



BHAGYANAGAR GAS LIMITED

(A JOINT VENTURE OF HPCL & GAIL)

BID DOCUMENT FOR

**Procurement of MDPE Fittings, Tools & Tackles for
Operational & Maintenance purpose for the Vijayawada**

**UNDER LIMITED DOMESTIC
COMPETITIVE BIDDING**

Bid Document No.: BGL/409/2017-18

VOLUME-II of II

**VOLUME II OF II
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SECTION – 8
SPECIAL CONDITIONS OF CONTRACT (SCC)

SPECIAL CONDITIONS OF CONTRACT (SCC)

GENERAL

- 1.1 Special Conditions of Contract shall be read in Conjunction with the General Conditions of Contract, Specification of work, Drawing and any other documents forming part of this Contract wherever the context so requires.
- 1.2 Notwithstanding the sub-division of the documents into these separate sections and volumes ever part of each shall be deemed to be supplementary to and complementary of every other part and shall be read with in the Contract so far as it may be practicable to do so.
- 1.3 Where any portion of the General Conditions of Contract is repugnant to or at variance with any provisions of the Special Conditions of Contract, unless a different intention appears, the provisions of the Special Conditions of Contract shall be deemed to over-ride the provisions of the General Conditions of Contract and shall be the extent of such repugnancy, or variations, prevail.
- 1.4 Wherever it is mentioned in the specification that the Contractor shall perform certain work or provide certain facilities, it is understood that the Contractor shall do so at his cost and the **Value of Contract** shall be deemed to have included cost of such performance and provisions, so mentioned.
- 1.5 The materials, design, and workmanship shall satisfy the relevant Indian Standard, the Job Specifications contained herein and Codes referred to where the job specification stipulate requirements in addition to those contained in the standard codes and specifications, these additional requirements shall also be satisfied.
- 1.6 In case of an irreconcilable conflict between Indian or other applicable standards, General Conditions of Contract, Special Conditions of Contract, Specification, Drawings or Schedule of Rates, the following shall prevail to the extent of such irreconcilable conflict in order of precedence:
 - i) Letter of Acceptance/ FOI along with Statement of Agreed Variations.
 - ii) Schedule of Rates as enclosures to Letter of Acceptance
 - iii) Special Conditions of Contract
 - iv) Drawings
 - v) Technical/ Material Specifications
 - vi) Instruction to Bidder
 - vii) General Conditions of Contract
 - viii) Indian Standards
 - ix) Other applicable standards
- 1.7 It will be the Contractor's responsibility to bring to the notice of Engineer-in-charge any irreconcilable conflict in the contract documents before starting the work(s) or making the supply with reference which the conflict exists.
- 1.8 In the absence of any Specifications covering any material, design of work(s) the same shall be performed/ supplies/ executed in accordance with Standard Engineering Practice as per the

instructions/ directions of the Engineer-in-charge, which will be binding on the Contractor.

2.0 DELIVERY SCHEDULE:-

8 weeks from placement of P.O.

3.0 PAYMENT TERMS:-

100% Payment will be done by BGL against submission of invoices, warrantee certificates, all related technical documents. Payment would be released by the finance department at BGL, Hyderabad within 15 days from the date of submission of acceptable documents duly certified by the Engineer – In – Charge. Payment will be made through cheque.

4.0 DELIVERY LOCATION:-

Delivery Address: Vijayawada

5.0 WARRANTY:

12 months from the date of supply against poor workmanship & manufacturing Defects.

6.0 EVALUATION CRITERIA:

Evaluation shall be done on least cost basis for PART A & B separately.

7.0 Other GCC:-

All other GCC remains unaltered.

8.0 CONTRACT PRICE

The contract price shall be deemed to be firm and valid for the entire duration of the contract till the completion of work, and shall not be subject to any adjustment due to increase in price of materials, utilities, or any other input for performance of work and the contract except for increase/decrease in taxes and duties on account of subsequent legislation.

9.0 QUALITY ASSURANCE/QUALITY CONTROL:

- 9.1. The Contractor shall "prepare a detailed quality assurance plan for the execution of Contract for various facilities, which will be mutually discussed and agreed to.
- 9.2. The Contractor shall establish document and maintain an effective quality assurance system outlined in recognized codes.
- 9.3. The Purchaser while agreeing to a quality assurance plan shall mark the stages where they would like to witness the tests; review any or all stages of work at shop/site as deemed necessary for quality assurance.

10.0 QUANTITY VARIATION

The tendered quantity may vary depending upon the project requirement. BGL reserves the right to decrease/ increase the quantity depending upon its requirement.

11.0 DISPATCH INSTRUCTIONS

- 11.1 Seller shall obtain dispatch clearance from the Purchaser prior to each dispatch.
- 11.2. Copy of Inspection Release Certificate, Dispatch Clearance and statement showing the

name of the Vessel/Trailers description and weight of material and shipping marks etc. to be submitted along with the documents.

12.0 INSPECTION

Third party Inspection Agency shall carry out stage wise inspection during manufacturing of Electrofusion Welding Machine and Accessories as per approved quality assurance plan (QAP) submitted by the bidder. Supplier shall furnish all the material test certificates, proof of approval/license from specified authority as per specified standard. The QAP and factory Acceptance Test procedure will be forwarded to BGL for review and approval. No additional Inspection/testing charges will be paid to supplier for arranging the Inspection test. Bidder has to suggest atleast 3 TPIA approved by PNGRB for carrying out the job and BGL will select one from them.

13.0 REJECTION

- 13.1. Any materials/goods covered under scope of supply, which during the process of inspection by appointed third party, at any stage of manufacture/fabrication, and subsequent stages, prior to dispatch is found not conforming to the requirements/specifications of the Purchase Requisition /Order, shall be liable for immediate rejection.
- 13.2. Supplier shall be responsible and liable for immediate replacement of such material with acceptable material at no extra cost or impact on the delivery schedule to EMPLOYER

14.0 COMPENSATION FOR DELAY (PRICE REDUCTION /LIQUIDATED DAMAGES)

In case of delay in delivery of materials beyond contractually agreed delivery schedule, price reduction schedule will be applicable @0.5% of material value for the unsupplied portion per week of delay or Part thereof, subject to ceiling of 5%(FIVEPERCENT)of the total order value. For details, please refer relevant clause of GCC-Goods.

The value referred in PRS clause is excluding GST & all taxes & duties.

15.0 PERFORMANCE BANK GUARANTEE SECURITY DEPOSIT:

Bidder will provide Performance Guarantee @10% of order value within 30 days of receipt of FOA/ WO from the Owner. The contract performance bank guarantee shall be valid 03(three) months beyond the expiry of Warrantee/Guarantee period. The Performance Guarantee shall be in form of either Demand Draft or Banker's Cheque or irrevocable Bank Guarantee and shall be in the currency of Contract (issued by any Indian Scheduled bank or a branch of an International Bank situated in India and registered with Reserve Bank of India as Scheduled Foreign Bank).

However, in case of Bank Guarantee from banks other than the Nationalized Indian bank, the bank must be a commercial bank having net worth in excess of Rs. 100 Crores or equivalent US Dollars and a **declaration** to this effect should be made by such commercial bank either in the bank guarantee itself or separately on its letterhead.

Performance Guarantee for 10% of order value shall be excluding taxes & duties.

BGL shall not be liable to pay any bank charges, commission or interest on the same.

Failure of the successful bidder to comply with the requirement of this clause shall constitute a breach of contract, cause for annulment of the award, forfeiture of the bid security and any such remedy the Owner may take under the Contract pursuant to GCC-Goods.

There is no exemption to MSEs including SSI units from submission of Security Deposit/ Contract Performance Bank Guarantee (CPBG).

16.0 REPEAT ORDER

BGL reserves the right to place a repeat order within Six (06) months from date of purchase order for upto 50% of order quantities/ 02 NOS. on same rate, terms and conditions.

17.0 PACKING, MARKING AND SHIPMENT

The Seller, wherever applicable shall after proper painting, pack and create all goods for sea/air/road/rail transportation in a manner suitable to tropical humid climatic region in accordance with the internationally accepted practices and in such a manner so as to protect it from damage and deterioration, in transit by sea or air or road or rail and during storage at the storehouse. The Seller shall be held responsible for all damages due to improper packing. The Seller shall ensure sizing or packing of all oversized consignments in such a way that availability of carrier and/or road/rail route is properly taken into consideration.

Seller shall comply with the Packing, Marking and Shipping Instructions and Special Packaging Requirement as per the Bidding Document.

18.0 INDEPENDENT SELLER

It is expressly understood and agreed that Seller is an independent party and that neither the Seller/its personnel are servants, agents or employees of Purchaser nor the Seller has any kind of interest in other sellers.

19.0 LIEN

Seller shall ensure that the Scope of Supply supplied under the Agreement shall be free from any claims of title/liens from any third party. In the event of such claims by any party, Seller shall at his own cost defend, indemnify and hold harmless Purchaser or its authorised representative from such disputes of title/liens, costs, consequences etc.

20.0 LIMITATION OF LIABILITY

Notwithstanding anything contrary contained herein, the aggregate total liability of Supplier under the Contract or otherwise shall be limited to 100% of contract value. However, neither party shall be liable to the other party for any indirect and consequential damages, loss of profits or loss of production.

21.0 GOVERNING LAW

Laws of India will govern the Agreement and Hyderabad courts will have exclusive jurisdiction on all matters related to Agreement.

22.0 OWNER'S RIGHTS AND REMEDIES

Without prejudice to Owner's right and remedies under Agreement, if SUPPLIER fails to commence delivery as per agreed schedule and/or in reasonable opinion of the OWNER, CONTRACTOR is not in a position to make up the delay to meet the intended purpose, the OWNER may terminate the AGREEMENT in full or part at SUPPLIER's default and may get

supplies from other sources at SUPPLIER's risk and cost.

23.0 Clause no. 16.0 of GCC shall be appended with the following :

Bidder shall arrange Transit Insurance and the cost of which shall be borne by bidder. Quoted price shall be inclusive of the same.

24.0 Clause no. 30.4 of GCC shall be appended with the following :

SETTLEMENT OF COMMERCIAL DISPUTES BETWEEN PUBLIC SECTOR ENTERPRISE(S) INTER-SE AND PUBLIC SECTOR ENTERPRISE(S) AND GOVERNMENT DEPARTMENT(S) THROUGH PERMANENT MACHINERY OF ARBITRATION (PMA) IN THE DEPARTMENT OF PUBLIC ENTERPRISES

In the event of any dispute or difference relating to the interpretation and application of the provisions of the contracts, such dispute or difference shall be referred by either party for Arbitration to the sole Arbitrator in the Department of Public Enterprises to be nominated by the Secretary to the Government of India in-charge of the Department of Public Enterprises. The Arbitration and Conciliation Act, 1996 shall not be applicable to arbitrator under this clause. The award of the Arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may make a further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law & Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary / Additional Secretary. When so authorized by the Law Secretary, whose decision shall bind the Parties finally and conclusively. The parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator.

25.0 FAILURE & TERMINATION CLAUSE

Time and date of delivery shall be the essence of the contract. If the vendor/contractor fails to deliver the entire quantity of materials ordered/ complete the work or a part thereof within the contractual delivery/ completion period agreed to for such part or total quantity as per the delivery / time schedule or at any time repudiates the contract before the expiry of such period, BGL may without prejudice to any other right or remedy available to it recover damages for breach of the contract in any manner stipulated hereunder:-

(a) Recover from the vendor/contractor an agreed amount towards Price Reduction Schedule and not by way of penalty a sum equivalent to 1/2% (half percent) of the contract price of the whole unit per week for such delay or part thereof (this is a genuine pre-estimate of damages duly agreed by the parties) which the vendor/ contractor has failed to deliver within the period fixed for delivery in the schedule, where delivery thereof is accepted after expiry of the aforesaid period.

It may be noted that such recovery of PRS may be up to 5% of the contract price / of the total quantity of items of materials / equipment which the contractor has failed to deliver within the period fixed for delivery; or

(b) Purchase or authorise the purchase elsewhere on the account and at the risk of the contractor, of the materials not so delivered or others of a similar description, by serving prior notice to the contractor / supplier without cancelling the contract in respect of the installment not yet due for delivery;

or

- (c) Cancel the contract or a portion thereof by serving prior notice to the contractor and if so desired, purchase or authorise the purchase of the materials not so delivered or others of a similar description (where such materials exactly complying with particulars are not, in the opinion of the purchaser, which shall be final, readily procurable) at the risk and cost of the contractor. If the contractor had defaulted in the performance of the original contract, the purchaser shall have the right to ignore his tender for risk purchases even through the lowest. Where the contract is terminated at the risk and cost of the firm under the provisions of this clause, it shall be solely upto the purchaser to exercise his discretion to collect or not, the security deposit from the firm, on whom the contract is placed, at the risk and expense of the defaulting firm.
- (d) Where action is taken under sub-clause (b) or sub-clause(c) above, the contractor shall be liable for any loss which the purchaser may sustain on that account, provided the purchase or if there is an agreement to purchase, such agreement is made, in case of failure to deliver the materials within six months from the date of such failure and in case repudiation of the contract within six months from the date of cancellation of contract. The contractor shall not be entitled to any gain on such purchase and the manner and method of such purchase shall be at the entire discretion of the purchaser. It shall be necessary for the purchaser to give a notice of such purchase on the contractor.
- (e) It may further be noted that clause (a) above provides for recovery of PRS on the cost of contact price of delayed supplies (whole unit) at the rate of 1/2% (half per cent) of the contract price of the whole unit per week for such delay or part thereof upto a ceiling of 5% of the contract price of delayed supplies thus accrued will be recovered by the paying authorities of the purchaser specified in the supply order, from the bill for payment of the cost of the material submitted by the vendor/contractor in accordance with terms of supply order, or otherwise.
- (f) Notwithstanding any thing stated above equipment and materials will be deemed to have been delivered only when all its components, parts are also delivered. If certain components are not delivered in time the equipment and material will be considered as delayed until such time all the missing parts are also delivered.

26.0 General Conditions

- (i) When the materials are dispatched to the consignee intimation must also be given to this effect. Reference to the supply order should invariably be given in all the relevant correspondence.
- (ii) The tender is liable to be rejected in case the tender does not comply with tender stipulations or the goods, works and services offered do not conform to the required specifications indicated therein.
- (iii) Any other terms and conditions offered by the firm and not included in the order/contract, are not acceptable to BGL.

SECTION – 9 TECHNICAL SPECIFICATIONS

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

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1.0 SCOPE AND FIELD OF APPLICATION

This specification elaborates the requirements for Electro fusion fittings in the nominal size range 20 to 125 mm made from PE compound used with PE pipes for supply of natural gas and to be used at operating temperature not more than 40°C.

The material grades to be used are PE 100. The fittings shall be black in colour.

Electro Fusion Fitting Jointing

- 1.1** For Electro Fusion fitting jointing an electrical resistance element is incorporated in the socket of fitting which when connected to an appropriate power supply, melts and fuses the materials of the pipe and fitting together.
- 1.2** The effectiveness of this technique depends on attention to the preparation of the jointing surfaces, in particular the removal of the oxidized surface of the pipe over the socket depth and ensuring the jointing surface are clean. If ovality causes gap between concentrically located pipe and the fitting to exceed 1% of the pipe OD after re-rounding to ensure correct welding. If the gap still exceeds 1% of the pipe OD after re-rounding then a check should be made of the pipe OD dimensions to determine if it meets specification.
- 1.3** The maximum gap between eccentrically located pipe and fitting i.e. pipe touching fitting at one point must not exceed 2% of the pipe OD.
- 1.4** Sometimes coiled pipes may be too oval to fit into couplers, or the end of the pipe may make the alignment of the ends impossible. In such circumstances the use of a mechanical pipe straightener or rounding tool is necessary.

2.0 EQUIPMENT

- 2.1** The control box input supply is to be from a nominal 240V generator, which is normally of approximately 5kVA capacity. The Nominal output of the generator is to be 240V + 15%, - 10% between no load and full load . Control box are to include safety devices to prevent excessive voltages being present at the control box output. The safety devices shall operate in less than 0.5 s.

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

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

A mechanical pipe surface preparation tool is to be used before fusion is attempted. The tool is capable of removing the oxidized surface of the pipe in excess of the insertion depth. The tool is to remove a layer of surface material 0.2-0.4 mm thick from outer surface of the pipe preferably in a continuous strip of swarf over that length and round of the pipe.

Pipe clamps for restraining, aligning and re-rounding the pipes in the fusion process are to be used.

Pipe cutters with saw and saw guide Protection against adverse weather conditions.

2.2 Electro Fusion Jointing Method /Procedure Preparation

- Ensure there is sufficient space permit access to the jointing area. In a trench a minimum clearance of 150 mm is required.
- Check that the pipe ends to be jointed are cut square to the axis of the pipe and any burrs removed.
- Wipe pipe ends clean lint free material to remove traces of dirt or mud
- Mark the area over which the oxidized pipe surface is to be removed i.e. by placing the socket of the bagged fitting along side the pipe end. Trace a line round the circumference at the appropriate distance from the end of the pipe using a felt tip pen or similar.

Note that the fitting should not to be removed from the packaging at this stage.

- Connect the electro fusion control box input leads to the generator
- Check that the reset stop button, if fitted on the control box is in the correct mode.
- Check that reset stop button if fitted on the control box is in the correct mode
- Using the pipe end preparation tool, remove the entire surface of the pipe uniformly, preferably in continuous swarf over the area identified. i.e. in excess of insertion depth.
- A mechanical scraper could be used however there is a considerable risk that the end preparation will not be adequate with the use of such a tool.

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

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

Note that while Iso-propanol is a suitable cleaner, its use is subject to local health and safety regulation.

Check that the pipe clamps are of the correct size for the pipes to be jointed.

Insert the pipe ends into the fitting so that they are in contact with centre stop.

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

Connect the control box and check that they have been fully inserted.

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

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

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

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

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

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

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

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

2.4 Electro-Fusion Saddle Jointing

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

The effectiveness of this technique depends on attention to the preparation of the jointing surfaces, in particular the removal of the oxidized surface of the pipe over the socket depth and ensuring the jointing surface are clean.

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

2.5 Electro-Fusion Saddle Jointing Method /Procedure.

Preparation

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

Clean the pipe over the general area on which the saddle is to be assembled using clean, disposable lint free material

Without removing the fitting from its packaging, place over the required position on the main. Mark the pipe surface all around and clear of the saddle base area using a felt tip pen or similar.

Remove the surface of the pipe to a depth of 0.2 to 0.4mm over the full area marked using a suitable tool, remove the swarf.

Connect the electro fusion control box input leads to the generator

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

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

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

Note that while Iso-propanol is a suitable cleaner, its use is subject to local health and safety regulation.

Position the fitting base onto the prepared pipe surface, and bring the lower saddle into position then gradually and evenly tighten the nuts until the upper saddle makes firm contact with scrapped pipe.

Check that there is sufficient fuel for the generator to complete the joint.

Start the generator and check that it is functioning correctly

Switch on the control box if applicable

Connect the control box output leads to the fitting terminals and check that have they have been fully inserted.

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

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

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

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

On completion of the heating cycle , the melt indicators where incorporated should have risen . If there is no apparent move in the melt indicators a new saddle joint should be made. Cut the tee of the faulty joints from its base.

If a satisfactory joint has been made , the joint is to be left in the clamps for the cooling time specified on the fitting label or any the automatic control box

Note 3 : If the fusion cycle terminates before completion of the countdown , check for faults as indicated by the control box warning lights and check that there is adequate fuel in the

The connection of the service pipe to the fitting outlet should be carried out in accordance with the procedure of the appropriate section of this item.

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

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

2.6 STOPPING THE GAS FLOW

In the operation of a distribution system there is a periodic need to stop the gas flow for either routine or emergency maintenance. The flow may be stopped through the use of installed fitting such as valves. Where installed fittings are not available or the use of such would cause significant supply disruption, then one of the following methods may be employed.

2.7 SQUEEZE - OFF

- a. To control the gas flow a special tool may be used to squeeze the pipe walls together. Hydraulic jacks are used to supply the necessary force to compress the pipe walls for sizes 90 mm and above.

- b. As will be seen the squeeze-off equipment comprises two bars to apply pressure to outside of the pipe. The bars are brought together either manually or hydraulically, squeezing the pipe material together until a seal is formed where the upper and lower walls meet.
- c. The hydraulic machines should have a spring return for the jack and locking to prevent accidental release of pressure during operation. All squeeze – off machines should be fitted with check plate or stops to avoid over compression of the pipe.
- d. Where the pipe walls are compressed the polyethylene pipe will be severely deformed in the regions of maximum compression. The pipe will eventually regain its original shape after squeezing but there will be reduction in some pressure bearing properties.
- e. A complete stop may not always be obtainable because of wrinkling of the inside of the pipe. If a complete stop is required than a second squeeze can be used, with an intermediate vent to remove the gas which passes the first squeeze from say the trench of three pipe diameters area. A second squeeze – off procedure should be a minimum of three pipe diameters and right angles to the squeeze.
- f. While not essential it would be good practice to fit a reinforcing stainless steel band / do not squeeze again adhesive tape around the pipe upon the completion of squeezing operation.

2.8 BENDING – BACK

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

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

3.0 SYMBOLS & DEFINITIONS

3.1 Symbols for Electro fusion Fittings

3.1.1 Symbols for Electro fusion Socket Fittings

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

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

D2 is the minimum bore comprising the minimum diameter of the flow channel through the body of the fitting.

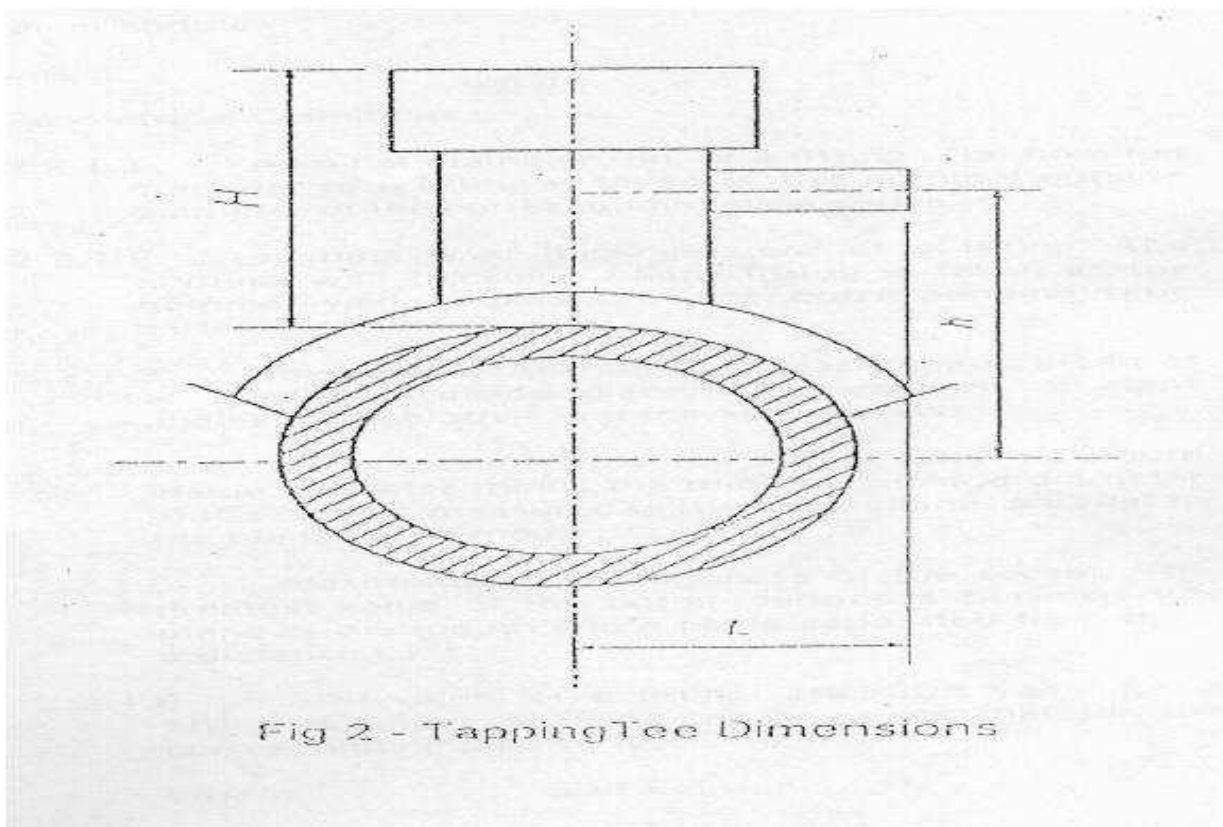
L1 is the depth of penetration of the pipe or of the male end of a spigot fitting.

L2 is the nominal length of the fusion zone corresponding to the heated length.

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

3.1.2. Symbols for Electrofusion Tapping Tees

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



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

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

3.2 Definitions

3.2.1. Geometrical Definitions

3.2.1.1 Nominal diameter, dn, of a fitting:

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

3.2.1.2 Nominal wall thickness, en, of a fitting:

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

3.2.1.3 Mean inside diameter:

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

3.2.1.4 Out of roundness of the Socket:

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

3.2.1.5 Maximum out of roundness of the socket:

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

3.2.1.6 SDR value for a fitting:

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

Where, $SDR = dn/en$

3.2.1.7 Wall thickness, E of a fitting:

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

3.2.2 Material Definition

3.2.2.1 Virgin Material :

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

3.2.2.2 Own Reprocessable Material :

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

3.2.2.3 Compound:

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

3.2.3 Definition related to Material Characteristics

3.2.3.1 Lower Confidence Limit (LCL):

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

3.2.3.2 Overall Service (Design) Coefficient (C):

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

3.2.3.3 Minimum Required Strength (MRS):

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

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

3.2.3.4 Melt Mass Flow Rate (MFR):

A value relating to the viscosity of the molten material at a specified temperature and rate of shear.

3.2.4 Definitions Related to Service Conditions

3.2.4.1 Gaseous Fuel:

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

3.2.4.2 Maximum Operating Pressure (MOP)

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

20 * MRS

Note : It is given by the equation : $MOP = \text{-----}$

-- $C*(SDR-1)$

3.2.5 Definition on Design of Electro fusion Fittings:

3.2.5.1 Electrofusion Socket Fitting:

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

3.2.5.2 Electrofusion Saddle Fitting:

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

3.2.5.3 Tapping Tee:

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

3.2.5.4 Branch Saddle:

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

3.2.5.5 U Regulation :

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

3.2.5.6 I Regulation:

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

4. DESIGNATION

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

4.2 Grade of Material:

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

Table-1

Material	<i>M.R.S. Mpa</i>	1 cl (20° C, 50 Yrs 97.5%) Mpa	Maximum Allowable Operating Pressure
PE 80	8.0	8.00 □ 1 cl □ 9.99	5.5 Bar
PE 100	10.0	10.00 □ 1 cl □ 11.19	7.0 Bar

PE 100 grade shall be utilized in the project

4.3 Nominal Diameter

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

4.4 Material

4.4.1 Polyethylene Compound:

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

Table-2 : Characteristics of PE Compound

Characteristics	Units	Requirements	Test Parameters	Test Method
Conventional Density	Kg/m ³	□ 930 (base polymer)	23 °C	ISO 1183 - ISO 1872/1
Melt Mass-flow Rate	g/10 min	± 20% of value nominated by compound producer	190 °C condition 18	ISO 1133
Thermal Stability	Minutes	> 20	200 °C (2)	ISO TR 10837
Volatile Content at Extrusion	mg/kg	□ 350		ISO 4437 Annex. A
Water Content (3)	mg/kg	□ 300		ASTM D 4019
Carbon Black Content	% (m/m)	2,0 □ □ 2,5		ISO 6964
Carbon Black Dispersion (4)	Grade	□ 3		ISO DIS 11420
Pigment Dispersion (5)	Grade	□ 3		ISO DIS 13949
Resistance to Gas Constituents	h	□ 20	80 °C 2 Mpa	ISO 4437 Annex. B
Resistance to rapid crack propagation (RCP) (6)	Mpa	The critical pressure in the FS test shall be greater than or equal to the value of the MOP of the system multiplied by 1:5	0°C	ISO DIS 13478
Full Scale (FS) test : d □ 250mm				
Or S4 Test : in principle according to all diameters (7)	Mpa	The critical pressure in the S4 test shall be equal to or greater than the value of the MOP of the system divided by 2,4 (8)	0°C	ISO DIS 13477
Resistance to slow crack growth en> 5mm	h	165	80 °C, 8,0 bar (f) (9) 80 °C, 9,2 bar (f) (10)	ISO DIS 13479

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

5.0 DESIGN

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

5.1 Electro-fusion Socket Fittings

Electro-fusion Socket Fittings shall incorporate a method of controlling pipe penetration within each socket. The inner cold zone of each socket shall not be less than $(0.1 d + 5)$ mm for sizes upto 125 mm & $0.1 d$ for sizes greater than 125 mm.

5.2 Tapping Tees

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

5.3 Transition Pieces

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

5.3.1 MDPE Pipe:

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

5.3.2 Jointing between Steel and MDPE Pipes:

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

6.0 ELECTRICAL CHARACTERISTICS

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

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

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

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

The heating element wire shall not be disturbed during assembly.

7.0 DIMENSIONS

7.1 Measuring Temperature

Fittings shall not be measured within 24 hrs. of manufacturer to allow for normalization. The fittings shall be measured at an ambient temperature of 23 + or - 2°C, after a conditioning period of 5 Hrs.

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

7.2 Dimensional Stability

7.2.1 Couplers (Including all forms of socket fittings)

All coupler dimensions shall conform to their specified value when the fitting has been stored for a period of 12 months at a temperature of 30 + or- 2°C.

7.2.2 Tapping Tees and Branch Saddles:

All tapping tee and branch saddle dimensions shall conform to their specified agreed values when the fitting has been stored for a period of 12 month at a temperature of 30 + or - 2°C.

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

TABLE 3 : SOCKET DIMENSIONS

160	162.1	161.4	42	98
180	182.1	181.5	46	105

Notes:

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

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

TABLE 4: OVERALL LENGTH OF REDUCERS: Not Applicable

TABLE 5: BRANCH SADDLE ASSEMBLY OUTLET LENGTH

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

* Flange size DN 50

** Flange size DN 100

*** Flange size DN 150

+ Flange size DN 250

++ Flange size DN 250

8 PERFORMANCE REQUIREMENTS

8.1 Mechanical Characteristics

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

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

TABLE 6: MECHANICAL PROPERTIES

Characteristics	Units	Requirements	Test	Parameters	Test Method
Hydrostatic strength at 20°C	H	Failure time □ 100	End caps orientation Conditioning time. Type of test circumferential (hoop) stress pipe PE 80, PE 100, Test Temperature.	Type a) free 1 h 9 Mpa, 12.4 Mpa, 20°C	ISO DIS 9356
Hydrostatic strength at 80°C	H	Failure time □ 165	End caps orientation Conditioning time. Type of test circumferential (hoop) stress pipe PE 80, PE 100, Test Temperature.	Type a) free 12 h water-in- water 4.6 Mpa 5.5 Mpa 80°C	ISO DIS 9356
Hydrostatic strength at 80°C	H	Failure time □ 1000	End caps orientation Conditioning time. Type of test circumferential (hoop) stress pipe PE 80, PE 100, Test Temperature.	Type a) free 12 h water-in- water 4 Mpa, 5 Mpa, 80°C	ISO DIS 9356
Cohesive resistance	mm	Length of initiation of brittle fracture L/3	Test temperature choice of method	23°C	ISO 13954 (A) ISO 13955 (A) ISO 13956

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

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

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

TABLE 7

Hydrostatic strength (80°C) – Stress/

Minimum Failure Time Correlation

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

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

8.2 Physical Characteristics

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

200 °C, in case of dispute the reference temperature shall be 200 °C.

TABLE 8 : Physical Characteristics of Fittings

1) Test may be carried out at 210 °C providing that there is a clear correlation to the results at

8.3 Technical File

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

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

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

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

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

9. MARKING

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

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

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

10. PACKING

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



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OF II

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

Note:

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

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

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

All the fittings shall be used for the network operating at 4.0 - 6.0 Bar(g) Pressure.

Item	PE Ball Valve
Application	Natural Gas Distribution Services
Code	ASME B16.40/EN1555-4
Rating	PE 100 SDR 11
Operating Pressure	4-6 bar (g)
Operating Temp.	0°C to 60°C
End Connection	PE Material (Spigot Type)
Stem Extension	Not Required
Valve Design	Full Bore
Ball Position Indicator	Open/Close Limits required

SECTION 10 SCHEDULE OF RATES (SOR)

PART-A (SOR)

S.No.	Item Description	Units	Size	Qty	Unit Rate(including all taxes & duties excluding GST) in Rs.	Total Amounts on FOT Site basis incl. Freight, Transit Insurance excl. GST) in Rs.
A. MDPE FITTINGS & VALVES						
1	Coupler	Nos	20 mm	30		
2	Coupler	Nos	32mm	50		
3	Coupler	Nos	63mm	30		
4	Coupler	Nos	125mm	30		
5	Coupler	Nos	90 mm	20		
6	End Cap	Nos	20mm	20		
7	End Cap	Nos	32mm	30		
8	End Cap	Nos	63mm	10		
9	End Cap	Nos	125mm	10		
10	Transition Fitting	Nos	32x3/4"	5		
11	Transition Fitting	Nos	32x1"	5		
12	Transition Fitting	Nos	20x1/2"	5		
13	PE Ball Valve	Nos	32mm	6		
14	PE Ball Valve	Nos	63mm	4		
15	PE Ball Valve	Nos	125mm	4		
Sub-total (Rs):(i)						
GST 18 %:(ii)						
Total Amount of Fittings incl. GST and all taxes & duties (Rs)=(i)+(ii)						

PART-B (SOR)

B. PNG MAINTAINANCE TOOLS						
S.No	Item Description	Units	Size	Qty	Unit Rate(including all taxes & duties excluding GST) in Rs.	Total Amounts on FOT Site basis incl. Freight, Transit Insurance excl. GST) in Rs.
1. Multi Alignment Clamp						
a	Multi Alignment Clamp	Nos	20-32mm	2		
b	Multi Alignment Clamp Variable	Nos	16-63mm	2		
c	Multi Alignment Clamp with Re rounding	Nos	63-125 & 63-125mm	1		
d	Squeeze Clamps Manual	Nos	20-63 mm	4		
2. Pipe Cutters						
a	Ratchet Cutters	Nos	-	3		
b	Rotary Cutters	Nos	-	2		
c	Eclipse Saw	Nos	-	2		
3	Hand Scrapers	Nos	-	2		
4	Hydraulic Squeezer / Squeez - off tool (63-180mm Pipe)	Nos	63-180 MM	2		
Sub-total (Rs):(i)						
GST 18 %:(ii)						
Total Amount of Fittings incl. GST and all taxes & duties (Rs)=(i)+(ii)						

Note: Evaluation shall be done separately for PART A & B on least cost basis.