AC Interference Mitigation
Model BEC, Scope, Specifications & SOR

Guidance Document

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Cover Note and Guidelines

(a) In order to have the uniformity in procedures for implementation of AC Interference mitigation measures across GAIL pipeline networks, model BEC, Scope, Specifications, Special Conditions and SOR has been formulated and given in this document. This can be used for implementation of AC Interference mitigation measures by all the pipeline networks wherever required.

(b) Indenting department at site shall fill/modify in the italicized part of the texts applicable for the specific tender. Further as per clause no. 2.4.7 of C&P procedure, the indenting department with due reasoning may suitably formulate the BEC depending upon the job requirements and the same may not be treated as deviation to the C&P procedure. In case any changes in this standardized BEC is required, the same may be done and informed to CO O&M. Certification / authentication requirements of documents supporting technical BEC shall be incorporated as per C&P procedure and latest circulars issued by CO C&P in consultation with the concerned C&P department while finalizing the BEC for a Tender. Approval of entire BEC including financial part for specific tender shall be in accordance with the C&P Procedure and Delegation of Powers in each case.

(c) While finalizing the special conditions of contract, essential requirements as per latest amendments of C&P procedures/circulars issued from time to time shall be considered for their inclusion / modification as required. Other tender requirements such as ITB etc. shall be as per C&P procedures.

(d) To complete the job in time bound manner, it is preferable to engage more than one contractor where the concerned network is having larger length of network by making groups of pipelines so that job can be carried out simultaneously by different contractors & at faster pace. In such cases, tender conditions can be suitably modified and list of pipelines can be grouped in Group-A, B, C etc.

(e) In case site intends to engage separate contractor group-wise, provision of evaluation should be incorporated in the ITB such that it is on least cost basis e.g. entire work shall be finalized on least cost to owner. A suitable evaluation and award methodology shall be specified in the ITB.

(f) SCC provisions in this document are for reference only and can be modified by the respective indenting department wherever necessary.

(g) Provision for performing ECDA & SCCDA job has been included in this model document and site may retain or delete the same as per requirement.

(h) Commercial part BEC and SCC of this document shall be reviewed for each cases of tender and shall be in line with the standard ITB and other requirements advised by Corporate C&P from time to time.
1.0 Introduction
GAIL (India) Limited is a Central Public Sector Undertaking (PSU) under the Ministry of Petroleum & Natural Gas (MoPNG), Government of India. GAIL operates a network of Natural Gas pipelines of more than 12500 Kms & LPG pipeline network of more than 2000 Kms.

2.0 Objective
(a) In view of AC Interference on the GAIL’s buried Pipelines due to High Voltage AC power transmission lines, electrified railway traction, GAIL (India) Limited intends to implement the AC Interference Mitigation measures based on the finding of the AC Interference Study, so as to bring the impacts of AC Interference within acceptable levels on the Pipelines and reduce the possibility of Electrical Hazard/AC Corrosion after implementing mitigation measures. GAIL intends to hire the services of reputed Cathodic Protection contractor(s) [hereinafter referred as ‘contractor’ throughout this document] for mitigation of AC interference on pipelines without any interruption of pipeline normal operations.

(b) The proposed list of pipelines covered under this contract is given at Appendix-I.

3.0 Technical Part of Bid Evaluation Criteria (BEC)
The standardized Bid Evaluation Criteria (BEC) for meeting the Technical experience is given under:

(a) A bidder can submit the bid on the basis of:
(1) its own technical experience [OR]
(2) technical experience of FOREIGN BASED ANOTHER COMPANY (SUPPORTING COMPANY) which holds more than fifty percent of paid up share capital of the bidder company or vice versa.

[In such case, all other requirements to be incorporated by the site as per amendment no. 37 of C&P procedure dated 31.07.2019 or any subsequent amendments in this regard and C&P procedure]

3.1 Technical Part of BEC
(All work in single group and evaluated accordingly)

(a) The Bidder should have successfully executed / completed the job of AC Interference Mitigation / Cathodic Protection System Installation / Cathodic Protection System Monitoring & Maintenance works for Hydrocarbon pipeline for a minimum length of [50% of the estimated quantity however where contract period is more than one year, 50% of single order quantity is to be considered on annualized basis] Km in single work order [OR] value of Rs. [50% of the cost of the estimated value, however where contract period is more than one year, 50% of single order value is to be considered on annualized basis including taxes and duties] in a single work order during preceding seven years (07) reckoned from bid due date.

3.2 Technical Part of BEC
(Work is intended under groups say Group-A, B.... etc. and evaluated accordingly)

(a) For Group-A
The Bidder should have successfully executed AC Interference Mitigation/ Cathodic Protection System Installation / Cathodic Protection System Monitoring & Maintenance for Hydrocarbon pipeline for a minimum length of [50% of the estimated quantity in group-A however where contract period is more than one year, 50% of single order quantity is to be considered on annualized basis] Km in single work order [OR] value of Rs. [50% of the cost of the estimated value of group-A, however where contract period is more than one year, 50% of single order value is to be considered on annualized basis including taxes and duties] in a single work order during preceding seven years (07) reckoned from bid due date.

(b) For Group-B or C or...
[same as above, group-A to be replaced by B or C etc. as the case may be]
(c) In case Bidder quotes for more than one group then the minimum qualifying requirement of quantity/values shall be the cumulative of each group requirement for which Bidder has quoted.

3.3 Documents required:
(a) Copy of Contract(s) / Work order(s) /agreement(s) with copy of relevant pages of the scope of work / service establishing documentary evidence of work executed along with clear establishment of the type of CP surveys performed & Length of pipeline/ order value in the last seven (07) years.

(b) Copy of completion certificate(s) / proof of completion of the said work(s) along with documentation establishing completion of work by the bidder with reference to work order(s) / contract(s) / agreement(s). The Completion Certificate submitted in support of successful execution should preferably indicate the following:

(1) Full Name & Address of Client and officer issuing certificate (issued by end user / owner (or their consultant who has been duly authorized by them to issue such certificate
(2) Reference to relevant work order
(3) Executed Value or quantity & Date of actual completion
(4) A certificate from the client stating that the work has been completed satisfactorily

(c) In case, the bidder is currently executing a contract of such nature as mentioned above in Oil & Gas Pipelines and the executed value of such contracts till one day prior to the due date of submission of bids is equal to or more than the minimum requirement as mentioned above such experience will also be taken into consideration provided that the bidder has submitted satisfactory work execution certificate to this effect issued by the end user / owner or their authorized consultant.

3.4 Authentication of documents to be submitted in support of BEC

[ to be incorporated as per model ITB and latest C&P procedures]

3.5 Evaluation Methodology

[Site to suitability incorporate based on site requirements considering available vendor base/ quantum of job/ entire job by one contractor or multiple contractors in groups]
4.0 Scope of Work

4.1 General Details of Scope of Work
(a) Contractor shall carry out the AC interference mitigation job for pipelines as given at Appendix-I.

(b) The mitigation job shall be executed as per the minimum requirements as mentioned in this document and shall also include the additional actions as per National/International codes & standards for the better results. Contractor shall also include additional requirements based on the site specific requirements and conditions.

(c) Contractor shall carry out necessary liaison with the land owners / farmers / authorities / others for smooth execution and completion of job at site and obtain the necessary consent as required. Rate quoted in SOR shall be inclusive of all costs including liaison cost as applicable with land owners / farmers / authorities / others. Other than SOR Item Rate, GAIL shall not pay any additional amount related to this job.

(d) The Clearance of pipeline ROW from grass, bushes etc. to facilitate movement of personals to carry out the job is the responsibility of the Contractor without extra cost to GAIL. The contractor shall make his own arrangement for transportation of labour, material; machinery etc. at the actual work place without any extra cost to GAIL which is included on overall contract and tendered shall make a note of it before quoting their rates in the tender.

(e) All the materials, equipments, instruments, manpower (skilled/unskilled), consumables like backfill material, water, tool-tackles, required to carry out the jobs are in the scope of contractor including their mobilization & demobilization, lodging, boarding, fooding etc. In case Contractor fails to deploy the above within stipulated time as well as in quantity as required in this contract, penalty shall be imposed as per Special conditions of Contract (SCC).

(f) Supply and Installation of new CP test station with terminal Plate as per Specification and drawing to accommodate the Polarisation Cell at the locations wherever there are no Test station facilities available. [Tentative requirement shall be provided in the tender]

(g) Supply and Installation of test station boxes of higher sizes as per requirement with Terminal Plate, wherever there is existing normal size test station facilities are available and required to be installed with Solid State Polarization Cell (SSPC). This includes removing of the old test station from foundation, fixing of the new higher size of the test station on the existing foundation re-termination of the cable, fixing of revised connection diagram etc.; to complete the work in all respect as per speciation, drawing and instruction of EIC.

(h) Supply and Laying of Zinc ribbon anodes of size & required length as per SOR item with 25 Sq. mm single core multi strand armoured cable as per specification and backfill materials at various locations.

(i) Supply and Installation of prepackaged Zinc grounding anodes as per specifications with anode tail copper cable of size 25 sq. mm single core multi strand armoured cable as per specification and backfill materials at all required locations.

(j) Supply and installation of Solid State Polarization cell inside the test station, with other consumables like, connecting cable, lugging, termination etc. to complete the work in all respect as speciation, drawing and instruction of EIC.

(k) Making pipe to cable connection: This including excavation and backfilling, surface preparation, pipe to cable connection. All the cable to pipe connections to the new / uncharged pipeline shall be made using an approved exothermic process and for charged pipeline stud type pin brazing shall be used. Eutectic solder shall not be acceptable for any pipeline. A suitable water proof sealing system of the cable connections shall be made which will be compatible with parent coating system of the pipeline after exothermic process. The resistance of cable to pipe at the connection point shall not exceed 0.1 Ω. Coating shall be repaired after connection of cable conductor to pipeline. The coating
repair material shall be compatible with the original coating and shall prevent ingress of water along the cable surface and at the interface of coating repair with the original pipe coating.

(l) Supply and Laying of cables cutting in to right sizes, laying and end termination, of different sizes of XLPE annealed high conductivity stranded armoured Copper conductor of 650/1100 V grade and backfilling.

(m) Applying permission, follow-up, getting permission from the statutory authorities / Land owners / farmers / others as applicable before execution of the work. Compliance with all stipulations / conditions / recommendations of the said authorities / Land owners / Farmers as per the requirement.

(n) The contractor is solely responsible for rectification and repair of any damages resulting out of the contract execution. Damages to water pipeline, irrigation line and any other utilities like power cable, OFC cable etc., if any and fencing shall be restored / repaired after completion of job and no additional payment other than SOR rate shall be paid by GAIL. The SOR rate quoted shall be inclusive of all these cost as applicable.

(o) Obtaining NOC from various statutory authorities / land owners / Farmers after restoration of work site of relevant jurisdiction / concerned.

(p) Providing of portable reference cell/ Multi meter / Earth resistance meter for taking readings of PSP, AC PSP, Earth resistance etc. are in the scope of the contractor.

(q) All the measuring instruments should have the valid calibration certificate traceable to NABL/International standards/equivalent reputed accreditation agency or from OEM & same needs to be submitted before the start of the job.

(r) The details of CP system & other ROU details of the referred pipelines are as below (information at appendix-II, III, V, VII shall be provided on award of the job and other along with the tender):

(1) List of Pipelines – refer Appendix-I
(2) List of TRU/CPPSM units - refer Appendix-II
(3) List of Test Stations (TLPs) - refer Appendix –III
(4) List of Foreign Pipeline Crossings, Pipelines in common ROU & Bonding locations with their Chainages- refer Appendix -IV
(5) List of HT Crossings/Parallellism with their Chainages- refer Appendix -V
(6) List of River & Water Crossings-refer Appendix -VI
(7) Drawings of Test stations, Anodes, connection to Polarisation cells – Refer Appendix VII

(s) Validation surveys for AC mitigation job shall be performed if required at identified locations after rectification of the problem as decided by EIC. If validation surveys still show some abnormality then no payment shall be made for the validating surveys performed. Also contractor has to perform the re-validation survey after implementation of mitigation if any.

4.2 Contractor’s Organization for this Work & Competencies

(t) Contractor shall deploy adequate and competent personnel to execute, supervise and manage the various activities in the scope of this contract and augment the same as and when required and asked by the Engineer-in-Charge (EIC)/ Site-in-Charge (SIC) depending upon the job requirement and exigencies so as to complete all the works within the contract time schedule. Contractor shall submit an organization chart within 15 days of FOA / LOA indicating therein the personnel who shall be deployed for this contract for carrying out site activities along with the CVs of the key personnel.

(u) Contractor shall designate an experienced Project Manager who shall observe & manage the entire operations and who shall be the nodal contact for GAIL EIC to interact and coordinate.

(v) The key personnel shall meet the following minimum qualifications:
(1) **Filed Activity Technician:** ITI with minimum 3 years of experience in the field of CP implementation jobs such as pin brazing, installation of TLP/ wiring, cable to pipe connection making using the suitable equipments. In case of Diploma holders, minimum experience criteria shall be 2 years in the CP field along with other requirements as mentioned herewith.

(2) **Team leader/Site Supervisor during field activities:** Graduate Engineer with minimum 3 years of experience in the Cathodic Protection Jobs and NACE CP Level II / EN 15257 Level-1/Level-2 of ISO 15257 certification.

(w) In general, one team for field activity shall consist of minimum 1 (one) no. of field activity technician, Team leader/supervisor with required no. of labor/helper including for masonry/civil works. There will be one Team leader/Site Supervisor irrespective of no. of teams deployed. Requirements of qualifications will be minimum as mentioned above.

(x) List of personnel in requirement with the above for carrying out the AC mitigation job shall be submitted to GAIL along with their resume before the start of the job.

### 4.3 Project Scheduling & Monitoring

(a) Contractor shall submit within two (02) weeks of Notification of Award [Fax of Intent (FOI) or LOA], a detailed overall project schedule in the activity network form, clearly indicating the major milestones, inter relationship / interdependence between various activities together with analysis of critical path and floats. This shall be reviewed and approved by EIC and comments if any shall be incorporated before issuing the same for implementation. This activity schedule thus finalized shall form part of the contract document and the same shall not be revised without the prior permission from EIC/SIC during the entire period of execution of contract.

(b) Contractor shall submit within two (02) weeks of award of work, the methodology of progress measurement and the basis of computation of overall services / physical progress. GAIL reserves the right to modify the methodology in part or full.

(c) Contractor shall present the programme and status at various review meetings as required after start of actual work. Project review meetings shall be held at a frequency and venue to be intimated to contractor by GAIL EIC.

### 4.4 Scope of Work

#### 4.4.1 Supply and Installation of bigger size CP test station with terminal board:

Supply, installation, testing and commissioning of big size CP test station with terminal board, size of test station shall be sufficient to accommodate the polarization cell as per the drawing in the ANNEXURE – B. The job includes:

(a) Test stations shall be provided as per requirement along the pipeline ROU for monitoring the performance of the cathodic protection system as per the recommended location and as directed by the EIC or his representative. Orientation of test station box should be such that its door faces the pipeline.

(b) Carrying out necessary liaison with the land owners/farmers/authorities/others for smooth execution and completion of job at site and obtaining the necessary consent as required. Rate quoted in SOR shall be inclusive of all costs including liaison cost as applicable with land owners/farmers/authorities/others. Other than SOR Item Rate, GAIL shall not pay any additional amount related to this job

(c) Excavation of pit for installation of new test station, casting of foundation of 50MM PCC base and 600mm (L) ×600mm (W) ×800mm (H) dimensions of PCC foundation at site location. Concrete mix shall be of M20 grade.

(d) The outside / inner surface of test station shall be painted with Two coats of zinc red epoxy primer type CF 686 Asian paints or equivalent make and Two coats of battle ship grey colored epoxy paint type dark A grade CF 691 of Asian paints or equivalent. Total paint thickness including primer shall be 150-200 microns.
(e) A nameplate of anodized aluminium with black back ground and white letters shall be fixed to the inner side of the test station. The name plate shall be fixed to the inner side of shutter. The nameplate of each test station shall carry the following information:

1. Test station no.
2. Chainage in KM.
3. Test Station connection scheme type d) Distance from pipe in Meters
4. Direction of product flow.

The test station number shall be written with black paint on the back and pipe in a uniform manner.

(f) The cables also shall be drawn in the MTS for termination on terminal plate. Copper, tinned lugs only shall be used for termination of cables. Ferrules of proper size shall be put for identification of cables. The cable entry to the test station shall be sealed at the bottom inside the bend with putty/cable sealing compound. The remaining excavated pit shall be backfilled after installation of MTS, laying of cables etc. All cables coming to test station shall be labelled on both ends with identification numbers/ and as per connection scheme. Lugs for cable connections to the test station shall be crimped on the cable conductor.

(g) Terminal plate shall be Phonetic laminated sheet not less than 5 mm thick with SS, Nuts, Bolt & washers of Min 8MM. The number of terminals used shall be same for all test stations. The terminals used for each test station shall depend upon the requirements of the connection at the particular location.

(h) Test between terminals and body at 2 KV for one minute.

(i) The contractor shall keep ready all the Test Stations before supply for Pre delivery factory inspection by EIC or his rep.

(j) Test Stations shall be randomly checked for conformance to IP55 protection grade either at the Testing facility available at the Contractor’s premises in the presence of GAIL’s representative or at the approved Third Party Test Laboratory. The contractor had to submit the IP55 test certificate from a reputed test laboratory.

(k) Specification of Test Station is as below:

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<tr>
<th>SN</th>
<th>Item Description</th>
<th>Specifications</th>
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<tbody>
<tr>
<td>1.1</td>
<td>Type</td>
<td>Three Part / Piece</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1) Termination Box</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Support Post with Bottom Foundation plate</td>
</tr>
<tr>
<td>1.2</td>
<td>Degree of Protection</td>
<td>Weatherproof, IP55 Certificate from approved test lab shall be submitted</td>
</tr>
<tr>
<td>1.3</td>
<td>Material</td>
<td>1) Termination Box: Min 3mm thick MS Sheet (Cold Rolled)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Support Post: Min 100mm DIA MS Pipe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3) Foundation Plate: Min. 6mm thick</td>
</tr>
<tr>
<td>1.4</td>
<td>Termination Box Locks</td>
<td>Siemens type concealed lock + Allen key</td>
</tr>
<tr>
<td>1.5</td>
<td>Terminal Plate</td>
<td>Min 8mm thick Laminated Sheet Terminal Plate with holes drilled as per requirement. 20% spare terminals shall be provided (Min 2 Nos). Copper bus bars, interconnection copper link shall be tinned or nickel/silver coated.</td>
</tr>
<tr>
<td>1.6</td>
<td>Gasket for Shutter</td>
<td>Neoprene rubber gasket with 10% Neoprene and balance rubber</td>
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| 1.7| Enclosure Size (Suitable to accommodate the Polarisation Cell) | Width – 425mm (Min.)
|    |                                               | Height – 420mm (Min.)                                                        |
|    |                                               | Depth – 300mm (Min.)                                                         |
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### 1.8 Nut & Bolts

- All Nut & Bolts used for the Termination of the cable should be minimum 8 mm / OR 5/16” SS.
- Minimum two spare terminals shall be provided in each test station after connection of individual anodes through copper links. Copper bus bars, interconnection copper link shall be tinned or nickel/silver coated.

(l) The drawings and specifications for different type manual test stations are attached as a separate Annexure (Drawing) for reference.

#### 4.4.2 Supply & installation of pre-packed Zinc anodes with cable

(a) Supply, installation, testing and commissioning of prepacked Zinc anodes having net weight minimum 10Kgs & Length of 1.50 meter including supply of required length of 1Core X 25 SQMM Cu XLPE cables, excavation, backfilling, cable laying up to existing test station and cable termination in test station with cable identification ferrules, consumables, labors etc. Detailed technical specification, installations drawings and procedures shall be submitted by the contractor for approval. The contractor has to submit the inspection and test certificate of the manufacturer.

(b) Carrying out necessary liaison with the land owners/farmers/authorities/others for smooth execution and completion of job at site and obtaining the necessary consent as required. Rate quoted in SOR shall be inclusive of all costs including liaison cost as applicable with land owners/farmers/authorities/others. Other than SOR Item Rate, GAIL shall not pay any additional amount related to this job.

(c) A typical drawing of prepackaged Zinc anode is given as annexure-VI

(d) The anodes shall be pre packed with special backfill adequately so that the performance of the anode is not affected by the carbonates, bicarbonates, nitrates, etc., present in the soil.

(e) Excavation of trench of minimum 400MM width of 1.5 to 2 Meter depth / pipeline depth for each anode as per the site conditions

(f) The anode tail cable shall be 25 Sq.mm 1 core copper armoured XLPE cable. No joint in the anode tail cable is allowed.

(g) The cable shall be connected with anode through tinned copper bolt & nut / Copper Split Bolt Connector / Cold Silver Soldering with proper end terminal in the cable AND connection should be properly sealed with Araldite/ Dr Beck 2-part mix.

(h) Armour shall not have in contact with anode metal / anode to cable connector and it shall be taped and sealed properly at both ends.

(i) The Anode shall be laid in combinations of 2/3/4 Anodes in one location. The anodes shall be laid 3 mtr away the pipeline and anodes to anode inter distance shall be 3 mtrs Min.

(j) Anode with backfill material should be properly soaked in water before installation in trench.

(k) Back filling of the trench with soft soil after laying of anode and watering of the anode bed. Levelling and restoration of the of the trench

(l) Termination of cable ends inside the test station box as per the Polarization cell grounding connection scheme.

(m) Measurement of grounding resistance of each anode and combined (Grid) value after completion of laying and termination of tail cable shall be recorded. Anode voltages shall be recorded before (OCV) and after connecting (CCV) with polarization cell.
(n) Required labour, handling, transportation of materials, consumables like backfill material, water, tools and tackles etc. are in the scope of contractor without any additional cost to GAIL.

(o) The contractor shall provide necessary test certificates from manufacturer giving test, result, date of manufacture shall be furnished during delivery. Any delivery affected without prior approval of owner may be rejected and no payment shall be made against such material.

(p) The anode surface shall be free from cracks, which may reduce the performance of the anode. Any cracks which follow the longitudinal direction of elongated anodes shall not be acceptable.

(q) The composition of special back fill for anodes depending on the soil resistivity of the location to be installed should be as Gypsum powder: 50% & Bentonite Powder: 50% OR Gypsum powder: 75%, Bentonite Powder: 20% & Sodium Sulphate: 5%.

(r) The anode shall confirm to the requirements of ASTM 418 standard. The anode (other than ribbon anode) shall be packaged with special back fill. The metallurgical composition of anode, potential and consumption rate shall be as below. Anodes of Type I shall be used for seawater, brackish water or saline electrolyte application and anodes of Type II shall be used for fresh water, back fill and soil applications.

<table>
<thead>
<tr>
<th>Composition Element</th>
<th>Type I</th>
<th>Type II</th>
</tr>
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<tbody>
<tr>
<td>Aluminium</td>
<td>0.1% to 0.5%</td>
<td>0.005% max</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.025 – 0.07%</td>
<td>0.003% max</td>
</tr>
<tr>
<td>Copper</td>
<td>0.005% max.</td>
<td>0.002% max</td>
</tr>
<tr>
<td>Iron</td>
<td>0.005% max</td>
<td>0.0014% max</td>
</tr>
<tr>
<td>Lead</td>
<td>0.006% max.</td>
<td>0.003% max</td>
</tr>
<tr>
<td>Other</td>
<td>0.01% max</td>
<td></td>
</tr>
<tr>
<td>Zinc</td>
<td>Remainder</td>
<td>Remainder</td>
</tr>
</tbody>
</table>

(ii) Anode closed circuit potential

<table>
<thead>
<tr>
<th></th>
<th>Type I</th>
<th>Type II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anode closed circuit potential</td>
<td>1.1 volts</td>
<td>1.1 volts</td>
</tr>
</tbody>
</table>

(iii) Anode consumption rate

<table>
<thead>
<tr>
<th></th>
<th>Type I</th>
<th>Type II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anode consumption rate</td>
<td>11.24 kg/(A-yr.) max</td>
<td>11.24 kg/(A-yr.) max</td>
</tr>
</tbody>
</table>

(s) Obtaining NOC from various statutory authorities / land owners / Farmers after restoration of work site of relevant jurisdiction / concerned.

(t) Damages to water pipeline, irrigation line and any other utilities like power cable, OFC cable etc., if any and fencing shall be restored / repaired after completion of job and no additional payment other than SOR rate shall be paid by GAIL. The SOR rate quoted shall be inclusive of all these cost as applicable.

4.4.3 Supply and installation of Zinc ribbon anodes

(a) Supply and Laying given length Zinc Ribbon Anode as per SOR of cross section 25.4 mm x 31.75 mm, 3.57 Kg/meter (Minimum) weight grade with a core wire of 4.7mm Galvanised Steel, of required length as per SOR with 25 Sq. mm 1 core XLPE, armoured Copper cable of required length.

(b) Total length of Zinc Ribbon Anode of 25 Meter and higher length should be installed in a horizontal along the pipeline at the distance of Approx. 12 Meter from the pipeline.

(c) Supply, installation, testing and commissioning of Zinc Ribbon including excavation along the Pipeline, back filling cable laying up to existing test station and cable termination in test stations with cable identification ferrules, consumables, labour etc. Detailed technical specification, installations drawings and testing and commissioning procedures shall be submitted by the contractor for approval. The contractor has to submit the inspection and test certificate of the manufacturer.
(d) Carrying out necessary liaison with the land owners/farmers/authorities/others for smooth execution and completion of job at site and obtaining the necessary consent as required. Rate quoted in SOR shall be inclusive of all costs including liaison cost as applicable with land owners/farmers/authorities/others. Other than SOR Item Rate, GAIL shall not pay any additional amount related to this job.

(e) Excavation of trench of minimum 400 mm width of Approx. 2 mts depth of required length at each location. And in the bottom of trench one small trench of approx. 100 to 150 mm Square to lay the Zn Ribbon and fill the trench with backfilled material. A procedure is to be developed to centre the Zn Ribbon in the small trench so that backfill material will be covering all sides. The backfill material shall be made in the form of slurry before putting in to trench.

(f) Supply and spreading of adequate quantity of Back fill material at Min 50mm all around the anode.

(g) The anode tail cable shall be 25 Sq. mm 1 core copper armoured XLPE cable. The cable shall be connected with anode through tinned copper bolt & nut / Copper Split Bolt Connector / Cold Silver Soldering with proper end terminal in the cable and connection should be properly sealed with Araldite/ Dr Beck 2-part mix and holiday testing of sealing point. Armour shall not have in contact with anode metal / anode to cable connector and it shall be taped and sealed properly at both ends.

(h) Back filling of the trench with soft soil after laying of anode and backfill spread. Watering of the anode bed and Levelling and restoration of the field / ground in original condition.

(i) Termination of cables inside the test station box as per the Polarization cell grounding connection scheme.

(j) Measurement of grounding resistance after completion of laying and termination. Anode voltages, shall be measured and recorded before (OCV) and after connecting (CCV) with polarizations cell, also grounding AC & DC current should have recorded.

(k) Required labour, handling, transportation of materials, consumables like backfill material, water, tools and tackles etc. are in the scope of contractor without any additional cost to GAIL.

(l) The composition of special back fill for anodes depending on the soil resistivity of the location to be installed should be as Gypsum powder: 50% & Bentonite Powder: 50% OR Gypsum powder: 75%, Bentonite Powder: 20% & Sodium Sulphate: 5%.

(m) The anode shall conform to the requirements of ASTM B 418 standard. The metallurgical composition of anode, potential and consumption rate shall be same as Zinc Anode. The contractor shall provide necessary test certificates from manufacturer giving test, result, date of manufacture shall be furnished during delivery. Any delivery affected without prior approval of owner may be rejected and no payment shall be made against such Material.

(n) The anode surface shall be free from cracks, which may reduce the performance of the anode. Any cracks which follow the longitudinal direction of elongated anodes shall not be acceptable

(o) No joint in the anode tail cable is allowed.

(p) Obtaining NOC from various statutory authorities / land owners / Farmers after restoration of work site of relevant jurisdiction / concerned

(q) Damages to water pipeline, irrigation line and any other utilities like power cable, OFC cable etc., if any and fencing shall be restored / repaired after completion of job and no additional payment other than SOR rate shall be paid by GAIL. The SOR rate quoted shall be inclusive of all these cost as applicable.

4.4.4 Supply and installation of Copper anodes

(a) Specifications: Make: Matcor or equivalent
(b) Diameter not less than 38.1 mm (1.5”)

(c) Internal Copper conductor (multi stranded) size not less than AWG No. 2. No. of strands of copper conductor shall not be less than 19

(d) Internal Conductor encased with low resistance backfill with copper corrosion inhibitors. Further to be encased with a tough fabric (durable, non-degrading and porous), sleeve wrapped with braiding for greater strength.

(e) Resistance to earth for a 500 ft length cable should be 0.10 ohms in 10 ohm-mtr soil.

(f) Insulation on exit cable with a proper end seal for termination of the same in CP test box. If exit cable is not available, the same is to be connected / terminated with copper cable and payment of this cable shall be done by separate SOR. Standard procedure is to be used for jointing the insulated copper cable with this copper grounding cable.

(g) Bidder shall supply and lay the Copper cable, in meters as per requirement and instructions of Gail, as per above specifications.

(h) The following but not limited are in the scope of bidder for the execution of the SOR:

(i) Liaisoning with the land owner,

(j) Excavation of trench along the pipeline (typically 2 m away from the pipeline for sufficient width accommodating the copper cable) for each location,

(k) Laying of the copper anode cable, backfilling of trench, levelling and restoration of the area to previous condition. Obtaining NOC from various statutory authorities / land owners / farmers after restoration of work site of relevant jurisdiction / concerned.

(l) Termination of the 25 Sq. mm 1 core copper armoured HMWPE anode tail cable in the test station as per the Polarization cell grounding connection scheme. The cable shall be connected with cable through tinned copper bolt & nut with proper end terminal in the cable. Armour shall not have in contact with anode metal and it shall be taped and sealed properly at both ends. Sealing of the connection with Araldite/ Dr Beck 2-part mix and holiday testing of sealing point.

(m) Measurement of grounding resistance after completion of laying and termination. Anode voltages must be measured and recorded before connecting and after connecting with polarizations cell.

(n) Other jobs including supply of required labour, transportation materials, tools tackles, consumables required for installation of anode shall be in the scope of bidder.

4.4.5 Supply & Installation of Solid State Polarization Cells (SSPC)

(a) SSPC shall be a Solid State Device as specified in specification / data sheets, designed to simultaneously provide isolation for DC current and low resistance path for AC current. The device shall require minimum maintenance. The solid state device shall have weather proof enclosure and shall be suitable for mounting inside a test station with suitable clamps/ hardware.

(b) Carrying out necessary liaison with the land owners/farmers/authorities/others for smooth execution and completion of job at site and obtaining the necessary consent as required. Rate quoted in SOR shall be inclusive of all costs including liaison cost as applicable with land owners/farmers/authorities/others. Other than SOR Item Rate, GAIL shall not pay any additional amount related to this job

(c) Unless otherwise specified in specification / data sheet the DC blocking voltage shall not be less than 2.0 Volts. The DC leakage current at 2.0 volt shall not be more than 0.1 mA. The device shall be suitable for continuously conducting maximum AC steady state current and short time AC short circuit current expected to flow through the pipeline under the normal operating condition/any kind of fault on the EHV/HV line at respective sites, subject to minimum ratings as indicated below. The contractor shall provide necessary test certificates from manufacturer.
(d) Field tests shall be carried out and readings to be recorded in the presence of GAIL Engineer. Readings of DC PSP, AC PSP, shall be recorded before and after connection of Zinc anodes and AC&DC Current passing through Polarisation cell. Required labour, handling, transportation of materials, consumables like backfill material, water, tools and tackles etc. are in the scope of contractor without any additional cost to GAIL.

(e) Specifications:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum rated 50 Hz steady state current (RMS symmetrical)</td>
<td>30A min at 28 °C and min 2V DC</td>
</tr>
<tr>
<td>Steady State AC Current Rating</td>
<td>30 Amperes Nominal</td>
</tr>
<tr>
<td>DC Blocking</td>
<td>(-)2.0 Volts Negative to (+)2.0 Volts Positive</td>
</tr>
<tr>
<td>DC leakage current at 1.2 volt</td>
<td>&lt;0.1 A (max)</td>
</tr>
<tr>
<td>AC fault current</td>
<td>≥ 2.0 KA min for 25 Cycle (RMS symmetrical)</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>10 to 55 °C</td>
</tr>
<tr>
<td>AC voltage under maximum rated AC fault current</td>
<td>Less than 10 V peak to peak</td>
</tr>
</tbody>
</table>

4.4.6 Making pipe to cable connection

(a) Excavation and backfilling, coating removal, surface preparation, pipe to cable connection. All the cable to pipe connections to the new / uncharged pipeline shall be made using an approved exothermic process and for charged pipeline stud type pin brazing shall be used. Eutectic solder shall not be acceptable for charge pipeline. Care should be given while removal of coating and metal on the pipeline surface shall not be scratched /removed.

(b) A suitable water proof sealing system of the cable connections shall be made which will be compatible with parent coating system of the pipeline. The resistance of cable to pipe at the connection point shall not exceed 0.1 ohm. Coating shall be repaired after connection of cable conductor to pipeline. The coating repair material shall be compatible with the original coating and shall prevent ingress of water along the cable surface and at the interface of coating repair with the original pipe coating.

(c) The contractor shall be responsible for making all necessary arrangement to remove or pump out water from the trench or from wet area, if required; during excavation for pipe to cable connection without any extra cost/liability to the owner.

(d) Required labour, handling, transportation of materials, consumables like sealing / backfill material, water, tools and tackles etc. are in the scope of contractor without any additional cost to GAIL.

(e) The contractor is warned that while excavation job is carried out, the pipeline, which is carrying highly explosive natural gas, should not be damaged and chiseling, hammering, etc. are not allowed.

(f) The distance between two adjacent pipe cable connections shall be a minimum of 300 mm. Any damage to coating or pipe metal should be brought to the notice of engineer/supervisor/inspector so that requisite corrective actions may be taken.

(g) All cables are to be appropriately tagged. One set of drawing/documents should be kept by site supervisor at work place.

(h) A standard procedure for pin brazing is given below, however the contract has to submit a detailed procedure in line with the manufacturer’s pin brazing equipment.

4.4.6.1 Procedure for Pin Brazing Job (for reference only)
(a) Select the location for making cable to pipe connection away from the seam or circumferential weld of the pipe. Ensure that location is as specified and in case of change in location obtain necessary approval.

(b) Insure that the distance between two adjacent pipe cable connections shall be a minimum of 300 mm. Any damage to coating or pipe metal should be brought to the notice of engineer/supervisor/inspector so that requisite corrective actions may be taken.

(c) The Required PIN Brazing Kit comprising minimum the following equipment must be mobilized by the Contractor.

- Pin Brazing Machine Kit
- Stud Type Pin Brazing Tool Box
- Sealing compounds and M Seal
- Emery, cotton Cloth etc.
- Holiday Detector
- Multi Meter
- Portable Reference Electrode
- Thickness Gauge Meter

(d) Remove pipe coating of size approx. 2” X 2” to expose joint area on the pipe surface. Clean the exposed area to get a shining surface with emery paper. Take the thickness of the pipe. Compare the measured thickness with the original thickness. If it is less than 60% of original thickness, inform the EIC and select another location.

(e) Remove approximately 25 mm of insulation on the cable at one end, polish the copper conductor strands and crimp 15 to 20 mm long copper sleeve on wire strands. Place brazing gun with proper sized Stud on exposed area of pipe & carryout the pin brazing on Pipe. Check the Mechanical integrity of the brazing by the use of hammer (0.5 kg.) striking the weld firmly but gently as close to the steel pipe surface as possible in a direction parallel to the pipe surface.

(f) Connect the cable with Pin Brazing Stud & Check the continuity of the cable with pipe & OR between Two Cable. Check the Pipe to soil potential using Multimeter & Reference electrode. The readings shall be recorded on inspection / installation formats.

(g) Position a plastic funnel around the exposed area such that about 5mm wide coating remains inside the plastic funnel. Place M seal around outer side of the plastic funnel to prevent leakage of encapsulation compound. Seal the exposed area by pouring Epoxy and hardener mixture (10:1) by volume in the funnel so as to achieve electrical insulation and bonding. After drying and hardening check pipe coating using Holiday detector.

4.4.7 Supply and laying of cables

(a) Supply and laying of cables cutting in to right length, laying and end termination including proper lugging of different sizes of XLPE annealed high conductivity stranded armoured Copper conductor of 650/1100V grade cables.

(b) Different colour of the cables should be used for the pipeline & grounding anode.

(c) CP Cables shall be of Single core annealed high conductivity stranded copper conductor, 650/1100V grade XLPE conforming to IS1554 part I.

(d) The size of the copper conductor of the cables shall be as below:

- Size of 6 & 10 sq. mm for potential measurement from pipe to Test station,
- Size of 25 sq. mm for grounding & from pipe to Test station polarization cell

(e) Laying of underground cable including excavation of cable trench (300mm width, 1mtr depth) in all kinds of soil, cable laying, supply & laying of bricks, sand, soil backfilling. Outside the station/plant area the routes shall be marked with polyethylene cable warning mats placed at a depth of
0.9M from the finished grade. RCC or GI pipes of proper size shall be provided for all underground cables for road crossings OR if sufficient cover is not met. Cables shall be neatly arranged in trenches in such a manner that crisscrossing is avoided.

4.4.7.1 Procedure for Cathodic Protection Cable Laying (for reference only)
(a) The cables are to be laid in Soil at a required depth. The Cables will be identified, checked against the data sheet and inspected for mechanical damage.

(b) Identify and measure the actual length of cables. Cut the cable as required at site and check the continuity of cable. Cables are to be of sufficient length so as to reach the Pipe connection to TLP Box without any joint.

(c) Lay the cables in ROW at minimum depth of 1.0m/ Pipe connection to test station. Cable laid under road crossings will be through RCC Hume / GI pipes. In paved area on Identified location a narrow trench shall be cut in the paved way and trench shall be made and GI pipe shall be laid.

(d) The Installed cables should be terminated using lugs of proper size and crimped properly. Crimping shall be by means of properly designed tools only. The cables should pass through support pipes of TLP. All cables are to be appropriately tagged and cable identification mark is to be done properly.

(e) The inspection will be recorded on inspection / installation formats.

(f) One set of drawing / documents should be kept by site supervisor at work place

4.5 Documentation & Report
Complete Mitigation report including procedure, material inspection report, all mitigation inspection report, as built drawing, photographs shall be submitted in Hard copy (One set in original with one set of copy) and also Soft Copy. Final report shall include the following documents but not limited to the following:

(a) Approved procedures
(b) Material inspection report
(c) Mitigation Inspection report
(d) As built Drawing of all locations
(e) Photographs

4.6 Vendor List
If not mentioned in this list and vendor is in approved list of EIL & MECON, is acceptable.

4.6.1 Sacrificial Anodes (Other than Ribbon Anodes)
(1) M/s Platt Bros. and Company, USA
(2) M/s Yuxi, China
(3) M/s Titanor
(4) M/s Xian Metal China
(5) M/s Shunrui China
(6) M/s Sargam Metal

4.6.2 Ribbon Anodes
(1) M/s Platt Bros
(2) M/s Xian Metal China
(3) M/s Yuxi China

4.6.3 Copper Anodes
(1) Matcor or Equivalent

4.6.4 Cables
(1) M/s NETCO CABLES
(2) M/s NICCO
(3) M/s KEI Industries
(4) M/s Torrent Cables
(5) M/s Universal cables
(6) M/s Asian Cables (RPG Cables)
(7) M/s Finolex Cable
(8) M/s Rediant Cables
(9) M/s Polycab

4.6.5 Pin Brazing
   (1) M/s Safe Track
   (2) M/s Bac, UK

4.6.6 Thermite Weld
   (1) M/s Erico Europa
   (2) M/s Cad Weld
   (3) Polarisation Cell – Solid State
5.0 Special Conditions of Contract (SCC)

[whole document may be suitably modified as per cover note & requirement of specific site requirements]

5.1 General

(a) Special Conditions of Contract shall be read in conjunction with the General Conditions of Contract, specification of work, drawings and any other documents forming part of this contract wherever the context so requires.

(b) Where any portion of the General Condition 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 to the extent of such repugnancy, or variations, prevail.

(c) Wherever it is mentioned in the specifications that contractor shall perform certain work or provide certain facilities, it is understood that 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.

(d) The material, design, and workmanship shall satisfy the relevant Indian standards, 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.

(e) In the absence of any specifications covering any material, design of work(s), the same shall be performed / executed in accordance with standard engineering practice and as per the instructions / directions of the EIC, which will be binding on contractor.

(f) All the work specifically mentioned in the tender document is under the scope of contractor. All other works not specifically mentioned but required for successfully execution of the work shall also be performed by contractor and payment shall be paid as per the terms and conditions mentioned elsewhere in this document.

5.2 Location:

[site information to be mentioned by the indenter]

5.3 Completion period

[it should be clearly mentioned for each group if job is indented to be implemented by more than one agency]:

(a) It shall be ........ months from the date of FOA/LOA.

(b) The time of completion stipulated above is inclusive of time required for supply of material, mobilization of equipment and personnel at site by contractor as well as for demobilization. Mobilization period shall not be more than 90 Days from the date of award of the job or date of intimation for deployment of personnel by EIC.

(c) The above time also includes the time required for completion of all other associated works

5.4 Mobilisation Advance

No mobilization advance shall be paid GAIL.

5.5 Tests and Inspection

EIC or representatives will have absolute authority to inspect the entire system to cross check the reported results at any time with or without notice to the contractor

5.6 Terms of Payment

(a) No advance payment/cost towards mobilization/de-mobilization shall be payable by GAIL.

(b) Compensation for extended stay or idle manpower is not admissible.
(c) Pro rata payment shall be made as under upon the satisfactory completion of each stage of job:

<table>
<thead>
<tr>
<th>SN</th>
<th>Stage</th>
<th>% Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Payment towards supply of material of each SOR</td>
<td>50%</td>
</tr>
<tr>
<td>2</td>
<td>Payment towards supply of material of each SOR after its implementation</td>
<td>50%</td>
</tr>
<tr>
<td>3</td>
<td>Completion of site works with site report on submission of RA bill and other requisite documents</td>
<td>90%</td>
</tr>
<tr>
<td>4</td>
<td>Completion of all the works including submission of all final documentation</td>
<td>10%</td>
</tr>
</tbody>
</table>

(d) Penalty towards Non-Deployment of Resources:

In case, contractor fails to deploy the resources as mentioned in the Scope of Work, deductions will be made from the running bill as per the following:

1. Non-deployment of min. no. of Site Technicians for field activities Rs. 500/man-day
2. Non-deployment of Team leader/Site Supervisor during field activities Rs.1,000/man-day
3. Non-deployment of vehicle Rs.2,000/day
4. Non-deployment of min. required no. of Equipments/Tools-Tackles Rs.1,000/day

(e) Measurement of Works: Payment will be made on the basis of joint measurements taken & signed jointly by Contractor & EIC/SIC.

5.7 Paying Authority
HOD (F&A) ...... [Mention the locations]

5.8 Defect Liability Period
(a) Defects liability period shall be 12 months from the date of completion of entire works.
(b) If during the Defect Liability period any portion of the work / equipment is found defective and is rectified/replaced, the period of liability for such equipment/portion of work shall operate from the date such rectifications / replacements are carried out and contract performance guarantee hall be furnished separately for the extended period of liability for that portion of work / equipment only.
(c) Notwithstanding the above, all manufacturers’ warranties and guaranties for equipment’s/ materials supplied by the contractor shall be passed on to the owner

5.9 Price Reduction Schedule
As per applicable GCC & its latest amendments.

5.10 Contract Performance Bank Guarantee
As per applicable GCC & its latest amendments.

5.11 Schedule of Rates
(a) The Schedule of Rates (SOR) shall be read in conjunction with Scope of Work, Special Conditions of Contract, General Conditions of Contract, Technical Specifications, Drawings and any other Document forming part of the contract. The quantities shown against the various items are only approximate and are subject to variations. Payment shall be done based on the actual quantity against SOR items executed.
(b) This quoted rates also includes the vehicle required by the contractor personnel for day to day movement of his personnel for successfully carrying out the job. A dedicated vehicle shall be deployed by the Contractor during the execution of job and if contractor fails to deploy the vehicle, deductions shall be made as per the terms & conditions of this contract.
(c) All the works, item wise, shall be measured upon completion and paid for at the contracted rates. In case any activity though specifically not covered in Schedule of Rates description but the same is covered under Scope of work / specification / drawings etc., no extra claim on this account shall be entertained, since SOR is to be read in conjunction with SCC, GCC, Technical specifications, drawings & any other documents forming part of the contract.

(d) All items of work in the Schedule of Rates shall be carried out as per the Specifications, drawings and instructions of the EIC and the Rate so quoted in Schedule of Rates shall be inclusive of all material, consumable, labour, supervision, tools and tackles, as well as preparatory, incidental, intermediate / auxiliary / ancillary or enabling works etc.

5.12 Deviation in SOR Quantity
SOR quantity(ies) are indicative and there can be variations in SOR quantity(ies) during execution. In case of non-execution of any SOR item(s) / quantity(ies) due to reasons attributed to GAIL, no compensation shall be made to contractor in this regard. However, non-execution of any SOR item due to reasons attributed to contractor will not be acceptable & shall be dealt as per tender terms & conditions of the contract.

5.13 Extra Items / Substituted Items
(a) If any work to be executed relating to the contracted work and rate for the same is not available in the Schedule of Rates, then the following methodology shall be adopted.

(1) If the item of work is similar to the item for which he has quoted rates in the Schedule of Rates, the rates will be derived from similar items of work in the SOR.

(2) If any item of work does not appear in the SOR quoted by the contractor in that case the rates of such items shall be derived from cost of materials and labour plus 15% to cover the contractor’s profits and overheads. The rate shall be derived from market rate analysis.

5.14 GAIL’s Scope
(a) Permissions from the landowners/any compensation to land owners during the survey or excavation shall be in the scope of Contractor only. However, GAIL shall facilitate by issuing the letter in the name of landowner if required.

(b) Guest house accommodation to contractor personnel depending on availability at locations where GAIL has its own Guest House shall be provided on chargeable basis. For rest of the locations, contractor shall make his own arrangements for accommodation of his personnel.

5.15 Compliance with Labour Laws
As per GAIL’s requirement [to be included as per statutory requirements].

5.16 Entry and Gate Pass
(a) Entry Pass
Contractor has to apply for photo entry passes for his workers & staff in a prescribed performa available with GAIL. The photo entry passes shall be issued by GAIL for a maximum period of three months and if extension is required, contractor shall have to apply separately for extension. As a special case temporary entry passes for a maximum period of seven days may be issued. Unutilized / expired entry passes shall have to be submitted immediately to GAIL. In case of loss of any entry pass, contractor has to lodge FIR with local police station and inform the EIC and will have to pay Rs. 150/- against each computerized entry pass and Rs. 50/- for ordinary photo pass or as per standard guidelines of GAIL Security department. Identity card issued by the security section should always be carried / displayed by contractor’s employee while working inside GAIL installation.

(b) Gate Pass:
(1) To bring material / equipment’s / tools / tackles etc. inside GAIL installation for execution of job, contractor has to produce challan / proper documents to GAIL personnel at gate. The materials shall be checked thoroughly by GAIL’s personnel at gate and recorded in their register before allowing any materials to bring inside GAIL installation by contractor / his representative. It is contractor’s responsibility to see that the recorded entry no., date, signature of GAIL’s authorized representative personnel with stamp are there on the challan / supporting documents before taking any materials inside GAIL installation. In addition to above, entry of the material will be permitted only during the stipulated working hour, and more so, if consignee is available to receive the said material.

(2) To take contractor’s materials out of GAIL installation, contractor has to apply with specific purpose / reasons to the EIC, attaching challan / supporting documents signed by GAIL’s personnel at gate during entry. Contractor shall abide by security regulations as enforced by GAIL from time to time.

### 5.17 Work Permit and Safety Regulations

(a) **Work Permit**: GAIL shall arrange the work permit. Job wise and area wise permit shall be issued to contractor.

(b) **Vehicle Permit**: Permits are to be obtained separately for entry / use of vehicles inside GAIL installation. The following requirements are to be met to obtain vehicle permit:

1. Vehicle / equipment etc. should be brought to site in good condition.
2. Muffler / spark arrestor if required shall be provided by GAIL on returnable basis.
3. The driver / operator shall furnish valid driving license, valid road tax certificate, valid load test certificate, fitness certificate and insurance policy from the competent authority.

(c) **Validity of the Permit**:

1. Permit shall be valid between 9:30 to 17:30 hrs. Same can be extended beyond this period but not before sunrise & after sunset based on decision of EIC/SIC considering site conditions.
2. No permit is valid if it is not renewed by the Shift-in-Charge / his representative in shifts (morning & evening).
3. The permit shall be issued for a maximum period of one month and if extension is required, contractor has to apply for fresh permit.
4. As a special case working hours may be extended up to 19:00 hrs., after approval of EIC, if contractor applies for extended hours well in advance with valid reasons.
5. No permit is valid on holidays unless special permission is obtained from the EIC/SIC/Competent authority in GAIL.

(d) **Safety Regulations**

The work shall be carried out inside GAIL installation as per safety practices enforced by GAIL safety section and instruction of EIC issued from time to time. Many times it may happen that the working hours may reduce to meet certain safety requirements and contractor shall meet these requirements without any argument for time and financial implications. To obtain work permit and to satisfy all conditions laid down therein, shall be the responsibility of contractor. No claim for idling of machinery, manpower etc. for safety reasons or non-issuance of work permit by Safety Section In-Charge, shall be considered. Contractor shall abide by all safety regulations of GAIL installation and ensure that safety equipment for specific job kit as stipulated in the factory act / safety handbook is issued to the employee during the execution of work, failing which all the works at site will be suspended.

(e) **Regarding use of Vehicle**

1. Vehicle must not ply on any road within GAIL installation at a speed exceeding permitted speed for particular installation.
2. Parking of vehicles shall not be permitted inside GAIL installation.

### 5.18 Taxes, Duties and Levies
5.19 Documents and Reports
(a) The Contractor will maintain all records and relevant documents as required. The Contractor will submit the day-to-day work progress and inspection reports to respective "SIC/EIC". The materials, design and workmanship shall satisfy the applicable relevant national/international standards, the job specifications contained herein and codes referred to. Where the job specifications stipulate requirements in addition to those contained in the standard codes and specifications, these additional requirements shall also be satisfied.

(b) All the procedures shall be prepared prior to start of work and clearly indicate the steps required for successfully completion of work and to be submitted to GAIL for approval.

(c) Complete Mitigation report with, procedure adopted, relevant as built drawings, data sheets, photographs (soft/hard), shall be submitted.

5.20 Confidentiality of Information and Data
All information obtained by bidder/contractor or its personnel during the work and all information/data/maps etc. provided by the Company to the bidder/contractor must be considered confidential and must not be divulged by the bidder/contractor or its personnel to any-one other than the Company's personnel. This obligation of bidder/contractor shall be in force even after the termination of the contract. For publishing scientific / technical papers or presenting in conferences / seminars based on the findings/results of the interpretation in scientific journals etc. the personnel engaged by the bidder/contractor or its personnel must take prior approval of GAIL in this regard. This shall be applicable even in case GAIL’s name or reference of location is omitted if the case pertains to GAIL. In case such non-compliances come to GAIL’s notice, the contract is liable to be terminated forthwith along with legal action thereof.
### 6.0 Schedule of Rates (SOR)

#### SOR for carrying out AC Mitigation Job

<table>
<thead>
<tr>
<th>SOR</th>
<th>Description</th>
<th>UOM</th>
<th>Unit Rate</th>
<th>Total Qty.</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Supply and Installation of bigger size CP test station with terminal board as per SOW, SCC &amp; Drawings</td>
<td>EA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Supply &amp; Installation of Test Stations on available foundation as per SOW, SCC &amp; Drawings</td>
<td>EA</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>02</td>
<td>Supply &amp; installation of pre-packed Zinc anodes with cable as per SOW, SCC &amp; Drawings</td>
<td>EA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Supply and installation of Zinc ribbon anodes as per SOW, SCC &amp; Drawings</td>
<td>MTR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Supply and installation of Copper anodes as per SOW, SCC &amp; Drawings</td>
<td>MTR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Supply &amp; Installation of Solid State Polarization Cells (SSPC)</td>
<td>EA</td>
<td></td>
<td></td>
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<tr>
<td>06</td>
<td>Making pipe to cable connection</td>
<td>EA</td>
<td></td>
<td></td>
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<tr>
<td>07</td>
<td>Supply and laying of cables</td>
<td></td>
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</tr>
<tr>
<td>7.1</td>
<td>6 sq. mm</td>
<td>MTR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td>10 sq. mm</td>
<td>MTR</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7.3</td>
<td>25 sq. mm</td>
<td>MTR</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>08</td>
<td>Monitoring of mitigated locations</td>
<td>EA</td>
<td></td>
<td></td>
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</tbody>
</table>
### Appendix-I

**List of Pipeline sections (Group-A, B...)**

**Pipeline Network:**

<table>
<thead>
<tr>
<th>SN</th>
<th>Maint. Base</th>
<th>PIPELINE SECTION CODE</th>
<th>PIPELINE SECTION NAME</th>
<th>SIZE (INCH)</th>
<th>LENGTH (KM)</th>
<th>P-O-P (KG/CM²)</th>
<th>TYPE COATING</th>
<th>OF CP SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tbody>
</table>

### Appendix-II

**List of TR/CPPSM Unit**

<table>
<thead>
<tr>
<th>SN</th>
<th>Location Name</th>
<th>Chainage (in meter)</th>
<th>TRU/CPPSM I/P Rating (V/A)</th>
<th>I/P</th>
<th>TRU/CPPSM O/P Rating (V/A)</th>
<th>O/P</th>
<th>Anode Type &amp; Configuration</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

### Appendix-III

**List of Test Stations**

<table>
<thead>
<tr>
<th>SN</th>
<th>Type of TLP</th>
<th>Additional Connection of TLP</th>
<th>Location Details</th>
<th>Chainage (in Meters)</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>H</td>
<td>A</td>
<td>XXXX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>C</td>
<td>XXXX</td>
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</table>

### Appendix-IV

**List of Foreign Pipeline Crossings, Pipelines in common ROU & Bonding locations**

<table>
<thead>
<tr>
<th>SN</th>
<th>Type of TLP</th>
<th>Location Details</th>
<th>GAIL Chainage (in Meters)</th>
<th>Foreign/other GAIL Pipeline Name</th>
<th>Foreign /other GAIL Pipeline Chainage (in Meters)</th>
<th>Remark (Bonding/Not Bonded)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>XXXX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>XXXX</td>
<td></td>
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<td></td>
<td></td>
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</tbody>
</table>
Appendix-V

List of HT Crossings/Parallelism with their Chainages

<table>
<thead>
<tr>
<th>SN</th>
<th>Type of TLP</th>
<th>Location Details</th>
<th>GAIL Chainage (in Meters)</th>
<th>Power Line Name &amp; Operator</th>
<th>Rating (in KV)</th>
<th>Remark (Crossing/Parallel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>H</td>
<td>XXXX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>H</td>
<td>XXXX</td>
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Appendix-VI

List of River & Water Crossings

<table>
<thead>
<tr>
<th>SN</th>
<th>Location Details of River &amp; Water Bodies /Crossings</th>
<th>Approx. ROU Length (in meter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix-VII

Drawings of Test stations, Anodes, connection to Polarisation cells
NOTES:-

1. TEST STATION SHALL HAVE WEATHERPROOF ENCLOSURE HAVING DEGREE OF PROTECTION IP=55, AS DEFINED IN IEC-529(1989)/

   IS:2147 (1982). THE SHUTTER SHALL BE HINGED TYPE WITH CONCEALED LOCK AND SHALL HAVE DOOR GASKET.

2. THE HINGES SHALL BE WELDED TO THE SHUTTER AND THE BOX SUITABLY.

3. THE MS ANGLES SHALL BE NIPPED TO THE SIDES. THE ANGLES SHALL HAVE TAPPED HOLES FOR FIXING TERMINAL PLATE.

4. THE INNER SURFACE OF THE TEST STATION SHALL BE PAINTED WITH LEAD OXIDE PRIMER.

5. THE OUTSIDE OF THE TEST STATION SHALL BE PAINTED WITH TWO COATS OF ZINC RED EPOXY PRIMER

   AND THREE COATS OF GREY COLOURED EPOXY PAINT COMPLETE WITH CABLE PIPE & FDN. PLATE.

6. THE NAME PLATE SHALL BE OF ANODISED ALUMINIUM WITH BLACK BACKGROUND AND WHITE LETTERS (SIZE 3 mm). THE NAME

   PLATE SHALL BE FIXED TO INNER SIDE OF SHUTTER BY ARALDITE OR EQUIVALENT.

7. THE NAME PLATE OF EACH TEST STATION SHALL CARRY THE FOLLOWING INFORMATION:

   A) TEST STATION CONNECTION SCHEME TYPE

   B) RELEVANT TEST STATION CONNECTION SCHEME DIAGRAM

   C) TEST STATION NO.

   D) CHAINAGE IN KM

   E) DISTANCE FROM PIPE IN m

   F) DIRECTION OF GAS FLOW

8. WHEN ERECTED, THE TEST STATION SHALL BE IN UPRIGHT POSITION.

9. TEST STATION SHALL BE SO ERECTED AS TO SERVE ALSO AS PIPELINE MARKER, AND ANODE GROUND BED MARKER.

   THEIR SHUTTERS SHALL BE PARALLEL TO THE LINE OF AXIS OF PIPELINE AND FACING IT.

10. THE NUMBER OF ALL TEST STATIONS SHALL BE WRITTEN WITH BLACK PAINT USING 40 mm STENCIL BLOCK ON THE

    OUTER SIDE OF THE SHUTTER IN A UNIFORM MANNER. AN ARROW SHOWING DIRECTION OF FLOW OF GAS

    SHALL BE MARKED TO UNDERLINE THE TEST STATION NUMBER ON SHUTTER.

11. HEIGHT OF THE TEST STATION ABOVE GROUND LEVEL SHOWN IN THE DRAWING IS TYPICAL.

12. ALL CABLES COMING TO TEST STATION SHALL BE LABELLED ON BOTH ENDS WITH IDENTIFICATION NUMBERS

13. TOTAL NUMBER OF TEST STATIONS AND THEIR TYPES ARE MENTIONED IN CONSOLIDATED B.O.M.

14. TEST BETWEEN BRASS TERMINALS AND BODY AT 2kV FOR ONE MINUTE.

15. ALL DIMENSIONS ARE APPROXIMATE AND CAN VARY SLIGHTLY.

16. ALL DIMENSIONS ARE IN mm.

17. THE ENTRY SHALL BE SEALED WITH BITUMEN COMPOUND AFTER CABLE LAYING TO PREVENT WATER ENTRY.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Brass Washer φ 8 mm dia (Mi) Cd Coated</td>
<td>AS REQ.</td>
</tr>
<tr>
<td>11</td>
<td>Brass Nut Bolt Washer</td>
<td>AS REQ.</td>
</tr>
<tr>
<td>20</td>
<td>Brass Slug</td>
<td>AS REQ.</td>
</tr>
<tr>
<td>28</td>
<td>Binding wire</td>
<td>M.S.</td>
</tr>
<tr>
<td>29</td>
<td>100 mm @ 40°</td>
<td>90° Refer Elbow R=50</td>
</tr>
<tr>
<td>30</td>
<td>Variable Resistance</td>
<td>0-0.1 Ohm</td>
</tr>
<tr>
<td>21</td>
<td>Foundation plate</td>
<td>BTHK</td>
</tr>
<tr>
<td>22</td>
<td>Neoprene rubber gasket</td>
<td>BTHK</td>
</tr>
<tr>
<td>23</td>
<td>Rubber Bush Matching With Pipe</td>
<td>01</td>
</tr>
<tr>
<td>24</td>
<td>Tightener plate</td>
<td>BTHK</td>
</tr>
<tr>
<td>25</td>
<td>Rod</td>
<td>A.S.</td>
</tr>
<tr>
<td>26</td>
<td>RCC Mix, W20</td>
<td>0.324 m³</td>
</tr>
<tr>
<td>27</td>
<td>RCC Mix, W10</td>
<td>0.064 m³</td>
</tr>
<tr>
<td>28</td>
<td>RCC Mix, W10</td>
<td>0.324 m³</td>
</tr>
<tr>
<td>29</td>
<td>RCC Mix, W20</td>
<td>0.064 m³</td>
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<tr>
<td>30</td>
<td>RCC Mix, W10</td>
<td>0.324 m³</td>
</tr>
<tr>
<td>31</td>
<td>Copper Link</td>
<td>2.5 THK x 12 x LENGTH AS REQ.</td>
</tr>
<tr>
<td>32</td>
<td>Copper Link</td>
<td>2.5 THK x 12 x LENGTH AS REQ.</td>
</tr>
<tr>
<td>33</td>
<td>Terminal plate</td>
<td>1.6 x 200 Phenolic Laminates (SH)</td>
</tr>
<tr>
<td>34</td>
<td>Hinge For Shutter</td>
<td>02</td>
</tr>
<tr>
<td>35</td>
<td>Castle Lock With One Key Per Test Station</td>
<td>01</td>
</tr>
<tr>
<td>36</td>
<td>Wing Plate</td>
<td>0.9 x 0.9 x ANODISED ALUMINUM</td>
</tr>
<tr>
<td>37</td>
<td>Shutter, 3mm THK MS SH</td>
<td>01</td>
</tr>
<tr>
<td>38</td>
<td>Top</td>
<td>675.5 x 350 x 3 mm THK, MS Sh</td>
</tr>
<tr>
<td>39</td>
<td>Side Plate</td>
<td>300 x 200 x 300 x 400 x 3 mm THK MS SH</td>
</tr>
<tr>
<td>40</td>
<td>Rear Plate</td>
<td>425 x 425 x 3 mm THK, MS SH</td>
</tr>
<tr>
<td>41</td>
<td>Bottom Plate</td>
<td>200 x 200 x 300 x 400 x 3 mm THK MS PLATE</td>
</tr>
</tbody>
</table>

BILL OF MATERIALS
Pre Packaged Zinc Anode
Pipe cable connection by Pin Brazing

NOTE:
1. INSTRUCTIONS APPEARING WITH THIS DRG IS SUITABLE FOR COPPER CONNECTIONS.
2. FOR SEALING THE COMPLETED JOINT SEAL WITH EPOXY RESIN FORMULATION ENSURING THAT EVERY METALLIC PART OF THE JOINT IS COMPLETELY INSULATED, M-SEAL SHALL BE APPLIED AT THE EDGE OF THE EPOXY RESIN TO SEAL THE EPOXY RESIN AND PE COATING.
3. PIN BRAZING CONNECTION SHALL BE DONE ONLY ON FERROUS/CHARGED PIPELINE.
Connection Scheme – Polarization Cell

PIPELINE GROUNDING THROUGH POLARISATION CELL AND GALVANIC ANODE
AC Interference Mitigation: Model BEC, Scope, Specifications & SOR

DETAIL 4

DETAIL 2

DETAIL 1

DETAIL 3

NOTES:

1. PIPE ASSEMBLY SHALL BE HOT DIP GALVANISED AFTER FABRICATION.