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

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

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

17.0 MOLING

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

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

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

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

18.0 HORIZONTAL DIRECTIONAL DRILLING (HDD)

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

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

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

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

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

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

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

19.0 CASING PIPE

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

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

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

20.0 RESTORATION

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

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

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

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

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

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

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

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

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

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

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

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

21.0 TESTING

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

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

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

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

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

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

22.0 PURGING

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

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

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

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

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

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

23.0 VALVE PITS

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

Payment for the valve pit construction shall be paid as per SOR item no.19. The construction of the valve chambers shall be taken up immediately after installation of valve.

23.1 Material for Valve Pit

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

23.2 Workmanship

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

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

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

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

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

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

24.1 Construction of dedicated trench (as per approved drawing)

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

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

24.2 Construction of dedicated trench (as per approved drawing)

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

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

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

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

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

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

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

Note- Actual quantity (Cubic meter) of sand filling for 21.1, 21.2 & 21.3 shall be claimed in this SOR
Note- In all of the above items 10% amount shall be withheld till availability of NOC from concerned authority.

25.0 ROUTE MARKERS

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

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

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

26.0 GUIDELINES:

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

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

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

27.0 ASSISTANCE IN COMMISSIONING

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

28.0 STANDARD OF WORK

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

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

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

29.0 RECORDING (AS-BUILT DRAWINGS)

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

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

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

30.0 CIVIL WORKS

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

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

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

ANNEXURE # 1

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

Sl. No.	Equipment Details	Minimum Requirement (In Nos.)
1	Electro Fusion Box (Automatically readable)	2
2	Voltage Stabilizer	1
3	Generator (5.5 KVA)	2
4	Moiling Equipment (for all sizes)	As and when required
5	HDD Machines & Equipment (for all types & sizes)	As and when required
6	Squeeze Tools (Manual) up to 63 mm	2
7	Squeeze Tools (Hydraulic) from 63 mm up to 180 mm*	2
8	Rotary Peelers	2
9	Universal Scrapers	3
10	Tapping Tools/Allen Keys	Two sets of all sizes
11	Pipe Cutter (Round)	2
12	Pipe Cutter (Guillotine)	1
13	Pipe Cutter (ratchet type)	2
14	Gas Detection Unit	As and when required
15	Cable and Pipe Locator	As and when required
16	Test Ends	One set of all sizes
17	Pipe Alignment Clamps	As and when required
18	Joining Clamps for Coupler (All sizes)	2
19	Joining Clamps for Saddle (All sizes)	2
20	Pipe Straightness	As and when required
21	Re-rounding Tools (All sizes)	As and when required
22	Jumping Jack Compactor	As and when required
23	Roller for Asphalting	As and when required
24	Calibrated Pressure Gauges (0-6 Bar)	6
25	Water Tankers	As and when required
26	Automatic Thread cutting machine	As and when required
27	Heating Element for HDPE Butt joint along with clamping, roller and other accessories	As and when required