the pipes including the materials required for conversions and tools and tackles etc. shall be complete as per specification.

29.10 Conversion of all types of LPG kitchen appliances to NG based appliances & to take Sign on RFC card & Joint Meter Records (JMRs) of customer.

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

29.12 Cleaning, flushing, pneumatic testing and commissioning to the GI / Cu tube & fittings, meters, valves etc. as per specification and hand over the same to Owner/Customer to the entire satisfaction of EIC / CONSULTANT.

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

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

29.15 Preparation and submission of above ground installation card for each house indicating the laid GI/Cu tube including fittings, mentioned the reasons, if connection is not provided to the customers and deviation statements on completion /commissioning of work.

29.16 Any other activities not mentioned/covered explicitly above, but otherwise required for satisfactory completion/operation/safety/statutory/maintenance of the works in new & existing gas charged areas

shall also be covered under the Scope of work and has to be completed by the Contractor within specified schedule at no extra cost to Owner.

30.0 MATERIAL, MANPOWDER, EQUIPMENT AND MACHINERY

4.1 Material to be supplied as a free issue material

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

4.2 Material / Equipment & machinery to be supplied by contractor

Contractor shall procure / purchase powder coated GI Pipe & GI fittings, Brass fittings, Cu tube & fittings, Corrugated Flexible metal Hose (Anaconda) and Reinforced rubber hose with other material which is required to satisfactory completion / safety / statutory of the works as per tender at no extra cost to Owner.

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

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

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

The contractor has to submit the valid calibration certificate for Pressure gauges.

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

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

30.1.1 Plant and Equipment

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

30.1.2 Sealant, Grout

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

30.1.3 Clamps, Rawal Plugs, Screws and Nozzles etc.

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

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

30.1.4 Consumables Items

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

30.1.5 Other Materials

The contractor shall supply & Installation the following items wherever required:

- All materials required for work, NPT threading, copper tube jointing, testing etc.
- All signs, barricades, lights and protective equipment.
- All material required for working at higher floor levels (i.e., scaffolding, Ladder, Safety Belts, Self-Locking Safety Harness Belts etc.).
- Special consumable such as grease for maintenance of domestic appliances, all paints for painting of scratched portion of powder coated GI Pipes, GI fittings, Regulator Boxes, Consumables such as TeflonTapes, Solder-wire, Flux, Lacquer, Thinner, Petrol, Diesel, Fuels and Oils required are to be supplied by the contractor and are included for within the rates.
- All minor items not expressly mentioned in the contract but which are necessary for the satisfactory completion and performance of the work under this contract.

Acquisition, Receipt and Storage of Materials

The Contractor shall collect DRS/MRS/Metering skid, Domestic/Commercial meter, Regulators, Isolation and Appliance Valve from Owner's designated stores in between the hours to be advised by the EIC and installation of the same items.

The contractor shall carry out assessment of material required for GI/Copper installation in allocated area. After approval from Owner, contractor shall place order for purchasing of GI Pipes & fittings, Copper tubes & fittings, Brass Fittings, Corrugated Flexible metal Hose (Anaconda) and Reinforced Rubber hose (Technical specifications attached in the tender document) to anyone of approved vendors as per the list attached in the tender document. It is contractor's responsibility for document submission, arranging dispatch clearance, handling, loading, transportation and unloading of these materials at their own respective store.

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

The Contractor shall physically examine all materials at the time of acceptance the material in store and notify the EIC immediately o1f any damage or defect noticed by the Contractor. The EIC shall duly note any damage or defect in a site instruction book and both parties shall countersign the entry.

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

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

The Contractor shall be required to submit inventory details of materials every month.

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

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

31.0 ISSUE OF WORK INSTRUCTIONS

31.1 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 enclosed drawing for reference. It may vary in case of individual and multi storied flats.

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

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

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

32.0 PROGRESS OF WORK

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

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

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

33.0 WORK SHEETS

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

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

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

34.0 CO-ORDINATION /LIAISON

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

34.2 The prospective bidder shall work in close consultation/coordination with the EIC.

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

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

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

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

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

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

35.0 REFERENCE SPECIFICATION, CODES AND STANDARDS

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

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

36.0 RIGHT-OF-USE SURVEY AND MARKING

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

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

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

Owner/Consultant and the contractor at each premises or housing colony to be supplied with gas will conduct a joint survey. The survey record will note Customer details, the potential gas supply points

and proposed meter positions and estimates of material quantities. The contractor's representatives will make as sketch of the agreed pipe routes, if necessary.

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

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

The contractor shall also 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 Owner necessary to protect the public.

37.0 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, such shades etc. If the same does occur, the contractor has to immediately make things to original.

38.0 GI AND COPPER 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 regulator, valves, fittings, meters, clamps etc. The contractor shall be required to provide all equipment, tools and materials necessary to execute the work in an efficient and effective manner. Along with ladders, scaffolding pipe, dies, tripods, vices, fittings and Teflon tape, drills for concrete and other masonry, drills for timber, Granite, Marble Stones and laminated surfaces inside Customers property, bending tools, clamps, sleeves to facilitate the pipe passing through floors and walls, paint for marking etc

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

Contractor has to supply different types/sizes of approved powder coated clamps (Mild Steel) for fixing GI pipes suiting to the site conditions. The contractor shall get approval from EIC for every fresh lot of the clamps, brackets, regulator boxes and other consumables, prior to start of installation. The detailed cross sectional of Powder coated GI Pipe Clamps/Meter brackets are as per Drawing.

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

Where pipe passes through the balcony and the surface is slightly elevated around the service pipe or its surrounding sleeve to prevent the accumulation of water at that point. Where a short piece of sleeve is used around the gas pipe, the sleeve should be embedded in the concrete with a mix of mortar and the void between the pipe and sleeve filled with a suitable sealant. The sealant should be bevelled such

as to prevent an accumulation of water. Supply of clamps for all sizes of the GI pipes is in contractor's scope. Contractor has to take prior approval for design/types of clamps, paintings etc.

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

The rates for providing a connection are payable as per relevant SOR Item No. depending upon the length of the GI and Copper tube installed. It also includes the installation of domestic meters, meter regulator with associated inlet and outlet connections (GI/Brass fittings, Corrugated Flexible metal Hose (Anaconda)), on the wall with approved powder coated meter brackets and angles, painting, testing upto Appliance valve The Pipe installation includes all type of Pipe & Fittings (GI/Copper and Corrugated Flexible metal Hose (Anaconda),etc

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

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

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

During installation the Copper tube is to be cut to proper length with tube Cutter, the burrs removed with a file, cleaning of outside surface of pipe & inside surface of fitting, applying flux to the tube and fitting around the outer/inner ends, inserting the tube in to the fitting, applying heat to the assembled joints using conventional blow torch to melt solder wire. Contractor shall submit the joining procedure of Cu tube & Fitting to the approval or as per the instructions of EIC.

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

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

Installation of Meter

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

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

Firmly secure the meters on the wall with good quality Rawal Plugs, screws etc. In case the Rawal Plugs are not holding then wooden blocks or other fixing arrangements like cement etc. to be used for proper grouting.

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

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

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

Powder Coating/ Painting of GI Pipes

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

(a) PAINTING (for scratched powder coated pipes and fittings only)

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

All painting materials including primers and thinners brought to site by contractor for application shall be procured directly from manufacturers/dealers as per specifications and shall be accompanied by manufacturer's test certificates. Paint formulations without certificates are not acceptable. The contractor shall ensure that smooth finish is attained after carrying out painting.

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

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

(b) POWDER COATING (REFER ATTACHED PTS FOR POWDER COATING)

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

39.0 TESTING OF GI/COPPER INSTALLATION

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

39.2 The testing of GI riser pipe up to regulator shall be done with the isolation valve in open condition and open end plugged.

39.3 The joints shall be painted only after carrying out testing of the installation. Powder coating to GI pipes shall be carried out in factory/shop, and repair / touching shall be carried out at site.

39.4 The GI/Copper installation from regulator outlet to appliance valve (except meter) shall be tested at a pressure of 2.0 bar (g) for a holding period of 2 hour with no pressure drop. All the joints in the installation shall be checked with soap solution.

39.5 The meter shall be removed while carrying out the testing at 2 bar (g) and joints of the meter shall be tested on line with soap solution after completion of the work. For testing proper test ends shall be made along with gauges and subsequently approved by EIC. For the installation to be tested by

manometer or diaphragm gauge the meter shall not be dismantled/removed and testing shall be carried out at **80 m** bar with holding period of 15 min with no pressure drop.

39.6 The contractor shall supply the Calibrated Pressure Gauges / Manometer / Diaphragm Gauges of suitable range for testing of GI/Copper Installations ranging from 0-4 bars/0-150 m bar/0-250 m bar respectively. The calibration certificate shall be submitted before the start of the execution work.

39.7 The pressure gauges shall be calibrated from time-to-time as desired by EIC but positively once in every six months.

39.8 The details of testing shall be properly recorded in the GI/Copper cards.

40.0 INSPECTION

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

41.0 PURGING & COMMISSIONING

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

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

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

- Ensure the method of purging is such that no pockets of air are left in any part of the Customer's piping.
- Ensure 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.

42.0 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 Reinforced rubber hoses and nozzles and re-greasing taps as necessary.
- The contractor shall supply the Reinforced rubber hoses at the time of conversions.
- 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, soundness and performance of appliances.
- Instructing the Customer for safe use of natural gas and for fixing of safety and conversion labels.
- Contractor must attend the complaints regarding appliances, leakage, fire etc. till the total area is handed over to Owner's operation and maintenance.
- All consumables (Nozzles, greases etc.) are in contractor's scope.
- Changing or repairing of any items damaged during conversion.

It may be noted that the rates as per SOR item no. 8 will apply to conversion of all type of domestic appliances under the rates, the contractor will have to provide both Pin gauges and standard sized nozzles. The payment shall be released only after submission of necessary documents i.e. RFC & JMR Card of the individual house to Owner.

43.0 RESTORATION

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

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

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

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

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

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

44.0 SUBMISSION OF FINAL RECORDS

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

a) Total list of houses in the area allotted to him giving details of connections provided & reasons where connection could not be given / completed.

b) The details recorded in RFC cards of every domestic house.

c) Details of houses where piping done along with materials used.

d) Total material consumption report

e) Material reconciliation with respect to the materials issued.

f) Test reports & calibration certificates of gauges etc.

g) Any other documents/records required.

h) Extra Piping details

ANNEXURE # 1

TOOLS & EQUIPMENT TO BE PROVIDED BY CONTRACTOR FOR GI/COPPER WORKFOR BUILDING OF HEIGHT BELOW 20 METER

S.N0.	HAND TOOLS DESCRIPTION	PER TECHNICIAN	PER TEAM
1	Pipe wrench 250 mm	1	4
2	Pipe wrench 350 mm	1	4
3	Pipe wrench 450 mm	-	2
4	Adjustable spanner 50 mm	-	4
5	Adjustable spanner 150 mm	1	2
6	Adjustable spanner 250 mm	1	2
7	Set of combination spanner 3/16”-11/4” AF	1	1
8	Set of combination spanners 5mm - 30mm	1	1
9	Large tool boxes	1	2
10	Set flat-headed screw drivers	1	2
11	Set Philips screw drivers	1	2
12	Small hammer	1	2
13	Combination pliers/mole grips	1	2
14	Set of files	1	2
15	Drill bits for 1” pipe	-	2

16	Stocks and dies for NPT threading ½", ¾", GI Pipe	-	3
17	Blowtorch	-	1
18	Soldering iron	-	2
19	Copper tube Bending Machine	-	2
20	Hand drill 3/8" chuck	-	2
21	Portable electric drill 240V, heavy duty	-	2
22	Spare blades	4	4
23	Battery powdered torches	2	2
24	Measuring tape 30 m	1	2
25	Wire brush	1	2
26	Portable pipe vice & tripod	-	2
27	Set steel twist drills 0.5-2.0 mm (for appliance conversion)	-	1
28	Set steel twist drills 1mm-10mm	-	2
29	Set masonry drills 1mm-10mm	1	2
30	Graphite based grease	As required	As required
31	Lubricating oil	As required	As required
32	Hand cleaner	As required	As required
33	Copper tube Cutter 12mm	-	4
34	GI Pipe Cutters ½"	-	2
	Gas Detection Equipment	As required	-
	Powder Generator 2.5 KVA	1	-
	Pressure Gauge (0-10 bar)	2	4
	Pressure Gauge (0-4 bar)	2	8
	Diaphragm Gauge (0-400 m bar)	1	2
	Manometer (0-150 m bar)	1	1

35	Automatic Thread cutting machine	-	2
36	GI Pipe Cutter	-	2

CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR & BAREILLY

PTS –GI/COPPER INSTALLATIONS FOR PNG CONNECTIONS IN HIGH RISE BUILDINGS IN KANPUR & BAREILLY

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1.0 GENERAL INFORMATION

1.1 Introduction

CENTRAL UP GAS LIMITED (CUGL) plans to augment PNG network. It supplies natural gas to domestic & commercial consumers in the city of Kanpur, Unnao & Bareilly. It is proposed to execute the work of GI pipe installations for PNG connections in High Rise Buildings in Kanpur & Bareilly. Owner is seeking Contractors to assist in meeting the above objective.

The main scope of this PTS comprises the installation of above ground pipes from the outlet of 'PE/GI transition fitting' up to the domestic /commercial Customers 'Appliance/stove/oven valve' as per the Distribution schedule placed in enclosed drawing**.**

The scope includes installation & procurement of above ground GI / Cu pipes and associated fittings for Domestic /commercial Customers in High Rise Buildings height 20.0 mtrs& above.

Except service regulator, domestic meter, meter regulator, Isolation and appliance valve, Contractor shall procure each material (GI fittings, GI pipes, Wrought steel fittings(forged fittings), Cu pipe, Cu/Brass fittings, Corrugated Flexible metal Hose (Anaconda) etc.) which is required from the outlet of PE / GI transition fitting up to the Domestic/Commercial customers " Appliance / stove / oven.

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

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

2.0 DEFINITIONS

OWNER	Central UP Gas Ltd., CUGL
Consultant	Tractebel Engineering Private Ltd.,
PTS	Present <<Particular Technical Specification>>and its entire appendix, if any.
TPIA	Third Party Inspection Agency to be appointed by CUGL.

EIC Engineer – in – charge

3.0 SCOPE OF WORK

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

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

3.2 **Contractor shall liaison with house owner /RWA / society and takes the registrations from house owner /RWA / society and submits the complete registration form to CUGL and generate the Business partner no before conversion. For the registration payments shall be made according to relevant SOR**

3.3 Contractor shall submit the ITP/procedure/drawing etc. of all the material to be procured by him for approval before procuring the items. If, ITP/procedure/drawing etc are not approved from client/consultant then owner has the authority to refuse /reject the material.

3.4 Receipt of Service Regulators, Domestic Meters, Meter Regulators, Isolation and Appliance Valve as a free issue items from Owner's stores, loading, transportation, unloading at project site. Proper storing, stacking, identification, providing security and insurance during and before installation and commissioning ofpipelines. Obtaining the approval for optimum route and permission for work from the concerned authority and EIC.

3.5 Selection of route with the EIC / Consultant and marking the same on walls/floors between 'transition fitting' to 'cooking oven/stove/appliance', making openings and making provisions for fixing clamps. Making temporary but stable platforms/scaffolding/rope ladder etc., required for installation of pipes/fittings at all heights/multi storied flats and locations.

3.6 Contractor shall procure all material except free issue items for installation at the outlet of PE/ GI transition fitting upto the Domestic / commercial customers "Appliance /stove / oven for satisfactory completion to the owner/owner's representative.

3.7 **Installation of Service Regulators as per attached drawing P.00xxxx N10 1005.**

3.8 **Supply and Installation of Regulator Box including fabrication as per drawing no. P.00xxxx N10 1006.**

3.9 **Supply and Installation of ¾" to 1.0" Welded Riser from Transition Fittings to last floor of high rise buildings. Assessment of material requirement for installation of riser & header at site, Procurement of GI Pipes (heavy duty) as per IS-1239 Part-I duly powder coated & wrought steel fittings (forged fittings) conforming to IS-1239 Part-II from any of the approved vendors of CUGL.**

Scheduling, Planning of material & forwarding inspection call, Getting Dispatch clearance from CUGL/PMC, Handling, loading, transportation and unloading of these materials at contractor's store / site.

Preparation and approval of sketches, schedules, execution procedures & WPS as per technical specification. All consumables e.g. electrodes, flux etc. for welding pipes and fittings are under contractor's scope. Finalizing optimum route in consent to CUGL representative from transition fitting to last floor of building including lateral piece with isolation valve as per Drawing attached in tender.

Erection, Fabrication, Socket Welding, Testing & Installation of welded GI Pipes & Fittings etc., including NPT threading as per technical specification.

Supply & fixing of MS angle clamps, Ceiling clamps & dowel plugs with screws, grout material, suitable thread sealant i.e. Teflon Tape / lock tight, Supply and fixing of studs & bolts of various sizes ranging from 1/2" to 1", Jointing of transition fittings to above ground GI pipes, purging, testing and commissioning of the complete installation.

Welded riser shall be installed after successful testing at ground level. Pneumatic testing shall be carried out for entire riser length after installation of riser as per technical specification. All the safety equipments, tools and tackles required for satisfactory execution of welding/installation work are under contractor's scope.

Any other material & activities not mentioned/covered above, but otherwise required for satisfactory completion/safety of work as defined in tender has to be supplied / done by contractor within specified schedule at no extra cost to owner.

3.10 Supply and Installation of Powder Coated GI pipes of ½" dia. from welded riser tapping TEE (Isolation Valve) to customer's kitchen appliances including NPT threading of GI pipes, supply of proper seal outs for threads to join fittings such as elbows, tees, connectors, regulators, meters, appliance & isolation valves etc., as per laid procedures and specification including clamping and sealing etc. The Powder Coated GI pipe shall be finally touched up (painted) where the powder coating vanished and fitting joints after the testing of the GI installation.

3.11 Supply & Installation of Copper pipes including supply of solder wire and flux to join fittings such as elbows, tees, connectors, meters, valves etc., complete as per procedures and specifications including clamping and sealing etc.

3.12 Supply of clamps for fixing pipes, Meters wherever required, painting of pipes and fittings. Providing consumables grout material, repair/restoration of walls/floors changes for the pipes including the materials required for conversions and tools and tackles etc. shall be completed as per specification.

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

3.14 Conversion of all types of LPG kitchen appliances to NG based appliances. & to take Sign on RFC card & Joint Meter Records (JMRs) of customer.

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

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

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

3.18 Preparation and submission of above ground installation card for each house indicating the laid GI/Cu pipe including fittings. Reason for not providing the connection to the customers and deviation statements/consent form on completion /commissioning of work in a particular society/block.

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

3.20 Following activities are also in Contractor's Scope:

- Receive Customer's request and complaints logged on CUGL's .
- Carry out joint technical feasibility survey for requests received.
- Attend and resolve customer complaints.
- Maintain and update the request and complaint status in CUGL's.
- Maintain new connection list.

3.21 Providing adequate manpower, minimum 1 no. each such as data entry operator, customer care executive etc. for data logging like new connection request & new connection records, attending complaints, day to day interaction with customers and residents so that work can be executed within defined time period.

3.22 Providing adequate manpower for carrying out laying for PNG installation for emergency cases as and when required.

4.0 MATERIAL, MANPOWER, EQUIPMENT AND MACHINERY

4.1 Material to be supplied as a free issue material

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

4.2 Material / Equipment & machinery to be supplied by contractor

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

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

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

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

The contractor has to submit the valid calibration certificate for Pressure gauges.

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

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

4.2.1 Plant and Equipment

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

4.2.2 Sealant, Grout

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

4.2.3 Clamps, Rawal Plugs, Screws and Nozzles etc.

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

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

4.2.4 Consumables Items

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

4.2.5 Other Materials

The contractor shall supply the following items wherever required:

- All materials required for work, NPT threading, copper pipe jointing, testing etc.
- All signs, barricades, lights and protective equipment.
- All material required for working at height (i.e., scaffolding, Ladder, Safety Belts.
- Self-Locking Safety Harness Belts like PETZL or equivalent as mentioned in safety procedure are mandatory.).
- Special consumable such as grease for maintenance of domestic appliances, all paints for painting of GI Pipes, Regulator Boxes, Consumables such as Teflon Tapes, Solder-wire, Flux, Lacquer, Thinner, Petrol, Diesel, Fuels and Oils required are to be supplied by the contractor and are included within the rates.
- All minor items not expressly mentioned in the contract but which are necessary for the satisfactory completion and performance of the work under this contract

4.3 Acquisition, Receipt and Storage of Materials

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

The Contractor shall carry out assessment of material required for GI/Copper installation in allocated area. After approval from Owner, contractor shall place order for purchasing of GI Pipes & fittings, Wrought Steel Fittings(Forged Fittings), Copper pipes & fittings, Brass Fittings, Corrugated Flexible metal Hose (Anaconda) and Reinforced Rubber hose (Technical specifications attached in the tender document) to any of the approved vendors as per the list attached in the tender document. It is contractor's responsibility to submit documents, arranging dispatch clearance, handling, loading, transportation and unloading of these materials at their own respective stores.

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

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

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

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

Any material found defective during installation shall be brought to the notice of EIC within one month from issue date.

The Contractor shall be required to submit inventory details of materials every month.

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

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

5.0 ISSUE OF WORK INSTRUCTIONS

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

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

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

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

6.0 PROGRESS OF WORK

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

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

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

7.0 WORK SHEETS

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

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

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

8.0 PERMISSIONS / APPROVALS

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

8.2 The Contractor shall work in close consultation/coordination with the Owner/Owner's Representative

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

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

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

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

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

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

9.0 REFERENCE SPECIFICATION, CODES AND STANDARDS

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

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

10.0 RIGHT-OF-USE SURVEY AND MARKING

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

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

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

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

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

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

The Contractor shall also 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 Owner necessary to protect the public.

11.0 PROTECTION OF STRUCTURES AND UTILITIES

The contractor shall at his own cost, support and protect all buildings, walls, fences or other structures and all utilities and property which may, unless so protected, be damaged as a result of the execution of the works. He shall also comply with the requirements in the specification relating to protective measures applicable to particular operations or kind of work.

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

12.0 GI AND COPPER ABOVE GROUND SERVICE PIPE

12.1 Definitions:

- **High Rise Buildings – A building having height 20.00 mtrs or more above ground level.**

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

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

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

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

- **Riser Isolation Valve (RIV) -** Riser Isolation valve is fitted at the bottom of the riser to isolate the riser from the underground gas supply network.

- Lateral Isolation Valve (LIV) – Lateral Isolation Valve is fitted on horizontal riser (lateral) after TEE to facilitate online Tapping and other maintenance works.

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

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

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

12.2 Specification For Welding

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

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

Welding Consumables:

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

Welding Process:

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

Welding

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

12.3 Planning And Design Of GI Welded Riser

- Risers and laterals must be designed to run by the shortest possible route, taking into consideration potential meter positions, design regulations and access for future maintenance.
- The riser and associated laterals must be constructed in the most economical manner using the minimum no. of fittings, minimum pipe and considering future maintenance requirements.
- **For buildings having height 20.0 mtrs and above - for ease in construction and maintenance the preferred method will be welded pipe-work laid in a purpose designed and built ventilated utilities shaft.**
- Risers and laterals must be laid a minimum of 300 mm from any electrical equipment or installations. On occasions where the pipe has to cross over a cable, this has to be done at right angles and a minimum gap of 25 mm must be maintained between the pipe and cable. Consideration may be given to wrapping the pipe with electrical insulation tape for protection against electrical short circuiting.
- Provision for access to the riser for future maintenance must be made at the design stage & involved undertaking a risk assessment for undertaking future maintenance work.
- The GI service pipe installation work includes all work necessary to connect from the PE/GI transition fitting on the down-stream of the PE service, to the Customers appliance, including the installation of service regulator, meter regulator, valves, fittings, meters, clamps etc. The

contractor shall be required to provide all equipment, tools and materials necessary to execute the work in an efficient and effective manner. Along with ladders, scaffolding pipe, dies, tripods, vices, fittings and Teflon tape, drills for concrete and other masonry, drills for timber, Granite, Marble Stones and laminated surfaces inside Customers property, bending tools, clamps, sleeves to facilitate the pipe passing through floors and walls, paint for marking etc.

- All Welded GI risers at the outside of buildings shall be fully supported to carry the weight of piping. A flanged foot or similar device, capable of supporting the total weight of the riser, shall support risers. The riser shall be installed in a vertical line from its point of support to its highest point with a minimum of changes in direction. The threading of GI pipe shall be NPT and conforming to ANSI B1 20.1
- Contractor has to supply different types/sizes of approved powder coated clamps (Mild Steel) for fixing GI pipes suiting to the site conditions. The contractor shall get approval from Owner/Owner's Representative for every fresh lot of the clamps, brackets, regulator boxes and other consumables, prior to start of installation. The detailed cross sectional of Powder coated GI Pipe Clamps/Meter brackets are as per Drawing.
- All riser and lateral pipe shall be clamped to the building at intervals not exceeding 1.5 mtrs. Maximum distance between clamps shall be 1.0 - 1.5 m when pipe goes to the straight, if any tee or fittings lies in between the pipe then clamp shall be placed 150 mm far away from centre line of fittings at every sides. However, the same may be changed as per site conditions/as directed by EIC. Minimum gap between pipe & wall shall be 25 mm. The joints/ fittings of the GI installation shall be painted only after carrying out testing of the installation.
- Where pipe passes through the balcony and the surface is slightly elevated around the service pipe or its surrounding, sleeves to be provided to prevent the accumulation of water at that point. Where a short piece of sleeve is used around the gas pipe, the sleeve should be embedded in the concrete with a mix of mortar and the void between the pipe and sleeve filled with a suitable sealant. The sealant should be bevelled such as to prevent an accumulation of water. Supply of clamps for all sizes of the GI pipes is in contractor's scope. Contractor has to take prior approval for design/types of clamps, paintings etc.
- Pipe shall preferably be entered into building above ground and remain in a ventilated location. The location for entry shall be such that it can be easily routed to the usage points by the shortest practicable route.
- For welded riser, riser length (excluding lateral tapping) shall be considered. The payment shall be **done through running mtrs. rates as per relevant SOR Item.**
- For lateral tapping, the lateral tapping length from lateral isolation valve near tapping tee to appliance valve shall be considered. The payment shall be done through running mtrs rates as per relevant**SOR Item.**under project/ O & M area. The rates quoted against**SORitem** are inclusive of installation of valves and fitting, meter & meter regulator etc. from Lateral isolation valve till appliance valve.
- Installation of Meter and Meter Regulators with associated inlet and outlet connections/fittings shall be connected with meter as per attached drawing and the payment of the said activities are included in relevant SOR Item. The rate also includes testing of joints till commissioning.
- **Installation of Service Regulator and supply and installation of regulator boxes including fabrication as per attached drawing and the payment shall be done as per relevant SOR.**
- **Foundation works for service regulators includes providing and laying of Plain Cement Concrete (PCC – 1:2:4) as per attached drawing and the payment shall be done as per relevant SOR Item.**

- Except Service Regulator, Meter, Meter Regulator, Isolation and appliance valve, Contractor shall procure all other materials (i.e. Pipe, fittings, clamps etc.) as per attached specification for installation and to the entire satisfaction of Owner/Owner's Representative.
- The contractor shall also ensure that gas supply shall not be provided to the customer in any Concealed Piping.
- The Copper service pipe installation work includes all work necessary to connect downstream of the meter (inside the kitchen) to the Customers appliances. The contractor shall be required to provide all equipment, tools and materials necessary to execute the work in an efficient and effective manner. Along with these, he will be required to provide ladders, scaffolding pipe, drills for concrete and othermasonry, special drills for timber, Granite, Marble Stones and laminated surfaces inside Customers property, bending tools, sleeves to facilitate the pipe passing through floors and walls, etc. Copper pipes & fittings shall be provided by Contractor.
- During installation the Copper pipe is to be cut to proper length with tube Cutter, the burrs removed with a file, cleaning of outside surface of pipe & inside surface of fitting, applying flux to the tube and fitting around the outer/inner ends, inserting the tube in to the fitting, applying heat to the assembled joints using conventional blow torch to melt solder wire. Contractor shall submit the joining procedure of Cu pipe & Fitting for approval or as per the instructions of EIC.
- Contractor has to supply different types/sizes of approved clamps (PE 80/PVC) for fixing Copper pipes suiting to the site conditions. Contractor has to take prior approval of EIC for quality of the clamps, solder, flux, lacquer, thinner etc. The approval shall be taken for every fresh lot of clamps from EIC before installation at site.
- All copper piping shall be clamped to the walls at intervals not exceeding 500 mm. The solder wire shall be of reputed company of diameter size 3.25mm, Lead free as per BS 29453:1994 (Soft solder alloys) and supplied in coils. The detail specification is attached in tender for reference. Solders for use with copper tube & fittings generally melt within the temperature range 180°C - 250°C. The contractor has to furnish the certificate of confirmation of standards before start of work.

12.4 Riser And Laterals Fabrication, Installation And Testing :-

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

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

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

The entire riser assembly shall be fabricated with socket welds both for threaded riser assembly and plain ended pipes. Threaded joints are permitted after first isolation valve on laterals on account of workability and future maintenance considerations.

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

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

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

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

Special Safety Harness and Protective equipments of PETZL / equivalent make are mandatory for riser installation. Details would be as per approved Safety Job Procedure. Ensure that all equipments and safety devices used are inspected, certified by competent authority & valid & suitable for use.

Plumber deployed for riser installation for high rise buildings shall be certified and prequalified with medical tests as per Safety Job Procedure.

12.5 Meter & Meter Regulator Positions

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

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

Meter Regulators will be installed as per enclosed drawing.

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

Risers and laterals upto Isolation Valves shall be Leak tested with compressed air @ 2 bar (g) for minimum 2 hrs.

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

For the laterals beyond the buildings heights 20.0 mtrs or above, flexible Anaconda shall be used in compliance to the material specification of SS316, fittings shall be used with brass connections conforming to IS 319, in order to account for the temperature induced stresses.

12.6 Installation of Meter

Installation of domestic meters with associated inlet and outlet connections (GI/Brass fittings), on the wall with approved powder coated meter brackets and angles.

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

Firmly secure the meters on the wall with good quality Rawal Plugs, screws etc. In case the Rawal Plugs are not holding then wooden blocks or other fixing arrangements like cement etc. to be used for proper grouting.

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

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

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

12.7 Laterals

The lateral extending from the riser at right- angles must extend a minimum of 400 mm from the riser before passing through a wall. Where the 400 mm length cannot be achieved, a flexible fitting such as stainless steel hose (anaconda) shall be fitted

On Risers supplying gas at height 20.0 mtrs or above, a stainless steel hose (anaconda) should be fitted to the lateral as per attached drawing.

12.8 Ventilation

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

12.9 Pipes Passing Through Walls

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

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

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

12.10 Powder Coating / Painting of GI Pipes

Contractor shall install powder coated GI pipes in consultation with EIC. Contractor shall submit detailed procedure of powder coating for approval to Consultant prior to supply of powder coated GI pipes. After installation of the entire piping system, final touching with paint shall be done to the satisfaction of EIC.

Apart from above, Contractor shall install painted fittings after proper surface preparation 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. (No other make shall be used for painting).

All painting materials including primers and thinners brought to site by contractor for application shall be procured directly from manufacturers/dealers as per specifications and shall be accompanied by manufacturer's test certificates. Paint formulations without certificates are not acceptable. The contractor shall ensure that smooth finish is attained after carrying out painting.

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

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

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

13.0 TESTING OF GI/COPPER INSTALLATION

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

- The GI/Copper installation from lateral valve to appliance valve shall be tested at a pressure of 150 mbar (g) for a holding period of 15 minutes with no pressure drop. All the joints in the

installation shall be checked with soap solution.

- The contractor shall supply the Calibrated Pressure Gauges / Manometer / Diaphragm Gauges of suitable range for testing of GI/Copper Installations ranging from 0-4 bars/0-500 m bar respectively
- The calibration certificate shall be submitted before the start of the execution work.
- The pressure gauges shall be calibrated from time-to-time as desired by EIC but positively once in every six months.
- The details of testing shall be properly recorded in the GI/Copper cards.

14.0 INSPECTION

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

15.0 PURGING & COMMISSIONING

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

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

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

- Ensure the method of purging is such that no pockets of air are left in any part of the Customer's piping.
- Ensure 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 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 and handing over old appliance connection Reinforced rubber hoses and nozzles to Customers and re-greasing taps as necessary.
- The contractor shall supply the Steel Reinforced rubber hoses at the time of conversions.
- 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, soundness and performance of appliances.
- Instructing the Customer for safe use of natural gas and for fixing of safety and conversion labels.
- Contractor must attend the complaints regarding appliances, leakage, fire etc. till the total area is handed over to Owner's operation and maintenance.
- All consumables (Nozzles, greases etc.) are in contractor's scope.
- Changing or repairing of any items damaged during conversion are in Contractor's scope..

It may be noted that the rates as per relevant **SOR item** will apply to conversion of all type of domestic appliances under the rates, the contractor will have to provide both Pin gauges and standard sized nozzles. The payment shall be released only after submission of necessary documents i.e. RFC & JMR Card of the individual house

17.0 RESTORATION

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

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

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

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

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

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

18.0 SUBMISSION OF FINAL RECORDS

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

a) Total list of houses in the area allotted to him giving details of connections provided & reasons where connection could not be given / completed.

b) The details recorded in RFC cards of every domestic house.

c) Details of houses where piping done along with materials used.

d) Total material consumption report.

e) Material reconciliation with respect to the materials issued.

f) Test reports & calibration certificates of gauges etc.

g) Any other documents/records required.

h) Extra Piping details

ANNEXURE # 1

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

S.N0.	HAND TOOLS DESCRIPTION	PER TECHNICIAN	PER TEAM
1	Pipe wrench 250 mm	1	4
2	Pipe wrench 350 mm	1	4
3	Pipe wrench 450 mm	-	2
4	Adjustable spanner 50 mm	-	4
5	Adjustable spanner 150 mm	1	2
6	Adjustable spanner 250 mm	1	2
7	Set of combination spanner 3/16”-11/4” AF	1	1
8	Set of combination spanners 5mm - 30mm	1	1
9	Large tool boxes	1	2
10	Set flat-headed screw drivers	1	2
11	Set Philips screw drivers	1	2
12	Small hammer	1	2
13	Combination pliers/mole grips	1	2
14	Set of files	1	2
15	Drill bits for 1” pipe	-	2
16	Stocks and dies for NPT threading ½”, ¾”, GI Pipe	-	3

17	Blowtorch	-	1
18	Soldering iron	-	2
19	Copper Pipe Bending Machine	-	2
20	Hand drill 3/8" chuck	-	2
21	Portable electric drill 240V, heavy duty	-	2
22	Spare blades	4	4
23	Battery powered torches	2	2
24	Measuring tape 30 m	1	2
25	Wire brush	1	2
26	Portable pipe vice & tripod	-	2
27	Set steel twist drills 0.5-2.0 mm (for appliance conversion)	-	1
28	Set steel twist drills 1mm-10mm	-	2
29	Set masonry drills 1mm-10mm	1	2
30	Graphite based grease	As required	As required
31	Lubricating oil	As required	As required
32	Hand cleaner	As required	As required
33	Copper pipe Cutter 12mm	-	4
34	GI Pipe Cutters ½"	-	2
	Gas Detection Equipment	As required	-
	Power Generator 2.5 KVA	1	-
	Power Generator 5.0 KVA	-	1
	Pressure Gauge (0-10 bar)	2	4
	Pressure Gauge (0-4 bar)	2	8
	Diaphragm Gauge (0-400 m bar)	1	2
	Manometer (0-150 m bar)	1	1

35	Automatic Thread cutting machine	-	2
36	GI Pipe Cutter	-	2
37	Welding Equipment	01 set per site	01 set per site
38	Full Body Safety Harness like PETZL or Equivalent	03 set per site	03 set per site

CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR & BAREILLY

PTS - PE FITTINGS, VALVES AND TRANSITION FITTINGS

TABLE OF CONTENTS

1. INTRODUCTION & SCOPE

CENTRAL UP GAS LIMITED (CUGL) plans to augment PNG network. It supplies natural gas to domestic & commercial consumers in the city of Kanpur &The present document covers the technical specifications for the procurement of PE Fittings.

2. DEFINITIONS

CUGL	Shall mean Central UP Gas Ltd. (Owner).
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 CUGL.
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.

5.1. **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 CUGL BEFORE STARTING PRODUCTION.

6. MDPE PIPE MATERIAL

The raw material of MDPE pipe shall be PE 100, thick as per SDR11. The MDPE pipe shall confirm standards for polyethylene pipes for supply of gaseous fuels IS 14885 (latest edition).

7. MATERIAL REQUISITION

Not Applicable

8. QUALITY ASSURANCE (QA)

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

9. DEFECT LIABILITY PERIOD

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

10. 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 PE ACCESSORIES

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

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

Electrofusion 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 electro fusion

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 alongwith drawing of particular saddle for approval of CUGL.

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 ACCEPTANCE PROCEDURES

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 PE VALVES

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 tender specification.

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

Nominal diameter DN	**Flow M3/hr**
32	10
63	60
90	180
125	450

8.0 ADD

Marking

b) Material and designation (e.g. PE 100)

DELETE

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

CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR & BAREILLY

PTS - ELECTRO FUSION FOR PE PIPES & FITTINGS

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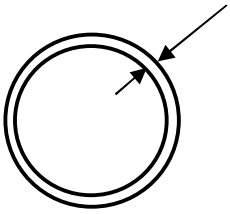
1 ELECTRO FUSION FOR PE PIPE

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.

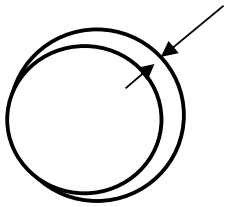
1.1.2 The effectiveness of this technique depends on attention to the preparation of the jointing surfaces, in particular the removal of the oxidized surface of the pipe over the socket depth and ensuring the jointing surfaces area clean. Also, the pipe should be checked for ovality. If ovality causes 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.

Max gap 1% of pipe OD



Concentrically Located

Max gap 2%of pipe OD



Eccentrically Located

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

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

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

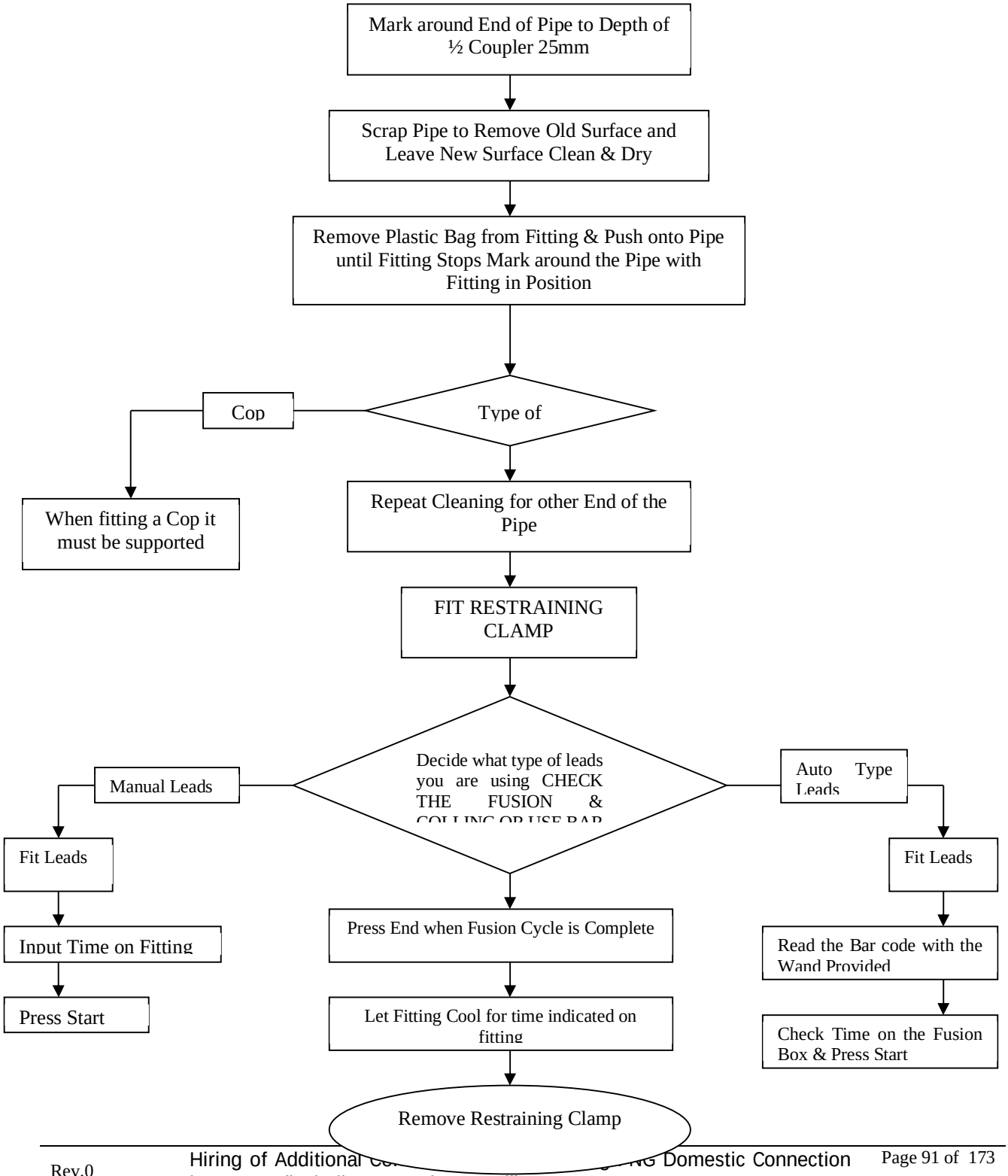
1.11 Bending-Back

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

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

ANNEXURE # 1

FUSION COUPLERS FROM 20MM TO 125MM



CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR BAREILLY

PTS - GI PIPES

TABLE OF CONTENTS

1.0 INTRODUCTION AND SCOPE

CENTRAL UP GAS LIMITED (CUGL) plans to augment PNG network. It supplies natural gas to domestic & commercial consumers in the city of Kanpur &.

This present document covers the technical specification for the procurement of GI Pipes used in high pressure natural gas transportation and distribution systems. It describes the general requirements, controls, tests, QA/QC examination and final acceptance criteria which needs to be fulfilled.

This specification covers the requirements for GI pipes of heavy steel tube. Unless modified by this specification, requirements of IS 1239 (Part-I): 2004 (Latest edition) shall be valid.

2.0 DEFINITIONS

Owner	Shall mean CENTRAL UP GAS LIMITED (CUGL)
Manufacturer	Means the Manufacturer of the GI pipe.
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 CUGL.
GTS	Means the present <<General Technical Specification>> and its entire appendix, if any.

3.0 MATERIAL

The material used for the manufacturing of GI pipes confirming to IS 1239 (Part -1): 2004 (Latest edition).

4.0 DIMENSIONS, THICKNESS & DIMENSIONAL TOLERANCES

The dimensions & nominal mass of tubes shall be in accordance with Table 5 subject to the tolerances permitted in CL.8.1 & 9 of IS 1239 (Part-I) : 2004 (Latest edition). Length of each pipe shall be 6 mtrs with. + 6, - 0 mm tolerance. However, pipe length shall be considered 6 m. only for measurement / payment purpose.

Nominal Diameter DN	15 mm	20 mm
Grade	Heavy	Heavy
Outer Dia. (Max. / Min.)	21.8 mm / 21.0 mm	27.3 mm / 26.5 mm
Thickness (mm)	3.2	3.2
Nominal weight (Kg / m)	1.44	1.87

5.0 END CONNECTION OF PIPE

GI Pipes shall be supplied with plain end.

6.0 FREEDOM FROM DEFECTS

On visual examination the outside & inside surfaces of pipes shall be smooth & free from defects such as cracks etc.

7.0 GALVANIZING

i. Pipes shall be galvanized to meet the requirement of IS: 4736 – 1986 with latest amendment.

ii. Zinc conforming to any grade specified in IS: 13229- 1991 with latest amendment shall be used for the purpose of galvanizing.

iii. Galvanizing bath: The molten metal in the galvanizing bath shall contain not less than 98.5% by mass of zinc.

iv. Mass of zinc coating: Minimum mass of zinc coating determined as per IS: 6745 shall be 360 gms/m^2.

v. Uniformity of galvanized coating: The galvanized coating when determined on a 100 mm long test piece in accordance with IS 2633: 1986 with latest amendment shall withstand 5 one – minute dips.

vi. Freedom from defect: The zinc coating on internal & external surfaces shall be uniform adhered, reasonably smooth & free from such imperfections as flux, ash & drop inclusions, bare patches, black spots, pimples, lumpiness runs, rust stains, bulky white deposits & blisters. Rejection & acceptance for these defects shall be as per Appendix - A of IS 2629: 1985 with latest amendments.

vii. Samplings

a) All materials of the same type in coating bath having uniform coating characteristics shall be grouped together to continue a lot. Each lot shall be tested separately for the various requirements of the specification. The number of units to be selected from each lot for this purpose shall be IS: 4711 1995 with latest amendment.

b) The sample selected according to Clause 6.1 & 6.2 of IS: 4736 – latest edition.

c) The sample found conforming to above requirements shall then be tested for mass of zinc coating in accordance with Clause 5.1 of IS: 4736 – 1986 with latest amendment.

d) Criteria for conformity: As per IS: 4736 – 1986 with latest amendments.

8.0 PRESSURE TEST

Hydrostatic pressure test shall be carried out at a pressure of 5 Mpa for the duration of at least 3 second and shall not show any leakage in the pipe. Vendor to submit the internal pressure test certificate for the same.

9.0 MARKING

Each pipe shall be embossed with manufacturer's name or trademark, size designation, class of pipe at the interval of not more than 1 meters.

Each packing containing pipes shall carry the following embossed, stamped or written by indelible ink.

a) Manufacturers name or trademark.

b) Class of pipe – Heavy

c) Indian standard mark (ISI)

d) Lot number / Batch no. of production

Each pipe conforming to this standard shall also be marked with BIS standard mark.

10.0 INSPECTION / DOCUMENTS

Inspection shall be carried out as per Owner Technical Specification.

The manufacturer shall have a valid licence to use ISI monogram for manufacturing of pipe in accordance with the requirement of IS:1239.

Vendor shall furnish all the material test certificates, proof of approval / licence from specified authority as per specified standard, if relevant, internal test / inspection reports as per Owner Tech. Spec. & specified code for 100% material, at the time of final inspection of each supply lot of material.

For any control, test or examination required under the supervision of TPIA/Owner/Owner's representative, latter shall be informed in writing one (1) week in advance by vendor about inspection date and place along with production schedule.

Even after third party inspection, Owner reserves the right to select a sample of pipes randomly from each manufacturing batch & have these independently tested. Should the results of these tests fall outside the limits specified in Owner technical specification, then Owner reserves the right to reject all production supplied from the batch.

11.0 PACKAGING

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

CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR & BAREILLY

PTS - GI FITTINGS

TABLE OF CONTENTS

45.0 INTRODUCTION AND SCOPE

CENTRAL UP GAS LIMITED (CUGL) plans to augment PNG network. It supplies natural gas to domestic & commercial consumers in the city of Kanpur,Unnao& Bareilly..

This present document covers the technical specification for the procurement of GI fittings used in high pressure natural gas transportation and distribution systems. It describes the general requirements, controls, tests, QA/QC examination and final acceptance criteria which need to be fulfilled.

This specification covers the requirements for Malleable Cast Iron Fittings unless modified by this specification, requirements of IS 1879 – latest edition shall be valid.

46.0 DEFINITIONS

Owner	Shall mean Central UP Gas Ltd. (CUGL).
Manufacturer	Means the Manufacturer of the GI fittings.
PTS	Means the present <<Particular Technical Specification>>and its appendix, if any.
Third Party Inspection Agency	Means the Inspection Agency to be appointed by CUGL.

GTS	Means the present <<General Technical Specification>> and its entire appendix, if any.

47.0 MATERIAL

The material used for the manufacturing of GI fittings shall conform to ISI 14329 – 1995 with latest amendments Grade BM 300.

48.0 DIMENSIONS & DIMENSIONAL TOLERANCES

i. Dimensions of various types of fittings shall be as specified in sections 2 to 10 of IS 1879 – 1987 with latest amendments, as applicable.

ii. Wall thickness of fittings and tolerances on them shall be as given in Table 1.2 of S 1879 – 1987 with latest amendments,

iii. In case of reducing fittings, the dimensions at each outlet shall be those appropriate to the nominal size of the outlet.

iv. Elbows, Tees, Sockets and caps shall be of reinforced type.

49.0 WEIGHT

Weights of various types of fittings shall be as specified in sections 2 to 10 of S 1879 – 1987 with latest amendments, as applicable.

50.0 THREADS

i. Threads shall be NPT type and conforming to ASME B1.20.1.

ii. Outlets of fittings shall be threaded to dimensions & the tolerances as specified in ASME B1.20.1.

iii. All internal & external threads shall be tapered.

iv. For checking conformity of threads gauging practice in accordance with ASME B1.20.1 shall be followed.

v. Chamfering: The outlet of fittings shall have chamfer.

51.0 FREEDOM FROM DEFECTS

On visual examination, the outside & inside surfaces of fittings shall be smooth & free from any defects such as cracks, injurious flaws, fine sand depth etc.

52.0 GALVANIZING

viii. Fittings shall be galvanized to meet the requirement of IS: 4759 – 1996 with latest amendments.

ix. Zinc conforming to any grade specified in IS: 13229-1991 with latest amendments shall be used for the purpose of galvanizing.

x. Galvanizing bath: The molten metal in the galvanizing bath shall contain not less than 98.5% by mass of zinc.

xi. Coating requirements: Mass of coating shall be 610 - 700 gms/m^2.

xii. Freedom from defect: The zinc coating shall be uniform adhered, reasonably smooth & free from such imperfections as flux, ash bare patches, black spots, pimples, lumpiness runs, rust stains, bulky white deposits & blisters.

xiii. Samplings

a) All materials of the same type in coating bath having uniform coating characteristics shall be grouped together to continue a lot. Each lot shall be tested separately for the various requirements of the specification. The number of units to be selected from each lot for this purpose shall be given in Table 2 of IS 4759 – latest edition.

b) The sample selected according to Column 1 & 2 of Table 2, IS: 4759 – latest edition shall be tested for visual requirements as per Clause 6.2 of IS:4759 – latest edition

c) The sample found conforming to above requirements shall then be tested for mass of zinc coating in accordance with Clause 9.2 of IS: 4759 – latest edition.

d) Criteria for conformity: As per Clause 8.3 of IS: 4759-latest edition.

e) Test procedure shall be as per Clause 9 of IS: 4759-latest edition.

53.0 PRESSURE TEST

Vendor shall carry out pneumatic pressure test as per Clause 11.1b of 1879 – 1987 with latest amendments on each & every fittings. Vendor to submit the Internal Quality control certificate for the same. Owner shall witness pneumatic testing as per the sampling procedure specified in 1879 – 1987 with latest amendments.

54.0 COMPRESSION TEST

This test shall be conducted to judge the malleability of the pipe fittings & shall be carried out as per Clause 12 of 1879 – 1987 with latest amendments.

55.0 SAMPLING

Owner Representative of Third Party Inspection Agency appointed by Owner shall witness the tests as per clause 14 of 1879 – 1987 with latest amendments. However, vendor to perform 100%

inspection of visual, dimensional & pressure test. Vendor shall furnish Internal test certificates at the time of final inspection to the Owner.

56.0 MARKING

Each fitting shall be embossed with CUGL's logo, manufacturer's name or trademark and the size designation.

Each packing containing fittings shall carry the following embossed, stamped or written by indelible ink.

a. Manufacturer's name or trade mark.

b. Designation of fittings.

c. Lot number.

Each fitting conforming to this standard shall also be marked with BIS standard mark.

57.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Packing size shall be approved by owner / owner's representative before packing the material. The vendor shall submit the packaging details during QAP and also complied with at the time of delivery.

58.0 INSPECTION / DOCUMENTS

i. Inspection shall be carried out as per Owner Technical Specification.

ii. Vendor shall furnish all the material test certificates, proof of approval / licence from specified authority as per specified standard, if relevant, internal test / Inspection reports as per Owner Tech Spec. & specified code for 100% material, at the time of final inspection of each supply lot of material.

Even after third party inspection, Owner reserves the rights to select a sample of fittings randomly from each manufacturing batch & have these independently tested. Should the results of these tests fall outside the limits specified in Owner technical specification, then Owner reserves the rights to reject all production supplied from the batch.

CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR & BAREILLY

PTS - COPPER TUBE

TABLE OF CONTENTS

11. SCOPE

This specification covers the requirements for 12 mm OD X 0.6 mm wall thickness Copper tube, Half Hard. Unless modified by this specification, requirement of BS EN 1057 (latest), Half Hard, shall be valid, with the recommended changes in physical properties to suit wrinkle free bend ability.

12. MATERIAL

The material used for the manufacturer of Copper tube shall confirm to BS EN 1057(latest), Grade Cu - DHP or CW024A.

a. Mechanical Properties:

i. Ultimate Tensile Strength – 250 N/ sq.mm (min)

ii. Elongation – 30% (min)

iii. Hardness - 75 to 100 on HV scale.

b. Chemical Properties:

In Each heat one no. of the copper tube will be tested for chemical properties to confirm to non-arsenical Cu - DHP / CW024A as per BS EN 1057 to have the following chemical composition:

Copper Percentage including silver	:	Min 99.9%
Phosphorus Percentage	:	0.015 to 0.040%

13. DIMENSIONAL TOLERANCES

The mean outside Diameter of the tube shall not vary from the specified outside diameter by more than the amount of tolerances specified in table 4 of BS EN 1057. The tolerance on the wall thickness shall be as specified in table 5 of BS EN 1057.

The length of the tube shall be 3 m. Allowable tolerance shall be (-0, +0.5 mm).

14. MANUFACTURE

The tubes shall be solid drawn by the process of melting, extrusion and thereafter Bright annealing. The ends shall be cut clean & square with the axis of the tube in no case shall tubes be redrawn from old or used tubes.

15. FREEDOM FROM DEFECTS

a. The tubes shall be free from internal & external fins, flaws, skin defects, blow holes etc. or other irregularities which might restrict the free flow of fluid and shall be so designed that resistance to the flow of fluid through the tubes is minimized.

b. All tubes will be supplied 100% Eddy Current tested as per ASTM E243 and BS EN 1057. Eddy Current testing is a computer aided test, wherein the tube passes through a probe & an electro magnetic field is created around the peripheral of the tube to detect any flaw or blow hole which may not be visible to the naked eye. The manufacturer must have in-house Eddy

Current testing facilities to supply to CUGL. CUGL reserves the right to witness the Eddy Current facility at the manufacturer's factory premises.

16. HYDROSTATIC TEST

Hydrostatic test shall be carried out minimum 35 bar pressure for a period of 10 second as per EN 1057 (latest).

17. DRIFT EXPANDING TEST

Drift expanding test shall be carried out as per EN 1057. The O.D. of the tube end shall be expanded by 30% using a conical mandrel (at angle 45º) with no wrinkles, cracks, break or any form of defect should occur on the tube during & after the test.

18. CARBON FILM TEST

Copper tubes to be tested for carbon film test & the manufacturer will certify that the tubes meet the requirement of clause 8.5 of BS EN 1057

19. CARBON CONTENT TEST

Copper tubes to be tested for carbon content test to ensure a carbon level to avoid the formation of carbon film during installation. Max. Carbon level shall be permitted as per clause 6.5 of BS EN 1057.

20. MARKING

Each tube shall be permanently marked every meterwith manufactures name & size and specification of the tube.

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

a) Manufacturers name or trade mark

b) Designation of tubes (OD x wall thickness)

c) Lot number.

d) No. of the standard (EN 1057)

21. PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Packing size shall be approved by owner / owner's representative before packing the material. The vendor shall submit the packaging details during QAP and also complied with at the time of delivery.

22. INSPECTION / DOCUMENTS

i. Inspection shall be carried out as per CUGL Technical Specifications, relevant codes/standard and Inspection Plan/ QAP. Vendor to prepare detailed QAP and submit the same for approval of CUGL / CUGL's Authorized Representative.

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

iii. Even after third party inspection, CUGL reserves the right to select a sample of tube randomly from each manufacturing batch and have these independently tested. Should the results of these tests fall outside the limits specified in CUGL Technical specification, then CUGL reserves the rights to reject all production supplied from the batch.

For any control test or examination required under the supervision of TPIA/owner/owner's representative, latter shall be informed in writing one (1) week in advance by vendor about inspection date & place along with production schedule.

CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR & BAREILLY

PTS - COPPER FITTINGS

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5. CARBON IN BORE
6. CHEMICAL PROPERTIES
7. STRESS CORROSION RESISTENCE TEST
8. FREEDOM FROM DEFECTS
9. HYDROSTATIC PRESSURE TEST
10. PNEUMATIC PRESSURE TEST
11. MARKING
12. PACKAGING
13. INSPECTION / DOCUMENTS

1. SCOPE

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

2. MATERIAL

The material used for the manufacturer of Copper Capillary Fittings shall conform to BS EN 1254-1(latest), Half Hard

3. DIMENSIONAL TOLERANCES

Dimensions tolerances of various types of copper capillary fittings shall be as per EN 1254 part I (Open tolerances on dimensions shall be +/- 0.1 mm).

The tolerances as specified in EN 1254 Part I in nominal diameter are as follows (Ref Table 2).

Nominal Diameter	Tolerance on the mean diameter with respect to the nominal diameter		Resulting Diametrical difference	
D	Outside Dia of male end (mm)	Inside Dia of socket (mm)	Max (mm)	Min (mm)
12 mm	+.0.04 -.0.05	+ 0.15 +0.06	0.20	0.02

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

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

4. END CONNECTION

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

5. CARBON IN BORE

The internal surface of copper capillary fittings for soldering or brazing shall not contain any detrimental film nor present a carbon level high enough to allow the formation of such a film during installation. The maximum total carbon level on internal surfaces shall not exceed 1.0 mg/dm^2 when tested in accordance with the specification.

6. CHEMICAL PROPERTIES

The composition shall confirm to the following requirement

Cu + Ag min. 99.90%

0.015% $\leq$P $\leq$ 0.040%.

This copper grade is designated either Cu - DHP or CW024A.

7. STRESS CORROSION RESISTANCE TEST

A stress corrosion resistance is to be carried out as per method defined in ISO 6957 using test solution of pH 9.5 but without pickling.

8. 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.

9. 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.

10. PNEUMATIC PRESSURE TEST

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

11. MARKING

Each tube shall be embossed with CUGL's logo, manufacturers name or trade mark EN 1254 Part I and designation of fittings.

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

e) Manufacturer's name or trade mark.

f) Designation of fittings.

g) Lots no.

h) Month and year of manufacture

12. 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.

13. INSPECTION / DOCUMENTS

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

i. 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 CUGL Technical Specification, at the time of final inspection of each supply lot of material.

ii. Even after third party inspection, CUGL reserves the right to select a sample of tube randomly from each manufacturing batch and have these independently tested. Should the results of these tests fall outside the limits specified in CUGL Technical specification, ten CUGL reserves the rights to reject all production supplied from the batch.

iii. Vendor shall prepare and submit the detail drawings of required copper fittings for approval by CUGL/TEPL before starting production

For any control test or examination required under the supervision of TPIA/owner/owner's representative, latter shall be informed in writing one (1) week in advance by vendor about inspection date & place along with production schedule

CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR & BAREILLY

PTS - BRASS FITTINGS

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3.0 DIMENsIOnAL TOLERANCES

4.0 end connection

5.0 CHEMICAL PROPERTIES

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8.0 STRESS CORROSION RESISTANCE TEST

9.0 FREEDOM FROM DEFECT

10.0 hydrOstatic PRESSURE TEST

11.0 pneumatic pressure test

12.0 MARKING

13.0 Packaging

14.0 INSPECTION / DOCUMENTS

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	
D	Outside Dia of male end (mm)	Inside Dia of socket (mm)	Max (mm)	Min (mm)
12 mm	+.0.04 -.0.05	+ 0.15 +0.06	0.20	0.02

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

Nominal Dia mm, D	Minimum wall thickness (mm) Brass
12	1.1

4. 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^2 when tested in accordance with the specification. This test shall be carried out as per clause no. 5.4 of EN 1254 -1.

7. 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 CUGL'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.

i) Manufacturer's name or trade mark.

j) Designation of fittings.

k) 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, CUGL Technical Specification and Inspection Plan/ Vendor's detailed QAP duly approved by owner/owner's representative.

ii. 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 CUGL Technical Specification, at the time of final inspection of each supply lot of material.

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

iv. Vendor shall prepare and submit the detail drawings of required brass fitting for approval by CUGL /TEPL before starting production.

For any control test or examination required under the supervision of TPIA/owner/owner's representative, latter shall be informed in writing one (1) week in advance by vender about inspection date & place along with production schedule.

CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR & BAREILLY

PTS - CORRUGATED FLEXIBLE METAL HOSE

TABLE OF CONTENTS

1.0 INTENT OF SPECIFICATION

The intent of this specification is to establish minimum requirements to manufacture and supply of corrugated flexible metal hose used for supply of domestic natural gas.

2.0 SCOPE OF WORKS

The scope of the tender will include manufacture/ supply, inspection, testing, marking, packaging handling and dispatch of corrugated flexible metal hose assembly, as indicated in the Material Requisition & Schedule of Rates, meeting all the requirements as laid down in manufacturing standard BS: 6501 Part 1(latest).

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

Owner/ Owner's Representative reserves the right to delete or order additional quantities during execution of order, based on unit rates and other terms & conditions in the original order.

3.0 DEFINITIONS

Owner	Shall mean Central UP Gas Ltd. (CUGL).

Manufacturer	Means the Manufacturer of the corrugated flexible metal hose assembly.
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 CUGL.

4.0 TECHNICAL SPECIFICATIONS

Item : Corrugated Flexible metal Hose Assembly (Type-A flexibility) for Natural Gas Service

Applicable Code : BS: 6501 Part-I: (latest)
Specification for Corrugated Hose Assemblies

Nominal Size : DN 12

Total Length of Hose Assembly : 350mm end to end

Movement Required : Static

Medium Flowing through Hose assembly : Natural gas (PNG)

Nominal Pressure/Design Pressure : 0.25 bar (g) at 20°C

Temperature Range : 0–65°C

Cyclic Life : 30 Bends minimum when tested in accordance with Cl. 14.2 of BS: 6501 Part-I (latest).

Static Bend Radius : 25mm

Type & Material of End Fitting : ¾" NPT SS Female Swivel Nut with Flat Seat Nipple with Rubber Gasket / `O' Ring (and second end shall be SS Male ¾" NPT and threads shall be conforming to ANSI B 1.20.1 . Fittings shall be conforming to SS316.

Note: TIG welding shall be carried out for welding SS fittings to corrugated hose.

Material of rubber gasket : Polymer NBR / nitrile with thickness 3-4 mm

Material of Hose : SS316 conforming to BS: 1449 Part-2 (latest) & 0.3 mm thickness

Braiding : Not required

Product to be conveyed : Natural Gas

Heat Treatment Requirement : Parent sheet or the finished hose must undergo annealing. The purpose of this is to relieve stress due to cold working.

Surface Coating : No zinc plating is required on SS hose, SS fittings & welded portion. At the welded portion suitable anti rusting provision shall be made. .

5.0 TESTING, CLEANING & PACKAGING

Tests : Pneumatic Test at a pressure of 1.5 kg/cm^2(g) & Type testing as per Cl.Nos. 14.1, 14.2, 14.5 & 14.6 of BS: 6501 Part-I (latest)

Cleaning & Packaging : As per Cl.No. 17.0 of BS: 6501 Part-I (latest)

Test Certificate : As per Cl.No. 18.0 of BS: 6501 Part-I (latest)

6.0 MARKING

Each corrugated flexible metal hose and SS316 fittings shall be embossed with CUGL's logo, manufacturers name or trade mark BS: 6501 part I (latest) and designation of fittings.

Each packing containing corrugated flexible metal hose shall carry the following stamped or written in indelible ink.

- Indication of the source of manufacture/Trade mark/Type
- Designation of fittings
- Maximum working pressure
- Nominal bore
- Month and year of manufacture

7.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Bidder shall submit the packaging details like numbering of pieces per package, along with QAP and also complied with at the time of delivery. One package will consist of one corrugated flexible metal hose assembly (metal hose + end fitting on both sides) & two gaskets for each end.

8.0 INSPECTION / DOCUMENTS

a) Inspection shall be carried out as per design code/standard, CUGL Technical Specification and Inspection Plan/ Vendor's detailed QAP duly approved by Owner/Owner's representative.

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

c) Even after third party inspection, CUGL reserves the right to select a sample of flexible metal hose randomly from each manufacturing batch and have these independently tested. If the results of these tests fall outside the limits specified in CUGL Technical specification, then CUGL reserves the rights to reject all production supplied from the batch.

d) For any control test or examination required under the supervision of TPIA/owner/owner's representative, latter shall be informed in writing one (1) week in advance by vender about inspection date & place along with production schedule.

Vendor shall submit the dimensional drawing for Hose, end fittings and Rubber Gasket along with the technical bid.

CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR & BAREILLY

PTS - STEEL REINFORCED RUBBER HOSE

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6.0 MARKING

7.0 Packaging

8.0 INSPECTION / DOCUMENTS

1.0 INTRODUCTION AND SCOPE

CENTRAL UP GAS LIMITED (CUGL) plans to augment PNG network. It supplies natural gas to domestic & commercial consumers in the city of Kanpur & Bareilly..

This present document covers the technical specification for the procurement of steel reinforced rubber hose, Type 4 used in distribution systems. It describes the general requirements, controls, tests, QA/QC examination and final acceptance criteria which need to be fulfilled.

This specification covers the requirements for steel reinforced rubber hoseunless modified by this specification, requirements of IS: 9573 shall be valid.

2.0 DEFINITIONS

Owner	Shall mean Central UP Gas Ltd. (CUGL).
Manufacturer	Means the Manufacturer of the Steel Reinforced Rubber Hose.

PTS	Means the present <<Particular Technical Specification>>and its appendix, if any.
Third Party Inspection Agency	Means the Inspection Agency to be appointed by CUGL.
Type 4	Wire Reinforced hose for domestic / commercial installations

3.0 MATERIAL

i. Lining: - It shall be nitrile – butadiene rubber (NBR) or chloroprene rubber (CR) compound. It shall be smooth in bore, uniform in thickness and free from air blisters, porosity and splits.

ii Reinforcement material :- It shall have wire reinforcement in braided form in between the lining & cover.

iii Cover :- It shall be manufactured out of synthetic rubber compound resistant to abrasion, weather and natural gas. The cover color shall be orange.

iv. The whole shall be consolidated by wrapping or any other suitable method and uniformly vulcanized to give good adhesion between reinforcement plies and the rubber lining of the cover.

4.0 DIMENSIONS & TOLERANCES

i. Bore size

Nominal size (mm)	Minimum base diameter (mm)	Minimum bend radius (mm)
8 mm	7.9	95

The Nominal bore size of the hose shall be accordance to table # 1 of IS 9573: 1998 shall be as given above table. It shall be tested/ checked as method defined in IS 4143

ii. The Minimum thickness of lining & cover shall be 2 mm & 1 mm respectively.

iii. Length of hose shall be as defined in M.R. & the tolerances on length shall be permitted ± 1%.

5.0 FEATURES

5.1 Mechanical properties

Tensile strength (Lining & cover) at break - 10 MPa (minimum)

Elongation (Lining & cover) in at break (%) - 200 & 250 respectively (minimum)

5.2 Resistance of Lining to n-pentane

The n-pentane absorbed and the n-pentane extractable matter as determined Clause no. 5.4.3.2 of IS 9573: 1998 shall not exceed 10% & 5% respectively to the initial mass of lining.

5.3 Adhesion

The minimum adhesion between rubber lining & reinforcement, between layers of reinforcement and between reinforcement & cover shall be 2KN/m.

5.4 Low temperature flexibility

Flexible hose is conditioned at -40 ° C for at least 5 hrs. and then bent at 180° around a mandrel with a diameter 12 times the nominal bore diameter of the hose, no cracks or breaks shall be shown.

5.5 Flexibility of Hose

The hose shall be capable of being bent empty to the radius 95 mm without flattening and suffering structural damages.

5.6 Ozone resistance

It shall be carried out as per clause no. 5.5.of IS 9573: 1978

5.7 Hydrostatic test

All hoses shall be leak tightness tested at 2 Mpa for a period of 1 minutes and no leakage is permitted. This test shall be performed on each size of the hoses as per clause no. 5.5.5.1 of IS 9573: 1978.

5.8 Bursting pressure

It shall be carried out as per Clause 5.5.2 of IS 9573. The minimum burst pressure shall be 5 Mpa.

5.9 Grip strength test

The hose shall comply to the requirement of Clause no. 5.5.7 of IS 9573.

5.10 Burning behaviour

The burning test shall be carried out on hose as per clause no. 5.5.8 of IS 9573. The hose at least shall not burn till 45 second.

6.0 MARKING

Each hose shall be indelibly marked as follows:

l) Manufacturer's name or trade mark., if any

m) Nominal bore

n) Batch no. / Lot no.

o) Month and year of manufacturer

p) Type of hose i.e Type 4

q) BIS marking

7.0 PACKAGING

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

8.0 INSPECTION / DOCUMENTS

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

ii. For all tests purposes, the minimum time between vulcanization & testing shall be 16 h.

iii. 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 CUGL Technical Specification, at the time of final inspection of each supply lot of material.

iv. Even after third party inspection, CUGL reserves the right to select a sample of hose randomly from each manufacturing batch and have these independently tested. If the results of these tests fall outside the limits specified in CUGL Technical specification, then CUGL reserves the rights to reject all production supplied from the batch.

v. Vendor shall prepare and submit the detail drawings of required steel reinforced rubber hose for approval by CUGL /TEPL before starting production.

For any control test or examination required under the supervision of TPIA/owner/owner's representative, latter shall be informed in writing one (1) week in advance by vender about inspection date & place along with production schedule.

CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR & BAREILLY

PTS – WARNING MAT

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7.0 RECOMMENDED MANUFACTURER FOR RAW MATERIAL

1. INTRODUCTION & SCOPE

CENTRAL UP GAS LIMITED (CUGL) plans to augment PNG network. It supplies natural gas to domestic & commercial consumers in the city of Kanpur & Bareilly.

The present document covers the technical specifications for the procurement of Warning Mat. Warning Mats shall be laid in the ground above the gas main line in order to indicate their presence.

2. DEFINITIONS

Owner	Shall mean Central UP Gas Ltd. (CUGL).
Manufacturer	Means the Manufacturer of the Warning Mat / Warning Grid / Warning Net / Warning Tape.
PTS	Means the present <<Particular Technical Specification>> and its entire appendix, if any.

Third Party Inspection Agency	Means the Third Party Inspection Agency to be appointed by the Owner.

3. REFERENCE CODE

EN 12613 – Plastics warning devices for underground cables and pipelines with visual characteristics

4. FEATURES

4.1. Material

Warning Tape, Type 1 as per EN 12613 shall be used for the present project.

The material grade of Warning Mat shall be Virgin Low density polyethylene (PE) material with warning sticker / stamp. The material shall be having the density between 0.913 to 0.923 g/cc at 27 deg. Celsius as per IS 2508.

The tape shall be uniform in colour, texture and finish and shall be free from holes and foreign materials.

Rodent repellent chemicals to be added to the plastic master batch for protection against rodents.

The material and colour, if used, for printing shall have no detrimental effects on the environment.

4.2. Mechanical properties

Mechanical properties of the Warning Mat (Type I) shall be in accordance with the code EN 12613.

Minimum tensile withstand load in longitudinal direction shall not be less than 200 N. The test piece shall not exhibit a reduction of more than 20% of its width after removal of the specified load.

4.3. Colour

The Warning Mat shall be of bright golden yellow colour. This colour must not take any alteration in the course of time.

4.4. Dimensions

Warning Mat shall have following dimensions:

Width	300 ± 2 mm
Thickness	1.0 mm (Minimum)

Negative tolerance on the thickness is not allowed.

4.5. Marking

4.5.1. The warning mat shall be marked at intervals not exceeding 1 meter. Marking on the mat shall be approved by owner. The marking shall be legible and durable. The warning mat must be printed with "Caution: High Pressure Gas Pipeline Below" in both English and Hindi, Chainage marking along with CUGL's logo and CUGL's 24 Hours Emergency Number ----------, ---------- at a

frequency of every meter. In addition, name or trademark of the manufacturer, year of manufacture and reference of code of manufacture of warning mat shall be included in the marking.

4.5.2. Vendor shall submit proposed Artwork to be marked on the Warning Mat for approval from Owner / Owner's representative.

4.5.3. Vendor shall submit 02 Metres sample of Warning Mat meeting the tender requirements along with the Bid.

4.6. Tests

All the tests and test procedures for Warning Mats shall be as per EN 12613 or as per required National/ International standards mentioned in EN 12613. In addition, all requirements pertaining to statutory requirements, if any, as specified from time to time shall be complied.

The required tests are briefed as below:

4.6.1. Colouring

Three separate tests shall be carried out in accordance with:

- As per normative annexure B of EN 12613, using 20% ammonium sulphide.
- As per EN ISO 175, using 10% nitric acid & 20% sodium carbonate solution.

The tests shall be repeated for each colour (if any).

There shall be no discolouration or change of the initial colour of the warning tape after the tests.

4.6.2. Tensile Withstand Strength

The test sample shall be selected as per mentioned in EN 12613. The test samples shall be preconditioned for not less than 12 h at 23±2 ^{o}C.Static loads shall be carried out to the samples over a period of 10 s.

After the test, the test piece shall withstand without starting to separate at weak points (if any) for not less than 5 minutes. Also it should no exhibit a reduction of more than 20% of its width after removal of specified load.

The minimum tensile withstand load for the warning mat in the longitudinal direction shall be not less than 200 N.

4.6.3. Visual Warning Characteristics

The test shall be carried out in accordance with normative annexure A of EN 12613.

4.6.4. Permanence of Printing

The test shall be performed as per CL. 9.3 of IEC 60898:1995.

The test is made by rubbing the marking by hand for 15 sec with a piece of cotton soaked with water and again for 15 sec with a piece of cotton soaked with aliphatic solvent hexane with a content of

aromatics of max. 0.1% by volume, a kauributanol value of 29, an initial boiling point value of approx. 65 ^{o}C, a dry point of approx. 69 ^{o}C and a density of approx. 0.68 gm/cm^{3}.

After the test, the marking shall be easily legible.

4.6.5. Test of laying Characteristics

The test is for the assessment of transverse rigidity of the warning mats.

The test shall be performed as per EN 12613.

4.6.6. Warning Mat Virginity Test

Differential Scanning Calorimeter (DSC) Scan test along with the temperature of melting (T_m) shall be performed for the Warning Mat and its raw polymer i.e. virgin low density polyethylene (LDPE).

The Differential Scanning Calorimeter (DSC) Scan curve of the Warning Mat obtained from its DSC Scan test along with its Temperature of Melting (T_m) shall then be compared with the DSC Scan curve and the Temperature of Melting (T_m) of its raw polymer (i.e. virgin LDPE).

To ensure the virginity of the Warning mat, the DSC Scan curve and T_m of the Warning Mat (finished product manufactured from the raw polymer) shall match on overlapping with its corresponding raw polymer's DSC Scan curve and T_m.

4.7. Packing

The warning mat shall be delivered in rolls of minimum 50meters. Packing size to be mentioned to ensure uniformity in delivery conditions of the materials being procured. Bidder shall submit the packing details during offer and also compiled with at the time of delivery. Packaging of the Warning Mat shall be such that there won't be any deterioration due to Ultraviolet (UV) effect during transportation and storage of the Warning Taps prior to use.

5. QUALITY ASSURANCE (QA)

Manufacturer shall prepare detailed QAP and submit for the approval from Owner / Owner's representative.

6. DEFECT LIABILITY

Defect liability period shall be as per the commercial volume I of II.

7. RECOMMENDED MANUFACTURER FOR RAW MATERIAL

1. SOLVAY
2. BOREALIS
3. TOTAL PETROCHEMICALS
4. DOW
5. ELENAC
6. RELIANCE
7. GAIL
8. HALDIA

However any other reputed national or international Manufacturer may also be consider for supply of Raw material with approval of Owner / Owner's representative.

CENTRAL UP GAS LIMITED (CUGL)

CITY GAS DISTRIBUTION PROJECT IN KANPUR & BAREILLY

HEALTH, SAFETY AND ENVIRONMENTAL ASPECTS

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1. HEALTH, SAFETY AND ENVIRONMENTAL ASPECTS (HSE)

1.1. *SCOPE / GENERAL SPECIFIC TO THE BIDDER*

1.1.1. **This specification establishes the Health, Safety and Environment (HSE) management requirement to be complied with by the BIDDER throughout the tenure of the contract by stipulating the relevant Act(s) / legislations and technical specifications.**

1.1.2. **The safety policy and guideline is prepared to direct & appraise BIDDER's personnel about the safety aspects involve in the job. The document deals with basic rules to be followed therein. However, BIDDER shall comply the HSE plan that addresses the HSE risks specific through mobilization, execution and demobilization at each location, where the work to be performed (Office, Factory, Fabrication Yard, Construction Site, inside the House, Kitchen (customer premises), Vessel, etc.), and the management of controls to eliminate / reduce or mitigate these risks.**

1.1.3. **OWNER reserves the right at all the time to audit and review the BIDDER's facilities, services, and / or performance of its activities in respect to the compliance of his HSE plan.**

1.1.4. **OWNER reserves the right to suspend the work or any part thereof, if BIDDER does not comply with HSE policy. Before any work is suspended OWNER shall liaise with BIDDER to allow him the opportunity to rectify any non-conformances within an acceptable timescale. BIDDER may at any time suspend the work for HSE reasons; in such event, however, he shall immediately inform OWNER in writing of those reasons, and details of actions taken.**

1.1.5. **Leadership & Accountability**

a. It is OWNER's policy to protect the health, safety and security of its employees, to minimize the risk to the public from them and to protect the natural environment. BIDDER shall ensure that all his employees are briefed in, understood and strictly adhere to the OWNER's policies and directives on Health, Safety and Environmental aspects.

b. BIDDER shall demonstrate leadership and commitment through actively participating in all aspects of HSE, supporting open dialogue and by allocating sufficient resources.

c. BIDDER shall ensure that HSE responsibilities, authorities, accountabilities and competencies are clearly defined, documented, communicated and exercised at all levels.

d. BIDDER shall ensure that individual and team contributions to HSE performance are recognized and considered during performance appraisals. Also, shall set clear goals, objectives and targets and performance are evaluated against them.

1.1.6. **Organization, Responsibilities, Resources and Documentation**

a. Organization

BIDDER shall provide sufficient and appropriate manpower and supervision in his organization; with clear responsibilities and reporting structure to ensure that HSE performance is not compromised.

b. Employee Orientation Program

i. BIDDER shall provide, for all his personnel involved in the work, an orientation training program to the site and all requirements of the HSE plan.

ii. BIDDER shall ensure that no individual works unless he has been fully inducted.

c. HSE Competence Requirements

BIDDER shall ensure that his personnel are;

i. Medically, physically and mentally fit to carry out the duties to which they are assigned in respect of the work.

ii. Aged eighteen years or above.

iii. Technically competent and experienced in the tasks assigned to them.

d. HSE Training

BIDDER shall be responsible for, and implement, competency based HSE training of his personnel as may be organized / advised from time to time.

e. HSE Promotion and Awareness

BIDDER shall establish a mechanism for communication and feedback of HSE issues and performance among his personnel on the site and to OWNER's representatives.

f. Sub-Contractors

BIDDER shall ensure that all his sub-contractors, if any, receive a copy of, and comply with the requirements of the HSE plan and are provided with a copy of this document.

g. HSE Communication

i. BIDDER, where applicable, ensure before commencing operations pursuant to the contract that all companies, organizations and communities that could potentially be affected by such operations have been notified. At the work site, BIDDER shall also ensure that effective toolbox talks are undertaken.

ii. Where applicable, BIDDER's arrangement for emergency communications shall be integrated with the requirements of the work.

h. HSE Meetings Program

BIDDER shall establish an effective structure and schedule for HSE meetings involving all personnel assigned to the work, to promote communication and involvement in HSE matters.

i. HSE Legislation

BIDDER shall comply with, and shall be able to demonstrate compliance with;

i. Relevant and applicable Health, Safety, Environmental legislation for all places, where work is performed,

ii. OWNER's Policy, Procedures and Standards,

iii. BIDDER's corporate and project specific policies and procedures.

1.1.7. Evaluation & Risk Management

a. BIDDER shall ensure that, for all activities, a documented risk assessment procedure and risk register is in place and operating. This risk assessment procedure shall be suitable and sufficient to appropriately assess the health, safety and environmental risks involved. A copy shall be issued to the OWNER.

b. BIDDER shall be responsible for ensuring timely delivery of the risk assessment of all activities, covered in the scope of work, in order to meet the work schedule, the OWNER HSE plan and regulatory requirements.

1.1.8. Planning & Procedures

a. HSE Procedures

i. BIDDER shall provide written HSE procedures to cover hazardous operations. Method statements in case of major erection, construction and O&M work to be prepared in advance and approval obtained from the Owner or Owner Representative. These will be available to all personnel in their working language. A copy shall be provided to the OWNER.

ii. BIDDER shall abide by the OWNER permit to work system at sites.

b. Emergency Response Procedures

i. BIDDER shall be responsible for the establishment and implementation of emergency procedures related to the work. BIDDER shall consult with OWNER to ensure appropriate interface with the procedures.

ii. BIDDER shall submit OWNER, within 30 days from the date of commencement of contract, the details of its provisions and procedures for proposed actions in the event of;

- An incident involving serious injury or death to any member of the team.
- A major incident involving third party equipment.
- Any release of chemicals or hydrocarbons to the local environment.

iii. BIDDER shall ensure competency of his personnel in its emergency response procedures through a programme of drills and testing and shall submit the report to OWNER.

iv. BIDDER shall participate in an emergency response exercise, whenever required.

c. Equipment & Inspection

OWNER shall at any time during the tenure of the contract conduct the audit for all the tools, appliances, machines, vehicles, equipments, etc…for their safe working condition includes documents. Also, BIDDER shall ensure that they should be used only by authorized and competent persons and inspected periodically.

d. Environment

i. BIDDER shall protect environmental resources by applying best available techniques not entailing excessive cost, to preferably eliminate or minimize any direct or indirect impact from operations.

ii. BIDDER shall ensure that all activities are planned in a manner that will not create unnecessary danger, disturbance or effects on the environment or to other users.

iii. BIDDER shall minimize nuisance, disturbance or interference to the community, their activities, and other users of the environment.

iv. BIDDER shall unless otherwise directed by OWNER, avoid conducting activities in protected areas or where there is an unacceptable risk of damage to sensitive environmental resources.

v. BIDDER shall ensure that fishing, hunting and gathering of flora and fauna or any other environmental resources are strictly prohibited within the area impacted by the work.

vi. BIDDER shall where applicable be responsible for restoration of any land used or affected by BIDDER's activities under the Contract (Restoration of top soil in case of major excavation jobs is a must). This will include removal of BIDDER's equipment, surplus materials and waste to the satisfaction of OWNER's representative.

vii. BIDDER shall coordinate & carry out the disposal of any waste produced or occurring as a consequence of its operations pursuant to the contract, all such disposals shall be in accordance with all legislation, OWNER's norms and best practices, whether that shall be for hazardous waste or non-hazardous waste. BIDDER shall ensure that all necessary approvals or licenses are obtained and that any subcontractors utilized for this purpose fully comply with such requirements. BIDDER shall record & provide OWNER with a copy of each waste transfer / disposal report / note.

viii. BIDDER shall prepare & notify OWNER in writing of the method for managing disposal of all hazardous waste and gain approval therefore before commencing such disposal. The water de-watered from the valve pits shall not be discharged hitherto and thitherto. Used transformer oil shall be collected in a container and submitted to OWNER's stores.

1.1.9. Implementation & Performance Monitoring

a. General

i. BIDDER shall establish an HSE performance monitoring programme and provide reports as per MIS to OWNER.

ii. BIDDER shall report all incidents in accordance with the requirements.

iii. BIDDER shall provide a report of fatal accident, Lost Time Injuries (LTI), Restricted Work Day Cases (RWDC), Medical Treatment Cases (MTC), Medical Evacuations, First Aid Cases (FAC), Near Miss Reports and Frequency of Hazardous Occurrence (numbers of hazardous situations without details) for the entire work, if required by OWNER from time to time.

iv. We shall, where applicable, maintain a waste / disposal log book.

b. Incident Investigation

i. BIDDER shall interface with OWNER's Incident Investigation and Reporting requirements.

ii. BIDDER shall document and report immediately to OWNER for any incidents or event, which could have led to environmental damage, uncontrolled release or hydrocarbons, breaches or potential breaches of environmental regulations or complaint from local groups, organizations including enforcement agencies or individuals.

1.1.10. Auditing & Review

a. BIDDER shall establish a schedule for HSE audit / inspection for its activities & submit to OWNER.

b. BIDDER shall provide all input and support as OWNER deems necessary to ensure all HSE activities that OWNER's initiates are successfully carried out and the actions arising are closed out to OWNER's satisfaction. OWNER's personnel shall be available for interview as part of audits and reviews.

c. Before commencement of the work, OWNER may conduct an audit to satisfy itself of BIDDER's arrangements regarding Health, Safety and environmental aspects. BIDDER shall co-operate fully with the audit team and rectify / correct any agreed deficiency observed without undue delay and in any event before work commences.

d. BIDDER shall submit / provide a report on HSE performance during the contract, as part of the contract close-out documentation.

1.2. *INSTRUCTIONS / GUIDELINES*

Following recommended safe practices / instructions should be observed when performing operations and maintenance activities;

1.2.1. Work Permit / Cold Permit

Prior to starting the work, BIDDER must have a valid work permit;

i. Either in the form of an order or work assignment supplemented by written work permits of the OWNER for operations in natural gas stations /site.

ii. Or in the form of an order or work assignment for work at or in the vicinity of existing installations and pressurized pipelines, which are not located in natural gas stations.

iii. OWNER's work permit must be issued / obtained for a well-defined working area and to be requested prior to commencing the work. All special instructions stipulated in the permits must be strictly observed.

Carrying out work without a valid work permit or outside the working area as described in the permit will be considered as a serious breach of the safety rules.

1.2.2. Fire Permit / Hot Permit

Prior to starting work with a naked flame, BIDDER must ensure, if Fire / Hot work permit in areas, where the risks of fire and explosion cannot be ruled out / likely hood or having severe consequences;

a. Either in the form of a written fire permit issued by the OWNER for work with a naked flame in operational natural gas stations / sites.

b. Or in the form of continuous supervision by OWNER's representative for work with a naked flame at or in the vicinity of an underground pressurized gas pipeline / station.

c. Prior to obtaining a fire permit, BIDDER must have at least a valid work permit.

d. Work with a naked flame is defined as,

i. All welding, grinding and cutting work by electrical or thermal means. All work with burners for, among other things, cladding or pre-heating of welds.

ii. All work with electrical hand tools which are not explosion-proof.

iii. In general, all work whereby a naked flame or a spark may be created.

iv. All machines or vehicles with an internal combustion engine.

v. OWNER's fire work permits are issued for a clearly defined working area and must be requested and renewed daily. All particular instructions stipulated in the permit must be strictly followed.

vi. The issuance of a fire work permit does not preclude the need for a ban on smoking.

vii. Performance of work with a naked flame without a valid fire permit or outside the working area as described in the permit will be considered as a serious breach of the safety rules.

viii. BIDDER must in all cases install essential and suitable fire-fighting equipment in the immediate vicinity of the works, when work with a naked flame is being carried out.

1.2.3. Ban on Alcohol and Drugs

Employees must not bring on to site or consume any liquid substance containing narcotics substances or alcohol beverages between the hours of starting and finishing work and must not drive a company vehicle, if affected by alcohol or drugs. A total ban on alcoholic beverages and drugs applies on all sites belonging to OWNER. Non-observance of the ban on alcohol & drugs shall be considered as serious breach of safety rules and will result in the immediate expulsion of the person enlisted from their job.

1.2.4. Ban on Smoking

Smoking is prohibited at any of OWNER's facilities or vehicles. Smoking is also prohibited within a work site (i.e. within public warning signs), including the right of way. Specific site conditions and rules must be always observed and due recognition given to any gas leak. Non-observance of the ban on smoking at work site shall be considered as serious breach of safety rules.

1.2.5. Speed Limits for Vehicle on / Near Worksite

As per statutory / Safety requirement.

1.2.6. **Safety Torches**

Only approved / fire proof / intrinsically safe torches shall be used for pipeline patrolling / gas leakage survey / any operation & maintenance related activities.

1.2.7. Two-Way Radios / Wireless Phones

Two-way Radios should be left turned on during all normal operations. However, if there is a significant gas leak in the vicinity, the user shall remove the radio to a safe location.

Note: intrinsically safe walkie-talkies can be used within stations.

Mobile Phones **shall not be used** within the Stations or within the vicinity of a live gas operation.

1.2.8. Incidents / Accidents

a. All accidents involving injury to a person or damage to property must be reported immediately to the OWNER's representative, within specified time limits / norms.

b. Incidents involving an unusual occurrence, failure of a procedure or equipment must also be reported. Any apparent fault in a safety system or equipment must be reported even if the incident was not considered significant at that time.

1.2.9. Checking For Leaks

a. Checking for leaks may only be carried out visually, by use of a gas detector or with soapy water. **Naked flames must never be used / allowed to locate gas leaks**. The natural gas in the transmission pipeline / system does not contain odorant and can therefore not be detected by smell.

b. Before removing plugs, caps or blind flanges from vents, drains and other connections, etc., ensure all necessary valves are closed.

c. Care must be taken when removing plugs or caps from vents, drains and other connections, etc., in case there is a build-up of pressure behind it.

1.2.10. Precautions to be taken before Gas Venting

a. Before venting of gas from a section, the isolation of the section should be confirmed and the all isolation valves involved should be greased and roused to prevent minor passing of the valve.

b. Ensure that no source of ignition like overhead live electrical cables, sparks, etc…are not present at least within 15 Mtrs. radius. Depressurising should be confirmed by opening another vent (if any) or pressure gauge, if fitted. No smoking or open flame should be ensured in vicinity of the nearby area.

c. The vent pipe should be of proper length (minimum 3 Mtrs.) for the protection to person operating valves in the chamber and for easy dissipation. Wind direction & velocity should be ensured & monitored continuously.

d. Venting area should be cordoned off and person with adequate PPE's (Methnometer / Pulsecometer) should be posted at the cordoned boundary in down wind direction to monitor the percentage of methane in the atmosphere, which should not concentrate as per specified limit / range or increase more than 2.0%. If indicates more than 2.0 % then venting should be stopped intermittently to give more time for gas dispersion.

e. Gas venting should be stopped intermittently when the vehicle passes near the spot, while venting operation is being done on traffic roads.

f. Whenever NG is required to be vented, the venting shall be done in a controlled manner as specified by the engineer in-charge to ensure minimal release of the gas to the atmosphere.

1.2.11. Human Failures

The major factors of human failures reasonable for an accident are the following;

a. NEGATIVE OR INDIFFERENT ATTITUDE: This is the neglect or carelessness by a person towards considering and eliminating all major and minor factors leading to an unsafe condition or unsafe act. The negative or different attitude of a person may be the result of overconfidence & lack of safety awareness.

b. LACK OF SKILL: If a person doing a job is not having the required skill for performing that job; it can be lead to an accident. Hence selecting the best skilled person for particular job is a must.

c. LACK OF KNOWLEDGE: the person doing a job is expected to have enough knowledge of the job and safe condition to be preserved while performing that job.

1.2.12. Bypassing Safety Equipment

No person shall interfere with, remove, displace or render ineffective any safeguard, safety device, personal protective equipment or any other appliance provided for health and safety purposes, except when necessary as part of an approved maintenance or repair procedure.

1.3. *PROTECTIVE MEASURES*

Personnel performing any gas or health hazardous operation must wear Safety Helmets, Safety / Gum Shoes, Approved Clothing, Protective Footwear and Safety GoCUGLes, Safety Harness, Ear Protection, Nose Masks, Hand Gloves, Breathing Apparatus, High visibility vest or reflective bands on coverall, Safety Guard / Belt / Fall Arrester, Face Shield, Special Equipment for Hazardous / Unusual activity, etc…in adequate numbers & suitably. Personnel must observe the safety rules for on-site and off-site operations as well.

1.3.1. Ignition Sources

Match boxes, cigarette lighters, calculators, cameras or other sparking devices must not be carried on for all facilities (refer Table - 1 given below);

TABLE – 1
SOURCES OF IGNITION

Sr. No.	Ignition Source	Precautions
1.	Internal combustion engines of buses, cars, tractors, digging and combustion equipment, portable pumps, generators, welding equipment, etc…	Only diesel powered internal combustion equipment to be used in the vicinity of an escape of gas and the following precautions are recommended; Fit a spark arrestor to the engine exhaust. Do not operate the engine starter in a gaseous atmosphere. **Generally, vehicles should not be taken near to an escape of gas.**
2.	Passing motorists or pedestrians carelessly throwing lighted matches boxes, cigars or cigarettes into the work area, and pedestrians smoking in the work area	Properly display warning signs and place barricades around the work area to prevent such an occurrence. If necessary divert traffic and / or place a watchman to warn pedestrians against smoking in the area.
3.	Cigarettes, cigars, pipes, match, open fires	Do not allow smoking, match boxes, cigarette lighters and open fire, in the hazardous work area.
4.	Sparks from hand tools, removal of manhole covers, etc…	Work carefully, removing sources of such sparking (stone, paving blocks, etc...) from the work area as job progresses. Use proper tools when removing manhole covers. Use tools carefully to avoid glancing blows on minerals and concrete.

		Area to be dampened and maintained damp. Grinders and friction cutting tools shall not be used in the presence of live gas.
5.	Sparks from electrical switches, relays, telephones, electric motors, power generation, cameras, and calculators, mobile phones	In potentially explosive atmosphere, do not operate any electrical device. If a switch is on do not switch off, unless there is no other quick means of isolating a sparking device such as an electric motor.
6.	Stray electrical currents on main or service when damaged of cut ends of pipe are separated	Never cut or separate ends of pipe unless proper bonding is done with jumper leads across the point of separation.
7.	Static electricity	Where gas is escaping from a plastic pipe, wet down the plastic pipe and surrounding work area. Discharge static charge by grounding metal main on service pipe. Discharge the static charge on the person by touching an earlier state, or alternatively provide protection by wearing rubber gloves. Avoid impingement of gas stream on clothing.
8.	Traffic lighting control boxes, power cables, railway and telephone cables, etc…	Request appropriate authority to temporarily disconnect, or shut down, if these structures are causing a hazardous situation.
9.	Appliance pilot lights	Shut off service valves.
10.	Welding torches, arc welding, and heater torch	This equipment is not to be used until the area has been declared safe.
11.	Lighting, lanterns, flashing lights	Only suitable equipment should be used in a hazardous area.
12.	Other potential ignition sources inside structures, building, and confined areas	Request appropriate Authority to temporarily disconnect or shut down, and take other action as necessary.

1.1 FIRST AID

1.1.1 Information Support Services / Hospitals / Doctors / First Aid

a. BIDDER must include in his HSE plan a detailed list with the particulars of the eye specialists, general practitioners and hospitals nearest to the site.

b. Prior to the start of the work, BIDDER must agree with these persons and services on the fastest ways to treat emergency cases.

c. At least one competent first aider must be available at site. This person must be easily accessible through an efficient communication channel of which the particulars are included in the list of support services.

d. All OWNER's / BIDDER's vehicles and worksites shall be provided with a first-aid kit. The kits are to be kept clean and properly stocked as per the prescription and nature of business at BIDDER's cost / risk. A record must be kept of all injuries, no matter, how minor. All injuries must be reported to the OWNER's representative without delay.

1.2 FIRE SAFETY

a. BIDDER must ensure the installation and maintenance of adequate equipments, material and devices for fire-fighting. However, periodic refilling, testing & calibration of such equipments owned by OWNER shall be carried out at his cost & risk.

b. On each site, there must be sufficient fire-fighting equipment, both in the central construction site installations and on the site itself. Particularly in places, where work is being carried out with an increased fire hazard, such as welding and grinding work, cladding work or the use of inflammable products, particular attention must be given to installing fire-fighting equipment beforehand.

c. All fire-fighting equipment must be in good condition and must always bear a valid inspection stamp. Any fire-fighting equipment that fails to meet these conditions must be removed immediately from the site. The approval of fire-fighting equipment is to be renewed each year, unless otherwise indicated by the Recognised Inspection Organisation.

d. All fire-fighting equipment must always be located at immediately accessible place in case of incident. The storage of material and equipment or the parking of vehicles or placing of installations in front of fire-fighting equipment is therefore strictly forbidden.

e. All vehicles shall be fitted with an approved (and regularly serviced) fire extinguisher. Fire extinguishers are located at OWNER's strategic points. All personnel must ensure that they have access to a suitable fire extinguisher before beginning an operation. All personnel must be familiar with the use / operation of fire fighting equipment. No vehicle must be allowed in vicinity of the hazardous area, and if so, suitable spark / flame arrester must be ensured.

f. In fire-hazard areas, all detonation sources must be avoided, unless, specifically agreed by OWNER and / or its representative, the use of radios, cameras and video cameras is expressly forbidden.

g. At the end of work, the site must be checked for possible fire-hazard situations.

h. BIDDER shall ensure that a trained fire fighting personnel is available at site.

1.3 SCAFFOLDINGS / LADDERS

a. Before using any scaffoldings / ladders, BIDDER must submit a copy of the valid inspection certificate. Scaffoldings / ladders to be built on the site must be inspected by the Recognised Inspection Organisation prior to use on the construction site and at the cost of the BIDDER. They must also be checked periodically in conformity with the prevailing regulations; a copy of the inspection report must be submitted to the OWNER without any remarks.

b. All scaffoldings must be checked by the BIDDER for their stability before they are used. At least once a week the scaffolding must be checked by a qualified representative of the BIDDER.

c. Mobile scaffoldings must be anchored before they can be used. Moving mobile scaffoldings is strictly forbidden if any persons, material or equipment are present on the scaffolding.

d. Scaffoldings must not be constructed in the vicinity of electrical installations, they must be properly earthed prior to use.

1.4 CONSTRUCTION / O&M SITE

a. The construction site plan must be included in the HSE plan and must contain at least an overview of the access roads, traffic direction and parking lots and the location of utility pipelines, first-aid unit, stores, site offices, canteens and sanitary installations.

b. Such structures may only be installed on the construction site in accordance with the provisions of the construction site plan.

c. For storing large quantities of fuel, gas bottles and small hazardous waste, a permit must be obtained from the competent authorities.

d. BIDDER must place the legally provided health installations in conformity with the prevailing norms at the disposal of his personnel and maintain them daily. Meals may only be eaten in buildings specially provided for this purpose.

1.4.1 **Warning Signs**

Site must have a warning sign at entrances, exits and at any crossings with public, main / private roads, premises, stations, etc…, bearing the words "ENTRY STRICTLY PROHIBITED / RESTRICTED" or "NO ENTRY", "NO SMOKING", "ASSEMBLY POINTS", "NO PARKING", "WORK IN PROGRESS", "NO OPEN / NAKED FLAMES", etc…. Wherever practically possible, BIDDER must fence-off / cordon-off the site with a physical enclosure, where necessary with entrances that can be locked, such as at the natural gas stations / chambers / sites and isolation valve chambers.

1.4.2 **Access Roads and Escape Roads**

a. Construction site must be provided with a sufficient number of access roads and escape roads. Each physically enclosed site must have at least two diagonally opposed entrances and exits.

b. The access roads and escape roads must remain completely free and adequately accessible under all circumstances. Therefore, any storage of materials or parking of vehicles in these areas is strictly forbidden.

1.4.3 **Means of Communication**

Site must have sufficient means of communication to allow the OWNER and / or support services to be immediately informed in case of incident.

1.4.4 **Lighting / Illumination**

If works have to be carried out under circumstances of insufficient daylight, such as during overtime or in winter, BIDDER must furnish and maintain the required adequate lighting on the site in conformity with the prevailing legislation (Lighting should be intrinsically safe, flame proof type).

1.4.5 **Stability of Equipment**

All equipments such as site sheds, material containers, generators, distribution cabinets, dewatering pumps, welding machines, electrical equipments / installations, etc… must always be erected in such a way as to ensure maximum stability.

1.4.6 **Noise Pollution of Equipment**

a. All construction machines, including welding units, compressors and generators must comply with the prevailing enforced standards (db level monitoring) on measures to fight noise pollution caused by equipments / machines.

b. For this reason, in the vicinity of residential centres, machines will be used that are connected to the electrical mains.

1.4.7 **Signposting and Pegging-Out**

a. BIDDER must submit in his HSE plan a copy of the signposting plan approved by the local authorities.

b. Work may only start after following approval by the OWNER and / or its representative of the signposting plan and after installation of the signposts described in the plan.

c. BIDDER is responsible for the installation and the maintenance of these signposts throughout the duration of the works as well as for all damage and problems arising directly or indirectly from shortcomings in the signposting. The approval by the OWNER of the signposting plan does not in any way diminish the BIDDER's responsibility.

d. BIDDER must place a sign at each local signpost with the particulars of the person responsible who must be reachable 24 hours a day. This sign must be placed in the direction of traffic and preferably at the end of the working area.

1.4.8 **Monitoring of Site**

BIDDER must guarantee the monitoring of the construction site 24 hours a day in order to be able to intervene immediately and efficiently in any situation which may arise. During pipeline works, he must put together an emergency team and keep them at the ready with sufficient resources / material to be able to attend any emergency / problems.

1.5 CLEANLINESS / HOUSEKEEPING

a. BIDDER shall ensure the discharge of the various waste waters in accordance with the prevailing norms.

b. BIDDER shall upkeep & maintains the facility of Toilets, Offices / Premises, Stations, Sites, Water storage tanks, etc…in hygiene condition on daily basis.

c. Depending on the type of waste materials (household waste, industrial waste, small hazardous waste, etc...), BIDDER shall submit the documentary proof for the removal of these materials to an authorised / recognised dumping / disposal site in accordance with the prevailing norms.

d. The disposal / dumping of waste materials of any kind in the trenches / working pit is strictly prohibited. All environmental pollution must be prevented and BIDDER will take all the measures necessary to avoid polluting the soil, the air and the water in accordance with the stipulations of the prevailing norms.

e. BIDDER shall be responsible for the cleanliness of any public and private roads, which become soiled because of the work. They must at all times be free of obstacles and hindrances.

f. All damages and costs resulting either directly or indirectly from the non-observance of these stipulations, or failure to observe them sufficiently, shall be borne by the BIDDER.

1.6 EXCAVATION WORK

1.6.1 Pegging-Off, Trial Trenches and Soundings

Prior to starting excavation works, a detailed investigation must be carried out into the possible existence of underground installations / utilities, etc...This investigation must be carried out taking into account surface indications, available plans, soundings of the subsoil and manual excavation of trial trenches.

1.6.2 Type, Condition, Nature and Equipment Of Machines

Each excavation machine brought to the site must,

i. Be suitable for the work envisaged,

ii. Be in impeccable condition,

iii. Have the correct size / capacity for the work to be performed,

iv. Be fitted with the necessary equipment to make the use of the machine as safe as possible.

In order to reduce to a minimum risk of damage to BIDDER's / OWNER's property, the capacity of the machines for operation in the vicinity of the installations must be limited according to the mechanical strength of the installation.

1.6.3 Machine Operators

a. BIDDER should ensure that all machine operators have sufficient knowledge, experience and ability to be able to drive / perform on the machines / equipments safely & efficiently.

b. If the OWNER deems that the operator of an excavation machine / equipment does not have the necessary abilities, BIDDER must, upon simple request by the OWNER, assign the person in question to another task or, where necessary, remove him from the site. The OWNER's representatives do not need to justify their decision in the matter.

1.6.4 Minimum Distance To The Working Pits

a. Prior to the excavation of pits and trenches, a safe distance must always be maintained between the edge of the excavation and the support surfaces of the machine. This distance must be adjusted to the stability of the subsoil and must, under optimum conditions, be at least equal to the depth of the excavation.

b. BIDDER is fully responsible for observing the instructions and the evaluation of the prevailing conditions. Any deviations from this rule may only be permitted if the BIDDER can prove safety by means of the necessary calculations.

1.6.5 Margin to Existing Installations

Mechanical excavation up to a safe / appropriate distance from existing installations during excavations in the vicinity of such installations is only permitted after determining the exact position by means of soundings. Any excavations within the distance must be carried out entirely manually.

Exceptions to this rule may be made when;

i. OWNER has given his explicit approval,

ii. The capacity of the machine is suited to the mechanical strength of the OWNER installation,

iii. The machine is equipped with a non-toothed shovel,

iv. The excavation machine is accompanied by a labourer in the trench or pit,

v. For each excavation of a layer manual soundings are carried out,

vi. There is continuous supervision by OWNER's representative.

Any non-observance of these rules will be considered as a serious breach of the safety instructions and will result in the immediate exclusion of the persons concerned.

1.6.6 **Support and Enclosure Of Existing Installations**

Existing installations that become visible during the performance of the excavations must be properly supported and enclosed for the entire duration of the works in order to avoid sagging or damage.

1.7 WORKING PITS AND TRENCHES

1.7.1 **Shoring Up and Forming Banks**

a. Earthworks, both for raising and excavating, must be carried out in such a way that collapsing is prevented.

b. The stability of the pit or trench walls should be ensured by installing a bank profile or shoring, as the excavation work demands. A construction drawing with calculations shall be submitted to the OWNER and / or its representative upon simple request.

c. The condition of the walls and any shoring must be checked on a daily basis, in any case on every occasion before work activities begin in the pit or the trench.

d. Suitable materials must be used for the shoring of walls with regard to both mechanical strength and resistance to seepage. The use of compressed fibre plates is strictly forbidden for the shoring of excavation walls.

e. It is also strictly forbidden to use the trestles of the shoring walls for hanging or supporting equipment or material.

1.7.2 **Opportunities for Escape**

a. Any excavation of a pit or trench with a depth of more than 1.5 metres and in which work will be carried out should be provided with a sufficient number of ladders to offer the personnel working in the excavation the possibility of rapid evacuation.

b. In working pits and trenches that are deeper than 4 metres, no work may be carried out without continuous supervision from outside the pit or trench. In these cases, continuous measurement of oxygen levels and harmful substances is required.

1.7.3 **Minimum Dimensions of Working Pits**

Each pit, in which people have to work, will comply with the minimum dimensions defined in the OWNER's Particular Technical Specifications.

1.7.4 **Pegs and Railings**

a. Throughout the work, excavation openings will be screened off by means of pegs and black / yellow warning tape, railings or covering plates around the edges to warn or protect personnel.

b. Also, strong railings will be erected on the edges of working pits with a depth of more than 1.5 metres and in all hazardous areas and maintained in good condition.

1.7.5 **Sand Buffer for Working Pits on Main Roads**

a. In the event that digging work is carried out on or next to the main roads and on private roads, a sand buffer shall be placed in the direction of the traffic prior to the digging work so that no vehicle can fall into the pit.

b. This sand buffer can be made either with excavated material or with imported sand that is then used as backfill.

1.7.6 **Catwalks over Pits and Trenches**

a. BIDDER shall install the necessary catwalks in all places where people have to cross over the excavations. The strength of these walkways must be calculated in accordance with the loads they will be used to carry and will be equipped with regulation railings.

b. In places, where work will not be performed immediately, pits and trenches will be solidly screened off with strong fences or, better still, covered over with plates that are of sufficient strength.

c. BIDDER shall submit the necessary calculations for the stability and strength of these catwalks and covering plates upon simple request by the OWNER and / or its representative.

1.7.7 **Water Evacuation and Working Floor**

Any excavation, in which, people will be working should be kept dry and provided with a working floor of sufficient hardness. Where necessary, dewatering equipment will be set in place for this purpose and the working floors may be covered with gravel or wooden boards. BIDDER shall ensure that rainwater and water coming from the dewatering equipment is removed according to regulations and that no erosion is caused thereby.

1.8 ELECTRICITY

1.8.1 **Inspection**

a. Every electrical installation on the site, including generators, distribution cabinets, etc…, will be inspected on site by a Recognised Inspection Organisation, before it is brought into service. Any defect must be reported immediately.

b. BIDDER will attach a copy of the inspection report to his HSE plan and hand it over to the OWNER and / or its representative.

1.8.2 **Cables And Connections**

a. Distribution panels must remain closed at all times during use. The connection to distribution panels may only be made using approved and waterproof plugs.

b. The electrical cables for connection to the various users of site electricity shall be in impeccable condition and shall be protected in a sufficient manner. In places where traffic must run over the connecting cables, they must be buried with a protective sleeve. The same rules apply for the connections of the cables. Furthermore, they must be watertight.

c. All connections must be at least suitable for use in humid conditions.

1.8.3 **Earthing**

a. Both the central electrical site installation and any stand-alone generators will be fitted with proper earthing of which the earthing resistance will be checked before use as well as periodically.

b. Metal site sheds and material containers will each be properly earthed to rule out the possibility of the structure becoming live.

c. The central electrical site installation will be equipped with a suitable earth switch with circuit-breaker. Also, the pipeline to be earthed to prevent the static effect.

1.8.4 **Electrical Tools**

a. Electrical hand-tools must conform to the stipulations of the regulations of the prevailing norms, be in impeccable condition and be suitable for the work to be carried out. They must be properly earthed or double-insulated.

b. Welding transformers, generators, machine must be equipped with a power limiter that will guarantee the prescribed safety current.

c. In closed areas, tunnels, deep construction pits and damp crawling spaces, only tools with safety current may be used.

d. Only explosion-proof electrical equipment shall be used in classified hazardous area. BIDDER shall ensure to adhere to the hazardous area classifications.

1.8.5 **Protection against Electrical Hazards**

Followings are some of the keys for protection against electrical hazards such as Insulations Ground Wires, Fuses and Circuit Breakers, Double Insulated Tools, Ground Fault Circuit Interrupter, Recognition of Hazardous Situations and Preventive Maintenance;

a. Fire may arise from faulty or over load electrical installation or as a result of accidental short circuits. Result flash over may ignite combustible material.

b. The above dangers can be prevented in respect of electrical system by paying attention to the following points;

i. Proper design including current specifications of all components.

ii. Correct installation, Recognition of Hazardous situations..

iii. Correct use including preventive maintenance.

1.9 HOISTING WORK

1.9.1 Hoisting Gear and Hoisting Material

a. All machines brought to the site and which can be used as hoisting gear must be provided with a valid certificate (Third party Inspection)of approval. If no certificate is available, BIDDER will have an inspection carried out before bringing the machine onto the site. All certificates of approval for machines on the site will be listed by the BIDDER in his HSE plan.

b. Each hoisting device must be suitable for the work to be carried out, both as regards the type and the characteristics. Hoisting devices must be properly maintained and exhibit no obvious defects.

c. Hoisting equipment such as hoisting straps, chains, steel ropes, hooks and clamps must be suitable for the work to be carried out, as regards both the type and the characteristics. Furthermore, all hoisting equipment must bear a valid inspection stamp, be in impeccable condition and exhibit no obvious defects. The inspection certificates for the hoisting equipment will also be listed in the HSE plan.

d. When hoisting work is being carried out, special attention will be paid to the placing and stabilisation of the hoisting gear. If a hoisting device is provided with stabilising feet, these must be used for every hoisting operation. If the stability of the subsoil is insufficient, supporting feet or plates will be used to ensure the safe installation of the hoisting devices.

e. Hoisting buckets will always be used for hoisting loose materials and gas cylinders. The hoisting of persons will only be permitted by means of an approved hoisting cage. All hoisting equipment will be stored in a clean, dry place immediately after use.

1.9.2 Personnel and Organization

a. All personnel involved in carrying out hoisting work - in particular the operators of the hoisting gear and the riggers - must be properly trained to carry out this work in a manner that is efficient and safe. Crane operators must be in possession of a certificate of qualification issued by an authorised institution.

b. For large and difficult loads, such as loads with an awkward shape, a hoisting plan will be drawn up before carrying out the hoisting operation. This hoisting plan will define the centre of gravity of the construction and the hoisting equipment to be used.

c. For very large loads a calculation will be submitted upon simple request by the OWNER and / or its representative.

d. Wherever necessary, such as in hoisting operations in existing installations above ground, the load must be guided by one or more persons and the circuit along which the load may be moved will be determined beforehand in consultation with the OWNER and / or its representative.

e. During hoisting, no-one may stand under the load-bearing arm or the load itself.

f. Moving a load with more than one crane is only permitted after permission has been obtained from the OWNER and provided a hoisting plan has been submitted.

1.10 MATERIAL STORAGE AND HANDLING

1.10.1 General

a. A clear storage plan will be drawn up in advance, both for the central site equipment and the storage areas along the perimeter of the site. For storage areas along public or private roads, this plan must be approved beforehand by the parties involved.

b. BIDDER is responsible for drawing up and adhering to these storage plans. He will ensure that the storage areas are always left in a clean and orderly condition and that they are clearly marked out and signposted.

c. All materials must be stacked in a stable manner and protected against the weather.

1.10.2 Hazardous Products

a. All hazardous products such as Gases, Odorant, Fuels, Paints and Poisonous and aggressive products will be stored in clearly separated areas and provided with leakage trays as required. The storage of such products will be specially indicated on the building site plan listed in the HSE plan. A copy of the safety and health cards(MSDS) for the products used must be attached to the HSE plan.

b. Gas Cylinders should be stored separately on a firm base and provided with a suitable protective cover over the connector tap during storage and transport. They may never be left unattended or laid flat on the ground.

c. Products must never be siphoned over into Cylinders / Bottles / Vessels / Canisters that were originally used for foodstuffs.

d. All products on the sites must be labelled according to regulations. Each label must describe the properties and risks of the relevant product, the precautionary measures to be taken and the actions to be taken in case of accident (MSDS).

e. When storing hazardous products, sufficient and suitable fire-fighting equipment must be on hand. The location of this fire-fighting equipment must be such that it can be used immediately in the event of an incident.

f. The storage of hazardous products must arranged in such a way that the various products can easily be isolated.

g. Relevant / necessary statutory approvals should be obtained for the storage, removal / handling, transfer / transportation, disposal, etc…in accordance with the prevailing norms.

h. In works, where harmful or poisonous vapours are released / generated, measures must be taken to remove them efficiently.

1.10.3 Handling of Hazardous Materials

a. All personnel must be familiar with the Material Safety Data Sheet (MSDS) for a particular material like odorant (Ethyl Mercaptan) before handling the same.

b. Container should be kept tightly closed and stored in well ventilated cool & dark area. To prevent, the physical damage to the container protective container shall be used.

c. The person handling the hazardous material like Ethyl Mercaptan should wear suitable & adequate personnel protective equipment (PPE's) such as rubber gloves, filter respirator guard, plain goCUGLes&self contained breathing apparatus, etc…

1.11 ACETYLENE WELDING AND CUTTING EQUIPMENT, BUTANE AND PROPANE BURNERS

a. The welding vehicles for acetylene welding and cutting equipment must be constructed and set up in a stable manner. The oxygen and fuel gas cylinders will be placed vertically or at an angle of at least 35° during use. They must be mounted on a stable trolley.

b. Gas cylinders for butane or propane burners and for heating devices for site sheds must be set up in a stable manner. They will be properly secured to prevent them from tipping over.

c. Any installation for acetylene welding and cutting must be equipped with a sufficient number of blow-back protection devices. These devices should preferably be located as close as possible to the tools.

d. The gas hoses and manometers must be in impeccable condition and of the correct type. They will always be protected against damage and immediately stored again after use.

e. After use, the cylinders should be closed and the pressure shall be released from the hoses. When working with a naked flame, adequate / suitable fire extinguishers must be available on site as per work permit. Proper & necessary caution should be marked. After completion of work, house keeping should be carried out at site.

1.12 COMPRESSED AIR / GAS INSTALLATIONS

1.12.1 Equipment

All Compressed Air / Gas Equipments, such as Compressors, Hoses, Couplings, Tools/Tackles, etc…will be kept in impeccable condition. Equipment with visible defects or which is unsuitable / non-compatible for the work will be immediately replaced.

1.12.2 Use

Only authorised personnel may use Compressed Air / Gas Equipments. After use, the pressure will be released from each installations / equipments.

1.13 RADIOACTIVE SOURCES

1.13.1 Use

Only personnel from the Recognised Inspection Organisation are authorised to use or transport radioactive sources for testing purposes.

1.13.2 **Warning Signs**

When transporting or storing such sources, standardised warning signs must be posted in the vehicle or in the storage room. These signs must be removed when there are no longer any radioactive sources in the vehicle or in the storage premises.

1.13.3 **Marking Out Of the Test Area**

The areas where radioactive sources are being used must be clearly marked out by means of yellow / black warning tape and standardised pictograms with the words "No Entry - Radiation Hazard".

1.13.4 **Safety Guard at the Test Area**

Throughout the duration of testing with radioactive sources, a safety guard will be posted, in addition to the warning signs. The decisions and orders of these safety guards must be strictly adhered to at all times.

1.14 PRESSURE TESTS

1.14.1 **Inspection of Test Equipment**

All the equipments to be used for carrying out pressure tests, such as hoses, couplings, testing heads, etc…, will be inspected in advance by a Recognised Inspection Organisation. A copy of the inspection certificates shall be enclosed with the HSE plan by the BIDDER.

1.14.2 **Marking Out and Screening Off the Test Area**

a. The areas, where pressure tests are to be carried out will be clearly marked out by means of black / yellow warning tape and a warning sign with the words "No Entry - Installation under Pressure".

b. Where possible, the areas where the likelihood of pressure escaping is highest will be screened off by means of boards / plates or an earthen wall. While tests are being carried out on pipelines / cylinders or vessels / installations / equipments, all activities at and in the vicinity of the same will be brought to a halt.

1.14.3 **Presence of Personnel**

All the personnel, who are not strictly needed for carrying out pressure tests, will be evacuated from the test area. The personnel responsible for monitoring the pressure tests will be responsible for refusing admittance to the test area to unauthorised persons.

1.15 PERSONNEL BEHAVIOR

a. Every person working on the site must behave correctly and with the necessary courtesy towards his colleagues, employees of other contracting parties / subcontractors, representatives of the OWNER and third parties. Any improper conduct may be restrained by the OWNER by removing the persons involved from the site.

b. All unsafe situations and actions must immediately be reported to the OWNER and / or BIDDER. The instructions given by OWNER's representative must be complied with strictly and immediately.

c. The use of the available means of protection is compulsory and must be strictly adhered to at all times.

d. It is forbidden to operate the existing installations of the OWNER or of third parties; such operations may only be carried out only by authorised persons.

e. Entry into existing installations / premises / sites owned by the OWNER or third parties is completely forbidden unless this is strictly necessary for carrying out work and the permission of the OWNER has been secured.

1.16 SAFETY PRECAUTIONS FOR GAS DISTRIBUTION / O&M

1.16.1 General / Industrial Safety

a. Human beings and all living creatures have an in-built consciousness of safety. This consciousness tempts them to protect themselves from accidents in general life. The level of this consciousness varies from person to person and creature to creature. This variation has much effect on the causes and number of accidents. Usually, this consciousness is being used incidentally when we face any unexpected physical trouble in general life.

b. Apart from the general consciousness of safety, a planned programme is required to preserve and upgrade the safe conditions and safe activities at Industries. This is because, here the human beings has to work with machines, materials and environment, which involve different type of risks and hazards which are not common in general life. This planned programme of safety recommends the type / quality of man, machines / materials to be used, working / operating procedures, condition to be observed, precautions to be taken and methods of handling emergencies. This programme also covers training on these wide areas, to develop the employees to operate the Industry in ultimate Safety. The result of this programme is termed as Industrial Safety.

1.16.2 Safety Precautions While Doing Jobs In Valve Chambers / Pits

a. Leak Test / Cleaning / Painting

i. Extra care to be taken while lifting the sleepers from chamber.

ii. Detect Gas leak (if any) in the chamber, before starting any activity in the chamber / making entry in the chamber.

iii. Do not start any job, if there is any gas leakage in the chamber. Arrest / Repair the leak first and check again by the detector /soap solution.

iv. In no case smoking and naked flames shall be allowed near the open valve chamber.

v. Minimum one person must be posted outside the chamber for keeping watch inside the chamber.

vi. Open valve chamber must be cordoned off and warning sign boards placed.

vii. Keep contact with wireless communication with nearest Control Room.

viii. Before closing valve chamber, do final check inside the chamber. Do not leave paper rag and other combustible.

b. Demolishing of Valve Chamber & Removal of Valve Assembly for Live Network

Demolishing

i. Install caution boards at both sides of valve chamber at safe distance of minimum 5 Mtrs. each from valve chamber.

ii. Locate Fire Extinguishers at a suitable place with a trained person, to operate on emergency.

iii. Shift the chamber covers to a distant and suitable place.

iv. Check the inside of valve chamber for any sharp materials or creatures. Pump our water, if there in water inside.

v. Take care test and ensure no leakage.

vi. Clean / remove all unwanted materials from 2 Mtrs. surroundings of the valve chamber.

vii. Only one worker should get inside the chamber at a time, to break the chamber. Pipe valve to be protected and should be covered.

viii. Break the walls from inside the chamber to outside so that the bricks would not fall inside and bit / damage the valve assembly.

ix. The bricks nearer to the pipeline should be taken out one by one to avoid any damage to the pipeline.

x. Remove all the broken materials from the chamber and surroundings.

xi. If the concrete / cement floor of the chamber is required to be broken, it should be done only after isolating and venting out NG from the pipelines section.

Removal

i. Isolate the section including the valve assembly by closing nearest isolation valves or squeezing at nearest point.

ii. Vent out NG from the section using vent pipes after ensuring no source of fire at the surroundings. Take case of traffic / vehicles.

iii. In case of MS network, do purging with Nitrogen / inert gases and ensure the Methane content is less than 2%.

1.16.3 **Safe Route Selection Procedure For U/G Pipeline Work**

a. The Safety and life of a gas distribution network is highly depending upon the selection of the route of the network. A proper route selection;

i. Facilitates easy laying of the pipeline,

ii. Eliminates hazardous areas / identifies the type of protection to be provided.

iii. Minimizes the changes of damage to pipeline by other U/G utility agencies.

iv. Confirm proper location of valves / venting / LPT & Maintenance can be safe and unpopulated area.

b. Following are some of the guidelines for route selection of U/G pipeline network;

i. A visual survey of the alternative route should be made and note down all apparent physical obstacles, natural or constructed, that may affect the conduct or the work.

ii. Details should be obtained from concerned agency / ROU holder that may affect the conduct of the work.

iii. Local authorities should be contacted to obtain any available information on the construction of adjacent buildings and other structures and future planning / proposals. Account must be taken of any stray current that may exist in the vicinity.

iv. Wherever possible the route should be chosen so as to avoid locations where the proposed pipelines could be subjected to abnormal mechanical loading or other adverse condition which may lead to accelerated deterioration.

c. Avoid laying in the following areas;

i. Areas already congested with underground plant / utilities.

ii. In proximity to unstable structures or walls retaining material above the ground level.

iii. Areas, where there has been recent infill especially within the last two years.

iv. Ground liable to subsidence or side slip.

v. Areas of known or suspected corrosion activity.

d. Following additional care should be taken for laying;

i. If the pipes are laid in areas, where future maintenance would result in no damage to structures or plant of third party.

ii. Main pipes should be laid as far away from a building as is practicable and in any event not closer that would subject the pipes to structure loads from the building.

iii. Ensure that branch lines dedicated to direct supply to customers are preferably routed in land for public use.

iv. Trial pit may be necessary, particularly at road crossings, culverts and bridges to prove the route and the type of ground.

v. Special drawings will be required for certain crossing e.g. Culverts, bridges, etc...

vi. A plan of the proposed route of the main must be prepared. Design of the pipe size should be considering future extensions.

vii. Use proper pipes which has proper diameter and thickness.

viii. Lay pipes in open areas so that in case of gas leakages it would easily disperse in the atmosphere.

ix. Ensure no source of ignition close to the pipeline from surrounding.

x. Location of isolation valves should be in unpopulated / isolated areas and be at a reasonable distance from the roads, so that it would not be damaged by vehicles and maintenance / testing jobs could be carried out safely.

xi. Take care that isolation valves should not be in parking areas and just under electrical cable / nearby electrical installations like transformer, etc...

1.16.4 **Safety in Commissioning / Charging Industry / Commercial**

Safety checks / precautions to be observed before and during commissioning of Gas inside an Industry are as follows;

a. Ensure that all items like pipes, valves, fittings are of standard Quality supplied / certified by OWNER. Also, ensure approval of PRS & its installation / equipments including vent line prior to commissioning.

b. Ensure that standard fabrication, welding inspection and installation methods are followed.

c. Check the layout of gas train and equipment / valves used in gas train.

d. Check the electrical items used in gas train are of flame proof type.

e. After pre-commissioning check, all pipeline section / equipment should be Nitrogen purged to minimize the Oxygen percentage below 2.

f. After successful purging, charge the pipeline and equipment in following sequence;

i. Gas charging in the supply line.

ii. Gas charging in PRS.

iii. Gas charging in Internal Piping.

iv. Gas charging in Gas train / Burner.

g. Before charging the burner, take dry-run of the burner, i.e. switch on the burner without gas and check the sequence controller as well as flame failure safety interlocks.

1.16.5 **Precaution before Doing Hot Work On Gas Line**

a. Ensure that a work permit is taken for the job to be executed well in advance.

b. Ensure all Safety Equipments adequate & suitable Fire Extinguishers, Personnel Protective Equipments, etc…are available at the site of work.

c. Establish wireless / telecommunication with the control room before starting the job.

d. Grease the main Isolation valve at Valve chamber / Metering platform before job.

e. Pre-purge the section for hot work with nitrogen and check methane percentage at any of the tapping point / pressure gauge point with suitable analyzer / detector, it should be zero.

f. Repeat the pre-purge operation if methane percentage is detected until zero percentage is achieved.

g. Do the actual gas cutting / welding work on the line once zero methane percentage is achieved.

h. Use Personal Protective Equipments while doing the Gas Venting, Cutting, Welding and Grinding Operations.

i. After finishing of the job test pipeline section with Nitrogen at recommended test pressure with soap solution and lock pressure test.

j. After confirmation of testing, Post purging of the section should be done and Oxygen percentage should be checked at the farthest point which be minimum 2%.

k. Before charging NG following pre-commissioning checks should be done;

i. Inspection of the job done.

ii. Ensure all drain valves, Pressure gauge tapings are in closed condition.

iii. All tools tackles & equipment not required should be removed from the site.

iv. All activities should be stopped.

v. Only required personnel should be present at the site.

l. Inform all concerned before charging NG in the section including control room.

m. While recharging, always crack & gradual open the inlet valves.

n. Vent the gas from all farthest points to remove Nitrogen percent if present. Check that Methane percentage is more than 5%.

1.16.6 **Safety Guideline for Plumbing Installation**

a. Route Selection

i. Underground Tapping Line.

ii. Location of tapping saddle should be at a free place away from other utilities, electric posts, septic tanks etc.

iii. Length of U/G piping in customers' premises should be as minimum as possible. The U/G pipeline should not cross any U/G tanks or open trenches.

iv. Riser pipe should be provided on a wall having enough space to install Audco valves, Pressure regulator, Meter etc.

v. In parking area / boundary wall A/G piping should be avoided or minimized.

vi. Height of the A/G horizontal pipe should be in such a way that children cannot use it for climbing or jumping.

vii. Wherever possible; initial rise / elevation to the piping should be given inside the boundary wall to avoid any vehicular accident / foul play by outsiders.

viii. Pipeline routing should be in such a way that door / window / any similar moving parts should not hit the gas pipe, valve, meter and regulator.

ix. Ensure that electric cables do not come in physical contact with gas line. It is recommended to keep a minimum distance of 1.5 feet between gas pipeline and electrical lights, cables / installation.

x. Isolation / Control valves, meter, regulator and any other joint should not be provided nearest to electric lights, switch boards etc. install single pipes without joints as a minimum distance of 1.5 feet at these points.

xi. Location of gas tap should be at enough distance from the hot plates / burners so that the gas tap & rubber tube do not get heated up.

xii. Gas tape should be at convenient height not less than 4 feet. In special cases, if the gas taps a re to be installed further below an extra isolation / control valve should be provided on the tapping pipe. Gas taps should not be provided in closed cabinets.

xiii. Individual control valve should be installed for each connection outside the house at a height of 6 feet. For apartments one main control valve should be installed at a convenient height on the main riser pipe; in addition to individual valves.

b. Installation

i. RCC guard should be provided where A/G & U/G piping join each other.

ii. Clamping / Supports should be provided at both sides of gas meter.

iii. Clamping / Supports should be provided at a distance of at least 1 Meter.

iv. Proper & firm supports should be provided for riser and branches to avoid direct load on fittings, valves, regulators, etc...

v. Minimize the number of joints as much as possible inside the house.

vi. Avoid the A/G gas pipe crossing other pipelines, wires, etc...

vii. In case of large size installations union joints to be provided for easy dismantling and repairs.

viii. Avoid bending of GI pipes more than 45 degrees.

ix. Pipeline should not be installed hanging between pillars of any projections on walls.

x. No gas tap should be left without connecting to a burner. In such cases the gas point should be kept closed by and end cap.

c. Ground Connection

i. Pressure test to be confirmed before giving ground connection.

ii. Do the ground connection after charging of PE network.

iii. Before ground connection; check all plumbing network. Entire network should be completed up to gas tap with proper supporting work.

iv. All extra gas taps should be plugged.

v. Soap solution test of the Ground Connection should be done up to Saddle / Tee joint.

vi. Do not connect, if regulator is not provided.

d. Testing

i. Only inspected / calibrated Pressure Gauges should be used.

ii. Pump cylinder to be dismantled and line should be plugged after achieving required pressure. At farthest end i.e. at gas tap; pressure to be checked and confirmed for at least 1 hrs. All joints should be checked with soap solution.

e. Conversion

i. Pressure test report to be confirmed.

ii. Uncompleted work should be checked (i.e. any open ends, gas taps, plugs, etc...)

iii. Soap solution test to be carried out, after removing spool piece & installation of meter, regulator, unions, connectors, etc...

iv. Do not charge if there is any leakage.

v. All wall openings & supports should be well completed before conversion.

1.16.7 **Conditions to be Observed Prior to Start Work on Gas Installation**

a. All required sizes of valve keys, wheels are available and placed nearest to their application place.

b. Minimum 2 nos. suitable (DCP) Fire Extinguishers should be available at each site.

c. Continuous wireless communication between site and control room and between sites must be established, immediately on reaching the sites and before staring any activity.

d. No smoking should be done in the 15 Mtrs. radius of site.

e. Only intrinsically safe / flame proof / explosion proof electrical equipments / items should be used.

f. No source of ignition / spark should be present within 15 Mtrs. radius of site.

g. Check wind direction and position the diesel fired / electrical items accordingly keep it 15 Mtrs. away from the site.

h. Wherever possible work should be done during the slack hours of traffic and gas consumption.

i. Measuring instruments must be in good working condition (Oxygen Analyzers, Gas Detectors, Gas Surveyor, Flame Ionization Detector, etc…)

j. Use calibrated Pressure gauges only.

k. Only 24 volt D.C. supply is to be used for transmitter calibration work.

l. For Venting out gas locate / choose safe place considering;

i. Open ventilated place available.

ii. Overhead Electrical Wires / Installations.

iii. Vehicular Traffic.

iv. No smoking zone – non populated area.

v. Always vent – Gas at height by providing minimum 3 Mtrs. long pipe to vent pipe.

1.16.8 **Guideline for Working in Confined Space**

a. Definitions

In general industry terms a confined space means a space in any vat, vessel, tank, container, silo, valve pit / chamber, trenches, odorant storage, receptacle, underground sewer, shaft, well, tunnel or other similar enclosed or partly enclosed structures, when the space is;

i. Intended or likely to be entered by any person, and

ii. Has a limited or restricted entry and exit, and

iii. Intended to be at normal atmospheric pressure while a person is in that space, and

iv. Contains, or is intended to contain, an atmosphere that has a harmful level of contaminants or an unsafe oxygen level.

b. In terms of gas distribution, defined spaces may include regulator or valve pit, meter rooms, trenches or excavations, odorant facility, drainage or other pits of other utilities.

c. Hazards in Confined Spaces

A hazard is a potential source of harm or injury. A risk is the likelihood of being affected by a particular hazard. Thus "hazard" and "risk" have different meanings. Hazards encountered in confined spaces include oxygen deficiency, oxygen enrichment, flammable gases, toxic gases, noise, dust, smoke, fumes, heat stress, and mechanical hazards.

Oxygen - Deficiency or Enrichment

i. The minimum oxygen content in air should be 19.5% by volume under normal atmospheric pressure. The usual oxygen level in outdoor air is 20.9%.

ii. Oxygen enrichment, greater than 23.5%, is associates with increased fire hazards in that lower than usual concentrations of flammable gases or other combustible materials will burn because of the higher oxygen level.

Flammable Gases

i. The presence of a flammable gas in concentrations between its lower (LEL) and upper (LEL) explosive limits can produce a potentially explosive atmosphere. A source of ignition, such as a flame or spark can cause an atmosphere to explode causing injury, death and property damage.

ii. Other flammable gases and vapors include petrol, kerosene, ammonia, benzene, toluene and xylene. There are hundreds of other compounds which could be included in this list.

Toxic Gases

Exposure to toxic gases can result in widespread effects ranging from local irritation of the airways and eyes through to wide ranging effects throughout the body including death. The following provides information about two commonly found toxic gases;

Carbon Monoxide, is a colorless, odorless gas which is impossible to detect by the normal senses. It is a product of incomplete combustion. This can be in an internal combustion engine, whether petrol, diesel or LPG, such as chain saws, motor mowers, or petrol driven pumps, etc. Nearly all fires produce some carbon monoxide. Carbon monoxide inactivates the oxygen carrying compound of the blood preventing sufficient oxygen reaching the brain. It takes about three to five minutes for an Oxygen starved brain to suffer irreversible damage and death results in about ten minutes.

Hydrogen Sulphide, commonly known as "rotten egg gas" for an obvious reason, results from the action of microbes in a variety of conditions, e.g. in sewage and rotting animal and vegetable matter. While hydrogen Sulphide is easily recognized by its smell, anyone exposed to even low levels of the gas will soon develop "olfactory fatigue".

This means that although it is still present in the air the sense of smell becomes less sensitive. This could result in death if the concentration suddenly increases to a toxic level, as the person exposed will not notice this increase. Hydrogen Sulphide may irritate the eyes and airways and affect many body functions.

Dust, smoke and fumes

Some dusts, once they become airborne, can result in an explosive atmosphere but this is not common in confined spaces. Airborne dust, also referred to as particulates, is measured in milligrams per cubic meter ($mg/m^{3)}$ of air sampled. Dust has a health consideration as well. Breathing of dust particles, depending upon the material from which they came and their size can cause any or a combination of;

i. Pneumoconiosis

ii. Emphysema

iii. Silicosis asbestosis

1.16.9 **Precautions for Geyser**

Installation

The balance flue type gas geyser is the safest one, but as it is not available in India and it will take some time to develop the same. We can continue using flue type gas geyser safely by taking following precautions;

i. As far as possible install gas geyser in well ventilated bathroom only, and this ventilation should remain effective even after the bathroom door is closed.

ii. If you are in a bathroom, with a gas geyser on, and if you start feeling certain abnormalities like, deep breathing. Fast breathing, headache, etc…open the door immediately and come out of the bathroom at once.

iii. To be sure safe, store the hot water by switching on the gas geyser, but keeping bathroom door and ventilators open. After storing the required hot water, shut off the geyser and take a bath even after closing the door.

Four Steps for Safe Operation of a Gas Geyser

i. First open the gas tap.

ii. Ignite the pilot flame-either with inbuilt ignition system or with a match-stick.

iii. Observe the pilot flame and make sure it is stable.

iv. Lastly open the water valve.

Never Open Water Valve Prior To Opening of a Gas Tap

i. This will open the main gas regulator, resulting in to gas coming out of the geyser combustion chamber, which may cause fire flames outside the combustion area of geyser. And in this condition, if ignition is delayed by any reason, than good amount of gas may accumulate in the bathroom, which may cause explosion.

ii. Never encourage children to operate the geyser; gas tap should be located at 6" height, beyond the reach of children.

iii. Never keep clothes and hair loose, while operating geysers, and never operate geysers, very closely.

1.16.10 **Others**

a. **VENTILATION:** Before installing the gas connection / gas geyser, adequate & proper (cross) ventilation should be ensured. Generally, a standard bathroom, kitchen does not comprise any cross ventilation. Hence, all the installation must be carried out based on the OWNER's / statutory norms. Since, the natural gas replaces the air contains oxygen very quickly & so oxygen required for human being deficits, cause human fatality, too. Also, it the likely hood of fire & explosion increases. Every person working on the site must behave correctly and with the necessary courtesy towards his colleagues, employees of other contracting parties / subcontractors, representatives of the OWNER and third parties. Any improper conduct may be restrained by the OWNER by removing the persons involved from the site. Also, in the bathroom, there are chances of producing Carbon dioxides & monoxides from geyser & human taking bath therein, which are also having potential hazards of an accident.

ROAD SAFETY: Considering, Indian road conditions & human tendency, road safety is required during performing the work on the main roads, pipeline routes, patrolling, monitoring, complaint attendance, emergency call, etc…Defensive driving plays major role in this issue, hence, driver should be well trained, accountable towards the specified responsibility, having valid licence for the particular vehicle, renewal from time to time, should be trained for hazardous goods transportation (TREM CARD is required in such cases). Emergency Vehicle should be given utmost importance in terms of operatabiltiy, statutory aspects, maintenance, spark arrestor (exhaust muffler), etc. The work to be carried out in dark / night hours should also be given substantial importance by following best engineering practices.

RECOMMENDED VENDOR LIST

ITEM CODE / DESCRIPTION	**GI Pipe**
VENDOR NAME	**Remark**
M/s Swastik Pipe Ltd.	
M/s Jindal Industries Ltd.	
M/s Vishal Pipes Ltd.	
M/s Indus Tubes Ltd.	
M/s Advance steel Tubes Ltd.	
M/s Good Luck Tubes Ltd.	
M/s. Rama Steel Tubes	
ITEM CODE / DESCRIPTION	**GI Fittings**
VENDOR NAME	**REMARKS**
M/s Sarin Industries Ltd.	
M/s Jupiter Metal Industries Ltd.	
M/s Jainsons Industries Ltd.	
ITEM CODE / DESCRIPTION	**Copper Tubes & Fittings**
VENDOR NAME	**REMARKS**
M/s RajcoMetal	
M/s Mehta Tubes	
M/s Jay Banas Metals	
ITEM CODE / DESCRIPTION	**Brass Fittings**

VENDOR NAME	**REMARKS**
M/s Chandan Enterprises	
M/s Paras Industries Ltd.	
ITEM CODE / DESCRIPTION	**Corrugated Flexible Metal Hoses(Anaconda)**
VENDOR NAME	**REMARKS**
M/s KPC Flex Tubes	
M/s Vestas Hose Division	
M/s Alfa Flexi tubes	
M/s Chandan Enterprises	
ITEM CODE / DESCRIPTION	**Steel Re-inforced Rubber Hose(Type-4)**
VENDOR NAME	**REMARKS**
M/s Super Seal Flexible Hose Ltd.	
M/s Suraksha Products Pvt. Ltd.	
M/s Vansh Industries	
M/s T & L Gases	
ITEM CODE/DESCRIPTION	Warning Mat
VENDOR NAME	**REMARKS**
M/s. Sparco Multi Plast	
M/s. Sri Vijay Wire & Cable	
ITEM CODE/DESCRIPTION	**HDPE Pipe**
VENDOR NAME	**REMARKS**
M/s. Adventec Polymers	
M/s. Duraline India	
M/s. Jain Irrigation	
M/s. Kirti Industries	
ITEM CODE/DESCRIPTION	**PE(Fitting/Valves/Transition Fittings)**
VENDOR NAME	**REMARKS**
M/s. TegaMuhendislik	
M/s. Georg Fischer Piping System	
M/s. Kimplas piping Systems	
M/s. Glynwed pipe systems	
M/s. RMG Autometers gas technologies	
Notes :	

1. Above vendor list is indicative only and any other vendor(s) apart from as mentioned above may be accepted subject to approval by Owner/Owners representative based on past track record.

2. For the vendors of items not covered in above vendor list, but required for completion of project successfully, supplier shall take approval form Owner/Owners representative for the same during project execution. Bidder shall submit the required certifications, documents, PTR and Performance letters from clients for the same.