



CENTRAL U.P. GAS LIMITED

(CITY GAS PROJECT IN KANPUR, BAREILLY & JHANSI)

BID DOCUMENT FOR THE ENGAGING CONTRACTORS FOR PNG INDUSTRIAL & COMMERCIAL CONNECTIVITY WORKS IN KANPUR, UNNAO, BAREILLY & JHANSI FOR CITY GAS DISTRIBUTION PROJECT OF M/S. CENTRAL U. P. GAS LIMITED, FOR THE PERIOD OF 01 YEAR

BID DOCUMENT NO : CUGL/C&P/TEN2526/53

THROUGH E-TENDERING MODE

**OPEN DOMESTIC COMPETITIVE BIDDING
TECHNICAL VOLUME**

(Volume II of II)

MAIN TABLE OF CONTENTS		
LAYING OF MDPE PIPE, INSTALLATION OF GI/CU AND ASSOCIATED WORKS FOR CITY GAS DISTRIBUTION PROJECT AT KANPUR, UNNAO, BAREILLY & JHANSI GA		
SL.NO.	DESCRIPTION	PAGE No.
	NIT	
I	SECTION A - COMMERCIAL (VOLUME I OF II)	
II	SECTION B - TECHNICAL (VOLUME II OF II)	
1	TS INTRODUCTION	1-3
2	TS LAYING OF MDPE MAIN PIPELINE & SERVICE PIPELINE	4-29
3	TS INSTALLATION OF ABOVE GROUND GI PIPING & FITTINGS	30-42
4	TS ELECTROFUSION FOR PE PIPES & FITTINGS	43-51
5	TS HEALTH, SAFETY & ENVIRONMENT	52-72
6	TS SUPPLY OF MDPE FITTINGS, VALVES AND TRANSITION FITTINGS	73-79
7	TS GI PIPES	80-84
8	TS GI FITTINGS	85-89
9	TS WARNING MAT	90-95
10	TS ISOLATION BALL VALVE	96-101
11	TS APPLIANCE BALL VALVE	102-107
12	TS POWDER COATING	108-111
13	TS INSTALLATION GI, COPPER	112-127
14	TS COPPER FITTINGS	128-132
15	TS BRASS FITTINGS	133-137
16	TS CORRUGATED FLEXIBLE METAL HOSE	138-142
17	TS STEEL REINFORCED RUBBER HOSE	143-147
18	TS COPPER TUBE	148-152
19	GTS PE ACCESSORIES FOR UNDERGROUND NETWORK FOR NATURAL GAS DISTRIBUTION	153-174
20	GTS PE COMPOUNDS FOR MANUFACTURE OF PIPES AND FITTINGS FOR UNDERGROUND NETWORKS FOR NATURAL GAS DISTRIBUTION - ACCEPTANCE PROCEDURE	175-184
21	GTS PE VALVES FOR NATURAL GAS DISTRIBUTION UNDERGROUND NETWORK	185-204

CENTRAL U.P. GAS LIMITED (CUGL)

LAYING OF MDPE NETWORK AND GI / Cu INSTALLATION WORK FOR DOMESTIC CONSUMERS AT CUGL GA's IN KANPUR, UNNAO, BAREILLY & JHANSI IN THE STATE OF U.P

INTRODUCTION

TABLE OF CONTENTS

1.0 INTRODUCTION



TECHNICAL SPECIFICATION
LAYING OF MDPE MAIN PIPELINE AND SERVICE
PIPELINE

1.0 INTRODUCTION

1.1. Central U.P. Gas Limited (CUGL) is a joint venture company of Gail & BPCL is responsible for distribution of Natural Gas for Domestic, Commercial & Industrial sectors including setting up CNG refueling stations for vehicles etc. in district of Kanpur, Unnao, Bareilly, Jhansi.

1.2. Central U.P. 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 above mentioned GAs through its CGD and CNG networks. CUGL intends to develop its CGD and CNG network in above mentioned GA.

Resonance Energy Private Limited (REPL) is consultant for EPMC for Kanpur, Unnao, Bareilly and Jhansi for 02 year for city gas Distribution. Currently REPL is engaged in preparation of tender, Evaluation and recommendation of bidders for Laying, Installation, testing and Commissioning of MDPE P/L & PNG Domestic Connection in CUGL.

The present document covers the technical specifications for the enquiry.



TECHNICAL SPECIFICATION
LAYING OF MDPE MAIN PIPELINE AND SERVICE PIPELINE

CENTRAL U.P. GAS LIMITED (CUGL)

LAYING OF MDPE NETWORK AND GI / Cu INSTALLATION WORK FOR DOMESTIC FOR CUGL GA's IN KANPUR, UNNAO, BAREILLY & JHANSI IN THE STATE OF U.P

TECHNICAL SPECIFICATION

LAYING OF MDPE MAIN PIPELINE AND SERVICE PIPELINE

TABLE OF CONTENTS

1.0	GENERAL INFORMATION
2.0	DEFINITIONS
3.0	SCOPE OF WORK
4.0	MATERIAL, MANPOWER, EQUIPMENT AND MACHINERY
5.0	PROGRESS OF WORK
6.0	CO-ORDINATION/LIAISON FOR PIPELINE LAYING
7.0	REFERENCE SPECIFICATION, CODES AND STANDARD
8.0	QUALITY OF WORK
9.0	SAFETY
10.0	ROUTE SURVEY
11.0	ORGANISATION STRUCTURE
12.0	STRUCTURES, SERVICES AND OTHER PROPERTY
13.0	TRENCHING
14.0	LAYING
15.0	JOINTING OF POLYETHYLENE PIPE
16.0	BACKFILLING
17.0	TRENCHLESS LAYING (ONLY FOR 90MM & 125 MM)
18.0	RESTORATION
19.0	TESTING
20.0	PURGING
21.0	VALVE CHAMBERS
22.0	PERMANENT MARKERS
23.0	ASSISTANCE IN COMMISSIONING
24.0	STANDARD OF WORK
25.0	RECORDING (AS-BUILT DRAWINGS)
26.0	CIVIL WORKS

1.0 GENERAL INFORMATION

Central UP Gas Limited (CUGL), is a joint venture of Bharat Petroleum Corporation Limited (BPCL) and GAIL (India). CUGL plans to install an underground Natural Gas Distribution network in District of Kanpur, Unnao, Bareilly, Jhansi. The objective is to supply Natural Gas to both Domestic 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 gas charged areas of sizes ranging from 20 mm upto 125mm OD, which includes PE/GI transition fitting above ground level and LMC work.

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 U.P. GAS LIMITED (CUGL)
PMC	Resonance Energy Private Ltd.,
TECHNICAL SPECIFICATION	Present <<Technical Specification>>and its entire appendix, if any.
TPIA	Third Party Inspection Agency
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 pipeline laying and submit to OWNER/PMC for approval.
- 3.3 Co-ordination /Liaison from respective land-owning agencies such as CPWD, ADA, NHAI, 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.

TECHNICAL SPECIFICATION

LAYING OF MDPE MAIN PIPELINE AND SERVICE PIPELINE

- 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 Laying pipelines by any methodology including trenchless technology methods with or without casing pipes (HDPE pipes) as per specifications and as directed by EIC. Casing Pipe (HDPE Pipes) shall be supplied by Contractor i.e. PE 80/PE 63, PN 6, IS 4984.
- 3.13 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.
- 3.14 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.
- 3.15 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.
- 3.16 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.
- 3.17 Commissioning of gas in the tested PE Line shall be done as per the approved procedure.
- 3.18 Restoration of existing ground features such as grass/turfing, paving, roads, drains, concrete, floral beds, fencing, tiles, marbles, flooring masonry etc. to original condition and to match with adjoining conditions, functionally and aesthetically up to the entire satisfaction of Owner / Owner's representative /any other Third-Party agency designated by Owner and local authorities, failing which, it will be done at the risk and cost of the contractor. Obtaining satisfactory completion certificates form the restoration work done from the concerned authorities.
- 3.19 Returning surplus material to Owner stores after obtaining clearance from TPIA/Consultant/ Owner, reconciliation of free issue material/consumables.
- 3.20 Handing over the completed works to Owner for their operation/use purposes.
- 3.21 Rectification of defects arising due to poor workmanship during defect liability period of pipelines / installations handed over to Owner.
- 3.22 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.
- 3.23 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.
- 3.24 Contractor to note that sizes to be taken as precisely as per drawing given in tender document. In any case due to site constraint, sizes given in drawing may vary.

- 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 only supply following material such as MDPE – pipes (125, 63, 32- & 20-mm OD). Other than Carrier Pipe, fittings, Transition fittings and valves 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.
- 4.4 Material reconciliation statement of free issue material duly certified by Owner and PMC shall be submitted to OWNER on monthly basis.
- 4.5 **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.
- 4.6 Contractor shall procure the materials such as HDPE Casing Pipes & required valves fittings and Warning Mat etc.
- 4.7 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.
- 4.8 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.
- 4.9 **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.
 - Permanent markers with foundation
- 4.10 Manpower
- The Contractor shall provide the skilled labour, tools, material and equipment necessary for the proper execution of the Work.
- 4.11 Equipment, Machinery & Tools
- This will include but is not limited to the list of specialized items included in Annexure # 1.
- 4.12 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.

- 4.13 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.

- 4.14 Acquisition, Receipt & Storage of Materials

The Contractor shall collect all free issue materials from OWNER 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 OWNER store, if found in nonworking 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 OWNER 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 logbook 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, LDA, ADA 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) from these statutory bodies. Contractor shall ensure that the Road Restoration Charges are to the minimum against the work to be carried out. OWNER may return back the demand note, if the Road Restoration charges are not

found reasonable then OWNER shall not be liable to pay any Road Restoration Charges against the same to Concern Authority.

However, OWNER 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-to-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 OWNER 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 OWNER 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 OWNER.

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 OWNER. 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. OWNER 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 TECHNICAL SPECIFICATION – Laying of MDPE Main Pipeline and Service pipeline.

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 finalize the route along with these agencies and Owner/ Owner's representative.

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

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.

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 centerline 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 enclosed in the tender.

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. 02.a** 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.

Murram

It shall be obtained from pits of weathered disintegrated rocks. It should preferably contain siliceous material and natural mixture of clay of calcareous origin. The size of the Murram shall not be more than 20 mm. Murram for filling shall be clean and well graded. Murram shall not contain any vegetation,

organic, clayey or other material. Additional rates shall be payable for Murram excavation as per the **SOR item no. 02 b** over and above the pipeline laying rates.

Boulder

It is a rock with grain size of usually not less than 256 mm (10 inches) diameter. Additional rates shall be payable for Boulders excavation as per **SOR item no. 02 b** over and above the pipeline laying rates.

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.



TECHNICAL SPECIFICATION

LAYING OF MDPE MAIN PIPELINE AND SERVICE PIPELINE

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 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 enclosed drawing in the tender. 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 applicable TECHNICAL SPECIFICATION which is part of this tender document. Only Bar coded electro-fusion machine (Automatically Readable) that can read the bar code of the fittings automatically shall be used for jointing 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 oxidized surface of the pipe using Universal Scrapper up to 63mm/Rotary Peeler for 63 mm and above before inserting into the electro-fusion coupler. The tool must remove a layer of 0.1mm to 0.4mm from the outer surface of the polyethylene pipe. No fusion will be allowed without 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 from 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 backfilling, 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 backfilling 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 90MM & 125 MM)

Both Manual Molding and HDD are to be considered as methods of trenchless laying for 90mm & 125 mm diameter pipeline only.

Manual Molding

The Manual Molding 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 Molding 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 molding work is in contractor's scope. The type of molding 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 Molding.

For Molding 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 Molding the hole shall be properly compacted / filled with soil by watering and by approved procedures.

TECHNICAL SPECIFICATION

LAYING OF MDPE MAIN PIPELINE AND SERVICE PIPELINE

The length of the Hole (excluding the sizes of the pits on both ends) shall be considered for the measurement of Molding 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 Molding 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/Molding 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 mobilizing / 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 mobilize 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 relevant SOR item no. 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 Molding/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	20		50
2	32	50	90
3	63	110	160
4	90	180	
5	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 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.

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.

The rate of restoration includes Asphalted / bituminous, concrete pavement, Agra stone/Kota stone / Tiles (Chequered / any other type of tiles), Marbles, interlocking paver blocks, Dry brick pavements etc. and is payable under one SOR.

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

Contractor has to obtain the No Objection Certificate (NOC) from the concerned local authorities/RWA after completion of the restoration work. The restoration specification specified in the tender is only a typical specification and the contractor has to carry out restoration as per the latest version CPWD/IRC 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 stabilization 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. Prefabricated 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.

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. 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 20 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 shall be installed after every two RCC route marker
- 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 (Enclosed in Tender) shall be installed outside of individual societies/areas as per the instructions of the Owner representative.
- For the distribution network, 125, 90, 63, 32 & 20mm OD 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 of 1:200 and shall be submitted in an A-0 sheet. 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 meters. 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 clearly mentioned in the as laid. Gas objects (off valves, tees, elbows, couplers, transition fittings etc..) shall be shown as block objects (which form a single node to connect) with respect to Owner symbols / legend. The As laid drawings shall be as per the approved legends provided by EIC.
- 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 laid 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 building's 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 (1:200).

- 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 hydrams/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 OWNER/PMC. The contractor shall ensure extra / surplus materials / malba shall be immediately removed from the site after completion of the job.

TECHNICAL SPECIFICATION
LAYING OF MDPE MAIN PIPELINE AND SERVICE PIPELINE

ANNEXURE-I

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 Asphaltting	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

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 Competent authority.
- 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 wherever 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 Competent authority)

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

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.

TECHNICAL SPECIFICATION
LAYING OF MDPE MAIN PIPELINE AND SERVICE PIPELINE

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

In addition to the above construction materials such as interlocking 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 – 30	3
4	31 – 50	4
5	51 and above	4 + 1 additional sample for each additional 50 Cu. M and part thereof.

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

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



TECHNICAL SPECIFICATION

LAYING OF MDPE MAIN PIPELINE AND SERVICE PIPELINE

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.



TECHNICAL SPECIFICATION
LAYING OF MDPE MAIN PIPELINE AND SERVICE
PIPELINE



**TECHNICAL SPECIFICATION - ELECTROFUSION
FOR PE PIPES & FITTINGS**

CENTRAL U.P. GAS LIMITED (CUGL)

**LAYING OF MDPE NETWORK AND GI / Cu INSTALLATION WORK
FOR DOMESTIC FOR CUGL GA's IN KANPUR, UNNAO, BAREILLY &
JHANSI IN THE STATE OF U.P**

TECHNICAL SPECIFICATION

ELECTROFUSION FOR PE PIPES & FITTINGS

TABLE OF CONTENTS

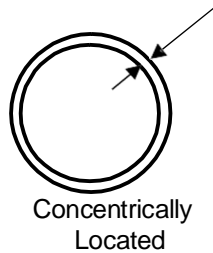
1.0 ELECTRO FUSION FOR PE PIPE

1.0 Electro Fusion Fitting Jointing

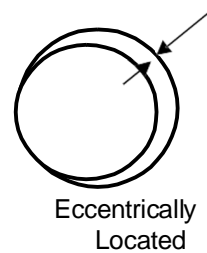
1.0.1 For electro fusion fitting jointing, an electrical resistance element is incorporated in the socket of the fitting which, when connected to an appropriate power supply, melts and fuses the materials of the pipe and fitting together.

1.0.2 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



Max gap 2% of pipe OD



1.0.3 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.

1.0.4 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.

1.0.5 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.

1.1 **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 alongside the pipe end. Trace a line round the circumference at the appropriate distance from the end of the pipe using a felt tip pen or similar.

Note that the fitting should not 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.

1.2 Records

Records of appropriate servicing and calibration shall be kept.

1.3 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.

1.4 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.

1.5

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.

1.6 **Records**

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

1.7 **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.

1.8 **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.

1.9 **Squeeze-off**

- a. To control the gas flow a special tool may be used to squeeze the pipe walls together. Hydraulic jacks are used to supply the necessary force to compress the pipe walls for sizes 90 mm and above.
- b. As will be seen the squeeze-off equipment comprises two bars to apply pressure to the outside of the pipe. The bars are brought together, either manually or hydraulically, squeezing the pipe material together until a seal is formed where the upper and lower walls meet.
- c. The hydraulic machines should have a spring return for the jack and locking to prevent accidental release of pressure during operation. All squeeze-off machines should be fitted with check plate or stops to avoid over compression of the pipe.
- d. Where the pipe walls are compressed the polyethylene pipe will be severely deformed in the regions of maximum compression. The pipe will eventually regain its original shape after squeezing but there will be some reduction in the pressure bearing properties.
- e. A complete stop may not always be obtainable because of wrinkling of the inside of

the pipe. If a complete stop is required then a second squeeze can be used, with an intermediate vent to remove the gas which passes the first squeeze from say the trench area. A second squeeze-off procedure should be a minimum of three pipe diameters and right angles to the initial squeeze.

- f. While not essential it would be good practice to fit a reinforcing stainless-steel band / do not squeeze again adhesive tape around the pipe upon the completion of a squeezing operation.

1.10

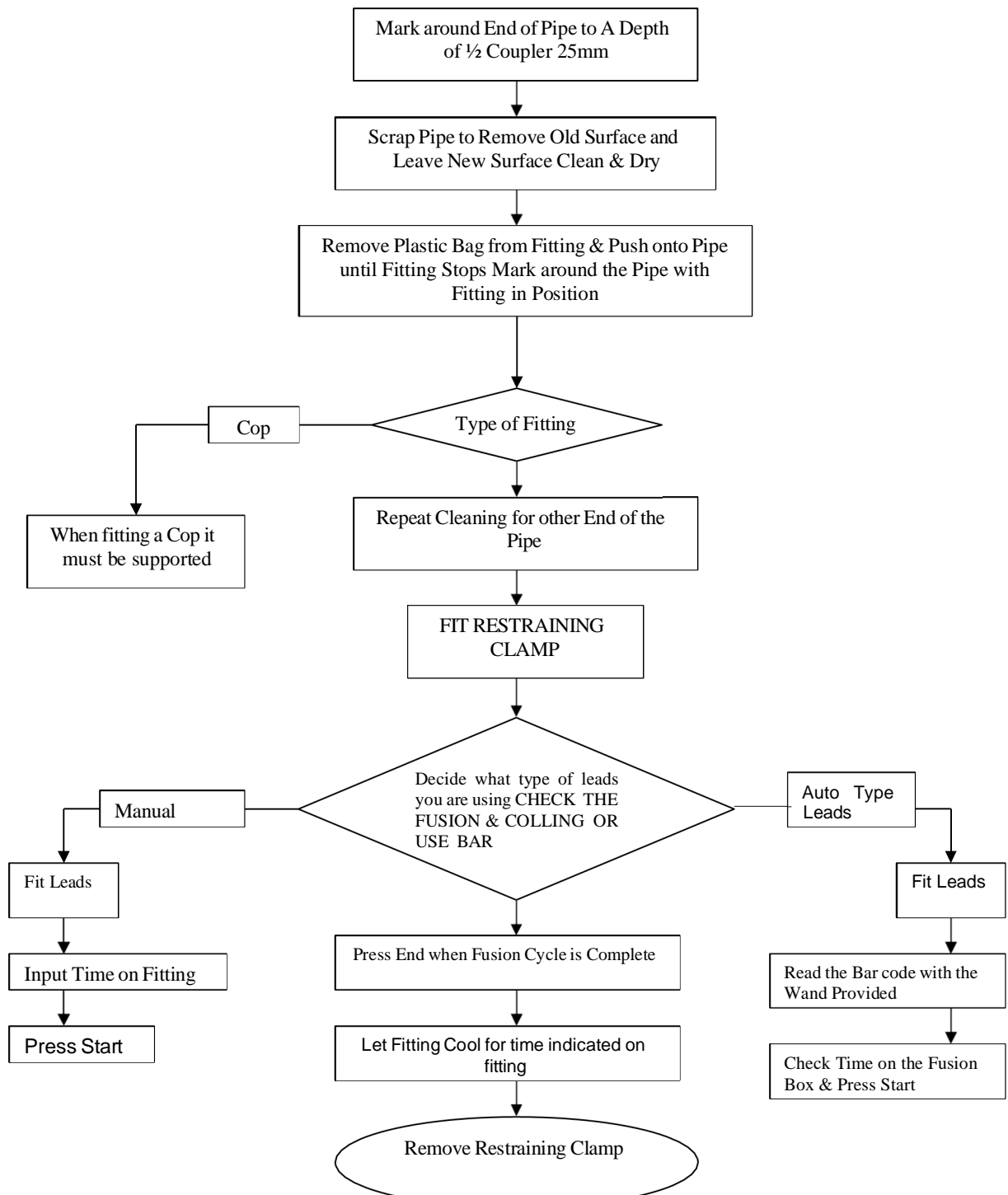
Bending-Back

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.

ATTACHMENT # 1

FUSION COUPLERS FROM 20 MM TO 180 MM





**TECHNICAL SPECIFICATION – HEALTH, SAFETY
& ENVIRONMENT**

CENTRAL U.P. GAS LIMITED (CUGL)

**LAYING OF MDPE NETWORK AND GI / Cu INSTALLATION WORK
FOR DOMESTIC FOR CUGL GA's IN KANPUR, UNNAO, BAREILLY
& JHANSI IN THE STATE OF U.P**

TECHNICAL SPECIFICATION

HEALTH, SAFETY & ENVIRONMENT

TABLE OF CONTENTS

- 1.0 SCOPE**
- 2.0 REFERENCES**
- 3.0 RESPONSIBILITY & ORGANISATION**
- 4.0 GENERAL REQUIREMENT**
- 5.0 ACCIDENT, INCIDENT AND NEAR-MISS REPORTING**
- 6.0 HSE REQUIREMENTS AT SITE**

ANNEXURE – A

ANNEXURE – B

□ □ □

1.0 SCOPE

This specification establishes the Health, safety and Environment (HSE) aspects to be complied with by the contractor during construction at site.

2.0 REFERENCES

This document should be read in conjunction with following.

- General Condition of Contract (GCC)
- Special Condition of Contract (SCC)
- Job Specifications
- Relevant IS codes
- Reporting Formats

3.0 RESPONSIBILITY & ORGANISATION

Safety activities at site shall be under control of contractor's RCM. He shall be responsible for implementation of HSE provisions. The nominated or designated safety engineer/ officer shall assist and perform day to day HSE work as per his advice.

4.0 GENERAL REQUIREMENT

- 4.1. The contractor should follow HSE policy of owner as applicable to construction site.
- 4.2. The contractor shall deploy a full time HSE engineer / officer to coordinate the site.
The HSE officer shall be duly qualified in Industrial Health & Safety management with an experience of 4-5 years.
- 4.3. The contractor shall ensure that HSE requirements are clearly understood & faithfully implemented at all level, at each site.
- 4.4. The contractor shall organize safety awareness programs regularly.
- 4.5. The contractor shall ensure his participation in the every HSE meeting called by owner/owner representative.
- 4.6. The contractors shall conduct daily tool box talk.
- 4.7. The contractor shall submit Monthly HSE reports (Form attached in ANNEXURES).
- 4.8. The contractor shall provide all help and support to the injured person got injury at site during construction work and arrange compensation as per insurance policy / Act.
- 4.9. The contractor shall adhere consistently to all provisions of HSE. In case of non-compliance or continuous failure the owner/ owner representative may impose stoppage of work without any cost time implication to owner. A penalty amount of Rs 1000/- shall be imposed on the contractor for the serious HSE violation.
- 4.10. Three times of this penalty may count as a serious violation of contractor in line with HSE. This may affect to new work assignment/award of contractor.

5.0 ACCIDENT, INCIDENT AND NEAR-MISS REPORTING

Accident

Unintended occurrence arising out of and in the course of employment of a person, which results in to injury with or without damage to plant/equipment/materials.

Incident

means an unplanned and uncontrolled event which results in damage to plant or equipment or loss of material without causing any injury to persons, like fire, spill, leak, property damage etc.

Near-miss

An unexpected, unwanted event not causing loss, injury or illness but which under slightly altered conditions can lead to an accident.

can be defined as “Any event which under slightly unfavorable circumstances, may have resulted in any of the following:

- Injury, fatal or otherwise or ill health to people
- Loss of property, damage to plant or materials
- Damage to the environment
- A business interruption”

Accident, Incident and Near miss reporting form listed in ANNEXURES

6.0 HSE REQUIREMENTS AT SITE

6.1 Personnel Protective Equipments

The contractors shall provide sufficient numbers of following personal protective equipment's (PPEs) to workmen and supervisors/engineers to use them properly at work site.

Following five numbers of Personnel protective equipments are identified as MANDATORY for all.

- Safety Helmet
- Coverall
- Safety shoes/footwear
- Safety Glasses
- Hand Gloves (as per job requirement)

Other PPEs are depending upon nature of job like Arc Welding – Welding face shield

Grinding – Grinding face shield

Height work – Full Body harness (above 2 meters)

Ask site supervisor for proper use and selection of protective clothing / equipment for specialised jobs

6.2 Welding

- Ensure that welding machine is in order and approved by site engineer.
- Ensure that welding cables are in order.
- Ensure that welding machine is properly earthed.
- Remove all combustible material from welding area to avoid fire
- Place a fire extinguisher near by welding premises.
- Ensure welding holder, cable and its lugs in good condition and use only industrial power socket and plugs (3 Pin) to avoid electricity risk.
- Make sure that welding machine is provided with ON/OFF switch and is earthed/grounding.
- Do not overload electrical appliances and cable, Shocked pin etc,
- Ground the work piece separately from the welding return connection only.

6.3 Gas Cutting

- Check the cylinder and its valve or leakage and move out any leaking cylinder immediately.
- Ensure that flash back arresters are installed with torch and NRV (Non return valve) on the gas cylinders side.
- Ensure cylinders in vertical position (Cylinder trolley) and far away from fall of sparks and hot metal.
- Check the regulator and torches that they are inspected prior to every use.
- Check for leaks around regulators, hoses/fittings & nozzle with soap solution.
- Check the entire hose length if it is cracked or worn out cut that length of hose or replace the hose.
- Check that flash back arrester used for the purpose is of approved make/specification only.
- Place a fire extinguisher near by welding premises.

6.4 Grinding Operation

- Grinding wheels should be stored in dry place.
- After expiry date, grinding wheel must be condemned, broken in to pieces.
- Power supply cable of adequate current carrying capacity shall be used and it should be in good workable condition without abrasions, cuts or puncture in outer insulation.
- Socket pin provided at supply end and On/off switch in working condition.
- Proper earthing of the body in case of metallic body.
- Wheel guard properly fitted in position.

- Machine body without any damage like crack etc.
- Moving part (wheel) must be properly fixed to the machine with the help of spanner.
- Grinding wheel must be of suitable size as per the speed of grinding machine.
- Grinding wheel without manufacturer's sticker showing size, speed and expiry date must be condemned.
- Don't use portable grinding machine as bench grinder.
- Don't fit over size wheel than recommended size by machine/wheel manufacturer.
- Don't grind small, unstable object without fixing it in the vice.
- Don't over press the grinding wheel against the job for fast removal of metal.
- Put OFF the main switch, while machine is not in use (tea break etc.)
- Don't chip off grinding/cutting wheel for achieving fast cutting rate.

PPEs:

- Use of helmet, face shield or safety goggles (where face shield is not possible.) and hand gloves.

6.5 Use of Power Tools and Cables

- All electrical equipment and tools used by the contractors and their employees shall be properly checked by contractor's supervisor before use.
- All power tools must have proper guard at all time.
- Leads /cables must be placed so that they do not create a tripping hazard.

6.6 Material Handling and Storage

The Contractor will only use crane/Hydra and lifting equipment that has been tested and certified as fit for purpose by 3rd Party. All crane operators and riggers will be adequately trained and certified. The Contractor will keep records of tests and certification of all lifting equipment crane employed on the Works.

Maintenance records shall be routinely inspected by the Contractor and made available for Safety audits.

LIFTING GEAR: Lifting machine, chains, ropes and lifting tackles used at site shall conform to the following:

- All parts shall be good construction, sound material and adequate strength and free from defects.
- Shall be properly maintained, thoroughly examined, load tested by competent person.
- No lifting machine and no chain, rope or lifting tackle shall except for purpose of test be loaded beyond safe working load and this safe working load must be plainly marked on the gear concerned.
- All material must be properly stacked and secured to prevent sliding, falling or collapse.

- Stairs and passageways must be kept clear at all time.

6.7 Trenches and Excavation

Before commencing any excavation work the Site in charge will ensure that the proposed works have been adequately assessed and planned to ensure that they are executed safely and without risks to Health and safety. The factors to be assessed and planned will include:

-
- The nature and stability of the material being excavated and the need for any support of walls.
- The effect of excavation on nearby area.
- The foreseeable presence of hazardous contaminants.
- The proximity of mobile plant.
- The provision of edge protection (fall prevention of people and materials)
- Access and egress

6.8 Pipe Transportation and lowering

- All drivers shall hold a valid driving license for the class of vehicle.
- Securing of the load shall be according to established and approved methods.
- All overhangs shall be made clearly visible and restricted to acceptable limits.
- Load shall be checked before moving off and after traveling a suitable distance.
- All vehicles used by Contractors shall be in worthy condition and in conformance to the Land Transport requirement.
- Use of certified side booms after 3rd Party inspection.
- Effective communication should be done among all involved personals.
- Signaling shall be done by authorized foreman only.
- Ensure appropriate measures are taken for overhead hazards.
- Persons are not allowed towards trench side / under the boom at the time of lowering.
- Co-ordination of lowering in by a single man only.
- Inspection of equipment before use.
- All personnel should stay clear of moving equipment.
- Use of certified lifting tools and tackles.

6.9 **Pressure / Leak Testing**

Hydraulic and Pneumatic Test

Access to the test area shall be limited to essential personnel only before the test commences compliance is required with the following points:

- Persons supervising pressure or leak tests must have sufficient knowledge and experience of testing to fully understand the hazards of the activity and the precaution, which must be taken.
- Effective communication, including formal procedures, must be established between sites whenever the test envelope extends beyond one site, for example, pipelines.
- The area shall be cordoned off (using tape, shields or barriers, etc) at an adequate distance from the equipment to be tested, as specified on the Permit to Work
- Warning signs shall be posted at access ways, at other strategic positions, and on the equipment to be tested (including the doors of test workshops or other designated areas
- Pressuring equipment shall be provided with suitably calibrated pressure control / regulator devices.
- Pressuring equipment shall not be left unattended at any time during the test.
- Pressuring equipment shall be isolated from the equipment under test and where practicable disconnected, when the test pressure has been reached.
- Care must be taken to ensure that materials of construction have the required ductility at the test temperature to prevent brittle fracture.
- A safety valve should be fitted to the equipment/system being tested, set to relieve at a pressure that will prevent over pressurization
- Sufficient venting / draining points shall be provided in order to prevent trapping of pressurizing medium behind non-return valves, check valves, between isolation valves, or within dead legs of the pressure envelope
- The equipment/plant to be pressure tested must be subjected to thorough examination prior to testing. It may be necessary to 100% inspect all welds using visual, radiographic or other NDT techniques
- The gas supply must be isolated when test pressure has been achieved
- The pressure envelope must contain sufficient vents, to a safe location.
- De-pressurization after pneumatic testing must be gradual

6.10 **Scaffolding and Ladder**

- All working platform must be constructed with the specific requirement of job.
- All portable ladders must be in good condition as per the site norms.
- If the working platform is not permanent, then safety belt must be used.
- There shall be firm foundation for all scaffoldings. All scaffolding shall be made of sound material.
- Scaffolding material shall be inspected and used, only if found in good condition.
- Provide metal base plate is used under all upright or standard scaffoldings. Correct type of couplers shall be used for all connections.

- Plumb and level scaffoldings as erection proceeds, so that braces will fit without forcing. Fasten all braces securely.
- Working platforms shall be provided with guards. This should consist of top rail, mid rail, and toe board. The toe board shall be of minimum height 100 mm, while the mid rail and top rail shall be at heights of 600 mm and 1200 mm respectively.
- Do not use ladders or makeshift devices on top of scaffoldings to increase the height.
- Shall be placed at least 75 deg. to the floor.
- Ladder shall extend 3' to 4' above the point of Landing and topmost 3 rungs shall not be used.
- Ladder is checked visually for defects before every use.
- Ladders shall not be used in a horizontal position as runways or scaffoldings.
- Ladders shall not be placed in front of a door that opens toward the ladder unless the door is locked, blocked or guarded.
- Fall arrestor to be used wherever applicable.

6.11 Work Permit Procedure

- For working at more than 10' height the permission must be obtained from site in-charge.
- For doing any Hot work in the fire risk areas the permission must be obtained from site in charge or safety officer.
- For any Excavation work it must be ensured that there are no underground utilities like cables, Water pipeline etc.
- For any work inside confined space, entry permit must be obtained from site engineer.

6.12 Barricades and Warning Signs

- Area where work is being carried out above man height or below 1' ground depth must be barricaded.
- Follow the instruction of all types of warning signs like "NO SMOKING" "NO ENTRY" "DANGER" "Work at height"

6.13 Emergency Plan and Procedures

- All Contractor's employees should be aware of site Emergency control plan
- Periodic drill to train employees for their awareness & information should be followed.

6.14 Road Safety Norms

- For roadside working site to be barricaded as per approved barricading norms given in drg. No. 7452- L-15-0107. Penalty clause for road safety & barricading shall be applicable as per relevant clause of commercial part of tender.
- Only eligible driver can drive required vehicle inside site
- Speed limit norms of site must be followed
- No riding or travelling on the back of open-end vehicle, fork lift or trailers should be done.

6.15 Labour Welfare & Legal Requirement

- All mandatory provisions with regard to safety as prescribed under contract Labour (Abolition & Regulation) Act 1970 and Rules made there under are applicable.
- Workmen compensation insurance and registration under ESI should be maintained.
- Time to time, all rules and regulations suggested by safety committee of site must be followed and implemented.



**TECHNICAL SPECIFICATION – HEALTH, SAFETY
& ENVIRONMENT**

ANNEXURES

IS :
3521
–
1983

ANNEXURE – A

RELEVANT IS-CODES FOR PERSONNEL PROTECTION

ANNEXURES

- IS : 2925 – 1984 : Industrial Safety Helmets.
- IS : 4770 – 1968 : Rubber gloves for electrical purposes
- IS : 6994 – 1973 (Part – I) : Industrial Safety Gloves
- (Leather & Cotton) IS : 1989 – 1986 (Part – I & III) : Leather safety boots
and shoes
- IS : 3738 – 1975 : Rubber knee boots
- IS : 5557 – 1969 : Industrial and Safety rubber knee boots
- IS : 6519 – 1971 : Code of practice for selection, care
and repair of Safety footwear
- IS : 11226 – 1985 : Leather Safety footwear having direct moulding
sole
- IS : 5983 – 1978 : Eye protectors
- IS : 9167 – 1979 : Ear protectors.



TECHNICAL SPECIFICATION – HEALTH, SAFETY & ENVIRONMENT

ENVIRONMENT (HSE) PLAN

Project :-----

Contractor:-----

ANNEXURE – B

FORMAT - 1.0

Date : -----

Owner.....(To

be prepared & submitted by each Construction Agency)

Activity Description	Procedure / W.I./ Guidelines	Code of Conformance	Performing Function			Audit Function
			Performance	Checker	Approver	Customer Review/ Audit Requirements

PREPARED BY

REVIEWED

APPROVED BY



TECHNICAL SPECIFICATION – HEALTH, SAFETY & ENVIRONMENT

2.0 : MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (1/6)

Project: _____

Contractor : _____

Date: _____

Owner : _____

Inspection By : _____

Note: write 'NC' (Not Concern) wherever any of the items are not applicable

Item	Yes	No	Remarks	Action
HOUSEKEEPING				
Waste containers provided and used				
Sanitary facilities adequate and Clean				
Passageways and Walkways Clear				
General neatness of working areas				
Proper Material Storage				
Wooden Boards properly stacked and nails removed				
Cords, leads out of walk and traffic ways				
Scraps removed from the work site				
Other				
PERSONNEL PROTECTIVE EQUIPMENT				
Goggles: Shields				
Face protection				
Hearing protection				
Safety Shoes provided				
Hand protection				
Respiratory Masks etc.				
Safety Belts				
Safety Helmets				
Other				
EXCAVATIONS / OPENINGS				
Excavation permit				
Excavated earth kept away from edge				
Dewatering pump kept away from edge				
Safe access into excavated area				
Opening properly covered or barricaded				
Excavations shored				
Excavations barricaded				
Overnight lighting provided				
Other				



**TECHNICAL SPECIFICATION – HEALTH, SAFETY
& ENVIRONMENT**

MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (2/6)

Item	Yes	No	Remark	Action
Welding Cutting				
Valid not work permit				
Flashback arrester provided for cylinders				
Power cable not crossing the welding cable				
Adequate earthing provided				
No combustible materials kept near welding & cutting works				
Gas cylinder chained upright & kept in trolleys				
Cables and hoses not obstructing				
Screens or shields used				
Flammable materials protected				
Fire extinguisher (s) accessible				
Other				
SCAFFOLDING				
Fully decked platform				
Guard and intermediate rails in place				
Toe boards in place & tied properly				
Adequate shoring				
Adequate access				
Other				
LADDERS				
Extension side rails 1 m above				
Top of landing				
Properly secured at top & bottom				
Angle $\pm 70^\circ$ from horizontal				
Other				



**TECHNICAL SPECIFICATION – HEALTH, SAFETY
& ENVIRONMENT**

MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (3/6)

Item	Yes	No	Remark	Action
HOISTS, CRANES AND DERRICKS				
Condition of cables and sheaves OK				
Condition of slings, chains, hooks and eyes OK				
Inspection and maintenance logs maintained				
Outriggers used				
Singh/ barricades provided				
Signals observed and understood				
Qualified operators				
Other				
MACHINERY, TOOLS AND EQUIPMENT				
Proper instruction				
Safety devices				
Proper cords				
Inspections and maintenance				
Other				
VEHICLE AND TRAFFIC				
Rules and regulations observed				
Inspection and maintenance				
Licensed drivers				
Others				



**TECHNICAL SPECIFICATION – HEALTH, SAFETY
& ENVIRONMENT**

MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (4/6)

Item	Yes	No	Remark	Action
TEMPORARY FACILITIES				
Emergency instruction posted				
Fire extinguishers provided				
Fire-aid equipment				
Secured against storm damage				
General nemeses				
In accordance with electrical requirements				
Other				
Fire Prevention				
Personnel instructed				
Fire extinguishers checked				
No smoking in prohibited areas				
Hydrants clear				
Other				
ELECTRICAL				
Proper wiring & earthing				
ELCB's provided				
Ground fault circuit interrupters				
Protection against damage				
Prevention of tripping hazards				
Proper electrical cable joints				
Light poles secured				
Clear way to power distribution board				
Proper rating of fuses				



**TECHNICAL SPECIFICATION – HEALTH, SAFETY
& ENVIRONMENT**

MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (5/6)

Item	Yes	No	Remark	Action
HANDLING AND STORAGE OF MATERIALS				
Properly stored or stacked				
Passageways clear				
Other				
FLAMMABLE GASES AND LIQUIDS				
Containers clearly identified				
Proper storage				
Fire extinguishers nearby				
Other				
WORKING AT HEIGHT				
Erection plan				
Safety nets				
Safety belts tied properly				
Illumination				
No loose material at height				
No body under working area				
All openings covered				
Other				
ENVIRONMENT				
Chemical and other Effluents properly disposed				
Cleaning liquid of pipes disposed off properly				
Seawater used for hydrotesting disposed off as per agreed proceeding				
Lubricant Waste/ Engine oils properly disposed				
Waster from Canteen office, sanitation etc. disposed properly				
Disposal of surplus earth stripping materials, Oily rags and combustible materials done properly				
Green belt protection.				



**TECHNICAL SPECIFICATION – HEALTH, SAFETY
& ENVIRONMENT**

MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (6/6)

Item	Yes	No	Remark	Action
HEALTH CHECK				
Hygienic conditions at labour camps OL				
Availability of First Aid facilities				
Proper sanitation at site, office and labour camps				
Arrangements of medical facility				
Measures for dealing with illness				
Availability of potable drinking waters for workmen & staff				
Provision of cretches for children				
ERECTION				
Slings/ D'shakle checked				
Signal Man				
Tag line for guiding the load				
Protecting the slings from sharp edges				
No loose materials at height				
Ladder & platform welding inspected				
No one under the suspended load				
Stay rope				
SWL				

Signature of
Resident
Engineer with
Seal



TECHNICAL SPECIFICATION – HEALTH, SAFETY & ENVIRONMENT

**Monthly Health, Safety & Environmental (HSE)
Report (To be submitted by each
Contractor)**

Actual work start date: _____ For the month of: _____

Project: _____ Report No.: _____

Name of the Contractor: _____ Status as on: _____

Name of Work: _____ Name of Safety officer: _____

Item	This Month	Cumulative
Total strength (Staff – Workmen)		
Number of HSE meeting organised at site		
Number of HSE awareness programmes conducted at site		
Whether workmen compensation policy taken	Y/N	
Whether workmen compensation policy valid	Y/N	
Whether workmen registered under ESI Act	Y/N	
Number of Fatal Accident		
Number of Loss Time Accident (Other than Fatal)		
Other accident (non loss time)		
Total No. of accident		
Total man-hours worked		
Man-hour loss due to fire and accident		
Compensation cases raised with insurance		
Compensation cases resolved and paid to workmen		

Remark

Date: ____ / ____ / ____

Safety Officer/RCM
(Signature and name)

To: OWNER..... COPY
RCM/SITE-IN-CHARGE COPY



TECHNICAL SPECIFICATION – HEALTH, SAFETY & ENVIRONMENT

SUPPLEMENTARY ACCIDENT, INCIDENT & NEAR MISS REPORT

Project: _____ Supplementary to Report No.: _____

(Copy enclosed)

Site: _____ Date: _____

Contractor: _____

NAME OF THE INJURED..... FATHER'S NAME SUB-CONTRACTOR M/S..... DATE & TIME OF ACCIDENT..... LOCATION.....

BRIEF DESCRIPTION & CAUSE OF A ACCIDENT

NATURE OF INJURY / DAMAGE

COMMENTS FROM MEDICAL PRACTITIONER WHO ATTENDED THE VICITIM/INJURED

SUGGESTED IMPROVEMENT IN THE WORKING CONDITION IF ANY

LOSS OF MANHOURS AND IMPACT ON SITE WORKS

ANY OTHER COMMENT BY SAFETY OFFICER

Date: ____ / ____ / ____ /

SIGNATURE OF CONTRACTOR WITH SEAL

To : OWNER..... 1 COPY : RCM/SITE-IN-CHARGE 1 COPY



TECHNICAL SPECIFICATION – SUPPLY OF MDPE FITTINGS, VALVES AND TRANSITION FITTINGS

ACCIDENT REPORT

(To be submitted by Contractor after every accident within 2 hours of accident)

Name of Site: _____ CONTRACTOR _____

Report No. _____ Date: _____

NAME OF THE INJURED

..... FATHER'S

NAME SUB-

CONTRACTOR M/S.....

DATE & TIME OF ACCIDENT.....

LOCATION.....

BRIEF DESCRIPTION OF ACCIDENT

CAUSE OF ACCIDENT

NATURE OF INJURY / DAMAGE

MEDICAL AID PROVIDED / ACTIONS TAKEN

INTIMATION TO LOCAL AUTHORITIES

Date : ____ / ____ / ____

SIGNATURE OF CONTRACTOR WITH SEAL

To : OWNER..... 1 COPY
: RCM/SITE-IN-CHARGE 1 COPY



**TECHNICAL SPECIFICATION – SUPPLY OF MDPE
FITTINGS, VALVES AND TRANSITION FITTINGS**

CENTRAL U.P. GAS LIMITED (CUGL)

**LAYING OF MDPE NETWORK AND GI / Cu INSTALLATION WORK FOR
DOMESTIC FOR CUGL GA's IN KANPUR, UNNAO, BAREILLY & JHANSI
IN THE STATE OF U.P**

TECHNICAL SPECIFICATION –

SUPPLY OF MDPE FITTINGS, VALVES AND TRANSITION FITTINGS

TABLE OF CONTENTS

- 1.0 INTRODUCTION & SCOPE**
- 2.0 DEFINITIONS**
- 3.0 MATERIAL GRADE**
- 4.0 APPROVED MANUFACTURER FOR RAW MATERIAL**
- 5.0 TRANSITION FITTINGS**
- 6.0 MDPE PIPE MATERIAL**
- 7.0 MATERIAL REQUISITION**
- 8.0 QUALITY ASSURANCE (QA)**
- 9.0 DEFECT LIABILITY PERIOD**
- 10.0 PACKAGING**



TECHNICAL SPECIFICATION – SUPPLY OF MDPE FITTINGS, VALVES AND TRANSITION FITTINGS

1.0 INTRODUCTION & SCOPE

Owner plans to augment the PE Network. The present document covers the technical specifications for the procurement of PE Fittings, Valves & Transition Fittings.

2.0 DEFINITIONS

Manufacturer	Means the Manufacturer of the PE Fitting, Valves and Transition Fitting
TECHNICAL SPECIFICATION	Means the present <<Technical Specification>> and all its appendix, if any.
Third Party Inspection Agency	Means the Inspection Agency.
GTS	Means the present <<General Technical Specification>> and all its appendix, if any.

3.0 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.

4.0 APPROVED MANUFACTURER FOR RAW MATERIAL

1. INEOS (Formerly SOLVAY)
2. BOROUGE
3. TOTAL PETROCHEMICALS
4. DOW
5. ELENAC
6. BOREALIS
7. LYONDELLBASELL

5.0 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.

The material grade (SS-304 as per ASTM A-479) and end connection (in built EF Ends with integral pipe fixation device) 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 Owner before starting production.

6.0 MDPE PIPE MATERIAL

The raw material of MDPE pipe shall be PE100, thick as per SDR11. The MDPE pipe shall confirm standards for polyethylene pipes for supply of gaseous fuels IS 14885 (latest edition).



TECHNICAL SPECIFICATION – SUPPLY OF MDPE FITTINGS, VALVES AND TRANSITION FITTINGS

7.0 MATERIAL REQUISITION

As per SOR/Contract

8.0 QUALITY ASSURANCE (QA)

Manufacturer to submit their Inspection and Test Procedure (ITP) for the approval of Owner/PMC.

9.0 DEFECT LIABILITY PERIOD

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

10.0 MARKING

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

- a) Owner name as CUGL.
- b) Manufacturer's name and/or trademark
- c) Material and Designation
- d) Design application series
- e) The size of the fitting in mm
- f) Fusion time in seconds
- g) Cooling time in minutes
- h) Fusion parameters in BAR code
- i) Traceability code (fittings) as per standard ISO 12176-4.
- j) Number of the system standard. This information can be printed/formed directly on the fitting or on a label associated with the fitting or on an individual bag
- k) Production period, year and month

The marking shall stay legible during normal manipulation, storage and installation.

The marking shall not adversely influence the performance of the fitting and prevent the nonconformity of the fitting.

11.0 PACKAGING

All the MDPE fittings of more than one piece shall be kept in 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

3.2 ADD

Branch piping/tapping saddle of sizes upto 63 mm OD shall preferably 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 Tees shall be a single piece to avoid dual welds.

5.2 ADD

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

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

The following are strictly forbidden:

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

5.2.1 ADD

Material and end connection of transition fittings shall be as per Owner/Owner's representative.

6.3 REPLACE

All accessories shall be of yellow 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, Electrofusion and Transition fittings with integral pipe fixation device to be supplied up to 63 mm dia.

Unless otherwise agreed between Owner/PMC and the supplier, all electrofusion accessories must be "single wire" type.

6.5.3 REPLACE

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



TECHNICAL SPECIFICATION – SUPPLY OF MDPE FITTINGS, VALVES AND TRANSITION FITTINGS

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 Owner.

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	125x32	1.0
10	180x32	1.0
40	125x63	1.0
40	180x63	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

1 REPLACE

The Compounds that meet this specification must be PE 100.

The colour shall be yellow or black in accordance with the local requirements.

3.2 ADD

Minimum Required Strength (MRS 8 & 10)

Standardized class of compounds for which the LCL is equal to 8 & 10 respectively.

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 EN 1555-1.

AMENDMENT TO GTS

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 GTS

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 8 & 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
125	450
180	765

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)



**TECHNICAL SPECIFICATION – SUPPLY OF MDPE
FITTINGS, VALVES AND TRANSITION FITTINGS**

CENTRAL U.P. GAS LIMITED (CUGL)

**LAYING OF MDPE NETWORK AND GI / Cu INSTALLATION WORK FOR
DOMESTIC FOR CUGL GA's IN KANPUR, UNNAO, BAREILLY & JHANSI IN
THE STATE OF U.P**

TECHNICAL SPECIFICATION

WARNING MAT

TABLE OF CONTENTS

- 1.0 INTRODUCTION & SCOPE**
- 2.0 DEFINITIONS**
- 3.0 REFERENCE CODE**
- 4.0 FEATURES**
- 5.0 QUALITY ASSURANCE (QA)**
- 6.0 DEFECT LIABILITY**
- 7.0 RECOMMENDED MANUFACTURER FOR RAW MATERIAL**

1.0 INTRODUCTION & SCOPE

Owner plans to augment the PNG Network. It supplies natural gas to Domestic, Industrial & Commercial Consumers.

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

2.0 DEFINITIONS

Manufacturer Means the Manufacturer of the Warning Mat / Warning Grid / Warning Net / Warning Tape.

TECHNICAL SPECIFICATION Means the present <<Technical Specification>> and its entire appendix, if any.

TPIA Means the Third-Party Inspection

3.0 REFERENCE CODE

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

4.0 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 OWNER's logo and OWNER'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 °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 not 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 °C, a dry point of approx. 69 °C and a density of approx 0.68 gm/cm³.

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 50 meters. 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 complied 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.

5.0 QUALITY ASSURANCE (QA)

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

6.0 DEFECT LIABILITY

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

7.0 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 considered for supply of Raw material with approval of Owner / Owner's representative.



**TECHNICAL SPECIFICATION – ISOLATION BALL
VALVE**

CENTRAL U.P. GAS LIMITED (CUGL)

**LAYING OF MDPE NETWORK AND GI / Cu INSTALLATION WORK
FOR DOMESTIC FOR CUGL GA's IN KANPUR, UNNAO, BAREILLY &
JHANSI IN THE STATE OF U.P**

TECHNICAL SPECIFICATION

ISOLATION BALL VALVE



TECHNICAL SPECIFICATION – ISOLATION BALL VALVE

TABLE OF CONTENTS

- 1.0 INTENT OF SPECIFICATION
 - 2.0 SCOPE OF WORKS
 - 3.0 DEFINITIONS
 - 4.0 MATERIAL SPECIFICATION FOR ISOLATION VALVES
 - 5.0 INSPECTION
- ANNEXURE - I



TECHNICAL SPECIFICATION – ISOLATION BALL VALVE

1.0 INTENT OF SPECIFICATION

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

2.0 SCOPE OF WORKS

2.1. The scope of the tender will include manufacture/ supply, inspection/ testing/ marking/ packaging/ handling and despatch of Isolation Ball Valves, as indicated in the Material Requisition & Schedule of Rates, meeting all the requirements as laid down in manufacturing standard ANSI B16.33 / EN 331.

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

2.3. 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

Manufacturer Means the Manufacturer of the isolation ball valves

TECHNICAL SPECIFICATION Means the present <<Technical Specification>> and its entire appendix, if any.

Third Party Inspection Agency Means the Inspection Agency

4.0 MATERIAL SPECIFICATION FOR ISOLATION VALVES

As given in Annexure 1 (Data Sheet)

4.1.1. Markings

Markings shall be provided & shall include:

- i) Manufacturer's name or trademark Model designation
- ii) Rate working pressure in Bar.

4.1.2. 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 despatching the material. Bidder shall submit the packaging details during offer and also complied with at the time of delivery.

4.1.3. Leak Tightness

All Valves shall be leak tightness tested at 1.5x 4 bars for a period of 15 seconds and no leakage is permitted. This test shall be performed as per clause no. 4.2 of ASME 16.33.

4.1.4. Temperature resistance test

This test shall be carried out as per 4.3 clause of ASME B 16.33.

4.1.5. Mechanical Strength

- i) The body of the valves shall be capable of withstanding without deformation or leakage as per ASME B16.33 with a Min. torque of 90 Nm, as applied to a pipe being connected to the valve.
- ii) Valve shall be capable of withstanding without deformation or leakage, when bending



TECHNICAL SPECIFICATION – ISOLATION BALL VALVE

moment as per Table 3 of ASME B 16.33, if applied to a pipe connected to the valve.

- iii) The valves shall be capable of withstanding 25 Nm impact without breakage or leakage.
- iv) Vendor shall submit Model Number along with catalogues in English along with un-priced bids.
- v) Maximum turning torque to operate the valve as per table 5 of ASME B 16.33

5.0 INSPECTION

- SUPPLIER shall submit ITP to CLIENT/CLIENT's representative for approval and also provide required certification as mentioned in MR.
- Inspection shall be carried out as per Technical Specifications and approved Inspection Test Plan.
- SUPPLIER shall furnish all the material test certificates, proof of approval/license from specified authority as per specified standard, at the time of final inspection of each supply lot of material. Also, all above mentioned certificates to be furnished in soft copy to Owner.
- Even after third party inspection, owner reserves the right to select a sample randomly from each manufacturing batch and have these independently tested .should the results of these tests fall outside the limits specified in Owner technical specifications, then Owner reserves the right to reject all production supplied from the batch.

5.1. Testing

The Isolation valves shall be tested as per EN331/ASME B 16.33 only. Supplier shall submit detailed datasheet and QCT for approval by owner/owner's representative before commencing the production. Testing shall be carried out as per approved QCT.

ANNEXURE - I

S.NO	DESCRIPTION	DATA SHEET
1.00	PROCESS DATA	
1.01	Fluid	Natural gas
2.00	Operating condition	
2.01	Pressure	4 bar (g)
2.02	Temperature (°C)	0-48
3.00	Design condition	
3.01	pressure	-
3.02	Temperature (°C)	0-60
4.00	VALVE DATA	
4.01	Size	As per SOR/Contract
4.02	Type	Isolation Ball Valve with Full Bore, NPT Female (Confirming to ANSI B1.20.1) ends for natural gas application. With operating knob, and locking arrangement with provision for sealing wire and lead seal (without Key). Valve full open/close position shall be at 90°.
4.03	Rating	125 #
4.04	End connection	End connection should be NPT Female (conforming to ANSI B1.20.1).
4.05	Body material	Forged Brass (ASTM B 283, Alloy UNSC37700) with Nickel/ Chrome Plated.
4.06	Ball material	Forged Brass (ASTM B 283, Alloy UNSC37700) with Hard Chrome/Nickel Plated with Teflon Seat
4.07	Stem	-
4.08	Seat & seal	-
4.09	Fire safe	-
4.10	Anti blow out	-
4.11	Antistatic	-
4.12	Extension stem	-
4.13	Operator	Butterfly arrangement
5.00	PAINTING	-
5.01	Surface preparation	-
5.02	Primer	-
5.03	finish	-
5.04	insulation	-
6.00	TEST	
6.01	Hydrostatic shell test	
6.02	Test pressure	6.0 bar(g)
6.03	Test medium	-
6.04	Hydrostatic seat test	6.0 bar(g)
6.05	Test pressure	-
6.06	Test medium	-
6.07	Functional test	-
6.08	Test pressure	-
6.09	Leak test	-
6.10	Impact test	AS per TECHNICAL SPECIFICATION
6.12	Bending Test	AS per ASME B 16.33 / TECHNICAL SPECIFICATION
6.13	Torque test	AS per TECHNICAL SPECIFICATION
6.14	Turning torque test	As per ASME B 16.33
6.15	Antistatic test	-
6.16	Fire test	-
6.17	Visual and dimensional examination	-
Note	Unless otherwise stated all tests will be witnessed by the purchaser	



TECHNICAL SPECIFICATION – ISOLATION BALL VALVE

7.0	QUALITY CONTROL	-
7.01	Material certificates	EN 10204, 3.2 Certificate
7.02	All testing certificates	-

- NOTE:**
1. Lever type handle are not acceptable.
 2. Minimum Nickel/ Chrome Plated on the ball & body of appliance ball valve shall be 25 Micron.
 3. The above specified tests in TECHNICAL SPECIFICATION/Data sheet are minimum However, the other Remaining/specified tests shall be done as per ASME B 16.33



**TECHNICAL SPECIFICATION – APPLIANCE
BALL VALVE**

**PE ACCESSORIES
for underground networks for natural gas distribution**

TABLE OF CONTENTS

- 1. SUBJECT AND AREA OF APPLICATION.**
- 2. REFERENCE STANDARDS AND SPECIFICATIONS**
- 3. DEFINITIONS**
 - 3.1. ELECTROFUSION ACCESSORY
 - 3.2. ELECTROFUSION SADDLE
 - 3.3. END TO END WELDING ACCESSORIES
- 4. GENERAL SPECIFICATIONS**
- 5. MATERIALS**
 - 5.1. GENERAL INFORMATION
 - 5.2. RAW MATERIAL SPECIFICATIONS
 - 5.3. SPECIFICATIONS FOR COMPONENTS MADE OF MATERIALS OTHER THAN POLYETHYLENE
- 6. GENERAL ACCESSORY CHARACTERISTICS**
 - 6.1. TECHNICAL INFORMATION
 - 6.2. APPEARANCE AND FINISH
 - 6.3. COLOUR
 - 6.4. JOIN APPEARANCE
 - 6.5. ELECTROFUSION ACCESSORY ELECTRICAL CHARACTERISTICS
 - 6.6. SUPPORT DRILLING EQUIPMENT
 - 6.7. BRANCHING SUPPORT AND SADDLE LOAD LOSS UNDER LOW PRESSURE
 - 6.8. ELECTROFUSION SLEEVE B LOCK
- 7. GEOMETRICAL CHARACTERISTICS**
 - 7.1. SIZE OF ELECTROFUSION SLEEVES
 - 7.2. ELECTROFUSION SADDLE MEASUREMENTS

7.3. MEASUREMENTS OF ACCESSORY ENDS TO BE WELDED

8. ACCESSORY MECHANICAL CHARACTERISTICS

9. PHYSICAL CHARACTERISTICS

10. PRODUCT APPROVAL

11. MARKING

11.1. ACCESSORY MARKING

11.2. COMPLEMENTARY INFORMATION

12. PACKAGING AND DELIVERY

13. QUALITY CONTROL

13.1. GENERAL RULINGS

13.2. CONTROLS

13.3. ACCEPTANCE OR REFUSAL

ANNEX 1

1. SUBJECT AND AREA OF APPLICATION

This specification has been established to define the requirements that must be met by injected moulded polyethylene accessories (PE) destined for the construction or the maintenance of underground networks for natural gas distribution where the maximum operating pressure (MOP) is equal to 5 bars.

It also defines some of the more general characteristics of materials used for accessory manufacturing and includes the appropriate classification model.

The specification also includes testing method parameters for the material in question.

All accessories included in these specifications are listed as follows :

- Electrofusion welded accessories
- Electrofusion welded saddles
- Accessories equipped with insertion connection for end to end welding and assembly using electrofusion-welded sleeve coupling.

This specification is limited to accessories with a nominal diameter of 225 mm and a working temperature between -20°C and +40°C.

PE and steel accessories with a tapered section and front section connections are not included in these specifications.

2. REFERENCE STANDARDS AND SPECIFICATIONS

EN 682	Air-tight rubber seals - specification for air-tight seal materials for gas and hydrocarbon fluid transfer piping
EN 1555-1	Plastic piping systems for combustible gas distribution. Polyethylene (PE). Part 1. General information
EN 1555-3	Plastic piping systems for combustible gas distribution. Polyethylene (PE). Part 3 . Accessories
EN 1555-7	Plastic piping systems for combustible gas distribution. Polyethylene (PE). Part 7. Conformity evaluation.
ISO DIS 11413	Preparation of test assemblies between a polyethylene (PE) pipe and an electrofusion fitting.

ISO DIS 11414	Preparation of test assemblies between a pipe/pipe or pipe/fitting polyethylene (PE) by butt fusion
ISO DIS 12093	Format for a technical brochure for electrofusion joint characteristics
ISO TR 13950	Electrofusion identification methods
CEI 60335-1	Safety standards for household appliances and similar equipment.
CEI 364	Electrical installations on buildings (including building sites and other temporary installations)
CEI 449	Voltage domains for building electrical installations.

3. DEFINITIONS

3.1. ELECTROFUSION ACCESSORY

This term covers all injected moulded polyethylene accessories equipped with a heated element designed to transform electrical energy into heat to create self-welding.

In certain exceptional cases, an accessory can present one or more smooth ends. In this case the accessory will provide for the requirements of each connection end as regards shape, measurement, and technical characteristics.

3.2. ELECTROFUSION SADDLE

This term covers a saddle shaped injection moulded PE accessory that is equipped with one or several heating elements that convert electrical energy into heat. The released heat provides a fusion surface sufficiently large to ensure correct saddle-pipe assembly.

Electrofusion saddles can be subdivided into two categories:

Wrap around Electrofusion saddle whose upper shell is brought against the pipe during welding using a fastening stirrup located on the lower part of the accessory to guarantee that the welding pressure is sufficient. Generally the stirrup is left in place after welding.

Top load Electrofusion saddle where the welding pressure is obtained by pressing down on the saddle head using a fixing system (clamp) that is removed after welding is completed.

There are four different saddle types:

Support This is an accessory designed for joining branch pipes and is equipped with a drill bit made to pierce the wall of the pipe; this bit remains in the saddle body after installation.

Branch piping saddle

This accessory is designed for joining branch piping where an additional bit is necessary to pierce the wall of the main pipe next to the branch.

Ballooning saddle

This accessory provides the positioning of a sealing (or blocking) balloon and that can be filled again after work completion. **Repair saddle** This accessory will seal/block any leaks on the pipe or will reinforce piping in the case of localised deterioration.

According to their leakage flow, the supports are divided into two model categories:

Model 1	Supports whose maximum immediate external leak flow is practically equal to zero at 5 bar pressure in the piping.
Model 2	Supports whose maximum immediate external leak flow never exceed 200 litres an hour at 5 bar pressure in the piping.

3.3. **END TO END WELDING ACCESSORIES**

This term describes injection moulded polyethylene accessories with smooth ends but not equipped with integrated heating elements. These are connected to the network by end-to-end welding using electrofusion sleeves.

In certain exceptional cases, an accessory can also present one or more electrofusion ends. In this case the accessory will provide for the requirements of each connection end in shape, measurement, and technical characteristics.

4. GENERAL SPECIFICATIONS

This specification is based on the series of EN 1555 standards, which standardise all the gas distribution network plastic piping systems.

The accessories described in this document comply with all prescriptions included in EN standard 1555-3, as well as all complementary.

5. MATERIALS

5.1. GENERAL INFORMATION

The materials used for the manufacturing of the accessories must conform to the requirements demanded for components used in gas fuel distribution networks.

The accessory material that is in contact with the PE piping must not be composed of any material that will provoke a reduction in pipe performance, nor must it provoke cracking under stress.

All equipment will be marked with inscription/description and specification in English language.

5.2. RAW MATERIAL SPECIFICATIONS

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

The raw material belongs to class PE100.

The following are strictly forbidden:

- use of recycled raw materials
- mixing of different raw materials
- The addition of supplementary additives to the raw material.

5.3. SPECIFICATIONS FOR COMPONENTS MADE OF MATERIALS OTHER THAN POLYETHYLENE

5.3.1. Metal parts

All metal parts subject to corrosion must be protected in an adequate manner

Metal parts must conform to prescribed standards of that particular material for gas distribution, for quality levels, size/gauge and measurements.

Cast iron, aluminium and its alloys are not authorised for use.

5.3.2. Elastomers

Elastomer air and watertight seals, like all other elements manufactured in this material, must comply with the prescriptions of EN 682 standards.

5.3.3. Other materials

All other materials used are in compliance with the prescriptions described in paragraph

5.1. The accessories included in the paragraph comply with the requirements of this specification and are adapted for all general use for natural gas distribution.

6. GENERAL ACCESSORY CHARACTERISTICS

6.1. TECHNICAL INFORMATION

The manufacturer must supply a technical information dossier composed and including the same material and presented in the same manner, in compliance with the prescriptions of the ISO DIS standard 12093.

This dossier must mention all of the following information for each accessory:

- PE raw material used
- Measurements and tolerances
- Domain of application (temperature and pressure limits, SDR and ovalisation)
- Assembly instructions
- Welding instructions (welding parameters and limits)
- Test results attesting to the accessory conformity standard: c.f. EN standard 1555-3 for test descriptions.

For electrofusion accessories, the manufacturer must also supply the SDR series for the pipes, which will be used together with their accessory, according to their thickness.

In addition, for the saddles:

- The attaching method (tools necessary and/or lower shell)
- saddle category (refer to 3.2)
- Maximum saddle height (H in figure 2)
- the height of the branch pipe for supports (h in figure 2)

For all smooth ended accessories, the manufacturer must also supply the SDR series of connections; the accessory must be guaranteed for use on piping of the same class.

In the case of welding parameter modification, size or raw material changes, the manufacturer must include a new technical dossier providing proof that the accessory in question is still compliant with the specification prescriptions.

Testing assemblies will take into consideration manufacturing tolerance, assembly tolerance and the variations in environmental temperature corresponding with the conditions where the accessories will be in use. The manufacturer must observe all methods recommended for polyethylene accessory installation as shown in the

specifications.

The accessories will be tested exclusively using piping in compliance with Technical Specifications.

The assembly of piping and accessories manufactured and used in the tests must be in compliance with the manufacturer's technical instructions and the limits of use conditions. When the test assemblies are carried out, the manufacturing and assembly tolerances must be taken into consideration. Samples destined for assembly testing with electrofusion accessories must be prepared according to standard ISO DIS 11413. End-to-end welded samples must be prepared according to standard ISO DIS 11414.

6.2. APPEARANCE AND FINISH

The internal and external surfaces of the accessories must be smooth, clean and free of all scratching, pitting and other surface faults that can possibly reduce accessory and assembly performance.

No element of any accessory must show any signs of damage: scratching, scraping, piercing, blisters, bloating, denting, holes, cracks or other faults that can reduce required performance.

It must be possible to place the accessory on the pipe or on another accessory without moving the electric winding or the air/water tight seals etc. and this must respect the tolerance permitted for piping and accessories.

6.3. COLOUR

All accessories will be black. If agreed previously, they can also be coloured yellow or orange.

6.4. JOIN APPEARANCE

After welding, when examined visually without a magnifying glass, the internal and external surfaces of the pipes and accessories must appear free of welding exudation outside the accessory limits (unless identified by the accessory manufacturer as normal, or carried out deliberately as a welding test, but on condition that there is no wiring position change inside the electrofusion accessories that could provoke a short-circuit). Internal surfaces of all adjacent piping must remain identical to the previous condition before welding.

6.5. ELECTROFUSION ACCESSORY ELECTRICAL CHARACTERISTICS

6.5.1. General information

The accessories include an electrical system as described in the standards CENELEC 60335-1, CEI 364 and CEI 449.

This system is equipped with an appropriate electrical protection for the voltage and intensity of the current in use, and adapted to the characteristics of the electrical supply line.

For voltage over 24 V protection is essential against direct contact with the active parts (conductors on line). The type of protection in question depends on the local site conditions.

6.5.2. 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.

The power required for electrofusion accessory welding must not exceed 3kW during welding operations.

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

Unless otherwise agreed between REPL and the supplier, all electrofusion accessories must be “single wire” type.

6.5.3. Connectors

Electrical connectors installed on electrofusion accessories must comply with the diagram included in Annex 1 with these specifications, also including constant current supply where this is the case. The state of the connector terminal surface must offer the minimum possible contact resistance during voltage cable joining.

6.5.4. Protection against overheating

Electrofusion accessories that can only be welded once are equipped with a lock system which prevents re-welding.

Electrofusion accessories that cannot be re-welded immediately after initial welding are equipped with an incorporated security system in their welding program: that is they cannot weld while the wire is still hot.

If the welding program does not possess this lock system, the electrofusion accessory must absolutely be protected against a second or several welding cycles whatever the temperature of the winding wire.

6.6. SUPPORT DRILLING EQUIPMENT

The support drilling equipment has been 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 manoeuvring opening for the insertion of a 17 mm hexagonal spanner.

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

The drill mechanism is designed so that no additional tools (except the hexagonal spanner described above) are necessary for carrying out drilling operations.

6.7. BRANCHING SUPPORT AND SADDLE LOAD LOSS UNDER LOW PRESSURE

The maximum load loss measured with natural gas at an inlet pressure of 20 mbar must not exceed the values listed below.

Flow m ³ /hr	Saddle Type	Maximum load loss Mbar
10	63 x 32	1.0
10	110 x 32	1.0
10	160 x 32	1.0
10	200 x 32	1.0
40	63 x 63	2.0
40	110 x 63	1.0
40	160 x 63	1.0
40	200 x 63	1.0

6.8. ELECTROFUSION SLEEVE B LOCK

All electrofusion sleeves are equipped with an immovable block in the centre of the sleeve.

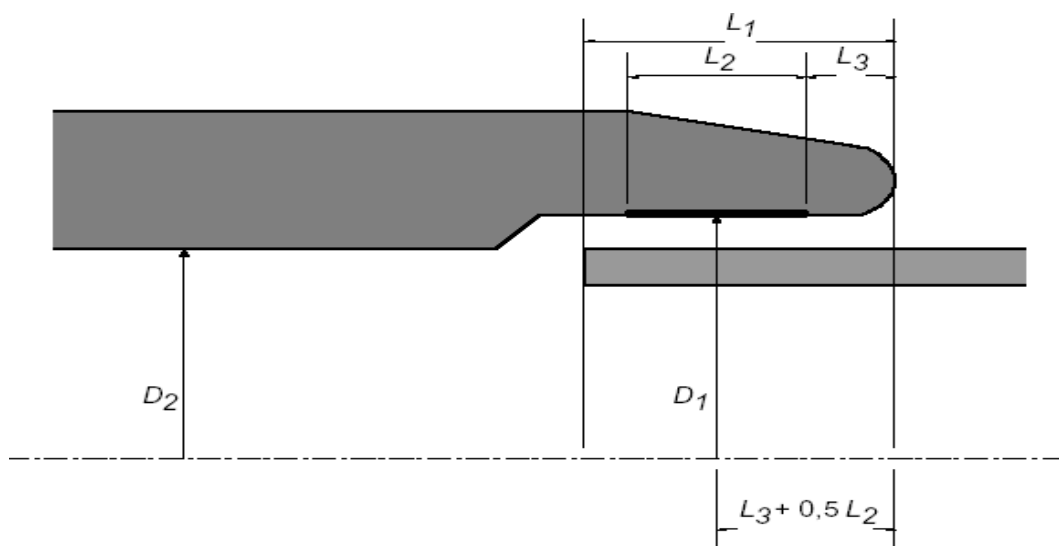
7. GEOMETRICAL CHARACTERISTICS

7.1. SIZE OF ELECTROFUSION SLEEVES

The sizes of the electrofusion accessory sleeves and their tolerance limits are described in chapter “Geometrical characteristics” of EN standard 1555-3.

They are controlled according to the method described in the specification standard. Any possible sealing plugs are removed from the sleeve 4 hours before the size control check. Measurements are controlled without the plugs inserted.

The main symbols are shown in the figure 1 below:



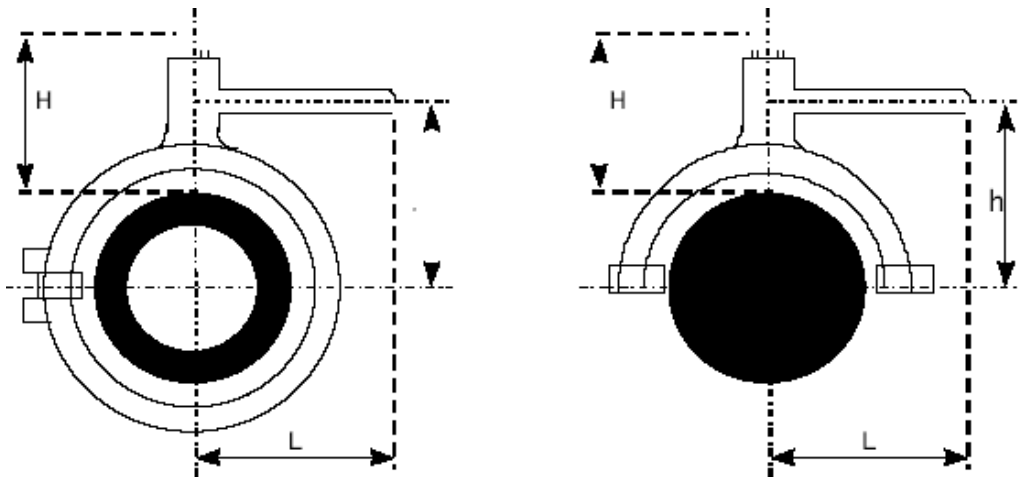
- D₁** The “average internal diameter in the welding zone” – that is: the average internal diameter measured in a parallel plane to the opening plane, at a distance of $L_3 + L_2/2$ of the latter.
- D₂** “Minimum drilling/boring” – that is the minimum diameter of the draining canal through the body of the accessory.
- L₁** “penetration depth” of the pipe or the inserted (male) end of the accessory
- L₂** “Nominal length of the welding zone” that corresponds with the length subject to heating.
- L₃** “Nominal non-heated entry/inlet length of the sleeve”. This refers to the distance between the tip of the accessory and the beginning of the welding zone.

7.2. ELECTROFUSION SADDLE MEASUREMENTS

The measurements of the electrofusion saddles and their tolerance limits are described in EN standard 1555-3

They are controlled according to the method described in the specification standard. Any possible sealing plugs are removed from the sleeve 4 hours before the size control check. Measurements are controlled without the plugs inserted.

The main symbols are shown in the figure 2 below:



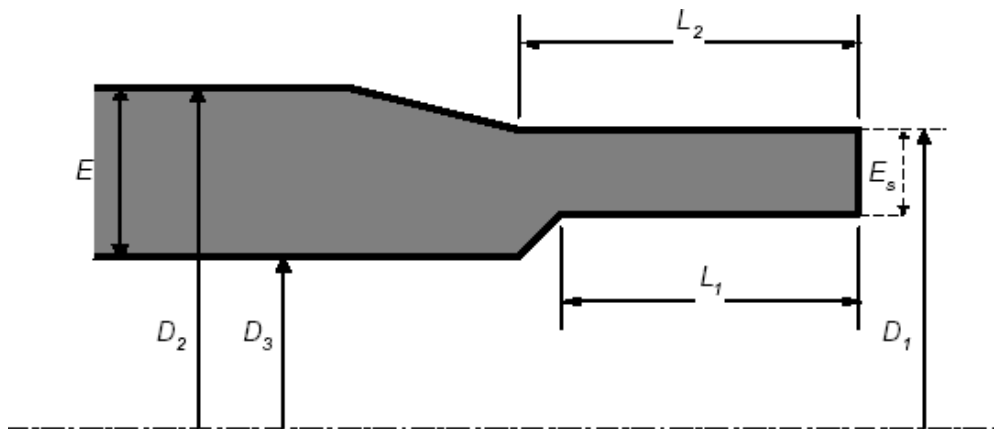
- H The “height of the saddle” – that is the distance between the upper generator of the main pipe and the top of the branch pipe saddle
- h The “height of the branch pipe” – that is the distance between the axis of the main pipe and the axis of the branch pipe
- L The “width of the branch pipe saddle” – that is the distance between the axis of the pipe and the surface plane of the branch pipe opening

7.3. MEASUREMENTS OF ACCESSORY ENDS TO BE WELDED

The measurements of the ends and their tolerance limits are described in EN standard 1555-3.

They are controlled according to the method described in these specification standards. Any possible sealing plugs are removed from the sleeve 4 hours before the size control check. Measurements are controlled without the plugs inserted.

The measurements and main symbols used in this specification are shown in the figure 3 below:



- D₁** The “average external diameter of the end to be welded measured on any plane parallel to the inlet/entry plane at a distance where this plane does not exceed L_2 (tubular section).
- D₂** The “average external diameter of the body” of the tip of the accessory.
- D₃** “Minimum drilling/boring” – that is the minimum diameter of the passage through the body of the accessory. Measuring of the diameter must not include any ribbing due to welding.
- E** “Thickness of the accessory body wall” – that is: the thickness measured at any point of the accessory wall.
- E_s** “Thickness of the end to be welded” measured at any point but where the distance does not exceed L_1 (length that can be cut) compared to the inlet/ entry plane, must be equal to the thickness of the nominal pipe wall.
- L₁** The “cuttable section” of the end to be welded – that is the initial depth of the tip of the insertion section, necessary for end-to-end welding or for starting an end-to end weld again.

L2 The “tubular section” of the end to be welded — that is the initial length of this section. This tubular section permits the following in all types of combination :

- Use of the clamp stirrups, as is essential for end-to-end welding, or for electrofusion.
- Assembly using electrofusion sleeves.

8. ACCESSORY MECHANICAL CHARACTERISTICS

All accessories must obey the requirements and tests described in the chapter concerning the mechanical characteristics of EN standard 1555-3. They must also comply with the hydrostatic test conditions described in the same standard.

They must be controlled as described in the same standard.

9. PHYSICAL CHARACTERISTICS

All accessories must obey the requirements and tests described in the chapter concerning the mechanical characteristics of EN standard 1555-3

They must be controlled as described in the same standard

10. PRODUCT APPROVAL

The product will be approved by the Owner if all results of the tests, controls and checking prescribed by this specification are satisfying.

The manufacturer will provide a complete approval dossier including all the product characteristics specified in 6.1. (technical dossier) and the results of tests prescribed in these specifications. The number of tests run on the product must comply with EN standard 1555-7. The results of these tests described in the approval dossier must be confirmed by the Owner authorised laboratory. Hydraulic testing must be continued until the rupture of at least two test samples for each set of tests. (max. 2000 hours).

All changes made to the approved product must be communicated to the Owner, and this entails further control checks for approval.

Any requirement not observed or test missing from this specification will result in the withdrawal of the product approval and can even result on annulment of contract.

11. MARKING

11.1. ACCESSORY MARKING

11.1.1. Identification marking will be made directly on the accessory. The system used to make the product must not provoke cracking or other faults. All marking must be permanently legible for the product life under standard stocking conditions, exposure to external weather conditions, treatment, installation, and use.

11.1.2. Where the products are printed, the colour of the printed identification mark must be different from that of the basic product colour.

11.1.3. Marking quality and size must be of a standard that can be read with the naked eye without magnification.

No marking must be printed on the minimum length of the insertion section of accessories.

11.1.4. 11.1.4. Each accessory must be marked with at least the obligatory details required by EN standard 1555-3. The marking must be printed on the accessory itself or on a label as shown in the standard described above

The SDR pipe range that are to be fitted with these accessories must be clearly marked on the fitting. Details must include: each SDR value, or the upper and lower value of the permitted SDR range.

11.2. COMPLEMENTARY INFORMATION

All complementary information on welding conditions (welding time and cooling time) can also be described on a label affixed to the accessory or delivered with the accessory.

12. PACKAGING AND DELIVERY

Normally all accessories are packed separately in plastic sheeting and/or cardboard boxes.

Sometimes they can be loosely packed together where there is no danger of damage or deterioration or loss of loose parts.

All boxes and plastic sheeting must be marked with at least one label showing the manufacturer's name, the product type, part measurements, and number of single parts contained in the box or bag, plus all details necessary for stocking and stock expiry dates.

All electrofusion accessories must be printed with a bar code and an individual magnetic card. 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.

With regard to stocking guarantee, accessories must correspond with the prescriptions of the local laws & regulations if any. If the guarantee period decided by the manufacturer is shorter than that in these documents, the Owner must be informed in writing at the time of the offer.

13. **QUALITY CONTROL**

13.1. GENERAL RULINGS

13.1.1. Manufacturer's responsibility

The manufacturer is entirely responsible for the quality of the PE accessories manufactured by his firm.

All control checks prescribed above do not relieve him of this responsibility.

To ensure that all PE accessories are in compliance with the specification in all aspects, they must be controlled by the plant control service, which must be independent from the manufacturing department.

All PE accessories supplied are guaranteed for a one-year period after application for use, that is a maximum of three years after the date of production.

13.1.2. Quality assurance

The manufacturer must have some form of quality control to ensure that products comply with EN standards 29001 or 29002. The quality assurance manual must be made available to the Owner Control Service or an external Control laboratory appointed by him.

The system of quality assurance must be certified by an authorised body.

13.2. CONTROLS

13.2.1. Control testing by the manufacturer

13.2.1.1. *By material batch.*

The manufacturer demands a certificate from the raw material manufacturer including the following :

- Fluid index
- Water content
- Volume mass
- Carbon black or yellow stabilising agent content
- Carbon black or yellow stabilising agent quality

- OIT value (thermal stability)

13.2.1.2. *By accessory batch*

The manufacturer must run control checks as follows :

- Appearance / colour
- Measurements
- Hydraulic testing
- Electrical resistance
- Printing/marketing.

Control checks and the number of tests must be carried out according to the prescriptions of the EN standard 1555-3

Also refer to table N° 8, paragraph 4.2.3. "Lot release tests" of EN standard 1555-7.

The results must be written out in documents that contain the complete identification of the accessory batch.

These documents must be made immediately available for the Owner representative.

13.2.2. Plant Reception by the Owner Control Service representative

13.2.2.1. *General information*

All quality controls must be run in the presence of the Owner Control Service representative.

All tests and control checks must comply with appropriate standard prescriptions and with the specific specifications established with the order.

At each visit by the Owner representative, the manufacturer must provide, free of charge, all means and personnel necessary for running the established control checks.

While the order is under production, the Owner representative must have access to stocking installations of all raw materials before manufacturing, manufacturing and control installations, as well as the accessory stocking areas for any control checks he is responsible for.

During his visits, the Owner representative will receive a certificate as soon as he reaches the plant for each batch of accessories presented for reception.

Each time this is requested by the Owner representative, the manufacturer must provide recent reports of all control checks and measuring instrument results and testing results.

13.2.2.2. *Convocation for reception*

Convocation instructions for reception are to be defined with the order.

13.2.2.3. *Reception control checks*

For each accessory batch or any fractions of the batch, minimal batch sampling is established in annexed enclosure 3. These control checks and tests are to be run according to the prescriptions of EN standard 1555-3

13.3. ACCEPTANCE OR REFUSAL

13.3.1. Appearance, measurements and marking

Any requirements not supplied will lead to the refusal of the complete batch. However in the case where a batch is refused, it can be presented for approval again after a control check, on agreement with the Owner Control Service.

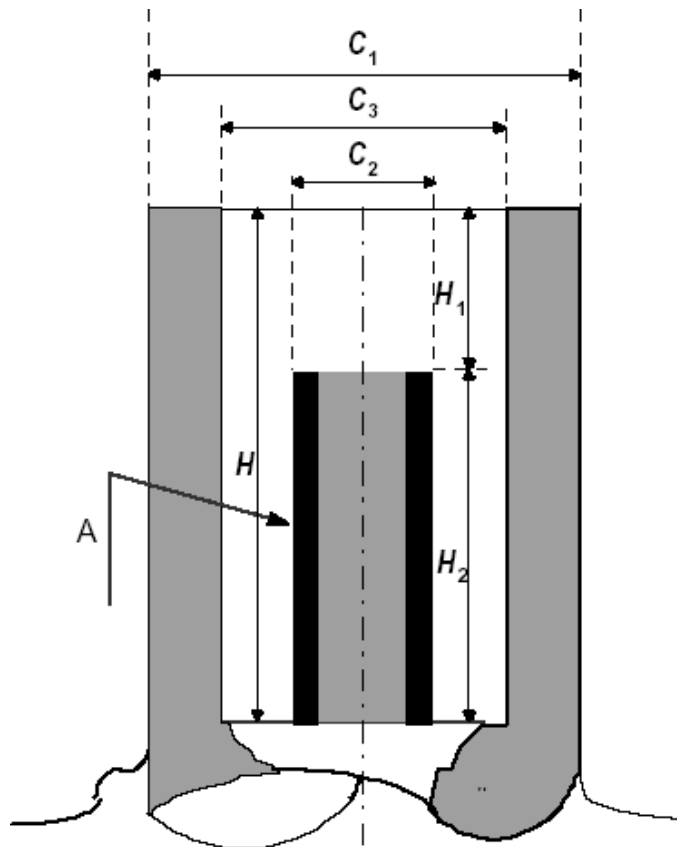
13.3.2. Control check on characteristics

All results that do not comply with the specification prescriptions and the particular specifications requested with the order, demand counter-testing on at least double the number of the samples previously tested. If the undesirable result is confirmed, then the batch is refused permanently. If the result is positive, then the batch will be accepted.

As a complementary control check, other analyses and/or tests can be run after common agreement, and at the manufacturer's cost.

ANNEX 1

CONNECTOR FOR ELECTROFUSION ACCESSORIES



Symbols

C₁	External diameter of connector	$C_1 \geq 11,8 \text{ mm}$
C₂	Diameter of active part of connector	$C_2 = 4.0 \pm 0.03 \text{ mm}$
C₃	Internal diameter of connector	$C_3 = 9,5 \pm 1,0 \text{ mm}$
C₄	Max. Diameter of active part foot	$C_4 \geq 6,0$
H	Connector internal depth	$H \geq 12,0$ $H \geq H_1 + H_2$
H₁	Distance between upper part of connector and active part	$H_1 = 3,2 \pm 0,5$
H₂	Height of active part	$H_2 \geq 7,0 \text{ mm}$
A	Active zone.	

RECEPTION AT MANUFACTURER'S PLANT.

Characteristics	Reference EN 1555-3	Minimum drill tests / frequency	N° of samples	N° of measure/ samples
Appearance /colour	5.2 /5.3	1 x /size / product type / internal space	10	1
Measurements	6	1 x /size / product type / internal space	10	1
Thermal stability (OIT)	8.2	1 x batch	1	1
Meltmass/flow rate (MFR)	8.2	1 x batch	1	1
Electrical resistance	5.6	1 x /size / product type / internal Space	5	1
Cohesion resistance	7.2	1 x /size / product type	2	1
End-to-end seam resistance to traction (cohesion resistance)	7.2	1 x /size / product type	2	1
Shock resistance	7.2	1 x /size / product type	1	1
Load loss	7.2	1 x /size / product type	1	1
Marking	10.2	1 x /size / product type	1	1

□ □ □

Polyethylene compounds for manufacture of pipes and fittings for underground networks for natural gas distribution

Acceptance procedure

TABLE OF CONTENTS

- 1. SUBJECT**
- 2. REFERENCES: STANDARDS AND SPECIFICATIONS**
- 3. DEFINITIONS AND SYMBOLS**
 - 3.1. LOWER CONFIDENCE LIMIT (LCL)
 - 3.2. MINIMUM REQUIRED STRENGTH (MRS 10)
 - 3.3. PE 100
 - 3.4. BATCH OF COMPOUND
 - 3.5. BATCH OF PIPES
- 4. GENERAL SPECIFICATIONS**
- 5. SUMMARY OF THE PROCEDURE**
 - 5.1. GENERAL
 - 5.2. APPLICATION FOR APPROVAL
- 6. TECHNICAL FILE**
 - 6.1. EVALUATION
 - 6.2. ADDITIONAL TESTS
- 7. CONFIRMATION TESTS**
- 8. FOLLOW-UP**
 - 8.1. TECHNICAL DATA SHEET
 - 8.2. CONTINUITY OF THE COMPOUND

APPENDIX 1

1. SUBJECT

This specification describes the procedure to be followed for acceptance of a polyethylene (PE) compound for manufacture of natural gas underground distribution systems.

This specification also gives the minimum requirements which have to be met by PE compounds for manufacture of pipes, fittings and valves and for the construction of underground distribution systems for natural gas.

The compounds that meet this specification must at the minimum be PE 100. The colour shall be black or orange in accordance with the local requirements.

2. REFERENCES: STANDARDS AND SPECIFICATIONS

This section contains the list of standards and specifications referred to in this specification.

EN 728: 1997	Plastics piping and ducting systems – Polyolefin pipes and fittings - Determination of oxidation induction time.
EN 1555-1	Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE) - Part 1: General
EN 1555-3 EN 1555-7	Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE) - Part 7: Assessment of conformity.
EN 12099	Plastics piping systems - Polyethylene piping materials and components - Determination of volatile content.
EN 12118	Plastics piping systems - Determination of moisture content in plastics by coulometry.
EN ISO 12162: 1995	Thermoplastics materials for pipes and fittings for pressure applications - Classification and designation - Overall service (design) coefficient.
EN ISO 13478: 1997	Thermoplastics pipes for the conveyance of fluids - Determination of resistance to rapid crack

propagation (RCP) - Full-scale test (FST).

EN ISO 13479: 1997	Thermoplastics pipes for the conveyance of fluids - Determination of resistance to crack propagation (RCP) - Test method for slow crack growth on notched pipes (notch test).
EN 45001: 1990	General criteria for the operation of testing laboratories.
ISO 1133: 1997	Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics.
ISO 6964: 1996	Polyolefin pipes and fittings - Determination of carbon black content by calcination and pyrolysis - Test method and basic specification.
ISO/DIS 9080	Plastics piping and ducting systems - Determination of the long-term hydrostatic strength of thermoplastics materials in pipe from by extrapolation.
ISO 11420: 1996	Method for the assessment of the degree of carbon black dispersion in polyolefin pipes, fittings and compounds.
ISO 13477: 1997	Thermoplastics pipes for the conveyance of fluids - Determination of resistance to rapid crack propagation (RCP) - Small-scale-steady-state test (S4 test).

3. DEFINITIONS AND SYMBOLS

3.1. LOWER CONFIDENCE LIMIT (LCL)

A quantity with the dimensions of stress, in megapascal, which can be considered as a property of the material under consideration and represents the 97.5% lower confidence limit of the predicted long-term hydrostatic strength at a temperature of 20°C for 50 years with internal water pressure.

3.2. MINIMUM REQUIRED STRENGTH (MRS 10)

Standardised class of compounds for which the LCL is equal to 10.

3.3. PE 100

Standard designation for PE compounds in class MRS 10.

For such PE compounds, the long-term hydrostatic strength – calculated and classified according to the standardised method (ISO 9080 and ISO 12162) for a temperature of 20°C, a period of 50 years and a reliability of 97.5 % – must be at least 10 MPa.

3.4. BATCH OF COMPOUND

By batch of compound is meant a homogeneous quantity of PE compound of the same origin and of a particular brand.

The batch must be registered under a single identification number (batch number) which leaves no doubt as to the origin, identity and date of manufacture of the compound.

3.5. BATCH OF PIPES

By batch of pipes is meant a homogenous lot of pipes with identical dimensions, made in a continuous process by the same extrusion machine and from the same batch of compound.

4. GENERAL SPECIFICATIONS

The PE compounds that are acceptable according to the requirements of this specification must conform to the requirements for PE 100 described in EN1555-1.

If the proposed compound is destined for manufacture of pipes, then the acceptance procedure is carried out as described in this specification.

If the proposed compound is destined for manufacture of fittings, then the first stage (section 6) of this acceptance procedure is carried out, after which type tests are carried out on the fittings manufactured from the material concerned. An independent laboratory appointed by Owner will then evaluate whether conformity with the characteristics mentioned in the technical file has been proved, on the basis of the provisions of EN 1555-7.

5. SUMMARY OF THE PROCEDURE

5.1. GENERAL

The acceptance procedure for PE compounds comprises two stages, namely the evaluation of the technical file and the confirmation tests. The different steps are carried out in the order described below.

The tests which form part of the technical file are carried out on pipes or samples supplied by the compounds manufacturer. In principle, all tests mentioned in the technical file are carried out on pipes from the same batch.

The tests mentioned in chapter 7 are carried out on pipes manufactured by a pipe manufacturer chosen by Owner.

The tests mentioned in chapter 6.1 (table 1), 6.2 and 7 are carried out in a laboratory appointed by Owner.

5.2. APPLICATION FOR APPROVAL

A manufacturer that wishes to have a certain PE compound classified for the manufacture of PE gas components must submit a written application to Owner.

This application must be accompanied by a clear description of the compound concerned, including the technical characteristics.

All correspondence must be in English.

6. TECHNICAL FILE

6.1. EVALUATION

If the application is taken into consideration by Owner, the compound manufacturer must submit a technical file to a laboratory appointed by Owner.

This technical file must include the following information:

- name and class of the PE compound;
- technical characteristics of the compound, with reference to the standard;
- a dossier with test results, from an independent laboratory, showing that the proposed compound meets the requirements of EN 1555-1 for a PE 100 compound. The dossier must also state which tests have been carried out on the same batch of pipes or test samples, including the identification of their origin.

The laboratory chosen by Owner will also evaluate the conformity of this dossier, taking the following rules into account:

- a) If the tests mentioned in the technical file have been carried out by a laboratory

accredited according to EN 45001, and if the tests have been carried out on the same batch of pipes for the required diameter and wall thickness, then the evaluation will be limited to an examination of the dossier in accordance with the provisions of EN 1555-1 and the quantity of test samples laid down in 1555-7;

- b) If the tests mentioned in the technical file have been carried out by a laboratory that is not accredited according to EN 45001 and/or on different batches of pipes for the same diameters/wall thickness, then the evaluation will be done on the basis of further tests in order to confirm the characteristics mentioned in the technical file.
- c) The characteristics for rapid crack propagation (RCP) and slow crack propagation (SCG), as mentioned in the technical file, must comply with the requirements of the standard. Furthermore, the requirements of table 1 must be met:

Table 1

Characteristic	Requirement	Standard
Pc S4	DN 250 – SDR 11 0°C - > 3,5 BAR	ISO 13477
Pc FS	DN 250 – SDR 11 0°C - > 15 BAR	EN ISO 13478
SCG	DN 250 – SDR 11 80°C – σ4,6 - > 500 h	EN ISO 13479

The tests mentioned in table 1 must be carried out by an independent laboratory appointed by Owner. The three series of tests must be carried out on the same batch of pipes.

If it emerges from the evaluation of the technical file that conformity with EN 1555-1 is guaranteed, then the next stage of the procedure can commence, as described in section 7.

6.2. ADDITIONAL TESTS

6.2.1. General

If from the evaluation it emerges that the dossier submitted is incomplete or does not offer the necessary guarantees of conformity with the standard, then additional tests will be carried out by the laboratory appointed by Owner, at the cost of the compound manufacturer.

The same procedure will be followed if the technical file has been drawn up by a laboratory that is not accredited and/or if several batches of pipes have been used for each diameter/wall thickness in carrying out the tests.

6.2.2. Delivery of the pipes

The required batch of pipes must be delivered by the compound manufacturer, the pipes having been produced by a pipe manufacturer who at that moment is a Owner supplier.

The number of pipes must be based on the numbers and frequencies mentioned in EN 1555-7.

If the technical file is based on tests carried out by a non-accredited laboratory and/or carried out on several batches of pipes per diameter/wall thickness, then the tests will be repeated on at least half of the required test samples; if the number thus calculated is not a whole number, the number of test samples taken will be equal to the next whole number.

6.2.3. Test results

If from the additional tests it appears that conformity with EN 1555-1 is guaranteed, then the next phase of the procedure can commence, as described in section 7.

If despite the additional tests no unambiguous decision can be taken regarding the conformity of the compound, then further additional tests will be carried out, until the number of test samples is at maximum equal to the number specified in the standard concerned. For this purpose, the manufacturer must keep sufficient pipes of the same batch in reserve.

If the evaluation is still not positive after the maximum number of samples has been tested, then the compound will be considered as not accepted.

7. CONFIRMATION TESTS

The second stage of the acceptance covers the industrial production of pipes, the verification of the characteristics, the laying of the pipes and the fusion to existing PE systems.

This second stage of the acceptance is carried out by Owner.

Before this stage can commence, the manufacturer must provide Owner with a technical data sheet (see appendix 1) showing the limit values for the characteristics of the compound concerned.

For the purpose of carrying out this part of the procedure, Owner will order a batch of pipes from one of its pipe manufacturers. After verification of the characteristics in the factory and confirmation by an independent laboratory, the pipes will be installed in the Owner gas distribution network, taking into account the following aspects:

- Any problems with delivery and with extrusion of the compound will be noted.
- The limits of the characteristics mentioned in the technical data sheet.

- For characteristics not included in the technical data sheet, the measured value may
- deviate by max. 30% from the average values mentioned in the technical file, to the extent that these are relevant and not in conflict with the requirements of the standard.
- Any problems with laying or welding or connecting the pipes; these will be noted.

If from the test results it appears that the characteristics of the compound and/or pipes do not comply with the requirements, or if anomalies are found in laying and/or welding of the pipes, then the acceptance procedure will be provisionally suspended. The problems found will be analysed in consultation with the compound manufacturer, and an attempt will be made to find solutions which are acceptable to both parties. If this turns out to be impossible, then the compound will be considered as not accepted.

In such a case, the costs of the second stage could be charged to the compound manufacturer.

If the second stage of the procedure is successfully completed, then the compound is accepted and will be included in the list of "Approved PE Compounds".

8. FOLLOW-UP

8.1. TECHNICAL DATA SHEET

The manufacturer must supply Owner with a technical data sheet, as described in Appendix 1, with permission for Owner to publish this technical data sheet in the specifications for PE pipes and fittings, for as long as the compound is included in the list of approved compounds.

The data entered on this data sheet apply as limit values for the compound concerned. Whenever one or more characteristics of a batch of compounds falls outside these limits, then the batch will be automatically refused for production of components destined for our gas network.

8.2. CONTINUITY OF THE COMPOUND

No alterations may be made to the compound without prior permission from Owner.

As mentioned in 8.1, the limits mentioned in the technical data sheet must be respected. Furthermore, in the case of characteristics not included in the technical data sheet, the measured values may not deviate by more than 30% from the average value mentioned in the technical file, to the extent that these are relevant and not in conflict with the requirements of the standard.

Each change that affects the final characteristics of the compound can result in additional tests being carried out by the compound manufacturer in accordance with the provisions of EN 1555-7 appendix A. The procedures for the test shall correspond to those described in section 6.1 of this specification.



GENERAL TECHNICAL SPECIFICATION

APPENDIX 1

Technical Data Sheet

Characteristics of (name of PE compound)
as per EN 1555-1

Characteristics	Standard	Specification
MRS	EN ISO 12162	> MPa
Density	Method D of ISO 1183	
min.	 kg/m ³
max.	 kg/m ³
MFR 190/5	ISO 1133	
min.	 g/ 10 min
max.	 g/ 10 min
Volatile content	EN 12099	
max.	 mg/kg
Water content	EN 12118	
max.	 mg/kg
Carbon black content	ISO 6964	
min.	 %
max.	 %
Carbon black dispersion	ISO 11420	
max.		≤ grade ...
OIT at 210°C	EN 728	
min.		... min

Company

Person responsible

Position

Signature

□ □ □



GENERAL TECHNICAL SPECIFICATION

POLYETHYLENE VALVES FOR NATURAL GAS DISTRIBUTION UNDERGROUND NETWORK

TABLE OF CONTENTS

1. SCOPE AND FIELD OF APPLICATION

2. NORMATIVE REFERENCES

3. DEFINITIONS

- 3.1. NOMINAL SIZE DN/OD
- 3.2. NOMINAL OUTSIDE DIAMETER (D_N)
- 3.3. NOMINAL WALL THICKNESS (E_N)
- 3.4. COMPOUND
- 3.5. MAXIMUM OPERATING PRESSURE (MOP)
- 3.6. VALVES
- 3.7. BASE PLATE
- 3.8. SPINDLE PROTECTION SLEEVE
- 3.9. EXTERNAL LEAK-TIGHTNESS
- 3.10. INTERNAL LEAK-TIGHTNESS
- 3.11. LEAK-TIGHTNESS TEST
- 3.12. INITIATING TORQUE
- 3.13. RUNNING TORQUE
- 3.14. LEAKAGE

4. GENERAL SPECIFICATION

5. MATERIAL PARTICULARITIES

- 5.1. GENERAL
- 5.2. PE COMPOUND FOR POLYETHYLENE VALVES BODIES
- 5.3. SEALS
- 5.4. LUBRICANTS

5.5. OPERATING CAP

6. VALVES GENERAL PARTICULARITIES

6.1. TECHNICAL FILE

6.2. DESIGN

6.3. APPEARANCE AND COLOUR

6.4. DIMENSIONS

7. MECHANICAL CHARACTERISTICS FOR ASSEMBLED VALVES

7.1. GENERAL

7.2. RUNNING TORQUE

7.3. INDIVIDUAL TEST (BATCH RELEASE TEST)

7.4. PRESSURE DROP AT LOW PRESSURE

8. MARKING

9. PACKAGING AND DELIVERY

10. GUARANTEE

11. QUALITY CONTROL

11.1. GENERAL RULINGS

11.1.1. Manufacturer's responsibility

11.1.2. Quality assurance

11.2. CONTROLS

11.2.1. Control testing by the manufacturer

11.3. ACCEPTANCE OR REFUSAL

11.3.1. Appearance, measurements and marking

11.3.2. Control check on characteristics

ANNEXE A

DIMENSIONS OF THE EXTENSION SPINDLE

ANNEX B



GENERAL TECHNICAL SPECIFICATION

DIMENSIONS OF THE OPERATING CAP TYPE A

ANNEX C

DIMENSIONS OF THE OPERATING CAP TYPE B

ANNEX D

DIMENSIONS OF THE OPERATING CAP TYPE C

1. SCOPE AND FIELD OF APPLICATION

This General Technical Specification specifies the requirements for valves and its component made from extruded or injected moulded polyethylene (PE) and which are intended to be used for the Natural gas distribution systems where the maximum operating pressure (MOP) is equal to 5 bar.

In addition, it specifies some general properties of the materials from which these valves are made.

It applies to bi-directional valves with spigot ends or electrofusion sockets intended to be fused with polyethylene pipes in accordance with the Technical standards.

This specification is limited to valves with a nominal diameter (d_n) up to and including 225 mm.

2. NORMATIVE REFERENCES

EN 1555-1	Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 1 : General
EN 1555-4	Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 4 : Valves
EN 1555-7	Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 7 : Guidance for assessment of conformity
ISO CD 12176-4	Plastics pipes and fittings - Equipment for fusion Joining polyethylene system - part 4 : traceability coding
ISO TR 13950	Plastics pipes and fittings - Automatic recognition systems for electrofusions

3. DEFINITIONS

3.1. NOMINAL SIZE DN/OD

Nominal size, related to the outside diameter.

3.2. NOMINAL OUTSIDE DIAMETER (d_n)

Specified outside diameter, in millimetre, assigned to a nominal size DN/OD.

3.3. NOMINAL WALL THICKNESS (e_n)

Numerical designation of the wall thickness of a component, which is a convenient round number, approximately equal to the manufacturing dimension in millimetre (mm).

Note : For thermoplastics components conforming to EN 1555, the value of the nominal wall thickness e_n is identical to the specified minimum wall thickness at any point, e_{min} .

3.4. COMPOUND

Homogenous mixture of base polymer (PE) and additives, i.e. anti-oxidants, pigments, UV-stabilisers and others, at a dosage level necessary for the processing and use of components conforming to the requirements of this standard.

3.5. MAXIMUM OPERATING PRESSURE (MOP)

Maximum effective pressure of the fluid in the piping system, expressed in bar, which is allowed in continuous use. It takes into account the physical and the mechanical characteristics of the components of a piping system.

Note : It is calculated using the following equation : $MOP = \frac{(20 \times MRS)}{Cx(SDR \square 1)}$

3.6. VALVES

An obturating device designed to stop or restore the gas flow by operating the opening and closing mechanisms.

3.7. BASE PLATE

The valves are split into two models.

MODEL 1	Valve supply without base plate
MODEL 2	Valve supply with a base plate fixed or integrated

3.8. SPINDLE PROTECTION SLEEVE

A sleeve tube that protect the valve spindle. The protection sleeve exists in two models

VENTILATED	The sleeve is provided with opening and wrapped with textile fabric in order to let the gas escape and prevent the soil to go in.
NON VENTILATED	A normal sleeve tube without textile fabric.

3.9. EXTERNAL LEAK-TIGHTNESS

The tightness of the body enveloping the space containing the gas, with respect to the atmosphere.

3.10. INTERNAL LEAK-TIGHTNESS

The tightness between the inlet and the outlet of the valve, obtained by closing the operating mechanism.

3.11. LEAK-TIGHTNESS TEST

Test to determine

- the internal leak-tightness of the valve's closing seat when closed and pressurised from either side;
- the external leak-tightness of the valve when half open.

3.12. INITIATING TORQUE

Torque required to initiate movement of the obturator.

3.13. RUNNING TORQUE

Torque required to achieve full opening or closing of the valve at maximum allowable operating pressure.

3.14. LEAKAGE

Emission of gas through the body, sealing membrane or any other component of the valve.

4. GENERAL SPECIFICATION

The present specification is based on the European Standards EN 1555 series prepared by technical committee CEN/TC 155 plastic technical and ducting system.

The requirements of this General technical specification are chosen in order to guarantee a high quality gas system which will respond to the European Standards for gas supply systems.

- the valves described in this General technical specification comply with the standard EN1555-4 and the complementary particular requirements or options of the present GTS.
- the valves are intended to be use in gas distribution networks made of PE pipes and accessories complying with technical standards.
- the valves are laid and welded as specified in the technical standards.

5. MATERIAL PARTICULARITIES

5.1. GENERAL

All parts of the valve in contact with the gas stream shall be resistant to the gas, its condensates and other occurring substances such as dust.

All metallic parts of the PE valve shall resist to both internal and external corrosion.

5.2. PE COMPOUND FOR POLYETHYLENE VALVES BODIES

- The PE compound from which the valve body, with spigot end or electrofusion socket is made out, shall conform to EN1555-1 and comply with the technical standards "acceptance procedure".
- The PE valves bodies are PE 100 class made from approved material as specified in the technical standards General requirements - appendix 1.

Are forbidden :

- use of recycled materials,
- mixture of different materials,
- addition of complementary materials.

5.3. SEALS

- The seals shall be homogeneous, without any inner crack, inclusion or impurities and cannot contain any component that can alter the properties of the materials they are

in contact with, and prevent the non-conformity of those materials with the present specification.

- additives shall be distributed evenly.
- The rubber seal rings shall comply with standard EN 682.
- Other seals shall comply with the relevant standard and be suitable for gas service.

5.4. LUBRICANTS

Lubricants cannot have any adverse effects on the long-term performance of the valve parts.

5.5. OPERATING CAP

Operating cap are in plastic material or in metal, protected against corrosion.

6. VALVES GENERAL PARTICULARITIES

6.1. TECHNICAL FILE

The manufactures of the valves shall deliver for each type of valve a technical file which includes:

- Raw materiel used,
- drawings, dimensions and tolerances, including for the accessories,
- application range (temperature and pressure limits),
- running torque and initiating torque,
- pressure drop and flow diagram,
- test results and data proving the conformity of the valve in accordance with EN1555-4 and EN1555-7,
- the pipe elements used during valves testing have to be conform to the technical standards.
- the assembly pipes/valves realised during testing shall be in conformity with the manufactures instructions and the extreme installation conditions.
- For the test assembly due consideration should be taken regarding the fabrication tolerances and the variation of the outside ambient temperature.
- The welding of the assembly will comply with technical standards.

6.2. DESIGN

- The valves will be designed for a maximum operating pressure (MOP) equal to 10 bar.
- The wall thickness of the PE valve body shall be equal or greater than the minimum wall thickness of the corresponding SDR 11 series pipes.
- Valves body and valves ends form an indivisible whole.
- Except otherwise stated in the Owner purchase order, all valves will be "ball valve" type.
- The operating cap shall be designed in a way that it cannot be ejected "non blow out" type.
- The design of the extension spindle and the spindle protection sleeve will be such that they will never, in any case, even due to soil settlement, lay on the non reinforced part of the valve body or the valve ends. The spindle protection sleeve cannot turn during valve turning operation.
- The owner will specify if the spindle protection sleeve is a ventilated or non-ventilated type.
- The spindle protection sleeve ventilated type will have holes (min. diameter 10 mm) or slot type holes (min. width 1 mm) all around the sleeve in sufficient number in order to assure a maximum permeability for the gas.
- The sleeve will be covered by a non-waved geo-textile fabric (90 µm). The geo-textile fabric with a 50 mm overlap will be well secured on the sleeve;
- The valves should be equipped with a base plate. In order to achieve this, the valve body will be design with a flat base (model 1) or with an attached base plate or an integrated one (model 2). The Owner or his representative will specify the model.
- The operating mechanism and the stop wedges will be protected against water intrusion.
- The valve body is completely sealed except a passage for the spindle mechanism.

6.3. APPEARANCE AND COLOUR

- The internal and external surfaces of valves shall be smooth clean and shall have no scoring, cavities or other defects to an extend that would prevent non-conformity to the present GTS or to the standard EN 1555-4.
- The colour of the PE valves shall be either yellow, black or orange.

- The colour of the valve shall be specify by the Owner or his representative in the purchase order;

6.4. DIMENSIONS

- The dimensions will be in conformity with the standard EN1555-3 and EN1555-4.
- The dimensions of the extensions spindle are detailed in appendix A.
- The operating cap will be design as per appendix B, C or D.
- The type of the operating cap will be specified by the Owner or his representative in the purchase order.
- The design of the extension spindle is such that the extension can be turn easily at any time to suit the site conditions.

7. MECHANICAL CHARACTERISTICS FOR ASSEMBLED VALVES

7.1. GENERAL

The valve shall have mechanical characteristics and be tested as specified in the standard EN 1555-4.

7.2. RUNNING TORQUE

The running torque and the concept of the valve shall prevent the valve from being easily operated (by hand) without an operating key. To operate the valve designed with running torque as specified I the standard EN 1555-4, the use of an operating key is requested. Neither the operating cap nor the spindle shall be damaged when operating at maximum operating torque as specified in the standard EN 1555-4;

7.3. INDIVIDUAL TEST (BATCH RELEASE TEST)

Before delivery each valves will be individually tested for mechanical strength and leaktightness as per standard EN1555-4.

A combined mechanic resistance and leak-tightness test shall be performed in conformity with the EN1555-4.

By batch of valves a supplementary leak-tightness test (25 mbar) shall be performed in conformity with the EN 1555-4 on 3 valves taken at random.

7.4. PRESSURE DROP AT LOW PRESSURE

The drop of pressure is measured with natural gas as a medium and according to the

diagram specified in the standard EN 12117 (fig.1).

The maximum drop of pressure measured with natural gas (inlet pressure 25 mbar) will be limited to 0,2 mbar for a nominal gas flow as per table below.

d_n	Flow m³/h
32	10
40	15
63	60
90	180
110	250
160	600
200	1000

8. MARKING

At least the information given below shall be printed or formed directly on the valve :

- a) Manufacturer's name and/or trademark;
- b) Material and designation (e.g. PE 100);
- c) Design application series (e.g. SDR 11);
- d) Nominal diameter;
- e) Internal fluid "gas";
- f) Traceability code (valve and component) as per standard ISO/FDIS 12176-4;
- g) Number of the system standard (e.g. EN 1555-4) this information can be printed/formed directly on the valve or on a label associated with the valve or on an individual bag.
- h) Production period, year and month;

The marking shall stay legible during normal manipulation, storage and installation.

The marking shall not adversely influence the performance of the valve and prevent the non-conformity of the valve.

No marking will be accepted at the valve spigot ends.

9. PACKAGING AND DELIVERY

The valve and its accessories shall be packaged individually in plastic bags in order to prevent them from deterioration. The valves ends shall be protected with external caps.

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

10. GUARANTEE

The manufacturer will extend his guarantee for each part for 10 years after production. This guarantee period is valid if the parts are kept in proper conditions and in the original packaging.

The valves equipped with electrofusion sockets will be supply with a magnetic card and a code bar tag containing the welding parameters. The coding of the parameters shall be in conformity with the standard ISO TR 13950.

The operating manual (in English) will be inserted in the individual part package.

11. QUALITY CONTROL

11.1. GENERAL RULINGS

11.1.1. Manufacturer's responsibility

The manufacturer is entirely responsible for the quality of the PE valves manufactured by his firm.

All control checks prescribed above do not relieve him of this responsibility.

To ensure that all PE valves are in compliance with the specification in all aspects, they must be controlled by the plant control service, which must be independent from the manufacturing department.

All PE valves supplied are guaranteed for 10 years after the date of production.

11.1.2. Quality assurance

The manufacturer must have some form of quality control to ensure that products comply with EN standards 29001 or 29002. The quality assurance manual must be made available to the Owner Control Service or an external Control laboratory appointed by him. The system of quality assurance must be certified by an authorised body.

11.2. CONTROLS

11.2.1. Control testing by the manufacturer

11.2.1.1. *By material batch.*

The manufacturer demands a certificate from the raw material manufacturer including the following :

- Fluid index
- Water content
- Volume mass
- Carbon black or yellow stabilising agent content
- Carbon black or yellow stabilising agent quality
- OIT value (thermal stability)

11.2.1.2. *By accessory batch*

The manufacturer must run control checks as specified in the standard EN 1555-4 and EN 1555-7:

Control checks and the number of tests must be carried out according to the prescriptions of the EN standard 1555-4.

Also refer to table N° 8, paragraph 4.2.3. "Lot release tests" of standard EN 1555-7.

The results must be written out in documents that contain the complete identification of the accessory batch.

These documents must be made immediately available for the Owner representative.

11.2.2. Plant Reception by the Owner Control Service representative

11.2.2.1. *General information*

All quality controls must be run in the presence of the Owner Control Service representative.

All tests and control checks must comply with appropriate standard prescriptions and with the specific specifications established with the order.

At each visit by the Owner representative, the manufacturer must provide, free of charge, all means and personnel necessary for running the established control checks.

While the order is under production, the Owner representative must have access to stocking installations of all raw materials before manufacturing, manufacturing and control installations, as well as the accessory stocking areas for any control checks he is responsible for.

During his visits, the Owner representative will receive a certificate as soon as he reaches the plant for each batch of accessories presented for reception.

Each time this is requested by the Owner representative, the manufacturer must provide recent reports of all control checks and measuring instrument results and testing results.

11.2.2.2. *Convocation for reception*

Convocation instructions for reception are to be defined with the order.

11.2.2.3. *Reception control checks*

For each accessory batch or any fractions of the batch, minimal batch sampling is established in annexed enclosure 3. These control checks and tests are to be run according to the prescriptions of standard EN 1555-4.

11.3. ACCEPTANCE OR REFUSAL

11.3.1. Appearance, measurements and marking

Any requirements not supplied will lead to the refusal of the complete batch. However in the case where a batch is refused, it can be presented for approval again after a control check, on agreement with the Owner Control Service.

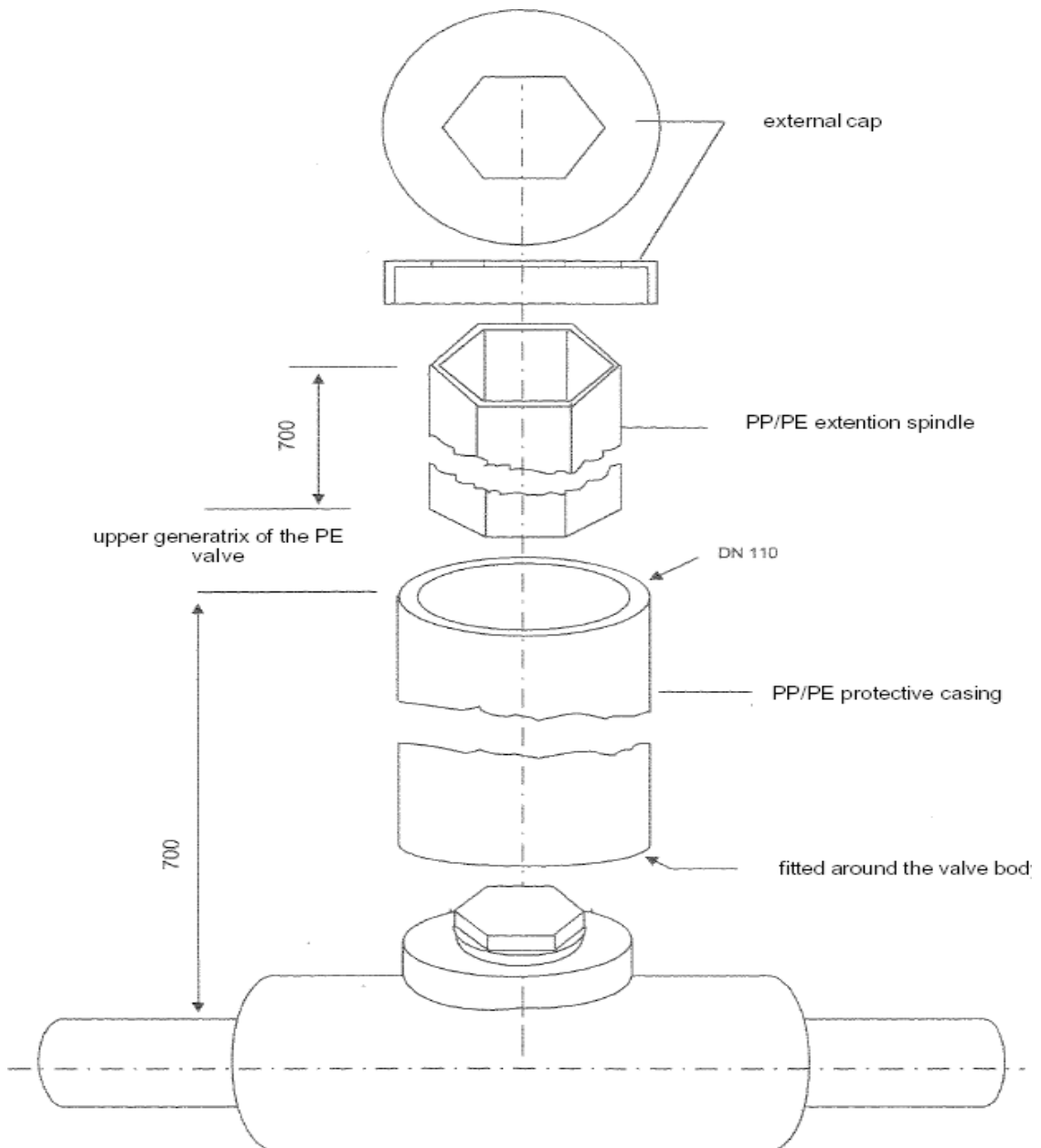
11.3.2. Control check on characteristics

All results that do not comply with the specification prescriptions and the particular specifications requested with the order, demand counter-testing on at least double the number of the samples previously tested. If the undesirable result is confirmed, then the batch is refused permanently. If the result is positive, then the batch will be accepted.

As a complementary control check, other analyses and/or tests can be run after common agreement, and at the manufacturer's cost.

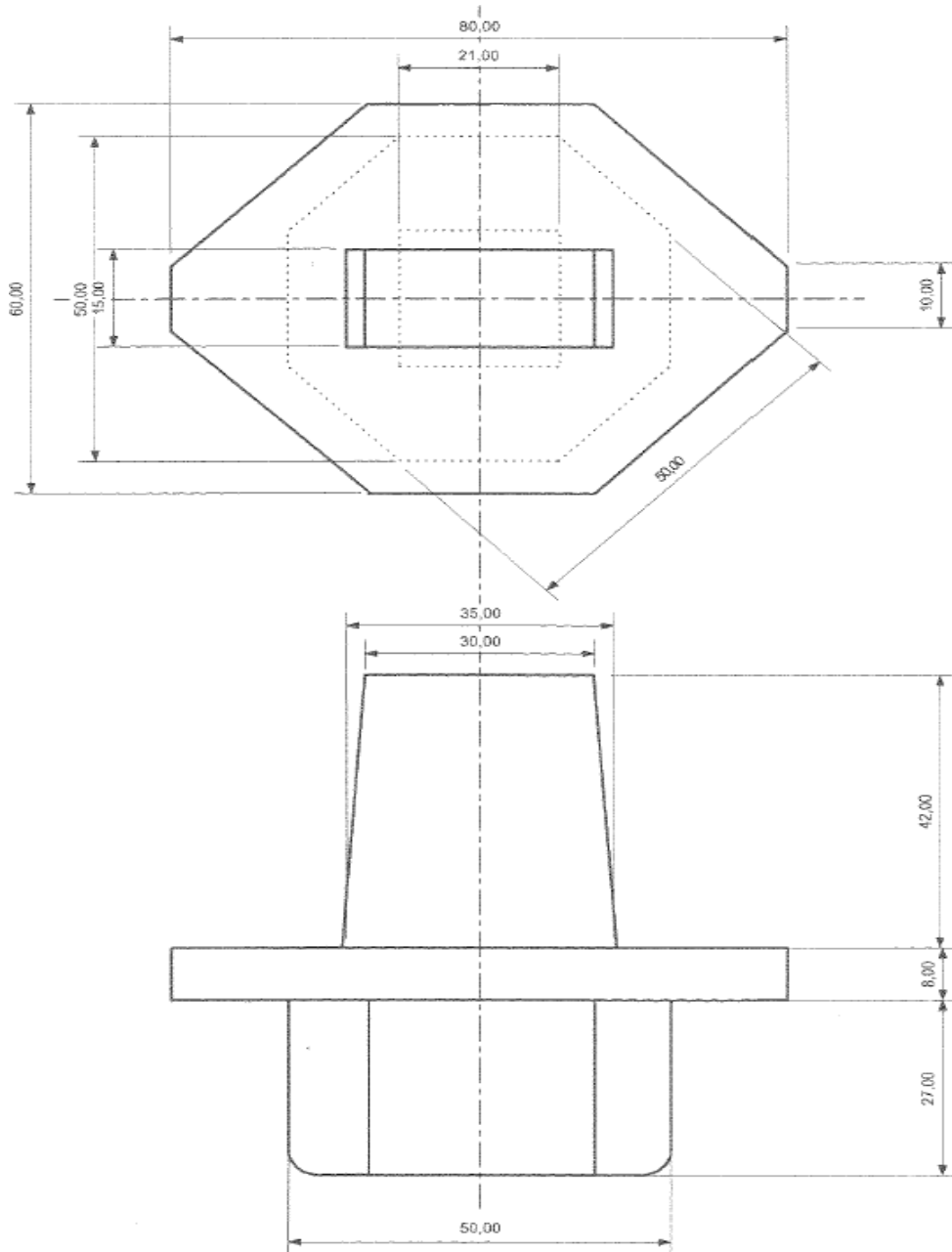
ANNEXE A

Dimensions of the extension spindle



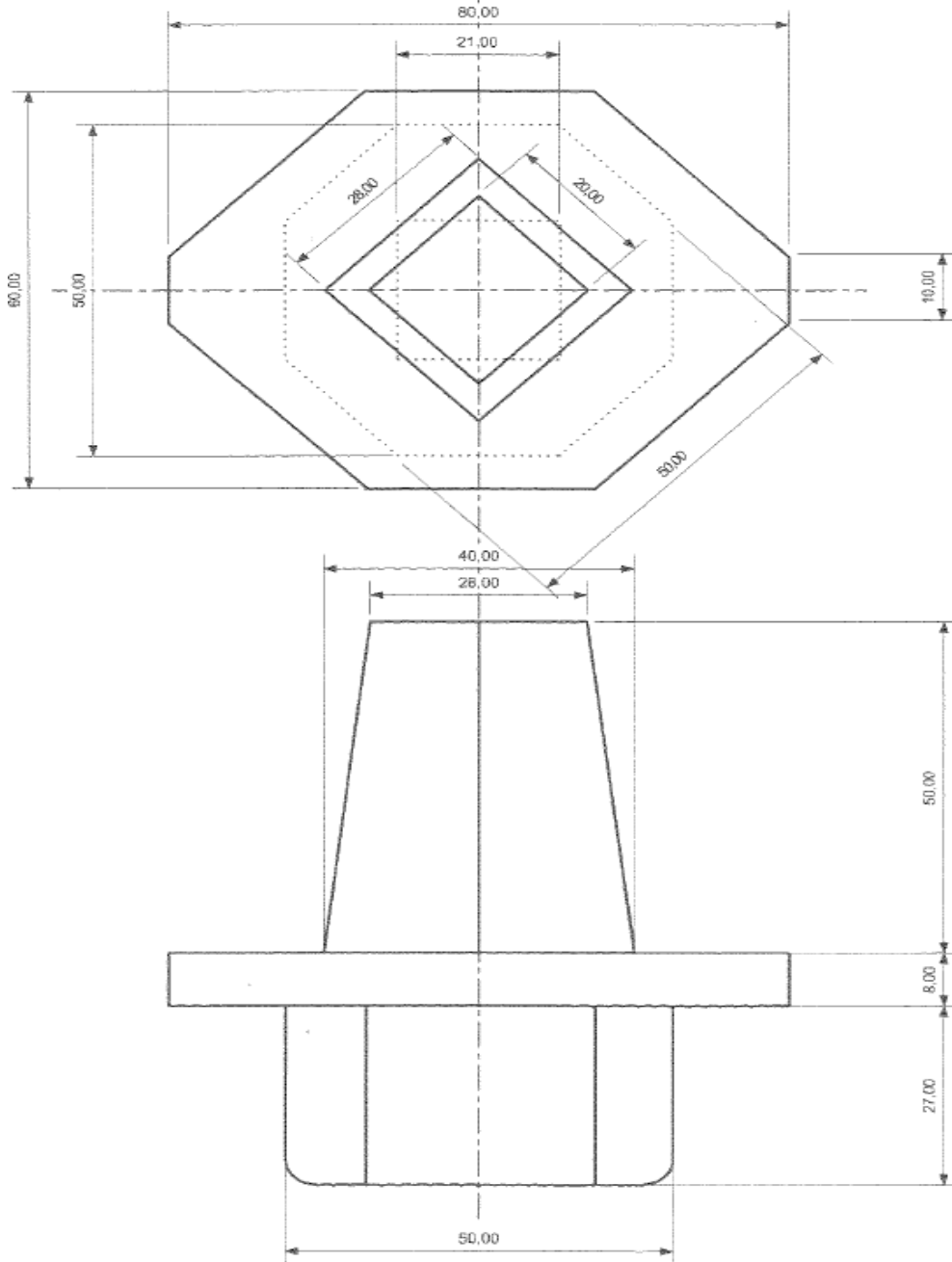
ANNEX B

Dimensions of the operating cap Type A



ANNEXURE C

Dimensions of the operating cap Type B



TECHNICAL TENDER

CUGL/REPL/WORKS/2024/01

ANNEXURE D

Dimensions of the operating cap Type C

