



BHAGYANAGAR GAS LIMITED
(A JOINT VENTURE OF HPCL & GAIL)

BID DOCUMENT FOR

**Tender for Annual Monitoring & Maintenance
Contract of Cathodic Protection (CP) System installed
at Hyderabad, Vijayawada & Kakinada GA's.**

**UNDER OPEN DOMESTIC
COMPETITIVE BIDDING**
e- tender

Bid Document No.: BGL/529/2021-22

VOLUME-II of II

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SECTION-7

SERVICE REQUISITION

SERVICE REQUISITION

Bid Document ref: BGL/529/2021-22, dtd. 03.09.2021

Item : Annual Maintenance Contract for Monitoring & Maintenance of Cathodic Protection (CP) System installed in Hyderabad, Vijayawada & Kakinada GA's.

| Sr. No. | DESCRIPTIONS | UOM | QTY (A) | QTY (B) | QTY (C) | TOTAL QTY |
|---------|---|-----|---------|---------|---------|-----------|
| | | | HYD | VJA | KKD | |
| 1 | HALF YEARLY TR- UNIT MONITORING | | | | | |
| | To carry out monitoring of CP Unit: (Any Make type TR) & Submission of Reports as per ISO formats enclosed with recommendation from NACE Level 2 (min) CP Specialist or CP Expert for any preventive/Breakdown Action Required if any. Activities to be performed as defined in the scope of work. | Nos | 12 | 8 | 2 | 22 |
| 2 | HALF YEARLY ON- PSP MONITORING. | | | | | |
| | To carry out ON PSP monitoring at test station(quarters every year) as per ISO Format (including status of insulating Joints, Sacrificial Anode Voltage, Anode Current drawn, Casing Status, Spark Gap Arrestor, Grounding Cell, Bonding Status with Foreign Pipeline, or Polarisation cell or Krirk Cell etc. at one particular Location with recommendations (NACE Level 2 (min) CP Specialist or CP Expert) for any Preventive/Breakdown Action required if any. Activities to be performed as defined in the scope of Work. | Nos | 4 | 4 | 4 | 12 |
| 3 | YEARLY ON-OFF PSP MONITORING | | | | | |

| | | | | | | |
|---|---|-----|---|---|---|----|
| | To carry out ON- PSP with Simcorder(This activity to be carry out once every year) at test Station as per procedure defined in the Scope of work Including Installation of current interrupter (with GPSSynchroniser) wherever required (including status insulating joints, Sacrificial Anode Voltage, Anodic current drawn, Casing Status, Surge Arrestor, Grounding cell, Bonding Status with Foreign Pipeline, or Polarisation cell or Krirk Cell etc. at one particular Location with recommendations (NACE Level 2 (min) CP Specialist or CP Expert) for any Preventive/Breakdown Action required if any. Activities to be performed as defined in the scope of Work. | Nos | 2 | 2 | 2 | 6 |
| 4 | Half Yearly ON PSP IN COMMON ROU | | | | | |
| | To carry out ON- PSP monitoring in Common ROU Pipeline network (Min 02 quarter every year or as directed by the EIC) as per ISO formats (including status insulating joints, Sacrificial Anode Voltage, Anodic current drawn, Casing Status, Surge Arrestor, Grounding cell, Bonding Status with Foreign Pipeline, or Polarisation cell or Krirk Cell etc. at one particular Location with recommendations (NACE Level 2 (min) CP Specialist or CP Expert) for any Preventive/Breakdown Action required if any. Activities to be performed as defined in the scope of Work. | Nos | 4 | 4 | 1 | 9 |
| 5 | YEARLY MONITORING OF ANODE BED | | | | | |
| | To carry out Anode bed (horrorizontal or deepwell) monitoring of CP Unit (Any Make type TR/Solar/CPPCM/CPVCM etc) once every year as per ISO formats at particular location with recommendations (From NACE Level 2 (min) CP Specialist or CP Expert) for any Preventive/Breakdown Action required if any. Activities to be performed as defined in the scope of Work. | Nos | 6 | 4 | 4 | 14 |
| 6 | MAINTENANCE OF EARTHING SYSTEM | | | | | |

| | | | | | | |
|----|--|-----|---|---|---|----|
| | To be performed when the individual earth pit resistance during monitoring is observed >5 ohms by pouring of Earth Activation (Vimco or Equivalent 5 kg), Salt(20kg) and Water (200 ltrs.). Activities to be performed as defined in the scope of Work. | Nos | 6 | 4 | 2 | 12 |
| 7 | PERMANENT REFERENCE CELL | | | | | |
| | Supply Installation and commissioning with termination and connection Cu-cuso4 permanent reference cell (make: MC Miller/tinker Raiser/Borin) with necessary backfill material including excavation/backfilling cable laying, cable identification ferrules, including consumables like sand , brick,lugs, brass washers, insulation tape etc. labour, tools & tackles complete in all respects.Activities to be performed as defined in the scope of Work. | Nos | 6 | 4 | 2 | 12 |
| 8 | PORTABLE Cu-cuso4 REF CELL | | | | | |
| | Supply,testing with terminations ,connections, cables , lugs, crocodile pins etc. complete in all respects Portable Cu-cuso4 ref cell (Mc-Miller or Tinker raiser or Borin).Activities to be performed as defined in the scope of Work. | Nos | 4 | 4 | 2 | 10 |
| 9 | NEW TEST STATIONS (WITH BENDS) | | | | | |
| | Supply & Installation of new test station, (with Bend & foundations including 01 no of variable bonding resistance (2 ohms, 5A, 50W). As per the standard drawing for A/B/C/D/E/F Type (as per site requirement) with bakelite terminal plate with SS nut,bolts with Siemens key lock, connection diagram, name plate, pipeline chainage marker on TS including all civil materials/work, termination & connections, complete in all respects. Activities to be performed as defined in the scope of Work. | Nos | 3 | 5 | 2 | 10 |
| 10 | NEW TEST STATIONS (WITHOUT BENDS) | | | | | |

| | | | | | | |
|----|---|--------|----|----|----|-----|
| | Supply & Installation of new test station, (without Bend & foundations including 01 no of variable bonding resistance (2 ohms, 5A, 50W). As per the standard drawing for A/B/C/D/E/F Type (as per site requirement) with bakelite terminal plate with SS nut,bolts with Siemens key lock, connection diagram, name plate, pipeline chainage marker on TS including all civil materials/work, termination & connections, complete in all respects. Activities to be performed as defined in the scope of Work. | Nos | 2 | 2 | 0 | 4 |
| 11 | TLP DOOR | | | | | |
| | Supply & replacement Of TLP Door (compatible with any type of existing box TLP for A/B/C/D/E/F Type as per existing) with 4 Allen screws including drilling and tapping work in TLP body. Activities to be performed as defined in the scope of Work. | Nos | 10 | 8 | 5 | 23 |
| 12 | 6 SQUARE MM ARMOURED CABLE | | | | | |
| | Supply & replacement of Copper Conductor XLPE insulated and PVC sheeted , 6 sq. mm stranded single core 600/1100 volts armoured CP cables with ISI mark. Activities to be performed as and when required based on the replacement of TLP stations as defined in the scope of Work. | meters | 50 | 50 | 30 | 130 |
| 13 | 10 SQUARE MM ARMOURED CABLE | | | | | |
| | Supply & replacement of Copper Conductor XLPE insulated and PVC sheeted, 10 sq. mm stranded single core 600/1100 volts armoured CP cables with ISI mark. Activities to be performed as and when required based on the replacement of TLP stations as defined in the scope of Work. | meters | 50 | 50 | 60 | 160 |
| 14 | 25 SQUARE MM ARMOURED CABLE | | | | | |
| | Supply & replacement of Copper Conductor XLPE insulated and PVC sheeted ,25 sq. mm stranded single core 600/1100 volts armoured CP cables with ISI mark. Activities to be performed as defined as and when required based on the replacement of TLP stations in the scope of Work. | meters | 50 | 50 | 30 | 130 |
| 15 | 35 SQUARE MM ARMOURED CABLE | | | | | |

| | | | | | | |
|----|--|-------------|-----|----|----|-----|
| | Supply & replacement of Copper Conductor XLPE insulated and PVC sheeted, 35 sq. mm stranded single core 600/1100 volts armoured CP cables with ISI mark. Activities to be performed as defined in the scope of Work. | meters | 50 | 50 | 0 | 100 |
| 16 | PIN BRAZING | | | | | |
| | Pipe to cable joint with Pin brazing method, its encapsulation and holiday detection test including excavation, backfilling etc. complete with supply of all materials equipment's required for Pin Brazing as per standard drawings/specifications defined in the scope of work. Activities to be performed as defined in the scope of Work. | Nos. | 25 | 20 | 16 | 61 |
| 17 | EXCAVATION & BACKFILLING IN RCC/ROAD | | | | | |
| | Excavation / Laying in RCC/Road earth surface of all types of sizes of CP or TR Electrical Cable, Backfilling and finally making back to its original surface including terminations, connections, lugging, crimping etc. with copper lugs, laying 01 layer of bricks, sand and polyethylene sheet in the cable trench etc. complete all respects as defined in the scope of work and soft surface of all type of sizes of CP or TR Electrical Cables as per procedure defined in the scope of work. Activities to be performed as defined in the scope of Work. | cubic meter | 30 | 30 | 15 | 75 |
| 18 | EXCAVATION & BACKFILLING IN NORMAL SOIL | | | | | |
| | Excavation in normal soil surface, Backfilling and finally making back to its original surface complete all respects as defined in the scope of work. Activities to be performed as defined in the scope of Work. | cubic meter | 100 | 75 | 60 | 235 |
| 19 | CP CABLE JOINT | | | | | |
| | Supply and making CP Cable underground joint with jointing kit consisting of mould, epoxy/Resin and ferrules, lugs, etc. as defined in the scope of work. Activities to be performed as defined in the scope of Work. | Nos. | 20 | 18 | 16 | 54 |
| 20 | 17 LBS MG ANODE | | | | | |

| | | | | | | |
|----|--|------|----|---|---|----|
| | Supply & Installation, testing and commissioning of prepacked 17 lbs Mg Galvanic anode with 10 mtrs max. cables of 10 sq.mm, termination & connections & excavation & backfilling as per the standards drawing & specifications defined in the scope of work . Activities to be performed as defined in the scope of Work. | Nos. | 10 | 6 | 2 | 18 |
| 21 | SPARK GAP ARRESTOR | | | | | |
| | Supply & Installation, testing and commissioning of Spark Gap arrestor (OBO betterman/ DHEN GMBH) as per the standards drawing & specifications, complete in all respects as defined in the scope of work . Activities to be performed as defined in the scope of Work. | Nos. | 10 | 8 | 2 | 20 |
| 22 | ZINC GROUNDING CELL | | | | | |
| | Supply & Installation, testing and commissioning of Prepacked Zinc Grounding Cell(22kgs) total weight with 10 mtrs max. cables of 10 sq.mm, & as per the standards drawing & specifications, complete in all respects as defined in the scope of work . Activities to be performed as defined in the scope of Work. | Nos. | 6 | 5 | 4 | 15 |
| 23 | ANODE LEAD JUNCTION BOX | | | | | |
| | Supply, installation and commissioning of Anode Lead Junction box (with bend and foundation) including backelite plate, SS nuts, bolts, port type resistor & shunt arrangement, civil works with materials as per spec. & drawing. Activities to be performed as defined in the scope of Work. | Nos. | 2 | 2 | 0 | 4 |
| 24 | MAINTENANCE OF ANODE GROUD BED (HORIZONTAL OR DEEP WELL) | | | | | |
| | Maintenance of Anode Ground Bed complete with 500 kgs common Salt, 18 kltrs of water, including excavation of trench for creating bund (appx 2.5m depth x1.5m width x 60m length) & backilling as defined in the scope of work. Activities to be performed as defined in the scope of Work. | Nos. | 6 | 2 | 1 | 9 |
| 25 | COATING REPAIR | | | | | |

| | | | | | | |
|----|---|--------------|----|----|----|----|
| | Repair of Pipe coating (with coating materials) : Coating repair using cold tapes (with coating materials): Pipeline rehabilitation using DENSOLEN/RAYCHEM 3 Ply/2 ply cold applied, self amalgamating corrosion prevention tapes. Removing the Old/damaged coating at fault locations with hand brush/buffing, emerypaper/watercleaning etc or combination of all repairing of the coating using cold applied tapes by applying a uniform coat of primer to the steel surface using the paint roller or brush & wait for 30 min for drying and after that wrap 3 ply tapes. wrapping the 3 ply tapes spirally under tension around the pipe with the grey side facing the steel surface with a min. of 50% overlap, wrap the 2 ply tape spirally under tension around the pipe with the butyl adhesive facing the innerwrap with a minimum of 50% overlap. Ensure that the outer wrap completely covers the inner wrap. The cold Tapes (both inner and outer) and Primer will be supplied by the bidder. Activities to be performed as defined in the scope of Work. | meter square | 15 | 15 | 30 | 60 |
| 26 | SOLID STATE POLARISATION CELL | | | | | |
| | Supply and replacement of (Dairyland/ Rustrol make polarisation Cell) in the existing system as per NACE/VDE specification for protection of up to 66/132 KV/HV/EHV power line crossing including backfilling cabling termination complete in all aspects as defined in the scope of work. Activities to be performed as defined in the scope of Work. | Nos. | 5 | 1 | 1 | 7 |
| 27 | TEST STATION FOR POLARISATION CELL | | | | | |
| | Supply & Installation Test station for polarisation cell as per Drawing, include, termination, connection, civil works etc complete in all respects as defined in the scope of work. Activities to be performed as defined in the scope of Work. | Nos. | 5 | 1 | 1 | 7 |
| 28 | INTERFERENCE SURVEY AT RAILWAYS XING | | | | | |


| | | | | | | |
|----|---|------|----|---|---|----|
| | Interference survey at railway crossing includes 24 hours data logging, data collection at railway tracks, and recommend miligation measures/modification required (by NACE level; 2 or CP Expert) as defined in the scope of work with specification, design and detail engineering . Activities to be performed as defined in the scope of Work. | Nos. | 8 | 2 | 2 | 12 |
| 29 | INTERFERENCE SURVEY AT FOREIGN PIELINE XING | | | | | |
| | Interference survey at foreign pipeline crossing or running parallel with our pipeline including 24 hours data logging, data collection at foreign pipeline crossing locationand from foreign pipeline operator and recommend miligation measures/modification required (by NACE level; 2 or CP Expert) as defined in the scope of work with specification, design and detail engineering . Activities to be performed as defined in the scope of Work. | Nos. | 10 | 2 | 1 | 13 |
| 30 | INTERFERENCE SURVEY AT HT LINE XING | | | | | |
| | Interference survey at HT line crossing including 24 hours data logging, data collection of data from SEBs, measurement and calculationof AC corrosion current and recommendation for miligation measures/modification if required (by NACE level; 2 or CP Expert) as defined in the scope of work with specification, design and detail engineering . Activities to be performed as defined in the scope of Work. | Nos. | 12 | 4 | 4 | 20 |
| 31 | INSPECTIONS OF ROAD XING'S | | | | | |
| | To carry out the inspection of ROAD crossings along with the yearly PSP monitoring schedule as per the activities defined in the ISO format. Activities to be performed as defined in the scope of Work. | Nos. | 10 | 5 | 6 | 21 |
| 32 | INSPECTION OF VALUNERABLE LOCATIONS | | | | | |
| | To carry out the vulnerable location inspection (along with the quarterly PSP monitoring schedule) as per the activities | Nos. | 10 | 4 | 1 | 15 |

| | | | | | | |
|----|---|------|----|---|----|----|
| | defined in the ISO format. Activities to be performed as defined in the scope of Work. | | | | | |
| 33 | YEARLY COMPREHENSIVE AMC OF TR UNIT | | | | | |
| | Yearly comprehensive AMC of CP unit including preventive/ breakdown maintenance (TR/CPPCM/CPVCM/Solar units, etc) & spares management, replacement of control card, critical repairs(including hiring of OEM service engineer in case bidder is not able to rectify the CP unit from its own resources, whenever required) complete in all respects to ensure 24 x 7 availability of the CP unit. Bidder is responsible to either rectify the breakdown call within 48 hours or has to provide alternate CP unit to ensure Integrity of the pipeline is maintained. Owner will provide spare CP unit as per availability basis only. Activities to be performed as defined in the scope of Work. | Nos. | 6 | 2 | 2 | 10 |
| 34 | CONSTRUCTION OF BRICK WALL CHAMBER | | | | | |
| | Construction of closed brick wall chambers of size 2'x2'x3' from 3' depth of ground level including all masonry work with 2 nos. of cable entry points & PVC pipes & supply of CL or precast RCC cover of same size with lifting handle (02 nos) for installation of Solid state polarisation cell as per attached drawing & scope of cables. Activities to be performed as defined in the scope of Work. | Nos. | 4 | 4 | 2 | 10 |
| 35 | PAINTING OF TLP | | | | | |
| | Painting along with lettering of chainage no TLP No. type of TS etc of box type TLP/ALJB/CJB/Bond Box/Polisation Cell Box etc. Activities to be performed as defined in the scope of Work. | Nos. | 20 | 2 | 55 | 77 |
| 36 | METALLIC PRINTED CIRCUIT | | | | | |
| | Supply & installation of different type of printed circuit diagram plate (mettalic) .(FOR Type A/B/C/D/E/F as per existing Type Test Station. Activities to be performed as defined in the scope of Work. | Nos. | 30 | 8 | 50 | 88 |
| 37 | Coke breeze with Goa carbons make | | | | | |

| | | | | | | |
|----|--|-----|------|-----|-----|-----|
| | Supply & Installation of petroleum coke breeze with goa carbons for maintenance of existing Anode bed, As per instruction by EIC or SIC. Activities to be performed as defined in the scope of Work. | KG | 1000 | 350 | 250 | 16 |
| 38 | PANEL METER | | | | | |
| | Supply & Installation of Panel meter on emergency basis of existing TR unit, As per instruction by EIC or SIC. Activities to be performed as defined in the scope of Work. | Nos | 10 | 4 | 2 | 16 |
| 39 | CONTROL CARDS | | | | | |
| | Supply & Installation of control cards on emergency basis (Cards 106, 105, 104, 103 and 107) of existing TR unit, As per instruction by EIC or SIC. Activities to be performed as defined in the scope of work. | Nos | 12 | 6 | 4 | 22 |
| 40 | CAT - CAT survey | | | | | |
| | A frame to check the condition of coating. Survey report for pin pointing the exact Locations of the coating defects including supply of equipment, consumables, manpower & transportation etc & GPS coordinates of all defects locations. Complete in all respects as defined in scope of work. Activities to be performed as defined in the scope of Work. | KM | 33 | 24 | 43 | 100 |

SECTION – 8

SCOPE OF WORK

| | | |
|--|---|--|
|  Bhagyanagar Gas Limited | <p align="center">Tender for Annual Maintenance Contract for Monitoring & Maintenance of Cathodic Protection (CP) System installed in Hyderabad, Vijayawada & Kakinada GA's.</p> <p align="center">Bid Document No. BGL/529/2021-22</p> | <p align="center">Volume II of II</p> |
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“The intent of this document is to install and commission new CP stations along with Deepwell anode bed, CJB, ALJB, Power meter Box, Permanent Reference Cell, Earth Pit, and associated civil work, cabling work etc.”

The latest version of the following codes and standards will be considered as a minimum requirement:-

NACE Publications.

I. CATHODIC PROTECTION SYSTEM -

Introduction

Pipeline network (in Km)is in 03 Cities Hyderabad, Vijayawada, & Kakinada as per following:

| Sr.No | Location | Dia 16" | Dia12" | Dia10" | Dia 6" | Dia4" |
|-------|------------|----------|---------|----------|----------|---------|
| 1 | Hyderabad | 30.91 km | 16.40km | --- | 2.8km | 2.8km |
| 2 | Vijayawada | ---- | 28.23km | ---- | 8.59Km | 6.23Km |
| 3 | Kakinada | -- | | 24.67 Km | 11.22 Km | 6.96 Km |

There are about 44 Nos. of manual test stations provided along the pipeline for monitoring of the CP of the pipeline in Hyderabad and 52 Nos. in Vijayawada and 55nos. in Kakinada. The said underground natural gas pipelines are passing through city and urban areas and are provided with Impressed Current Cathodic Protection (ICCP) System to protect from external corrosion as a supplementary system in addition to external coating of the pipelines of different diameters and length. The power source for ICCP system, in case of isolated pipelines is using Transformer Rectifier units with conventional type ground beds with backup power with battery banks are provided to maintain required corrosion protection level.


Test Stations have been installed at an interval of around 1 Km approx. in case of isolated pipeline networks and Gas Pipeline networks in order to monitor the health of the pipeline and performance of the CP systems.

SITE INFORMATION:

It is understood that before quoting the rates, the bidder has to visit the work site at own cost and has acquainted himself fully with nature and quantum of the job to be carried out by him in case of award of contract. Ignorance of this will not be considered after the award of contract. Contractor will be responsible to complete the job in all respect, including any other work necessary to complete the job satisfactorily, though specifically not covered in the “scope of work & Technical”.

The system is to be maintained so as to achieve the following protection criteria:-

- a)** The Pipe to soil potential measurements of steel structures in soil will be between (- Ve) 0.85 and (-Ve) 1.50 Volts in case of isolated pipelines and (-ve) 0.95 and (-ve) 1.50 volts in case of Gas Pipeline networks with respect of Copper/Copper Sulphate reference electrode.

| | | |
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b) The pipeline will be considered protected when minimum (-Ve) 300 Millivolt potential shift has been achieved from the initial-native potential to the "ON" potential.

c) A minimum polarization shift of (-Ve) 100 Millivolt will indicate adequate level of Cathodic Protection of the pipeline.

I) SPECIFICATIONS FOR MATERIAL AND SCOPE OF WORK IN EXECUTION OF INSTALLATION OF CP UNITS:

1) SPECIFICATION FOR CATHODIC PROTECTION RECTIFIER UNITS

BGL is presently having approx. 52.91 kms of network and 03 nos. of TR units in Hyderabad, 36.33 kms of network and 02 nos. in Vijayawada and 43.16 kms of network and 02 nos. in Kakinada and remaining pipe lines of length of approximately 21.78 Km is having TCP. BGL is presently using different TR units of make Kristron and Raychem RPG Ltd. For protection of pipe lines in Hyderabad and Vijayawada.

There are about 44 Nos. of manual test stations provided along the pipeline for monitoring of the CP of the pipeline in Hyderabad and 52 Nos. in Vijayawada and 55nos. in Kakinada.

Bidder has to maintain the minimum spares required to maintain the TR units at Hyderabad, Vijayawada and Kakinada to avoid the untoward breakdown of existing system and as specified below in TR unit design specifications, existing TR units has all the controls and standard conditions.

Details of the TR units installed are as follows:

Item: Auto/Manual Controlled Automatic C.P. Rectifier

Input: 230V \pm 20%, 1Ph, 50 Hz., AC

Output: 0 to 50V, 0 to 50A DC or 0 to 25 V or 0 to 25 A

Make : Kristron / Raychem.


TR Units Details

- AC Input-240 V \pm 10% VAC.
- Frequency-50Hz
- Output DC-25Volts & 25Amps.
- Ref Cell-AS3(Cu/CuSo₄) Type
- Make-Kristron System
- 1-phase, 1000 VA, 50Amps

TR Units Details

- AC Input-240 V \pm 10% VAC.
- Frequency-50Hz
- Output DC-50Volts & 50Amps.
- Ref. Cell-Cu/CuSo₄-zinc
- Make-Raychem RPG Ltd
- Type :TRA7
- 1-phase, 4000 VA, 50Amps..

TR Units Details

| | | |
|--|---|--|
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AC Input-240 V+/-10% VAC.

- Frequency-50Hz
- Output DC-25 Volts & 25 Amps.
- Ref. Cell-Cu/CuSo₄
- Make-Raychem RPG Ltd
- Type :TRA2
- 1-phase, 1250VA, 25Amps

TR Units Details

AC Input-240 V+/-10% VAC.

- Frequency-50Hz
- Output DC-25 Volts & 25 Amps.
- Ref. Cell-Cu/CuSo₄-Zinc
- Make-Raychem RPG Ltd
- Type :TRA7
- 1-phase, 1000VA, 25Amps


TR Units Details

- AC Input-230 V+/-10% VAC.
- Frequency-50Hz
- Output DC-48Volts & 25Amps.
- Ref Cell-AS3(Cu/CuSo₄) Type
- Make-Kristron System
- 1-phase, 2000 VA, 25Amps

Further , bidder has to supply TR unit with following details if required, design details is mentioned below for ready reference to the bidder. This specification covers the requirement of design, manufacture, inspection, testing and supply of Cathodic Protection Rectifier Units to be used as source for impressed current C.P System for underground pipelines. Reliability of equipment and ease of maintenances of utmost importance. The workmanship shall be of highest grade and entire design and construction in accordance with the best modern practice. The CP-Rectifier Units shall be capable of continuous trouble free operation at full load rating specified. The protection devices and control components shall be of standard design and carefully chosen to meet the requirements of the specifications. Special care shall be exercised in the design and manufacture for aging effects, low input voltage, A.C. Voltage fluctuations, high forward current through the rectifying elements and high temperature conditions during operation.

Apart from the de-ratings for site conditions an additional de-ratings of 20% shall be considered for the specific use as per International Standards. The components of the units shall be designed for maximum operating efficiency. The CP Rectifier Units shall be provided with all the necessary protections required as detailed:

50V, 50A or 25 V 25 A AC OPERATED AUTOMATIC CP TRANSFORMER RECTIFIER UNIT:

| | | |
|--|---|--|
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Item: Auto/Manual Controlled Automatic C.P. Rectifier

Input: 230V \pm 20%, 1Ph, 50 Hz., AC

Output: 0 to 50V, 0 to 50A DC or 0 to 25 V or 0 to 25 A Control:

- a) Automatic PSP Control Mode
- b) Constant Voltage/Constant Current Manual control
- c) 24 step Basic Manual Control by means of separate Autotransformer Standard Indications:
 1. Mains ON
 2. Unit working in Auto Mode
 3. Unit working in AVCC Mode
 4. Under-protection
 5. Overprotection
 6. Overcurrent
 7. All Reference Fail
 8. Ref 1 fail
 9. Ref 2 fail
 10. Ref 3 fail
 11. Reference 1 Lowest
 12. Reference 2 Lowest
 13. Reference 3 Lowest

Standard Metering:

48mm X 96mm Digital meters for

- a) AC Input Voltage
- b) AC Input Current
- c) DC Output Voltage
- d) DC output Current
- e) Digital meter with 10 Meg Impedance for- P.S.P.

Protection: -


HRC fuses in AC Input

- HRC fuses in DC Output
- MCB in AC Input
- MCB in DC output
- Lightning Arrestors at Input & Output
- MOV/RC Surge suppressors each Diode/SCR
- Fast acting Electronic Overcurrent/Overload protection

No. of Ref Inputs: (03) Three.

- Automatic Reference Selection logic will be provided.
- Facility will also be provided to manually select any one Reference Input.

Current Interruption: Built-in Programmable/Synchronisable Current Interrupter will be provided. Current Interrupter will have GPS Sync feature. Construction:

| | | |
|--|---|--|
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- Indoor/outdoor type, confirming to IP42/IP55 degree of Protection.
- Natural Air Cooled. Panel will be fabricated from 2.0mm/2.5mm CRCA sheet steel
- General Features : As per the enclosed Technical Specifications enclosed

Details of Each Major Equipment / Component is Specified with Drawings. However, minimum requirements for the major equipment / component to be supplied by the Contractor are given below:

All equipment shall be new and supplied by approved reputed manufactures. Equipment offered should be field proven. The equipment, accessories and material supplied shall comply in design, construction and performance with the latest relevant Indian and International standards together with the requirement of concern authorities having jurisdiction over all or part of their manufacture, installation and operation.

All MS Component / Equipment should be protected against corrosion by Hot Dipped Galvanizing, coated with one coat of Epoxy Zinc Rich Primer, second coat of Epoxy Painted and Third Coat of Poly Urethane Paint.

The minimum testing and inspection requirements for all components/ equipment shall conform to the requirement as defined in the relevant codes and standard.


CONTROL PANEL

Circuit-breakers, Ammeter, Voltmeter, Selector switches and all other items shall be mounted above the transformer rectifier assembly in a gasketed enclosure on a non- magnetic, high dielectric strength, electrically non-conducting and strong panel board having phenolic resin base to minimize operating shock hazard through accident all leakage etc. Enclosure shall have all meters and switches surface mounted with hinged lockable doors.

The control panel shall be invariably be marked/engraved indicating the various Switch gear components, for distinct identification. All indicating instruments shall be marked on dials for identification.

TEST & INSTALLATION

- a) During manufacture, the C.P. Rectifier Units shall be subjected to inspection by BGL's Engineer. The manufacturer shall furnish all information and facilities to enter into the work spot.
- b) All tests shall be carried out at the manufacturer's works under his care and Expenses.
- c) The load tests shall mainly determine the performance characteristics of unit. The supplier shall certify the tests carried out at his works. Certified test reports of manufacturer's test at quarter, half and full load and operating temperatures shall be submitted for each set. The reports shall include tests on efficiency, power factor, AC volts, Amps, Watts, DC Volts, Amps, regulation, ripple and hum content, voltage and current settings. All the testing procedures are being adopted to be clearly stated along with the tender.
- d) Shop tests shall be witnessed by inspecting authority of BGL's representative.
 - i) As a part of general inspection visual checks shall also be carried out. This shall cover measurement of overall dimensions, locations, numbering on leads and terminal markings, rating, setting of links, meters etc.

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- ii) Manual and electrical operation of switches.
- iii) Insulation tests at power frequency for the circuits.
- iv) Operation check for the controls as per specifications.

DRAWINGS

- a) A single line circuit diagram printed on non-corrosive metallic sheet shall be affixed on the inside of the door of each C.P.R. Unit using rivets/screws. The diagram shall clearly indicate the terminal numbers, markings, values of the circuitry components etc.
- b) A detailed circuit diagram of the C.P.R. Unit offered together with the technical specifications of the various components shall also be supplied along with the tender.
- c) Complete design of transformer to be used in C.P.R. Units should also be submitted with TR.

GUARANTEE

The C.P. Rectifier units shall be guaranteed for trouble free operation for a period of 12 months from the date of commissioning of the unit at site or 18 months from the date of delivery whichever is earlier. Any defects discovered during this period shall be rectified by the supplier at BGL's site / premises at suppliers cost.

SPARE PARTS

The tenderer has to quote separately for various spare parts which are to be procured along with the equipment. The list of such spare parts shall be included all the items which are essential for day-to-day maintenance of the units and should be limited to the attached list.

MAINTENANCE MANUAL

The tenderer shall supply 1 set of maintenance manual along with each rectifier unit.

Acceptable Makes:

Raychem / Kriston / ORMAT

Bidder has to submit the specifications and delivery Time schedule from the above mentioned makes and Upon Approval from the EIC, bidder will procure and install the rectifier unit complying to specifications and timely commissioning of the CP unit.


2) **CABLE TO PIPE JOINT**

In the making of the joint(s) particular care shall be taken to avoid any loose or imperfect joint(s) because it is on the continuity of these joints that the reliability and performance of the whole system depends.

- (a) The pipe to cable connection can be made by Pin brazing
- (b) The pipe to cable connection can also be made by using Pin brazing or Thermit weld.

The following procedure is to be followed for Thermit Weld:


- i. Excavate a pit manually over the pipeline to expose the pipeline top surface opposite to the test station / CP station location, care should be taken not to damage the coating.
- ii. Excavate another trench from the pipeline to the test station mouth for cable laying 1.5 m depth.
- iii. The distance between two connection points will be maintained as 300 mm. The number of

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connections will be as per the connection scheme type at that particular location. The location for cad welding of cable shall be selected such a way that the pipe joints and field coated areas are avoided.

- iv. Care shall be taken that cable to pipe joint is not made upon the seam on circumferential weld of pipe.
- v. Cut open the coating on the pipeline with care without damaging the pipe for a size of approximately 50 mm x 50 mm to suit the size of the thermit welding mould.
- vi. All the cables shall be tested before installation to ascertain the healthiness of the cables.
- vii. Remove the insulation from the cables to expose the bare copper conductor minimum 25mm or as required to crimp 15 mm long sleeve on wire strands.
- viii. Place the cable on to the pipeline surface on the weld area at an angle of 10 to 15 degrees from pipe surface and place the thermit weld mould over the cable suitably.
- ix. Put the metal disc on the react in mould and fill up the mould cavity with the weld powder as for the weight required from the thermit weld cartridge and fill up the surface distributed with the starting powder.
- x. Ignite the starting powder with a flint igniter to have the cable welded to the pipeline.
- xi. Remove the mould after cooling. Remove the extra flux from the weld area by tapping it with a small hammer.
- xii. Check the cable connection by hammer test.
- xiii. Remove the flux and any other debris using hand brush.
- xiv. Visually examine the cad weld, checking that the entire conductor is incorporated in the weld metal.
- xv. Check the continuity of the bare cable conductor to the pipe using a resistance meter with a scale which can read less than one ohm. A value of 0.1 ohm and less is accepted.
- xvi. Place a plastic funnel 70 mm ID (approx.) around the exposed area such that about 5 mm wide coating remains inside the plastic funnel. Place mastic around the plastic funnel to prevent leakage of encapsulation materials.
- xvii. Fill up the conical mould from the top by pouring epoxy hardener.
- xviii. Allow the epoxy hardener to set and test the insulation level by a holiday detector.
- xix. After the successful inspection lay the cable up to the test station and terminate it inside the box as per approved drawing.
- xx. The cable shall be back filled in the excavated cable trench as per Drawing and clean up the area.
- xxi. The resulting surface shall be clean, bright and slightly rough.
- xxii. Qualification of thermit welding procedure to be carried out before taking up field work /field joint.

The joint(s), after having been made (either by means of (a) or (b)) shall be protected with recoating and rewinding that part of the cable where the joint(s) is/are made. Care shall be taken while coating and wrapping all the leads and terminals so as to leave no metallic part uncovered and to prevent any contact with water. Identification markings shall be provided adjoining the sealed position.

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3) SPECIFICATIONS OF MATERIALS FOR CIVIL WORK

All materials for civil works shall be of standard quality, manufactured by renowned concerns conforming to Indian Standards or equivalent. The CONTRACTOR shall get all materials approved by Engineer-In-Charge prior to procurement & use. If required, the CONTRACTOR shall furnish manufacturer's certificates for the materials supplied by him or get the materials tested from an approved test laboratory at the direction of Engineer-In- Charge. The cost for all tests & test certificates shall be borne by the CONTRACTOR. Any material brought to site & not conforming to specifications & satisfaction of Engineer-In- Charge shall be rejected & the CONTRACTOR shall have to remove the same immediately from the site at his own expense & shall not have any claim for compensation due to such rejection.

1.1 WATER

Water used for cement concrete, mortar, plaster, grout, curing or washing of coarse aggregates shall be clear & free from injurious contents of oil, acids, alkali, organic matters or other harmful substances in such amounts that may impair the strength or durability of the structure. Potable water shall generally be considered satisfactory for mixing & curing of concrete. The Engineer-In-Charge may require the CONTRACTOR to get the water tested from an approved laboratory at the latter's expense & in case the water contains any sugar or an excess of acid, alkali or any injurious amounts of salts etc., the Engineer-In-Charge may refuse to permit its use.

2.0 AGGREGATE

Coarse & fine aggregates for concrete shall conform in a respect to IS:383 specifications for coarse & fine aggregates from natural sources for concrete & to IS: 515 specifications for natural & manufactured aggregates for use in mass concrete, as the case may be. Aggregates shall consist of naturally occurring sand and gravel or stone, crushed/uncrushed or a combination thereof & shall not contain any harmful material such as iron pyrites, coal, mica, shale, clay, organic impurities etc. in such quantities as to affect the strength or durability of the concrete and in addition to the above, for reinforced concrete any material which might cause corrosion of the reinforcement. The sum of percentages of all deleterious materials shall not exceed 5% by weight & 8% by volume, which includes materials passing 75 micron IS: Sieve.

2.1.1 COARSE AGGREGATE


Coarse aggregate is aggregate most of which is retained on 4.75 mm IS: Sieve & shall have a specific gravity of not less than 2.6. These may be obtained from crushed or uncrushed gravel or stone.

2.1.2 FINE AGGREGATE

Fine aggregate is aggregate most of which passes through 4.75 mm IS: Sieve but not more than 10% passes through 150 micron IS: Sieve. Fine aggregates shall consist of natural sand resulting from natural disintegration of rock & which has been deposited by streams or glacial agencies or crushed stone sand or gravel sand.

3.0 SAND FOR FILLING

Sand for filling shall be medium hard, strong, free from any organic & deleterious materials. Any sand (FINE/COARSE) proposed, shall be used only after it is approved by the Engineer-In-Charge.

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4.0 CEMENT

The cement used shall be ordinary Portland cement conforming to IS: 269 or as approved by the Engineer-In-Charge. The cement shall be stored in a suitable weather tight store in such a manner as to permit easy access for proper inspection. The cement shall be stored in such a manner as to prevent deterioration due to moisture & to minimize ware-house deterioration.

At the discretion of the Engineer-In-Charge, cement can be subjected to any or all of the tests & analysis required by the relevant Indian Standard Specifications. The CONTRACTOR shall bear the cost of all such tests. The Engineer-In-Charge may reject any cement as a result of any tests thereof. He may also reject cement which has deteriorated owing to inadequate protection from moisture or due to intrusion of foreign matter or other causes. Any cement which is considered defective by the Engineer-In-Charge shall not be used, & shall be promptly removed from the site by the CONTRACTOR at his own expense.

5.0 STEEL REINFORCEMENT

Mild steel reinforcement shall conform to IS: 422 Part-1. Structural steel shall conform to IS: 226 / IS: 2062.

6.0 BRICK

6.1 These shall be sound, hard, tough, rectangular in shape & size, well burnt (not over burnt) of uniform deep red colour & shall conform to IS: 1077 first class bricks (50 A class)

6.2 The brick shall be free from cracks, chips, flaws or humps of any kind and shall not show signs of efflorescence. The bricks shall be of fine, compact homogeneous structure & emit a clear ringing sound on being struck & shall have minimum compressive strength of 50 Kg / cm² & shall not absorb water more than 20% of its dry weight when soaked in cold water for 24 hours. The tolerance limit shall be 3% for absorption.

6.3 All other materials not fully specified herein & which may be used in the work shall be of quality approved by the Engineer-In-Charge & he shall have the right to determine whether all or any of the materials supplied by the CONTRACTOR for use in the work are suitable for the purpose.


7.0 CHEQUERED PLATES & STRUCTURAL STEEL WORKS

Chequered plates shall be 6mm (7mm moreover chequered & shall conform to IS: 3502). Steel for chequered plate shall conform to IS: 226 shall be clearly rolled & shall be free from harmful surface defects such as crack surface flaws etc. The plate shall be cut to shape & fixed to the bearing members as shown in relevant drawings & directed by Engineer-In-Charge. The edges shall be made smooth, no burrs or gagged ends shall be left. The plates may be spliced with prior consent of the Engineer-in-Charge. But in that case care should be taken so that there is continuity in the pattern of the plates between the portions.

8) CHAIN LINK FENCING:

Fixing of chain link fencing of GI Wire (3mm thick) of mesh size (50mm x 50mm) fixed angle iron of size 50mm x 50mm x 6mm grouted in PCC 1:3:6 in foundation & painted with aluminium paint including brick work in cement mortar 1:6 along the length under the chain link fencing with PCC 1:2:4 (50mm thick) on the brick work to hold the fencing at the bottom, the height of chain link fencing should be 2.5 mtrs above the floor.

Arrangement of all consumables items viz. insulation tape, MS-Brass nuts & bolts, washers,

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cable lugs, Bakelite-plates & terminals, warning tapes / mats, lubricants, grease, waste cotton, cold soldering materials like eutectics 157-Sealing / capsulation materials like M-seal and the necessary tools and tackles, instruments, equipment's (tri port, chain pulley etc.) to carry out tendered job is in the scope of contractor without any extra cost. Contractor shall have to furnish all details regarding availability of tools and tackles, instruments, equipment's before commencement of work.

For executing any item if contractors outsource/hire the expertise from outside agency the cost of the same would be admissible as per SOR defined only. In such cases prior permission of EIC is to be obtained.

All arrangements / payments (if any) necessary for carrying out maintenance SOR mentioned jobs, ROU opening, excavation job, crop compensation and negotiations / discussions with landowner, farmer or any other public / private agency, liaison with authorities for non receipt of the energy bills, correction in reading etc. & power restoration of TR CP unit in case of any fault, shall be the contractor's responsibility without any extra cost to BGL as a part of monitoring activity.

9) COKE BREEZE:- DATA SHEET:


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| CHEMICAL COMPOSITION | : |
| Moisture, Volatile (On Dry Basis), Ash and Sulphur | : 1% (% By Mass) |
| Fixed Carbon | : 99% Minimum |
| BULK DENSITY | : 800 – 1200 Kgs / M3 |
| REAL DENSITY | : 2.03 gm / cc |
| POROSITY | : 40% |
| RESISTIVITY | : 0.1 Ohm Cm at 150 PSI |
| Particle Size | : (-) 1.0 mm Max Dust Free |

10) ANODE LEAD JUNCTION BOX:-

(a) Anode lead junction box is having facility for individual anode connection and suitable for pillar mounting. Appropriate cable glands provided in bottom side of box. A hinged lockable lid is provided as front door for access to the box. Box includes min 6-10 No. single anode circuits and main positive feed cables of maximum 25 Sq. mm cross section lugged copper conductor.

(b) Bus bar -- NiCd plated Copper bus bar of 25mm x 3mm mounted on two number epoxy supports, with brass studs/nuts/washers and anti vibration washer to accommodate lugged cable connection of up to 2 x 25 sq. mm. main anode cable and tap off interconnection for 18 nos. individual anode circuits.

All terminals should be of SS-304 material and size M-8 (08mm) nut, bolts, spring washer. The termination boards should be Fabric reinforced Bakelite of minimum 08 mm thickness.

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(c) Anode Circuit --- Each anode circuit is provided with following:

1. Removable link (Copper)
2. Measurement shunt: 10Amp, 100mV rating.
3. Variable Resistor: Slides wire type 5 Ohm 5 amps rating.
4. Individual anode terminals will comprise of studs/nuts/washers and anti vibration washers to terminate 10 Sq. mm lugged cables.

(d) Enclosure: The fabrication details as per following -

Material - MS Sheet 2.5 mm thick, weight - 30 Kg (approximate),

Painting : Surface Preparation SA 2 ½ Hot Dipped Galvanised – 80um One
Coat of Zinc Primer Two Coat of Epoxy Paint IS631 Shade

11) GEB Power supply /Energy meter box and Isolation switch box:-

Both boxes are same size as per existing meter and switches & isolation boxes at TR or Solar stations/ terminals. The fabrication details as per following -Material- MS Sheet 2.5 mm thick, waight-5 -7 Kg (approximate), the cabinet has hinged front doors with neoprene gasket and is Pad lockable. Any modification, if required, must be accommodated as directed by the EIC.

Surface painting : Sand Blasting SA 2 -1/2

Hot Dip Galvanizing to 80um

One Coat of Zinc Chromate Primer, One coat of Phosphate & \

Two Coats of Epoxy Paint - Light Grey 631 Total Paint Thickness – 120um DFT

12) DEEP ANODE GROUND BED SPECIFICATIONS & DATA SHEET SCOPE:


This specification covers the minimum technical requirements for the design, manufacture, performance, inspection, testing and supply of Mixed Metal Oxide coated Titanium Tubular Anode String for Deep Anode Ground beds for ICCP System.

The MMO Anode String should be a standard product of a manufacturer regularly engaged in production of MMO Anodes. The Anodes shall be supplied in accordance with the following specifications and data sheets.

CODES AND STANDARDS

The design, manufacturing, testing of MMO lida Anode String for Deep Anode Groundbed shall be in accordance with the latest revisions of the following Indian standards, wherever applicable. Where appropriate Indian standards are not available, the relevant IEC standards shall apply.


- a) Indian Standards institution (ISI)
- b) International Electro technical commission (IEC)
- c) American Standards Institution (ANSI)

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d) British Standards Institution (BS)

DATA SHEET :

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| Base Material | : Titanium substrate (ASTM B 861 Grade I) Coated with mixed metal oxide (MMO) of noble metals of group VIII. |
| Anode Type | LIDA (Linear Distributed Anodes)- Mixed Metal Oxide (MMO) coated Titanium Anodes |
| Anode Diameter | : 25.4mm + 0.40 / -0.79 mm |
| Anode Length | : 1000mm +/- 5 mm long |
| Anode Weight | : 0.280kg/m +/- 0.028 kg/m |
| Anode Current Output | : 8 Amperes |
| Number of Anodes in Single String | : 6 Nos or 8 Nos as defined in respective SOR items |
| Total Anode String Current Output | : 48 Amperes or 24 Amp |
| Anode Design Life at Maximum Output | : 35 years |
| Maximum Operating Current Density with carbonaceous backfill | 100 Amp/M ² |
| Coating resistivity | 6 x 10 ⁻⁵ Ohm - cm |
| Anode to cable connection | LIDA anode to cable patented crimp connection at centre and end sealing. |
| Anode quantity on string | As per current requirement |
| Contact resistance/Electrical continuity | 1 milli Ohm (max.) |
| Coating Consumption rate | 1 mg per ampere -year |
| Mixed metal Oxide (MMO) coating | More than 9 gm /M ² |
| Weight | |

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| Coating deposition Method | Thermal decomposition |
| Inactive Depth of Deep Anode bed | : Up to 24 Meters (or +10% as per Site conditions of Water Body Level) |
| Active Depth of Deep Anode bed | : 30 Meters or 15 Meters for 3 Lida |
| Total Depth of Deep Anode bed | : Up to 54 meters (or + 10% as per Site conditions) for 6 Lida Anodes or Up to 24 Meters (or +- 10 % as per Site conditions) for 3 Lida Anodes |
| Deep Anode bed Casing Pipe Material | : MS |
| Deep Anode bed Casing Pipe Diameter | : 150 mm |
| PVC perforated vent pipe | 1 inch |

VENT PIPES:

Deep Anode Ground Bed installations must have the vent pipe is perforated throughout the active column and solid through the inactive column, standard perforations range from .006 inch wide slots to 1.4 in diameter holes and are commonly placed every 6 in of pipe length. To prevent plugging with inactive column backfill, perforations should end even with top anode. Upper end of the vent pipe should be terminated so produced gases are allowed to dissipate naturally to the atmosphere. Terminations should be above any flood plain elevation.

ANODE SUSPENSION SYSTEMS:

The standard method of installation is to lower each anode by its attached wire suspend it at the desired depth, and tie it off at the surface.

ANODE CENTRING DEVICES:


Anode centralizers may be installed to ensure that carbon backfill surrounds each anode. Centralizers should be designed to prevent damage to anode wires during installation and allow anode movement in the well without snagging on down hole formations or other anode assemblies.

Carbon Backfill

High quality calcined petroleum coke is to be used for all deep anode installations. Granular carbon sinks readily in fresh water and is normally poured directly from the bag into the well. Fluid coke is comprised of fine carbon particles that compact tightly around anodes. Because of small particle size, fluid coke should be pumped from the

Loading Procedures

As previously mentioned, deep anodes are ordinarily drilled with direct mud rotary equipment. After reaching desired depth, down hole mud slurry must be thinned to nearly the viscosity of fresh water to allow proper carbon settlement around anodes. Thinning is performed by

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pumping potable water from the bottom up through mud circulation system until it returns to surface in well bore. Accurate well thinning is

critical to system installation. After thinning, drill pipe is removed from well to allow system loading. Vent pipe is usually lowered first and tied into position. Anodes are lowered by their attached wire to the desired elevation and tied off at the surface. After anodes are placed at desired elevations, carbon backfill is poured or pumped down hole. Anode resistance logging before, during, and after carbon backfill provides proof of proper carbon settlement. Settlement of top-loaded granular carbons normally occurs within 1 hr. Settlement of pumped fluid carbons normally takes 6 to 12 hr. Total settlement should occur before backfill of inactive column.

MMO ANODE:

The Anode base metal shall be titanium substrate confirming the ASTM Grade – I / II material specifications. The Titanium substrate shall be coated with refractory & precious mixed metal oxides augmented by the Plasma Spray Processed Catalytic Coating Method. The coating density, mixture ratio, type of precious & refractory metal oxides and the dielectric material used for insulation shall be suitable for operations in different electrolytes and environment. The Plasma Spray Coating process gives an Enhanced Mixed Metal Oxide Coating that should give three distinct advantages.

- a. Abrasion Resistance :
EMMO Coating on the Anode should be abrasion resistant to sharp rock or sharp The metal edges.
- b. Coating Mechanical Stability :
The EMMO Coating on the Anode should be mechanically stable and resistant to rupture due to electrolysis-generated gas in the coating porosity.
- c. Coating Thickness :
The EMMO Catalytic Coating mean thickness on the Anode should be ~900 microns.

ANODE STRING CABLE AND JOINT:

The EMMO tubular Anode string cable should be highly conductive copper of cross sectional area of 25 mm² or 4 AWG with double insulation. The EMMO tubular Anodes cable primary insulation of ECTFE Copolymer of 1mm +10% thickness to isolate the copper conductor in presence of Nascent chlorine gas that is generated at the anode in the electrolysis process in chloride / halogen ion environment. The ECTFE primary insulation should be protected by a 1.6mm Thick HMWPE jacket to provide mechanical strength.


The Anode to Cable joint should be TIG Welded Circumferential Swage, which shall give a very low resistance as specified in data sheet.

The Anode String shall be dual feel type which should make the Anode Groundbed fail-safe. The anode to cable connection shall have high tensile pull strength within 10% of the cable handbook pull strength.

The anode to cable sealing should be six layer seal plus the anode to cable interface at the ends shall be chemical resistant Teflon End Plugs and Teflon Sleeves.

ANODE STRING CENTRALIZER AND VENT PIPE:

Each EMMO tubular Anode string should have a centralizer. The Dual feed cable should have

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a spacer to separate the Cable from the Anode. The Anode String shall be installed with a flexible vent pipe with micro slots / holes for venting of gas generated at the anode surface during electrolysis. The Vent pipe diameter shall be 25mm and bottom end of the vent pipe should be sealed.

ANODE GROUNDBED BACKFILL:

Calcined Petroleum Coke Breeze with chemical composition of minimum 98% Carbon and (-)1mm mesh size. The consumption rate of coke breeze should be 1.1Kg / Amp – Yr and the Anode Ground bed Design life should not be less than 35 years at an operating load current of 50 Amperes.

DOCUMENTS AND DRAWINGS:

The Anode Manufacturer shall have a proved track record in manufacturing of EMMO Anodes for 10 years and Performance Certificates should be produced for Approval from Owner. The Anode Manufacturer should provide fabrication drawings and data Sheet for approval from Owner before placement of Purchase order.

The Anode Manufacturer should provide fabrication drawings and data Sheet for approval from Owner before proceeding with manufacturing. After approval of Fabrication drawing and proto type test is cleared the anode strings should be finally manufactured.

TESTING OF EMMO ANODE STRING:

All Anode Strings shall be tested by contractor and inspected by Owner before despatch, testing shall be conducted by the manufacturer to satisfy this document either as routine tests done by manufacturer or additional tests so required.

WARRANTY:


The EMMO Anode Strings should be warranted for minimum 05 years from the date of installation. The New EMMO Anode String should be provided by its manufacturer if it stops functioning within 05 years when installed and operated per manufacturer's guidelines.

13) PROCEDURE FOR CP CABLE TRENCH BED & BACKFILLING:-

- (i) 1 Mtr. deep laying layer of sand
- (ii) Approved class brick layer of 3" thick
- (iii) Red color polythin of 0.25 mm thick
- (iv) Back filling with soil
- (v) Watering (As & when required)
- (vi) Making normal surface
- (vii) As per the approved drawing


14) EARTHING SYSTEM / EARTHING PIT :-

The earthing system of TR Unit / Solar CP Station and P/L or at Gas terminal comprises of Earth pits, Earthing grid etc. Monitoring, Maintenance/Repair is to be carried out as per IS 3043 (pipe).

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|--|---|--|

1.0 SCOPE: This Procedure covers the inspection and test procedures pertaining to the installation of Cathodic Protection Systems. The equipment described here in covers the protection of underground pipelines by ICCP system.

2.0 PURPOSE

The purpose of this procedure is to define the inspection, testing method and criteria for installation work of Cathodic Protection System to achieve Job Completion.

3.0 GENERAL REQUIREMENT

.1 Reference

- 1.1 All material received at site shall be inspected, handled and stored upon receipt.
- 1.2 All installation/construction/testing works shall be carried out in compliance with Project Safety Requirement
- 1.3 Inspection and testing shall be conducted by the client.

Verification of inspection, checklist and testing shall be recorded on installation/test formats and will be signed by the client where appropriate.

- 1.4 All test equipment shall have a valid calibration certificates available at site.


.2 Installation & Testing Equipment

- 2.1 Pin Brazing Machine Kit
- 2.2 Tool Box
- 2.3 Dobefill 60 Epoxy & Harder 758 Resin & Mseal / Beckseal.
- 2.4 Grinder, West Cloth
- 2.5 Holiday Detector & Multi Meter & Portable Reference Electrode

4.0 INSTALLATION PROCEDURE

Pipe to cable connection involves following steps:

- 4.1 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.
- 4.2 Remove pipe coating of size (2" X 2") to expose joint area on the pipe surface.
- 4.3 Clean the exposed area to get a shining surface with rough file.
- 4.4 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
- 4.5 Place pin brazing gun on exposed area of pipe & done the pin brazing on Pipe.
- 4.6 Check the Mechanical integrity of the weld by the use of flight 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.
- 4.7 Check the continuity of the cable.
- 4.8 Remove 3 layer polyethylene (3 LPE) coating around the joint such that a surface area of

| | | |
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|--|---|--|

60 mm dia is exposed.

- 4.9 Position a plastic funnel around the exposed area such that about 5mm wide coating remains inside the plastic funnel. Place M seal around the plastic funnel to prevent leakage of encapsulation materials.
- 4.10 Seal the exposed are by pouring Epoxy and hardner mixture (10:1) by volume in the funnel so as to achieve electrical insulation and bonding.
- 4.11 After Pin Brazing check pipe coating using Holiday detector.
- 4.12 After completing total work check the natural Pipe to soil potential using Multimeter & Reference electrode.
- 4.13 The inspection will be recorded on inspection / installation formats

5.0 PRECAUTION

- 5.1 Before start the work check materials inspection test certificate & shipment release note
- 5.2 Prior to removal to site the cable will be inspected for mechanical damage.
- 5.3 Check using pins are supplied from original supplier only.
- 5.4 Cables are to be of sufficient length so as to reach the termination point without any joint providing sufficient lop for future maintenance purposes.
- 5.5 The distance between two cable-to-cable connections shall be a minimum of 300 mm.
- 5.6 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.
- 5.7 All cables are to be appropriately tagged.
- 5.8 One set of drawing/documents should be kept by site supervisor at work place

6.0 RECORD

All the parameters recorded during the installation at site will be recorded in inspection format.

7.0 ATTACHEMENT

1. INSPECTION REPORT
2. INSPECTION & TEST PLAN



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INSPECTION REPORT : PIN BRAZING REPORT

**Chainage
No.**

LOCATION/REFERENCE:

Report No.

Date :

| Sr. No. | Cable Size in sq.mm | Continuity Check | Holiday Test | Remarks |
|---------|---------------------|------------------|--------------|---------|
| | | | | |
| | | | | |
| | | | | |

STRENGTH OF PIN BRAZING : OK/ NOT OK

EPOXY & HARDNER FILLING : OK/ NOT OK

| | | |
|--------------|------------|------------|
| | For | For |
| Sign: | | |
| Name: | | |
| Date: | | |



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INSPECTION & TEST PLAN FOR PIN BRAZING


| Sl. no | Material details and Activity Description | Procedure to Cable to Pipe connection by Pin Brazing | Frequency of inspection | | Record to be submitted by |
|--------|--|--|-------------------------|------------|---------------------------|
| | | | Contractor | PMC/Client | |
| 1 | Check location | Procedure | W | R | Procedure |
| 2 | Check spacing between Two welds | | P | W | |
| 3 | Cable for cable size and type | | P | W | |
| 4 | Check connection to pipe | | P | W | |
| 5 | Check Encapsulation | | P | W | |
| 6 | Check continuity of cable to pipe | | P | W | |
| 7 | Check holiday at 15 KV (For encapsulation) | | P | W | |
| 8 | Check restoration | | P | W | |
| 9 | Holiday testing equipment Calibration Certificate Test | | P | W | |

Inspection Codes:

W – Witness. Prior notification required P - perform

R – Review

| | | | | |
|------|------|-------------------------|-------------|-------------|
| 00 | | For Review and Approval | | |
| Rev. | Date | Description | Prepared by | Approved by |

| | | |
|--|--|----------------------------|
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PROCEDURE-CABLE LAYING

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| 6.0.0 | RECORD..... | 04 |
| 7.0.0 | ATTACHEMENT..... | 04 |

1.0 SCOPE : This Procedure covers the inspection and test procedures pertaining to the installation of Cathodic Protection Systems. The equipment described here in covers the protection of underground M.S pipelines from corrosion by Cathodic Protection Systems.

2.0 PURPOSE

The purpose of this procedure is to define the inspection, testing method and criteria for installation work of Cathodic Protection System to achieve Job Completion.

3.0 GENERAL REQUIREMENT


Reference

- 2.6 All material received at site shall be inspected, handled and stored upon receipt.
- 2.7 All installation / construction / testing works shall be carried out in compliance with Project Safety Requirement
- 2.8 Inspection and testing shall be conducted by the client /client representative. Verification of inspection, checklist and testing shall be recorded on installation / test formats and will be signed by the client/ client representative.
- 2.9 All test equipment shall have a valid calibration certificates available at site.

Installation & Testing Equipment

- 2.10 Crimping Tool
- 2.11 Cable Jack
- 2.12 Sand, bricks, cable lugs, cable warning mat etc.
- 2.13 Tool Box for Cable Termination to test station

4.0 INSTALLATION PROCEDURE

| | | |
|--|---|--|
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The cables are laid in Soil at a required depth with bricks & sand cover. Laying of cables involves following steps:

- 4.1 The Cables will be identified, checked against the data sheet and inspected for mechanical damage.
- 4.2 Identify the cable layout route and measure the actual length of cables.
- 4.3 Cut the cable as required at site and check the continuity of cable.
- 4.4 Lay the cables in ROW at minimum depth of 1.5m outside plant & inside plant 0.75M depth and cover it with sand and brick. Cable laid under road crossings will be through RCC Hume / GI pipes/ pvc pipe as per customer requirement.
- 4.5 In paved area on Identified location a narrow trench will be cutting the existing concrete.
- 4.6 Lay the cable in proper sized G.I.Conduit & installed in a concrete trench.
- 4.7 After installation of the conduit & cable trench shell be properly paved to restore the RCC to its original condition.
- 4.8 Wherever possibility for damaged of cables the cable shell be installed in proper G.I./ PVC Conduit.
- 4.9 Terminate cables should be terminated using lugs through support pipes.
- 4.10 Cable Identification mark is to be done properly.
- 4.11 The cable route should be identified with permanent cable markers.
- 4.12 The inspection will be recorded on inspection / installation formats

5.0 PRECAUTION


- 5.1 Before start the work check materials inspection test certificate.
- 5.2 Prior to removal to site the cable will be inspected for mechanical damage.
- 5.3 Cable termination shall be by means of correctly sized compression (crimped) lugs.
- 5.4 Crimping shall be by means of properly designed tools only.
- 5.5 Cables are to be of sufficient length so as to reach the termination point without any joint.
- 5.6 All cables are to be appropriately tagged.
- 5.7 One set of drawing / documents should be kept by site supervisor at work place

6.0 RECORD

All the parameters recorded during the installation at site will be recorded in inspection format.

7.0 ATTACHEMENT

1. INSPECTION REPORT
2. INSPECTION & TEST PLAN

| | | |
|---|--|----------------------------|
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INSPECTION REPORT : CABLE LAYING REPORT

Chainage no.

LOCATION/REFERENCE:

Report No.

Date :


| Sr.No. | Cable Size in sq.mm | From | To | Continuity Check | Remarks |
|--------|---------------------|------|----|------------------|---------|
| | | | | | |
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| | | | | | |

SAND BRICKS COVER WARNING MAT & BACK FILLING : OK/ NOT OK

CABLE TERMINATION : OK/ NOT OK

DEPTH OF LAYING : OK/ NOT OK

| | | |
|-------------|------------|------------|
| | For | For |
| Sign | | |
| Name | | |
| Date | | |

| | | |
|--|--|------------------------|
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(i) Inspection Test Plan: Cable Laying for Underground Pipeline

| Sr. No. | Activity Description | Reference Document | Frequency of Inspection | | Record to be submitted by |
|---------|---------------------------------------|--------------------|-------------------------|------------|---------------------------|
| | | | Contract or | PMC/Client | |
| 1 | Approval of Work Instruction | procedure | W | R | procedure |
| 2 | Location & depth check if underground | | P | W | |
| 3 | Padding & brick laying | | P | W | |
| 4 | Warning mat | | P | W | |
| 5 | Grading and restoration of earth work | | P | W | |

Inspection Codes:

W – Witness. Prior

notification required P -

perform

R – Review

| | | | | |
|------|------|-------------------------|-------------|-------------|
| 00 | | For Review and Approval | | |
| Rev. | Date | Description | Prepared by | Approved by |



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PROCEDURE FOR ANODE JUNCTION BOX INSTALLATION

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| 4.0 | <i>Procedure..... 3</i> |
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| 6.0 | <i>Test Report 5</i> |

Inspection and Test Plan

Inspection Report

| | | |
|--|---|--|
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1.0 PURPOSE

To describe the procedure for installation of anode junction box provides adequate quality assurance/control of workmanship and inspection at site.

2.0 SCOPE

The procedure covers installation of anode junction box should be as per site condition left /right side towards direction of flow.

3.0 MATERIALS AND REFERENCES

3.1 Equipments: Calibrated portable multimeter, Portable Reference Cu/CuSO₄ electrode.

3.2 Materials: Shuttering, concrete, Cable lugs, ferrules, etc.

4.0 PROCEDURE

4.1 Make a pit of dimension 1 m x 1 m x 0.5 m. The pit should be made at proper distance from pipeline on the wider side of the ROW.

4.2 Foundation should be cast either in site or at a convenient storage yard. Keeping the M.S. pipe vertically aligned. Take care so that the top of the foundation and the top of the enclosure the overall dimensions of foundations shall be 900 mm x 900 mm x 600 mm.

4.3 Take care about the mainline pipe and its insulation to ensure that no damage is caused to them during excavation on the pipeline for cable to pipe connections. A reference should be made to approve anode Junction box Schedule for the type of connection scheme designed for the respective anode Junction box. Make required number of cable to pipe connections of appropriate cable size and length.

4.4 Insert cable carefully on the rim of the M.S. pipe protruding out of the foundation block. This is to avoid damage to cable insulation while pulling the cables into the enclosure.

4.5 Pull the cables up to the top of foundation and then harness them through the support pipe into the enclosure.

4.6 The M.S. support pipe along with enclosure should be erected on top of foundation block by matching the base plate holes and fastening the bolts grouted in the foundation secured by the matching nuts.

4.7 Take care so that the top of the foundation and the top of the enclosure remain in the horizontal plane.

4.8 The orientation of the enclosure (box) should be such that its door faces the pipeline.


4.9 Mount the necessary hardware within the enclosure and terminate the cable onto the respective terminals.

4.10 Measure pipe to soil potential with portable multimeter and Cu/CuSO₄ reference electrode at all cables terminals inside the box.

5.0 PRECAUTIONS

5.1 Cables used shall be of sufficient length so as to reach termination point without any joint and providing sufficient slack for future maintenance purposes.

5.2 Tag all cables appropriately.

| | | |
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- 5.3 Check all the connections for proper tightening
- 5.4 Provide cable core ferrules at both ends before final termination.
- 5.5 Keep one set of drawing / documents by site supervisor at work place.
- 5.6 Neatly dress the cable inside the trench and terminated inside junction box.
- 5.7 Installed test stations are in the cultivated land / open field at the boundary of two plots and not in the middle of these plots.

6.0 TEST REPORT

Record and document all inspection result obtained in the Inspection report format

Inspection and Test Plan Inspection Report

Inspection Test Plan: Anode Junction Box Installation

| Sr. No | Activity Description | Reference document | Frequency of Inspection | | Record to be submitted by |
|--------|---|--------------------|-------------------------|--------|---------------------------|
| | | | CONTR | Client | |
| 1 | Check Pit dimensions and location as per drawing | Procedure | W | R | procedure |
| 2 | Concrete foundation, size and grade including curing time | | P | W | |
| 3 | AJB top mounting on foundation | | P | W | |
| 4 | Check foundation level | | P | W | |
| 5 | Checking height above ground level | | P | W | |


Inspection Codes:

W – Witness. Prior notification required

P - preform

R – Review

| | | | | |
|-----|------|-------------------------|-------------|-------------|
| 00 | | For Review and Approval | | |
| Rev | Date | Description | Prepared by | Approved by |

| | | |
|--|--|------------------------|
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BOX INSTALLATION REPORT

Chainage No.

LOCATION/REFERENCE:

Report No.


Date :

| TYPE OF TLP/JUNCTION BOX | CHAINAGE | DISTANCE FROM PIPE LINE | PIPE TO SOIL POTENTIAL | OTHERS |
|--------------------------|----------|-------------------------|------------------------|--------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

REMARKS:

LETTER WRITING ON TLP /JUNCTION BOX (CH No DISTANCE FROM PIPE LINE DIR. LINE FLOW) : OK/ NOT OK
CONNECTION DIAGRAM OF TLP/JUNCTION BOX (INSIDE) : BALANCE / COMPLETE

| | For | For |
|-------------|-----|-----|
| Sign | | |
| Name | | |
| Date | | |

| | | |
|--|---|--|
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PROCEDURE FOR CATHODE BOX INSTALLATION

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| 3.0 Materials and References | 3 |
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| 6.0 Test Report..... | 4 |

Inspection and Test Plan Inspection Report

1.0 PURPOSE

To describe the procedure for installation of Cathode junction box provides adequate quality assurance/control of workmanship and inspection at site.

2.0 SCOPE

The procedure covers installation of Cathode junction box should be as per site condition left/right side towards direction of flow.

3.0 MATERIALS AND REFERENCES

3.1 Equipments: Calibrated portable multimeter, Portable Reference Cu/CuSO₄ electrode.

3.2 Materials: Shuttering, concrete, Cable lugs, ferrules, etc. as per instruction of EIC.

4.0 PROCEDURE

4.1 Make a pit of dimension 0.7 m x 0.7 m x 0.8 m. The pit should be made at proper distance from pipeline on the wider side of the ROW.


4.2 Foundation should be cast either in site or at a convenient storage yard. Keeping the M.S. pipe vertically aligned. Take care so that the top of the foundation and the top of the enclosure the overall dimensions of foundations shall be 600 mm x 600 mm x 800 mm.

4.3 Take care about the mainline pipe and its insulation to ensure that no damage is caused to them during excavation on the pipeline for cable to pipe connections. A reference should be made to approve Cathode Junction box Schedule for the type of connection scheme designed for the respective Cathode Junction box. Make required number of cable to pipe connections of appropriate cable size and length.

4.4 Insert cable carefully on the rim of the M.S. pipe protruding out of the foundation block. This is to avoid damage to cable insulation while pulling the cables into the enclosure.

4.5 Pull the cables up to the top of foundation and then harness them through the support pipe into the enclosure.

4.6 The M.S. support pipe along with enclosure should be erected on top of foundation block by matching the base plate holes and fastening the bolts grouted in the foundation secured

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by the matching nuts.

- 4.7 Take care so that the top of the foundation and the top of the enclosure remain in the horizontal plane.
- 4.8 The orientation of the enclosure (box) should be such that its door faces the pipeline.
- 4.9 Mount the necessary hardware within the enclosure and terminate the cable onto the respective terminals.
- 4.10 Measure pipe to soil potential with portable multimeter and Cu/CuSO₄ reference electrode at all cables terminals inside the box.

5.0 PRECAUTIONS

- 5.1 Cables used shall be of sufficient length so as to reach termination point without any joint and providing sufficient slack for future maintenance purposes.
- 5.2 Tag all cables appropriately.
- 5.3 Check all the connections for proper tightening
- 5.4 Provide cable core ferrules at junction box ends before final termination.
- 5.5 Keep one set of drawing / documents by site supervisor at work place.
- 5.6 Neatly dress the cable inside the trench and terminated inside TLP.
- 5.7 Installed test stations are in the cultivated land / open field at the boundary of two plots and not in the middle of these plots.

6.0 TEST REPORT

Record and document all inspection result obtained in the Inspection report format

Inspection and Test Plan Inspection Report

Inspection Test Plan: Cathode Junction Box Installation

| Sr. No | Activity Description | Reference document | Frequency of Inspection | | Record to be submitted by |
|--------|---|--------------------|-------------------------|--------|---------------------------|
| | | | CONTR. | Client | |
| 1 | Check Pit dimensions and location as per drawing | Procedure | W | R | procedure |
| 2 | Concrete foundation, size and grade including curing time | | P | W | |
| 3 | TLP top mounting on foundation | | P | W | |
| 4 | Check foundation level | | P | W | |
| 5 | Checking height above ground level | | P | W | |

Inspection Codes:

W – Witness. Prior notification required
P – Perform

R – Review

| | | | | |
|-----|------|-------------------------|-------------|-------------|
| 00 | | For Review and Approval | | |
| Rev | Date | Description | Prepared by | Approved by |



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INSPECTION REPORT : TEST LEAD POINT/ JUNCTION BOX INSTALLATION REPORT

**Chainage
No.**

LOCATION/REFEREN

Report No.

Date :


| TYPE OF TLP/JUN C TION BOX | CHAINAGE | ANCE FROM PIPE LINE | PIPE TO SOIL POTENTIAL | OTHERS |
|--|----------|---------------------|---------------------------|--------|
| | | | | |
| | | | | |
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| | | | | |
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| | | | | |
| | | | | |

REMARKS:

LETTER WRITING ON TLP /JUNCTION BOX (CH No DISTANCE FROM PIPE LINE DIR. LINE FLOW) :

OK/ NOT OK CONNECTION DIAGRAM OF TLP/JUNCTION BOX (INSIDE) : BALANCE / COMPLETE


| | | |
|-------|-----|-----|
| | For | For |
| Sign: | | |
| Name: | | |
| Date: | | |

| | | |
|--|---|--|
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PROCEDURE FOR TRANSFORMER RECTIFIER UNIT INSTALLATION

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| | | |
|--|---|--|
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1.0 PURPOSE: To define the procedure for Installation of transformer rectifier unit and provide adequate quality assurance / control of workmanship and inspection at site.

2.0 SCOPE

This procedure covers installation of transformer rectifier unit for cathodic protection system.

3.0 MATERIALS & EQUIPMENTS

- ❖ Equipments : Measure tape, Electrician tool kit.
- ❖ Materials : Cable, Cable lugs, Ferrule, Gland.

4.0 REFERENCE

- ❖ Data sheet & Manual

5.0 PROCEDURE

1. Carefully unpack the unit after taking it is from the wooden case. Inspect the outside of the unit and check for transit damages.
2. Install the unit on the foundation (outdoor) or on channels (indoors). Care should be taken to ensure that the horizontal level of the foundation is correct. Incorrect foundation level will affect the alignment of the panel doors, which may cause difficulty in closing the doors. CP unit shall be installed inside the control room.
3. Take the cable entry in to the unit through suitably sized gland, which are fixed on the bottom gland plate of the unit. Open the front and back doors of the unit and visually inspect the inside of the unit carefully. Check all the components inside to ensure that there is no damage in transit. Tighten all connections.
4. Check the insulation between the AC input terminal and panel body by means of a megger.
5. The unit should be earthed by copper cable to be connected between the station earth system and the earthing bolt.
6. Pull up various cables such as AC input, anode header, cathode header, reference cell and negative cables, transducer cables and connect them to appropriate terminals in the unit as per wiring and cable termination diagram. The cable entry to the unit shall be through cable glands.
7. All the cables shall be tagged appropriately and ferruled before lugging with appropriate size lug.

6.0 PRECAUTION


All cables are to be appropriately tagged.

7.0 TEST REPORT

Record and document all inspection results obtained in the inspection report format.


8.0 ANNEXURE

Inspection Test Plan Inspection Report

| | | |
|--|--|------------------------|
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Inspection Test Plan: TR Unit installation

| INSPECTION & TEST PLAN FOR TR UNIT INSTALLATION | | | | |
|---|--|------------------|-------------|---------|
| SR.NO. | ACTIVITY | By CONTRACTOR | By Client | REMARKS |
| 1 | PROCEDURE APPROVAL | S | A | |
| 2 | VERIFICATION OF LOCATION, EARTHING & REFERENCE CELL | P | R/RM | |
| 3 | TR UNIT INSTALLATION | P | R/RM | |
| 4 | CABLE TERMINATION & TAGS | P | R/RM | |
| 5 | INSPECTION REPORT | P | R/RM | |
| LEGENDS: | | | | |
| "P" | PERFORM | | | |
| "RM" | RANDOM CHECK | | | |
| "W" | WITNESS ALL | | | |
| "S" | SUBMITTED BY | | | |
| "A" | APPROVAL | | | |
| | | | | |
| | | | | |
| | | | | |
| 00 | | | | |
| Rev. | Date | Prepared by | Approved by | |

| | | |
|--|--|------------------------|
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INSPECTION REPORT:

| | |
|-----------------------------------|-------------|
| TR UNIT RATING | KVA |
| INPUT VOLTAGE (AC/DC) | VOLTS |
| INPUT CURRENT (AC/DC) | Amps |
| OUTPUT VOLTAGE (DC) | VOLTS |
| OUTPUT CURRENT (DC) | Amps |
| EARTHING | OK / NOT OK |
| SCADA MONITORING FACILITY | OK / NOT OK |
| DISTANCE FROM PIPELINE(M) | OK / NOT OK |
| CABLE TERMINATION IN TEST STATION | OK / NOT OK |
| REMARK : | |


Inspection Codes:

W – Witness. Prior notification required

P - Perform

R – Review


| | | | | |
|-------------|-------------|-------------------------|--------------------|--------------------|
| 00 | | For Review and Approval | | |
| Rev. | Date | Description | Prepared by | Approved by |

| | | |
|--|--|----------------------------|
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**PROCEDURE FOR CP ANODE BED INSTALLATION
(DEEPWELL)**

CONTENTS

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1.0 PURPOSE

To describe a procedure for installation of ICCP Anode ground bed and provides adequate quality assurance/control of workmanship and inspection at site.

2.0 SCOPE


This procedure covers installation of Deep anode ground bed as per standard drawing & design document.

3.0 REFERENCES

Installation drawing for Deep anode ground Bed Design and Calculation document for CP system.

4.0 MATERIALS REQUIRED

| Sr.No | Material/Tool | Make | Application/Purpose |
|-------|--|---------------------------|--------------------------------|
| 01 | Crimping Tool | Standard | For crimping cable with lug |
| 02 | Excavation tools & Augers | Standard | For Excavation |
| 03 | Measuring Tape | Standard | Measurement |
| 04 | Petroleum coke breeze | Goa Carbons | Backfill material |
| 05 | Canister | Standard | Sheet steel for Backfilling |
| 06 | MMO Tubular anodes | Lida®/SME /other approved | Anodes for Anode bed |
| 07 | Anode Tail cable | 10 sq.mm XLPE | Connection for CP |
| 08 | Cu Sleeves/ Cable Lug/D clamps/Ferrules, PVC pipe & Warning mat etc. | Standard | Connection, Marking & Laying |
| 09 | Holiday Detector | Caltech | For cable insulation check |
| 10 | Electrical Tool Box | Standard | |
| 11 | Soil Resistivity meter | WACCO | Measurement of resistance |
| 12 | Casing Pipe for Deep anode bed | 6" dia., 3.5mm thick | Casing Pipe for Deep anode bed |
| 13 | PVC Shrouding Pipe | dia., 5mm thick | For Deep anode ground bed |
| 14 | PVC Vent Pipe | 1" dia., 3mm thick | For Deep Well |

| | | |
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| | | | |
|----|-------------------------------------|----------------|-------------------------------------|
| 15 | GI Pipe, Pit foundation, cover etc. | | For Deep anode bed pit |
| 16 | Power Distribution Box | As per Drawing | For Incoming supply |
| 17 | Cathode Junction Box | As per Drawing | For cable termination & measurement |
| 18 | Anode Junction Box | As per Drawing | For cable termination & measurement |
| 19 | Pin Brazing | Safe track | As per procedure defined in tender |

5.0 PROCEDURE

PROCEDURE FOR DEEP WELL ANODE BED

1. Mark the boundary of the land acquired for installation of anode bed. This shall be in line with approved CP equipment layout drawing
2. Locate the Drilling Rig at approved deep well ground bed location.
3. Start the drilling of borehole with suitable diameter drilling bit and drill a borehole of suitable depth as per approved document.
4. Lower the casing pipe (3mm thick min.) one length at a time and coupling various lengths with couplers one after the other.
5. After lowering MS casing pipe, a PVC shrouding pipe equal to the inactive length of the deep well ground bed shall be lowered along the casing pipe from the top.
6. Mark length equal to the required depth on the tail cables of anodes to avoid excessive lowering.
7. Shrouding pipe to be hold at top of casing suitably not to go higher depth.
8. Tie all MMO anodes with vent pipe and cables together and also install the centralizers for each anodes and End weight to last anode as per design approval.
9. Install the MMO anodes with nylon rope by preparing strings together and lower in bore hole along with end weight & vent pipe.
10. Pour coke breeze inside the bore well up to the active length by using suitable method and rest backfill with grout material. Insert PVC conduit up to required depth.
11. Backfilling to be done till active length from top of the pit, and then allow it to settle, fill the top of pit as per approved drawing with grout.
12. Clamp / Tie the anode tail cable and lay up to anode junction box
13. All the tail cables and Header cable shall be laid and terminated in anode junction box.
14. Prepare Anode Ground bed top cover as per approved drawing.

(Sign & Seal of Bidder)

| | | |
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15. All anode tail cable and anode header cable to be laid as per cable laying procedure.
16. Restoration work to be carried out at cable laying and anode bed location.

6.0 PRECAUTIONS

1. Lower anode carefully to avoid damage to tail cable.
2. After lowering the anode numbering to be done.
3. Tail cables and PVC conduits shall be of sufficient length so as to reach Anode Junction Box without any joint.
4. Wherever the underground cable rises above ground, suitable take care to prevent damage to the cable must be provided.
5. All cables are to be appropriately tagged before lowering cables in to trench/bore well.
6. Cable termination at AJB is to be done carefully so as not to damage insulation of the cable.

7.0 HEALTH, SAFETY & ENVIRONMENT

Hazard Identification and risk assessment will be carried out and Operational Control measures shall be adopted for Anode Installation Activities.


- i. Necessary PPE to be utilized
- ii. Only trained personnel to be deployed for this activity.

8.0 QUALITY ASSURANCE & QUALITY CONTROL

Quality Assurance shall be maintained by ensuring the systematic implementation of this Procedure and ensure that necessary quality records are generated as per ITP.

9.0 APPENDIX / FORMATS

- i. Inspection & Test Plan
- ii. Inspection Report

| | | |
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| FOR CONSTRUCTION OF DEEP ANODE GROUND BED | | | | | | |
|---|--|---|--------------------------|-----------------------|--------|---------|
| Owner : | | | | | | |
| CP Contractor : | | | | | | |
| Project : | | | | | | |
| P/L Description : | | | | Jurisdiction : | | |
| Report No. : | | | | | | |
| DOC No. : Procedure/ Drawing | | | | Date : | | |
| Sl No | Activity Description | Controlling Specification / Acceptance Criteria | Verifying Document | cp | client | Remarks |
| 1 | Location check & Checking of Distance, Depth and Length/dia of Anode Bed | Design document & Drawing | Inspection report | P | W | |
| 2 | Individual anode tail cable connection & conduit sealing | Drawing | Inspection report | P | RI | |
| 3 | Check alignment, & installation of Anode for deep well | Drawing | Inspection report | P | RI | |
| 4 | lowering of MS pipe for deep well | Drawing | Inspection report | P | RI | |
| 5 | Filling of Coke Breeze for deep anode bed | Procedure | Inspection report | P | RI | |
| 6 | Check the Cable Laying up to AJB and Backfilling of Soil | Drawing | Inspection report | P | RI | |
| 7 | Cable termination | Drawing | Inspection report | | | |
| LEGEND : RI - RANDOM INSPECTION | | W - WITNESS ALL | AP – APPROVAL/ACCEPTANCE | | | |
| P – PERFORM | | I - INPECTION | H - HOLD R- REVIEW | | | |
| | | | | | | |
| | | | | | | |
| For | | For | | | | |
| Name: | | Name: | | | | |



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Report No. :

DATE :

Reference doc.

Procedure

**Reference drawing
No**

CP station No. & Location

**Chainage
(Km)**

Dimension of anode

Spacing between Anode

| Tail cable size | | Backfill material | | | |
|--------------------|-----|-------------------|------------|--|-----------------------------|
| Casing pipe | Dia | | Thickness | | Anode bed depth (m) |
| | | | | | |
| Vent pipe | Dia | | length | | Anode bed Chamber OK/NOT OK |
| | | | | | |
| PVC Shrouding pipe | Dia | | length | | Coke breeze filling |
| | | | | | |
| End Weight | Kg. | | Connection | | Cable Laying |



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| Anode No | Cable length (m) | Depth of anode (m) | Anode centralizer | Cable tag Number | Remarks |
|----------|------------------|--------------------|-------------------|------------------|---------|
| A1 | | | | | |
| A2 | | | | | |
| A3 | | | | | |
| A4 | | | | | |
| A5 | | | | | |
| A6 | | | | | |
| A7 | | | | | |
| A8 | | | | | |

| | | | |
|------------|--|------------|--|
| For | | For | |
| Name: | | Name: | |
| Sign: | | Sign: | |
| Date | | Date: | |

| | | |
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HEALTH, SAFETY ENVIRONMENT [HSE] SPECIFICATIONS

HEALTH, SAFETY AND ENVIRONMENT [HSE] SPECIFICATIONS

1.0 SCOPE

These specifications establish the 'Health, Safety and Environment [HSE] Management' requirement to be complied with by the Contractors during executing their Job. Requirements stipulated in these specifications shall supplement the requirements of 'HSE Management' given in relevant act(s) / legislation(s).

2.0 REQUIREMENTS OF 'HEALTH, SAFETY AND ENVIRONMENT [HSE] MANAGEMENT SYSTEM' TO BE COMPLIED BY BIDDERS

2.1 Preferably, the Contract should have a documented 'HSE Policy' to cover commitment of their organization to ensure health, safety and environment aspects in their line of operations.

2.2 The Contractor shall ensure that the BGL's 'Health, Safety and Environment [HSE]' requirements are clearly understood and faithfully implemented at all level, at sites.


2.3 Contractor shall promote & develop consciousness for health, safety & environment among all personnel working for the Contractor. Regular work-site meetings shall be arranged on 'HSE' activities to cover hazards involved in various operations during executing their jobs, location of First Aid Box, trained personnel to give First Aid, Assembly Points, standby Ambulance or vehicle and fire protection measures such as fire hydrant, water and fire extinguishers, etc.

2.4 Non-conformance of 'HSE' by Contractor [including his sub-Contractors] as brought out during review/audit by BGL / external agency authorized by BGL, shall be complied by Contractor and its report to be submitted to BGL.

2.5 Contractor shall adhere consistently to all provisions of 'HSE' requirements. In case of non-compliance of continuous failure in implementation of any of the 'HSE' provisions, BGL may impose stoppage of work and a suitable penalty for non-compliance. The decision of imposing work-stoppage, its extent & monetary penalty shall rest with BGL.

2.6 All fatal accidents and other personnel accidents shall be investigated for root cause by BGL and Contractor shall extend all necessary help and cooperation in this regard. Recommend corrective and preventive actions of findings will be communicated to Contractor for taking suitable actions should be taken by the Contractors to avoid recurrence of such incidences.

2.7 Contractor shall ensure that all their staffs and workers, including their sub-Contractor(s), shall wear 'Personal Protective Equipments [PPEs]' such as safety

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helmets, safety shoes, safety belts, protective goggles, gloves, etc., as per job requirements. All these gadgets shall conform to relevant IS specifications or equivalent.

2.8 Contractor shall assign competent & qualified personnel for carrying out various tasks/jobs as per requirement.

2.9 All equipments should be tested and certified for its capacity before use.

2.10 Contractor shall ensure storage and utilization methodology of materials that are not detrimental to the environment. Where required, Contractor shall ensure that only the environment-friendly materials are used.

2.11 All persons deployed at site shall be knowledgeable of and comply with the environmental laws, rules and regulations relating to the hazardous material substances and waste. Contractor shall not dump release or otherwise discharge or dispose off any such materials without the express authorization of BGL.


2.12 Contractor should obtain all work permits before start of activities [as applicable] like hot work, confined space, work at heights, storage of chemicals/explosive materials and its use & implement all precautions mentioned therein.

2.13 Contractor should display at site office and work locations caution boards, provide posters, banners for safe working to promote safety consciousness, etc.

2.14 Contractor should carryout audits/inspections/supervisions at the sub-Contractor's works and submits the reports for review by BGL.


3.0 RELEVANT CODES FOR 'PERSONAL PROTECTION EQUIPMENTS'

| | |
|---------------------------|--|
| IS: 2925 – 1984 | Industrial Safety Helmets |
| IS: 47701 – 1968 | Rubber Gloves for Electrical Purpose |
| IS: 6994 - 1973 [Part-I] | Industrial Safety Gloves [Leather & Cotton Gloves] |
| IS: 1989 - 1986 [Part-II] | Leather Safety Boots & Shoes |
| IS: 5557 – 1969 | Industrial & Safety Rubber Knee Boots |
| IS: 6519 – 1971 | of Practice for Selections, Care & Repair of Safety Footwear |
| IS: 11226 – 1985 | Leather Safety Footwear Having Direct Molding Sole |
| IS: 5983 – 1978 | Eye Protectors |
| IS: 9167 – 1979 | Ear Protectors |
| IS: 3521 – 1983 | Industrial Safety Belts & Harnesses |

| | | |
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SECTION – 9

LIST OF SPECIFICATIONS & DRAWINGS

| | | |
|--|---|--|
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List of specifications and Drawings

A) Manual Test Stations (MTS) type A A.F A.G A.F.I A.I AD BI BD have been installed along the pipeline across the cities to monitor the performance of C.P. system. These type of M T.S. have the facility to measure PSP and current. In addition to these, intermediate test stations have also been installed depending upon the location of special points like Railway, H.T., Foreign P/L crossing, etc. Each test station has a terminal plate having 11 terminals fitted in a lockable metal enclosure. Brass links, resistors, shunts etc. have been used.


B) Anode Lead Junction Boxes (ALJB) are installed in customer premises. There are ten ALJBs installed across pipeline, where CPVCM/TR/CPPSM units are available. Few CPVCM/TR/CPPSM/ ALJB may exist at other pipeline installations ie. CNG station, CGS etc.

A detailed scope of work to be followed during annual rate contract of maintenance/repairing job of the installations has been given as under:

1) REPAIRING OF MTS(MANUAL TEST STATION). The scope of work shall include supply & replacement of damaged door, locks in MTS, proper cable termination, diagram plate, terminal plate, gasket, shunts, brass links, ferrules & painting of MTS (as per procedure mentioned at S. No.-0 'Painting 'etc. complete in all respect including labour, tools and tackles, consumables like MS/Brass bolts, nuts, washers, lugs, insulation tape, paint etc. as per the drawings specification. The scope of work shall also include repairing/ construction of MTS foundation of size 500(L) x 500 (W) x 700 (D) in 1:2:4 cement concrete (01Cement: 02 coarse sand: 04 aggregate) with supply and replacement of foundation bolts including labour, tools, tackles, consumables, like MS/Brass nuts, bolts, washers, insulation tape, cement, brick, sand, aggregates etc. complete in all respect as per approved drawings, specifications and direction of Engineer-In-charge. For drawings and specifications refer specification for MTS.

2) REPAIRING OF MTS DOOR: The scope of works includes supply and installation of MTS door, Locks in MTS, proper cable termination, diagram plate, terminal plate, gasket, shunts, brass links, ferrules etc. complete in all respect including labour, tools and tackles, consumables like MS/Brass bolts, nuts, washers, lugs, insulation tape, paint, welding etc. as per the drawings specification.

3) INSTALLATION & FIXING OF OLD MANUAL TEST STATION ON AVAILABLE FOUNDATIONS: The scope of work shall include installation of MTS on available foundation with supply and replacement of foundation bolts, minor repairing of foundation including labour, tools, tackles, consumables, like MS/Brass nuts, bolts, washers, insulation tape, cement, brick, sand, aggregates etc. complete in all respect as per approved drawings, specifications and direction of the EIC/SIC.

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4) Shifting of Manual Test Station along with foundation and cable to suitable location: The scope of work shall include installation of MTS along with foundation with supply and replacement of foundation bolts, minor repairing of foundation including labour, tools, tackles, consumables, like MS/Brass nuts, bolts, washers, insulation tape, cement, brick, sand, aggregates etc. complete in all respect as per approved drawings, specifications and direction of the EIC/SIC.

5) SUPPLY & INSTALLATION OF METALLIC TYPE MANUAL TEST STATION: The scope of work shall include supply of metallic type manual test station with lower bend and with PCC foundation (as per the specification mentioned in this tender), two joints with pipe, construction of foundation as per drawing mentioned in the tender document including transportation at the site, supply of terminal plate & diagram plate with 02 Nos allen-key lock & 01 No central lock, painting as per specification and entire satisfaction to the EIC.

6) SUPPLY & INSTALLATION OF METALLIC TYPE MANUAL TEST STATION: Supply & Installation of Manual Test Station without lower bend & without PCC foundation including terminal plate, diagram plate, cable identification ferrules and proper cable termination with lugs, numbering of Test Station etc. as per drawing & specification (with IP55) complete in all respect and per instruction of EIC.

7) SUPPLY OF XLPE ARMoured COPPER CABLE: (SOR# 70, 80, 90, 100 & 110) Supply of XLPE copper cable of sizes, 4, 6, 10, 25, 35 Sq. mm as per specification given below.

Cables specification: Cross linked polyethylene insulated, PVC sheathed, GI armoured single core multistranded copper conductor, tinned, annealed copper wire conductor of 650 /1100 V grade. The contractor shall submit inspection report & test certificate from manufacturer. Color of Cable should be as per specifications mentioned in NACE for CP cables.

Colour of sheath: Black PE compound.

Colour of insulation: Cross linked PE complying with IEC 502. No of core: shall be one core.

Armouring – Single layer of galvanized steel wire.


Voltage grade: 650 /1100 V

8) LAYING & TERMINATION OF XLPE ARMoured COPPER CABLE

Cable laying, details & cable connections:

The following types of cables are to be used for different jobs:

1) Anode Header Cable (1x35 Sq mm XLPE, Copper conductor (as per specification))

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- 2) Cathode cable, bonding & grounding (1x25 Sq mm XLPE, Copper conductor (as per specification))
- 3) Permanent reference cell cable (1x10 Sq mm XLPE, copper conductor (as per specification))
- 4) Test station cable (Potential measurements)/Connection between earth pit and Metering Skid (1x6 Sq mm XLPE, Copper conductor (as per specification))
- 5) Test station cable (Potential measurements)/ Connection Between earth pit and Metering Skid (1x4 Sq mm XLPE, Copper conductor (as per specification))
- 6) The size of cable may change with permission of EIC.
Cable laying of sizes 4, 6, 10, 25, 35 Sq. mm XLPE armoured cable inside the test station / over ground & underground / inside the panel including supply & laying of bricks, sand etc including tools tackles, labour, insulation tapes as per the direction of EIC.


All cables inside cables inside station/plant area shall be laid at a depth of 0.75 M. Cables outside station/plant area shall be laid at a depth of 1.5m. Cables shall be laid in sand under brick cover back filled with normal soil. 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.

9) PAINTING OF MTS/ALJB: The scope of work includes removing rust , oil bound dust & old paint etc. by paint removing chemical, emery paper, wire brush etc, preparing the surface smooth including necessary repairs of scratches/dents, applying priming coat of ready mixed red oxide primer of approved brand and repainting with ready mixed paint of approved brand (2 coats, having Dry Film Thickness not less than 130 micron) to give an even shade on painted MTS, ALJB & CTS as per procedure, specification and direction of EIC. All the consumables like red oxide, paint, emery paper, wire brush, painting brush etc are in the scope of contractor. The contractor shall use primer and synthetic enamel paint of reputed brands only ASIAN/BURGER/NEROLAC. The colour shall be epoxy light grey (Shade 631 of ISI).

After Painting the following information shall be clearly painted on the back of MTS–

- a. Test station no
- b. Chainage in KM.
- c. Dia & Name of Pipeline
- d. Test Station connection scheme type
- e. Direction of flow

10) SUPPLY & REPLACEMENT OF PERMANENT REFERENCE CELL: Highly reliable pre- packed in cotton bag (75% Hydrated Gypsum + 20% Bentonite + 5% Sodium Sulphate) permanent reference cells of make MC Miller /Tinker & Rasor are used in CPVCM stations. A reference cell is placed on a pipeline as shown in drawing and its cable connections are taken to the terminal of CPVCM. Drawing & connection diagram for the installation of

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permanent reference cell is enclosed in this tender document.

The scope of work includes supply and replacement of permanent reference cells, supply & termination of 50 meter XLPE 10 Sq. mm copper lead cable in the test station with complete digging, trenching & backfilling in all respects as per the direction of EIC. All the tools-tackles, labour, consumables like sand, bricks, lugs, MS/Brass nuts, bolts, washers, insulating tapes etc. For Permanent reference cell contractor has to provide the Warrantee of material and workmanship upto expiry of defect liability period

11) REPAIRING OF ALJB: The scope of work shall include supply & replacement of damaged lock & latch, shunts, variable resistance, brass links including welding fitting, hinges of anode lead junction box door, including labour, tools, tackles, consumables like lugs, MS/Brass nuts, bolts, washers, insulation tape etc. complete in all respect as per approved drawings, and direction of EIC. The locks to be provided for outer enclosure is of panel mounting throw type as per specification attached.

12) EXCAVATION OF PIT: The scope of work shall include excavation of pits on the pipeline for bell hole inspection for checking the health of pipeline including backfilling & restoration to original condition. This job includes all the tools- tackles, labour etc in all respect as per direction, specification & satisfaction of EIC.


13) MAINTENANCE OF AGB: The scope of work shall include maintenance of anode ground bed to achieve minimum grounding resistance as per NACE standard. All the consumable items (including water, salt, chemicals etc.) required for maintaining the anode ground bed are to be provided by the contractor. Job is to be carried out as per the direction, specification & satisfaction of EIC

14) CABLE CONNECTION TO THE PIPELINE: The scope of work shall include cable connection to the pipeline as per approved procedure including excavation, holiday test of the exposed portion, labour, tool-tackles etc. as per direction, specification & satisfaction of EI

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 pin brazing connection point shall not exceed 0.1 ohm. Cable connection by different method –

a) PIN BRAZING: The scope of work includes cable jointing by pin brazing as per the enclosed drawing, all consumables and hardware required are in the scope of contractor. The scope of work also includes removing coating as per approved procedure and drawings and repairing of coating after pin brazing.

b) SILVER SOLDERING: The scope of work includes cable jointing by silver soldering as per the enclosed drawing, all consumables and hardware required are in the scope of contractor. The scope of work also includes removing coating as per approved procedure and drawings and

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repairing of coating after soldering.


15) SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF EARTH PITS:

This includes excavation of hard/soft soil (3*1*1M), making of earth chamber (as specified in drg no. as Annexure-A), providing of Main Electrode (3M long 80mm dia GI PIPE) & MS Cover. The excavated portion is to be filled with high conductivity soil, common salt & charcoal & to be rammed & watered to get the proper bonding of the electrode with adjacent soil. Painting of cover & base frame with single coat red oxide & two coats of synthetic enamel paint. The painting job is to be started after thoroughly cleaning & descaling of the surface. The earth pit is also to be provided with identification number as per existing practice. The earth pit is to be connected with the adjacent earth strip to form the earth grid, all the hardware including spring washers used for this purpose shall be hot dip galvanized as per IS 802 or zinc passivated. Joints and tappings in the main earth loop shall be made in such a way that reliable and good electrical connections are permanently ensured. All joints below ground shall be welded and suitably protected by applying bitumen and covering with Hessian tapes properly. All joints above ground shall be by means of connectors/ lugs or properly welded. Welding should be free from defects; the joint is to be properly cleaned & same is to be galvanized by applying cold galvanizing compound or spray. (details also provided in attached technical specifications)

16) REPAIRING OF EARTHPIT CHAMBER: Chamber is to be repaired by dismantling the existing chamber and erecting new chamber with, Supply of all man, materials and machinery including earth pit cover, paints and primer to complete the job as per drawing are in the scope of the contractor. Painting is to be done with two coats of primer and two coats of synthetic enamel paints. Earth-pit cover is to be grouted after painting. Debris is to be removed to a site specified by EIC. (details also provided in attached technical specifications)

17) MAINTENANCE OF EARTHPIT : This job includes cleaning of earth pit surroundings and chambers, tightening of connections between earth pit and metering skid, replacing of nut bolts, lugs, pouring of soft soil, salt, water to achieve pit resistance of One Ohm, paintings of pit cover, letter wrighting on pit covers etc. All tools, tackles, consumables and labour are the scopes of the contractor.

18) SUPPLY, INSTALLATION & COMMISSIONING OF SPARK GAP ARRESTOR (Surge diverter): The scope of work includes supply, installation & commissioning of spark gap arrestor of DEHN or equivalent make and installing it across the Insulation joints. Required length & size of cable, consumables etc are in the scope of contractor.

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19) SUPPLY, INSTALLATION & COMMISSIONING OF SSPC (SOLID STATE POLARIZATION CELL):

The scope of work includes supply, installation & commissioning of SSPC (Solid state polarization cell) of ICCC (Rustroll system) or Dairyland or equivalent make (as approved by EIC) suitable for arresting induce AC voltage/ current, AC fault currents, lightning & surge protection, DC voltage (>3 volts) and blocks the protective cathodic protection current on the pipeline. Supply and installation of SSPC, zinc grounding cell (as per specification mentioned in this tender document), test station of suitable size, required length & size of cable, consumables etc are in the scope of contractor.

20) SUPPLY & INSTALLATION OF PRE –PACKED Zn/MG 48/18 LBS ANODE ALONG ROU:

The scope of work includes supply and installation of pre-packed magnesium/Zn anodes (as approved by EIC) having weight 48 pound/18 pound installed along city gas pipeline. This job includes excavation of pit, cable trenches, cable of suitable size, cable laying up to test station, cable termination in test station, backfilling with consumables, labour, toll-tackles etc as per approved drawing, specification and direction of EIC. Specifications should be as per ASTM-B- 418 standard. (details mentioned in attached technical specifications)


21) CHECK AND REPAIR OF CASED CROSSINGS: The scope of work shall include checking of cased crossings by recording of various parameters like CSP, PSP, ASP, low voltage megger reading for resistance between carrier and casing etc and in case probable moisture/dirt in the annular space between pipeline and casing, the would have to be cleaned as per the site requirement as per the direction of EIC. In case end caps needs to be replaced, same is to be supplied by the contractor, however, cost of the same shall be reimbursed by GAIL Gas.

22) SUPPLY OF PORTABLE REFERENCE CELL: The scope of work includes Supply of portable reference cell of Make Mc Miller / Tinker & Rasor Company / Borin as per the instruction of EIC.

23) SUPPLY AND LAYING OF GI 10SQMM EARTHING ROPE WITH SUITABLE SIZE LUGS: The scope of works includes supply and laying of GI 10sqmm earthing rope and laying as per direction of EIC. All tools, tackles, labour, trenching, removing debris from site etc are the scope of the contractor.

24) SUPPLY AND LAYING OF GI 25 X 3 MM EARTH STRIPS.

All the materials used for this work shall be in the scope of contractor GI EARTHSTRIP LAYING includes supply, fabrication , bending, cuttings, shifting of Strips; welding& drilling at site mentioned by EIC; terminating with nut, bolt and lug; applying paint and Hessian tape to prevent corrosion at welded joints, near drilled holes. The connections between GI earth electrode and the disconnecting plates shall be done by GI Strips.


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Applicable codes

The materials to be supplied shall unless otherwise specified, conform to the requirements of latest relevant applicable standards of:-


- i. NACE Standard RP-0169: Standard Recommended Practice Control of External Corrosion on Underground or Submerged Metallic Piping systems.
- ii. NACE Publication 10A190: Measurement technique related to criteria for CP of Underground or Submerged Steel Piping System (as defined in NACE Standard RPO169-83).
- iii. NACE Standard RP-0177: Standard Recommended Practice Mitigation of Alternating Current and Lighting Effects on Metallic Structures and Corrosion Control Systems.
- iv. NACE Standard RP-0286: Standard Recommended Practice the Electrical isolation of Cathodically Protected Pipelines.
- v. NACE Publication No. 54276: Cathodic Protection Monitoring for Buried Pipelines.
- vi. BS 7361 Part I: Code of Practice for Cathodic Protection for land and Marine applications.
- vii. VDE 0150: Protection against Corrosion due to Stray Current from DC Installations.
- viii. IS: 7098 Part I: XLPE insulated cables.
- ix. NACE Standard RP-0572: Standard Recommended Practice Design, Installation & Operation of Impressed Current Deep Ground beds.
- x. IS: 8062: Recommended Practice ICCP for Underground Piping.
- xi. IEEE Standards: Institute for Electrical and Electronic Engineers
- xii. OSID Standards: Oil Industry Safety Directorate
- xiii. IEC Standards: International electro technical commission
- xiv. PNGRB Guidelines: Petroleum & Natural Gas Regulatory Board
- xv. ASTM Standards: American Society for Testing and Materials
- xvi. PESO Norms: Petroleum and Explosive Safety Organization
- xvii. API Safety Norms: American Petroleum Institute
- xviii. IS: 1554 Part I: PVC Insulated (heavy duty) cables**

In case of conflicting requirements amongst any of the above standards the publication having most stringent requirement shall be governing.

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List of Specifications & Drawings

1. Specifications of Supply & Installation of metallic type MTS
2. Specifications & drawing for Cables and their laying
3. Specifications & drawing of Permanent Ref. Cell
4. Specification & drawing of Anode Lead Junction Box
5. Specifications & drawing of Magnesium Anode
6. Detailed drawing for Pin Brazing
7. Specifications & drawing of Earth pit
8. Specification & drawing for Spark Gap Arrestor
9. Specification & drawing for Solid State Polarization Cell
10. Specification & drawing for Zinc Grounding Cell
11. Specification & drawing for Zinc Anode
12. Drawings of various type Manual Test Station


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SPECIFICATION FOR SUPPLY & INSTALLATION OF METALLIC TYPE MTS

11 terminal weather proof manual test station (MTS) with complete foundation elbow post mounted type for current and potential measurement of C.P. system, complete with hinged door with concealed castle lock having flap and master key. Terminal plate shall be Phenolic laminated sheet with brass nuts & washers.

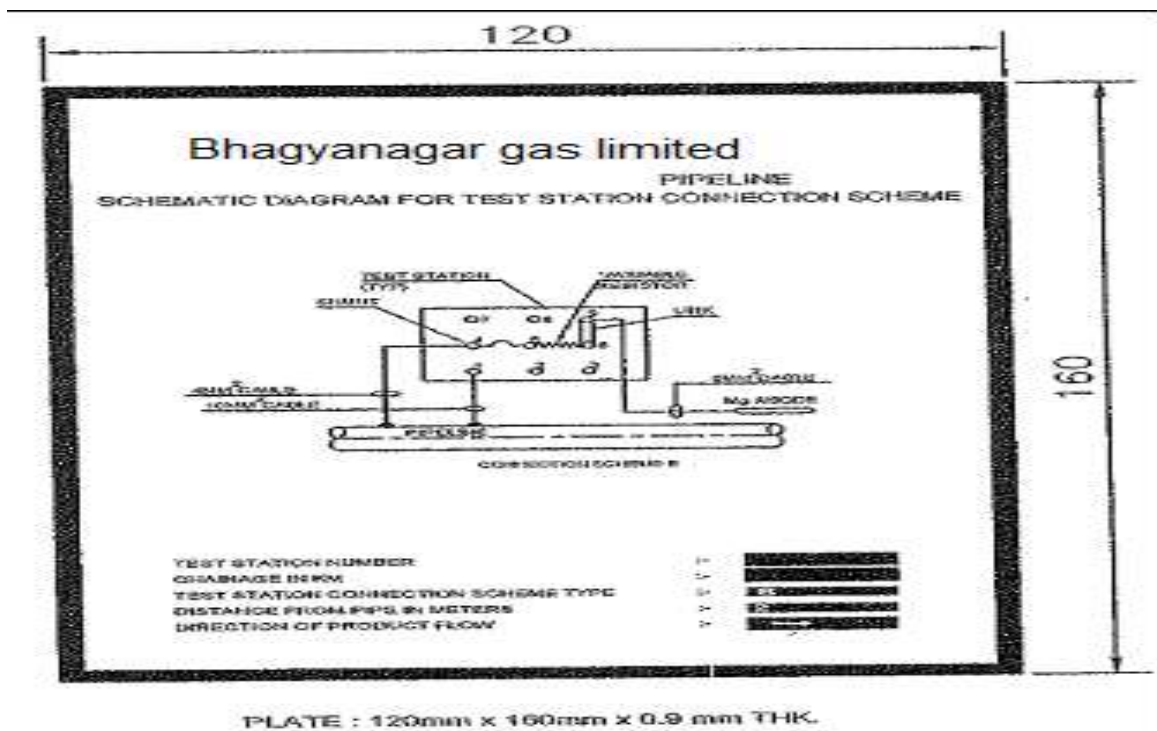
| | | |
|--|--------------|-------------|
| 1. Bottom Plate 5 mm thk | 400 x 400 mm | 1 |
| 2. Rear & sides 3 mm thk | | 1 |
| 3. Top 3 thk | 1 | |
| 4. Front top 3 mm thk | | 1 |
| 5. Front Bottom 3 mm thk | | 1 |
| 6. Shutter 3 mm TK | | 1 |
| 7. Name plate Anodized Aluminum 0.5 mm thk 120x160 | | 1 |
| 8. Castle lock with master key | | 1 |
| 9. Hinge for shutter | | 2 |
| 10. Terminal plate 6x160x200 mm Phenolic LAM SHT | | 1 |
| 11. Brass stud M6 x 50 | | 1 per term. |
| 12. Brass Nut M6 | | 4 per term. |
| 13. Brass washer | | 8 per term. |
| 14. MS Angle 5TK 50 x 50 x 30 | | 6 |
| 15. Brass Screw M6 x 16 | | 4 |
| 16. Latch for Shutter | | 1 |
| 17. MS Coupling plate 5 thk | MS Plate | 1 |
| 18. MS Pipe 100 Nominal Bore 4.5 thk | | 1 |
| 19. Neoprene Rubber Gasket 6 thk | | 1 set |
| 20. Foundation plate 6 mm thk* | | |
| 21. Rubber Bush | | 1 |
| 22. Foundation Bolt M-12 with spring washer and nut* | | 4 set |
| 23. Stiffner plate 6 thk, 100 x 100 mm | | 4 |
| 24. 8 mm dia steel rod* | | as required |
| 25. Concrete mix M-15* | | as required |
| 26. Binding wire* | | as required |
| 27. Ferrule | as required | |

- Test station shall have weather proof enclosure having degree of protection IP-55. As defined in IEC 529 1989 /IS :2140
- The shutter shall be hinged type with castle G/C-Type lock and shall have door gasket to make test station weather proof.
- The angles shall be welded to the shutter and the box suitably.
- The MS angles shall be welded to the sides. The angles shall have tapped holes for fixing terminal plate
- The inner surface of the test station shall be painted with lead oxide primer grade 'AA' sigma paint or its equivalent.
- The outside of test station shall be painted with two coats of zinc red epoxy primer type cf 686 Asian paints or equivalent make and three coats of battle ship grey colored epoxy paint type dark A grade CF 691 of Asian paints or equivalent. Total paint thickness


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including primer 100-140 microns.

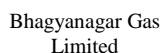
7. The nameplate shall be of anodized aluminum with black background and white letters. The name plate shall be fixed to the inner side of shutter by araldite.
8. The nameplate of each test station shall carry the following information
 - a. Test station no.
 - b. Chainage in KM.
 - c. Dia & Name of Pipeline
 - d. Test Station connection scheme type
 - e. Distance from pipe in Mtrs.
 - f. Direction of product flow.



9. When erected the test station shall be in upright position.
10. Test station shall be so erected as to serve as a pipeline marker also. Their shutters shall be parallel to the line of axis and facing it an arrow showing direction of flow should be marked to underline the test station number of shutter
11. The number of all test stations shall be written with black paint using 40mm stencil block on the outer side of the front shutter in a uniform manner
12. Height of the test station given in the drawing above ground level is typical. The actual height shall be decided on HFL levels to be ascertained.
13. All cables coming to test station shall be labeled on both ends with

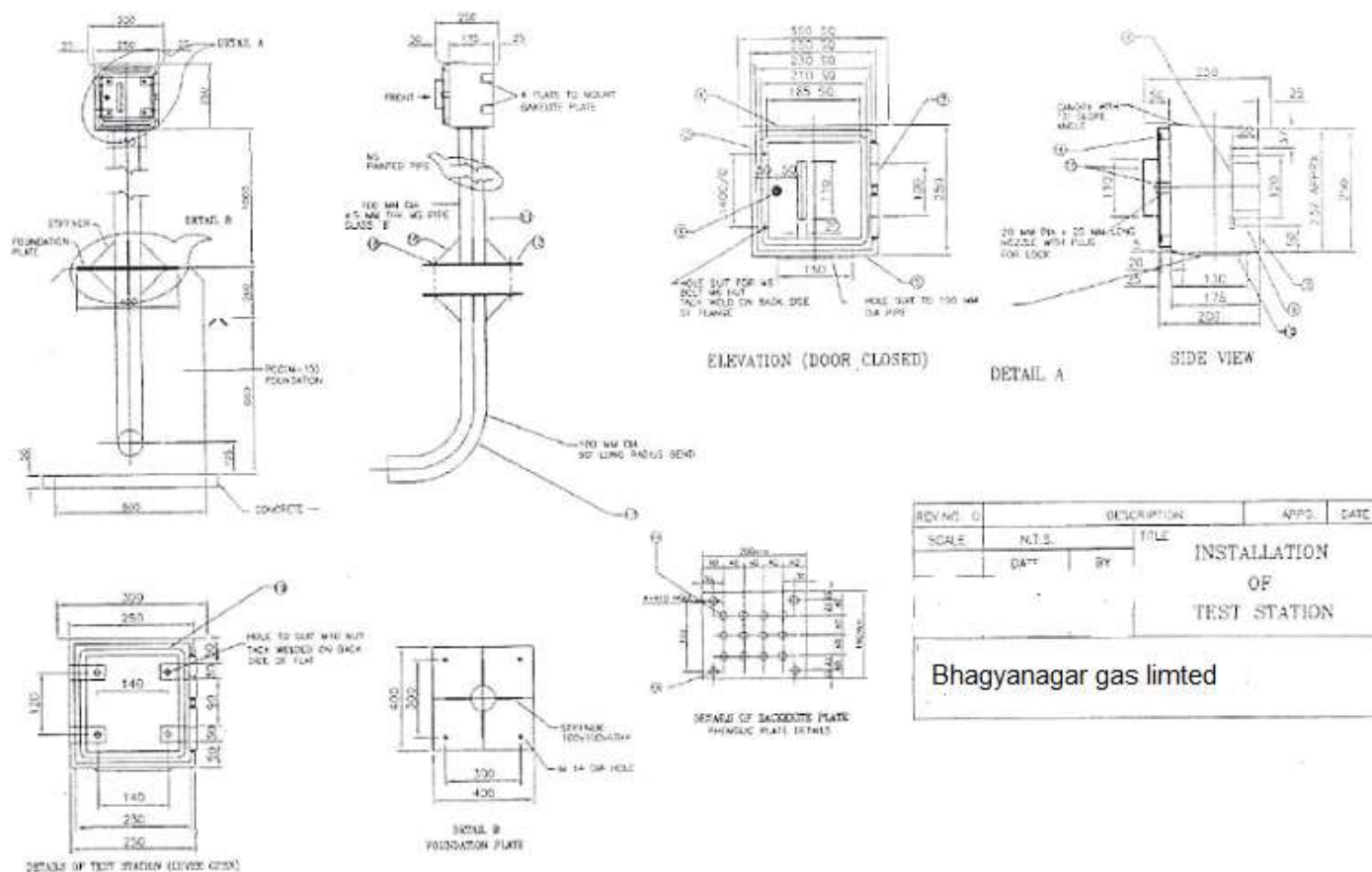
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- identification numbers/connection scheme.
14. Lugs for cable connections to the test station shall be double crimped on the cable conductor.
 15. The number of terminals used shall be same for all test stations. The terminals used for one test station depend upon the requirements of the connection at the particular location.
 16. Provide bottom clear cover as 70mm and for side reinforcement as 40mm.
 17. All dimensions are approx. and can vary slightly.
 18. Test between brass terminals and body at 2 KV for one minute.
 19. Foundation size shall be 500 (L) x 500 (W) x 700 (D)



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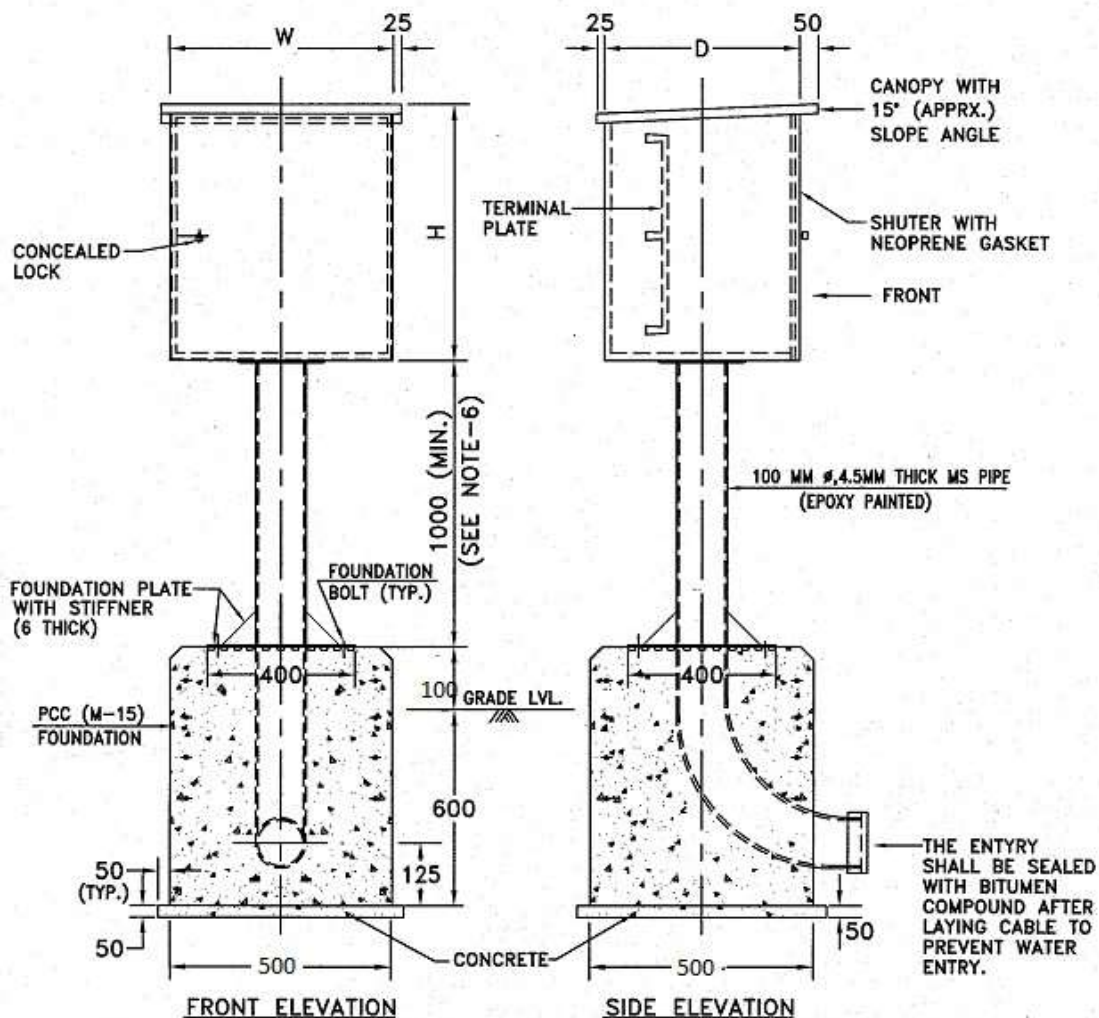


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NOTES :-

1. THE SHUTTER SHALL BE HINGED TYPE WITH CONCEALED LOCK & SHALL HAVE DOOR GASKET TO MAKE THE TEST STATION WEATHER PROOF (IP:55)
2. THE INNER & OUTER SURFACE OF THE TEST STATION SHALL BE EPOXY PAINTED.
3. THE NAME PLATE SHALL BE OF ANODISED ALUMINIUM WITH BLACK BACKGROUND & WHITE LETTERS & SHALL BE FIXED TO THE INNER SIDE OF SHUTTER.
4. TEST STATION SHALL BE ERECTED WITH THEIR SHUTTERS PARALLEL TO THE LINE OF AXIS & FACING THE PIPE LINE.
5. THE CHAINAGE OF TEST STATION SHALL BE WRITTEN WITH BLACK PAINT ON THE OUTER SIDE OF THE FRONT SHUTTER.
6. HEIGHT OF THE TEST STATION SHOWN ABOVE GROUND LEVEL IS MINIMUM ONLY. THE ACTUAL HEIGHT SHALL BE DECIDED BASED ON LOCAL FLOOD LEVELS TO BE ASCERTAINED.
7. CONTRACTOR SHALL FURNISH ALL THE DIMENSIONS OF THE TEST STATION.
8. ALL THE DIMENSIONS ARE IN MM.

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SPECIFICATION & DRAWING FOR CABLES & THEIR LAYING

All cables under the scope of supply within this tender shall be XLPE insulated, galvanised steel wire armoured, sheathed, single core tinned annealed copper conductor of various sizes up to and including 35 sq mm.


The contractor shall submit inspection /test certificate from the

| | |
|-------------------------|---|
| manufacturer. Conductor | : Stranded tinned annealed |
| copper wire | |
| Cross Sectional Area | : 4 sq mm; 10 sq mm; 25 sq mm; 35 sq mm |
| No of core | : single core |
| Armouring | : Single layer of galvanised steel wire |
| Voltage grade | : 650 /1100 volt |

Codes & Standards

Cables shall be designed in accordance with:

1. BS specifications & code of practice.
2. IEC publications.
3. IEEE publications.
4. India standard (IS).

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SPECIFICATIONS & DRAWING OF PERMANENT REF. CELL

High purity Copper-Copper sulphate type permanent reference cells of Mc Miller/ Tinker & Rasor make shall be supplied for buried and dry soil application. It consists of high purity bare copper rod/wire, submerged in saturated solution of high purity copper sulphate with excess crystals of copper sulphate at the bottom of ceramic container, with necessary sealing and porous ceramic plug to make contact with the surrounding earth. This reference cell shall be pre-packed in cotton bag with special back-fill and connected with a lead cable. The permanent reference cell shall be designed and guaranteed for 20 years of life in buried, unattended and even dry soil conditions including soft rocks. A tag showing the manufacturer's identification number, year of manufacture shall be attached to the lead cable end and near the reference cell end.

Backfill material shall contain

| | |
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| by volume: Gypsum | 75 % |
| Bentonite | 20 % |
| Sodium Sulphate | 5 % |

Lead Cable:

1. Conductor : Anneled high conductivity copper stranded
2. Cross Section area : stranded 4 m
3. No of Core : Single
4. Oversheath : Polyvinyl
5. Armouring : GI wire armoured
6. Voltage grade : 650/1000 V
7. grade : XLPE
7. Insulation : 50 meter long without any joint in between

Stability : Within ± 5 mv w r t standard Reference cell/ electrode.
: Within ± 20 mv w r t good copper-copper sulphate portable reference cell
Inspection / test certificates, warranty certificates by the anufacturer shall be submittedz



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AccuRef



Copper Sulfate AccuRef 20

MCM is pleased to present the **NEW AccuRef 20** permanent Copper/Copper Sulfate electrode. This electrode represents state-of-the-art technology and is the result of MCM's commitment to on-going research and development for the Cathodic Protection industry.

FEATURES:

- **Electrode:** Permanent Copper/Copper Sulfate.
- **Long Life:** AccuRef 20 - 20 year reference electrode.
- **Applications:** Under ground without chloride (<500 PPM) contamination and fresh water.
- **Low Freezing Point:** -20 degrees Centigrade.
- **Shelf Life:** 20 years (AccuRef 20).
- **High Purity:** Cu/CuSO₄ and triple de-ionized and distilled H₂O.
- **Cost:** Less expensive than most Copper Sulfate stationary electrodes.
- **Tip:** Moisture absorbent ceramic tip.
- **Evaporation:** Will not dry out at low humidity and/or high heat.
- **Wire:** 25 feet of AWG 12 lead wire; cross-linked Polyethylene jacket, direct burial, low leakage, 600 V, 90° C Rating, USE - 12/RHH/RHW-2. (Longer lengths of wire are available. Other wire types may be available. Contact MCM for more information.)

The AccuRef Permanent Electrodes are designed for 40-year life expectancy, de-rated for engineering practices to 20.

Antifreeze is added to the solution to lower the freezing point to -20 degrees Centigrade. This enables the AccuRef 20 Permanent Electrode to survive a deep frost without freezing and cracking the electrode.

Boiling point is 100 degrees Centigrade.

The AccuRef 20 contains 80 grams of high purity Cu 99.99% and 500 Milliliters of saturated Cu/CuSO₄.

Dimensions: 2.77" diameter, 15" long and 3.9 pounds.

*Specifications are subject to change without notice.



Part # 14630

MCM
MEMILLER Co.

Instruments and Equipment for the Corrosion Engineer

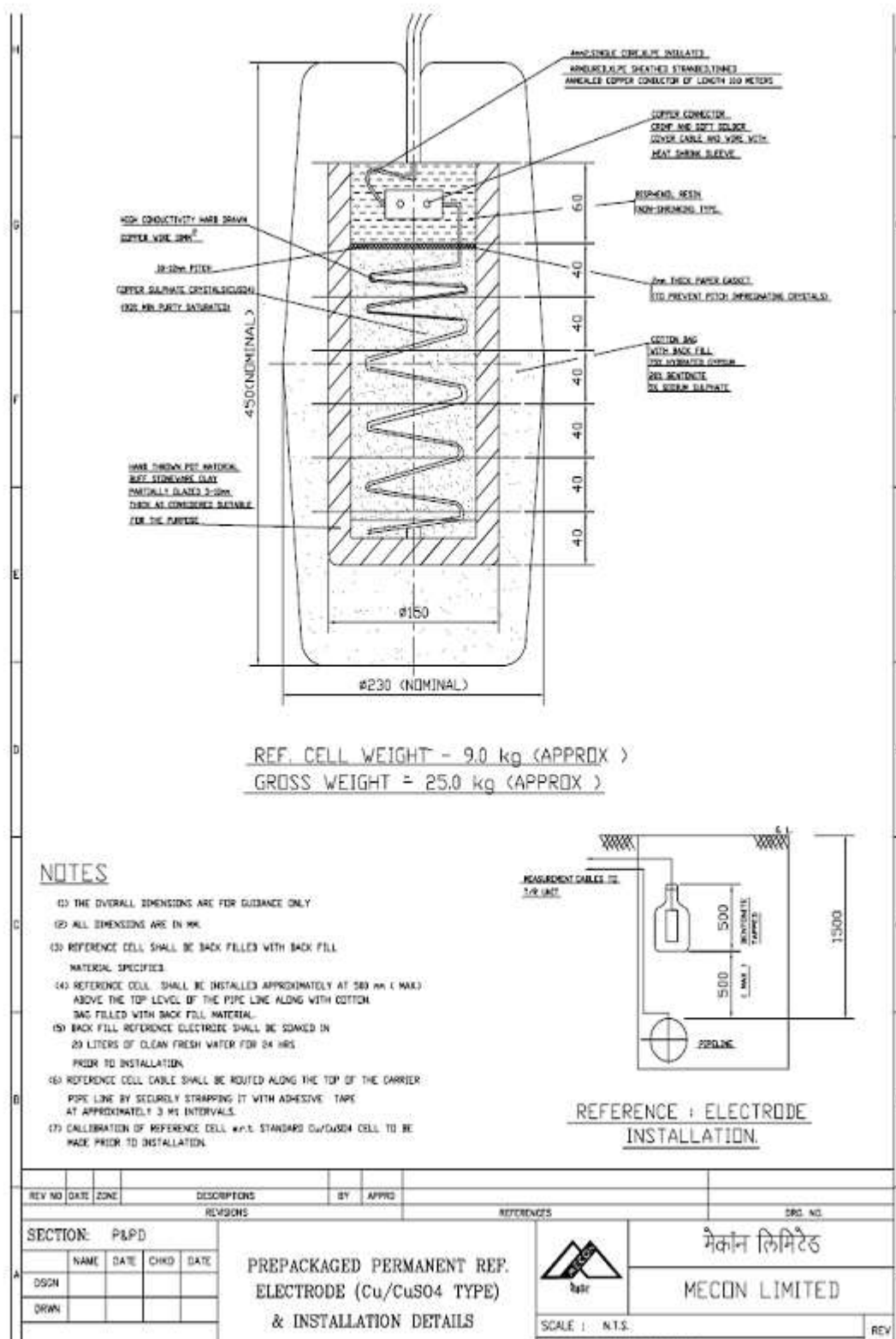


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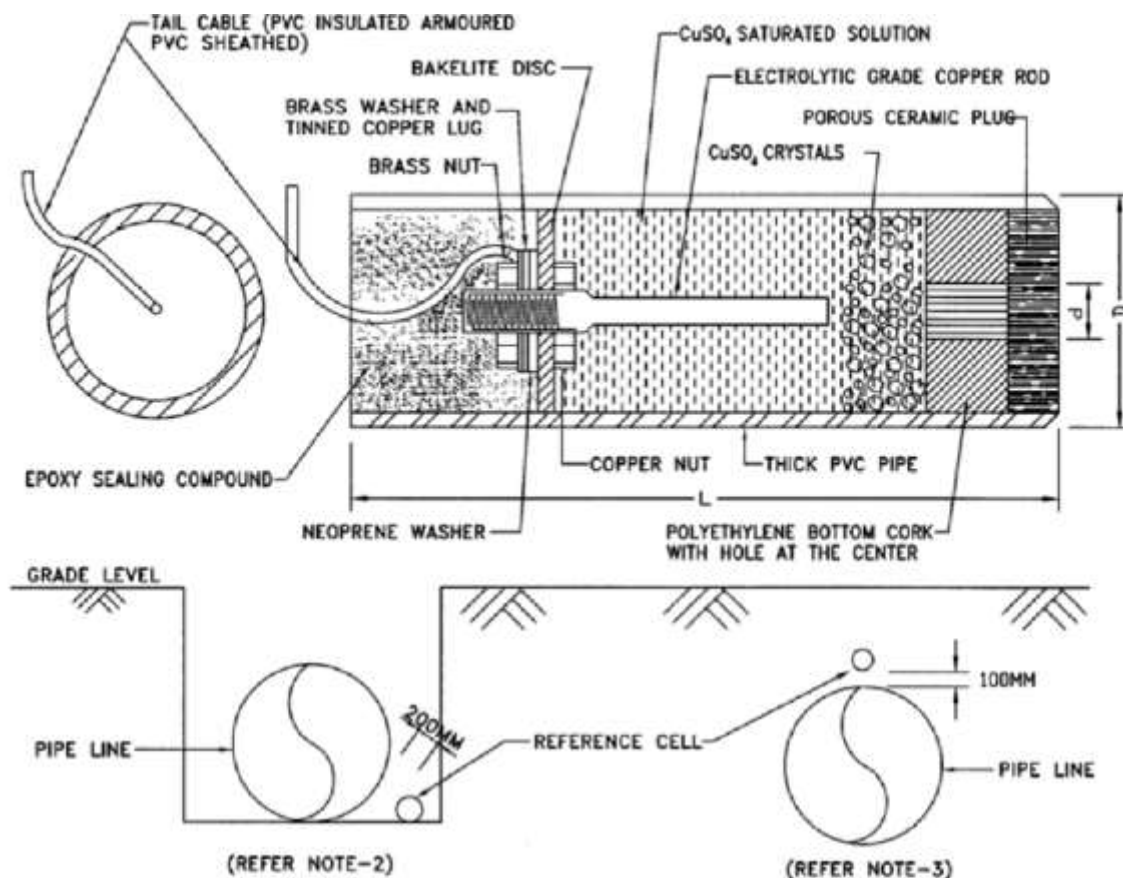


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REFERENCE CELL INSTALLATION

BACKFILL MATERIAL (REFER NOTE-7) :-

| | |
|-----------------|-------|
| GYPSUM | : 75% |
| BENTONITE | : 20% |
| SODIUM SULPHATE | : 5% |

NOTES:-

1. REFERENCE CELL SHALL BE BACK FILLED WITH REQUIRED BACK FILL MATERIAL.
2. FOR NEW PIPELINES REFERENCE ELECTRODE SHALL BE INSTALLED APPROXIMATELY AT THE BOTTOM LEVEL OF THE PIPE LINE, 200MM AWAY FROM SURFACE OF THE PIPELINE.
3. REFERENCE ELECTRODES MAY BE INSTALLED AT THE TOP OF THE PIPELINE, APPROXIMATELY 100MM ABOVE THE PIPELINE WHERE PIPE LINE HAS ALREADY BEEN LAID.
4. REFERENCE CELL CABLE SHALL BE ROUTED ALONG THE BOTTOM LEVEL OF THE PIPELINE AND 250MM (APPROX.) AWAY FROM THE SURFACE OF THE PIPE.
5. BACKFILLED REFERENCE ELECTRODES SHALL BE SOAKED IN 20 LTRS. OF CLEAN FRESH WATER FOR 24 HOURS IMMEDIATELY PRIOR TO INSTALLATION.
6. CONTRACTOR SHALL FURNISH REFERENCE CELL DRAWING WITH ALL DIMENSIONS.
7. IN CASE OF SILVER-SILVER CHLORIDE REFERENCE CELL THE BACK FILL MATERIAL SHALL BE BENTONITE-95%, AND SODIUM CHLORIDE-5%.
8. REFERENCE CELLS WITH ALTERNATIVE CONSTRUCTIONAL DETAILS, HAVING PROVEN RELIABILITY AND SPECIFIED DESIGN LIFE MAY BE CONSIDERED WHERE APPLICABLE.

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SPECIFICATION & DRAWING OF ANODE LEAD JUNCTION BOX

Anode lead junction box with facility provided for individual anode connection will be suitable for pillar mounting. Appropriate cable glands will be provided in underside of box. Access to the box will be provided by a hinged lockable lid.

Box will include single anode circuits and main positive feed cables of max. 35 Sq mm cross section lugged copper conductor.

Fittings

1. **Busbar:** Copper busbar with brass stud, nuts, washers and anti-vibration washers to accommodate lugged cable connection of up to 2 x 35 mm² main anode cable and tap off interconnection for individual anode circuits.

2. **For each anode circuit:**

Each anode circuit will be provided with following:

- a) Removable link (Copper)
- b) Measurement Shunt: 0.01 Ohm, 5 amp rating
- c) Variable Resistor: Side wire type 1 Ohm, 5 amp rating

Individual anode terminals will comprise of studs, nuts, washers and anti-vibrant washers to terminate 10 mm² lugged cable.

3. **Enclosure:**

Mild steel min. 3 mm thick enclosure will be dust, vermin, weather proof and will meet IP 55 requirement. The enclosure will be epoxy painted with minimum thickness of 120 micron DFT over zinc rich epoxy primer of min. thickness of 110 micron DFT. The paints will be applied on internal and external surfaces of the enclosure following surfaces preparation to SA 2.5 SW standard by sand / shot blasting. The color will be epoxy light grey (Shade 631 of ISI)

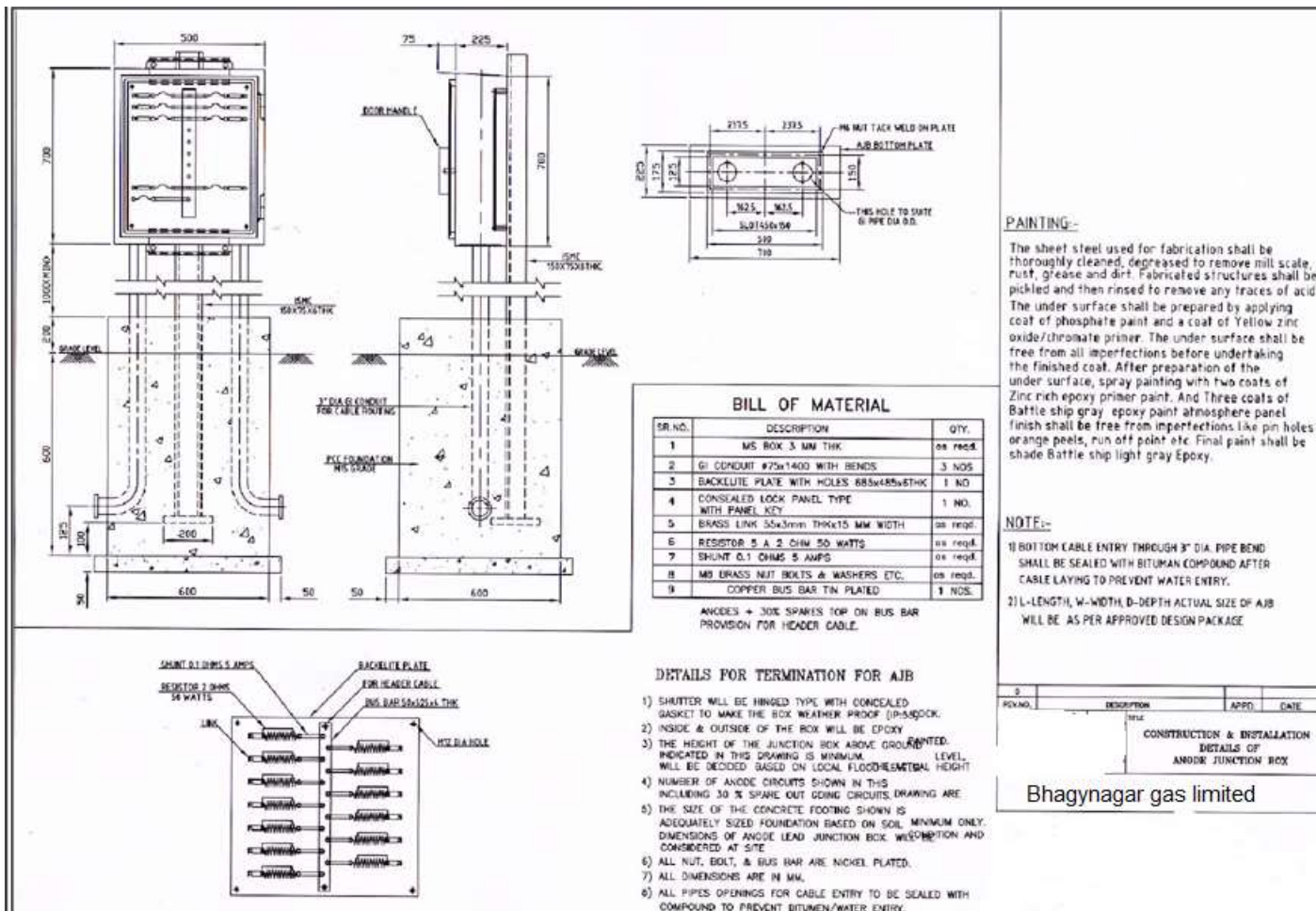



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SPECIFICATION OF PRE-PACKAGED MG 48/18 LBS ANODE

48 pound Magnesium prepackaged anodes shall be supplied as per following Metallurgic Composition -
Specifications should be as per ASTM-B 418

| S.No. | ELEMENTS | PERCENT BY WEIGHT |
|-------|---------------------------------|-------------------|
| 1 | ALUMINIUM (Al) | 0.010 (MAX) |
| 2 | MANGANESE (Mn) | 0.50 to 1.30 |
| 3 | COPPER (Cu) | 0.02 (MAX) |
| 4 | IRON (Fe) | 0.03 (MAX) |
| 5 | NICKEL (Ni) | 0.001 (MAX) |
| 6 | OTHER METALIC ELEMENTS, EACH | 0.05 (MAX) |
| | TOTAL | 0.30 (MAX) |

BALANCE IS MAGNESIUM (Mg).

Lead Cable:

1. Conductor : Anneled high conductivity copper stranded
2. Cross Section area : 10 m m²
3. No of Core : Single
4. Oversheath : Polyvinyl
5. Armouring : GI wire armoured
6. Voltage grade : 650/1000 V
7. Insulation : XLPE
8. Cable length : 15 meter long without any joint in between
9. Anode close circuit : 1.75V

Potential

- 10 Anode consumption : 7.9 Kg/ (A yr) Max. rate

The anode shall confirm to the requirements of ASTM-B 418 standard. The anode (other than ribbon anode) shall be packaged with special back fill.

Inspection / test certificates, warranty certificates by the manufacturer shall be submitted.

The composition of special back fill for anodes shall be as below. In any case, the thickness of back fill shall not be less than 50 mm on all sides of the anode.

| | |
|-----------------|-----|
| Gypsum | 75% |
| Bentonite | 20% |
| Sodium Sulphate | 5% |



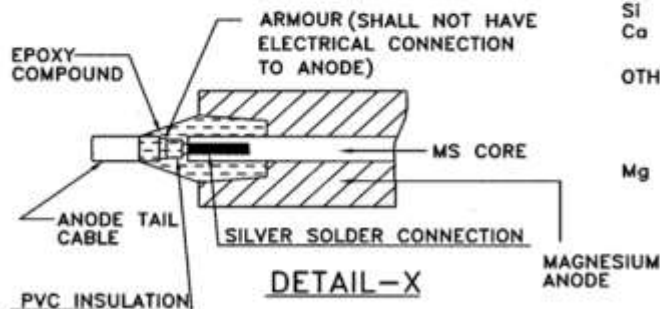
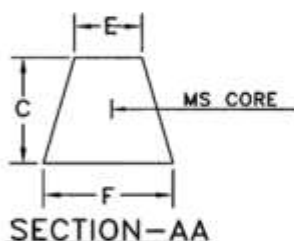
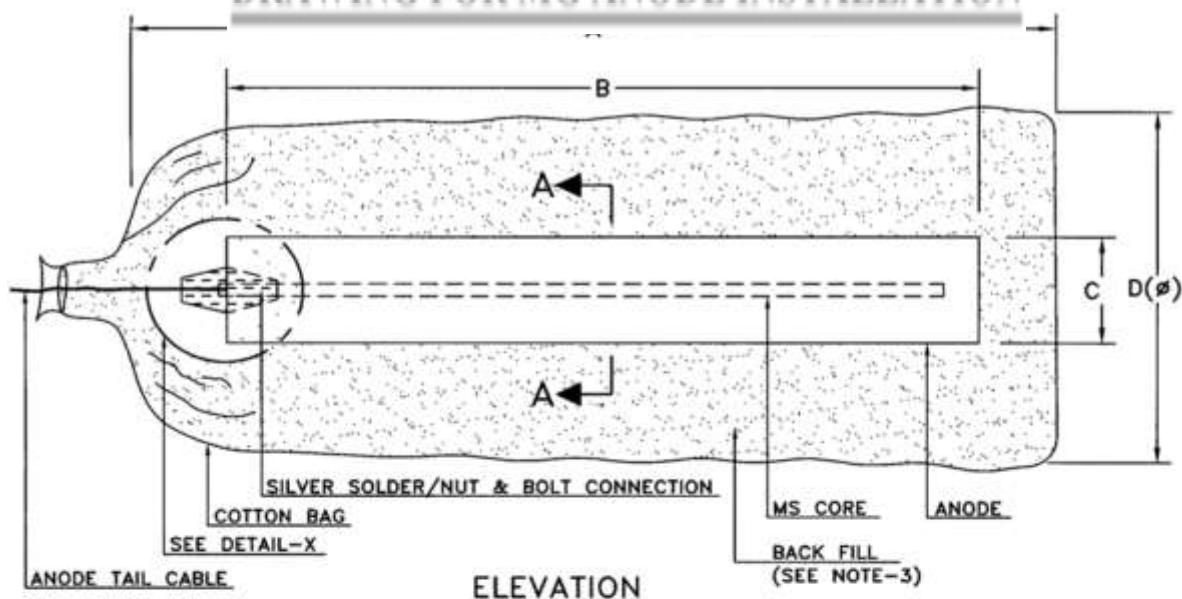
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DRAWING FOR MG ANODE INSTALLATION



CHEMICAL COMPOSITION OF ANODE (%WEIGHT):-

| ELEMENT | HIGH POTENTIAL | LOW POTENTIAL |
|-------------------------|----------------|---------------|
| | TYPE | TYPE |
| Al | 0.01(max) | 5.3-6.7(max) |
| Mn | 0.5-1.3 | 0.15-0.7 |
| Cu | 0.02(max) | 0.02(max) |
| Fe | 0.03(max) | 0.003(max) |
| Ni | 0.001(max) | 0.002(max) |
| Zn | - | 2.5-3.5 |
| Si | 0.05(max) | 0.1(max) |
| Ca | - | - |
| OTHER METALLIC ELEMENTS | | |
| -EACH | 0.05(max) | |
| -TOTAL | 0.3(max) | 0.3(max) |
| Mg | BALANCE | BALANCE |

BACK FILL COMPOSITION

| | | |
|-----------------|-------|-------|
| GYPSUM | ----- | : 75% |
| BENTONITE | ----- | : 20% |
| SODIUM SULPHATE | ----- | : 5% |

NOTES:-

1. ANODE COMPOSITION, NET WEIGHT, GROSS WEIGHT, PREPACKED ANODE WEIGHT AND DIMENSIONS (A,B,C,D,E & F) SHALL BE FURNISHED BY CONTRACTOR.
2. ANODE TAIL CABLE SHALL BE HIGH CONDUCTIVITY, STRANDED, COPPER CONDUCTOR, 650V GRADE, PVC INSULATED, PVC SHEATHED & ARMoured.
3. THICKNESS OF BACK FILL SHALL BE ADEQUATE TO SAFEGUARD THE ANODES AGAINST EFFECT OF CARBONATES, BICARBONATES, NITRATES etc. IN SOIL. ANODES SHALL BE PROVIDED WITH MIN. 50mm. THICK BACK FILL ON ALL THE SIDES OF THE ANODE OR MIN. 20kg_{NET}, WHICHEVER IS HIGHER.



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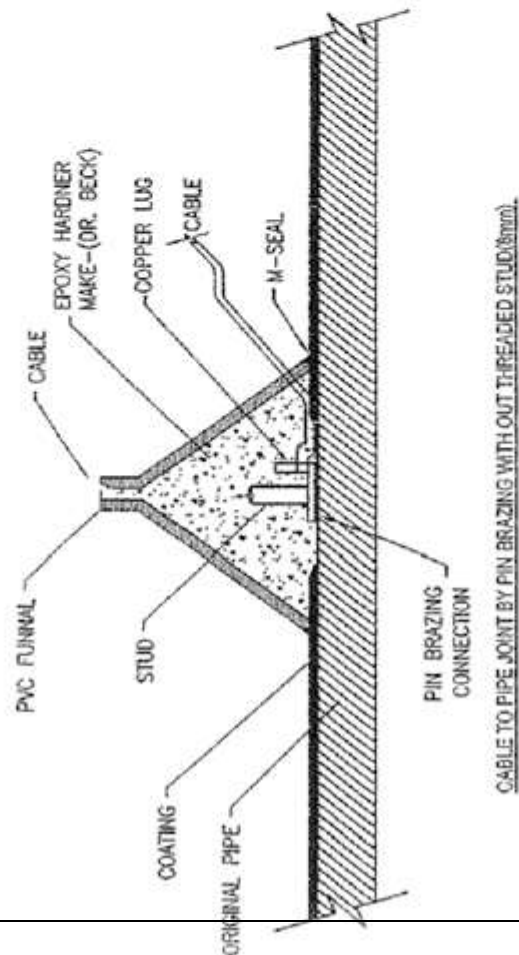
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DETAILED DRAWING FOR PIN BRAZING

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.



| NO | ISSUED | ISSUED FOR REVIEW | KA | HK | OWNERS APPROV |
|-----|--------|-------------------|----|------|---------------|
| REV | DATE | DESCRIPTION | BY | CHRD | |

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DETAIL - 1
WELDER-CABLE ASSEMBLY

DETAIL - 2
CROSS-SECTION OF FINISHED THERMIT WELD

PVC MOULD CAP
(ITEM 4)

| ITEM NO. | DESCRIPTION | QTY. |
|----------|---|----------|
| 7 | PLASTIC STRAPPING BAND, 12 WIDE WITH METALLIC CLIP | AS REQD. |
| 6 | 12 WIDE PROTECTIVE ADHESIVE TAPE OR M-SEAL COMPOUND | AS REQD. |
| 5 | EPOXY COATING COMPOUND WITH HARDENER | AS REQD. |
| 4 | PVC MOULD CAP | 1 |
| 3 | COPPER SLEEVE, ID 5 x OD 6 | 1 |
| 2 | METAL DISC | 1 |
| 1 | THERMIT WELD CHARGE | 1 |

BILL OF MATERIALS

NOTES:-


1. REMOVE PIPELINE COATING 45mm X 65mm OR ANY SUITABLE SIZE AS REQUIRED WITH A CUTTING TOOL. HAVING CUTTING SURFACE CONTOUR MATCHING THAT OF THE PIPE. EXPOSED AREA OF PIPELINE SHALL BE CLEANED WITH FILE TO BRIGHT STEEL, FREE OF RUST, PAINT, DIRT, GREASE AND MOISTURE.
2. REMOVE APPROXIMATELY 40mm OF INSULATION FROM END OF CABLE. INSTALL COPPER SLEEVE TO SUIT THE CABLE.
3. HOLD MOULD IN A VERTICAL POSITION AND INSERT METAL DISC IN THE BOTTOM OF THE MOULD CAVITY.
4. DUMP THERMIT WELD CHARGE WEIGHING 15g MAX. OR AS SPECIFIED BY MANUFACTURER INTO MOULD, BEING CAREFUL NOT TO UPSET THE METAL DISC. TAP THE MOULD TO LOOSEN STARTING MATERIAL.
5. POSITION WELDER OVER EXPOSED AREA OF PIPELINE AND INSERT CABLE UNDER MOULD. PACK CABLE AND MOULD WITH PACKING MATERIAL, IF NECESSARY.
6. PLACE IGNITOR AT OPENING OF MOULD AND APPLY SPARK WHICH WILL IGNITE WELD CHARGE. WITHDRAW IGNITOR QUICKLY TO PREVENT FOULING.
7. AFTER WELDER HAS BEEN IGNITED, HOLD WELDER IN PLACE FOR 15 SECONDS. THEN REMOVE WELDER.
8. LIGHTLY TAP THERMIT WELD WITH HAMMER TO REMOVE SLAG AND TEST WELD FOR GOOD BOND. CLEAN THE WELD.
9. REMAKE THE THERMIT WELD, IF FOUND DEFECTIVE.
10. PLACE PVC MOULD CAP OVER THE THERMIT WELD. SEAL CAP WITH ADHESIVE TAPE AROUND PVC MOULD. FILL THE MOULD WITH EPOXY COATING COMPOUND.
11. CUT OFF THE STEM OF PVC MOULD CAP.
12. ANY OTHER SUITABLE COATING MATERIAL TO COVER THERMIT WELD AND ALL EXPOSED COPPER WITHOUT ANY VOID MAY BE USED IN PLACE OF ITEMS 4, 5 & 6 OF BILL OF MATERIALS. THE COATING PATCH MUST OVERLAP EXISTING PIPELINE COATING AND INSULATION ON WIRE.
13. ALL DIMENSIONS ARE APPROXIMATE AND CAN VARY SLIGHTLY.
14. ALL DIMENSIONS ARE IN mm.

| Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 | Q16 | Q17 | Q18 | Q19 | Q20 | Q21 | Q22 | Q23 | Q24 | Q25 | Q26 | Q27 | Q28 | Q29 | Q30 | Q31 | Q32 | Q33 | Q34 | Q35 | Q36 | Q37 | Q38 | Q39 | Q40 | Q41 | Q42 | Q43 | Q44 | Q45 | Q46 | Q47 | Q48 | Q49 | Q50 | Q51 | Q52 | Q53 | Q54 | Q55 | Q56 | Q57 | Q58 | Q59 | Q60 | Q61 | Q62 | Q63 | Q64 | Q65 | Q66 | Q67 | Q68 | Q69 | Q70 | Q71 | Q72 | Q73 | Q74 | Q75 | Q76 | Q77 | Q78 | Q79 | Q80 | Q81 | Q82 | Q83 | Q84 | Q85 | Q86 | Q87 | Q88 | Q89 | Q90 | Q91 | Q92 | Q93 | Q94 | Q95 | Q96 | Q97 | Q98 | Q99 | Q100 |
|---------------------|------|-------|-------------|-------|---|------------|----------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| REV NO | DATE | ZONE | DESCRIPTION | BY | APPROV | REFERENCES | DRG. NO. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SECTION: ELECTRICAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NAME | DATE | CHKD | DATE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DSGN | AM | 05.09 | SS | 06.09 | DETAILS OF THERMIT WELD FOR CABLE TO PIPE JOINT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DRWN | SJ | 05.09 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

MECON LIMITED

SCALE : N.T.S.

REV

| | | |
|--|---|--|
|  Bhagyanagar Gas Limited | <p align="center">Tender for Annual Maintenance Contract for Monitoring & Maintenance of Cathodic Protection (CP) System installed in Hyderabad, Vijayawada & Kakinada GA's.</p> <p align="center">Bid Document No. BGL/529/2021-22</p> | <p align="center">Volume II of II</p> |
|--|---|--|

SPECIFICATIONS & DRAWING OF EARTH PIT

Supply, installation & commissioning of EHCC certified grounding tubular effective earthing system / hollow tube solid bar with G.I. Pipe in pipe technology suitable for RR/SV stations along the pipelines. One earthing system shall consists of a electrode and three bags of highly conductive packing material (25 Kgs each bag) for putting around the electrode.

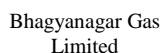
Pipe Electrode Size :- Outer Dia 85 mm X 3000 mm length, fitted with one GI funnel and welded GI strip at one end Current carrying capacity : - 15KA for 1 second

For concentric pipe earth electrode, hermetically filling inside the cavity i.e. between secondary conductor & primary conductor, crystalline compound is to be injected in the electrode assembly. It should be a combination of high conductivity metal alloys, copper & aluminium powder, conductive carbon/cement and bonding material etc. mixed in different proportion. The mixture is forced (pressurized) filled inside the earth electrode in the paste form and after solidification of the same, the end caps are welded. The metal alloys shall help in conducting the current and conductive carbon gives anti corrosive property. The conductive packing material shall consists of conductive cement, graphite, hydrous aluminium silicate, sodium montmorillonite etc and shall not contain bentonite. The earthing shall be confirms to IS3043:1987 specifications.

EARTH PIT CHAMBER: size internal 500 mm x 500 mm, external 750 mm x 750 mm with duly painted MS / metallic chequered plate cover (5 mm x 600 mm x 600 mm) with collapsible handle. The depth of chamber shall be 500mm from the top surface. The top surface of the earth-pit chamber shall be flushed with ground level.

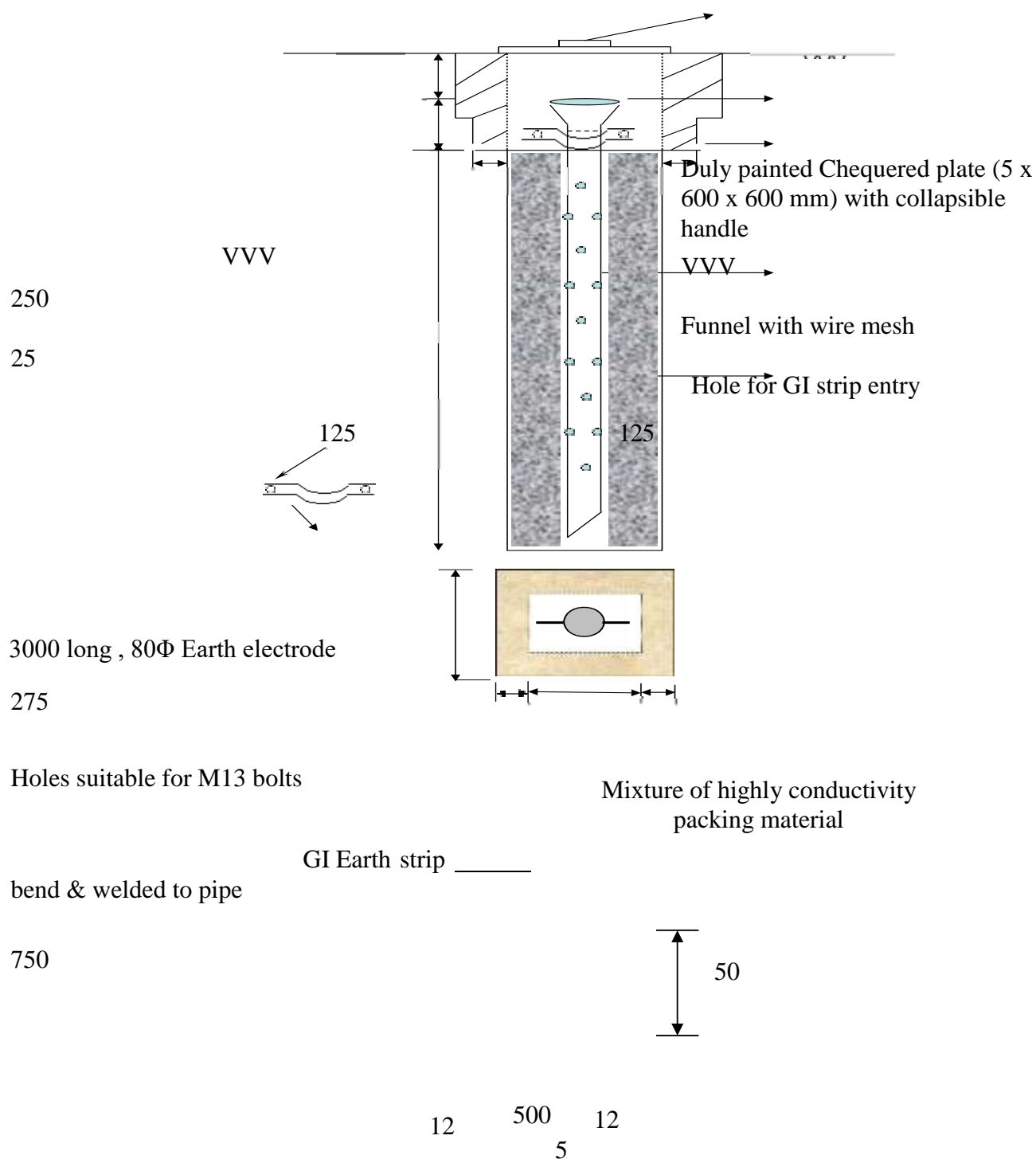
After commissioning, the earth pit resistance shall be with in the limits. All necessary connection between new earth electrode and earthing grid/ strips shall be made using flexible annealed copper rope having CSA of 50 sq mm.

The scope of work shall includes supply of all required material like earth cable, pipe electrode, packing material for filling around the electrode, flexible annealed copper rope having CSA of 50 sq mm, nuts/check nuts, funnel, water for curing and excavation of pit up to a depth of 3.75 meter minimum, making of earth-pit chamber in cement concrete (1:2:4 ratio), termination of earth wire and transportation of material up to work site, complete in all respect as per drawing & direction of Engineer-in-Charge.



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SPECIFICATION & DRAWING FOR SPARK GAP ARRESTOR

Spark gap arrester should be of DEHN or equivalent make which can be divert any surge on the above & underground pipeline installations due to faults on the nearby AC transmission lines or due to lightning etc. The spark gap arrester should be installed by skilled electrician only, under

| | | |
|--|---|----------------------------|
| Type | : | Spark gap, Explosion Proof |
| Power frequency voltage (50 Hz) | : | ≤ 1.2 kV |
| 100% lightning impulse sparkover voltage | : | ≤ 2.5 kV |
| Nominal discharge current | : | 100 kA |
| (8/20) Lightning impulse current | : | 50 kA |

Inspection / test certificates, warranty certificates by the manufacturer shall be

SPECIFICATION & DRAWING FOR SSPC

The SSPC (Solid State Polarization Cell) blocks the DC current needed for cathodic protection, while simultaneously providing an effective AC continuity grounding path for:-

- AC Fault Currents
- Lightning Protection
- Mitigation of Induced AC Voltages
- Power Switching Surge Currents

The SSPC of model SSP-20-SL-3-A48 or equivalent (as approved by EIC) shall be supplied along with zinc anodes/ grounding cell, test station of suitable size, cables of suitable size & consumables etc. The SSPC cell should be installed by skilled electrician only, under consideration of the relevant national regulation.



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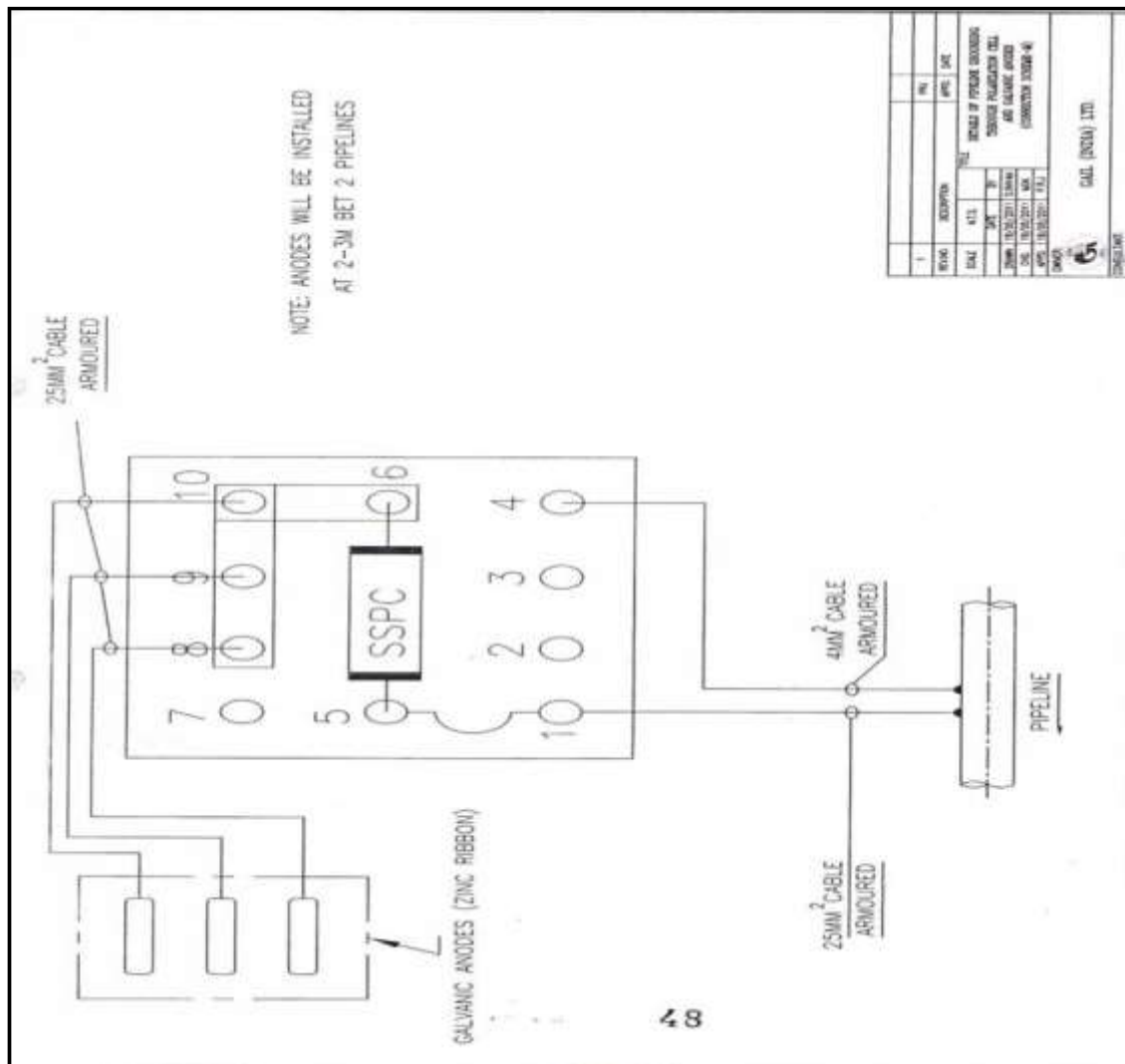
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SPECIFICATION & DRAWING FOR SSPC

The SSPC (Solid State Polarization Cell) blocks the DC current needed for cathodic protection, while simultaneously providing an effective AC continuity grounding path for:-

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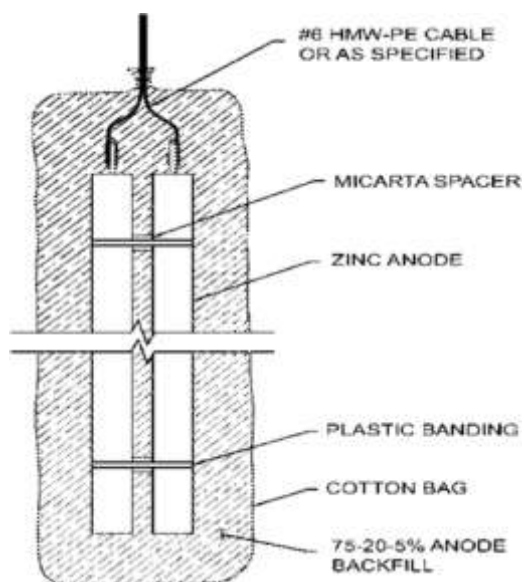
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|---|---|---|

SPECIFICATION FOR ZINC GROUNDING CELL

These cells consist of two zinc anodes, with insulation material to separate them, in a conductive backfill material, packaged in a bag. The insulation or separator leaves the zinc rods reasonably close together without touching. The backfill material, such as bentonite, promotes conduction and contact with the surrounding earth, as the package is buried near the points it is connected to. A wire lead attaches each rod to a point of interest, such as across an insulated flange, or between a pipeline and ground. The concept for protection is that the zinc rods will allow separation of the two structures, and minimize the DC cathodic protection current flow under normal conditions. Under over-voltage conditions, the small separation between the rods, and the conductive backfill will allow current to flow between them, draining the unwanted current.





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| <p>1900(Typ.)</p> <p>150</p> <p>150</p> <p>100</p> | | <p>SEE DETAIL 'X'</p> <p>DETAIL 'X'</p> <p>ANODES</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|---|---------------------|-------------|-----------|--------------|-----------------|------------|------------|-------------------------------------|------------|-------|------------------|------------------|-------|----------------|------------|------|----------------------------|------------|--------|---------------------|--------|----|--------------------------|-----------|---|--|--------|---|------------|--------|
| <p>NOTES:-</p> <ol style="list-style-type: none"> ALL DIMENSIONS ARE TYPICAL IN mm. ZINC GROUNDING CELLS SHALL BE INSTALLED VERTICALLY SUCH THAT THE TOP OF THE CELL IS APPROX. AT THE SAME ELEV. AS PIPE BOTTOM. ALL CABLE LEADS FOR ZINC GROUNDING CELL SHALL BE KEPT AS SHORT AND DIRECT AS POSSIBLE. GROUNDING CELL CABLE ARMOUR SHALL NOT HAVE ELECT. CONNECTION TO ANODE. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>ZINC ANODE COMPOSITION (%WEIGHT)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>ELEMENT</th> <th>TYPE-I</th> <th>TYPE-II</th> </tr> </thead> <tbody> <tr> <td>Al</td> <td>0.1-0.5 %MAX</td> <td>0.005 %MAX</td> </tr> <tr> <td>Cd</td> <td>0.025-0.07%MAX</td> <td>0.003 %MAX</td> </tr> <tr> <td>Cu</td> <td>0.005% MAX</td> <td>0.002 %MAX</td> </tr> <tr> <td>Fe</td> <td>0.005% MAX</td> <td>0.0014%MAX</td> </tr> <tr> <td>Pb</td> <td>0.006% MAX</td> <td>0.003 %MAX</td> </tr> <tr> <td>OTHERS</td> <td>0.1% MAX</td> <td>-</td> </tr> <tr> <td>Zn</td> <td>REMAINDER</td> <td>REMAINDER</td> </tr> </tbody> </table> <p>ZINC ALLOY CONFORMING TO ASTM-B-418-67</p> | | | ELEMENT | TYPE-I | TYPE-II | Al | 0.1-0.5 %MAX | 0.005 %MAX | Cd | 0.025-0.07%MAX | 0.003 %MAX | Cu | 0.005% MAX | 0.002 %MAX | Fe | 0.005% MAX | 0.0014%MAX | Pb | 0.006% MAX | 0.003 %MAX | OTHERS | 0.1% MAX | - | Zn | REMAINDER | REMAINDER | | | | | | |
| ELEMENT | TYPE-I | TYPE-II | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Al | 0.1-0.5 %MAX | 0.005 %MAX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cd | 0.025-0.07%MAX | 0.003 %MAX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cu | 0.005% MAX | 0.002 %MAX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fe | 0.005% MAX | 0.0014%MAX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pb | 0.006% MAX | 0.003 %MAX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OTHERS | 0.1% MAX | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Zn | REMAINDER | REMAINDER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>BACKFILL COMPOSITION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>GYPSUM</td> <td>75%</td> </tr> <tr> <td>BENTONITE</td> <td>20%</td> </tr> <tr> <td>SODIUM SULPHATE</td> <td>5%</td> </tr> </tbody> </table> | | | GYPSUM | 75% | BENTONITE | 20% | SODIUM SULPHATE | 5% | | | | | | | | | | | | | | | | | | | | | | | | |
| GYPSUM | 75% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BENTONITE | 20% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SODIUM SULPHATE | 5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>ITEM NO.</th> <th>DESCRIPTION</th> <th>QTY.</th> </tr> </thead> <tbody> <tr> <td>9</td> <td>TAPE STRAP</td> <td>AS REQD.</td> </tr> <tr> <td>8</td> <td>BAKELITE INSULATING SPACER 25X36X50</td> <td>2 NOS.</td> </tr> <tr> <td>7</td> <td>COTTON BAG 180#.</td> <td>1 NO.</td> </tr> <tr> <td>6</td> <td>BACK FILL MAT.</td> <td>AS REQD.</td> </tr> <tr> <td>5</td> <td>6mmØ GALVANISED STEEL CORE</td> <td>AS REQD.</td> </tr> <tr> <td>4</td> <td>HEAT SHRINK SLEEVE.</td> <td>2 NOS.</td> </tr> <tr> <td>3</td> <td>SILVER BRAZED CONNECTION</td> <td>2 NOS.</td> </tr> <tr> <td>2</td> <td>ANODE TAIL CABLE 25mm Sq. 1C Cu XLPE/ PVC SHEATHED ARMoured 600/1000V.</td> <td>30 mt.</td> </tr> <tr> <td>1</td> <td>ZINC ANODE</td> <td>2 NOS.</td> </tr> </tbody> </table> <p style="text-align: center;">BILL OF MATERIALS</p> | | | ITEM NO. | DESCRIPTION | QTY. | 9 | TAPE STRAP | AS REQD. | 8 | BAKELITE INSULATING SPACER 25X36X50 | 2 NOS. | 7 | COTTON BAG 180#. | 1 NO. | 6 | BACK FILL MAT. | AS REQD. | 5 | 6mmØ GALVANISED STEEL CORE | AS REQD. | 4 | HEAT SHRINK SLEEVE. | 2 NOS. | 3 | SILVER BRAZED CONNECTION | 2 NOS. | 2 | ANODE TAIL CABLE 25mm Sq. 1C Cu XLPE/ PVC SHEATHED ARMoured 600/1000V. | 30 mt. | 1 | ZINC ANODE | 2 NOS. |
| ITEM NO. | DESCRIPTION | QTY. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | TAPE STRAP | AS REQD. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | BAKELITE INSULATING SPACER 25X36X50 | 2 NOS. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | COTTON BAG 180#. | 1 NO. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | BACK FILL MAT. | AS REQD. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 6mmØ GALVANISED STEEL CORE | AS REQD. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | HEAT SHRINK SLEEVE. | 2 NOS. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | SILVER BRAZED CONNECTION | 2 NOS. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | ANODE TAIL CABLE 25mm Sq. 1C Cu XLPE/ PVC SHEATHED ARMoured 600/1000V. | 30 mt. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | ZINC ANODE | 2 NOS. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>REV NO</th> <th>DATE</th> <th>ZONE</th> <th>DESCRIPTIONS</th> <th>BY</th> <th>APPROD</th> <th>REFERENCES</th> <th>DRG. NO.</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>07/09</td> <td>05/09</td> <td>REVISED & ISSUED</td> <td>AM</td> <td>DE</td> <td></td> <td></td> </tr> </tbody> </table> | | | REV NO | DATE | ZONE | DESCRIPTIONS | BY | APPROD | REFERENCES | DRG. NO. | 01 | 07/09 | 05/09 | REVISED & ISSUED | AM | DE | | | | | | | | | | | | | | | | |
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| SECTION: ELECTRICAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NAME | DATE | CHKD | DATE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DSGN | AM | 03.09 | SS | 05.09 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DRWN | SJ | 03.09 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p style="text-align: center;">DETAILS OF ZINC GROUNDING CELL</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: right;"> <p>मेकॉन लिमिटेड</p> <p>MECON LIMITED</p> </div> </div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>SCALE : N.T.S.</p> <p>DRG. NO. - MEC/SD/05/09/F/CP/1609</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p style="text-align: right;">REV 1</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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SPECIFICATION & DRAWING FOR ZINC ANODE

The zinc anode shall be high purity zinc suitable for 20 year life in buried, untended situation and size of anode shall be approximately 36 mm x 36 mm x 1000 mm long.

Mettalurgic Compositions

| S.No | ELEMENTS | PERCENT |
|------|----------------|---------------|
| 1 | ALUMINIUM (Al) | 0.3 – 0.5 % |
| 2 | CADMIUM (Cd) | 0.075 – 0.1 % |
| 3 | COPPER (Cu) | 0.005 % (MAX) |
| 4 | IRON (Fe) | 0.002 % (MAX) |
| 5 | SILICON (Si) | 0.005 % (MAX) |
| 6 | LEAD (Pb) | 0.005 % (MAX) |

BALANCE IS ZINC (Zn).

Gross weight with special backfill shall be approximately 84 kg. Composition of special backfill shall be as follows:

Hydrated Gypsum : 75%
Bentonite : 20%
Sodium Sulphate : 5% m²

Lead Cable:

1. Conductor : Anneled high conductivity copper stranded
2. Cross Section area : 25 mm²
3. No of Core : Single
4. Oversheath : Polyvinyl
5. Armouring : GI wire armoured
6. Voltage grade : 650/1000 V
7. Insulation : XLPE
8. Cable length : 15 m Approx.

Inspection / test certificates, warranty certificates by the manufacturer shall be submitted.

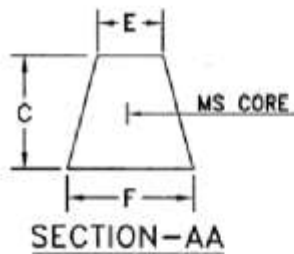
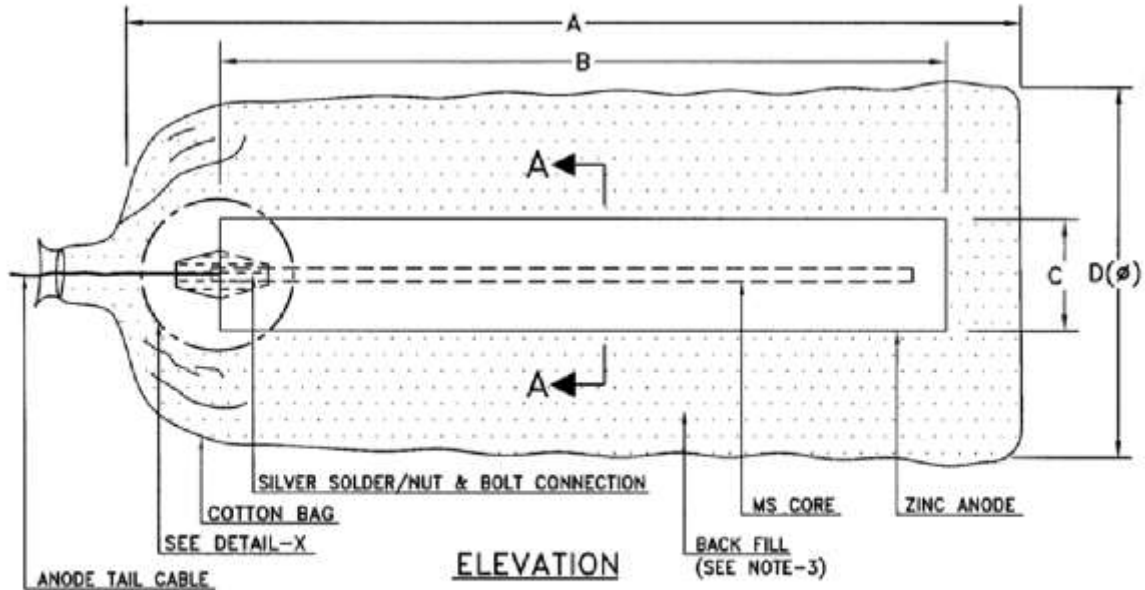


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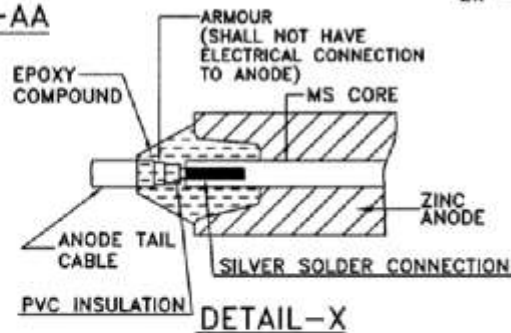


CHEMICAL COMPOSITION OF ANODE (% WEIGHT):-

| CHEMICALS | TYPE-I | TYPE-II |
|-----------|---------------|------------|
| Al ----- | :0.1%-0.5% | 0.005%MAX |
| Cd ----- | :0.025%-0.07% | 0.003%MAX |
| Cu ----- | :0.005%MAX | 0.002%MAX |
| Fe ----- | :0.005%MAX | 0.0014%MAX |
| Pb ----- | :0.006%MAX | 0.003%MAX |
| OTHERS -- | :0.1%MAX | - |
| Zn ----- | :REMAINDER | REMAINDER |

BACK FILL COMPOSITION

| | |
|--------------------|------|
| GYPSUM ----- | :75% |
| BENTONITE ----- | :20% |
| SODIUM SULPHATE -- | :5% |



NOTES:-

1. ANODE COMPOSITION, NET WEIGHT, GROSS WEIGHT, PREPACKED ANODE WEIGHT AND DIMENSIONS (A,B,C,D,E & F) SHALL BE FURNISHED BY CONTRACTOR.
2. ANODE TAIL CABLE SHALL BE HIGH CONDUCTIVITY, STRANDED, COPPER CONDUCTOR, 650V GRADE, PVC INSULATED, PVC SHEATHED & ARMoured.
3. THICKNESS OF BACK FILL SHALL BE ADEQUATE TO SAFEGUARD THE ANODES AGAINST EFFECT OF CARBONATES, BICARBONATES, NITRATES etc. IN SOIL. ANODES SHALL BE PROVIDED WITH MIN. 50mm. THICK BACK FILL ON ALL THE SIDES OF THE ANODE OR MIN. 20kg NET, WHICHEVER IS HIGHER.
4. ANODE TYPE-I SHALL BE USED FOR SEA WATER, BRACKISH WATER OR SALINE ELECTROLYTE AND ANODE TYPE-II SHALL BE USED FOR WATER, BACK FILLS & SOIL APPLICATION.



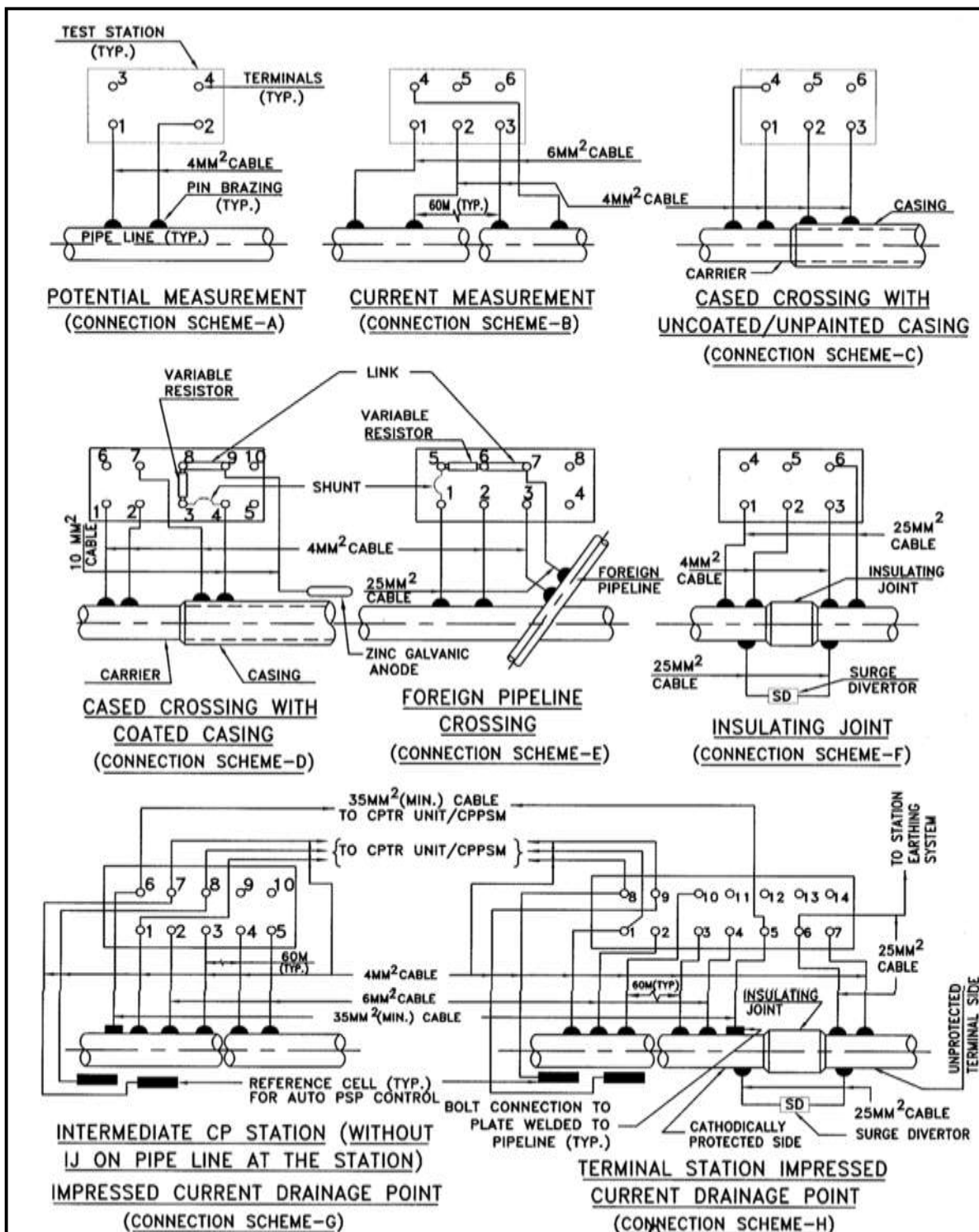
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DRAWINGS OF VARIOUS TYPE MANUAL TEST STATION





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SECTION – 10


SPECIAL CONDITIONS OF CONTRACT (SCC)

| | | |
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SPECIAL CONDITIONS OF CONTRACT (SCC)

1.0 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 every part of each shall be deemed to be supplementary to and complementary of every other part and shall be read within 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 include 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/ LOI 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.

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1.0 SCOPE OF WORK & SCOPE OF SUPPLY

- 1.1 The detailed scope of work shall be as specified in Technical Volume II of II & tender / addendum / corrigendum document. It is however, explicitly understood that scope described is not limiting, in far as the responsibilities of the contractor are concerned and shall include, interalia, carrying out any and all works and providing any and all facilities as are required to complete the works in all respect.

2.0 TIME SCHEDULE


The completion schedule for work shall be as follows:

| NAME OF WORK | TIME OF COMPLETION |
|--|---|
| Annual Monitoring and Maintenance of commissioned PCP system in Hyderabad & Vijayawada GA's. | Total 02 years from the date of issuance of Fax of Acceptance (FOA) |
| | The above period includes all post commissioning and AC & DC Interference detection and Mitigation. |


- i. The job will be intimated to the contractor on as and when required basis and the contractor has to complete the job within one month from the date of intimation unless otherwise specified. If the contractor fails to carry out any job within time stipulated and as per guidelines given by the EIC, the OWNER will have full right to get the work done by any other party at the sole risk and cost of the contractor.
- ii. A mobilization period of 15 days shall be reckoned from the date of issuance of LOI (Letter of Intent) or FOI (Fax of Intent) or LOA (Letter of Award) as the case may be.

3.0 DRAWINGS AND DOCUMENTS

- 3.1 The drawings accompanying the bid document (if any) are of indicative nature and issued for bidding purpose only. Purpose of these drawing is to enable the bidder to make an offer in line with the requirements of the Employer/Consultant. However no extra claim whatsoever, shall be entertained for variation in the "Approved for Construction" and "Bid document drawings" regarding any changes/units. Construction shall be as per drawings/specifications issued/approved by the Engineer-in-Charge during the course of execution of work. Detailed construction drawings (wherever required) on the basis of which actual execution of work is to proceed will be prepared by the contractor.
- 3.2 The drawings and documents to be submitted by the Contractor to Employer/Consultant after award of the work as per the requirements enlisted in the bidding document shall be for Employer/Consultant's review, information and record. The Contractor shall ensure that drawings and documents submitted to Employer/Consultant are accompanied by relevant calculations, data as required and essential for review of the document/ drawings. MECON shall review the drawings/ documents within two weeks from the date of submission provided the same are accompanied by relevant calculations, data as required and essential for review.
- 3.3 All documents and drawings including those of Contractors sub-vendor's manufacturer's etc. shall be submitted to Employer/Consultant after having been fully vetted in detail, approved and co-opted by the Contractor & shall bear Contractor seal/ certifications to this effect. All documents/drawings & submissions made to Employer/Consultant without compliance to this requirement will not be acceptable and the delay & liability owing to this shall be to the Contractor's account.

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- 3.4 The review of documents and drawings by Employer/Consultant shall not absolve Contractor from his responsibility to meet the requirements of specifications, drawings etc. and liabilities for mistakes and deviations. Upon receiving the comments on the drawing/documents reviewed by Employer/Consultant, Contractor shall incorporate the comments as required and ensure their compliance.
- 3.5 Copies of all detailed working drawing relating to the works shall be kept at the contractors' office at the site and shall be made available to the Engineer-in-charge/ Employer/Consultant at any time during execution of the contract. However no extra claim what so ever shall be entertained for any variation in the "approved/issued for construction drawings" and "tender drawings" regarding any changes/units unless otherwise agreed.
- 3.6 The Contractor shall rectify any inaccuracies, errors and non-compliance to contractual requirements. Any delay occurring on this shall not construe a reason for delay/ extension.
- 4.0 LIMITATION OF LIABILITY**
- 4.1 The final payment by the Owner/ Consultant in pursuance of the Contract terms shall not mean release of the Contractor from all of his liabilities under the Contract. The Contractor shall be liable and committed under this contract to fulfill all his liabilities and responsibilities, till the time of release of contract performance guarantee by the Owner/ Consultant.
- 4.2 Notwithstanding anything contrary contained herein, the aggregate total liability of Contractor 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 profit or loss of production.
- 5.0 CONTRACT PERFORMANCE GUARANTEE**
- 5.1 As a Contract Security, the Contractor to whom the work is awarded, within 30 (Thirty)days of such award of contract shall furnish a Contract Performance Guarantee in favour of the Employer/Consultant in the form of an irrevocable and unconditional Bank Guarantee as per Pro-forma approved by Employer/Consultant. This Bank Guarantee shall be issued by any Indian Nationalised /Scheduled Bank or reputed International Bank. The Guarantee amount shall be 03% (Three Percent) of the Contract Price as awarded excl. GST, for the faithful performance of the contract strictly in accordance with terms and conditions of contract. The Guarantee shall be valid till expiry of 90 (Ninety) days after the end of Defect Liability Period.
- 5.2 In the event completion of works is delayed beyond the Scheduled Completion Date for any reasons whatsoever, the Contractor shall have the validity of the guarantee suitably extended to cover the period mentioned above.
- 5.3 The Employer/Consultant shall have an unqualified option under this guarantee to invoke the Banker's Guarantee and claim the amount there under in the event of Contractor failing to honour any of the commitments entered into under this Contract and/or in respect of any amount due from the Contractor to the Employer/Consultant. In case Contractor fails to furnish the requisite Bank Guarantee as stipulated above, then the Employer/Consultant shall have the option to terminate the Notification of Award of Work and forfeit the Bid Security/Earnest Money amount and compensation for the works performed shall be payable upon such termination.
- 5.4 Upon completion of the Works as per Completion Schedule stipulated in Contract, the above said guarantee shall be considered to constitute the Contractor's warranty/guarantee for the work done by him or for the Works supplied and performance as per the specifications and any other conditions against this Contract. The warranty/guarantee shall remain in force for 12 months from the date of issuance of certificate of Completion and Acceptance against this Contract as per GCC. Contractor shall also arrange for the Performance Guarantee to remain

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valid until expiration of the guarantee period for entire works covered under the contract.

- 5.5** In the event of Completion of Project being delayed beyond the Scheduled Completion Date, the Employer/Consultant may without prejudice to any other right or remedy available to the Employer/Consultant, operate the Bank Guarantee to recover the Compensation for delay leviable as per GCC. The Bank Guarantee amount shall thereupon be increased to the original amount, or the Contractor may alternatively submit a fresh Bank Guarantee for the equivalent amount of compensation for delay recovered.

6.0 TAXES, DUTIES AND LEVIES


- 6.1** The Contractor agrees to and does hereby accept full and exclusive liability for the payment of any and all taxes, duties, including excise duty, service tax, custom duty, CVD, additional CVD, entry tax, octroi etc. now in force and hereafter increased, imposed or modified from time to time in respect of works and materials and all contributions and taxes for unemployment compensation, insurance and old age pensions or annuities now or hereafter imposed by any Central or State Government authorities which are imposed with respect to or covered by the wages, salaries, or other compensations paid to the persons employed by the Contractor and the Contractor shall be responsible for the compliance with all obligations and restrictions imposed by the Labour Law or any other law affecting employer-employee relationship and the Contractor further agrees to comply, and to secure the compliance of all subcontractors with all applicable Central, State, Municipal and local law and regulation, and requirement of any central, State or Local Government agency or authority. Contractor further agrees to defend, indemnify and hold Employer/Consultant harmless from any liability or penalty which may be imposed by the Central, State or Local authorities by reason of any violation by Contractor or Subcontractor of such laws, regulations or requirements and also from all claims, suits or proceedings that may be brought against the Employer/Consultant arising under, growing out of, or by reason of the work provided for by this Contract, by third parties, or by Central or State Government authority or any administrative sub-division thereof. **The prices shall also be inclusive of Sales Tax /Works Contract Tax/ VAT/ Trade tax/ Turnover tax/ Excise Duty / Entry tax as applicable but exclusive of service tax. The service tax shall be reimbursed by the Employer on submission Cenvetable invoices as per Service tax rule.**

- 6.2** Employer/Consultant shall make from Contractors bills such tax deductions as are required as per rules and regulations in force from time to time.

- 6.3** If excise duty is applicable during site fabrication, the same must be assessed and deemed to be included by the bidder in the quoted prices. The bidder in this regard shall arrange all required formalities.

1. Service tax in General and the applicability for this tender:

- A.** Service Tax shall be considered at the rate of 15 % for Service Contracts and in case of works contract, service value portion shall be calculated considering the abatement percentage (i.e. 60% for Original Works and 30% for other works) of the total amount charged for the purpose of discharging liability of Service Tax by Bidder & Buyer.
- B.** *Where the bidder is Individual /HUF/Partnership Firm/Association of Persons, the service tax liability in case of a works contract will be discharged by bidder and buyer (BGL) in the ratio of 50%-50%. Hence bidder should mention his entity status along with necessary proof supporting the same. The bidder has to indicate the details under “PARTICULARS & DECLARATION OF BIDDER”.* Bidder should also indicate BGL's service tax portion on his invoice, as payable by the recipient (BGL). However, the same will not be added in bill amount.
- C.** Bidder should quote his applicable service tax rate clearly under “taxes & extra” in price bid.


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- D. In the evaluation, the total service tax i.e. the liability by Bidder & Buyer towards service tax shall be considered as under.**
- i) For Individual / HUF / Partnership Firm / Association of Persons Bidder:**
- The bidder should quote his applicable service tax rate as if any separately and not as inclusive under "Taxes and Extras" in price bid.
 - In case, if the bidder quotes the rate, 'Inclusive of Taxes / Service Tax', it would be considered as if the bidder has included his service tax liability alone. Accordingly BGL's liability of ST on basic value would be loaded for evaluation purposes and the evaluation shall be carried out accordingly.
 - Even if the bidder quotes inclusive of taxes, please provide break up of Bidder's portion of service tax clearly in "PARTICULARS & DECLARATION OF BIDDER".
 - E.g. In case of works contract service under other than original works, service tax liability of bidder will be 5.25 % & buyer's (BGL) liability will be 5.25 %. (i.e. 15% *70%*50%). In case of original works bidder's liability will be (3%) and buyer's liability will be (3%) i.e. 15%*40%*50%.
- ii) For Corporate Bodies (Pvt / Public Limited etc.):**
- In case of Corporate Bodies, discharging of Service Tax liability will be by the Bidder. No addition/ adjustment will be made by the buyer (BGL) for evaluation purpose.
 - In case, if the Corporate Body Bidder quotes the rate, 'Inclusive of Taxes / Service Tax', it would be considered that the bidder has included the total Service Tax liability. The evaluation shall be carried out accordingly.
 - E.g. In case of works contract under other than original works, service tax liability of the bidder will be 10.5 % (i.e. 70% of 15%) & buyer's (BGL) liability will be 0%. In case of original works bidder's liability will be 6% (40% of 15%) & buyer's (BGL) liability will be 0%.
- iii) For bidders where service tax is not applicable (i.e. turnover less than the threshold limit which is currently Rs 10 Lakhs):**
- In case of such bidders, BGL portion of service tax under reverse charge in case of works contracts will only be added for evaluation purpose.

IMPORTANT NOTES FOR "EXTRA TAXES AND DUTIES":

- Please indicate the exact charges applicable as on the date of submission of bids in % terms clearly. DO NOT specify "At Actual", "by BGL" etc.
- It is the responsibility of the bidder to ascertain the exact charges applicable towards various Duties & Taxes (including charges towards Octroi, entry tax etc. if any applicable) prevailing at the time of submission of bids.
- In case any of the charges being Not applicable, Nil, or inclusive in the rates quoted by you, the same may be indicated clearly against the space provided for the same.
- In case any of the above boxes are left blank, the same will be construed as "NIL" for the purpose of evaluation, and PO will be placed accordingly.

The invoice / documents raised by the Contractor shall enable the Corporation to avail Set Off from the Statutory Authorities (VAT, Service Tax etc.) The unpriced bid documents of the tender to be submitted with copy of the relevant registration certificates.

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7.0 SUBSEQUENT LEGISLATION

- 7.1** All duties, taxes (including sales tax on works contract/ trade tax / turnover tax/ service tax as applicable), fees, charges, expenses, etc. (except where otherwise expressly provided in the Contract) as may be levied/ imposed in consequence of execution of the works or in relation thereto or in connection therewith as per the Act, laws, Rules, Regulations in force shall be to Contractors account. However, any new taxes / duties imposed after the date of submission of price bid & up to Contractual Completion date shall be to the GAIL's account but such Taxes / duties imposed beyond Contractual Completion date shall be to the Contractor's account.

8.0 ISSUE OF ESSENTIALITY CERTIFICATE

- 8.1** BGL shall not provide any kind of certificate

9.0 IMPORT LICENCE

- 9.1** Contractor shall arrange import of all materials required for permanent incorporation in the works as well as construction equipment as per the guidelines laid down by the Government of India. Employer/Consultant shall not provide import licence.

10.0 WITHHOLDING, ACCOUNTING AND TAX REQUIREMENT

- 10.1** Contractor agrees for withholding from wages and salaries of its agents servants or employees all sums required to be withheld by the laws of Republic of India or any other agency having jurisdiction over the area where Contractor is conducting operations and to pay the same promptly and directly when due to the proper authority. Contractor further agrees to comply with all accounting and reporting requirements of any Nation having jurisdiction over the subject matter hereof and to conform to such laws and regulations and to pay the cost of such compliance. If requested, Contractor will furnish the evidence of payment of applicable taxes, in the country (ies) of the Contractor's and his sub-contractor(s) and expatriate employees.

11.0 INTELLECTUAL PROPERTY


- 11.1** Neither Employer/Consultant nor Contractor nor their personnel, agents nor any subcontractor shall divulge to any one (other than persons designated by the party disclosing the information) any information designated in writing as confidential and obtained from the disclosing party during the course of execution of the works so long as and to the extent that the information has not become part of the public domain. This obligation does not apply to information furnished or made known to the recipient of the information without restriction as to its use by third parties or which was in recipient's possession at the time of disclosure by the disclosing party. Upon completion of the works or in the event of termination pursuant to the provisions of the contract, Contractor shall immediately return to Employer/Consultant all drawings, plans, specifications and other documents supplied to the Contractor by or on behalf of Employer/Consultant or prepared by the Contractor solely for the purpose of the performance of the works, including all copies made thereof by the Contractor.

12.0 FIRM PRICE

- 12.1** The quoted prices shall be firm and shall not be subject to price escalation till the work is completed in all respects.

13.0 PROVIDENT FUND ACT

- 13.1** The Contractor shall strictly comply with the provisions of Employees Provident Fund Act and register them with RPFC before commencing work. The Contractor shall deposit Employees and Employers contributions to the RPFC every month. The Contractor shall furnish along with each running bill, the challan receipt for the payment made to RPFC for the preceding months.

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14.0 CHANGE ORDERS /EXTRA WORKS/ DEVIATIONS

14.1 A change order will be initiated in case:

i) The Owner/Consultant directs the Contractor to include any addition to the scope of work not covered under this Contract or delete any Work included in the scope of work under the contract.

ii) Contractor requests to delete any part of the work which will not adversely affect the operational capabilities of the project and if agreed by the Owner / Consultant and for which cost and time benefits shall be passed on to the Owner.

14.2 Any changes required by the Owner / Consultant before giving their approval to detailed procedure or any other document relating to material procurement, layout plans etc. for complying with the requirements of bidding document shall not be construed to be a change in the scope of work under the contract.

14.3 Any change order as above comprising an alteration which involves a change in the cost of works (which sort of alteration is hereinafter called a "Variation") shall have impact on the contract value that shall be dealt towards end of contract. All change orders shall be approved by the Engineer-In-Charge.

14.4 If the Contract provides applicable rates for the valuation of the variation in question the contract price shall be increased or decreased in accordance with those rates. If the parties agree that the contract does not contain applicable rates then the parties shall negotiate a revision of the contract price which shall represent the change in cost of the works caused by the variations. Any change order must be duly approved by the Owner consultant in writing.

14.5 If there is a difference in opinion between the Contractor and the Owner / Consultant whether a particular work constitutes a change order or not, the matter shall be handled in accordance with the procedures set forth in.

14.6 Within 10 (Ten) working days of receiving the comments from the Owner / Consultant on the documents submitted by the Contractor for approval, the Contractors response in writing stating which item(s) is are potential change(s), if applicable, will be submitted to the Owner/Consultant.

14.7 Procedure

14.8 During execution of work if the Contractor observes that any new requirements which is not specific or intended in the bidding document has been indicated by Owner / Consultant, they shall discuss the matter with Owner / Consultants representatives.

14.9 In case such requirement arises from the side of the Contractor they would also discuss the matter with Owner / Consultants Representative.


14.10 In either of the two cases above, the representatives of both the parties shall discuss the project requirement and mutually decide whether the project requirement constitutes a change order.

14.11 If it is mutually agreed that the project requirement inquiry constitutes a "Change Order" then a joint memorandum will be prepared to confirm a "Change Order" and basic ideas of necessary agreed modifications.

14.12 Contractor will study the work required in accordance with the Joint memorandum and assess subsequent schedule and cost effect if any.

14.13 The results of this study would be discussed mutually to enable Owner / Consultant to give a final decision whether Contractor should proceed with the Change Order or not, in the best interest of the Project.

14.14 If Owner/Consultants representative accepts the change order in writing then Contractor shall proceed the work stipulated in the Change order. Time worked by all workmen employed and a

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statement showing the description and quantity of all materials and plant utilized for extra work shall be submitted to Owner / Consultant. The Owner / Consultant's representative shall sign and return to the Contractor the statement, as agreed. At the end of each month the Contractor shall deliver to the Owner / Consultants representative a priced statement of the labour, materials and plant used. Whenever any dispute arises as to cost allocation between the Contractor and the Owner / Consultant, the voucher shall nevertheless be signed by the Owner / Consultant as a record of time worked and materials used. List and vouchers so signed will be subject of negotiations between the Owner / Consultant and the Contractor regarding their cost allocation.

14.15 In case, mutual agreement as above that is whether Project Requirement constitutes a change order or not, reached, then Contractor, in the interest of the project, shall take up the implementation of the work, if advised in writing to do so by Owner / Consultants representative pending settlement between the two parties to the effect whether the Project Requirement constitutes a change order or not as per the terms and conditions of Contract Documents.

14.16 The time and cost effect in such a case shall be mutually verified for the purpose of record. Should it be established that the said work constitutes a Change Order, the same shall be compensated taking into account the records kept and in accordance with the contract.

14.17 Should the amount of Extra Work / Change Order, if any, which the Contractor may be required to perform by the Owner / Consultant, fairly entitles the Contractor to extensions of time beyond the scheduled completion date for completion of either the whole of the work or for such Extra Work only the Owner/ Consultant and the Contractor shall mutually discuss and decide the extension of time, if any to be granted to the Contractor.

15.0 CONSTRUCTION EQUIPMENT AND ORGANIZATION

15.1 The Contractor shall without prejudice to his overall responsibility to execute and complete the work as per specifications and time schedule, progressively deploy construction equipments and tools & tackles and shall augment the same as decided by the Engineer-in- Charge depending on the exigencies of the work so as to complete all works within the contracted time schedule and without any additional cost to Employer. No construction/ measuring equipment shall be supplied by the Employer.

15.2 The Employer/Consultant shall supply no Construction Equipment.

15.3 SITE ORGANIZATION

15.4 Subject to the provisions in the contract document and without prejudice to Contractor's liabilities and responsibilities to provide adequate qualified skilled, semi skilled and unskilled personnel on the work, contractor shall deploy supervisory personnel as specified in this SCC and augment the same as decided by the Engineer-in-Charge depending upon the site requirement & the exigencies of work so as to complete all works within the contracted time schedule and without any additional cost to Employer.

15.5 Qualification and experience of Key Supervisory Personnel to be deployed for this work as given in bid document. Contractor shall submit bio-data of Key Supervisory Personnel meeting the requirement as given in bid document will be reviewed and approved by Engineer-in charge.


16.0 MEASUREMENT OF WORKS

16.1 Shall be as per the provisions of relevant clause of GCC and as defined in the bid document.

17.0 TERMS OF PAYMENT

17.1 Basis and Terms of Payment shall be as set out in Annexure to SCC.

18.0 STATUTORY APPROVALS

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- 18.1** Owner shall obtain general in-principle permissions from concerned authorities, if any having jurisdiction over the site area as necessary for construction activities. However, for some of the permissions, if not available, Contractor shall do the follow up with the concerned authorities to get the permissions to execute the job in time. However, all the statutory payment required for such permissions shall be reimbursed by Employer at actuals.
- 18.2** The Contractor shall arrange the inspection of the works by the authorities and necessary co-ordination and liaison work in this respect shall be the responsibility of the contractor. However statutory fees paid, if any, for all inspections and approvals by such authorities shall be reimbursed at actual by the Employer/Consultant to the contractor on production of documentary evidence.
- 18.3** Any change/ addition required to be made to meet the requirements of the statutory authorities shall be carried out by the contractor free of charge. The inspection and acceptance of the work by statutory authorities shall however, not absolve the contractor from any of his responsibilities under this contract.
- 18.4** Notice and Licenses: The Contractor shall at his costs and expenses give to the Municipal or Panchayat, Police and any other private or public authorities all notices etc., that may be required in law to be given and obtain all necessary permissions and licenses etc., for temporary obstructions, enclosures and pay all fees, taxes charges etc. which may be leviable by such authorities for that purpose. The Contractor shall make good any damage to the adjoining property whether public or private.

19.0 TESTS AND INSPECTION

- 19.1** The Contractor shall carry out the various tests as enumerated in the technical specifications of this bid document and the technical documents that will be furnished to him during the performance of the work.
- 19.2** All the tests either on the field or at outside laboratories concerning the execution of the work and supply of materials by the Contractor shall be carried out by Contractor at his own cost.
- 19.3** The work is subject to inspection at all times by the Engineer-in-Charge. The contractor shall carry out all instructions given during inspection and shall ensure that the work is being carried out according to the technical specifications of this bid document, the technical documents and the relevant codes of practice will be furnished to him during the performance of the work.
- 19.4** The Contractor shall provide for purposes of inspection access ladders, lighting and necessary instruments at his own cost.
- 19.5** Any work not conforming to execution drawings, specifications or codes and approved methodology / scheme shall be rejected forthwith and the Contractor shall carryout the rectifications at his own cost.
- 19.6** All results of inspection and tests will be recorded in the inspection reports, proforma of which will be approved by the Engineer-in-Charge. These reports shall form part of the completion documents.
- 19.7** For materials supplied by Employer/Consultant, Contractor shall carryout the tests, if required by the Engineer-in-Charge, and the Employer/Consultant shall reimburse the cost of such tests at actual to the Contractor on production of documentary evidence.
- 19.8** Statutory fees paid to IBR authorities and for repeat tests and inspection due to failures, repairs etc. such reasons attributable to the Contractor shall be borne by the Contractor.
- 19.9** Inspection and acceptance of work shall not relieve the Contractor from any of his responsibilities under this Contract.

20.0 INSPECTION OF SUPPLY ITEMS

- 20.1** All inspection and tests on bought out items shall be made as per the specifications forming part of this contract. Various stages of inspection and testing shall be identified after receipt of Quality Assurance Programme from the Contractor/ Manufacturer.
- 20.2** Inspection calls shall be given for associations of Owner/Consultant's representative as per mutually agreed programme in prescribed proforma with 15 days margin, giving details of equipment and

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attaching relevant test certificates and internal inspection report of the Contractor. All drawings, General Arrangement and other contract drawings, specifications, catalogues etc. pertaining to equipment offered for inspection shall be got approved from Owner /Consultant and copies shall be made available to Owner /Consultant beforehand for undertaking inspection.

- 20.3** The contractor shall ensure full and free access to the inspection Engineer of Owner/Consultant at the Contractor's or their sub-contractor's premises at any time during contract period to facilitate him to carry out inspection and testing assignments.
- 20.4** The contractor/ sub-contractor shall provide all instruments, tools, necessary testing and other inspection facilities to inspection engineer of Owner /Consultant free of cost for carrying out inspection.
- 20.5** Where facilities for testing do not exist in the Contractor's/ sub-contractor's laboratories, samples and test pieces shall be drawn by the Contractor/ Sub Contractor in presence of Inspection Engineer of a Owner /Consultant and duly sealed by the later and sent for testing in Government approved Test House or any other testing laboratories approved by the Inspection Engineer at the Contractor's cost.

21.0 FINAL INSPECTION

- 21.1** After completion of all tests as per specification the whole work will be subject to a final inspection to ensure that job has been completed as per requirement. If any defects noticed in the work attributable to Contractor, the Contractor at his own cost shall attend these, as and when the Owner /Consultant brings them to his notice. The Owner /Consultant shall have the right to have these defects rectified at the risk and cost of the contractor if he fails to attend to these defects immediately.

22.0 COMPENSATION FOR EXTENDED STAY


- 22.1** The clause of GCC is modified to the following extent: Bidder to note that extended stay compensation is NOT APPLICABLE.

23.0 COMPUTERIZED CONTRACTORS BILLING SYSTEM

- 23.1** Without prejudice to stipulation in General Conditions of Contract, Contractor should follow following billing system.
- 23.2** The bills will be prepared by the contractors on their own PCs as per the standard formats and codification scheme proposed by BGL. The contractors will be provided with data entry software to capture the relevant billing data for subsequent processing. Contractors will submit these data to BGL in an electronic media along with the hard copy of the bill, necessary enclosures and documents. The contractor will also ensure the correctness and consistency of data so entered with the hard copy of the bill submitted for payment
- 23.3** Employer/Consultant will utilize these data for processing and verification of the Contractor's bill and payment."

24.0 SITE CLEANING

- 24.1** The Contractor shall clean and keep clean the work site from time to time to the satisfaction of the Engineer-in-Charge for easy access to work site and to ensure safe passage, movement and working.
- 24.2** If the work involves dismantling of any existing structure in whole or part, care shall be taken to limit the dismantling up to the exact point and/or lines as directed by the Engineer-in-Charge and any damage caused to the existing structure beyond the said line or point shall be repaired and restored to the original condition at the Contractor's cost and risks to the satisfaction of the Engineer-in-Charge, whose decision shall be final and binding upon the Contractor.
- 24.3** The Contractor shall be the custodian of the dismantled materials till the Engineer-in-Charge takes charge thereof.
- 24.4** The Contractor shall dispose off the unserviceable materials, debris etc. to any areas decided by the Engineer-in-Charge.

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24.5 The Contractor shall sort out, clear and stack the serviceable materials obtained from the dismantling/renewal at places as directed by the Engineer-in-Charge.

24.6 No extra payment shall be paid on this account.

25.0 COMPLETION DOCUMENTS

25.1 Contract shall provide completion documents as defined in bid documents.

26.0 TEST CERTIFICATES

26.1 Bidder shall be required to submit recent test certificates for the material being used in works room the recognised laboratories. These certificates should indicate all properties of the materials as required in relevant IS Standards or International Standards.

26.2 Contractor shall also submit the test certificate with every batch of material supplied which will be approved by Engineer-in-Charge. No secured advance will be given for the materials not having test certificate. In case any test is to be carried out, the same shall be done in the approved laboratory at the cost of contractor.

27.0 ADDITIONAL WORKS/ EXTRA WORKS

27.1 Employer/Consultant reserves their right to execute any additional works/ extra works, during the execution of work, either by themselves or by appointing any other agency, even though such works are incidental to and necessary for the completion of works awarded to the Contractor. In the event of such decisions taken by Employer/Consultant Contractor is required to extend necessary cooperation, and act as per the instructions of Engineer-in-Charge.

28.0 COMPENSATION FOR DELAY (L.D) / PRICE REDUCTION SCHEDULE FOR ANY DELAY

28.1 Clause of GCC, pertaining to Compensation for Delay (Liquidated Damages) stands modified to the following extent

28.2 The contractual completion period is 12 months as given in the SCC.

28.3 In case of delay in works in any of the parts against any of the activities stated in SOR, L.D / PRS shall be applicable @ ½% of the contract value of respective section(s). The maximum L.D/ PRS shall be limited to 5% of contract value. The contract value for L.D / PRS purpose shall be excluding service tax.


29.0 ABNORMALLY HIGH RATED ITEMS (AHR ITEMS)

29.1 Clause of GCC is modified to the following extent:

29.2 "In items rate contract where the quoted rates for the items exceed 50% of the owners/ estimated rates, such items will be considered as Abnormally High Rates Items (AHR) and payment of AHR items beyond the SOR stipulated quantities shall be made at the least of the following rates:

- i) Rates as per SOR, quoted by the Contractor.
- ii) Rate of the item, which shall be derived as follows:
 - a) Based on rates of machine and labour as available from the contract (which includes contractor's supervision, profit, overheads and other expenses).
 - b) In case rates are not available in the contract, rates will be calculated based on prevailing market rates of machine, material and labour plus 15% to cover contractor's supervision profit, overhead & other expenses.

30.0 BANK GUARANTEES

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30.1 The provision relating to submission of Bank Guarantee from any Nationalized Bank wherever appearing in above documents stand replaced by the following:


- i) Bank guarantees towards Bid Security from 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 in case of Indian bidder and from any reputed International Bank or Indian scheduled bank in case of foreign bidder, may be accepted. However, other than the Nationalized Indian Banks, the banks whose BGs are furnished, must be commercial banks having net worth in excess of Rs.1000 Million and a declaration to this effect should be made by such commercial bank either in the bank guarantee itself or separately on a letter head.
- ii) Similarly, bank guarantees towards Performance and Advance Payments may be accepted from 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 in case of Indian bidder as well as foreign bidder. However, other than the Nationalised Indian Banks, the banks whose BGs are furnished, must be commercial banks having net worth in excess of Rs.1000 Million and a declaration to this effect should be made by such commercial bank either in the bank guarantee itself or separately on a letter head.
- iii) Guarantee towards Bid Security/Contract and Equipment Performance/Advance payment may also be acceptable from All India Level Public Financial Institution on case to case basis meeting the following criteria:
 - a) The Institution is All India Level Public Financial Institution.
 - b) It should be rated AAA by any rating agency like CRISIL.
 - c) The Institution should be authorised by way of Law/its memorandum to issue such guarantee.

31.0 INSURANCES IN INDIA

31.1 In addition to the insurance covers specified in the General Conditions of Contract to be obtained and maintained by the Contractor, Contractor shall at his own expense arrange, secure and maintain insurance with reputable insurance companies to the satisfaction of the Employer/Consultant as may be necessary and to its full value for all such amounts to protect the works in progress from time to time and the interest of Employer/Consultant against all risks as detailed herein. The form and the limit of such insurance as defined herein together with the under writer works thereof in each case should be as acceptable to the Employer/Consultant. However, irrespective of work acceptance, the responsibility to maintain adequate insurance coverage at all times during the period of Contract shall be that of Contractor alone. Contractor's failure in this regard shall not relieve him of any of his responsibilities and obligations under Contractor.

31.2 Any loss or damage to the equipment during ocean transportation, port/custom clearance, inland and port handling, inland transportation, storage, erection and commissioning till such time the Work is taken over by Employer/Consultant, shall be to the account of Contractor. Contractor shall be responsible for preferring of all claims and make good for the damage or loss by way of repairs and/or replacement of the parts of the Work damaged or lost. Contractor shall provide the Employer/Consultant with a copy of all insurance policies and documents taken out by him in pursuance of the Contract. Such copies of documents shall be submitted to the Employer/Consultant immediately upon the Contractor having taken such insurance coverage. Contractor shall also inform the Employer/Consultant at least 60 (Sixty) days in advance regarding the expiry cancellation and/or changes in any of such documents and ensure revalidation/renewal etc., as may be necessary well in time.

31.3 Statutory clearances, if any, in respect of foreign supply required for the purpose of replacement of equipment lost in transit and/or during erection, shall be made available by the Employer/Consultant. Contractor shall, however, be responsible for obtaining requisite licenses, port clearances and other formalities relating to such import. The risks that are to be covered under the insurance shall include, but not be limited to the loss or damage in handling, transit, theft, pilferage, riot, civil commotion, weather conditions, accidents of all kinds, fire, war risk (during ocean transportation only) etc. The scope of such insurance shall cover the entire value of supplies of equipment's, plants and materials to be imported from time to time.

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31.4 All costs on account of insurance liabilities covered under this Contract will be to Contractor's account and will be included in Contract Price. However, the Employer/Consultant may from time to time, during the currency of the Contract, ask the Contractor in writing to limit the insurance coverage risk and in such a case, the parties to the Contract will agree for a mutual settlement, for reduction in Value Of Contract to the extent of reduced premium amounts.

31.5 Contractor as far as possible shall cover insurance with Indian Insurance Companies, including marine Insurance during ocean transportation.

32.0 DOCUMENTS TO BE SUBMITTED/ PRODUCED ALONGWITH R.A. BILLS

- i) Computerized R.A. Bill/ Manual Bill, with IT No./ ST No./ Labour License No. Printed thereon.
- ii) ESI/ EPF clearance certificates for the last month along with R.A. Bills.
- iii) Insurance Policy as per relevant clauses of Contract Agreement.
- iv) Attendance Register and Salary Records.
- v) Photocopy of the measurement book to be attached with R.A. Bills.
- vi) Any other document required for the purpose of processing the bills.
- vii) Registration Certificate with Sales tax authorities of state concerned.

33. DEFECT LIABILITY PERIOD

For all Contractors' supply and installation items, the defect liability period shall be 03 months from the date of Completion of the works. Contractor has to repair/ replace the defective material without any cost to the OWNER. The decision of EIC shall be final and binding on the CONTRACTOR in such cases. However, vendor is endorsed to coordinate with OEM for any warranty/ guarantee of supply items as per the provision of contract.

34. UTILISATION OF LOCAL RESOURCE


The contractor shall ascertain the locally available resources and explore the possibility of making use of them for smooth execution of the work. The contractor shall not recruit personnel of any category from among those who are already employed by the other agencies working at the site but shall make maximum use of locally available labour.

35. NOMINATING SITE COORDINATOR

The contractor shall nominate site coordinator for each site/ region prior to start of work and will furnish all the details like address, contact telephone number etc. to the respective OICs/ Terminal-in-charges/ site-in-charges and Engineer-in-charge. Providing residential accommodation for his staff and workers at his own cost shall be Contractor's responsibility. If required, site offices shall be established by the contractor at each location.

36. MAKE OF MATERIALS

- 36.1 All equipment and materials to be supplied or used under this contract shall be from approved vendors.
- 36.2 Wherever any make of item is specified by a brand name, manufacturer or vendor the make mentioned shall be for establishing type, function and quality desired. Other makes will be considered, provided sufficient informations are furnished to the owner to assess the make(s) proposed by the contractor as equivalent and acceptable.
- 36.3 Where the makes of materials are not indicated in the tender document, contractor shall furnish details of proposed makes and supply the same after written approval of owner.

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37. TEMPORARY WORKS

All temporary works, ancillary works, enabling works, including de-watering of surface and subsoil water, preparing approaches and working areas, wherever required for execution of the work, shall be the responsibility of the contractor. Such temporary works shall be removed after completion of the work, without any obligation to the OWNER.

38. COORDINATION WITH OTHER AGENCIES

Contractor shall be responsible for proper coordination with other agencies operating at the site of work so that work may be carried out concurrently, if necessary, without any hindrance. The EIC shall resolve disputes, if any, in this regard, and his decision shall be final and binding.

39. TESTS AND INSPECTION


- i. Bhagyanagar gas limited and its 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.
- ii. The contractor shall carry out the various tests as per the technical documents that will be furnished to him during the performance of the work and no separate payment shall be made unless otherwise specified in schedule of rates.
- iii. All the tests either on the field or at outside laboratories concerning the execution of the work and supply of materials by the contractor shall be carried out by contractor at his own cost.
- iv. The contractor shall provide proper resources i.e. access ladders, lighting and necessary instruments at his own cost for carrying out inspection.
- v. Any work not conforming to execution drawings, specifications or codes shall be rejected forthwith and the contractor shall carry out the rectifications at his own cost.
- vi. Inspection and acceptance of work shall not relieve the contractor from any of his responsibilities under this contract.

Statutory fees paid to statutory authorities for repeat tests and inspection due to failures, repairs etc. reasons attributable to the contractor shall be borne by the contractor.

40. FINAL INSPECTION

After completion of work as per specification, the whole work will be subject to a final inspection to ensure that job has been completed as per requirement. If any defects noticed in the work and are attributable to contractor these shall be attended by the contractor at his own cost, as and when they are brought to his notice by the owner. The owner shall have the right to have these defects rectified at the risk and cost of the contractor if he fails to attend to these defects immediately.

41. All instruments, equipments, tools tackles, materials, consumables manpower etc. shall be arranged by the contractor without any extra charge to complete the tendered work as per the scope of work. In addition to this requisite number of service units shall also be kept ready so as to meet any requirement at site during the progress of work. all equipment/ tool-tackles etc. of reputed make shall be deployed and maintained in good working condition at all times by the Contractor in each region.

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42. Contractor shall obtain necessary gate pass for his personnel, clearance, hot permit, work permit wherever and whenever applicable from the competent authority before starting and during execution of the job.

The contractor shall provide the requisite transport arrangements for his engineer/staff for repairing and maintenance activities as included in the BOQ.

43. MATERIAL TO BE SUPPLIED BY THE CONTRACTOR

Unless otherwise specified all material including consumables shall be supplied by the contractor and quoted rates shall be inclusive of the cost of all such material. The material to be supplied by the contractor shall confirm to the effective relevant standards/codes/specifications by IS/NACE/ASME/ANSI/IEC at the time of execution of the work. The prior approval of samples of material to be used shall be taken from the EIC before using the same at site. Supply of the following material as per the specification laid, is in the scope of the contractor.

- i. Cables of required sizes
- ii. Permanent Reference Cell
- iii. Mg/Zn Anodes
- iv. Grounding Cell
- v. Spark Gap Arrestor
- vi. Solid State Polarization Cell
- vii. Main Junction Box
- viii. MTS (METALIC TYPE)
- ix. All Consumables including paints, thinner, requisite hardware, rubber gaskets.
- x. Door-locks, hinges, diagram plates, terminal plates, cable jointing kits

However, the above items are illustrative only and the CONTRACTOR is required to bring the all requisite material for completion of the work

44) Public Procurement Policy for MSEs 2012:

Considering the nature of job, splitting of quantities will not be possible in this tender and hence the clause for award of 25 % of ordered quantity to MSE as per PPP 2012 is not possible. Therefore, MSE quoting within price band of L1 (other than MSE) + 15%, will be awarded for full/ complete services subject to matching of L1 (lowest) price as per ITB of tender document. In case two or more MSE bidder(s) comes within the price band of L1+15%, the preference to match the L1 rate shall be given in sequence of their inter-se position (L2, L3...and so on).




Bhagyanagar Gas
Limited

**Tender for Annual Maintenance Contract for
Monitoring & Maintenance of Cathodic
Protection (CP) System installed in Hyderabad,
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ANNEXURE TO SPECIAL CONDITION OF CONTRACT

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PAYMENT TERMS & MODE OF PAYMENT

1. PAYMENT TERMS

1.1 Supplies & Installation

1.1.1 75 % Pro-rata for supply portion as per approved Billing Schedule on submission of Invoice in triplicate with following document:

- i) On complete acceptance & certification of the EIC.
- ii) Vendor/Supplier Accepted copies of PO's along with Cenvatbale invoice.
- iii) Original LR / GR as applicable.
- iv) Packing List.
- v) Inspection release note issued by Owner / Consultant
- vi) Material receipt issued by Bidder & verified by Owner/Consultant at storage.

1.1.2 15% on Installation, site acceptance, testing and commissioning of individual item on submission of invoice in triplicate with following document:

- a) Certificate from Owner / Consultant for successful testing, commissioning & acceptance of CP system.
- b) Validity of performance bank guarantee as per tender requirement.

1.1.3 10% of total supply portion on completion, Post commissioning survey and on handing over the CP system on submission of invoice in triplicate with following document:

- a) Certificate from Owner/ Consultant for taking over of completed interference free CP system.
- b) Certificate from Owner / Consultant for receipt of all requisite documents such as
 - (i) Warranty certificate;
 - (ii) as built drawings;
 - (iii) test reports;
 - (iv) reconciliation statement etc.
- c) Validity of performance bank guarantee as per tender requirement.


1.2 For Work Portion (Erection, Installation & Commissioning Only)

1.2.1 90 % progressive monthly payment on submission of invoice in triplicate with following documents:

- a. Invoice covering PRS, if applicable
- b. Certificate from Owner / Consultant for completion of work as per approved Billing Schedule.
- c. Validity of performance bank guarantee as per tender requirement.

1.2.2 10% of total work portion on completion of works in all respect and on handing over the CP system shall be paid along with last 10% payment of Supply as detailed in para 1.1.3 above on submission of invoice covering PRS, if applicable in triplicate with following documents:

- a) Certificate from Owner/ Consultant for successful completion of CP system.
- b) Certificate from Owner/ Consultant for taking over of completed interference free CP system.
- c) Certificate from Owner / Consultant for receipt of all requisite documents such as

| | | |
|--|---|--|
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- (i) warranty certificate;
- (ii) Delay Analysis, if any
- (ii) As built drawings;
- (iii) Test reports;
- (v) Reconciliation statement etc.
- (vi) Survey reports & Recommendation etc.

d) Validity of performance bank guarantee as per tender requirement.

2.0 PAYMENT METHODOLOGY

- 1.1 The contractor may raise invoices on monthly basis. Bidder shall enclose all documents as per check list issued by BGL. However, EIC may authorize payments for bills more frequently i.e. periodicity of less than fortnight, depending on site requirements.
- 1.2 The payments to the Contractor will be released within a period of 15 days from the date of receipt of the complete invoice as per the terms and conditions of the Contract.
- 1.3 Further break-up of Lumpsum Prices, if applicable & deemed necessary for any progressive payment of individual item may be permitted after request by Contractor showing relevance of further breakup & recommendation by EIC.
- 1.4 All payments against running bills are advance against the work and shall not be taken as final acceptance of work / measurement carried out till the final bill.

3. MODE OF PAYMENT

- 3.1 All payments payable against the contract shall be released by Owner through account payee cheque payable at par.

4 DEDUCTION AT SOURCE

- 4.1 Purchaser will release the payment to the Seller after effecting deductions as per applicable law in force.
- 4.2 Purchaser will release payments to the Contractor after offsetting all dues to the Purchaser payable by the Contractor under the Contract.



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SECTION-11

SCHEDULE OF RATES (SOR)

| | | |
|--|---|--|
|  Bhagyanagar Gas Limited | <p align="center">Tender for Annual Maintenance Contract for Monitoring & Maintenance of Cathodic Protection (CP) System installed in Hyderabad, Vijayawada & Kakinada GA's.</p> <p align="center">Bid Document No. BGL/529/2021-22</p> | <p align="center">Volume II of II</p> |
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Bhagyanagar Gas Limited

SCHEDULE OF RATES (SOR)

Financial Bid / Priced Bid

Bid Document ref: BGL/529/2021-22, dtd. 03.09.2021

Item : Annual Maintenance Contract for Monitoring & Maintenance of Cathodic Protection (CP) System installed in Hyderabad, Vijayawada & Kakinada GA's.

| | |
|------------------------|--|
| Name of Bidder: | |
|------------------------|--|

| Sr. No. | DESCRIPTIONS | HSN/ SAC Code | UO M | QTY | QTY | QTY | Total QTY | Unit Rate (Rs) figures | Unit Rate (RS.) words | Total Amount (RS.) (figures) | Total Amount (RS.) (words) |
|---------|---|---------------------|---------|------------|------------|------------|--------------|---------------------------------|--------------------------------|---------------------------------------|-------------------------------------|
| (A) | (B) | (C) | (D) | (A) | (B) | (C) | (E) | (F) | (G)=(A+B+C)X (E) | (H)=(A+B+C)X (E) | (I)=(A+B+C)XC |
| | | | | HYD | VJA | KKD | | | | | |
| 1 | HALF YEARLY TR- UNIT MONITORING | | | | | | | | | | |
| | To carry out monitoring of CP Unit: (Any Make type TR) & Submission of Reports as per ISO formats enclosed with recommendation from NACE Level 2 (min) CP Specialist or CP Expert for any preventive/Breakdown Action Required if any. Activities to be performed as defined in the scope of work. | | No s | 12 | 8 | 2 | 22 | | | | |
| 2 | HALF YEARLY ON- PSP MONITORING. | | | | | | | | | | |



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| | | | | | | | | | | | |
|---|--|--|---------|---|---|---|----|--|--|--|--|
| | To carry out ON PSP monitoring at test station(quarters every year) as per ISO Format (including status of insulating Joints, Sacrificial Anode Voltage, Anode Current drawn, Casing Status, Spark Gap Arrestor, Grounding Cell, Bonding Status with Foreign Pipeline, or Polarisation cell or Krirk Cell etc. at one particular Location with recommendations (NACE Level 2 (min) CP Specialist or CP Expert) for any Preventive/Breakdown Action required if any. Activities to be performed as defined in the scope of Work. | | No s | 4 | 4 | 4 | 12 | | | | |
| 3 | YEARLY ON-OFF PSP MONITORING | | | | | | | | | | |
| | To carry out ON- PSP with Simcorder(This activity to be carry out once every year) at test Station as per procedure defined in the Scope of work Including Installation of current interrupter (with GPSSynchroniser) wherever required (including status insulating joints, Sacrificial Anode Voltage, Anode current drawn, Casing Status, Surge Arrestor, Grounding cell, Bonding Status with Foreign Pipeline, or Polarisation cell or Krirk Cell etc. at one particular Location with recommendations (NACE Level 2 (min) CP Specialist or CP Expert) for any Preventive/Breakdown Action required if any. Activities to be performed as defined in the scope of Work. | | No s | 2 | 2 | 2 | 6 | | | | |
| 4 | Half Yearly ON PSP IN COMMON ROU | | | | | | | | | | |
| | To carry out ON- PSP monitoring in Common ROU Pipeline network (Min 02 quarter every year or as directed by the EIC) as per ISO formats (including status insulating joints, Sacrificial Anode Voltage, Anode current drawn, Casing Status, Surge Arrestor, Grounding cell, Bonding Status with Foreign Pipeline, or Polarisation cell or Krirk Cell etc. at one particular Location with recommendations (NACE Level 2 (min) CP Specialist or CP Expert) for any Preventive/Breakdown Action required if any. Activities to be performed as defined in the scope of Work. | | No s | 4 | 4 | 1 | 9 | | | | |
| 5 | YEARLY MONITORING OF ANODE BED | | | | | | | | | | |
| | To carry out Anode bed (horizontal or deepwell) monitoring of CP Unit (Any Make type TR/Solar/CPPCM/CPVCM etc) once every year as per ISO formats at particular location with recommendations (From NACE Level 2 (min) CP Specialist or CP Expert) for any Preventive/Breakdown Action required if any. Activities to be performed as defined in the scope of Work. | | No s | 6 | 4 | 4 | 14 | | | | |



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|----|--|--|---------|---|---|---|----|--|--|--|--|
| 6 | MAINTENANCE OF EARTHING SYSTEM | | | | | | | | | | |
| | To be performed when the individual earth pit resistance during monitoring is observed >5 ohms by pouring of Earth Activation (Vimco or Equivalent 5 kg), Salt(20kg) and Water (200 ltrs.). Activities to be performed as defined in the scope of Work. | | No s | 6 | 4 | 2 | 12 | | | | |
| 7 | PERMANENT REFERENCE CELL | | | | | | | | | | |
| | Supply Installation and commissioning with termination and connection Cu-cuso4 permanent reference cell (make: MC Miller/tinker Raiser/Borin) with necessary backfill material including excavation/backfilling cable laying, cable identification ferrules, including consumables like sand , brick,lugs, brass washers, insulation tape etc. labour, tools & tackles complete in all respects.Activities to be performed as defined in the scope of Work. | | No s | 6 | 4 | 2 | 12 | | | | |
| 8 | PORTABLE Cu-cuso4 REF CELL | | | | | | | | | | |
| | Supply,testing with terminations ,connections, cables , lugs, crocodile pins etc. complete in all respects Portable Cu-cuso4 ref cell (Mc-Miller or Tinker raiser or Borin).Activities to be performed as defined in the scope of Work. | | No s | 4 | 4 | 2 | 10 | | | | |
| 9 | NEW TEST STATIONS (WITH BENDS) | | | | | | | | | | |
| | Supply & Installation of new test station, (with Bend & foundations including 01 no of variable bonding resistance (2 ohms, 5A, 50W). As per the standard drawing for A/B/C/D/E/F Type (as per site requirement) with bakelite terminal plate with SS nut,bolts with Siemens key lock, connection diagram, name plate, pipeline chainage marker on TS including all civil materials/work, termination & connections, complete in all respects. Activities to be performed as defined in the scope of Work. | | No s | 3 | 5 | 2 | 10 | | | | |
| 10 | NEW TEST STATIONS (WITHOUT BENDS) | | | | | | | | | | |



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|----|---|--|----------------|----|----|----|---------|--|--|--|--|
| | Supply & Installation of new test station, (without Bend & foundations including 01 no of variable bonding resistance (2 ohms, 5A, 50W). As per the standard drawing for A/B/C/D/E/F Type (as per site requirement) with bakelite terminal plate with SS nut,bolts with Siemens key lock, connection diagram, name plate, pipeline chainage marker on TS including all civil materials/work, termination & connections, complete in all respects. Activities to be performed as defined in the scope of Work. | | No s | 2 | 2 | 0 | 4 | | | | |
| 11 | TLP DOOR | | | | | | | | | | |
| | Supply &replacement Of TLP Door (compatible with any type of existing box TLP for A/B/C/D/E/F Type as per existing) with 4 Allen screws including drilling and tapping work in TLP body. Activities to be performed as defined in the scope of Work. | | No s | 10 | 8 | 5 | 23 | | | | |
| 12 | 6 SQUARE MM ARMoured CABLE | | | | | | | | | | |
| | Supply & replacement of Copper Conductor XLPE insulated and PVC sheeted , 6 sq. mm stranded single core 600/1100 volts armoured CP cables with ISI mark. Activities to be performed as and when required based on the replacement of TLP stations as defined in the scope of Work. | | me ter s | 50 | 50 | 30 | 13 0 | | | | |
| 13 | 10 SQUARE MM ARMoured CABLE | | | | | | | | | | |
| | Supply & replacement of Copper Conductor XLPE insulated and PVC sheeted, 10 sq. mm stranded single core 600/1100 volts armoured CP cables with ISI mark. Activities to be performed as and when required based on the replacement of TLP stations as defined in the scope of Work. | | me ter s | 50 | 50 | 60 | 16 0 | | | | |
| 14 | 25 SQUARE MM ARMoured CABLE | | | | | | | | | | |
| | Supply & replacement of Copper Conductor XLPE insulated and PVC sheeted ,25 sq. mm stranded single core 600/1100 volts armoured CP cables with ISI mark. Activities to be performed as defined as and when required based on the replacement of TLP stations in the scope of Work. | | me ter s | 50 | 50 | 30 | 13 0 | | | | |
| 15 | 35 SQUARE MM ARMoured CABLE | | | | | | | | | | |



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|----|--|--|------------------------|---------|----|----|---------|--|--|--|--|
| | Supply & replacement of Copper Conductor XLPE insulated and PVC sheeted, 35 sq. mm stranded single core 600/1100 volts armoured CP cables with ISI mark. Activities to be performed as defined in the scope of Work. | | me ter s | 50 | 50 | 0 | 10 0 | | | | |
| 16 | PIN BRAZING | | | | | | | | | | |
| | Pipe to cable joint with Pin brazing method, its encapsulation and holiday detection test including excavation, backfilling etc. complete with supply of all materials equipment's required for Pin Brazing as per standard drawings/specifications defined in the scope of work. Activities to be performed as defined in the scope of Work. | | No s. | 25 | 20 | 16 | 61 | | | | |
| 17 | EXCAVATION & BACKFILLING IN RCC/ROAD | | | | | | | | | | |
| | Excavation / Laying in RCC/Road earth surface of all types of sizes of CP or TR Electrical Cable, Backfilling and finally making back to its original surface including terminations, connections, lugging, crimping etc. with copper lugs, laying 01 layer of bricks, sand and polyethylene sheet in the cable trench etc. complete all respects as defined in the scope of work and soft surface of all type of sizes of CP or TR Electrical Cables as per procedure defined in the scope of work. Activities to be performed as defined in the scope of Work. | | cub ic me ter | 30 | 30 | 15 | 75 | | | | |
| 18 | EXCAVATION & BACKFILLING IN NORMAL SOIL | | | | | | | | | | |
| | Excavation in normal soil surface, Backfilling and finally making back to its original surface complete all respects as defined in the scope of work. Activities to be performed as defined in the scope of Work. | | cub ic me ter | 10 0 | 75 | 60 | 23 5 | | | | |
| 19 | CP CABLE JOINT | | | | | | | | | | |
| | Supply and making CP Cable underground joint with jointing kit consisting of mould, epoxy/Resin and ferrules, lugs, etc. as defined in the scope of work. Activities to be performed as defined in the scope of Work. | | No s. | 20 | 18 | 16 | 54 | | | | |
| 20 | 17 LBS MG ANODE | | | | | | | | | | |



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|----|--|--|----------|----|---|---|----|--|--|--|--|
| | Supply & Installation, testing and commissioning of prepacked 17 lbs Mg Galvanic anode with 10 mtrs max. cables of 10 sq.mm, termination & connections & excavation & backfilling as per the standards drawing & specifications defined in the scope of work . Activities to be performed as defined in the scope of Work. | | No s. | 10 | 6 | 2 | 18 | | | | |
| 21 | SPARK GAP ARRESTOR | | | | | | | | | | |
| | Supply & Installation, testing and commissioning of Spark Gap arrestor (OBO betterman/ DHEN GMBH) as per the standards drawing & specifications, complete in all respects as defined in the scope of work . Activities to be performed as defined in the scope of Work. | | No s. | 10 | 8 | 2 | 20 | | | | |
| 22 | ZINC GROUNDING CELL | | | | | | | | | | |
| | Supply & Installation, testing and commissioning of Prepacked Zinc Grounding Cell(22kgs) total weight with 10 mtrs max. cables of 10 sq.mm, & as per the standards drawing & specifications, complete in all respects as defined in the scope of work . Activities to be performed as defined in the scope of Work. | | No s. | 6 | 5 | 4 | 15 | | | | |
| 23 | ANODE LEAD JUNCTION BOX | | | | | | | | | | |
| | Supply, installation and commissioning of Anode Lead Junction box (with bend and foundation) including backelite plate, SS nuts, bolts, port type resistor & shunt arrangement, civil works with materials as per spec. & drawing. Activities to be performed as defined in the scope of Work. | | No s. | 2 | 2 | 0 | 4 | | | | |
| 24 | MAINTENANCE OF ANODE GROUD BED (HORIZONTAL OR DEEP WELL) | | | | | | | | | | |
| | Maintenance of Anode Ground Bed complete with 500 kgs common Salt, 18 kltrs of water, including excavation of trench for creating bund (appx 2.5m depth x1.5m width x 60m length) & backilling as defined in the scope of work. Activities to be performed as defined in the scope of Work. | | No s. | 6 | 2 | 1 | 9 | | | | |
| 25 | COATING REPAIR | | | | | | | | | | |



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|----|--|--|-------------------------|----|----|----|----|--|--|--|--|
| | Repair of Pipe coating (with coating materials) : Coating repair using cold tapes (with coating materials): Pipeline rehabilitation using DENSOLEN/RAYCHEM 3 Ply/2 ply cold applied, self amalgamating corrosion prevention tapes. Removing the Old/damaged coating at fault locations with hand brush/buffing, emerypaper/waterleaning etc or combination of all repairing of the coating using cold applied tapes by applying a uniform coat of primer to the steel surface using the paint roller or brush & wait for 30 min for drying and after that wrap 3 ply tapes. wrapping the 3 ply tapes spirally under tension around the pipe with the grey side facing the steel surface with a min. of 50% overlap, wrap the 2 ply tape spirally under tension around the pipe with the butyl adhesive facing the innerwrap with a minimum of 50% overlap. Ensure that the outer wrap completely covers the inner wrap. The cold Tapes (both inner and outer) and Primer will be supplied by the bidder. Activities to be performed as defined in the scope of Work. | | me ter squ are | 15 | 15 | 30 | 60 | | | | |
| 26 | SOLID STATE POLARISATION CELL | | | | | | | | | | |
| | Supply and replacement of (Dairyland/ Rustrol make polarisation Cell) in the existing system as per NACE/VDE specification for protection of up to 66/132 KV/HV/EHV power line crossing including backfilling cabling termination complete in all aspects as defined in the scope of work. Activities to be performed as defined in the scope of Work. | | No s. | 5 | 1 | 1 | 7 | | | | |
| 27 | TEST STATION FOR POLARISATION CELL | | | | | | | | | | |
| | Supply & Installation Test station for polarisation cell as per Drawing, include, termination, connection, civil works etc complete in all respects as defined in the scope of work. Activities to be performed as defined in the scope of Work. | | No s. | 5 | 1 | 1 | 7 | | | | |
| 28 | INTERFERENCE SURVEY AT RAILWAYS XING | | | | | | | | | | |
| | Interference survey at railway crossing includes 24 hours data logging, data collection at railway tracks, and recommend mitigation measures/modification required (by NACE level; 2 or CP Expert) as defined in the scope of work with specification, design and detail engineering . Activities to be performed as defined in the scope of Work. | | No s. | 8 | 2 | 2 | 12 | | | | |
| 29 | INTERFERENCE SURVEY AT FOREIGN PIELINE XING | | | | | | | | | | |



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|----|---|--|----------|----|---|---|----|--|--|--|--|
| | Interference survey at foreign pipeline crossing or running parallel with our pipeline including 24 hours data logging, data collection at foreign pipeline crossing location and from foreign pipeline operator and recommend mitigation measures/modification required (by NACE level; 2 or CP Expert) as defined in the scope of work with specification, design and detail engineering. Activities to be performed as defined in the scope of Work. | | No s. | 10 | 2 | 1 | 13 | | | | |
| 30 | INTERFERENCE SURVEY AT HT LINE XING | | | | | | | | | | |
| | Interference survey at HT line crossing including 24 hours data logging, data collection of data from SEBs, measurement and calculation of AC corrosion current and recommendation for mitigation measures/modification if required (by NACE level; 2 or CP Expert) as defined in the scope of work with specification, design and detail engineering. Activities to be performed as defined in the scope of Work. | | No s. | 12 | 4 | 4 | 20 | | | | |
| 31 | INSPECTIONS OF ROAD XING'S | | | | | | | | | | |
| | To carry out the inspection of ROAD crossings along with the yearly PSP monitoring schedule as per the activities defined in the ISO format. Activities to be performed as defined in the scope of Work. | | No s. | 10 | 5 | 6 | 21 | | | | |
| 32 | INSPECTION OF VALUNERABLE LOCATIONS | | | | | | | | | | |
| | To carry out the vulnerable location inspection (along with the quarterly PSP monitoring schedule) as per the activities defined in the ISO format. Activities to be performed as defined in the scope of Work. | | No s. | 10 | 4 | 1 | 15 | | | | |
| 33 | YEARLY COMPREHENSIVE AMC OF TR UNIT | | | | | | | | | | |
| | Yearly comprehensive AMC of CP unit including preventive/ breakdown maintenance (TR/CPPCM/CPVCM/Solar units, etc) & spares management, replacement of control card, critical repairs(including hiring of OEM service engineer in case bidder is not able to rectify the CP unit from its own resources, whenever required) complete in all respects to ensure 24 x 7 availability of the CP unit. Bidder is responsible to either rectify the breakdown call within 48 hours or has to provide alternate CP unit to ensure Integrity of the pipeline is maintained. Owner will provide spare CP unit as per availability basis only. Activities to be performed as defined in the scope of Work. | | No s. | 6 | 2 | 2 | 10 | | | | |



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|----|--|--|----------|----------|-----|-----|----|--|--|--|--|
| 34 | CONSTRUCUTION OF BRICK WALL CHAMBER | | | | | | | | | | |
| | Construction of closed brick wall chambers of size 2'x2'x3' from 3' depth of ground level including allmasonry work with 2 nos. of cable entry points & PVC pipes & supply of CL or precasted RCC cover of same size with lifting handle (02 nos) for installation of Solid state polarisation cell as per attached drawing & scope of cables. Activities to be performed as defined in the scope of Work. | | No s. | 4 | 4 | 2 | 10 | | | | |
| 35 | PAINTING OF TLP | | | | | | | | | | |
| | Painting along with lettering of chainage no TLP No. type of TS etc of box type TLP/ALJB/CJB/Bond Box/Polisation Cell Box etc. Activities to be performed as defined in the scope of Work. | | No s. | 20 | 2 | 55 | 77 | | | | |
| 36 | METALLIC PRINTED CIRCUIT | | | | | | | | | | |
| | Supply & installation of different type of printed circuit diagram plate (mettalic) .(FOR Type A/B/C/D/E/F as per existing Type Test Station. Activities to be performed as defined in the scope of Work. | | No s. | 30 | 8 | 50 | 88 | | | | |
| 37 | Coke breeze with Goa carbons make | | | | | | | | | | |
| | Supply & Installation of petroleum coke breeze with goa carbons for maintenance of existing Anode bed, As per instruction by EIC or SIC. Activities to be performed as defined in the scope of Work. | | KG | 10 00 | 350 | 250 | 16 | | | | |
| 38 | PANEL METER | | | | | | | | | | |
| | Supply & Installation of Panel meter on emergency basis of existing TR unit, As per instruction by EIC or SIC. Activities to be performed as defined in the scope of Work. | | No s | 10 | 4 | 2 | 16 | | | | |
| 39 | CONTROL CARDS | | | | | | | | | | |
| | Supply & Installtion of control cards on emergency basis (Cards 106, 105, 104, 103 and 107) of existing TR unit, As per instruction by EIC or SIC. Activities to be performed as defined in the scope of work. | | No s | 12 | 6 | 4 | 22 | | | | |
| 40 | CAT - CAT survey | | | | | | | | | | |



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A frame to check the condition of coating. Survey report for pin pointing the exact Locations of the coating defects including supply of equipment, consumables, manpower & transportation etc & GPS coordinates of all defects locations. Complete in all respects as defined in scope of work. Activities to be performed as defined in the scope of Work.

| | | | | | | | | | | |
|--|--|----|----|----|----|---------|--|--|--|--|
| | | KM | 33 | 24 | 43 | 10 0 | | | | |
|--|--|----|----|----|----|---------|--|--|--|--|

Sub-Total Amount in (Rs) :(I)

GST @.....%:(II)

Grand Total Amount inclusive of all taxes & duties in (Rs): (III=I+II)

Name of the Bidder :
Signature & Seal of the Bidder :

NOTE:

a) Bidders have to fill the price bid in excel format and also up-load the Price bid dully filled and digitally signed,

during financial bid submission as per the e-tendering procedures in e-tendering portal (<https://petroleum.euniwizarde.com/>) only.