# INDIAN OIL CORPORATION LIMITED
**(A Government of India Undertaking)**
**A Maharatna Company**

# Tender No: BD/CONT/26-27/SCM/04
# Notice for hiring of contractors for IOCL CGD project at Purnea GA (Purnea, Araria, Kishanganj & Katihar districts) through Walk-in Method Selection Process on First Cum First Serve Basis (FCFS)

**Address:** M/s INDIAN OIL CORPORATION LIMITED, PLANNING & BUSINESS DEVELOPMENT DIVISION, 10th Floor, Block-2 NBCC Commercial Complex East Kidwai Nagar, New Delhi Pin Code-110023

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INDIAN OIL CORPORATION LIMITED
(PLANNING & BUSINESS DEVELOPMENT DIVISION)

## NOTICE INVITING TENDER

**Tender No: BD/CONT/26-27/SCM/04** **Date: 01.10.2026**

**Notice for hiring of contractors for IOCL CGD project at Purnea GA through Walk-in Method Selection Process on first cum first serve basis (FCFS)**

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</table>

| | | |
|---|---|---|
| | | Bidder is advised to submit Notarised documents of PQC/BQC along with the Original bid. |
| 10 | Annual Turnover (ATO) | **a) Contractors with prior experience of PE Laying/LMC with IOCL CGD or its JVs:**<br>Not Applicable<br>**b) Contractors with prior experience in CGD / related Infra in Non- CGD works in defined category with any company: Refer Clause no.3 (III) of "Critical Information of Tender"** |
| 11. | Mode of Submission | a) **Physical Submission**<br>b) **Submission through E-mail**<br>For details refer Clause No. 6 "Critical Information of Tender".<br>Each bidder must submit only one bid per tender. Only the first submitted bid will be considered. Submitting multiple bids will result in the immediate rejection of all subsequent submissions by that bidder. |
| 12. | Other requirements | **1.** PF Code Allotment letter/PF registration or Undertaking for PF registration as given in Annexure to ITB.<br>**2.** Independent ESI Code or undertaking for Independent ESI code in the Format given as Annexure to ITB.<br>**3.** Proof of Authority in favour of person authorized to submit the bid.<br>**4.** Copy of PAN card & GST registration.<br>**5.** Certificate of Incorporation / Partnership deed/ Proprietor ship affidavit/ Societies Registration Certificate.<br>**6.** FORM FOR SUBMISSION OF OFFER.<br>**7.** Annexures to ITB. |
| 13. | Public Procurement (Preference to Make in India), 2017 and amendments thereof (PPPMII) | Not Applicable |
| 14. | Purchase Preference to Micro and Small Enterprises (MSEs) Bidders (PPP2012) | Not Applicable |
| 15. | Security Deposit (SD) | Applicable. 5% of the Contract Value<br>Refer Clause No. 7 of Critical Information of Tender |
| 16. | Mobilization Advance | Not Applicable |
| 17. | Consortium bidding | Not Allowed |

| | | |
|---|---|---|
| 18. | Tender Inviting Authority | GM (Materials & Contracts),<br>10th Floor, Block-2<br>NBCC Commercial Complex<br>East Kidwai Nagar, New Delhi<br>Pin Code-110023<br>Email: pbdtenders@indianoil.in<br>Phone No.: 01124347444 |

**For more details, Refer Critical Information of Tender.**

All other terms and conditions shall be as per following documents, which put together form "Tender Document". In case of any conflict, the relevant text given in the document appearing in higher position shall prevail upon the text given in the document at lower position in following list:

1. Agreed variation / deviation (if any)
2. Corrigendum / Addendum (if any)
3. NIT.pdf (Notice Inviting Tender)
4. Critical Information of Tender
5. Special Instructions to Tenderers (SIT) Technical
6. Special Conditions of Contract (SCC)-Technical
7. Technical Specifications
8. Schedule of Rates (Upfront declared contract rates)
9. Instructions to Bidders (ITB)
10. Annexures to ITB
11. GCC.pdf (General Conditions of Contract)

    **NOTE: GCC has been revised. The bidders are to go through the entire GCC thoroughly and submit their offer accordingly.**

12. PPE Matrix.pdf
13. Other attachments (if any).

By Tender Inviting Authority

**INDIAN OIL CORPORATION LIMITED**
**(PLANNING & BUSINESS DEVELOPMENT DIVISION), NEW DELHI**

# Critical Information of Tender

| S.N | Description |
|---|---|
| 1 | **Type of contract:**<br><br>The contract shall be awarded at the upfront declared Schedule of Rates (SOR) specified in the Tender document. No price bid or financial quotation shall be sought from the bidders. The bidder shall be deemed to have accepted the declared rates by participating in the Walk-In Process. Bidder to submit duly signed SOR along with other bid documents. |
| 2 | **Eligible Entities:**<br><br>**IOCL CGD or its JVs having experience in PE/ LMC Works:**<br><br>Contractors with prior experience of PE Laying/LMC with IOCL CGD or its JVs, shall be eligible for PE/ LMC works, as per terms and condition mentioned in this document.<br><br>**Any party having experience in CGD works/ related Infra in Non- CGD works:**<br><br>Contractors with prior experience of any CGD/ non-CGD works in defined category with any company, shall be eligible for PE/ LMC works, as per terms and condition mentioned in this document. |
| 3 | **BID QUALIFICATION CRITERIA:**<br><br>**1. Vendors worked with IOCL CGD and its CGD JVs.**<br><br>(**A) For Award of Contract value of ₹50 Lakh (Past Work order / Completion certificate/ Execution certificate of value above Rs. 10 lakhs)**<br><br>i. The bidder shall have prior execution experience with IOCL CGD or IOCL Group CGD companies (JVs/Subsidiaries, etc.), such as Indian Oil Corporation Limited, IOAGPL and Green Gas Limited, in execution of any of the following similar works under a single order of value of above ₹10 Lakh, either as a main contractor or as a subcontractor, during any of the last seven years ending on the last day of the month previous to the original date of bid submission:<br><br>ii. LMC GI Connection Works<br><br>iii. PE Pipeline Laying Works |

| S.N | Description |
|---|---|
| | **(B) For Award of Contract value of ₹ 25 Lakh (Past Work order / Completion certificate/ Execution certificate of value up to Rs. 10 lakhs)**<br><br>i. The bidder shall have prior execution experience with IOCL CGD or IOCL Group CGD companies (JVs/Subsidiaries, etc.), such as Indian Oil Corporation Limited, IOAGPL and Green Gas Limited, in execution of any of the following similar works under a single order value upto ₹10 Lakh, either as a main contractor or as a subcontractor, during any of the last seven years ending on the last day of the month previous to the original date of bid submission:<br><br>ii. LMC GI Connection Works<br><br>iii. PE Pipeline Laying Works<br><br>**Note:**<br><br>iv. Contractor shall submit either copy of Work Order /Letter of Acceptance (LOA) or Completion/ Execution Certificate (of any work order value) issued by the IOCL CGD or IOCL Group CGD companies, for the respective works / services.<br><br>v. The date of issue of Work Order / LOA or Completion/Execution Certificate must fall in preceding 7 years ending on the last day of the month, immediately previous to the month in which original date of bid submission end date falls, shall only be taken into consideration. Even in case the date of bid submission is extended, the date originally considered as reference date for the experience criteria, shall remain unchanged.<br><br>vi. Whenever a contractor had worked as a sub-contractor to main contractor, their experience also can be considered. In case bidder submits prior experience as a sub-contractor,<br><br>vii. The bidder has to submit a certificate from the end User/ Owner/Main Contractor/ Consultant of the owner engaged as EIC (Engineer-In- Charge) for the execution of the said works.<br><br>viii. The bidder has to submit a certificate from the end user / owner / consultant of the owner acting as EIC stating that sub-contracting has been approved/ permitted.<br><br>ix. CA certificate certifying the executed value of works shall be submitted along with UDIN no for works executed as a subcontractor. |

| S.N | Description |
|---|---|
| | x. Existing contractors working in Purnea GA shall be eligible to participate in the Walk-In process only after achieving at least 70% execution of the already awarded work(s), except where short closure is necessitated due to reduction/change in scope or for reasons not attributable to the contractor.<br><br>For the purpose of this, 70% execution shall be deemed to have achieved if 70% physical work under the contract /revised scope have been executed.<br>**1.** IOCL and/or its authorized representative may review the status of the work based on the aforesaid criteria and, at its sole discretion, recommend the contractor for participation. Such recommendation/clearance (As per format T-1), duly issued by IOCL for the concerned GA, shall be submitted by the bidder along with the bid documents.<br><br>**2. <u>Vendors having executed similar work for any company:</u>**<br><br>**(A) Experience in CGD-related works (For Award of Contract value of ₹10 lakh to ₹50 lakh).**<br><br>a. The bidder shall have prior execution experience of any of the following similar works under a single order as per table below (subject to minimum executed value of ₹ 2.5 Lakh), either as a main contractor or as a subcontractor, during any of the last seven years ending on the last day of the month previous to the original date of bid submission:<br><br>b. Laying/Installation of PE pipeline network,<br><br>c. Laying/Installation of GI/Cu pipe.<br><br>d. Providing operation through manpower deployment and maintenance services for the City Gas Distribution (CGD) Network.<br><br>e. Laying/Installation of Hydrocarbon Steel Pipeline in any City Gas Distribution Project or Cross-country Pipelines<br><br>f. Civil / Mechanical works at Petroleum & Gas Installations/ Refineries / Petrochemical Plants or Chemical Industries/any hydrocarbon plant.<br><br>**Note:**<br><br>1) Petroleum and Gas installations for this tender shall also include Retail and Consumer Outlets on Petroleum / CNG/LNG/CBG plant/CGS.<br><br>2) Chemical Industries: The chemicals should be covered in the list of hazardous chemicals under MSIHC rules<br><br>**Work award value** \| **Required Single order executed value (SOV) (₹ in lakh)** |

| | |
|---|---|
| ₹ 10 Lakh | ₹ 2.5 Lakh ≤ SOV < ₹ 3.75 Lakh |
| ₹ 15 Lakh | ₹ 3.75 Lakh ≤ SOV < ₹ 5 Lakh |
| ₹ 20 Lakh | ₹ 5 Lakh ≤ SOV < ₹ 6.25 Lakh |
| ₹ 25 Lakh | ₹ 6.25 Lakh ≤ SOV < ₹ 7.5 Lakh |
| ₹ 30 Lakh | ₹ 7.5 Lakh ≤ SOV < ₹ 8.75 Lakh |
| ₹ 35 Lakh | ₹ 8.75 Lakh ≤ SOV < ₹ 10 Lakh |
| ₹ 40 Lakh | ₹ 10 Lakh ≤ SOV < ₹ 11.25 Lakh |
| ₹ 45 Lakh | ₹ 11.25 Lakh ≤ SOV < ₹ 12.5 Lakh |
| ₹ 50 Lakh | SOV ≥ ₹ 12.5 Lakh |

**(B) Experience in non-CGD works, (For Award of Contract value ranging from ₹10 lakh up to a maximum of ₹25 lakh.)**

The bidder shall have prior execution experience of any of the following similar works under a single order as per table below (subject to minimum executed value of ₹ 2.5 Lakh), either as a main contractor or as a subcontractor, during any of the last seven years ending on the last day of the month previous to the original date of bid submission:

a. Laying/ Installation of underground pipelines for carrying water / sewage etc.

b. Laying underground ducts for power cables, telecommunication cables, Fiber optic cables. Laying underground cables.

c. Installation of above ground water pipelines /gas pipelines/ cryogenic pipeline/ fire-fighting system pipelines / process plant pipelines.

d. Construction of residential/ commercial/ institutional/ industrial buildings involving plumbing jobs.

| Work award value | Required Single order executed value (SOV) (₹ in lakh) |
|---|---|
| ₹ 10 Lakh | ₹ 2.5 Lakh ≤ SOV < ₹ 3.75 Lakh |
| ₹ 15 Lakh | ₹ 3.75 Lakh ≤ SOV < ₹ 5 Lakh |

<table>
<tr><th>S.N</th><th>Description</th></tr>
<tr><td></td><td>
<table>
<tr><td>₹ 20 Lakh</td><td>₹ 5 Lakh ≤ SOV < ₹ 6.25 Lakh</td></tr>
<tr><td>₹ 25 Lakh</td><td>SOV ≥ ₹ 6.25 Lakh</td></tr>
</table>
Note:
Contractor must submit either copy of Work Order /Letter of Acceptance (LOA) and Completion/ execution Certificate for the respective works / services. The date of issue of Work Order / LOA or Completion Certificate/execution certificate must fall in preceding 7 years ending on the last day of the month, immediately previous to the month in which original date of bid submission end date falls, shall only be taken into consideration. Even in case the date of bid submission is extended, the date originally considered as reference date for the experience criteria, shall remain unchanged.
Whenever a contractor had worked as a sub-contractor to main contractor, their experience also can be considered. In case bidder submits prior experience as a sub-contractor,
<ol type="i">
<li>The bidder has to submit a certificate from the end User/ Owner/Main Contractor/ Consultant of the owner engaged as EIC (Engineer-In- Charge) for the execution of the said works.</li>
<li>The bidder has to submit a certificate from the end user / owner / consultant of the owner acting as EIC stating that sub-contracting has been approved/ permitted.</li>
<li>CA certificate certifying the executed value of works shall be submitted along with UDIN number for works executed as a subcontractor.</li>
</ol>
</td></tr>
<tr><td>4</td><td>
Award value criteria:
Contracts value above Rs. 10 Lakhs and upto Rs. 50 Lakhs may be awarded as below:
a) IOCL CGD or its JVs having experience in PE/ LMC Works:
The value of contract to be awarded to a bidder shall be determined based on value of past experience documents submitted.
i) For past Work order / Completion certificate/ Execution certificate of value upto Rs. 10 lakhs, Contract of approximately Rs. 25 lakhs may be awarded.<br>
ii) For past work order / completion certificate/ Execution Certificate of value above Rs. 10 lakhs, Contract of approximately Rs. 50 lakhs may be awarded.<br>
b) Any party having experience in CGD / related Infra in Non- CGD works:
Bidder should have execution of similar work amounting to at least 25% of the estimated contract value.
</td></tr>
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| S.N | Description |
|---|---|
| | A bidder's eligibility for contract award shall be determined based on the value of similar work executed.<br><br>A bidder shall be eligible for award of work up to four times of the value of their qualifying executed order. Accordingly, Bidder should have a minimum executed order value of Rs. 2.5 Lakhs for be eligible to award of minimum 10 Lakhs criteria, subject to meeting their turnover criteria.<br><br>i) For bidders with experience in CGD-related works, contracts may be awarded for values ranging from ₹10 lakh to ₹50 lakh.<br><br>For bidders with experience in non-CGD works, contracts may be awarded for values ranging from ₹10 lakh up to a maximum of ₹25 lakh.<br><br>Existing contractors working in Purnea GA shall submit recommendation of participation as per format T-1 duly issued by IOCL along with Bid documents.<br><br>Participation shall be considered on a first-in-first-out basis (FIFO), subject to fulfilment of IOCL's requirements and at the sole discretion of IOCL. |
| **5** | **Annual Turnover (ATO):**<br><br>**a) IOCL CGD or its JVs having experience in PE/ LMC Works:**<br>Not Applicable<br><br>**b) Any party having experience in CGD / related Infra in Non- CGD works:**<br><br>The annual turnover of the bidder shall be at least 50% of the value of work proposed to be awarded in any one of the preceding 03 (three) financial years.<br><br>Accordingly, Bidder should have a minimum Annual Turnover of Rs. 5 Lakhs for be eligible to award of minimum 10 Lakhs criteria. |
| **6** | **Zero Deviation and Rejection Criteria**:<br><br>Bids must strictly comply with the terms and conditions of the bidding documents; any deviation may lead to rejection of the proposal. |
| **7** | **Mode of Submission:**<br><br>Bidders may submit their bids either through Physical mode or through email, as below:<br><br>**a) Physical Submission:**<br><br>1. Bids may be submitted in sealed envelopes at any of the following designated locations:<br><br>**IOCL Purnea GA Office:**<br>Maa Tara Complex, Near Aeham Hospital, |

| S.N | Description |
|---|---|
| | Line Bazar, District-Purnea (854301), Bihar<br>Contact Person: Shri Raman Kumar,<br>Designation: Senior Manager (CGD)<br>Email: ramankumar@indianoil.in<br>Mobile: 9316550562<br><br>**IOCL Patna cluster Office:**<br>Indian Oil Bhavan, Plot No- A-6,<br>Patliputra Industrial Area,<br>Patna – 800013, (Bihar).<br>Contact Person Name: Sh. Anish Kumar<br>Designation : Chief Manager (CGD)<br>Email: anish@indianoil.in<br>Mobile : 9909919266<br><br>**IOCL Delhi Office:**<br>Indian Oil Corporation Limited<br>Business Development (Corporate Office)<br>10th Floor, NBCC Commercial Complex, Block -2,<br>East Kidwai Nagar (EKN), New Delhi – 110023.<br>Contact Person: Mr. Subhendu Suman<br>Designation: Senior Manager (CGD)<br>Tel No: 011-24347444 & 011- 24347436<br>Email: pbdcontractcell@indianoil.in and pbdtenders@indianoil.in<br><br>An acknowledgement receipt shall be issued to the bidder or its authorized representative submitting the bid.<br><br>**b) Submission through E-mail:**<br><br>1. Bids may be submitted through e-mail to the designated e-mail ID at E-mail ID: pbdtender@indianoil.in<br>2. Receipt of bids submitted through e-mail shall be recorded based on the date and time stamp of the designated e-mail account.<br><br>c) The date and time of receipt of bids through either mode, i.e., physical submission or e-mail submission, shall be considered for determining priority under the First-Come, First-Served (FCFS) methodology.<br><br>d) The bidder shall submit the original notarized copy of the PQC/BQC document along with the bid in case of submission of a physical bid. In case the bid is submitted through e-mail, the notarized BQC document shall also be submitted with the original bid.<br><br>e) The bidder shall submit only **one bid**, irrespective of the mode of submission. Submission of multiple bids, whether through the same mode or through different modes, shall render **all such bids liable for rejection**.<br><br>f) IOCL reserves the right to verify the authenticity and time of receipt of any bid and its decision in this regard shall be final and binding on all bidders.<br><br>g) As a part of technical bid, Bidders shall submit the legible scanned copies of documents meeting BQC within bid submission period. |

| S.N | Description |
|---|---|
| | h) Existing contractors working in Purnea GA shall submit recommendation of participation as per format T-1 duly issued by IOCL. |
| **7.** | **Security Deposit (SD):**<br>• ISD value shall be 2% of awarded value.<br>• In addition, 5% shall be deducted from RA bills.<br>Total SD deductions including ISD shall not exceed 5% of awarded contract value. |
| **8** | **Special Initiative for Faster PNG Connectivity**:<br>IOCL invites eligible contractors/agencies under the Walk-in Method for execution of PE Laying/LMC works for DPNG connections through the Special Contracting Methodology (SCM) to accelerate PNG rollout.<br>The tender adopts simplified and relaxed conditions to ensure faster execution and wider participation. Selection shall be through a walk-in process with upfront declared SOR rates and no price bidding/negotiation.<br>In this regard, IOCL has introduced the following contractor-friendly measures to encourage wider participation and facilitate faster execution:<br>i. Faster payment mechanisms<br>ii. Special Incentive scheme for Plumbers<br>iii. Special Incentive for work at height<br>iv. Reduced penalty provisions<br>v. Simplified procedures for faster execution<br>The tender adopts simplified and relaxed conditions to ensure faster execution and wider participation. This initiative is expected to enhance contractor participation, improve execution efficiency, and enable faster PNG connectivity in IOCL CGD GAs. |
| **9** | **Site Visit:**<br>The Bidder is advised to visit and assess the site at its own cost and responsibility to obtain all necessary information for bid preparation and contract execution. For any assistance, bidder may contact at phone no. 9316550562 (Shri Raman Kumar), Senior Manager (CGD), Purnea. |
| **10** | **Contact Person:**<br>E-mail ID 01: pbdtenders@indianoil.in<br>Telephone No: 01124347444/7436<br>**In case of any unresolved issue or concern, please contact –**<br>**Contract execution including Technical: Harish Sharma (Manager-CGD). Contact No. 07617817722** |

| S.N | Description |
|---|---|
| | **For Commercial/all other issues:**<br>Subhendu Suman (Senior Manager-M&C) Contact No. 011-24347436,<br><br>E Mail id: subhendus@indianoil.in/pbdtenders@indianoil.in |
| **11** | **Checklist:**<br><br>Bidder to tick checklist during submission of bid to ensure all documents are included. |

## CHECKLIST OF REQUIRED DOCUMENTS

Bidders are requested to duly fill in the checklist. This checklist gives only certain important items to facilitate the bidder to make sure that the necessary data/information as called for in the bid document has been submitted by them along with their offer. This, however, does not relieve the bidder of his responsibilities to make sure that his offer is otherwise complete in all respects.

Please ensure compliance and tick (√) against following points:

| SL NO. | DESCRIPTION | BIDDER CONFIRMATION |
|---|---|---|
| 1. | FORM F-1 BIDDER'S INFORMATION (DULY FILLED WITH SIGNED & STAMP) | |
| 2. | ANNEXURES TO ITB: FORM FOR SUBMISSION OF OFFER FORM F-2 | |
| 3. | DEVIATION STATEMENT: FORM F-3 | |
| 4. | CONSENT LETTER FORMAT FOR E-PAYMENT FORM F-4 | |
| 5. | DETAILS OF THE PROPRIETOR / PARTNERS / DIRECTORS OF THE BIDDING FIRM / COMPANY AND CORRESPONDING DOCUMENTS (AADHAR CARD, PAN CARD AND PROOF OF DIN) OF THE ABOVE DETAILS (DULY FILLED WITH SIGNED & | |
| 6. | POWER OF ATTORNEY / AUTHORIZATION CERTIFICATE IN THE NAME OF AUTHORIZED (TO BE SUBMITTED ON THE LETTER-HEAD OF COMPANY: DULY FILLED WITH SIGNED & STAMP) | |
| 7. | QUALIFICATION CRITERIA TECHNICAL BQC DOCUMENTS (WORK ORDER AND ITS EXECUTION/ COMPLETION CERTIFICATE (DULY SELF ATTESTED) | |
| 8. | ACCEPTANCE OF SCC (DULY SIGNED & STAMP) | |
| 9. | ACCEPTANCE OF SCHEDULE OF RATES (SOR) (DULY SIGNED & STAMP) | |
| 10. | PAN COPY (DULY SIGNED & STAMPED) | |
| 11. | GST REGISTRATION COPY (DULY SIGNED & STAMPED) | |
| 12. | COPY OF PF REGISTRATION CERTIFICATE (DULY SIGNED & STAMPED) | |
| 14. | COPY OF ESI REGISTRATION CERTIFICATE, If Applicable or Declaration as given in F-2 (DULY SIGNED & STAMPED) | |
| 15. | COPY OF CORRIGENDUM (IF APPLICABLE) (DULY SIGNED & STAMPED) | |
| 16. | Audited Annual Financial Statement (ATO)/CA certificate & ITR with Form 3CD | |
| 17. | Notarised Copy of BQC (Bid Qualification Criteria) to be submitted along with the original bid | |
| 18. | Format T-1 (Signed, Stamped and duly filled) -If Applicable | |

Place: [Signature of Authorized Signatory of Bidder]

Date: Name:

Designation:

Seal:

**ENGAGEMENT OF PE/LMC/DMA CONTRACTORS THROUGH WALK-IN SELECTION FOR PURNEA GA IN STATE OF BIHAR**

**T-1**

**CERTIFICATE OF EXECUTION / ELIGIBILITY FOR ENGAGEMENT OF PE/LMC/DMA CONTRACTORS THROUGH WALK-IN SELECTION FOR BOKARO GA (PURNEA, ARARIA, KATIHAR & KISHANGANJ DISTRICTS) IN STATE OF BIHAR UNDER TENDER NO: BD/CONT/26-27/SCM/04**

*(To be issued on the letter head of IOCL of the concerned Geographical Area (GA) and submitted in original along with the bid document.)*

**1. Name of Contractor:** _____

**2. Name of Geographical Area (GA):** _____

**3. Contract(s) Previously Awarded in the Above GA (Contract no.):** _____

**A. Status of Work**

This is to certify that the contractor has achieved execution of the above-mentioned contract(s), based on the following criteria

☐ Minimum of 70% physical progress achieved under the contract scope/Revised scope.

Accordingly, the contractor is eligible to participate in the engagement of PE/LMC/DMA contractors through walk-in selection for Purnea GA IN STATE OF Bihar in accordance with the provisions of the Walk-In Methodology.

**Issued By**

On Behalf of Indian Oil Corporation Limited

_____

*Authorized Signature and Stamp*

**Name:** _____

**Designation:** _____

**Date:** _____

# इंडियन ऑयल कॉर्पोरेशन लिमिटेड

# (व्यापार विकास) नई दिल्ली

# INDIAN OIL CORPORATION LIMITED

# (Business Development) New Delhi

# INSTRUCTIONS TO BIDDERS (ITB)

**Issued by**

**INDIAN OIL CORPORATION LIMITED**
**(Business Development – Contracts Cell)**
**10th Floor, NBCC Complex**
**East Kidwai Nagar, New Delhi-110023**
**P&BD, Indian Oil Corporation Ltd.,**

*(This document is meant for exclusive purpose of bidding against this specification and shall not be transferred, reproduced, or otherwise used for purpose other than that for which it is specifically issued)*

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| 9. | Sub-contracting |
| 10. | Right of Owner to accept or reject tenders |
| 11. | Invalid Tenders/ Tenders liable for rejection |
| 12. | Evaluation criteria in case of tie |
| 13. | Modality against Suo moto changes in price |
| 14. | Guideline for Insolvency and Bankruptcy code, 2016 (IBC) |
| 15. | Settlement of commercial disputes |
| 16. | Health / Safety of workers |
| 17. | Taxes and duties |
| 18. | Mobilisation advance |
| 19. | Modality for Preferential Bidding Option and Evaluation |
| 20. | ePAY ONE PORTAL |
| 21. | Letter of Acceptance (LOA) / Notice of Award (NOA) |
| 22. | Contract Agreement |
| 23. | Blacklisting / Holiday Listing / Debarment / Banning Policy of Indian Oil Corporation Limited |
| 24. | Terms and Conditions for bidders from a country which shares a land Border with India |
| 25. | Reverse Auction |
| 26. | Public Procurement Policies |
| 27. | Zero Defect Zero Effect (ZED) and Lean certification for MSME Vendors |
| 28. | Annexures |
| P-1 | Declaration from Group / Parent Company in case their experience credentials are submitted by Bidder |

| | |
|---|---|
| P-2 | Declaration for consortium bidding |
| J | Completion Certificate from EIC for ARCs running under extension |

# INSTRUCTIONS TO BIDDERS

GENERAL

Bids are requested from bona fide bidders of sound financial standing and reputation for the subject item on e-procurement system in total compliance to technical specifications, scope, terms & conditions of enquiry documents / attachments.

These Instructions to Bidders ("Instructions") may become a part of LOA/Work order that might result from submission of a Bid in response to this Bid Request.

The issue of these Bid Request documents shall not automatically create any relationship, contractual or otherwise, between Indian Oil Corporation Limited (IOCL) and the Bidder, and IOCL shall not be liable for any costs and expenses incurred by the Bidder in the preparation and submission of a Bid.

In case of irreconcilable conflict in non-technical matters between the provisions in the separate Contract Documents concerning or governing the same aspect precedence shall be given to the provisions contained in the documents mentioned below in the order in which they are set out below:

1. Letter of Acceptance
2. Agreed variation / deviation (if any)
3. Corrigendum / Addendum (if any)
4. NIT.pdf (Notice Inviting Tender)
5. Critical Information of Tender
6. Special Instructions to Tenderers (SIT) Technical
7. Special Conditions of Contract (SCC)-Technical
8. Technical Specifications
9. Schedule of Rates (Upfront declared contract rates)
10. Instructions to Bidders (ITB)
11. Annexures to ITB
12. GCC (General Conditions of Contract-2026)
13. PPE Matrix.pdf
14. Other attachments (if any).

In addition to the General Instructions to the Tenderers forming part of General Conditions of Contract, the following instructions are issued to the tenderers.

## 1.) GENERAL

1.1) Bidder to note that Tendering can be abandoned without assigning any reason. No compensation is paid for the efforts made by the contractor.

1.2) **The Schedule of Rates (SOR) for all items has been pre-defined in the BOQ of this Advertisement/ tender. Bidders shall accept the prescribed rates without any deviation. No negotiation shall be applicable on the BOQ/SOR rates, and the contract shall be awarded at the rates specified in the BOQ.**

1.3) Deleted.

1.4) Deleted.

1.5) The Special Conditions of Contract of tender document covers owner's intention of availing Input Tax Credit (ITC) under GST on the supply of services in the subject work. Necessary details/ compliance required from the bidders/ contractors has been clearly specified in the tender document. Evaluation of bids shall be as per provision of BOQ.

1.6) Deleted.

1.7) Manner in which offer is to be submitted:

i) In case of involvement of foreign bidders, tenders can be submitted either by the bidder directly or by their Indian agent on their behalf, but not both. The Indian agent should represent only one bidder and they shall not be allowed to quote on behalf of another bidder if the same tender is re-floated for any reason whatsoever. The said Indian agent shall have a valid legal Power of Attorney from the principal foreign bidder for submission of bid on their behalf.

ii) In case a foreign bidder submits any of the pre-qualification support documents in any language other than English, then it will be the responsibility of such foreign bidder to also provide the English translation copy of the same duly certified, stamped and signed by their Local Chamber of Commerce. Translation by Indian Embassy / High Commission or authorized / approved translation agencies (by Indian Embassy / High Commission) or any other independent authority shall also be acceptable apart from the Local Chamber of Commerce of country of origin. This clause shall also apply in case an Indian bidder submits PQC document (full / part) in foreign language other than English.

iii) The bidder is required to state whether the proprietor is a director or is related to any director of IOCL, present or retired; or any partner or member of the firm is a director or is related to any director of IOCL, present or retired; or any of the directors of the company is a director or is related to any director of IOCL, present or retired.

iv) Deleted. If any other communication or terms and conditions are being attached by the bidder in the tender document, the same shall also be on bidder's letterhead.

v) Deleted.

1.8) In case of interest-bearing advance (if any) is given to the contractors, then interest on advance shall be recovered by IOCL from running account bills. Contractor, therefore, shall deposit the amount of TDS with the Income Tax Dept and claim reimbursement from IOCL against submission of TDS certificate.

1.9) Deleted.

1.10) Bidder to note that "Unless and until specified elsewhere validity of the acceptance of the SOR rates should be 60 days from the scheduled bid submission end date."

1.11) Bidder to note that "if validity of bid will not be as tender document, then their bid shall be rejected."

1.12) IOCL shall have rights to increase /decrease the tendered quantity of any or every item and delete any item at any stage of work at the accepted rates. The Contractor's claim for compensation or damages on account of these shall not be entertained subject to provision contained in GCC.

1.13) Bidder to note that "All payment to Contractor laborer shall be made through electronic mode in a scheduled bank i.e, NEFT by the contractor in the respective bank account of workmen.

Contractor will facilitate/extend required help to the workmen in opening a bank account if the workmen do not possess the same to ensure payment of wages directly to their bank account."

1.14) Deleted.

1.15) Foreign bidders are not permitted to bid against domestic tender.

1.16) The responsibility of downloading the tender documents including corrigenda, if any, and subsequent uploading of offer shall rest with the bidder. Bids will be accepted only through the e-tender portal. Tender issuing authority is not responsible for the delay / non-downloading of tender document by the recipient due to any problem in accessing the e-tender website. The tender issuing authority is also not responsible for delay in uploading bids due to any problem in the e-tender website.

1.17) IOCL does not take any responsibility for the correctness of tender documents obtained from any source other than IOCL official website.

1.18) Bidders are advised to visit IOCL official website before submitting their offer for official version of the tender document including any corrigendum / amendment if any, which shall be binding to all the bidders.

1.19) Failure of bidder to submit tender without taking cognizance of corrigendum/ amendment (if any) issued by IOCL are liable for rejection.

1.20) Legal dispute, if any, shall only be within the jurisdiction of local court situated at New Delhi.

1.21) Canvassing of information or submission of forged or false documents / information by any Tenderer shall make their offer invalid. In addition, suitable penal action as deemed fit shall also be taken by IOCL.

1.22) Provident Fund PF registration is mandatory requirement for domestic bidder. PF is not mandatory for foreign bidders, foreign bidders are required to submit an undertaking clearly stating that they will not employ any manpower from India OR in case they will employ the manpower from India, they will comply with the PF & ESI requirements. Concerned bidder is required to submit the ESI registration certificate (if applicable) within 15 days from the award of work to EIC. PSUs / organizations having their own PF trust / Govt. PF are considered 'At Par' with the bidders registered with the PF authorities, the necessary documentary evidence shall be submitted along with the bid.

1.23) Cutting and corrections in the bid document should be avoided and if it is unavoidable, it should be kept at the bare minimum and it should be neatly cut and re-written without over-writing and use of white fluid. All corrections should be duly signed by the tenderer. The tenderers resorting to many corrections including usage of white fluid in the tender document, the tender shall be liable for rejection.

1.24) Deleted

1.25) Deleted.

1.26) Deleted

1.27) If the Bidder(s), either before award or during execution of Contract commit(s) transgression through violation of the stipulations made in the tender document, such as to put bidder's reliability and/or credibility and/or integrity in question, IOCL is entitled to disqualify the

Bidder(s) from the Tender process or terminate the Contract, if already executed or exclude the Bidder/ Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by IOCL.

1.28) Intending bidders are requested to check their eligibility as per terms and conditions of this specific tender. Bidders who are not eligible or any unsolicited bid is liable for rejection without any communication from IOCL.

1.29) Deleted

1.30) Wherever the delay is attributable to the contractor, it should be noted that no extra compensation or escalation in prices for extended period is allowed to the contractor.

1.31) Formats of font (size, color, pattern etc.) shall not have any bearing on their importance. Tender terms and conditions and shall be read accordingly.

1.32) Bidders are advised not to use Information Rights Management (IRM) feature on BoQ and any other excel file submitted during bidding process. IOCL shall not be responsible for any consequential result due to same.

1.33) The successful bidder shall be issued Notice of Award (NOA) or any other notification of award of work. Immediately upon issuance of the said NOA or notification regarding award of work, the successful bidder shall be required to submit ISD (Initial Security Deposit) within stipulated time as mentioned in tender. A detailed Letter of Acceptance shall follow thereafter. This shall be binding on the bidder.

1.34) Deleted.

1.35) All communication will be made through e-Tendering web site (https://iocletenders.nic.in). However, IOCL reserve the right to take cognizance of the communication made outside e-Tendering Portal under exceptional circumstances.

1.36) Bidder should make sure that their priced bid (Part-II/BOQ) contain only prices. Rates mentioned elsewhere shall not be taken into cognizance. Offer shall be liable for rejection if any condition directly or implied, recorded in Priced Bid (Part-II/BOQ).

1.37) Bidders are advised to visit Announcement section/ Information for DSC/ Bidders Manual Kit/ FAQ of e-Tender Portal before bidding.

1.38) Any Addendum/Corrigendum/Sale date extension in respect of above Advertisement/Tender shall be issued on our website: https://eprocure.gov.in/epublish/app and https://iocl/com/suppliers-notices only and no separate notification shall be issued in the press. Bidders are therefore requested to regularly visit our website to keep themselves updated. Failure of Bidder to submit tender without taking cognizance of Corrigendum / Amendment (if any) issued by IOCL shall make bid liable for rejection.

1.39) IOCL does not take any responsibility for the correctness of tender documents obtained from any other source. Bidders are advised to visit above mentioned website before submitting their offer for official version of the tender document including any corrigendum / amendment if any, which shall be binding to the bidder.

1.40) Use of BIS/ ISI products will be insisted upon whenever same are available.

1.41) The minimum number of test laid down in the Indian standards, CPWD / IOCL specifications for ensuring quality of materials shall be required to be done wherever applicable.

1.42) Deleted

1.43) Deleted.

1.44) Deleted

1.45) Bidders to note that that this is a Zero Deviation Tender, and no deviations in the tender conditions shall be accepted.

**EXCEPTIONS/ DEVIATIONS MENTIONED ANYWHERE ELSE WILL NOT BE TAKEN INTO COGNIZANCE.**

1.46) Deleted.

1.47) Deleted.

## 2.) Pre-Qualification Criteria (PQC):

2.1) A work executed by a bidder for its own plant/projects shall not be considered as experience for the purpose of meeting requirement of experience criteria of the tender. However, jobs executed for Subsidiary / Fellow Subsidiary / Holding company will be considered as experience for the purpose of meeting experience criteria subject to submission of tax paid invoice(s) duly certified by Statutory auditor of the bidder towards payments of statutory tax in support of the job executed for Subsidiary / Fellow Subsidiary /Holding company. Such bidders shall submit these documents in addition to the documents specified in the PQ Documents to meet Experience Criteria.

2.2) If Detail work order qualifying for similar nature as described including covering letter and schedule of rates and satisfactory completion certificate containing executed value & date of completion of similar nature of work as defined above shall be required. The executed value of completed work submitted by the bidder shall be considered during evaluation for experience criteria of PQC. In case, the executed value of job is more than work order value and bidder claims for meeting the PQC requirement on the basis of executed value then it is the responsibility of the bidder to submit the documentary evidence of final executed value (such as copy of final bill, executed value mentioned in completion certificate etc.) along with his bid.

In case multiple orders have been placed against a single rate contract and the cumulative order value satisfies the PQC, it may also be considered, subject to submission of other documents as mentioned. Multiple GeM contracts against one GeM bid on a particular vendor shall be considered as a single PO for PQC evaluation. Multiple contracts against one tender on a particular vendor shall be considered as single PO for PQC evaluation.

2.3) Whenever a contractor had worked as a sub-contractor to main contractor, their experience also can be considered. With regard to sub-contracted work order, the bidder has to submit a certificate from the end user / owner / consultant of the owner acting as EIC stating that the main contractor has intimated them about the engagement of sub-contracting OR have been allowed/ permitted as a sub-contractor. In case when an approved sub-contractor and main contractor both participate in the same tender on the strength of the same work/ job, orders submitted by both the vendors shall be considered for evaluation against PQC.

2.4) In case any bidder submits work order and completion certificate of any completed contract where the bidder had worked as a leader / member of Joint Venture / Consortium / Joint Bidder, the work value shall be worked out as per the percentage share of the bidder in the JV / Consortium / Joint bidding agreement. Further in case the bidder had executed only a certain portion of the composite job through such agreement, their experience shall be counted for that particular portion of the job executed by them only, as specified in the JV/ consortium/joint bidder agreement. For such cases, in addition to work order and completion certificate(s), bidder will also submit copy of JV / consortium / joint bidder agreement and work order & completion certificate(s) has to be issued in the name of such JV / consortium / Joint bidder OR in the name of the Leader with brief details of JV / consortium / joint bidder specified in the work order.

2.5) The offers with incomplete /irrelevant documents or anomalies are liable to be rejected without any communication. Hence, bidders are advised to take utmost care while uploading their prequalification documents.

2.6) In case the work orders submitted by the bidder is in multiple currency/ non-INR, the same shall be converted to equivalent INR considering the conversion rate as on the date of issue of the reference order(s) based on SBI TT selling rate or RBI/Other scheduled bank/Customs Notified exchange rate. It is to be noted that conversion rates from the above sources are to be used uniformly for evaluation of all bidders participating in the tender.

2.7) Relevant supporting documents towards other requirements specified are also to be uploaded along with Techno-commercial bid failing which bid is liable for rejection.

2.8) The amount considered for meeting the experience criteria of PQC shall be inclusive of Tax/GST. In case proof /certificate submitted by the bidder does not have clarity regarding taxes i.e. the value of work specified in order /certificate is whether inclusion or exclusion of tax/GST, the amount appearing in the certificate/order shall be considered inclusive of tax/GST and shall be evaluated accordingly.

2.9) Submission of authentic documents is the sole responsibility of the bidder. However, IOCL reserves the right to verify the PQC (Pre-Qualification Criteria) documents submitted by the bidder(s). For the purpose of verification, bidders shall submit complete client details with names, address, phone numbers and e-mail id with the understanding that IOCL may contact the bidder's client to verify the PQC documents. Wherever required, bidders may have to submit notarized / verified copy of PQC documents. Non submission of these documents, if asked for, will lead to rejection of offer. Should IOCL decide to place order pending verification of PQC documents, payment shall be made only after completion of order. If at any stage, the PQC documents are found to be forged / false / fake, suitable penal action shall be taken, which may include offer rejection, EMD forfeiture, termination of order (wherever applicable) and holiday listing of the bidder / vendor.

2.10) Deleted.

2.11) If bidder has submitted a composite work order for evaluation and the AMC/CAMC /PWAMC/O&M is going on, after supply and installation part is completed by the Contractor as per completion certificate, the same is to be considered as completed work and the amount towards supply and installation hall be considered for qualifying the bidder in PQC towards experience criteria. Such work orders in which both supply & installation and AMC/CAMC/PWAMC/O&M is completed, the same shall be treated 'At Par' with the other work orders and bidder is required to submit the copy of work order and completion certificate for the complete work including AMC/CAMC/PWAMC/O&M part.

2.12) Deleted.

2.13) Notwithstanding any other condition / provision in the tender documents, bidders are required to submit complete documents pertaining to Pre-Qualification Criteria (PQC) along-with their offer. IOCL reserves the right to complete the evaluation, with or without seeking any additional supporting documents / clarifications.

2.14) In case, a bidder submits any of the Pre-Qualification supporting documents in any foreign language other than English, then it will be the responsibility of the bidder to also provide the English translation copy of such document duly certified, stamped and signed by their Local Chamber of Commerce/ Notary.

2.15) During the contract / engagement the organization, its employees, agents, other contractors, sub-contractors, and their employees, etc., may be exposed to certain unpublished price sensitive information (UPSI), that is not generally available and which upon becoming generally available is likely to materially affect the price of the securities issued by Indian Oil. Such UPSI shall be held by the organization, its employees, agents, other contractors, subcontractors, and their employees etc., in strictest confidence and shall not be disclosed to any other party except on need-to-know basis and with the prior consent of Indian Oil. It is hereby further cautioned that, the organization, its employees, agents, other contractors, sub-contractors, their employees, and immediate relatives thereof, should not trade in the securities of Indian Oil while in possession of such UPSI or communicate such UPSI to any person except in furtherance of legitimate purposes, performance of duty or discharge of legal obligations. Any trades in securities of Indian Oil, while in possession of any UPSI would be presumed to have been motivated by the knowledge and awareness of the UPSI and liable for penal action under this contract / engagement as well as under SEBI (Prohibition and Insider Trading) Regulations, 2015. It is therefore advised to familiarize with the "Code for Prevention of Insider Trading in the Securities of Indian Oil", copy of which is hosted on the website www.iocl.com. Accordingly, it must be ensured that any UPSI, whenever received from the Indian Oil,

(a) shall be used solely for the purpose for which it is being disclosed;
(b) shall be preserved and the secrecy of such information shall be maintained;
(c) shall not be disclosed to any third party;
(d) shall be kept securely and properly protected against theft, damage, loss and unauthorized access (including access by electronic means) by deploying means similar to those being used to secure their own confidential information;
(e) to notify Indian Oil immediately upon becoming aware that any of the confidential information has been disclosed to or obtained by a third party.

The organization shall undertake that its employees & their immediate relatives, agents, subcontractors and any other person associated with said contract / engagement does not violate any of the provision of the SEBI (Prohibition of Insider Trading) Regulation, 2015. Any violation shall be considered as breach of terms of contract / engagement and Indian Oil shall take necessary action for such breach in addition to reporting to SEBI for taking necessary action under SEBI (Prohibition of Insider Trading) Regulations, 2015.

2.16) For fulfilling the financial criteria (ATO), an audited financial statement (based on standalone financials of bidding entity) of the bidder shall be considered as acceptable proof.

2.17) **For Indian bidder other than Companies:** Audited Financial statements means below statements duly certified by Practising Chartered Accountant

i) Audited accounts under Income Tax Act 1961.

ii) However, if the Bidder is not required to get its accounts audited under the income Tax Act, 1961, a certificate from "Practicing Chartered Accountant towards the turnover of the Bidder and same is corelated with Annual GST turnover" along with copy of its Income Tax Return or Acknowledgement copy shall be furnished along with UDIN no.

**For Indian Companies:** As defined under section 2(40) of Companies

**For foreign bidders:** Similar documents under respective law of land.

2.18) Audited certificates / Balance Sheet / Profit & Loss Account Statement issued by any Auditor / Chartered Accountant shall mandatorily bear UDIN (Unique Document Identification Number) for such reports of FY 2019-20 onwards.

2.19) Published Annual report available in the public domain shall also be acceptable.

2.20) If a Foreign Bidder's Audited Financial Report is in currency other than INR, the respective/ desired figures for calculation of Annual Turnover shall be converted into equivalent INR considering the conversion factor indicated in Bidder's Audited Financial Report. In case the same is not indicated, the rate of conversion as on last date of respective financial years, for which the bidder has submitted the financial results, shall be considered. The conversion rates will be based on SBI TT selling rate or RBI/ Other scheduled bank/ Customs Notified exchange rate. The conversion rates from the above sources will be used uniformly for evaluation of all bidders participating in the tender.

2.21) For the bidders whose financial year is calendar year, the audited financial results shall be considered on calendar year basis in lieu of financial year.

2.22) If a Bidder is not required to get its accounts audited under Section 44AB of The Income Tax Act, 1961, certificate from a Practicing Chartered Accountant towards the turnover of the bidder along with copy of its Income Tax Return must be submitted by the bidder.

2.23) If any foreign bidder is unable to submit audited financial statements due to their internal/local regulation then in such cases, CEO's/ CFO's (howsoever designated) certificate in original, from the company or from the parent company (in case bidder is a subsidiary) stating the turnover of the bidding entity along with a declaration that the bidding company is not in a position to submit its financial statement as per the local/ internal regulation (clearly specifying the applicable regulation) with an endorsement by Chartered Accountant/ Statutory Auditor/ Certified Public Accountant (not being an employee or a Director or not having any interest in the bidder(s) company/ firm) may be accepted. Wherever Chartered Accountant/ Statutory Auditor/ Certified Public Accountant (not being an employee or a Director or not having any interest in the bidder(s) company/ firm) is not in a position to endorse such CEO's/ CFO's certificate due to local regulations, CEO's/ CFO's certificate in original without endorsement may be accepted provided a reference of the local regulation restricting this endorsement is given in the CEO's/ CFO's certificate.

2.24) In case where the bidder cites the reasons of Non Disclosure Agreement (NDA) for its inability to submit necessary documents in support of meeting the experience criteria & turnover criteria, a certificate, in original, certifying all the required information, issued by CEO/ CFO (howsoever designated) of the entity along with a declaration that the bidding company is not in a position to submit the required documents owing to the NDA with an endorsement by Chartered Accountant/ Statutory Auditor/ Certified Public Accountant (not being an employee or a Director or not having any interest in the bidder(s) company / firm).

2.25) Acceptance of PQC documents of related / unrelated parties shall be as follows:

| S.No. | Scenario | Financial criteria | Techno-commercial experience criteria |
|---|---|---|---|
| 1. | A New Entity formed as a result of merger of two entities and the earlier entity cease to exist | New Entity can use previous financial credentials of any of the merged companies till 7 years from the date of such merger or of its own | New Entity can use previous experience of any of the merged companies till 7 years from the date of such merger or of its own. |
| 2.(i) | An entity (A) takes over another entity (B) and B ceases to exists | Bidder can use previous financial credentials of company taken over by bidder or of its own. | Bidder can use previous experience of company taken over by bidder. |
| 2. (ii) | An entity (A) takes over another entity (B) partially and the said part of entity (B) vertical<br>specific business vertical of B ceases to exist | Bidder cannot use previous financial credentials of specific business vertical of company taken over by bidder | Bidder can use previous experience of the business vertical which has been taken over by bidder (not entire experience of entity B) |
| 3. | Parent company (bidder) using the credentials of its subsidiary | Financial credentials of the bidding entity | Parent company can use the credentials of its subsidiary.<br>Additional surety shall have to be submitted by parent and subsidiary for joint and several responsibilities. |
| 4. | Indian subsidiary (bidder) using the credentials of its Foreign Principals/ Foreign Parent Company | Financial credentials of only the bidding entity shall be used. | Technical Credentials of the Foreign Principals can be used.<br>However, the foreign principal shall be required to furnish a legally enforceable undertaking that they shall be jointly and severally liable, along with the bidder, for the successful execution of the order, if awarded. |
| 5. | Demerger of an entity B from another entity A by virtue of Corporate restructuring exercise | Demerged entity can use the credentials of original/ parent entity (based on the merit and circumstances of the cases like type of procurement, nature of demerger, number of eligible bidders available etc) to satisfy the eligibility criteria in the tender for 5 years from the date of incorporation of the new entity. | Demerged entity can use the credentials of original/ parent entity to the extent of demerger scheme as approved by the competent authority and subject to verification (based on the merit and circumstances of the cases like type of procurement, nature of de-merger, number of eligible bidders available etc) to satisfy the eligibility criteria in the tender for 5 years from the date of incorporation of the new entity. (However, same |

| | | | |
|---|---|---|---|
| | | | experience cannot be used by the original entity). |
| 6. | If Joint Venture company is the bidder | To be considered as sole bidder | To be considered as sole bidder |
| 7. | A new entity formed has taken over all the assets and liabilities of the proprietorship concern or partnership firm wherein one or more of the Directors of the new entity were the proprietor or partners and the erstwhile proprietorship concern/ partnership firm has ceased doing business after taking over of the business by the new entity | The new entity can use the financial credentials of the erstwhile proprietorship concern/partnership firm | The new entity can use the experience of the erstwhile proprietorship concern/ partnership firm. |
| 8 | The constitution of Proprietorship concern changes to partnership concern and erstwhile proprietorship concern has ceased doing business after the change of constitution. | The partnership concern can use the financial credentials of the erstwhile proprietorship concern, provided that the proprietor of the erstwhile proprietorship concern is a majority partner (having more than 50% controlling stake) in the newly formed partnership concern. | The partnership concern can use the experience of the erstwhile proprietorship concern, provided that the proprietor of the erstwhile proprietorship concern is a majority partner (having more than 50% controlling stake) in the newly formed partnership concern. |

The scenarios under Clause (1), (2) and (7) shall be applicable for all tenders in General. The eligible scenarios as specified under Clause (3), (4), (5), (6) & (8) shall only be allowed / applicable for consideration in the tender, if the provisions have been specified in the NIT.

2.26) Deleted.

## 3.) Guideline for EMD submission: (Not Applicable for this Advertisement/ tender

## 4.) Security Deposit (SD) / Initial Security Deposit (ISD):

Until and unless otherwise specified elsewhere in the tender documents, following will be applicable:

4.1) The Initial Security deposit (ISD) shall be equivalent to 2% of the Contract / work order value.

4.2) As soon as the tender is accepted, the contractor shall deposit the ISD / SD amount as applicable within 10 days from the date of issuance of Contract / Letter of Acceptance. Earnest money deposited (if any) by the contractor along with the tender shall be converted into security deposit and may be adjusted against the said 2% deposit. This 2% deposit is termed as Initial Security Deposit (ISD).

4.3) The remaining of the security deposit amount shall be recovered from the running payments made to the contractor for the work done. The recoveries shall be made @ 5% of the executed value till the required amount of security deposit is deducted based on 5% of total contract value.

4.4) Until and unless specified otherwise in the tender document, ISD / SD shall be computed as per the contract amount excluding GST.

4.5) The format of BG for SD/ISD shall be strictly as per **Annexure-3A** given in GCC.

4.6) The Contractor will be permitted to furnish a Bank Guarantee / Insurance Surety Bond (ISB) as per format attached for the full Security Deposit of 10% of the total contract value, in advance, in which case, no Initial Security Deposit will be required to be furnished and no deductions shall be made from his running bills towards Retention Money. Bank Guarantee / Insurance Surety Bond (ISB) shall be in the prescribed form from a scheduled bank and the amount covered by such BG is not less than Rs. 1,00,000. The Bank Guarantee shall be valid for a period of not less than three months after the expiry of Defect Liability Period.

4.7) If after completion of the work, the final executed value falls below the total contract value as indicated in the LoA, such that the total Security Deposit (made up of initial Security Deposit and Retention Money or otherwise) is in excess of the total required Security Deposit as per GCC of the final executed value, such excess amount shall be refunded to the Contractor after the Final Bill is passed. Alternately, the contractor may substitute his part or full security deposit with BG, whereupon the equivalent amount shall be refunded to the contractor. Such BG shall be valid till three months after defect liability period.

4.8) If the Security Deposit furnished by the Contractor in the form of Bank Guarantees / Insurance Surety Bond (ISB), is in excess of the full Security Deposit calculated on the contract value, by over Rs.1 Lakh, the Contractor shall be permitted to replace the Bank Guarantee(s) / Insurance Surety Bond (ISB) already submitted, by Bank Guarantee(s) / Insurance Surety Bond (ISB) to cover the reduced value of Security Deposit.

4.9) If the Security Deposit furnished by the Contractor in the form of Bank Guarantees / Insurance Surety Bond (ISB), is short of the full Security Deposit calculated on the final executed value, the Contractor shall be asked to replace the Bank Guarantee(s) / Insurance Surety Bond (ISB) already submitted, by Bank Guarantee(s) / Insurance Surety Bond (ISB) to cover the increased value of Security Deposit. Pending submission of the fresh BG for revised value, recovery of the shortfall may be made from the RA / Final bill.

4.10) In case mobilization advance is paid to the contractor under the provisions of GCC, it shall be permissible for the contractor to furnish a Composite Bank Guarantee / Insurance Surety Bond (ISB) to cover both mobilization advance as well as retention monies forming part of the Security Deposit, which shall be subject to the following conditions:

i) The Composite Bank Guarantee / Insurance Surety Bond (ISB) will be for a value equivalent to 110% of the advance plus applicable GST or 10% of the total contract value, whichever is greater, and shall be kept valid up to 3 months beyond the expiry of the Defect Liability Period.

ii) In addition, Initial Security Deposit shall be payable @2% of the total contract value.

iii) Recoveries will be effected from each running account bill at the rate of 5% of the gross bill value, till the entire mobilization advance (together with interest accrued thereon) is fully recovered.

iv) Initially, the composite Bank Guarantee / Insurance Surety Bond (ISB) will be entirely reckoned towards mobilization advance and progressively, the portions of Composite Bank Guarantee, vacated by the recoveries effected towards mobilization advance, shall be

reckoned towards Security Deposit, such that after the mobilization advance stands fully recovered with interest accrued thereon, the entire composite Bank Guarantee / Insurance Surety Bond (ISB) shall be reckoned to cover the Security Deposit for the work. The Initial Security Deposit furnished by the Contractor shall be refunded/ returned after recovery of mobilization advance is affected from the R.A. Bills up to an aggregate amount equivalent to the Initial Security Deposit.

4.11) The Security Deposit is refundable after completion of defect liability period (6 Months) after satisfactory completion of the work. In contracts where defect liability period is not applicable, security deposit may be released along with the final bill.

4.12) No interest shall be payable by the Corporation on the security deposit.

4.13) All compensations or other sums recoverable from the contractor may be deducted from the security deposit. In event the security deposit gets reduced due to such deductions, the contractor shall be responsible to make good the shortfall immediately.

4.14) Submission of SD/ISD through Demand draft or pay order or cash or cheque shall not be accepted.

4.15) For online submission of ISD / SD, any of the following methods may be adopted:

(a) **Through online Banking:**

| | | |
|---|---|---|
| Bank Name | : | STATE BANK OF INDIA |
| Beneficiary name | : | Indian Oil Corporation Limited |
| Account Number | : | **00000010813605465** |
| Bank IFSC Code | : | **SBIN0017313** |
| Branch name | : | **Corporate Accounts Group Branch** |
| Branch Address | : | **Corporate Accounts Group Branch-II**<br>**4th & 5th Floor**<br>**Red Fort Capital Parsvanath Towers, Bhai Vir Singh Marg**<br>**New Delhi - 110001** |

(b) **Through e-Pay One portal (if the IOCL vendor code of the bidder is available):** IOCL has launched the ePayOne portal which can be accessed through the link https://epayone.indianoil.in/. The said portal will facilitate users to make online payment through various modes viz., Internet Banking, UPI, Debit Card upto Rs.2000/-, Credit Card(Transaction charges @0.75% will be collected from users by SBI) and RTGS/NEFT. Options are available in the portal to the payers make payment through "New Payments" by registered users or Direct payment (without registration). Registered users shall have the facility of downloading cash receipt in PDF format at any point of time, to track the status of the payments and Transaction history. For illustrative purposes, the major payments covered in the portal are as below:-

Vendors - Security deposit/TT calibration Fees **The user manual can be downloaded from the 'ePayOne' portal Home page under the option 'Need Help'.**

## 5.) Guideline for preparation of Bank Guarantee (BG):.

i) The stamp paper of appropriate value is required to be purchased in the name of bank issuing the guarantee, In the Bank Guarantee, the first Party to the Bank Guarantee should be the Bank issuing the Guarantee and the second Party should be the beneficiary i.e. IOCL.

ii) Earlier, upon receipt of the Original Bank Guarantee, IOCL was seeking confirmation of the same directly from the issuer Bank/branch to check the authenticity of instrument. However, for faster confirmation of the Bank guarantee, henceforth bidders to ensure that BG issuing bank will send SFMS in IFN 760COV (for any new bank guarantee) and IFN 767COV (for any amendment in bank guarantee) through the SFMS platform as per mandatory fields given below:

| Field No | Description | Value |
|---|---|---|
| 7034 | Name of Beneficiary and his details | INDIAN OIL CORPORATION LIMITED |
| 7035 | Beneficiary IFSC | ICIC0000007 |
| 7036 | Beneficiary branch name and address | ICICI Bank, 9A, Phelps Building, Connaught Place, New Delhi-110001 |
| 7037 | Sender to Receiver information | IOCL0015 |

iii) ACCEPTANCE OF ELECTRONIC BANK GUARANTEE (eBG): The banks will issue eBG in NeSL platform through a complete digital process i.e. procuring e-stamp paper, preparing the eBG as per IndianOil format, digitally signing the eBG by banking officer/sand then finally issuing the eBG through NeSL (National E-Governance Services Limited) portal.

iv) BG for value up to Rs. 2 Crore can be accepted if it is issued by an Indian Branch of any Scheduled Bank appearing in the Second Schedule to the RBI Act of 1934.

v) BG for value above Rs. 2 Crore can be accepted if it is issued by an Indian Branch of:

(a) Any Nationalized/ PSU Bank appearing in the Second Schedule to the RBI Act 1934 or

(b) Any Scheduled Bank (other than a Nationalized/ PSU Bank) having at least Desired Credit Rating at the time of acceptance of the BG:

| Bank | If tenure of the BG is more than 1 year | If the tenure of BG is upto 1 year |
|---|---|---|
| In case of foreign banks | Credit rating of 'A' of Moody's or equivalent. | Credit rating of 'P-1' of Moody's or equivalent i.e. highest short term rating. |

| | | |
|---|---|---|
| In case of Indian banks | Credit rating of 'AA' of CRISIL or equivalent. | Credit rating of 'A-1+' of CRISIL or equivalent i.e. highest short term rating. |

vi) As on date, the following are the credit rating agencies approved by SEBI: (a) CRISIL Limited (www.crisil.com).(b) Fitch Ratings India Private Limited (www.fitchratings.com).(c) ICRA Limited (www.icra.in).(d) Credit Analysis & Research Ltd. (CARE) (www.careratings.com).

vii) As on date, the following are the credit rating agencies approved by SEBI:

(a) CRISIL Limited (www.crisil.com).

(b) Fitch Ratings India Private Limited (www.fitchratings.com).

(c) ICRA Limited (www.icra.in).

(d) Credit Analysis & Research Ltd. (CARE) (www.careratings.com).

(e) Brickwork Ratings India Private Limited (www.brickworkratings.in).

(f) SME Rating Agency of India Ltd. (SMERA) (www.smera.in).

viii) Apart from the above, irrespective of its amount, BG issued by any other bank including non-scheduled banks, foreign branches of scheduled banks and foreign branches of foreign banks, can be accepted provided such BG is counter guaranteed by any bank as per (iv) above.

ix) Merely signing or endorsing or forwarding the BG by the scheduled bank does not amount to counter guaranteeing. A proper document executed on a non-judicial stamp paper of appropriate value with specific reference to the BG being counter guaranteed, is essential.

x) In case of acceptance of BG issued or counter guaranteed by a bank mentioned above, the credit rating of the same will be verified by IOCL. During verification if the credit rating of such bank falls below the Desired Credit Rating during the validity period of BG, the concerned party shall either submit a fresh BG issued by other bank with required credit rating or get the existing BG counter guaranteed, at its own cost, through a bank mentioned (having threshold credit rating, if applicable).

xi) Hard copy of Original BG shall be submitted / delivered in person or sent by post directly from bank in sealed envelope (super scribing tender name, number & date of bid submission & opening) so as to reach the Tender Inviting Authority up to stipulated date & time of Bid Submission at the following address:

**General Manager (M&C),**
**Room No. C-21**
**10th Floor, NBCC Complex, Block-2**
**East Kidwai Nagar, New Delhi-110023**
**P&BD, Indian Oil Corporation Ltd.,**

## 6.) Insurance Surety Bond (ISB):

### 6.1 Definitions:

1. **Insurance Surety Contract:** It shall be a contract of guarantee under Section 126 of the Indian Contract Act, 1872. It is a contract to perform the promise, or discharge the liability of a third person in case of his default.

2. **Surety**: The person who gives the guarantee is called the "Surety" (viz. the Insurance Company).

3. **Principal Debtor:** The person in respect of whose default the guarantee is given is called the "principal debtor".

4. **Creditor:** The person to whom the guarantee is given is called the "creditor" (viz. IOCL).

**6.2 Guidelines:**

1) Insurance Surety Bond (ISB) can be accepted for contracts, agreements other than DCA (Draft Concession Agreement), Customers, and DOPW (DCA-Operated Polymer Warehouse), EMD / Security Deposit/ Performance Guarantee / Mobilization Advance/ Price Reduction for delay only.

2) ISB can be issued by the insurer registered with Insurance Regulatory and Development Authority (IRDAI). It is understood that only five insurers have launched surety insurance products so far namely-
    1. ICICI Lombard
    2. SBI General Insurance
    3. Bajaj Allianz General Insurance
    4. New India Assurance Company
    5. HDFC ERGO General Insurance Company

3) Only Indian Bidders can submit the ISB, for work/ supply commitment within India in INR executed on a Non-Judicial Stamp paper/ e-stamp paper.

4) It is the responsibility of the Insurer who is issuing the ISB to pay the correct stamp duty according to prevailing State Legislation.

5) ISB is irrecoverable, unconditional & without recourse/reference to the bidder. ISB shall be strictly in line with duly approved format.

6) ISB issued by the insurer should be signed by the authorized official of Insurance Company and the name, designation etc. of the officials, signing the ISB, should be mentioned on the ISB with the signatures. This applies for all subsequent renewal and amendments of ISBs also. All ISBs issued by the insurance company should be serially numbered. ISBs issued for Rs. 50,000/- & above should be signed by two officials jointly with clear mentioning of their name, designation.

7) ISBs have two important time periods/ dates, viz. Validity Date and claim period. Validity date of ISB refers to the validity period till which ISB remains valid, and Claim Period of ISB refers to a contractually agreed grace period beyond the validity period of ISB to make a demand to the Insurance Company against a default which had occurred during the validity period of the ISB.

8) The validity of the ISB shall be same as mentioned for BG against EMD / Security Deposit/ Performance Guarantee / Mobilization Advance/ Price Reduction for delay only, as applicable and stipulated in the tender.

9) The guarantee will not be discharged due to the change in the constitution of the Insurance Company.

10) The Insurance company agrees that the ISB may be invoked on number of occasions but the total amount payable hereunder shall not exceed the value of ISB. ISB format may contain a clause permitting both full & partial invocation of the ISB specifically permitting lodging of claims by invocation in parts from time to time up to the total value of the ISB till the expiry of the ISB.

11) If the clause for partial invocation is not mentioned in the ISB format, in the event of invocation of such ISB, the full ISB amount is to be invoked and the proceeds to be received into IOCL's bank account. The invocation proceeds received are to be adjusted against IOCL's claims, only after which the balance may be released to the vendors after obtaining approval from competent to approve release of security deposit.

12) The ISB formats against EMD and Security Deposit are attached as Annexure-8 and Annexure-9 respectively.

13) Hard copy of Original ISB shall be submitted / delivered in person or sent by post directly from bank in sealed envelope (super scribing tender name, number & date of bid submission & opening) so as to reach the Tender Inviting Authority up to stipulated date & time of Bid Submission at the following address:

**General Manager (M&C),**
**Room No. C-21**
**10th Floor, NBCC Complex, Block-2**
**East Kidwai Nagar, New Delhi-110023**
**P&BD, Indian Oil Corporation Ltd.,**

## 7.) Sub-contracting:

7.1) The Contractor shall not subcontract any part/ scope of the work of this Contract under any circumstances

7.2) Procurement of material, hire of equipment or engagement of labour will not mean sub-contracting.

7.3) Subcontracting by the contractor in any form and under any circumstances shall be a breach of contract.

## 8.) Right of Owner to accept or reject tenders:

8.1) Bidders are informed that tender process can be abandoned without assigning any reason thereof. No compensation shall be paid for the efforts made by the bidder.

8.2) The Tender Inviting Authority reserves the right to reject any or all of the tenders or any part of a tender so received, and no compensation shall be paid for the efforts made by the bidder.

8.3) No bidder shall contact the OWNER on any matter relating to its bid from the time of the bid opening up to the time that the contract is awarded. Any effort by a Bidder or Bidder's agent, consultant or representative, howsoever described to influence the OWNER in any way

concerning scrutiny, consideration, evaluation or computation of the Bid(s) or decision concerning award of contract shall entail rejection of the bid.

8.4) Deleted.

## 9.) Invalid Bids / Bids liable for rejection:

9.1) Bid is invalid in the following circumstances and liable for rejection:

a) Does not fulfill minimum qualification criteria prescribed in the tender documents.

b) In case the bidder misrepresents facts or submits, forged, false or fabricated document.

c) Bidder is holiday listed as per prevailing holiday listing guidelines.

d) If insolvency resolution process has commenced (viz. application has been admitted by Adjudicating Authority and moratorium has been imposed and IRP has been appointed) or liquidation or bankruptcy proceedings have commenced in respect of bidder in terms of Insolvency and Bankruptcy Code, 2016 or any other applicable law (in cases where code is not applicable) at any stage of evaluation of bid.

9.2) Bid is also liable for rejection in following circumstances:

a) If bidder stipulates the validity period of the bids lesser to what is stated in the tender document.

b) If a bidder stipulates their own conditions and refuses to withdraw them.

c) If a bidder does not disclose the full names and addresses of all his partners in the case of a partnership concern.

d) If a bidder does not fill in and sign the tender acceptance formats (and annexures) as specified in the tender.

e) If a bidder does not have their PF Code/ number from the Regional Provident Fund Commissioner. However, PSUs / organizations having their own PF trust / Govt. PF are considered 'At Par' with the bidders registered with the PF authorities, the necessary documentary evidence shall be submitted along with the bid.

f) If the bids are partly quoted.

g) If the bids contain unacceptable terms and conditions.

h) Any discrepancy done with the acceptance of BOQ.

i) Offers not meeting statutory requirement.

9.3) Offer from following types of bidders will not be acceptable:

(a) Who are in the Holiday list of IOCL or its Administrative Ministry, MoPNG.
(b) Who are under liquidation, court receivership or similar proceedings.
(c) Who are undergoing insolvency resolution process or liquidation or bankruptcy proceeding under Insolvency and Bankruptcy Code,2016(Code) or any other applicable law (in case where Code is not applicable).

(d) Whose insolvency resolution process or liquidation or bankruptcy proceeding is initiated under the Code or any other applicable law (in case where Code is not applicable) at any stage of evaluation of the bid. In case where the bid of the L-1 bidder is rejected on the aforesaid grounds during the period between Price-Bid-Opening and Award-of-Contract, then the bid of the next higher eligible bidder will be considered for further processing.

(e) Consultant or their subsidiary company or companies under the management of consultant for execution of the same project for which they are working as consultant.

(f) Consultant appointed for the project/ job shall not be allowed to participate in the tender either directly or indirectly. An indirect participation shall include participation through an affiliate or as a sub-contractor, consultant or supplier. The expression 'affiliate' for the purpose of this clause will include any person, or company or association (howsoever designated) who/ which is a member of the consultancy firm (if the consultancy firm is a joint venture or consortium or who or which is directly or indirectly holds 10% (ten percent) or more of the capital or voting capital of consultant (if the consultant or any of its members is a company or a body corporate) or who or which is a consultant or sub-contractor of the consultant with regard to the project.

(g) Foreign bidders are participating in Domestic /National tender.

(h) Offer from Joint Bidders / Consortium unless specifically permitted in the tender for such bidding.

## 10.) Evaluation criteria in case of tie i.e. identical rates quoted by more than one party shall be as follows:Deleted

## 11.) Guideline for Insolvency and Bankruptcy code, 2016 (IBC):

11.1) It will be the responsibility of the bidder to inform IOCL within 15 days from the date of order of insolvency resolution process or liquidation or bankruptcy proceeding passed by the Adjudicating Authority namely, National Company Law Tribunal (NCLT) or Debt Recovery Tribunal (DRT) under the Code.

11.2) If bidder refuses or fails to share the information regarding their status of insolvency resolution process or liquidation or bankruptcy proceeding in their bid or at any later stage, their offer is liable to be rejected by IOCL.

11.3) IOCL reserves the right to cancel/terminate the contract without any liability on the part of IOCL immediately on the commencement of insolvency resolution process or liquidation or bankruptcy proceeding of any party under the contract.

11.4) IOCL reserves its right to evaluate and finalize the bid without considering the bid of any party undergoing insolvency resolution process or liquidation or bankruptcy proceeding under the Code regardless of the stage of tendering.

11.5) A declaration / undertaking shall be submitted from the bidder in the Format (as per Annexures to ITB of tender document) along with techno-commercial bid.

## 12.) Settlement of commercial disputes:

In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs) / Port Trusts inter se and also between CPSEs . and Government Departments/Organizations (excluding disputes relating to Railways, Income Tax, Customs & Excise Departments), such dispute or

difference shall be taken up by either party for its resolution through AMRCD as mentioned in OPE OM No. 05/0003/2019-FTS-10937 dated 14th December, 2022 and the decision of AMRCD on the said dispute will be binding on both the parties.

## 13.) Health / Safety of workers:

13.1) Contractor has to submit fitness certificate of each contract worker to EIC as, before assigning any job.

13.2) Minimum frequency of health checkup for workers working in hazardous area should be annual in general and half yearly for working in Benzene environment or as directed by EIC.

13.3) Production of fitness certificate does not relieve the contractor of any of his responsibility in respect of workers engaged by him.

13.4) Contractor is to provide the protective clothing to their workmen with quality in line with PPE Matrix (separately attached with) and same shall be implemented as other conditions of work permit systems are enforced for the implementation at the work places.

13.5) Contractor is to comply and fulfill the requirement of applicable PPEs as per the PPE matrix (separately attached with).

13.6) Until and unless otherwise specified elsewhere in the tender document, the following penalties for violation/ non-adherence of safety procedures and practices shall be applicable:

i) For violation of applicable Safety, Health and Environment related norms, a penalty of Rs. 5000 per occasion shall be levied.

ii) Violation as above resulting in:

(a) Any physical injury: A penalty of 0.5% of the contract value (maximum up to Rs. 2,00,000) per injury in addition to Rs. 5000 per occasion as in (i).

(b) Fatal accident: A penalty of 1% of the contract value (maximum of. Rs. 10,00,000) per injury in addition to Rs. 5000 per occasion as in (i).

The contractor is advised to take appropriate insurance policy for the effective implementation of the above penalty provision. In case of accidents, in addition to hospitalization/ treatment charges and Group insurance amount, compensation shall be paid by the Contractor to the affected person/ his family members (depending on the seriousness of injury, etc.) as per Workmen Compensation Act.

## 14.) Taxes and duties:

14.1) That in the eventuality of award of work, the Contractor shall not be entitled to receive any payments from IOCL unless the Contractor either furnishes its Permanent Account Number or a declaration under section 197A to IOCL with its first running account bill.

14.2) Vendors / Contractors shall submit proper Cenvatable tax invoices, as per GST Act, to enable IOCL to take full input tax credit, under GST Act, in the absence of which, Payments shall not be released.

14.3) Bidder to accept the quote as per the provision of BOQ.

14.4) **Tax Conditions:**

i) The quoted price shall be as per provision of BOQ.

ii) The Bidder/Contractor shall not directly consign any material under their scope of supply to Owner.

iii) If during the period from the date of submission of the bid (or final price bid, if applicable) of the contractor to the date of Scheduled Mechanical Completion/ completion of the entire work(s) or during any time extension granted thereof, there is an increase in the rate of output tax (Goods and Services Tax (GST) etc. or any new output tax is introduced in addition to, or, in lieu of the existing taxes where the total financial implication on account of new output taxes is more and arises within the said contractual completion period, IOCL shall reimburse the additional tax burden. Beyond the contractual completion period also (including any grant of time extension), IOCL shall reimburse the additional tax burden, limited to its ITC entitlement on the increase in output taxes or new output taxes, as per applicable law. In other cases, Contractor shall bear the increase in the rates of existing taxes or any new output tax. Similarly, if there is any reduction in any of the said taxes, the contractor shall pass on the benefit of such reduction to IOCL by invoicing at the applicable reduced rate.

iv) It would be the responsibility of the Bidder/Contractor to get the registration with the respective Tax authorities. Any taxes being charged by the Bidder/Contractors would be claimed by issuing proper TAX Invoice indicating details /elements of all taxes charged and necessary requirements as prescribed under the respective tax laws and also to mention his correct and valid registration number(s) along with OWNER's registration number as applicable for particular supply on all invoices raised on OWNER. Bidder/Contractor to mention the correct GSTIN number from where the supply is proposed to be undertaken. Further the Service Accounting Code (SAC) as applicable for the subject tender needs to be provided in the columns provided in the technical bid. In case the Bidder/Contractor is opting for Composition scheme under the GST laws (i.e Section 10 of the CGST Act, 2017 and similar provisions under the respective State / UT law), the Bidder/Contractor should confirm the same. Further the Bidder/Contractor to confirm the issuance of Bill of Supply while submission of tender documents and no GST will be charged on OWNER. In such cases, bidder shall submit Form GST CMP 01 and GST CMP 02. His Bid shall be evaluated without considering GST. In case the Bidder/Contractor is falling under Unregistered category, the Bidder/Contractor should confirm the same.

v) Bidder has to obtain GSTIN registration at the location where Works Contract Services are to be performed or carried out. In case of other type of services, Bidder may decide depending upon their business requirement and provisions of GST Laws. However, it is advisable to obtain GSTIN in the State where job is required to be carried out/executed.

vi) Bidders are to necessarily indicate their Goods & Service Tax Identification Number (GSTIN) along with their techno commercial bids unless and otherwise they are exempted as per GST Laws & Rules. Offers without GSTIN will be treated at par with "Unregistered" Taxable.

vii) In case the Bidder/Contractor is opting for Composition scheme under the GST laws, in such event the evaluation of his bid will be based on the Quoted Price. GST liability, if any, on OWNER under reverse charge will be included for the purpose of evaluation.

viii) Depending upon the nature of service of subject tender, category of services, service accounting code (SAC) and applicable rate of GST (SGST+CGST OR IGST as the case may be) is to be confirmed by bidder as per prescribed format given in the technical bid.

ix) If the bidder deviates w.r.t. category of services, service code and GST rate as per the format given by OWNER in the technical bid, then details with proper justification must be provided.

x) In case a Bidder declares that he has applied for GSTIN registration at the time of submission of Bid, but GSTIN is not available, he must attach a copy of Application Reference Number (ARN) as proof of his declaration. And in such cases, Bid shall be evaluated after considering GST Rates and Service Accounting Code (SAC) as determined by the Owner if Bidder has not confirmed or quoted the same. In such cases, Work Order may be awarded pending submission of GSTIN by such Bidder. However, Bidder must submit GSTIN before submission of first bill under Contract.

xi) In case Service is specified where Service Recipient is liable to pay GST under Reverse Charge, same shall be clearly mentioned in the applicable Annexure.

xii) Invoice should be raised as per Tax Rates mentioned in the BIDs and in case at the time of raising Invoice if the invoices raised are not as per Tax rates mentioned in the bid, payment will be limited to the rate quoted as per BID subject to increase /decrease in rates after last date of submission of Price Bid provided delivery is within the Contractual period.

xiii) CGST & SGST (or UTGST) or IGST, as the case may be, shall be released only on receipt of GST Invoice containing the following details:

(a) Name, address and GSTIN of the supplier.

(b) A consecutive serial number of the invoice.

(c) Date of issue.

(d) Name, address and GSTIN or UIN, if registered of the recipient

(e) Name and address of the recipient and the address of the delivery, along with the State and its code,

(f) HSN Codes or Service Accounting Code (SAC)

(g) Description of goods or services;

(h) Total value of supply of goods or services;

(i) Taxable value of supply of goods or services taking into discount or abatement if any;

(j) Rate of tax (Central Tax, State Tax, Integrated Tax (for inter-state supply), Union Territory Tax or cess);

(k) Amount of tax charged in respect of taxable goods or services (Central Tax, State Tax, Integrated Tax (for inter-state supply), Union Territory Tax or cess);

(l) Place of supply along with the name of State, in case of supply in the course of inter-state trade or commerce;

(m) Address of the dispatch point where the same is different from the place of supplier;

(n) Whether the tax is payable under Reverse Charge basis and

(o) Signature or digital signature of the supplier or his authorized representative.

(p) Quick response code having embedded invoice reference number(IRN) in case invoice issued under rule 48/4.

xiv) E-invoicing under GST has been implemented w.e.f. 1st August 2023 for all the taxable person having turnover more than Rs. 5 Crore. It has been specified by the Govt that it is mandatory to mention a valid unique Invoice reference number (IRN) and QR code as generated from Govt. portal on a Tax invoice. Bidder/ Vendor who is required to comply with the requirements of E-invoice for B2B transactions as per the requirement of GST Law, as may be applicable at the time of raising of invoice, shall ensure the compliance of requirement of E Invoicing under GST law. All the payments to such Bidder/Vendor who is liable to comply with provisions of E-Invoicing as per GST Laws shall be made against the proper e-invoice(s) only.

xv) The Bidder/Contractor shall take steps viz. mention relevant GSTIN of OWNER in GST invoices and returns, uploading invoice in GSTR 1, payment of the tax liability on the said invoices and filing of Returns etc. and comply with all the requirements of applicable laws including GST laws for the time being in force to enable the OWNER to avail tax credit/s including input tax credit. Tax element on any Debit Note / Supplementary invoice, raised by the Bidder/Contractor will be reimbursed by OWNER as long as the same is within the permissible time limit as per the respective taxation laws and also permissible under the Contract terms and conditions. Bidder/Contractors to ensure that such debit Notes are uploaded while filing the Statutory returns as may be prescribed from time to time.

xvi) It's the obligation on the part of Bidder / Vendor / Contractor / Consultant to discharge their liability by payment of GST to Government of India in cash OR utilisation of Input Tax credit in respect of such supply of services through GST Invoice under this Contract, so that Owner will avail Input Tax credit on such supply. Also it shall be the obligation on the part of the bidder / vendor to include the tax invoices in the return ensuring matching of the tax amount and to ensure timely filing of the return in the GSTN portal. In the event that the input tax credit of the GST charged by the Bidder / Vendor/ Contractor / Consultant is denied by the tax authorities to Owner due to reasons attributable to Bidder / Vendor, Owner shall be entitled to recover such amount from the Bidder / Vendor/ Contractor / Consultant by way of adjustment from the next invoice or from Bank Guarantee. In addition to the amount of GST, Owner shall also be entitled to recover interest and penalty, in case same is imposed by the tax authorities on Owner.

xvii) The Bidder/Contractor would be liable to reimburse or make good of amount equivalent to the value of GST charged in tax invoice/debit note to OWNER along with other consequential implications in cases where Bidder/Contractor/supplier defaults in deposit of taxes to Govt. or non updation / incorrect updation of the invoice data in GSTN network or non-filling of returns or wrongly charges Integrated Tax in place of Central Tax + State/Union Territory Tax or vice versa or any other non-compliance of GST laws; by issuance of suitable credit note to OWNER. In case, Bidder/Contractor does not issue credit note to OWNER, OWNER would be constrained to recover the amount with consequential implications including interest / penalty payable.

xviii) It shall be obligatory for the Bidder to issue Credit Note for Price reduction on account of delay in delivery as defined in the Bid or Contract Documents in the month immediately following the month in which deduction of account of delay in delivery is effected by the Owner.

xix) Tax element on any Debit Note / Supplementary invoice, raised by the Bidder/Contractor will be reimbursed by OWNER as long as the same is within the permissible time limit as per the respective taxation laws and also permissible under the Contract terms and

conditions. Bidder/Contractors to ensure that such debit Notes are uploaded while filing the Statutory returns as may be prescribed from time to time.

xx) The Bidder/Contractor will be under obligation for quoting/charging correct rate of tax as prescribed under the respective Tax Laws. Further the Bidder/Contractor shall avail and pass on benefits of all exemptions/concessions/benefits/waiver or any other benefits of similar nature or kind available under the Tax Laws. In no case, differential Tax Claims due to wrong classification of goods and/or services or understanding of law or rules or regulations or any other reasons of similar nature shall be entertained by OWNER.

xxi) In case of any advance including Mobilization, Advance given as per Contract, the Contractor shall issue Receipt voucher immediately on receipt of advance payment and subsequently issue the tax invoice at the time of supply, after adjusting advance payments as per Contractual terms and GST Provisions.

xxii) In case any recovery is made for any facility or services provided by the Owner and such recoveries are subject to GST, amount of recovery plus applicable GST shall be deducted/ recovered from the Invoices/Claim of the Bidder.

xxiii) Wherever provisions of Tax deduction at Source (TDS) are applicable under the CGST / SGST / UTGST/IGST Act, 2017 on supplies of goods or services or both to OWNER, tax will be deducted from the invoice raised and deposited with the authorities by OWNER. OWNER shall file the TDS return on GST Portal on the basis of which Credit can be availed by the bidder/ contractor.

xxiv) IOCL will issue Road Permit/Way Bill, by whatever name it is called, to the Contractor only in those cases where materials is purchased by IOCL directly and/or IOC is statutorily required to issue the Road permit/Way Bill, by whatever name it is called. Contractor will be under obligation for proper utilization of road permits for the specific supply and in case of seizure of goods/vehicle; the Contractor will be wholly responsible for release and reimburse the litigation cost to IOCL.

xxv) IOCL shall on no account be responsible for delay or hold up due to the timely non availability of such documents as are required to be furnished by the owner to obtain the Road Permit/Way bill, by whatever name it is called. However, IOCL shall make best efforts to provide sufficient number of Road Permits/way bill, by whatever name it is called on demand to avoid any delay or Hold up.

14.5) **Income Tax**

i) The Bidder/Contractor shall be exclusively liable to pay directly to the concerned Income Tax Authorities in India and to bear all Indian Taxes payable relative to employment of any personnel by the Bidder/Contractor.

ii) Wherever withholding tax i.e. Tax deduction at source (TDS) is applicable under the Income tax Act, 1961 the same will be deducted from the Invoices raised and TDS Certificate as per provision of the Income tax Act and Rules shall be issued to the Bidder/Contractor.

iii) Bidder/Contractor should mandatorily provide the PAN. If PAN is not provided, TDS would be deducted at higher rate as per the provisions of Income Tax Act. TDS would also be deducted at higher rate if Bidder / Contractor is categorized as "Specified Person" by Income Tax Authorities for non -filling of return as per the provisions of the Income Tax Act.

iv) All amounts in this BID for supply of equipment, machinery, catalyst or any other supply of goods made from outside India shall be gross of withholding tax levied under Indian Income Tax or Double Taxation Avoidance Agreement. Owner shall deduct the Withholding Tax payable to Government of India from the total amount payable for such supplies. All relevant documents for such payment shall be provided to the bidder/contractor.

v) All amounts in this BID for services from within India in INR shall be gross of Indian TDS. Owner shall deduct the Withholding Tax payable to Government of India from the total amount payable for such Indian Services. All relevant documents for such deduction shall be provided to the bidder/contractor.

vi) Withholding tax / tax deductible at source is applicable to all payments to be made to the CONTRACTOR. Withholding / deduction is required to be made at the rates specified in the Indian Income Tax Act. However, in case of non-resident contractors, lower of the rate of withholding tax as available in the relevant Double Taxation Avoidance Convention or Agreements (DTAA) as notified or amended from time to time as compared to the rate applicable as per relevant Finance Act will be applicable subject to certain specified documentary compliances. Therefore, it is incumbent upon the Contractor/bidder to decide and declare whether it intends to take benefits of lower rate of Withholding Tax and commit to provide necessary documents. As per extant provisions of Income Tax Act and Rules made there under following documents are mandatory for this purpose (a) Tax Residency Certificate (TRC) issued by the competent authority of the country of residence of the Contractor (b) Electronically generated Form 10F as described in Income Tax Rules, 1962 (c) A declaration in specified format in lieu of Permanent Account Number (PAN) and (d) No PE Certificate.

vii) The Indian Income Tax Act and rules made there under contains provisions permitting deduction of tax at a lesser rate if the CONTRACTOR is able to justify to the Income Tax Authorities such lesser rate of deduction. However, a deduction once made has to be deposited by the OWNER with the Income Tax Authorities in India and will not be adjustable by the OWNER. It is therefore in the interest of the CONTRACTOR that prior to release of any payment due to the CONTRACTOR under the Contract that the CONTRACTOR obtains, from the relevant Income Tax Authorities in India, a certificate specifying the rate of deduction /withholding of Income tax at source, failing which, payment to the CONTRACTOR shall be made by the OWNER after Withholding / deduction at the highest rate as may be applicable to the non-resident contractors as per Provisions of Income Tax Act, 1961.

14.6) **Tax Conditions for LSTK Jobs:**

i) Apart from the Tax conditions already mentioned following Tax conditions shall also be applicable in LSTK Tenders.

ii) The entire Scope of jobs under this Tender/Contract has been classified as Supply of Material and Service in relation to an immovable property under GST and the place of supply of services shall be the location at which the Works is being executed. Accordingly, the BIDDER/CONTRACTOR is required to take GST registration for supply of services and subsequent invoicing to the OWNER under the Tender/Contract as per GST invoice Rules.

iii) The supplier of LSTK Bidder/Contractor should not issue its Invoice indicating OWNER as consignee since such sales cannot be treated as Sale-in-Transit under GST Law. Bidder/Contractor must procure material in their own name and avail ITC for the same and subsequently supply as part and parcel of Works Tender/Contract Service to OWNER. No waybill/road permit will be issued from OWNER.

iv) Billing for Import to be done on OWNER (except for EPCG & MOOWR cases where separate high seas agreement will be entered with Bidder/Contractor) with applicable CGST & SGST with reimbursement of BCD & Cess and CGST & SGST thereon, limited to the quoted Foreign Currency (FC) amount. However, impact of IGST due to inclusion of Anti-Dumping Duty and Safe Guard Duty in the value for calculation of IGST shall be on Contractors account.

v) Where the Owner opts to avail the benefits of EPCG/Post export EPCG or MOOWR, relevant License shall be provided to LSTK Contractor and Customs clearance shall be done under IOCL import export code by endorsement of EPCG License number/MOOWR License in Bill of entries as the Owner will be the importer on record.

vi) Withholding tax / tax deductible at source is applicable to all payments to be made to the CONTRACTOR. Withholding / deduction is required to be made at the rates specified in the Indian Income Tax Act. However, in case of non-resident contractors, lower of the rate of withholding tax as available in the relevant Double Taxation Avoidance Convention or Agreements (DTAA) as notified or amended from time to time as compared to the rate applicable as per relevant Finance Act will be applicable subject to certain specified documentary compliances. Therefore, it is incumbent upon the Contractor to decide and declare whether it intends to take benefits of lower rate of Withholding Tax and commit to provide necessary documents. As per extant provisions of Income Tax Act and Rules made there under following documents are mandatory for this purpose (a) Tax Residency Certificate (TRC) issued by the competent authority of the country of residence of the Contractor (b) Electronically generated Form 10F as described in Income Tax Rules, 1962 (c) A declaration in specified format in lieu of Permanent Account Number (PAN) and (d) No PE Certificate.

vii) The Indian Income Tax Act and rules made there under contains provisions permitting deduction of tax at a lesser rate if the CONTRACTOR is able to justify to the Income Tax Authorities such lesser rate of deduction. However, a deduction once made has to be deposited by the OWNER with the Income Tax Authorities in India and will not be adjustable by the OWNER. It is therefore in the interest of the CONTRACTOR that prior to release of any payment due to the CONTRACTOR under the Contract that the CONTRACTOR obtains, from the relevant Income Tax Authorities in India, a certificate specifying the rate of deduction /withholding of Income tax at source, failing which, payment to the CONTRACTOR shall be made by the OWNER after Withholding / deduction at the highest rate as may be applicable to the non-resident contractors as per Provisions of Income Tax Act, 1961.

viii) In case of any advance including Mobilization, Advance given as per Contract, the Contractor shall issue Receipt voucher immediately on receipt of advance payment and subsequently issue the tax invoice at the time of supply, after adjusting advance payments as per Contractual terms and GST Provisions.

ix) GST will be applicable on recovery for Land charges/ rent Safety Penalty, over speeding, other penalties etc . OWNER will issue GST Invoice in such cases.

x) Credit notes to be issued by the Bidder/Bidder/Contractor for Price reduction on account of delay in delivery for lower incidence of GST.

xi) Additional GST implication will arise on price variation of construction material and foreign exchange fluctuation and shall be paid extra on submission of proper GST invoice.

xii) The total price payable under the Tender/Contract shall be restricted to the Lump sum Price and applicable GST as per other existing terms & condition of the Tender/Contract. Bidder/Contractor to ensure progressive invoice value so that there should not be any additional liability to the OWNER.

14.7) **Custom Duty and Foreign Exchange Variation:**

i) Custom Duty Variation: With the implementation of GST, the custom duty shall be a part of quoted price and no variation shall be allowed. However, in exceptional cases, Customs Duty rate variation can be agreed subject to the following conditions:

(a) CIF value should be indicated in the offer. Materials to be imported covering the above CIF value should also be clearly spelt out. The rate of Customs Duty and the Tariff Number under which the item is covered should be clearly spelt out.

(b) Any increase in price due to increase in Customs Duty rates beyond the Contractual Delivery date (CDD) in respect of items which require further fabrication after import and for bought out imported items beyond the CDD, will be to Bidder/Bidder/Contractor's account. For all such claims necessary documentary evidence shall be provided by the Bidder/Bidder/Contractor to OWNER along with their claim request.

ii) Foreign Exchange (FE) variation:

(a) FE variation shall normally not be allowed. In (global tenders) cases where Foreign Exchange (FE) involvement is envisaged, and in case the bidders are quoting for FE rate variation, the details of item wise maximum CIF value (indicating quantity) of each currency should be indicated in the offer. This list shall be vetted by the indenting department / PMC at the time of giving technical recommendation to the effect that the listed items are required for the tendered material.

(b) Any increase in price due to increase in FE rates beyond the CDD in respect of items which require further fabrication after import and for bought out imported items beyond the CDD, will be to Bidder/Bidder/Contractor's account. However, any decrease in the prices due to decrease in FE rate at the time of actual clearance of imported materials, shall be passed on to OWNER. FE variation shall also include recovery if the actual exchange rate is less than the quoted rate.

(c) While seeking the maximum CIF value in the tender documents, the bidder shall be asked to separately indicate the imported bought out items and their maximum CIF value. In case order stipulates FE variation clause, the Bidder/Bidder/Contractor shall furnish Bill of Entry documents along with the invoice and raise invoice accordingly.

(d) In case the bidder quotes any component of Customs Duty based on exemption under the prevailing Indian Customs Laws [including any benefit available under any trade agreement which India has with any other nation or block of nations viz. Comprehensive Economic Partnership Agreement (CEPA), Free Trade Agreements (FTA) etc.] as on the date of Bid, then bidders shall be required to submit all the required documentary proof for the same at the time of dispatch of goods and in any case not later than the date on which Bill of Entry is required to be filed in India enabling Indian Oil, as importer, to avail the exemption as quoted by the Bidder. In the event of non- submission of the requisite documents as per the conditions for availing the exemption by the successful bidder, then any additional outflow suffered by Indian Oil on account of those taxes and duties (including interest, if any) shall be recovered from the bidder either from any

payment due to the successful bidder or separately. It shall be obligatory on the part of the bidder to acquaint itself with the provisions of Indian Customs Act, 1962 and other related regulations under which said exemption is quoted by the bidder.

**15.) Mobilisation advance: Deleted**

**16.) Preferential Bidding: Not applicable for this Tender**

**17.) ePAY ONE PORTAL :**

IOCL has launched the ePayOne portal which can be accessed through the link https://epayone.indianoil.in/. The said portal will facilitate users to make online payment through various modes viz., Internet Banking, UPI, Debit Card upto Rs.2000/-, Credit Card(Transaction charges @0.75% will be collected from users by SBI) and RTGS/NEFT. Options are available in the portal to the payers make payment through "New Payments" by registered users or Direct payment (without registration). Registered users shall have the facility of downloading cash receipt in PDF format at any point of time, to track the status of the payments and Transaction history. For illustrative purposes, the major payments covered in the portal are as below:- Vendors - Security deposit/EMD/TT calibration Fees **The user manual can be downloaded from the 'ePayOne' portal Home page under the option 'Need Help'.**

**18.) Letter of Acceptance (LOA) / Notice of Award (NOA):**

Wherever in any part of Tender Document including General Conditions of Contract, Special Conditions of Contract, the term 'Fax of Acceptance (FOA)' is appearing the same shall be read as 'Notice of Award (NOA)'. Definition of the Term and all other implications & usage of the term as specified anywhere in the entire tender document shall remain unchanged, treated as synonymous and will be applicable to NOA as presently being applicable to FOA. Thus, the terms FOA and NOA shall be read as synonymous.

**19.) Contract Agreement:**

Contract Agreement is applicable for the work order value of above INR 50.00 Lac. Contract Agreement is required to be signed within 30 days of receipt of LOA/WO. Successful bidder has to immediately submit a blank non-judicial stamp paper/e-stamp paper (Delhi) of INR 100/- for the preparation of Contract agreement. The format to be followed as per **Annexure-1A** given in GCC.

**20.) Blacklisting / Holiday Listing / Debarment / Banning Policy of Indian Oil Corporation Limited:**

The Blacklisting / Holiday Listing / Debarment / Banning policy of Indian Oil Corporation Limited can be accessed from any of the following portals:

a. www.iocl.com from the link https://iocl.com/uploads/holiday2023.pdf

b. Indian Oil e-tenders website (https://iocletenders.nic.in) under the "Announcement" Section

**21.) Terms and Conditions for bidders from a country which shares a land Border with India:**

21.1) Any bidder from a country which shares a land border with India will be eligible to bid in thistender only if the bidder is registered with the Competent Authority. The Competent Authorityfor the purpose of registration shall be the Registration Committee constituted by the Department of Promotion of Industry & Internal Trade (DPIIT) of Govt. of India.

21.2) "Bidder" (including the term 'Tenderer', 'Consultant' or 'Service Provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the description of bidders stated herein before, including any agency branch or office controlled by such person, participating in a procurement process.

21.3) "Bidder from a country which shares a land border with India" for the purpose means:-

a) An entity incorporated, established or registered in such a country; or
b) A subsidiary of an entity incorporated, established or registered in such a country; or
c) An entity substantially controlled through entities incorporated, established or registered in such country; or
d) An entity whose *beneficial owner* is situated in such a country; or
e) An Indian (or other) agent of such an entity; or
f) A natural person who is a citizen of such a country; or
g) A consortium or joint venture where any member of the consortium or joint venture falls under any of the above

21.4) The beneficial owner for the purpose of (iii) above will be as under:

i) In case of a company or Limited Liability Partnership, the beneficial owner is the nature persons(s), who, whether acting alone or together, or through one or more juridical person, has a controlling ownership interest or who exercises control through other means.

Explanation—

a. "Controlling ownership interest" means ownership of a entitlement to more than twenty-five per cent of shares or capital or profits of the company;

b. "Control" shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;

ii) In case of a partnership firm, the beneficial owner is the natural persons(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;

iii) In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;

iv) Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who hold the position of senior managing official;

v) In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

21.5) An Agent is a person employed to do any act for another, or to represent another in dealing with third person.

21.6) In tenders for works contracts, including Turnkey contracts. The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority.

Certificate (Undertaking Format)

Model Certificate for Tenders

*"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this bidder is not from such a country or, if such a country, has been registered with the Competent Authority. I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the competent Authority shall be attached.]"*

Model Certificate for Tenders for works involving possibility of sub-contracting

*"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the competent Authority shall be attached.]"*

Signature & Stamp of Bidder

**22.) ~~Reverse Auction Guidelines for Bidders (To be referred when RA is applicable in Tender)~~ (Not Applicable for this Tender/ Advertisement)**

23.) **Public Procurement Policies: Deleted**

24.) **Zero Defect Zero Effect (ZED) and Lean certification for MSME Vendors: Deleted**

## 25.) Annexures

**Annexure – 1**

FORM OF TENDER
(To be filled up by the Tenderer)

From
The participating bidder

To
Indian Oil Corporation Ltd.
Business Development, New Delhi

Dear Sirs,

1. Having examined the Tender Documents consisting of the Tender Notice, General Instructions to Tenderers/ Instructions to Bidders (ITB), General Conditions of Contract, Special Instructions to Tenderers, Special Conditions of Contract, Specifications, Plans, Drawings, Time Schedule, Form of Contract, Form of Schedule of Rates, other constituents of tender document and Addendum(s) to the Tender Documents, and having understood the provisions of the said Tender Documents and having thoroughly studied the requirements of Indian Oil Corporation Ltd. relative to the work tendered for in connection with this tendered work and this tender as referred above and having conducted a thorough study of the job site(s) involved, the site conditions, soil conditions, the climatic conditions, labour, power, water, material and equipment availability, the transport and communication facilities, the availability and suitability of borrow areas, the availability of land for right of way and temporary office accommodation and quarters and all other facilities and things whatsoever necessary for or relative to the formulation of the tender or the performance of work, I/we hereby submit my/our tender offer for the performance of proposed work in accordance with the terms and conditions and within the time mentioned in the Tender Documents.

2. In consideration of the sum of Rupee 1/- (Rupee one only) paid to me/us by Indian Oil Corporation Ltd., by adjustment in the price of Tender Documents, I/We further undertake to keep my/our this tender offer open for a period of not less than 4 (four) months from the scheduled date of opening of Tenders as specified in the General Instructions to Tenderers/ Instructions to Bidders (ITB) forming part of the Tender Documents.

3. I/We hereby further state subject to applicability that I/We/None of us (in the case of partnership firm) and none of our Directors (in the case of a Company) was/were employed as Directors of Indian Oil Corporation Ltd., during the period of 2 (two) years immediately preceding the date hereof OR I/We hereby declare that I / the concerned person one of our partners (in the case of partnership firm/Directors in the case of a Company) was employed as a Director in Indian Oil Corporation Ltd., during the period of 2 (two) years immediately preceding the date hereof and that I / the concerned person have/has obtained previous permission of Indian Oil Corporation Ltd. to make

this tender. OR the concerned person one of our partners is related to the concerned person who was employed as a Director in Indian Oil Corporation Ltd. during the preceding 2 (two) years as follows:

[State Relationship]

4. I/We have annexed to this Bid the following documents:
   i) Filled in Schedule of Rates in the prescribed form.
   ii) Earnest Money amounting to and in the manner specified in these Instructions to Bidders.
   iii) Original Power of Attorney or other proof of authority of the person who has signed the Tender OR copy of Power of Attorney attested by a Gazetted Officer or a Notary Public in proof of the authority of the person who has signed the Tender.
   iv) Audited Balance Sheets of the last 3 (three) years.
   v) Form of Tender. If the tender is called in 2 (two) separate parts, the tenders in the relevant Form of Tender as prescribed shall be submitted with respect to each part.
   vi) Information regarding tenderer in the form annexed to the Form of Tender.
   vii) Tenderer's past experience of comparable nature in the prescribed form accompanied by documents supporting the successful completion of claimed works / projects.
   viii) Information regarding construction, organization and equipment in the prescribed form.
   ix) Declaration of Blacklisting in the prescribed form.
   x) Declaration on Child Labour in the prescribed form.
   xi) Such other information as required from the tenderer.

5. I/We hereby undertake that the statements made herein/information given in the Annexures referred to above are true in all respects and that in the event of any such statement or information being found to be incorrect in any particular, without prejudice to any other right or remedy available to the Corporation, the same may be construed to be a misrepresentation entitling Indian Oil Corporation Ltd. to avoid any resultant contract.

6. I/We further undertake as and when called upon by Indian Oil Corporation Ltd. to produce, for its inspection, original(s) of the document(s) of which copies have been annexed hereto.

7. We, the participating bidder hereby agree to fully comply with, abide by and accept without variation, deviation or reservation all technical, commercial and other conditions whatsoever of the tender documents of this subject tender and all Addenda / Corrigenda issued by Indian Oil Corporation Ltd.

8. We further hereby waive, withdraw and abandon any and all deviations, variations, objections or reservations whatsoever thereto hereto before setting out, given or indicated in our offer, clarifications, correspondences, communications, or otherwise with a view that the price bid submitted may be treated to conform in all respects, with the terms and conditions of the said tender documents including all Addenda / Corrigenda.

9. We further hereby confirm that the prices quoted in the price bid are as per the provisions of the tender document and there is no deviation to the provisions in the price bid.

10. If the work or any part thereof is awarded to me/us, I/ We undertake to perform the work in accordance with the Contract Documents as defined in the Form of Contract forming part of the Tender Documents and accept the terms and conditions of Contract as laid down therein and undertake within 10 (ten) days of receipt of acceptance of Tender to pay to and/or deposit with the Accounts Officer, " ----------_" Indian Oil Corporation Ltd. (BD Group, BD Division) a sum which together with the amount of earnest money deposited by me/us in terms hereof, shall make XX % (ten percent) of the contract value as specified in the Acceptance of Tender for the purpose of security deposit, by any one or more of the modes of payments specified in this behalf in the General

Conditions of Contract, and to commence work at each job site(s) involved within 10 (ten) days of handing over the job site or any part thereof to me/us, and to sign the formal Contract in the terms of the form of contract forming part of Tender Documents, within 10 (ten) days of receipt of Letter of Acceptance from and on behalf of Indian Oil Corporation Ltd., in this behalf failing which Indian Oil Corporation Ltd., shall be at liberty, without reference to me/us and without prejudice to any of its rights or remedies, to terminate the Contract and/or to forfeit the earnest money deposited in terms hereof.

11. I/ we confirm that we have quoted the rates in the tender considering Inter-alia the following documents, as applicable, for the subject tender:

i. Price bid(BoQ) sheets
ii. Techno-Commercial Bid Document
iii. General Conditions of Contract (GCC), Other Conditions of Contract,
iv. PPE Guidelines
v. Addendum / Corrigendum (if any)
vi. All other attachments, drawings, specifications etc. which are part of the tender document.

I/we hereby certify that we have fully read and thoroughly understood the tender requirements and accept all terms and conditions of the tender including all documents mentioned above and all corrigendum/addendum issued. Our offer is in confirmation to all the terms and conditions of the tender including all corrigendum/addendum and minutes of the pre-bid meeting, if any except the deviations stated in format of "Deviations / Exceptions". In the event of award of contract to us, the complete tender document along with addendum /corrigendum, if any as uploaded by Indian Oil Corporation Limited at e- tender portal [https://iocletenders.nic.in] under the subject referring to the above-mentioned tender number shall be considered for constitution of Contract Agreement. I/ we declare that none of the electronic documents have been tampered with. In case of tampering of electronic documents, the bid shall be rejected outright and EMD forfeited without prejudice to any other rights or remedies available to IOCL. I / we further undertake and confirm that all the documents submitted by us along with the bid are true and genuine to the best of our knowledge and belief. In case at any time, any document / information furnished by us are found to be forged / false / fabricated / misleading, we shall be solely liable for any legal consequences, penal actions including holiday listing by IOCL.

12. I / We declare hereby that I / we, as participating bidder in this tender, am / are submitting only one bid for this tender and has not made any other bid or multiple bid.

Note: As per following, the submitted bids shall be considered as multiple bids.

i. A person shall be deemed to have submitted more than one bid if a person bids in an individual or proprietorship format at and/or in a partnership or association of persons format and/or in a company format.

ii. A company shall for this purpose include any artificial person whether constituted under the laws of Indian or of any other country.

iii. A person shall be deemed to have bid in a partnership format or in association of persons format if he is a partner of the firm which has submitted the bid or is a member of any association of persons which has submitted a bid.

iv. A person shall be deemed to have bid in a company format if the person holds more than 10% (ten percent) of the voting share capital of the company which has submitted a bid, or is a director of the company which has submitted a bid, or holds more than 10% (ten percent) of voting share capital in and/or is a director of a holding company of that company which has submitted the bid.

In case it is found that bidder has submitted more than one bid, all the bids shall be rejected and the Earnest Money Deposit (if applicable)s for all such bids shall be forfeited, not by way of penalty or liquidated damages but by way of reimbursement of the pre-estimated costs likely to be incurred by the OWNER towards bidding process and in the scrutiny and evaluation of bids.

----------End of Annexure-1----------

**Annexure – 2**

## UNDERTAKINGS

### A. UNDERTAKING OF NON TAMPERING OF DATA

I/We have downloaded the tender form from the GeM portal and I/we have not tampered with / modified the tender forms and electronic data contained therein in any manner. In case, if the same is found to be tampered with / modified, I / we understand that my / our tender will be summarily rejected and full Earnest Money Deposit (EMD) (if any) will be forfeited and I/we am/are liable to be banned from doing business with Indian Oil Corporation Ltd. And/or prosecuted.

### B. UNDERTAKING FOR NON-ENGAGEMENT OF CHILD LABOUR

**I/We hereby declare that:**

a) We are committed to elimination of child labour in all its forms:
b) Neither we nor any of our nominated sub-contractor(s) are engaging Child Labour in any of our work(s) in terms of the provisions of The Child Labour (Prohibition and Regulation) Act, 1986 and other applicable laws.
c) We as well as our nominated sub-contractor(s) undertake to fully comply with provisions of The Child Labour (Prohibition and Regulation) Act, 1986 and other applicable labour laws, in case the work is awarded to us.
d) It is understood that if I/We, either before award or during execution of Contract, commit a transgression through a violation of Article b/c above or in any other form, such as to put my/our reliability or credibility in question, the Owner is entitled to disqualify us from the Tender process or terminate the Contract, if already executed or exclude me/us from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Owner. Such exclusion may be for a period of 1 year to 3 years as per the procedure prescribed in the guidelines for holiday listing of the owner.
e) I/We accept and undertake to respect and uphold the Owner's absolute right to resort to and impose such exclusion.

### C. PROFORMA OF DECLARATION OF BLACKLISTING *I* HOLIDAY LISTING

**Based on the legal entity of the bidder following shall be undertaken by the bidder:**

**In the case of a Proprietary Concern:**

I hereby declare that neither I, in my personal name nor in the name of my Proprietary concern, which is submitting the accompanying Bid/Tender nor any other concern in which I am proprietor nor any partnership firm in which I am involved as a Partner are presently on any blacklist or holiday list declared by Indian Oil Corporation Ltd. or by Ministry of Petroleum & Natural Gas (MOPNG), nor any inquiry is pending by Indian Oil Corporation Ltd. or MOPNG, in respect of any corrupt or fraudulent practice(s) against me or any other of my proprietorship concern(s) or against any partnership firm(s) in which I am or was at the relevant time involved as a partner, except as indicated in designated Annexure for Deviation statement given in the tender.

**In the case of a Partnership Firm:**

We hereby declare that neither we, the participating bidder, which is submitting the accompanying Bid/Tender, nor any partner involved in the said firm either in his individual capacity or as proprietor or partner of any other firm or concern presently, are placed on any blacklist or holiday list declared by Indian Oil Corporation Ltd. or by Ministry of Petroleum & Natural Gas (MOPNG), nor any inquiry is pending by Indian Oil Corporation Ltd. or MOPNG, in respect of corrupt or fraudulent practice(s) against us or any partner or any other concern or firm of which he is proprietor or partner, except as indicated in designated Annexure for Deviation statement given in the tender.

**In the case of Company:**

We hereby declare that we are presently neither placed on any holiday list or blacklist declared by Indian Oil Corporation Ltd. Or by Ministry of Petroleum & Natural Gas (MOPNG), nor any inquiry is pending by Indian Oil Corporation Ltd. or MOPNG, in respect of corrupt or fraudulent practice(s), except as indicated in designated Annexure for Deviation statement given in the tender.

**In the case of Consortium:**

We hereby declare that none of the members of the Consortium are presently placed on any holiday list or blacklist declared by Indian Oil Corporation Ltd. Or by Ministry of Petroleum & Natural Gas (MOPNG), nor any inquiry is pending by Indian Oil Corporation Ltd. or MOPNG, in respect of corrupt or fraudulent practice(s), except as indicated in designated Annexure for Deviation statement given in the tender.

**NOTE: In case of submission of the Annexure without proper declaration (details of Holiday listing as applicable / NIL ) it will be construed that the vendor is declaring that he/she/they is/are not in IOCL Holiday List or blacklist or no inquiry against the vendor is pending by IOCL / MOPNG. At later stage, if the vendor is found to be in IOCL Holiday List or blacklist or if inquiry against the vendor is pending by IOCL / MOPNG on the day of the declaration, then the same declaration shall be considered as false declaration.**

## D. PERFORMA FOR DECLARATION ON PROCEEDING UNDER INSOLVENCY AND BANKRUPTCY CODE, 2016 (IBC)

**I / We, the participating bidder hereby declare that:**

**I/We am/are not undergoing insolvency resolution process or liquidation or bankruptcy proceeding as on date.**

It is understood that if this declaration is found to be false, Indian Oil Corporation Ltd. shall have the right to reject my/our bid, and forfeit the EMD, if any. If the bid has resulted in a contract, the contract will be liable for termination without prejudice to any other right or remedy (including black listing or holiday listing) available to Indian Oil Corporation Ltd.

**NOTE:** In case the bidder is undergoing insolvency resolution process or liquidation or bankruptcy proceeding as on date then details of the same to be provided by the bidder in designated Annexure for Deviation statement given in the tender.

## E. DECLARATION BY THE BIDDER REGARDING RELATIONSHIP WITH IOCL DIRECTOR

**I / We, the participating bidder hereby declare that:**

I / We am / are neither a director nor related to any director of IOCL, present or retired; or any partner or member of the firm is neither a director nor related to any director of IOCL, present or retired; or any of the directors of the company is neither a director nor related to any director of IOCL, present or retired.

**Note:** In case the proprietor / partner / member / director as applicable to the bidding entity is / are director of IOCL or related to any director of IOCL, present or retired, the details must be provided in designated Annexure for Deviation statement given in the tender.

## F. DECLARATION OF BIDDER REGARDING LAND BORDER SHARING

I have read the clause regarding restrictions on procurement from a bidder of a country which shares the land border with India; I certify that this bidder is not from such a country, has been registered with the Competent Authority. I hereby certify that this bidder fulfils all the requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached in designated Annexure for Deviation statement given in the tender.]

## G. PERFORMA FOR DECLARATION ON INSIDER TRADING PREVENTION

I/We, declare that:
The organization shall undertake that its employees & their immediate relatives, agents, sub-contractors and any other person associated with said contract / engagement does not violate any of the provision of the SEBI (Prohibition of Insider Trading) Regulation, 2015. Any violation shall be considered as breach of terms of contract / engagement and IndianOil shall take necessary action for such breach in addition to reporting to SEBI for taking necessary action under SEBI (Prohibition of Insider Trading) Regulations, 2015.

It is understood that if this declaration is found to be false, IOCL shall have the right to reject my/our bid, and forfeit the EMD, if the bid has resulted in a contract, the contract will be liable for terminate without prejudice to any other right or remedy (including holiday listing) available to IOCL.

## H. INDEPENDENT ESI

In case, I/We am/are not able to submit the ESI certificate, then we confirm that any of the following shall be applicable:

In case job is awarded to me/us, I/we shall/will acquire independent ESI code within 15 days of the date of issue of Work order. The gate pass for labour shall be issued only after furnishing the independent ESI code to Engineer-in-Charge (EIC). In case I/we fail to acquire the independent ESI code, EIC reserves the right to cancel the work order, forfeit the EMD and initiate suitable penal action against me/us as deemed fit by IOCL.

OR

If the ESI exemption claimed by me/us is accepted by IOCL, then I/we shall/will furnish an indemnity bond indemnifying IOCL against any eventuality regarding ESI becoming applicable to me/us during the tenure of the contract. In case the exemption claimed by me/us is not acceptable to IOCL then I/we shall/will be governed by above option by default.

**I. Provident Fund Registration**

In case, I/We am/are not able to submit the Provident Fund (PF) registration certificate/code, then I/We confirm that the following shall be applicable:

In case the job is awarded to me/us, I/we shall/will acquire an independent Provident Fund (PF) code/registration within 15 days from the date of issue of the Work Order. The gate pass for labour shall be issued only after furnishing the independent PF code/registration to the Engineer-in-Charge (EIC).

In case I/we fail to acquire the independent PF code/registration within the stipulated period, EIC reserves the right to cancel the Work Order, forfeit the EMD and initiate suitable penal action against me/us, as deemed fit by IOCL.

----------End of Annexure-2----------

**Annexure: P-1**

**Form of Letter from Group / Parent Company in case their Experience credentials are submitted by Bidder**

**FORMAT OF DECLARATION**

**(NOTARIAL ATTESTED)**

To,
Indian Oil Corporation Limited
.....
.....
Sub. : Tender No. : ..... for the job of .....

Dear Sir,

The Bid and Techno Commercial Offer No. .... dated ..... and the Price Bid dated ..... has been submitted by ..... for the subject work. The bidder ..... is the Holding / Affiliate / Subsidiary of ..... [Name of Entity giving this undertaking].

We understand that the bid of ....., has been evaluated taking into account our experience as a group company subject to our giving an undertaking as hereinafter appearing. Now, therefore, in consideration of the premises aforesaid, we undertake so as to bind also our successors and assigns that of the contract so awarded to the Bidder:

(a) We shall to be and remain Jointly and severally liable with the bidder and bound to you for the due and proper performance of the Work as set out in the Scope of Work under the contract and shall provide the bidder man power, machinery, equipment, technology, skill and expertise available to us to properly perform and complete the Work.

(b) We shall be and remain bound by this undertaking notwithstanding the existence of any inter-se agreement or dispute between the Bidder and us of between the bidder and you.

We hereby confirm that Mr. ....., the undersigned is authorized and competent to issue this letter/ undertaking on our behalf.

Yours faithfully,

For, ……..

**Annexure: P-2**

**~~FORMAT OF DECLARATION for consortium Bidding~~**

~~FORMAT OF DECLARATION~~

~~(NOTARIAL ATTESTED)~~

~~To~~

~~Indian Oil Corporation Ltd.~~

~~_____~~
~~_____~~

~~_____~~
~~_____~~

~~Sub: Tender No: _____ for _____~~

~~Dear Sir,~~

~~The Bid & Techno Commercial offer no. _____ dated _____ and the Price Bid dated _____ has been submitted by us (Leader) in consortium with _____(member) for the subject work.~~

~~We understand that the bid of _____, has been evaluated taking into account our experience subject to our giving an undertaking as hereinafter appearing. Now, therefore, in consideration of the premises aforesaid, we undertake so as to bind also our successors and assigns that if the Contract is awarded to the Bidder:~~

~~(a) We shall to be and remain jointly and severally liable with the member and bound to you for the due and proper performance of the Work as set out in the Scope of Work under the Contract and shall provide the member all necessary support including (but not limited to) providing man power, machinery, equipment, technology, skill and expertise available to us to properly perform and complete the Work.~~

~~(b) We shall be and remain bound by this undertaking notwithstanding the existence of any inter se agreement or dispute between the member and us or between the member and you.~~

~~We hereby confirm that Mr. _____ the undersigned is authorized and competent to issue this letter/ undertaking on our behalf.~~

~~Yours faithfully,~~

~~For_____~~

~~**Annexure – J**~~

## ~~**FORMAT FOR COMPLETION CERTIFICATE FROM E.I.C FOR ARC'S RUNNING UNDER EXTENSION**~~

| ~~**Sl. No.**~~ | ~~**Description**~~ | ~~**Details to be filled**~~ |
|---|---|---|
| ~~1~~ | ~~Name of Work~~ | |
| ~~2~~ | ~~Work Order Number~~ | |
| ~~3~~ | ~~Work Order Value~~ | |
| ~~4~~ | ~~Date of Commencement~~ | |
| ~~5~~ | ~~Contractual Completion Date~~ | |
| ~~6~~ | ~~Executed Value Upto Contractual Completion~~ | |
| ~~7~~ | ~~WO extended upto date~~ | |

~~The above details have to be duly certified by EIC/ WO Issuing Company with signature and seal/stamp.~~

~~Digital Signature of the Tenderer~~

**HIRING OF CONTRACTORS FOR IOCL's CGD PROJECT AT PURNEA GA (PURNEA, ARARIA, KISHANGANJ & KATIHAR DISTRICTS)**
**THROUGH WALK-IN METHOD SELECTION PROCESS FOR**
**DPNG CONNECTION / LMC WORKS**

**F-1**

## BIDDER'S GENERAL INFORMATION

**TENDER NO: BD/CONT/26-27/SCM/04**

| Sl. No. | Particulars | Details / Information |
|---|---|---|
| 1 | Full Legal Name of Bidder's Company | |
| | Country of Registration | |
| | Registered Office Address | |
| | Telephone Number | |
| | Email Address | |
| 2 | Quoting Office | |
| | Postal Address | |
| | Contact Person Name & Designation: | |
| | Email ID | |
| | Telephone & Mobile Number | |
| 3 | Name of Power of Attorney holders of bidder | |
| 4 | Whether Micro or Small Enterprise | Yes / No<br>Whether MSE is owned by SC/ST Entrepreneur(s): Yes / No<br>Whether MSE is owned by Women: Yes / No |

| | | | |
|---|---|---|---|
| **Bidders is requested to quote as below:** | | | |
| | | | |
| **1.0** | GSTIN registration number from which Invoice will be generated | | |
| **1.1** | Vendor code linked with GSTIN (as per 1.0) | | |
| 2.0 | **Particulars:** | **As per IOCL** | **As per Bidder** |
| 2.1 | Applicable Service Category (for GST purposes) | **Works Contract** | |
| 2.2 | Applicable % of GST | **18%** | |
| 2.3 | Service Accounting Code (SAC) for selected Service Category | **9985** | |
| **3.0** | **Kindly confirm: Yes or No:** | | |
| | | | |
| 3.2 | Whether the bidder is exempted from registration under GST (Turnover of less than Rs 20 Lacs/10 Lacs in case of special category States) | | |
| 3.3 | Whether Bidder is under Composition Scheme as defined under section 10 of CGST Act, 2017? | | |

**Note: In case the bidder seeks any deviation w.r.t. category of service, Service Accounting Code (SAC) and GST rate as pre-determined by IOCL, Bidder should provide the details with proper justification. Otherwise it will be construed that the bidder is agreeing with the IOCL declaration.**

**Declaration:**
**I/We hereby confirm that, if subject tender job is awarded to my/our firm, Work Order/LOA issued would be in GSTIN & Vendor Code mentioned in point 1.0 and 1.1 above. I/We shall not request IOCL to change the Vendor Code once the Work Order/LOA has been issued to us. I/We hereby also confirm that I/We am/are regularly filing GST Returns with NIL Default.**

(Signature(s) of the Tenderer(s))
Name & Designation of authorized person signing the
Tender on behalf of the Tenderer(s)
Full Name and address of the Bidder(s)

# इंडियन ऑयल कॉर्पोरेशन लिमिटेड

## (व्यापार विकास) नई दिल्ली

INDIAN OIL CORPORATION LIMITED
(Business Development) New Delhi

| ANNEXURES TO ITB | |
|---|---|
| | |
| **NOTE** | |
| 1. | Documents of this section are to be downloaded, printed, filled, signed, stamped, scanned and uploaded, email or physically submitted at the designated email id/ location.. |
| 2. | Vendors are advised to read carefully before filling up and signing the formats. |
| 3. | Bidders are advised not to make any changes/ modification /alteration in this section. |
| **Warning: Bidders to note that non-submission or Partial submission of Annexures to ITB may lead to rejection of their offer without any further communication.** | |

## WARNING

Bidders are advised to only fill out the relevant details in the fields specified and **NOT TO ALTER OR MODIFY** in any shape or form, this or any other tender document, including printing this document on their own letter head (unless specifically mentioned to this effect) and/or removing Indian Oil's logo or title and any other such actions.

If at any stage it is found that bidder has taken any action of such nature, their offer will become liable for **REJECTION** out rightly.

## INDEX



| SN | Description | | No. of Pages |
|---|---|---|---|
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| 2. | Deviation Statement | (F-3) | 5 |
| 3. | Consent Letter Format for Payment through Internet | (F- 4) | 6 |

**F-2**

## FORM FOR SUBMISSION OF OFFER

I / We, as participating bidder hereby declare that:

I / We have read complete Annexure-1 and Annexure-2 of Instructions to Bidder (ITB) and understood it in totality. I / We hereby provide our unconditional acceptance of the complete Annexure-1 and Annexure-2 and confirm the compliance of the provisions given in the Annexures.

**(Signature and Stamp)**

**Name & Designation of authorized person signing the form**

**NOTE:** Tenderers must submit this form duly digitally signed or with due seal & physical signature, failing which the offer shall be liable for rejection.

**F-3**

## (Annexure-3)

## DEVIATION STATEMENT

| SL. No. | Reference of bid document | | Subject | Deviations |
|---|---|---|---|---|
| | Page No. | Clause No. | | |
| | | | | |

**NOTE:**

1. Bidder to note that any deviation to the Tender may render the offer liable for rejection.
2. Bidder to fill the above format with either "Nil" Deviation' or with clause wise deviation.
3. **Deviation mentioned anywhere else will not be taken into cognizance.**
4. **In case of non-submission or submission of the blank Annexure without due seal and signature, it will be construed that there is no deviation to tender terms and conditions from bidder side and their offer shall be treated accordingly.**

**Name of the Bidder** : _____

**Signature of the bidder with stamp** : _____

**F-4**

## (Annexure-4)

### Consent Letter Format for E-Payment

(On the Letterhead of the Vendor / Contractor / Supplier)

Date : _____

To
Indian Oil Corporation Ltd.
Planning & Business Development Division,

Dear Sir,

With reference to the Tender/P.O./W.O / Advertisement ref. no./Contract Ref. No._____ Dtd. _____ issued to us by IOCL, we hereby give our consent to accept the related payments of our claims/ bills on IOCL through Cheques or Internet based online E-payments system at the sole discretion of IOCL. Our Bank account details for the said purpose are as under:

| SN | Particulars | Details |
|---|---|---|
| 1 | Name and Address of the Beneficiary | |
| 2 | Account No. of Beneficiary | |
| 3 | Account classification (CA / CC-11 or 29) & SB-10 as per cheque leaf. | |
| 4 | Name and address of the Bank Branch (where payments are to be sent by IOCL) | |
| 5 | Branch Name / Code | |
| 6 | The 9 Digit MICR code of the Branch (as appearing on the MICR cheque) | |
| 7 | IFSC Code of the Bank Branch for RTGS mode | |
| 8 | IFSC Code of the Bank Branch for NEFT mode | |
| 9 | E-mail ID of Beneficiary | |
| 10 | Any other Particulars (to be advised by Beneficiary for the E-payments purposes | |
| 11 | **Vendor code** (to be filled by IOC's Deptt. only) | |
| 12 | PERMANENT ACCOUNT NUMBER | |
| 13 | MOBILE NUMBER (FOR SMS ALERTS) | |
| 14 | TAN(Tax Deduction and Collection Account Number), if applicable | |

A blank copy of a cancelled cheque / photocopy of a cancelled cheque relating to the above account number for verifying the accuracy of the bank account details is enclosed.
A copy of PAN Card duly attested by authorized signatory for verifying the accuracy of the PAN is enclosed.

I/We hereby declare that the particulars given above are correct and complete.

**Date:**
**Place:**

**Signature of Account Holder**
**with Company Stamp (If a Company)**

**Encl: One Cheque / Photocopy of Cheque duly Cancelled & Copy of PAN Card.**

***We hereby confirm that the above bank account details of beneficiary are correct in all respects and the account of Beneficiary (IOCL Vendor) is maintained at our bank branch.

**(Name of the Bank & Branch)**
**Authorized Signatory**

***Verification required only in case (a) vendors not providing a cancelled cheque leaf or if vendors name is not printed/appearing on the cancelled cheque leaf submitted to IOCL Office. (b) Change in existing bank details.

# SPECIAL INSTRUCTIONS TO TENDERERS
# [Technical]

## Engagement of contractors through Walk-In Selection for PE Pipeline Laying and Last Mile Connectivity (LMC) Works for PNG Connections in Purnia Geographical Area (Araria, Purnia, Katihar and Kishanganj Districts) in the state of Bihar

**SPECIAL INSTRUCTIONS TO TENDERERS**
**[SECTION A - Technical]**

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## SPECIAL INSTRUCTION TO TENDERERS

### 1.0.0 INFORMATION

The information given in the Bid Documents and in the plans and drawings forming part thereof is merely intended as a general information without undertaking on the part of the Owner as to its accuracy and without obligation relative thereto upon the Owner. The Vendors are expected to conduct their own surveys and investigations prior to Bidding.

Before bidding, the vendor shall undertake and shall be deemed before bidding to have undertaken a thorough study of the proposed work, the job site(s) involved, the site conditions, the labour, power, water, material and equipment availability, transport and communication facilities and temporary offices and accommodation quarters, and all other factors, constraints and facilities necessary for the formulation of the Bid, supply of materials and the performance of the work.

The vendor shall inspect and examine the site and its surroundings and shall satisfy himself before submitting his tender as to the nature of the ground present, physical conditions and all roads, approaches and lands which may be used temporarily otherwise in connection with the works, means of access to the site accommodation he may require and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his tender.

### 2.0.0 INTRODUCTION

2.1.0 Indian Oil Corporation Limited – Planning and Business Development Division (P&BD), a Government of India Undertaking (hereinafter called as the Owner), owns, develops, and operates City Gas Distribution (CGD) networks across 26 Geographical Areas (GAs) authorized by the Petroleum and Natural Gas Regulatory Board (PNGRB).

2.2.0 Indian Oil Corporation Limited, a company registered in India under the Companies Act, 1956 has undertaken a special initiative under the Walk-in Method and On-the-Spot Selection process for the contractors, with an objective to expedite the rollout of PNG connections and ensure timely completion of associated works.

2.3.0 In this regard, IOCL has introduced the following contractor-friendly measures to encourage wider participation and facilitate faster execution:

(i) Relaxed & faster payment terms

(ii) Provision for faster billing and payment processing

(iii) Improved incentive scheme for PNG related GI / PE / Laying works

(iv) Reduced penalty provisions

(v) Simplified procedures for faster execution

2.4.0 Indian Oil Corporation Limited, a company registered in India under the Companies Act, 1956 IOCL invites tenders from bona fide and experienced Contractors for the

following job:

| | |
|---|---|
| Name of Work | Special Contracting Methodology (SCM) for engagement of PE/LMC/DMA contractors through Walk-In Selection in the Geographical Area of Araria, Purnia, Katihar and Kishanganj Districts (Purnia GA). |

**3.0.0 SITE VISIT**

3.1.0 The Tenderers are advised to visit the locations and examine its surroundings and obtain all information that may be necessary for preparing their Offer / Bid and entering into the contract. Non-familiarity with site conditions will not be considered a reason either for extra claims or for not carrying out the work conforming to the specifications.

3.2.0 The bidder may contact the following IOCL's site office with due appointment for necessary guidance and help during site visits:

| | |
|---|---|
| Purnia GA (Bihar) | Shri Raman Kumar, Senior Manager (CGD)<br>Email: ramankumar@indianoil.in<br>Mobile: 9316550562 |

**4.0.0 BRIEF DESCRIPTION OF WORK**

4.1.0 The main scope of work comprises laying, testing, and commissioning of underground Polyethylene (PE) main and service pipelines network of sizes ranging from 20mm up to 180mm Dia. along with above ground GI/ Cu pipe installation (LMC) and Direct Marketing Services for PNG Connections to Domestic, Industrial and Commercial consumers for City Gas Distribution project including installation of DRS / MRS /DCU/ Metering Skid / SR / Meters / Regulators etc., as per SOR. The scope also covers all the activities associated with the supply of materials (except free issue items).

**Owner's scope of supply (Free Issue Item).**

- PE Pipes of sizes from 20mm up to 180mm Dia. along with meters & Regulators, DRS, MRS, DCU, SR without cover box and metering skid.
- Supply of Powder coated GI Pipes size from ½", ¾", 1", 1.5" & 12mm copper pipe
- Supply of GI Isolation valves
- Supply of ¼" Appliance valve
- Supply of Meter & regulators

**CONTRACTOR'S SCOPE OF WORK**

**Items to be Supplied by the contractor**

- Supply of PE valves & fittings and transition fittings of all sizes from 180 mm to 20 mm, GI sleeves and Half Concrete Sleeves / HDPE crash guard.
- Supply of warning mat.
- Supply of HDPE duct and its associated accessories.
- Supply of all types of Powder coated GI & Copper Fittings, Brass Fittings, GI sleeves, clamps, screw, Teflon tape, meter bracket and all consumables.
- Service Regulator (SR) Box, GI fittings for SR piping or any other material except SR
- Supply of Corrugated Flexible Metal Hose (Anaconda), if required
- Supply of meter adaptors/union/bush for connection if required.
- Rubber hose, clamps and all materials required for natural gas conversion.
- All PPE materials are required for safe execution of projects.
- All other materials except owner supplied items required for smooth execution of project over and above as mentioned.
- Supply of GI Isolation valves (Only Upon direction of EIC).
- Supply of ¼" Appliance valve (Only Upon direction of EIC).

All above supply quantity as per relevant SOR item and shall be procured from owners approved vendors only after approval from IOCL or its consultant & as per instruction of Engineer-in-charge (EIC).

**4.2.0 The brief scope of work to be carried out is as follows: -**

**A. PE Laying works**

1. PE line should preferably be laid by open cut/moling methodology so that connection can be done easily as and when required. HDD method is allowed only after consent from Engineer In-charge (EIC) for any specific location/stretch for laying of PE line. Shallow depth to be preferred for HDD.
2. Contractor to provide Work Implementation & Execution plan along with a schedule for execution and work implementation as per QA/QC plans to be

issued by Owner/ Owner's representative. Contractor must submit the Construction/ Execution procedures before commencement of work to Owner/ Owner's representative for approval.

3. Survey & preparation of proposed construction drawings

4. Co-ordination/ Liaison/ Permissions/ Obtaining the approval from respective land-owning agencies, obtaining NOC from concerned authorities once the work is completed. Getting back/ refund of bank guarantee/ security deposits made to the agencies for laying of the pipelines.

5. Obtaining clearances and coordination with concerned RWA of the allotted area for internal network laying and obtaining NOC from RWA after completion of work.

6. Transportation of Free Issue material from OWNER stores to contractor stores and proper storing, stacking, providing security, insurance cover during transportation and storage, laying, commissioning, and handing over pipelines to owner.

7. Intimation to the parallel utilities (Electrical, Communication, Water etc.) owners using CBuD app and making trial pits to determine the underground utilities/services.

8. Carrying out Ground Penetrating Radar (GPR) survey from recognized agencies to determine the underground utilities/ services

9. Installation of safety/warning signs and barricading of the entire route to be trenched.

10. Intimation to all other utility agencies through owner/ CBuD app as per the directives of EIC.

11. Uncoiling/stringing the PE pipes of required sizes (i.e. 180mm, 125mm, 90mm, 63mm, 32mm & 20 mm) pipes into trenches as per approved procedure.

12. Supply and Installation of materials and PE fittings like Elbow, Tees, Reducers, Couplers, bends, tapping saddles, Transition fittings, End cap, warning mats and Half Concrete Sleeves HDPE pipe etc. including construction of supports, Valves pits, Inspection chambers etc. as per specification, drawing & satisfaction of the Engineer in charge (EIC).

13. Joining the pipe ends with fittings of valves by approved automated electro-fusion techniques only as per tender specification.

    - Electrofusion (EF) machine should be one having GPS coordinate nowadays available in market.
    - EF operator to be deployed for EF welding must be certified from approved vendors of EF fittings manufacturer/ Section IX of ASME BPV.

14. Laying pipelines by any methodology including trench less technology methods with or without casing pipes (HDPE pipes) as per specifications and as directed by EIC. Installation of warning mats.

15. Moling should be done with Teflon coated crowbar extension only and with proper ventilation in Moling pit. Electrical utility to be identified prior to attempting manual boring.

16. Contractor must take geostamped and time stamped photo of each EF welded joint and submit for Project in charge records on daily basis.

17. All tools & equipments shall be provided by the contractors for PE laying, GI Cu Installation.

18. Submission of daily reports (Planning, Manpower, Material Inventory, DPR) and monthly reports (QC, Meter reconciliation, material reconciliation, DPR, etc.) Contractor should submit daily site wise activity geostamped and timestamped photos to Engineer in Charge.

19. Contractor must also have to arrange his own equipment like water tanker for Water showering on construction site (trench valves pit areas).

20. Contractor to depute Storekeeper, HSE person and draftsmen for allotted work. One supervisor is required for each working site area. Fabrication, supply and inspection of approved quality GI sleeve, HDPE duct and half concrete sleeves and other material, fittings to be supplied by the contractors as per the provisions of tender.

21. Back filling and compaction by jumping jack compactor wherever required, using approved 'good' soil or using excavated earth or borrow earth as per requirement and specifications and replacement of the tiles, slabs removed during the excavation. Cleaning all unserviceable materials, debris, excess earth trenches etc. to designated disposal area.

22. Sand / soft soil padding around pipe wherever required in areas where trenching has been done in hard soil area / rocky area including supply of sand/ soft soil. The thickness of sand/ soft soil padding at the top of coated pipe shall be minimum 150 mm and bottom of coasted pipe shall be minimum 150 mm or as per standard drawing.

23. Carrying out pneumatic testing and purging as per specifications and approved procedures, providing all tools & tackles, instruments, manpower and other related accessories for carrying out the testing of pipes.

24. Supply, fabrication & installation of RCC route marker, Pole marker with foundations, Plate markers, valve chamber etc. as per the directions of the EIC/Owner's representative.

25. Nitrogen Purging to be done to point till Oxygen percentage is less than 2%. Contractor must arrange Purity certificate of Nitrogen used for purging. Nitrogen purging (including supply), commissioning and gas charging in the tested PE line shall be done as per the approved procedure.

26. Restoration of existing ground features such as grass/ turfing, paving, roads, drains, concrete, floral beds, fencing, tiles, marbles, flooring masonry etc. to original condition and to match with adjoining conditions, functionally and aesthetically up to the entire satisfaction of Owner / Owner's representative /any

other third-party agency designated by owner and local authorities, failing which, it will be done at the risk and cost of the contractor. Obtaining No Objection Certificates for the restoration work done from the concerned authorities.

Restoration should be done to satisfaction of EIC and Authority as per the specifications of road authority. Contractor must arrange joint site visit report for restoration and submit restoration report.

27. Returning surplus material to Owner stores after obtaining clearance from TPIA/Consultant/ Owner, reconciliation of free issue material/ consumables.

28. Handing over the completed works to owner along with detailed as built drawing showing pipeline route, fittings provided in the pipelines, for their operation purposes. Handing over 3 sets of completed as Built drawings which are GIS compliant. Also required handing over of Non-LMC above ground drawings (including Riser drawings and domestic PNG connections drawings) in editable Auto-Cad as well as PDF format.

29. Maintaining the completed pipelines/installation for any failure and defect arising due to poor workmanship during defect liability period.

30. Preparation and submission of all documents like Pit Wise as graph, As-built drawings, details of crossings, utility graphs, measurement sheet, PE cards for service line and deviation statements on completion/commissioning of work by way of drawing, sketches and tables in soft & hard copy.

31. Providing adequate manpower, tools, tackles, equipment for achieving the target of pipeline laying, data logging for pipeline, valves and fittings inventory status, attending complaints, day to day interaction with customers and residents so that work can be executed within defined time period.

32. Contractor should identify the name of local authority maintaining the road or drainage/canal & provide hard copy of final survey drawing after incorporating all comments from owner's representative

    - Survey drawing should mention suggested pipeline route in a separate layer for EIC approval before commencing laying.
    - EIC to approve line sizing after network hydraulics check /confirmation in a format and linked to annual budget.

33. Following activities are also in contractor's scope during contract:

    - Receive Customer's complaints logged during PE Laying.
    - Attend and Carry out joint technical feasibility survey for requests and resolve the complaint.
    - Maintain and update the complaint status.

34. Repair and Maintenance of PE pipeline as excavation, leakage arrest, jointing and restoration of any size including supply and installation of all fittings required in case of third-party damage after commissioning. PE Pipe required shall be issued by Owner as free issue material.

35. All skilled personnel like jointers, conversion technicians will be approved and certified by EIC based on the test conducted by approved trainers.

36. Contractor shall visit and survey all areas where PE laying is planned or in progress.

37. Any other activities not mentioned/ covered explicitly above, but otherwise required for satisfactory completion/ operation/ safety/ statutory/ maintenance of the works shall also be covered under the Scope of work and has to be completed by the Contractor within specified schedule at no extra cost to Owner.

**B. LMC works**

1. Receiving, taking over, handling, loading, transportation and unloading of owner supplied items as defined in specification from owners designated stock yard to contractors own store/ work site, proper storing stacking, identification, providing security and insurance cover.

2. Preparation and approval of sketches, schedules & execution procedures.

3. Making temporary but stable platforms/ scaffolding/ rope ladders and supply of all other safety devices.

4. SAP/ Portal entry / Data Entry for new connections

5. Installation of Powder Coated GI Pipes (Heavy Class)/Cu tube/Multi Layered Composite (MLC) pipes for all floor levels including high rise along with supply & installation of GI, Cu, MLC Fittings, welded fittings, Brass fittings, Flexible Hose (Anaconda) if required , Appliance Valve & Isolation valve, Meter, Regulator to complete the work asper the satisfaction of EIC. Connection using meter adaptor(s)/bush is preferrable instead of anaconda. Anaconda to be used only for specific cases as directed by EIC.

   Note:-Powder Coated GI Pipe, Cu Pipe, MLC Pipe, Isolation Valve, Appliance Valve of 1/4" dia, Meter & Regulators shall be free issue material.

6. Assessment of material requirement for installation at site, Order placement for Purchasing contractor supplied items.

7. Survey for technical feasibility for domestic connection and updating all data in mobile apps/ desktop apps of IOCL

8. Installation of GI service pipes & fittings, regulators, Valves etc. including NPT threading, as specified, Drillings of holes through the walls (Brick, RCC), Granite, Marble, Wood Cutting, Glass Cutting with proper heavy duty hammer drill machine, tools & tackles, using proper sealant/grout material and colours to match the original replacement of the damages during drilling, restoring the area to the original condition, Painting of scratched length of powder coated pipe and fittings after proper surface finish by one coat of approved primer paint and two coats of approved synthetic enamel paint. Restoring the wall surface to original conditions.

9. Installation, testing, pre-commissioning & commissioning 12 mm Copper Tube - Inside kitchen location only - including supply & installation of contractor's Supplied Materials. Submission/updation of as laid graphs/reports, isometric drawings etc. as required. Updation of all data in SAP/IOCL apps as directed by EIC

10. Supply & fixing of approved clamps & nylon plugs with SS 304 2" screws, grout material, suitable thread sealant i.e. Teflon Tape, Joining of transition fitting to

above ground service GI pipes, testing, purging and commission of the complete installation.

11. Installation in already gas charged area, planning & coordinating with existing consumer's for new tap offs from existing riser with or without tee, testing of these existing risers and commissioning of these connections with newly tap offs etc. is inclusive.

12. Testing of GI network installed including all tools & tackles, materials, any rectification & making connection ready for conversion. Submission/updation of as laid graphs/reports, isometric drawings etc. as required. Updation of all data in SAP/IOCL apps as directed by EIC.

13. Installation of regulator, meter with associated inlet & outlet connections with supply & installation of fittings/adaptors/anaconda, supply and fixing of approved meter brackets (as required) and other supports up to appliance valve & surakhsa hose including supply of all material in contractor's scope - for any area. Scope includes online testing of gas meter and regulator assembly, GIS tagging of connection, Updation of all data in SAP/IOCL apps as directed by EIC.

14. Pre-commissioning & Commissioning of GI network including all tools & tackles, materials, rectification/re-testing of any segment if required & making connection ready for gas supply. Submission/updation of as laid graphs/reports, isometric drawings etc. as required. Updation of all data in SAP/IOCL apps as directed by EIC.

15. Conversions of all the burners of LPG Stove (one appliance per household) to Natural Gas (NG) based appliances, Supply & changing of the nozzles / jets and associated controls for domestic & imported appliances with proper tools and tackles.

16. Testing and showing the performance to the customer, signing of joint meter records (JMR) and instructing the customer on use & safety norms, complete as per specifications & to satisfaction of owner / Engineer in Charge. (Supply of Steel Reinforced Rubber hose, Nozzle jets for conversion of burners is inclusive.)

17. Installation/Fixing of Commercial/Non-Commercial meter and regulator with associated inlet & outlet connections including supply of fittings, anaconda, valves, meter brackets. Using approved meters & regulator brackets and other supports by proper scaffolding/grouting. Restoring the area/walls to original condition as per specification and to complete satisfaction of consumer and EIC.

18. Supply of PPEs, Use of Safety Boots, harness belts, Hand gloves, Reflective jackets, Hard hats(helmets), Safety shoes, eye and ear safety equipment, Fire extinguishers, warning display board and as per the detailed scope of work in tender specifications and as per the direction of EIC.

**Detailed scope of work is further enumerated in the SCOPE OF WORK under SCC-Technical & Technical Volume of tender.**

## 5.0.0 LOCAL CONDITIONS

5.1.0 It will be imperative on the part of each Bidder to acquaint himself with all local laws, conditions and factors which may have any effect or bearing on the execution of works and supplies under the scope of this tender. The Bidders are requested to familiarise themselves with (but not limited to) the Indian Income Tax Act, Indian Companies Act,

Indian Customs Act, Factories and Boiler Act, Contract Labour (Regulation and Abolition) Act, Arbitration Act and other related Acts and Laws & Regulations of India with their latest Amendments, as applicable. In respect of Foreign Contractors, necessary permission from the Income Tax Authority and assessment of income tax deduction rate at source, are pre-requisites for release of any payments. The successful Bidder, to whom the work shall be awarded, shall arrange such permissions on his own initiative and contingent costs thereto. The Owner shall not entertain any clarification from the Bidder(s) regarding such local conditions.

5.2.0 The tenderer may note that the job includes laying of the PE network along with LMC connections. Contractor shall execute the works with due care and follow all safety norms, rules and regulations. Contractor is advised to take note of the above while submitting the bid.

5.3.0 Any permission for day-to-day work will be obtained by the contractor from designated authorities at his own cost and initiative. All necessary safety and security provision will be fully complied with by the contractor at his own cost. The contractor shall provide suitable barricading, as per approved drawing at his own cost, to separate the working area from the operating/ existing facilities/ structures as per requirement and as per directions of Engineer-in-Charge.

5.4.0 It must be understood & agreed that above factors have been properly investigated and considered while submitting the offer. No claim for financial or any other adjustments to contract price or completion time on account of lack of clarity of such factors, shall be entertained.

**6.0.0 BID QUALIFICATION CRITERIA: (FOR WALK-IN METHODOLOGY):**

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| **Vendors worked with IOCL CGD and its CGD JVs.** | (**A) For Award of Contract value of ₹50 Lakh (Past Work order / Completion certificate/ Execution certificate of value above Rs. 10 lakhs)**<br><br>i. The bidder shall have prior execution experience with IOCL CGD or IOCL Group CGD companies (JVs/Subsidiaries, etc.), such as Indian Oil Corporation Limited, IOAGPL and Green Gas Limited, in execution of any of the following similar works under a single order of value above ₹10 Lakh, either as a main contractor or as a subcontractor, during any of the last seven years ending on the last day of the month previous to the original date of bid submission:<br><br>ii. LMC GI Connection Works<br><br>iii. PE Pipeline Laying Works |

| | |
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| | **(B) For Award of Contract value of ₹ 25 Lakh (Past Work order / Completion certificate/ Execution certificate of value up to Rs. 10 lakhs)**<br><br>i. The bidder shall have prior execution experience with IOCL CGD or IOCL Group CGD companies (JVs/Subsidiaries, etc.), such as Indian Oil Corporation Limited, IOAGPL and Green Gas Limited, in execution of any of the following similar works under a single order of value up to ₹10 Lakh, either as a main contractor or as a subcontractor, during any of the last seven years ending on the last day of the month previous to the original date of bid submission:<br><br>ii. LMC GI Connection Works<br><br>iii. PE Pipeline Laying Works<br><br>**Note:**<br><br>i. Contractor shall submit either copy of Work Order /Letter of Acceptance (LOA) or Completion/ Execution Certificate (of any work order value) issued by the IOCL CGD or IOCL Group CGD companies, for the respective works / services.<br><br>ii. The date of issue of Work Order / LOA or Completion/Execution Certificate must fall in preceding 7 years ending on the last day of the month, immediately previous to the month in which original date of bid submission end date falls, shall only be taken into consideration. Even in case the date of bid submission is extended, the date originally considered as reference date for the experience criteria, shall remain unchanged.<br><br>iii. Whenever a contractor had worked as a sub-contractor to main contractor, their experience also can be considered. In case bidder submits prior experience as a sub-contractor,<br><br>a. The bidder has to submit a certificate from the end User/ Owner/Main Contractor/ Consultant of the owner engaged as EIC (Engineer-In- Charge) for the execution of the said works.<br><br>b. The bidder has to submit a certificate from the end user / owner / consultant of the owner acting as EIC stating that sub-contracting has been approved/ permitted. |

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| | c. CA certificate certifying the executed value of works shall be submitted along with UDIN number for works executed as a subcontractor.<br><br>iv. Existing contractors working in Purnia GA shall be eligible to participate in the Walk-In process only after achieving at least 70% execution of the already awarded work(s), except where short closure is necessitated due to reduction/change in scope or for reasons not attributable to the contractor.<br><br>For the purpose of this, 70% execution shall be deemed to have achieved if 70% physical work under the contract /revised scope have been executed.<br><br>IOCL and/or its authorized representative may review the status of the work based on the aforesaid criteria and, at its sole discretion, recommend the contractor for participation. Such recommendation/clearance (As per format T-1), duly issued by IOCL for the concerned GA, shall be submitted by the bidder along with the bid documents. |
| **Vendors having executed similar work for any company** | **(A) Experience in CGD-related works (For Award of Contract value of ₹10 lakh to ₹50 lakh).**<br><br>a. The bidder shall have prior execution experience of any of the following similar works under a single order as per table below (subject to minimum executed value of ₹ 2.5 Lakh), either as a main contractor or as a subcontractor, during any of the last seven years ending on the last day of the month previous to the original date of bid submission:<br><br>b. Laying/Installation of PE pipeline network,<br><br>c. Laying/Installation of GI/Cu pipe.<br><br>d. Providing operation through manpower deployment and maintenance services for the City Gas Distribution (CGD) Network.<br><br>e. Laying/Installation of Hydrocarbon Steel Pipeline in any City Gas Distribution Project or Cross-country Pipelines<br><br>f. Civil / Mechanical works at Petroleum & Gas Installations/ Refineries / Petrochemical Plants or Chemical Industries/any hydrocarbon plant. |

**Note:**

1) Petroleum and Gas installations for this tender shall also include Retail and Consumer Outlets on Petroleum / CNG/LNG/CBG plant/CGS.
2) Chemical Industries: The chemicals should be covered in the list of hazardous chemicals under MSIHC rules

| **Work award value (Including GST)** | **Required Single order executed value (SOV) (₹ in lakh) (Including GST)** |
|---|---|
| **₹ 10 Lakh** | **₹ 2.5 Lakh ≤ SOV < ₹ 3.75 Lakh** |
| **₹ 15 Lakh** | **₹ 3.75 Lakh ≤ SOV < ₹ 5 Lakh** |
| **₹ 20 Lakh** | **₹ 5 Lakh ≤ SOV < ₹ 6.25 Lakh** |
| **₹ 25 Lakh** | **₹ 6.25 Lakh ≤ SOV < ₹ 7.5 Lakh** |
| **₹ 30 Lakh** | **₹ 7.5 Lakh ≤ SOV < ₹ 8.75 Lakh** |
| **₹ 35 Lakh** | **₹ 8.75 Lakh ≤ SOV < ₹ 10 Lakh** |
| **₹ 40 Lakh** | **₹ 10 Lakh ≤ SOV < ₹ 11.25 Lakh** |
| **₹ 45 Lakh** | **₹ 11.25 Lakh ≤ SOV < ₹ 12.5 Lakh** |
| **₹ 50 Lakh** | **SOV ≥ ₹ 12.5 Lakh** |

**(B) Experience in non-CGD works, (For Award of Contract value ranging from ₹10 lakh up to a maximum of ₹25 lakh.)**

The bidder shall have prior execution experience of any of the following similar works under a single order as per table below (subject to minimum executed value of ₹ 2.5 Lakh), either as a main contractor or as a subcontractor, during any of the last seven years ending on the last day of the month previous to the original date of bid submission:

a. Laying/ Installation of underground pipelines for carrying water / sewage etc.

b. Laying underground ducts for power cables, telecommunication cables, Fiber optic cables.

c. Laying underground cables.

d. Installation of above ground water pipelines /gas pipelines/ cryogenic pipeline/ fire-fighting system pipelines / process plant pipelines.

e. Construction of residential/ commercial/ institutional/ industrial buildings involving plumbing jobs.

| **Work award value (Including GST)** | **Required Single order executed value (SOV) (₹ in lakh) (Including GST)** |
|---|---|
| **₹ 10 Lakh** | **₹ 2.5 Lakh ≤ SOV < ₹ 3.75 Lakh** |
| **₹ 15 Lakh** | **₹ 3.75 Lakh ≤ SOV < ₹ 5 Lakh** |
| **₹ 20 Lakh** | **₹ 5 Lakh ≤ SOV < ₹ 6.25 Lakh** |
| **₹ 25 Lakh** | **SOV ≥ ₹ 6.25 Lakh** |

**Note:**

Contractor must submit either copy of **Work Order /Letter of Acceptance (LOA) and Completion/ execution Certificate** for the respective works / services. The date of issue of Work Order / LOA or Completion Certificate/execution certificate must fall in preceding 7 years ending on the last day of the month, immediately previous to the month in which original date of bid submission end date falls, shall only be taken into consideration. Even in case the date of bid submission is extended, the date originally considered as reference date for the experience criteria, shall remain unchanged.

Whenever a contractor had worked as a sub-contractor to main contractor, their experience also can be considered. In case bidder submits prior experience as a sub-contractor,

i. The bidder has to submit a certificate from the end User/ Owner/Main Contractor/ Consultant of the owner engaged as EIC (Engineer-In- Charge) for the execution of the said works.

ii. The bidder has to submit a certificate from the end user / owner / consultant of the owner acting as EIC stating that sub-contracting has been approved/ permitted.

iii. CA certificate certifying the executed value of works shall be submitted along with UDIN number for works executed as a subcontractor.

| | |
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**7.0.0 SUBMISSION OF OFFER (TECHNICAL BID)**

7.1.0 As a part of technical bid, Bidders shall submit the legible scanned copies of documents meeting BQC within bid submission period.

7.2.0 Existing contractors working in Purnia GA shall submit recommendation of participation as per format T-1 duly issued by IOCL.

## SPECIAL CONDITIONS OF CONTRACT

## [TECHNICAL]

# Engagement of contractors through Walk-In Selection for PE Pipeline Laying and Last Mile Connectivity (LMC) Works for PNG Connections in Purnia Geographical Area (Araria, Purnia, Katihar and Kishanganj Districts) in the state of Bihar

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## 1.0.0 GENERAL

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

1.2.0 Notwithstanding the sub-division of the documents into these separate parts and volumes, every part of each shall be deemed to be supplementary to and complementary of every other part and shall be read with and into the contract in so far as it may be practicable to do so.

1.3.0 Where any portion of the GCC is repugnant to or at variance with any provision of the SCC, then the provision of the SCC shall be deemed to override the provisions of the GCC and shall, to the extent of such repugnance or variations, prevail.

1.4.0 Wherever it is mentioned in the specifications that the Contractor shall perform certain works or provide certain facilities, it is understood that the Contractor shall do so at his own cost, being deemed to be part of the relevant item in the Schedule of Rates (SOR) whether expressly stated or not.

1.5.0 The materials, design and workmanship shall satisfy the relevant Indian Standards, the specifications contained herein and codes referred to. Where the specifications stipulate requirements in addition to these contained in the standard codes and specifications, these additional requirements shall also be satisfied.

## 2.0.0 CO-OPERATION WITH OTHER CONTRACTORS

2.1.0 Further to Clause No. 4.0.5.0 of General Conditions of Contract, the OWNER may engage at the work site, other Contractors or agencies to perform other works. The Contractor shall co-operate with the Owner and other Contractors and agencies engaged at the work site to ensure harmonious working and shall comply with any instruction issued by the Engineer-in-Charge and/or Site Engineer for this purpose.

2.2.0 If due to the design and other stipulation or requirements at site (including for reasons contemplated in Clause No. 2.1.0 hereof) a particular sequence of construction operations has to be followed due to which certain interruptions to any one or more of the Contractor's operations are inherent, no claim for extra compensation or idleness resultant upon such interruption or suspension of works will be admissible or available to the Contractor except that suitable extension of time for completion shall be granted in accordance with the provisions of Clause No. 4.3.5.0 of General Conditions of Contract, if the reasons for delay are not attributable to the Contractor, and the Contractor hereby specifically waives any and all contrary rights and entitlements.

## 3.0.0 QUALITY ASSURANCE

3.1.0 Bidder should include in his offer the quality assurance programme containing the overall quality management and procedures, which is required to be adhered to during the execution of contract. After the award of contract detailed quality assurance program shall be prepared by the contractor for the execution of Contract for various works, which will be mutually discussed and agreed to.

3.2.0 Quality Assurance System plans/ procedures of the Contractor shall be furnished in the form of QA manual This document should cover details of the personnel responsible for the quality assurance, plans or procedures to be followed for quality control in respect of Design, Engineering, Procurement, Supply, Installation, Testing and Commissioning.

3.3.0 The Employer/ consultant / Consultant or their representative shall reserve the right to inspect/ witness, review any or all stages of work at shop/site as deemed necessary for quality assurance.

## 4.0.0 ADDITIONAL WORKS/ EXTRA WORKS

4.1.0 Owners reserve 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 Owner, Contractor is required to extend necessary cooperation and act as per the instructions of Engineer in-Charge.

## 5.0.0 COMPENSATION FOR IDLE TIME

5.1.0 The owner shall make every reasonable effort to have the materials and working front available so as not to delay laying activities. No idle time claim shall be entertained under any circumstances.

## 6.0.0 POWER AND WATER CONNECTION

6.1.0 The owner will not provide any power and water during construction period. Contractor shall apply and obtain necessary power and water during connection from relevant authority and will pay its usage charge or arrange the same from the other sources.

## 7.0.0 HEALTH SAFETY AND ENVIRONMENT (HSE) MANAGEMENT

7.1.0 After the award of the contract, detailed Health, Safety and Environment (HSE) program to be followed for execution of contract under various divisions of works will be mutually discussed and agreed between Contractor & owner.

7.2.0 The Contractor shall establish document and maintain an effective Health, Safety and Environment (HSE) management system.

7.3.0 In case contractor fails to follow the instructions of Engineer-in-charge with respect to above clauses, next payment due to him shall not be released unless he complies with the instructions to the full satisfaction of Engineer-in-charge.

## 8.0.0 PROGRESS SCHEDULE

8.1.0 In addition to the provisions of the General Conditions of Contract relating to "Progress Schedule" the Contractor shall take into account the instructions of the Engineer-in-Charge regarding the constraints, restraints and other requirements of works and the required sequence of works, in preparing the Progress Schedule.

Notwithstanding the provisions relating to "Approved Progress Schedule", weekly or monthly work programmes may be drawn up by the Engineer-in-Charge taking into account the availability of work fronts and the requirements of other Contractors or agencies involved at the work sites and the contractor shall abide by the weekly or monthly work programmes also so drawn-up.

8.2.0 In the event of failure on the part of the Contractor to adhere to the weekly or monthly work programmes drawn up by the Site Engineer/Engineer-in-Charge, the provisions of Clause No. 4.7.4.0 of General Conditions of Contract shall apply. The decision of the Engineer-in-Charge as to whether a failure on the part of the Contractor to comply with the weekly or monthly work programmes drawn up has occurred or not shall be final and binding on the Contractor.

8.3.0 Any delay caused due to non-availability of work fronts (including delayed availability of work front, wherever applicable) and/or due to the requirements of other Contractors and/or agencies engaged at the work sites shall not entitle the Contractor to any extra payments/ claims whatsoever, whether for idleness or otherwise. Only suitable extension of time for completion shall be granted in accordance with the provisions of Clause No. 4.3.5.0 of General Conditions

of Contract, provided the reasons for delay are not attributable to the Contractor, and the Contractor hereby specifically waives any and all contrary rights and entitlements.

## 9.0.0 PROGRESS REPORT

9.1.0 During execution of the contract the Contractor shall furnish monthly progress report to the Owner of the progress of the system engineering, software package development/ configuration, manufacturing, testing procurement of bought out items, installation, testing and commissioning of equipment, testing and commissioning, indicating the progress achieved during the month, the total progress till the month as against scheduled and anticipated completion date in respect of activities covered in the programme/schedules referred to above. If required by the Owner, the Contractor shall also furnish to the Owner resources data in a specified format and time schedule. The Contractor shall also furnish any other information necessary to ascertain the progress of the work, manufacture and/or procurement as required by the Owner.

9.2.0 Contractor shall make every effort to keep Owner adequately informed as to the progress of the work throughout the entire project. Apart from the periodic progress reports, if Owner calls for additional progress reports/ information related to the project the Contractor shall reply to the Owner's call within seven days.

9.3.0 Regular progress review meetings shall be held from time to time as per mutually agreed programmes/schedule. It shall be binding on the Contractor to attend these progress review meetings with all information as desired by the Owner.

## 10.0.0 CORRESPONDENCE PROCEDURE

10.1.0 All correspondence before and up to award of work/ contract agreement execution shall be addressed to the office of tender issuing authority. On award of work the correspondence procedure as specified in the letter of acceptance shall be followed.

## 11.0.0 ACCURACY OF WORK

11.1.0 The installation of equipment and instruments shall be in accordance with the specifications and in case of rectification, all rectification including re-doing or re-installation, if considered necessary by the Engineer-in-Charge or Site Engineer (whose decision shall be final) shall be carried out by the Contractor without any extra cost.

## 12.0.0 CONDITIONS OF WORK

12.1.0 In addition to the provisions of clause 4.2.0.0 of General Conditions of Contract and other associated clauses there under, notwithstanding the shutdown of works during rain, the Contractor shall without entitlement to any additional compensation or remuneration, at his own cost and initiative take all necessary steps to protect the materials, equipment and machinery at site during the rain and from the effects thereof, and the Contractor shall at his own cost and initiative do and perform all such rectification, repairs and / or reworking as shall be necessary.

12.2.0 Depending upon the requirements, time schedule/ drawn up programs and the target set to complete the job in time the works may have to continue beyond normal working hours to the extent of round the clock and on holidays also for which no extra claim shall be entertained.

12.3.0 In super session of Clause No. 4.0.4.0 of GCC, the Contractor shall ensure for each job site that his representative is available at all hours during which work is being performed at the job site, for the receipt of orders, instructions, notices, and other communications.

12.4.0 Contractor shall use CBuD (Call before u dig) mobile application before start of excavation to address the issues of coordination between excavation agencies/contractor and asset owner agencies.

## 13.0.0 TERMS OF PAYMENT (ON ACCOUNT PAYMENTS)

13.1.0 **ON ACCOUNT PAYMENT:** Subject to the provisions of Clause 6.4.0.0 and associated sub-clauses of GCC, "On Account" payment will be made for the items on the basis provided there under Each stage of payment as indicated hereunder shall be applicable only when the work has been accepted in accordance with the tender specification up to that particular stage.

13.2.0 **Mobilization Advance**: The Owner will not pay any advance.

13.3.0 The Payment terms shall be as follows:

Progressive payments for the part of work executed by the contractor shall be made by Owner on the basis of said work completed and certified by the Owner's representative as per the agreed milestone payment schedule and the percentage break-ups given below.

Certification of activity-wise completion shall be carried out at site immediately upon completion of the respective activities, to facilitate and expedite the timely processing and release of payments.

| | |
|---|---|
| **A** | **PE Pipeline Laying & associated Works*** |
| **1** | **PE Pipeline Laying by any method** |
| 1.1 | 90% on completion of work as per item description. For PE laying work payment shall be released after all jointing of pipeline, GIS data collection and acceptance by IOCL, backfilling and compaction as per scope of work and on submission of DPR/WPR and graphs & free issue material consumption statement. |
| 1.2 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of "As Built, As Graph Drawings", reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |
| **2** | **PE Pipeline Testing, Pre-commissioning & Commissioning work** |
| 2.1 | 90% on completion of work as per item description |
| 2.2 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of "As Built, As Graph Drawings", reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |
| **3** | **PE Valve Installation and Valve Chamber Construction** |
| 3.1 | 90% on completion of work as per item description |
| 3.2 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of "As Built, As Graph Drawings", reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |
| **4** | **GIS data collection, GPR Survey** |
| 4.1 | 90% on completion of work as per item description |

| | |
|---|---|
| 4.2 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of “As Built, As Graph Drawings”, reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |
| **5** | **Restoration Work** |
| 5.1 | 75% after completion of restoration to original condition and acceptance by IOCL. |
| 5.2 | 15% after obtaining NOC from respective local authorities / Third party agencies designated by landowning agencies / Resident Welfare Associations etc. |
| 5.3 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of “As Built, As Graph Drawings”, reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |
| **6** | **HSE Compliance** |
| 6.1 | 50% after all compliance in laying/installation |
| 6.2 | 20% after all compliance in testing |
| 6.3 | 20% after all compliance in pre-commissioning & commissioning |
| 6.4 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of “As Built, As Graph Drawings”, reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |
| **7** | **All Other Works for PE pipeline except mentioned above including civil/electrical/structural works** |
| 7.1 | 90% on completion of work as per item description. |
| 7.2 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of “As Built, As Graph Drawings”, reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |
| 8. | **Installations of Industrial/Commercial MRS** |
| 8.1 | 70% on Installation of MRS. |
| 8.2 | 20% on Commissioning of MRS including installation & Commissioning of Meter, EVC & Regulator. |
| 8.3 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of “As Built, As Graph Drawings”, reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |

| | |
|---|---|
| **B** | **GI/Cu Pipe & associated Works** |
| **1** | **GI/Cu Pipe Installation Work** |
| 1.1 | 90% on completion of work. Including installation of all fittings, valves, clamping, cementing of holes etc. and submission of reports/graphs/isometric drawings etc. |
| 1.2 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of "As Built, As Graph Drawings", reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |
| **2** | **GI/Cu Pipe Testing Work** |
| 2.1 | 90% on completion of work. After pneumatic pressure testing (PPT), testing of GI/Cu installation, repairs etc. |
| 2.2 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of "As Built, As Graph Drawings", reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |
| **3** | **GI/Cu Pipe Pre-Commissioning & Commissioning Work** |
| 3.1 | 90% on completion of work including Hook up of GI installation with TF |
| 3.2 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of "As Built, As Graph Drawings", reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |
| **4** | **Meter-Regulator Installation** |
| 4.1 | 60% Installation of meter & regulator, painting of installation and material consumption, booking and updation of meter no. against BP in CRM/SAP, installation of all other accessories and testing. |
| 4.2 | 30% on Commissioning & updation of all data in SAP |
| 4.3 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of "As Built, As Graph Drawings", reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |
| **5** | **HSE Compliance** |
| 5.1 | 50% after all compliance in laying/installation |
| 5.2 | 20% after all compliance in testing |
| 5.3 | 20% after all compliance in pre-commissioning & commissioning |

| | |
|---|---|
| 5.4 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of "As Built, As Graph Drawings", reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |
| **6** | **All Other Works for LMC except above** |
| 6.1 | 90% on completion of work as per item description. |
| 6.2 | Balance 10% contract / PO closure and submission of all documents as per contract for all work, certification by Owner/ Consultant/ TPI and submission of "As Built, As Graph Drawings", reconciliation of free issue materials with necessary wastage/scrap statements, recovery statements (if any) and handing over of complete pipeline system to owner. |
| **C** | **Direct Marketing Activities** |
| **1** | **Organizing events** |
| 1.1 | 90% after 15 days of completion of event |
| 1.2 | 10% after 30 days of completion of event |
| **2** | **Installation of Hoardings** |
| 2.1 | 90% on submission of monthly invoice during the period for which hoarding is installed. |
| 2.2 | 10% on completion of period for which hoarding is installed as decided by EIC. |
| **3** | **Advertising through running of video clip on Movie theatre/ TV Channels/ Audio Clip on FM Channel** |
| 3.1 | 90% on submission of monthly invoice during the advertisement |
| 3.2 | 10% on completion period of advertisement as decided by EIC |
| **4** | **Registration for PNG(Domestic) Connection & Security Deposit Reconciliation** |
| 4.1 | 90% on completion of activities as per item description |
| 4.2 | Balance 10 % on successful conversion of customer/contract/PO closure and submission of all documents as per contract/PO |
| **D** | **Other Works (Not Covered Above)** |
| i | 90% progressively on completion of individual item work as certified in monthly progress bill. |
| ii | Balance 10% contract / PO closure and submission of all documents as per contract |

** Payment for PE laying work shall be released only upon completion of 20mm PE service line along with TF installation for all the customers on the claimed PE section. The contractor shall ensure that Transition Fittings (TFs) are provided with adequate protection outside each household for all such stretches. Decision of EIC for completion of 20mm service line along with TF installation shall be final and binding on contractor.*

13.4.0 Running Account Bill(s) based on payment terms in the Contract shall be paid based on joint measurement and subject to approval of Engineer-in-charge after deduction of necessary dues

and duties as applicable and payable by Contractor in accordance with various provisions made elsewhere in this tender.

13.5.0 The Contractor shall submit RA invoices in triplicate to the Owner's Representative, along with all supporting documents acceptable to the Owner and certified by the Owner's Representative. The invoices should be submitted as per the following billing cycle:

i. Once every week for Work Orders valued up to ₹10 Lakhs.

ii. Once every fortnight for Work Orders valued above ₹10 Lakhs.

13.6.0 Payments made by owner to the contractor for any part of the work shall not deem that the Owner has accepted the work. The progress payment shall be considered only as an advance against the work done.

However, these payments shall be finally adjusted against full and final contract value to be made to the contractor.

13.7.0 Payment shall be made against the RA invoices submitted by the Contractor for the work executed during the relevant billing period, at the accepted unit rates as per the Contract. Payment shall be released based on certified measurements and supporting documents accepted by the Owner.

## 14.0.0 TIME SCHEDULE/ PERIOD OF COMPLETION:

14.1.0 As the quantity of work awarded to each contractor may vary, the completion schedule shall be specified in the LoA and shall be as per Table below. The completion period shall range from 75 days to 120 days.

| Contract Value | Completion period (Days) |
|---|---|
| ₹10 lakh to ₹20 Lakh | 75 |
| ₹25 lakh to ₹30 lakh | 90 |
| ₹35 lakh to ₹40 lakh | 105 |
| ₹45 lakh to ₹50 lakh | 120 |

14.2.0 It is envisaged that there can be more than one front / section for carrying out the work at a time, accordingly, bidder shall be required to work for all front/ section simultaneously & each front /section shall be dealt exclusively separate so that project(s) schedule is adhered & awarded work is completed on or before the schedule date of completion.

14.3.0 The completion time shall be inclusive of time for mobilization period, design, engineering, approval of procedure, QA & QC documents & procurement of contractor-supplied materials and intervening monsoon, if any.

## 15.0.0 SCOPE OF WORK

15.1.0 The main scope of work comprises laying, testing, and commissioning of underground Polyethylene (PE) main and service pipelines network of sizes ranging from 20mm up to 180mm Dia. along with above ground GI/ Cu pipe installation (LMC) and Direct Marketing Services for PNG Connections to Domestic, Industrial and Commercial consumers for City Gas Distribution project including installation of DRS / MRS /DCU/ Metering Skid / SR / Meters / Regulators etc., as per SOR. The scope also covers all the activities associated with the supply of materials (except free issue items).

15.2.0 **Owner's scope of supply (Free Issue Item).**

- PE Pipes of sizes from 20mm up to 180mm Dia. along with meters & Regulators, DRS, MRS, DCU, SR without cover box and metering skid.
- Supply of Powder coated GI Pipes size from ½", ¾", 1", 1.5" & 12 mm copper pipe
- Supply of GI Isolation valves
- Supply of ¼" Appliance valve
- Supply of Meter & regulators

15.3.0 **CONTRACTOR'S SCOPE OF WORK**

Items to be Supplied by the contractor

- Supply of PE valves & fittings and transition fittings of all sizes from 180 mm to 20 mm, Saddles/ Tees of required sizes, GI sleeves and Half Concrete Sleeves / HDPE crash guard.
- Supply of warning mat.
- Supply of HDPE duct and its associated accessories.
- Supply of all types of Powder coated GI & Copper Fittings, Brass Fittings, GI sleeves, clamps, screw, Teflon tape, meter bracket and all consumables.
- Service Regulator (SR) Box, GI fittings for SR piping or any other material except SR
- Supply of Corrugated Flexible Metal Hose (Anaconda), if required
- Supply of meter adaptors/ union/ bush for connection if required.
- Rubber hose, clamps and all materials required for natural gas conversion.
- All PPE materials required for safe execution of projects.
- Supply of GI Isolation valves & ¼" Appliance valve ***(only upon direction of EIC)***
- All other materials except owner supplied items required for smooth execution of project over and above as mentioned.

15.4.0 All above supply quantity as per relevant SOR item and shall be procured from owner's approved vendors only after approval from IOCL/Consultant & as per instruction of Engineer-in-charge (EIC). Standard Quality assurance plans (QAP) are given in technical specifications, contractor shall take approval of QAP of contractor supplied items from Engineer-in-charge/ Consultant before placing PO to approved vendor(s).

15.5.0 In case of non-availability of materials/services as per requirement from the vendors detailed in tender document (approved vendor/supplier list) or items with no vendor list, the contractor may propose any vendor having credentials for the respective items (for the same or higher size, pressure rating, schedule, capacity, etc as applicable) in the last 7 years in oil & gas applications (except for items meant for fire water service). In such cases the bidder shall provide supply records viz. Copy of PO, inspection reports, inspection release note, proven track record, experience details or any other documentary evidence to establish past supply, for owner's review and approval, as applicable. The acceptance of the same is at the discretion of the owner and shall require approval of Engineer-in-charge.

15.6.0 At the time of PO placement, proposed vendor/ supplier shall not be in holiday list of IOCL.

15.7.0 Generally, the following shall constitute the contractor's scope of work but not limited to:

**Part I: PE Network**

1. PE line should preferably be laid by open cut/moling methodology so that connection can be done easily as and when required. HDD method is allowed only after consent from Engineer In-charge (EIC) for any specific location/stretch for laying of PE line. Shallow depth to be preferred for HDD.

2. Contractor to provide Work Implementation & Execution plan along with a schedule for execution and work implementation as per QA/QC plans to be issued by Owner/ Owner's representative. Contractor must submit the Construction/ Execution procedures before commencement of work to Owner/ Owner's representative for approval.

3. Prior to start of construction activity, contractor shall carry out the route survey and prepare proposed construction drawings marked with proposed gas pipeline laying and submit to OWNER/ PMC for approval.

1. Co-ordination/ Liaison/ Permissions/ Obtaining the approval from respective land-owning agencies such as Municipal Corporation, CPWD, ADA/ LDA, Nagar Nigam, PWD-NH, NHAI, Indian Railway, Forest & Environment Department, Irrigation department and other land owing agencies for road cutting for laying of the pipelines, Liaison with the concerned authorities during execution of the job, obtaining NOC from concerned authorities once the work is completed. Getting back/ refund of bank guarantee/ security deposits made to the agencies for laying of the pipelines.

2. Obtaining clearances and coordination with concerned RWA of the allotted area for internal network laying and obtaining NOC from RWA after completion of work.

3. Transportation of Free Issue material from OWNER stores to contractor stores and proper storing, stacking, providing security, insurance cover during transportation and storage, laying, commissioning, and handing over pipelines to owner.

4. Selection of route with the EIC/Consultant/TPIA and marking the same on walls/floors from PE network, transition fittings to stove/cooking oven/appliance, making openings and making provisions for fixing clamps.

5. Making temporary but stable platforms/scaffolding/rope/ladder etc., required for installation of pipes/fittings at all heights/multi storied flats and locations.

6. Obtaining the approval for optimum route and ROU from the concerned authority and EIC.

7. Intimation to the parallel utilities (Electrical, Communication, Water etc.) owners and using CBuD app making trial pits to determine the underground utilities/services such as existing pipelines, cables (electrical/ communication), conduits, U/G drainage, Sewers, tunnels, subways foundations etc. for deciding optimum feasible route and depths for laying the pipelines based on the route plans indicated by owner.

8. Carrying out Ground Penetrating Radar (GPR) survey from recognized agencies to determine the underground utilities/ services such as existing pipelines, cables (electrical/communication), conduits, U/G drainage, Sewers, tunnels, subways foundations etc. for deciding optimum feasible route and depths for laying the pipelines based on the route plans.

9. Contractor must arrange road cutter machine for all areas where road cut need to be done.

10. Wherever required the grass/ turfing, pavement, linings, drains, roads and other such 'pucca' area shall be locally removed to facilitate trenching and pipe laying works. The same is to be reinstated as original.

11. Installation of safety/warning signs and barricading of the entire route to be trenched. Pits to be similarly barricaded along with warning signs and caution boards. Photograph of

each trench with geostamp and timestamp required after laying, placing warning mat and restoration respectively.

12. To make trenches with stable slopes but restricting minimum disturbance to above ground/underground services/installation as per specifications and approved route plans keeping the trenches free from water and soil till placement of pipes.

13. Uncoiling/stringing the PE pipes of required sizes (i.e. 180mm, 125mm, 90mm, 63mm, 32mm & 20 mm) pipes into trenches as per approved procedure.

14. Supply and Installation of PE pipe Rest material and fittings like Elbow, Tees, Reducers, Couplers, bends, tapping saddles, Transition fittings, End cap and Half Concrete Sleeves HDPE pipe etc. including construction of supports, Valves pits, Inspection chambers etc. as per specification, drawing & satisfaction of the Engineer in charge (EIC).

15. Joining the pipe ends with fittings of valves by approved automated electro-fusion techniques only as per tender specification.

    - Electrofusion (EF) machine should be one having GPS coordinate nowadays available in market.
    - EF operator to be deployed for EF welding must be certified from approved vendors of EF fittings manufacturer / Section IX of ASME BPV.
    - Contractor to obtain latest welder I-Card by getting training from approved agencies with practical knowledge of EF welding on highest dia. on which work is intended.

16. Laying pipelines by any methodology including trench less technology methods with or without casing pipes (HDPE pipes) as per specifications and as directed by EIC.

17. Fabrication, supply and inspection of approved quality GI sleeve, HDPE duct and half concrete sleeves and other material, fittings to be supplied by the contractors as per the provisions of tender.

18. Photos and videos with accurate geo reference and time stamp during lowering need to be captured by contractor and GPS Coordinates/ points (accurately captured using recommended GNSS device) to be mentioned in lowering report for each EF joint. Site Photographs for before and after scenarios showing trenching, its barricades and restoration to be captured with geo co-ordinates and time stamp.

19. Contractor must take geostamped and time stamped photo of each EF welded joint and submit for Project in charge records on daily basis.

20. Only hydraulic squeezers are allowed, and re-rounding tools are required.

21. Installation of pipes (by open cut/ Moling/ HDD) assembly, including supply of all materials (excluding free issue material if any) viz. as per the drawings/ specifications enclosed with bid package. HDD methodology and its profile submission prior to execution of HDD is in contractor's scope.

22. Installation of Steel & RCC markers. RCC route markers shall be installed at minimum spacing of 50 m and should be integral part of PE laying.

23. Moling should be done with Teflon coated crowbar extension only and with proper ventilation in Moling pit. Electrical utility to be identified prior to attempting manual boring.

24. All tools & equipments shall be provided by the contractors for PE laying, GI Cu Installation (For equipment detail refer Annexure-I in Standard specification of PE laying & GI Cu installation). HDD profile and Utility coordination report to be submitted before HDD approval to EIC. Any HDD performed beyond the intended /approved length will be paid as per SOR.

25. Contractor should submit following set of daily reports (Planning, Manpower, Material Inventory, DPR) and monthly reports (QC, Meter reconciliation, material reconciliation, DPR, etc.) Contractor should submit daily site wise activity geostamped and timestamped photos to Engineer in Charge.

26. Contractor must also have to arrange his own equipment like water tanker for Water showering on construction site (trench valves pit areas).

27. Contractor to depute Storekeeper, HSE person and draftsmen for allotted work. One supervisor is required for each working site area. Fabrication, supply and inspection of approved quality GI sleeve, HDPE duct and half concrete sleeves and other material, fittings to be supplied by the contractors as per the provisions of tender.

28. Back filling and compaction by jumping jack compactor wherever required, using approved 'good' soil or using excavated earth or borrow earth as per requirement and specifications and replacement of the tiles, slabs removed during the excavation. Cleaning all unserviceable materials, debris, excess earth trenches etc. to designated disposal area.

29. The contractor shall be responsible to arrange the supply of approved coarse sand (size 0.6 - 2 mm as per IS 383) free from any impurities like clay, mica, and soft flaky pieces, as per the instructions of EIC /Owner's representative.

30. Sand / soft soil padding around pipe wherever required in areas where trenching has been done in hard soil area / rocky area including supply of sand/ soft soil. The thickness of sand/ soft soil padding at the top of coated pipe shall be minimum 150 mm and bottom of coasted pipe shall be minimum 150 mm or as per standard drawing.

31. Carrying out pneumatic testing and purging as per specifications and approved procedures, providing all tools & tackles, instruments, manpower and other related accessories for carrying out the testing of pipes.

32. Supply, fabrication & installation of RCC route marker, Pole marker with foundations, Plate markers, valve chamber etc. as per the directions of the EIC/Owner's representative.

33. Nitrogen Purging should be done to point till Oxygen percentage is less than 2%. Contractor must arrange Purity certificate of Nitrogen used for purging. It is compulsory to use Nitrogen cylinder trolley while using Nitrogen for purging/ testing. It must be necessary to qualify welder/ manpower for Procedure Qualification Record for performing testing by pressure testing the PE pipe coil. Nitrogen purging (including supply), commissioning and gas charging in the tested PE line shall be done as per the approved procedure.

34. Restoration of existing ground features such as grass/ turfing, paving, roads, drains, concrete, floral beds, fencing, tiles, marbles, flooring masonry etc. to original condition and to match with adjoining conditions, functionally and aesthetically up to the entire satisfaction of Owner / Owner's representative /any other third party agency designated by owner and local authorities, failing which, it will be done at the risk and cost of the contractor. Obtaining No Objection Certificates for the restoration work done from the concerned authorities.

35. Restoration should be done to satisfaction of EIC & Road Authority as per specification of Road Authority. Contractor must arrange joint site visit report for restoration and submit restoration report.

36. Returning surplus material to Owner stores after obtaining clearance from TPIA/Consultant/ Owner, reconciliation of free issue material/ consumables.

37. Handing over the completed works to owner along with detailed as built drawing showing pipeline route, fittings provided in the pipelines, for their operation purposes. Handing over 3 sets of completed as Built drawings which are GIS compliant. Also required handing over of Non-LMC above ground drawings (including Riser drawings and domestic PNG connections drawings) in editable Auto-Cad as well as PDF format.

38. Maintaining the completed pipelines/installation for any failure and defect arising due to poor workmanship during defect liability period.

39. Preparation and submission of all documents like Pit Wise as graph, As-built drawings, details of crossings, utility graphs, measurement sheet, PE cards for service line and deviation statements on completion/commissioning of work by way of drawing, sketches and tables in soft & hard copy.

40. Providing adequate manpower, tools, tackles, equipment for achieving the target of pipeline laying, data logging for pipeline, valves and fittings inventory status, attending complaints, day to day interaction with customers and residents so that work can be executed within defined time period.

41. Contractors' responsibility to provide details as follows (if required): collection of industry details, its current fuel and its consumption and product they manufacture. Identify and locate the collector rate applicable in the particular road in case of NHAI, Forest and Railway. Indicate pipeline route for EIC approval and indicate line sizing after network hydraulics check/ confirmation by EIC. Identify and indicate the name of local authority maintaining the road or drainage/ canal Should provide hard copy of final survey drawing after incorporating all comments from owner's representative.

42. Contractor should identify the name of local authority maintaining the road or drainage/canal & provide hard copy of final survey drawing after incorporating all comments from owner's representative

- Survey drawing should mention suggested pipeline route in a separate layer for EIC approval before commencing laying.
- EIC to approve line sizing after network hydraulics check /confirmation in a format and linked to annual budget.

43. Following activities are also in contractor's scope during contract:

- Receive Customer's complaints logged during PE Laying.
- Attend and Carry out joint technical feasibility survey for requests and resolve the complaint.
- Maintain and update the complaint status.

44. **Repair/Rectification of PE pipeline** - the scope of work includes rectification, repair, and restoration of existing MDPE (PE) pipelines of any diameter for pipelines that are damaged whether commissioned or not, as directed by the Engineer-in-Charge (EIC).

45. The work involves locating leakage points, excavation of pits, safe exposure of pipelines, arresting leakage, cutting and removing damaged sections, jointing and installation of required MDPE fittings such as couplers, tees, reducers, and saddles using approved methods, while MDPE pipe material is provided as free issue by the Owner.

46. The contractor shall carry out flushing, testing, and retesting of repaired pipeline sections using compressors, including all operational arrangements such as manpower, fuel, tools, and maintenance including hiring of compressor, as directed by EIC. After successful repair, backfilling and complete restoration of the site to original condition, including roads and surfaces, shall be done. Repair to any damage caused during the repair process.

47. All skilled personnel like jointers, conversion technicians will be approved and certified by EIC based on the test conducted by approved trainers.

48. Contractor shall visit and survey all areas where PE laying is planned or in progress.

49. Handing over the completed works to owner along with detailed as built drawing showing pipeline route, fittings provided in the pipelines, for their operation purposes.

50. Any other activities not mentioned/ covered explicitly above, but otherwise required for satisfactory completion/ operation/ safety/ statutory/ maintenance of the works shall also be covered under the Scope of work and has to be completed by the Contractor within specified schedule at no extra cost to Owner.

**Part II: : GI/CU Installation**

1. Receiving, taking over, handling, loading, transportation and unloading of owner supplied items as defined in specification from owners designated stock yard to contractor's own store/ work site, proper storing stacking, identification, providing security and insurance cover

2. Preparation and approval of sketches, schedules & execution procedures. Finalizing optimum route with consent of customer from transition fitting to cooking oven / appliance and ensuring installations in well ventilated areas. Carrying out technical feasibility for D-PNG connections and updating data in mobiles apps/desktop apps of IOCL.

3. Assessment of material requirement for installation at site, Order placement for Purchasing of GI fittings, Copper fittings, Brass Fittings & Flexible Hose (Anaconda; adaptors to be used preferably, anaconda to be used only if unavoidable), 1/2" femaleX3/4" (or any size as required) male GI bush for GI to regulator & regulator to meter connection, 1/2" male X 3/4" (or any size as required) female SS adaptor for regulator to meter connection as per specification from approved/recommended vendors by Owner for completing the work, Scheduling, Planning of material & Forwarding inspection call, getting dispatch clearance, handling, loading, transportation and unloading of these items at respective contractor's store

4. Survey for technical feasibility for domestic connection and updating all data in mobile apps/ desktop apps of IOCL

5. Making temporary but stable platforms/ scaffolding/ rope ladders and supply of all other safety devices. SAP/ Portal entry / Data Entry for new connections - New registration tracking and feasibility survey and its updation as per Owner defined TAT, printing of stationary as per approved Owner formats required during connections. All fittings whatsoever required to complete the work is in contractor's scope.

6. Installation of powder coated GI pipes of ½'', ¾'', 1'' & 1.5'' dia. Between transition fittings to customer's kitchen appliances including NPT threading of GI pipes, supply proper seal outs for threads to join fittings such as elbows, tees, connectors, regulators, meters, appliance & isolation valve etc., as per laid procedures and specification including clamping and sealing etc. The scratched powder coated GI pipe and fittings shall be painted after the testing of the GI installation.

7. Installation of Powder Coated GI Pipes (Heavy Class)/Cu tube/Multi Layered Composite (MLC) pipes for all floor levels including high rise along with supply & installation of GI, Cu, MLC Fittings, welded fittings, Brass fittings, Flexible Hose (Anaconda) if required , Appliance Valve & Isolation valve, Meter, Regulator to complete the work asper the satisfaction of EIC. Connection using meter adaptor(s)/bush is preferrable instead of anaconda. Anaconda to be used only for specific cases as directed by EIC.

8. Supply and Installation of GI fittings such as elbows, tees, connectors, etc., complete as per procedures and specifications including clamping and sealing etc.

9. Supply & fixing of approved clamps & nylon plugs with SS 304 2" screws, grout material, suitable thread sealant i.e. Teflon Tape, Joining of transition fitting to above ground service GI pipes, testing, purging and commission of the complete installation

10. Supply of clamps for fixing pipes, meters, valves wherever required. Providing consumable grout material, repair/restoration of walls/floors changes for the pipes including the materials required for conversions and tools and tackles etc. shall be complete as per specification.

11. Installation in already gas charged area, planning & coordinating with existing consumer's for new tap offs from existing riser with or without tee, testing of these existing risers and commissioning of these connections with newly tap offs etc. is inclusive.

12. Installation of Isolation Valve, Appliance Valve & Supply & Installation of SS 316 Corrugated Flexible Metal Hose (Anaconda) – wherever required, etc., to complete the connection to the customer's appliance/stove.

13. Cleaning, flushing, pneumatic testing and commissioning to the GI pipe and fittings, meters, valves etc., as per specification and hand over the same to Owner/customer to the entire satisfaction of EIC.

14. Conversion of all types of LPG kitchen appliance to NG based appliance along with supply and installation of Steel Reinforced Flexible Rubber Hose as per IS 9573.

15. Preparation and submission of Ready for Conversion (RFC) card for each house indicating the laid GI pipe including fittings, mentioned the reasons, if connection is not provided to the customers and deviation statements on completion/commissioning of work.

16. Approval of customer on RFC card & recording Joint Meter Reading (JMR) of customer.

17. Details for commercial connection.

18. To Demonstrate the Customer regarding use, safety and maintenance related aspects of NG based appliances and installations.

19. Dismantling of scaffolding/temporary structures and cleaning of site & restore the site as per its original condition.

20. Restoration of walls, flooring and other damages while executing the above ground installation.

21. All risers and lateral pipe shall be clamped to the building at intervals not exceeding 1 m in place of 1.5m. Two clamps to be installed at each bend fittings or Tee fittings. Clamps should be 150mm away from each joint.

22. Contractor shall conduct Cu joining Qualification Test for jointers

23. Contractor has to supply different types/sizes of approved clamps.

24. Pneumatic testing of GI and Copper installation shall be done as per IOCL technical specifications.

    a) TEST PRESSURE IN CASE OF DIRECT REGULATOR SUPPLY (04 bar TO 21 mbar)

        - The GI installation from PE/GI transition fitting up to regulator shall be tested at the pressure of 6.0bar (g) for a holding period of 2 hour with no pressure drop.
        - The testing of GI shall be done with the isolation valve in open condition and open end plugged.
        - The GI installation from regulator outlet to Meter Inlet valve (except meter) shall be tested at a pressure of 2.2 bar (g) for a holding period of 2 hour with no pressure drop.

- The GI installation from meter outlet to appliance valve (except meter) shall be tested at a pressure of 2.2 bar (g) for a holding period of 30 minutes with no pressure drop.
- The Copper installation from meter outlet to appliance valve shall be tested at a pressure of 80-100 mbar (g) for a holding period of 30 minutes with no pressure drop.
- All the joints in the installation shall be checked with soap solution.
- The meter shall be removed while carrying out the testing at 2.2 bar (g) and joints of the meter shall be tested online at 100mbar with soap solution after completion of the work.

b) TEST PRESSURE IN CASE OF SERVICE REGULATOR SUPPLY (100-110 mbar)

- The installation from PE/GI transition fitting up to meter inlet (except regulator/meter) shall be tested at the pressure of 2.2bar (g) for a holding period of 2 hour with no pressure drop.
- The testing of GI installation shall be done with the isolation valve in open condition and open end plugged.
- The GI installation from meter outlet to appliance valve (except meter) shall be tested at a pressure of 2.2 bar (g) for a holding period of 30 minutes with no pressure drop.
- The Copper installation from meter outlet to appliance valve shall be tested at a pressure of 80-100 mbar (g) for a holding period of 30 minutes with no pressure drop.
- All the joints in the installation shall be checked with soap solution.
- The meter shall be removed while carrying out the testing at 2.2 bar (g) and joints of the meter/regulator shall be tested online at 100mbar with soap solution after completion of the work.

25. Only pretested riser shall be erected using pulley. Pretesting shall be done with compressed air @ 2.2 bar (g) for minimum duration of 30 minutes.

26. All the painting work must be done after completion of testing activity only

27. Testing of GI / Copper Installation * Arrangement for pressurizing the installation should be shown with diagram. The testing of GI riser pipe up to regulator inlet point shall be done with isolation valve in open condition at TF side and closed condition at regulator side. PPT/Riser Testing and MMT/RFC must be certified by TPIA. Testing of GI network installed including all tools & tackles, materials, any rectification & making connection ready for conversion. Submission/updation of as laid graphs/reports, isometric drawings etc. as required. Updation of all data in SAP/IOCL apps as directed by EIC.

28. If tapping exceeds more than 15meters, will be chargeable from customer." It should be aware to customer at the time of either route survey or AFC drawing and shall be communicated to IOCL/EPMC.

29. Pre-commissioning & Commissioning of GI network including all tools & tackles, materials, rectification/re-testing of any segment if required & making connection ready for gas supply. Submission/updation of as laid graphs/reports, isometric drawings etc. as required. Updation of all data in SAP/IOCL apps as directed by EIC.

30. Installation, testing, pre-commissioning & commissioning 12 mm Copper Tube - Inside kitchen location only - including supply & installation of contractor's Supplied Materials.

Submission/updation of as laid graphs/reports, isometric drawings etc. as required. Updation of all data in SAP/IOCL apps as directed by EIC.

31. Conversions of all the burners of LPG Stove (one appliance per household) to Natural Gas (NG) based appliances, Supply & changing of the nozzles / jets and associated controls for domestic & imported appliances with proper tools and tackles. The rates include testing of Kitchen piping from meter to Appliance valve and supply and fixing of one Steel reinforced Flexible Hose as per IS 9573 (with Type as per latest PNGRB guidelines) per appliance/stove with clamps. Cleaning and performing minor maintenance including gas inlet side change in stove, greasing etc. of the appliance. Testing and showing the performance to the customer, signing of joint meter records (JMR) and instructing the customer on use & safety norms, complete as per specifications & to satisfaction of owner / Engineer in Charge. (Supply of Steel Reinforced Rubber hose, Nozzle jets for conversion of burners is inclusive.)

32. Installation/Fixing of Commercial/Non-Commercial meter and regulator with associated inlet & outlet connections including supply of fittings, anaconda, valves, meter brackets. Using approved meters & regulator brackets and other supports by proper scaffolding/grouting. Restoring the area/walls to original condition as per specification and to complete satisfaction of consumer and EIC.

33. Supply of PPEs, Use of Safety Boots, harness belts, Hand gloves, Reflective jackets, Hard hats(helmets), Safety shoes, eye and ear safety equipment, Fire extinguishers, warning display board and as per the detailed scope of work in tender specifications and as per the direction of EIC.

34. All GI fittings must be Powder coated.

35. Inspection: It is responsibility of contractor to get Job Card / RFC check drawing certified at site only by TPIA. Each meter geo tagged location and time stamped photo required at the time of commissioning

36. Certified copies of RFC card in form of editable Auto-Cad drawings, PDF and hard copy to be submitted along with geo co-ordinates of Riser to be submitted. JMR to mention geo co-ordinates stamped and time stamped meter reading photo WAH ropes must be certified by PETZL and all WAH accessories must be of PETZL make, only Printable material i.e. RFC book and sticker as per owner design for each connection must be in contractor's scope in place of Client's scope as per their format.

37. The contractor shall supply the Calibrated Go-No Go Gauge and BSPT/ NPT (as decided) Gauges 1 set each of 1/2" and 1".

38. Any other activities not mentioned/covered explicitly above, but otherwise required for satisfactory completion/operation/ safety/ statutory/ maintenance of the works shall also be covered under the Scope of work and has to be completed by the Contractor within specified schedule at no extra cost to Owner.

**Part III: DMA Works**

The Detailed Scope of Work of the marketing agency shall include but not limited to the following and shall be considered as inclusive within various items of Schedule of Rate SOR.

1. Contractor shall coordinate with Resident Welfare Associations/Managing committee of the Societies/areas/House owners for various types of permissions/assistance required for conducting the survey, completing the registration process, and other activities related to laying of pipeline network & project execution.

2. Surveys of household population in the colony/society allocated by owner/owner's representative for collection of registration for creating a database with respect to

potential domestic customers and then submit a report in the format prescribed by owner.

3. Contractor shall collect the refundable security deposit and other applicable charges as informed by EIC for providing domestic connections within the customer's premises from all individual households as per the areas released by EIC on prevailing terms and conditions as decided by IOCL from time to time.

4. Contractor shall collect filled registration forms along with Cheques/Drafts and submit the listing with details of registration form and corresponding payment details in the prescribed formats. The listing of cheques/DD's being deposited to be provided in the prescribed formats along with duly stamped bank deposit slip on a weekly basis.

5. Contractor shall seek information from IOCL/EPMC regarding the approximate time in which connection will be given to the customers and inform them accordingly through a formal communication.

6. Contractor shall attend meeting the RWA or any other public forum as per day and time specified by the EIC.

7. For marketing of the PNG connections, contractor shall use an intelligent combination of the following techniques. Marketing and advertisement shall be in consultation with EIC after obtaining the necessary permissions from all concerned authorities/RWA's etc. All promotional items stated below shall be in scope of contractor.

    a. Leaflets
    b. Posters
    c. Frequently asked questions (FAQ)
    d. Banners
    e. Awareness cum Registrations Camps
    f. Inserts in Cable TV's
    g. Audio/Visual Presentations
    h. Demonstrations of Meter/Regulators
    i. Tele Marketing
    j. Door to Door Marketing
    k. Mailers
    l. Any other marketing activities, as advised by EIC.

8. Organizing events (Nukkad Natak/awareness camp/audio announcement in local language) for promotion of use of Natural Gas among household consumers in societies/ colonies etc.

9. Installation of Hoardings at prominent Location (to be decided by OWNER) within city

10. Advertise sing through running of video clip in a movie theatre.

11. Advertise sing through running of Video clip in one of the TV Channels

12. Advertise sing through running of audio clip in one of the FM Channels

13. Interaction with individual household consumers, Registration for PNG(Domestic) supply by getting prescribed For duly filled (Forms to be provided by IOCL), data entry in IOCL's mobile/desktop applications for PNG(D), submission of consolidated data in requisite format on daily basis. Providing assistance for clearance of cheque in bank, providing uniform and ID cards to marketing executives, collection of GPS coordinates of consumers' household and submitting it in the requisite format

14. Depending on need EIC may instruct DMA to undertake special campaign for registration of domestic connections by combination of one or more than one activity in specified/all areas.

15. Contractor shall generate MIS for all visits, Payment collected, progress/action plan of sales team regarding the status of registrations, market penetration and submission of the cheques to IOCL on day to day basis. These records will be maintained in the prescribed formats specified by EIC and copies (Soft copy in USB/Pen drives/CDs and hard copy in printouts) will be submitted to EIC/Authorized representatives on weekly basis.

16. Contractor shall mobilize the marketing team of sufficient size for carrying out marketing activities. The number of personnel to be mobilized will be as per the requirements as advised by EIC depending on the number of households targeted from time to time.

17. Contractor shall ensure that its marketing executives/office staff should communicate the correct information to consumers and conduct them in a dignified manner when representing IOCL. On receipt of any complaint regarding misbehavior/any other conduct by the persons employed by the contractor, the same shall be immediately bought to the knowledge of EIC. The contractor shall be completely responsible for consequences including any legal or financial implication for any act misbehavior on the part of persons employed/Contracted by him/her with prospective customer of IOCL.

18. Contractor shall ensure that their marketing executives/office staffs have proper police verification(s) and should carry the photo identity card (P-ID), issued by the contractor, while making visits on behalf of IOCL.

19. Registrations from unassigned areas will not qualify as successful & complete registration.

20. The Direct Marketing Agency (DMA) shall carry out all activities related to Domestic PNG registrations in the authorized GA as defined in the Scope of Work herein below under the supervision and complete control of the Marketing In-charge (PMC) nominated by IOCL or its Site Marketing In-charge (SMC).

| | |
|---|---|
| Pre-Registration | 1. Training of Marketing executives for awareness regarding the procedures, rules and regulations of IOCL, various schemes of PNG (D) connections & use of DMA application of IOCL. Presentation should be given by marketing executives to PMC/ IOCL before deployment for the marketing activities. DMA will issue identity card to qualified marketing executives and provide suitable attire (preferably a white T-shirt, black/blue jeans/pant, orange/green cap & shoes) to all marketing executives. Dress code shall be decided by PMC/IOCL. PMC/IOCL may suggest printing of any logo/ marketing theme on T-shirts/Caps to be provided by DMA to all marketing executives.<br><br>2. Identification of localities in consultation with PMC/ IOCL within GA, to define target areas. This shall be in Line with roll out of PNG Infrastructure (i.e., secondary pipeline network). |
| Technical Feasibility | Primary survey for Technical Feasibility of the premise for installation of PNG piping/ tubing as per the criteria laid down by PMC/ IOCL. |
| Registration & Collection of Prescribed | Submission of Registration Form along with prescribed documents and Fee (if any, as decided by PMC/OWNER) towards meter, regulator & piping / tubing up to 15 metres within customer premises & payment security. |

| | |
|---|---|
| Fee/Security Deposits | Obtaining duly signed acceptance of customer for payment of charges towards additional piping/tubing, if any.<br><br>Collection of GIS data for customer location.<br><br>Note: Registration Fee, Connection Security/ Gas security deposit to be collected as per Schemes of IOCL for PNG (D) connection. |
| KYC Compliance | Completing the KYC compliance of the customer registered for PNG (D) connections. |

21. DMA shall not make any registration from the areas not declared / specified by IOCL or not allotted to the DMA. In case it is observed that DMA have done the registration from the areas not specified by IOCL then the administration charges of Rs. 500/- per registration shall be recovered from DMA. Further any liability (legal, financial or otherwise) arising out of this shall be DMA sole responsibility. DMA will be required to obtain written/email instruction from designated officer of IOCL before starting process of registration in any area.

22. DMA shall provide regular training (every month) to the marketing executives and entire marketing activities shall be supervised/managed by Marketing Manager deployed at site office. Marketing manager shall directly report to PMC/IOCL.

23. DMA will issue identity card to all qualified marketing executives and provide suitable attire (preferably a white T-shirt, black/blue jeans/pant, orange/green cap & shoes) to all marketing executives. Dress code shall be decided by PMC/ IOCL. PMC/ IOCL may suggest printing of any logo/marketing theme on T-shirts/Caps to be provided by DMA to all marketing executives.

24. DMA shall ensure availability of Smartphones with internet 24X7 connectivity for all marketing executives for using DMA application of IOCL. All entries/activities of DMA application of IOCL shall be done by DMA executives.

25. DMA shall be responsible for collecting GIS data for location of the customer registered and submit the compiled data in the requisite format. Suitable device, as approved by PMC/IOCL, shall be provided by DMA for capturing location of the customer premises.

26. DMA will coordinate with the Resident Welfare Associations (RWA) Managing Committee of societies Builders rightful owner of the property/ etc, for various types of permissions / assistance required for conducting the registration process and other marketing activities related to laying of pipeline network & piping / tubing work in the registered houses.

27. DMA shall do registration with individual households of Group Housing Societies / Cooperative. Housing Body/ Government Quarters In the permitted Charge Area (CA)/ colony within the Geographical Area. However, IOCL reserves the right to sign the bulk registration agreement with above bodies directly. In such cases of bulk registration by IOCL, same shall not be considered in scope of DMA and no fee shall be payable to DMA against such cases.

28. For marketing of PNG connections, DMA will also use an intelligent combination of marketing techniques. such as distribution of leaflets, organizing registration camps, uses of AV (audio visuals aid, demonstrations of Meter / Regulators, tele/ digital marketing etc in consultation with IOCL to achieve maximum registrations. DMA will conduct the distribution of leaflets, arrange various registration camps in the city and cost of any advertising material will be in the scope of agency. DMA, shall he required to carry out awareness activities including organising awareness camps for duration of at least eight hours at one gated community before starting registration process.

However, the number of actual camps may vary according to the number or houses in said community. The DMA shall arrange requisite manpower, portable tents and other amenities as required equipment for AV aids etc. Depending on the requirement to yield better results, IOCL may instruct DMA to undertake special campaign for registration of domestic connections by combination of one or more than one activities in a specified area.

29. DMA will attend meetings with RWA or any other public forum as per the date and time specified by the concerned marketing officer. Any relaxation from this activity is required to be obtained in writing from the marketing officer.

30. DMA shall collect the money (cheque/online transfer) towards registration fee and other amounts from the customer (as decided by PMC/IOCL) which Include excess of 15 meters for individual houses (15 meter shall be calculated from riser Isolation Valve to Appliance Valve) and 12 meters for multistoried Apartment / individual multistoried houses (12 meter shall be calculated from Riser Tee to Appliance Valve) as per rates applicable at the time of execution.

31. Further, DMA shall collect consent form from domestic PNG customer for payment against the actual cost of the material and labour charges for excess of the length specified as above.

32. DMA will maintain a Marketing office with basic infrastructure facilities required in the office. DMA has to maintain proper office covering its allocated territory facilitating the reach of customers. The office must comprise of following necessary facilities:

    a. Availability of tele caller (s) on daily basis.

    b. Proper space for keeping all registration forms, documents and cheques in organized manner.

    c. Dedicated contact nos./ landlines – to ensure there is no call drop of customers and to support out bound calls.

    d. Proper arrangement to attend walk-in customers.

    e. Fast internet connectivity

    f. Laptops/Desktops, Scanner, Printer & all necessary electronic items required for office work

33. A successful domestic registration means:

    a. Identification of consumers in designated localities.

    b. Filling of Registration Form with full details.

    c. Providing details of registrations carried out on weekly basis to IOCL.

    d. Issue an acknowledgment along with registration number to customer.

    e. Collection of cheques or online payment (i.e., Application fee, Registration amount etc., if any) including depositing the cheques/record of online payment along with registration forms and the records in prescribed format in soft and hard copies to IOCL.

    f. Submission of GPS location of a customer & Completion of all entries/activities in DMA app of IOCL.

    g. Entry of Registration forms including Scanning of forms (for digitalization) in any Software/ Platform provided by IOCL.

34. DMA shall collect and submit duly filled in registration forms and Cheque / Draft (If applicable) to IOCL within the stipulated time period as intimated by Engineer-In-Charge.

35. Under no circumstances cash will be collected from any Customer. Any deviation from this policy of payment collection by online/cheque/DD will attract a minimum penalty of Rs. 1000/- per instance in addition to recovery of cash amount collected from the Customer.

36. DMA shall be required to maintain complete secrecy of Customer database of IOCL and shall not share it with any third party without a written approval from IOCL.

37. IOCL will provide Business Partner Number of customers to DMA & for further communication to each customer. DMA will seek information from the IOCL regarding approximate time period in which connection will be given to the customers and shall inform to customers.

38. DMA will ensure that its marketing executives/office staff should communicate the correct information to consumers and conduct them in a dignified manner when representing IOCL. On receipt of any complaint regarding wrong information to the customer, misbehaviour /any other misconduct by the persons employed by the DMA is received, the same shall be immediately brought to the knowledge of PMC/IOCL. DMA will remove such personnel from the Job on Instructions from PMC/IOCL. The DMA shall be completely responsible for consequences, if any, legal or financial for any act of misbehavior on the part of persons employed/contracted by him/her with prospective customers of IOCL.

39. DMA will be responsible for coordinating with site engineer of IOCL working in the area to facilitate installation/ conversions and getting the connection activated as per schedule. For any matter, which requires intervention from PMC, DMA will be responsible to bring such matters to the notice of PMC/OWNER team from time to time.

40. DMA shall timely address the queries /complaints of the customers with suitable reply and if it falls beyond its scope the same shall be forward to PMC.

41. DMA shall make best effort to promote the use of Gas based equipment's such as geysers and Genset without any extra cost/payment for such activities.

42. DMA shall make a list of all such residents/ houses that have not opted to register for a PNG connection in a society/ area. DMA will be responsible to ensure circulation of a notice informing resident's last opportunity to register for a PNG connection before winding up of execution activities in consultation with IOCL.

43. The pre-registration requests received online by Site PMC shall be provided to DMA from time to time and the physical registration activity shall be carried out by DMA for these requests subjected to technical feasibility.

44. DMA shall organize frequent Registration Camps on all weekends/public. holidays under prior intimation to Area Marketing Officer & must have sufficient Manpower for daily Door-to-Door marketing activities, including attending customer's request for a personal visit to his/her premises i.e., "visit on demand".

45. DMA shall carry out installation of Hoardings at prominent locations within the city which shall be decided in consultation of PMC for a period as defined in schedule of rates, Agency shall be responsible for paying various amount to authorities as per their rules and regulations. The material to be printed on hoardings shall be finalized by M/s IOCL. Hoardings can also be installed on existing advertising boards available at prominent locations, DMA shall also make necessary arrangements for advertising through running of video clip in movie theatres & TV Channel and also through running of audio clip in one of the FM Channels. Audio and video Clips shall be prepared by agency in

consultation with PMC/IOCL. Selection of Movie Theatre/ TV Channel/ FM channel for broadcasting the Video & Audio clip will be at the sole discretion of the OWNER only.

46. Any payment of charges/ commission for PNG Registration paid to DMA shall be recovered if a registered customer denies PNG connection and seeks refund of Security Deposit without any genuine/ legitimate reason like Transfer, Death, Sale of Property etc.

47. IOCL shall have absolute discretion / liberty to increase/ decrease or not to charge any refundable security deposit and the manner in which the same are to be Collect.

**Part IV: Services related to Commercial and Industrial Connection**

1. Installation of Commercial and Industrial connection which includes taking tap off from PE network, laying of PE pipeline along with associated fittings, installation of GI pipes with associated fittings, installation of meter & regulator etc.

2. Variation in pressure and meter running fast issue shall be check by contractor time to time for smooth execution of projects.

## 16.0.0 CONDITIONS FOR ISSUE OF MATERIALS

Whenever any material is issued by Owner, following conditions for issue of material in addition to other conditions specified in the contract shall be applicable.

1. Necessary indents will have to be raised by the Contractor as per procedure laid down by the Engineer-in-charge from time to time, when he requires the above material for incorporation in permanent works.

2. Materials will be issued only for permanent works and not for temporary works, enabling works etc. unless specifically approved by the Engineer-in-charge and the same shall not be taken into account for the purpose of materials reconciliation.

3. The contractor shall beer all other cost including lifting, carting from issue points to work site/ contractor's store, custody and handling etc. and return of surplus/ serviceable scrap materials to Owner's storage points to be designated by the Engineer-in-charge etc. No separate payment for such expenditure will be made.

4. No material shall be allowed to be taken outside the store without a gate pass.

5. The contractor shall be responsible for proper storage, preservation and watch & ward of the materials.

## 17.0.0 RECONCILIATION OF OWNER SUPPLIED MATERIALS

17.1.0 The Contractor is responsible for reconciliation of material used for job completed in a month. This record will be used for the reconciliation of material at the end of the contract.

17.2.0 The full replacement or repair costs of all damage items will be charged to the contractor.

17.3.0 It is mandatory that the contractor is required to undertake and submit inventory details of free issue and purchased materials on fortnightly basis to Owner/ Owner's representative as per the approved format of the owner. The inventory details shall be in correlation with the Daily progress chart and material reconciliation sheet. Material reconciliation statement of all free issue

materials shall be carried out on monthly fortnight basis & reconciliation statement shall be submitted to Owner along with invoices.

17.4.0 After the final reconciliation is carried out, the variances in materials issued against materials used and returned, will be assessed. All unused, scrap materials and salvageable materials shall be the property of the Owner and shall be returned by the Contractor category-wise at his cost to the Owner's designated store. In case the Contractor fails to do so or exceeds the limits of allowances specified below for scrap/ serviceable materials, then recovery for such quantities not returned as well as returned beyond as permitted under table below by the Contractor will be done at the penal rate i.e. 125% of landed cost at the time of final bill/ closing of contract by Engineer-in-charge shall be effected from the Contractor's bill (s) or from any other dues of the Contractor to the Owner except Meter and regulator for which penalty shall be levied as given below. Contractor shall be responsible for the adjustment and measurement of the surplus materials to be returned to the store. Contractor shall also be responsible for suitable segregation of returned materials into separate stacks of serviceable and scrap materials as per instruction of Owner. Wherever certain material is covered under Contractor's scope of supply whether part or in full for any item of work covered under SOR, no allowance towards wastage/ scrap etc. shall be accounted for during execution stage.

| ITEM | Scrap | Wastage (unaccountable loss) |
|---|---|---|
| PE pipes | 2% (Less than 5 mtr.)* | 1% |
| Service regulators | 0% | 0% |
| Gas Meter | 0% | 0% |
| Appliance & isolation valve | 0% | 0% |
| GI/CU Pipes | 2% (Less than 0.5 mtr.) | 1% |

*(*) Pipe lengths less than 5.0m for Dia (20mm/32mm/63mm/125mm/180mm) shall be considered as scrap.*

17.5.0 While reconciling owner supplied material at any stage, following recovery shall be levied from the contractor's RA bill for unaccounted Meters and Regulators:

| SR. No. | Item | Recovery per Piece |
|---|---|---|
| 1 | Meter (Mechanical) | 2000 INR |
| 2 | Regulator | 1000 INR |
| 3 | Smart Meter | 8000 INR |

17.6.0 Material consumption will be recorded. Material issued from the OWNER stores shall be consumed, recorded and returned using the same OWNER item code.

17.7.0 Any payments due to the Contractor may be withheld to cover these charges.

17.8.0 All waste materials, part lengths of pipe and other partly used items are the property of OWNER and must be returned to the stores with the appropriate documentation so that they can be considered as part of the material reconciliation.

**18.0.0 IN CASE OF NON-COMPLIANCE OF STATUTORY PROVISIONS PENALTY WILL BE IMPOSED BY THE OWNER AS DETAILED BELOW:**

i. Contractor's failure to submit RPFC challans along with the bills for more than one month during the tenancy of the contract shall attract penalty of INR 1000/- per month. Owner may suspend the work if challans are not submitted within three months.

ii. Delay in obtaining ESI/WC (Workman Compensation) cover taken for shorter duration will result into retention of an amount equal to 5% of RA bill which will be released on receiving the requisite documents/challans after deducting a penalty of INR 1000/- per month per instance over and above the amount which would have otherwise been paid by the contractor in obtaining the required ESI/ WC Cover.

iii. The contractor must obtain labour license before the start of work at allotted site. The completion period specified against each work order includes time required for mobilisation and fulfilment of all statutory requirements as defined in the tender document.

18.1.0 **Safety Violations, Unauthorized Work and Material Supply**

i. The following penalties for violation/ non-adherence of safety procedures and practices, Unauthorized Work and Material Supply:

a) In case safety equipment like Safety Shoes, helmets, fluorescent jackets etc. as per safety standard, could not be provided by the contractor during execution, work shall be suspended and shall be attract penalty of INR 500/- per instance (On issuance of site-memo for noncompliance till the closure of business day). Any subsequent instance shall attract penalty of INR 1000/- per instance with a notice to contractor by EPMC/ Owner.

b) In case it is noticed and confirmed by the Consultants/ Third party Agencies/ Owner Site-in charge that fusion Jointing is being carried out by personnel other than approved/qualified technicians as per the Technical Specifications for laying of underground PE pipeline and technical specification for installation of GI/Copper Pipes INR 1000/- per Joint shall be levied with a notice to contractor and the person supervising the work shall be suspended from Owner's sites.

c) In case of usage of contractor's supplied material procured from vendor other than Owner approved list or without inspection and prior approval from EIC/ Site-in-Charge, INR 10,000/- per instance shall be levied to the contractor from running bill.

ii. Violation as Safety procedures and practices resulting in:

a) Any physical injury: A penalty of 0.5% of the contract value (maximum up to INR 2,00,000/-) per injury in addition to INR 500 per occasion as in Clause 18.1.0. (i. a)

b) Fatal accident: A penalty of 1% of the contract value (maximum of. INR 10,00,000/-) per injury in addition to INR 500 per occasion as in Clause No. 18.1.0. (i. a).

iii. In case required numbers of equipment Tools & Tackles as per the lists enclosed with the Technical Specifications for laying of PE Pipelines and technical Specification for installation of GI/Copper pipes, could not be provided by the contractor at the time of need, a notice shall be

issued to the contractor by IOCL/PMC Site- In-charge and INR 500/- per week or part thereof shall be levied as penalty till such time the equipment, Tools & Tackles are available for completion of the work.

18.2.0 **Owner shall have right to levy following penalties on the Contractor and deduct applicable amount from the Contractor's Running Bills:**

i. In case proper barricading, along the trench and pits, as per technical specification for Laying of underground PE Pipelines are not provided, the work shall be immediately suspended till such time proper barricading shall attract penalty of INR 500/- per instance (On issuance of site-memo for non-compliance till the closure of business day). Any subsequent instance shall attract penalty of INR 1000/- per instance with a notice to contractor by PMC/Owner.

ii. Meter & regulator shall be free issued to the Contractor. Contractor has to ensure the installation of meter and regulator at customer premises and update correct details of meter & regulator by capturing the meter & regulator serial no. in SAP through Mob App. / other means. In case of incorrect updating / capturing of installed Meter & Regulator serial no. data in SAP through Mob App. / other means by the contractor, INR 500/- per instances shall be levied to the contractor from the running bill. In case of non-submission of material reconciliation statement on monthly basis & along with each RA bill, INR 5000/- per instance of delay shall be levied from the running bill.

iii. In case of non-submission of material reconciliation statement on monthly basis & along with each RA bill, INR 5000/- per instance of delay may be levied from the running bill.

iv. Deleted

v. Under no circumstances cash will be collected. Any deviation from this policy of payment collection cheque/ DD will attract a minimum penalty of INR 1000/- per instance in addition to recovery of cash collected.

vi. In case of any misplacement of customer's cheque/registration documents by the manpower engaged, a penalty of INR 1000/- per incident.

vii. The engaged manpower / sales team will be smartly dressed / presentable and carry identity cards authorization letters on door-to-door visits and marketing camps (ID cards to be vetted by IOCL). The contractor shall get the Police Verification done for all the staff deployed by them for cheque/ DD collection. Any deviation to this may attract a penalty of INR 1000/- per incident.

viii. The registration data should be sent to IOCL in soft copy in the same format which is provided on daily basis. Any error in the file sent to IOCL for Business Partner Number generation may attract a penalty of INR 500/- per erroneous data file received.

ix. Delay in submission of cheque beyond fifteen (15) days shall warrant a one-time penalty of INR 100/- per cheque. In addition, for further delay beyond one month from the date of cheque / date of collection of cheque whichever applicable a penalty of INR 20/- per cheque shall be charged for every single day delay in submission of cheque.

x. DMA will attend meeting with RWA or any other public forum as per day and time specified by the concerned Marketing officer of IOCL. Any relaxation from this activity is required to be obtained in writing from the EIC of IOCL. In case any instance where it is found that camps are not organized on advice of IOCL every such incident may attract a penalty of 5000/-.

xi. Supervisors are required to ensure that the target set by IOCL is being achieved and accordingly submit the weekly report in the prescribed format to IOCL. Any delay/ non–submission of weekly report may warrant a penalty of INR 1000/-. Supervisor will directly report to IOCL Site-in-charge for instructions and guidance

## 19.0.0 AMENDMENT OF GCC CLAUSE NO. 4.4.0.0 – PRICE ADJUSTMENT FOR DELAY IN COMPLETION

i. The provision of Price Reduction/Price Adjustment for delay in completion shall not be applicable for this tender/contract.

ii. Accordingly, no Price Adjustment shall be levied on the Contractor for delay in completion of the work under this contract.

## 20.0.0 SHORT-CLOSURE OF CONTRACT

i. Performance of contractor shall be evaluated in accordance with below mentioned clause 24.0.0 (Evaluation of Contractor Performance). In the event of unsatisfactory performance, inadequate progress, or non-fulfilment of contractual obligations by the Contractor, the Owner shall have the right to short-close the Contract at its sole discretion and without any financial or other liability on either side.

ii. Payment shall be made only for the satisfactorily executed and certified work up to the effective date of short closure.

iii. Further, any contractor whose contract is short-closed on account of unsatisfactory performance shall not be allowed to participate in future walk-in selection processes in the same state.

iv. Upon such short closure, the Security Deposit submitted by the Contractor shall be released only after the successful completion of the applicable Defect Liability Period, subject to fulfilment of contractual obligations and clearance of any dues, recoveries, or statutory requirements, if any, as per the terms of the Contract.

## 21.0.0 SUB-SEQUENT ORDERS:

i. IOCL may award further sub-sequent orders on same term and conditions, for additional works may be awarded to the contractor selected in the walk in methodology without processing new cycle.

ii. The allocation of additional works may be considered based on:

   a. Satisfactory performance,

   b. After confirmation and submission of an undertaking that a separate and independent team/resources shall be deployed for execution of the new job.

   c. Compliance with quality and safety requirements.

   d. Successful Completion of at-least 70% of the job awarded.

**iii.** In case of a subsequent award to the same contractor while the previous contract is still in progress, the contractor shall deploy a separate team for execution of the new work and shall submit an undertaking to this effect. However, subsequent award shall be sole discretion of IOCL and same shall be exercised as per the requirements**.**

## 22.0.0 AMENDMENT TO DEFECT LIABILITY

In partial modification to GCC Clause 5.6.1.0, the defect liability period for the tender shall be 6 (six) months from the date of Completion.

## 23.0.0 INCENTIVES TO PLUMBERS FOR EXPEDITING PNG CONNECTIONS

i. An incentive of ₹200 (Rupees Two Hundred only) per Ready for Connection (RFC) shall be payable to a Plumber, provided that the concerned Plumber achieves a minimum of 20 (twenty) RFC installations in a month under a contract.

In addition to the above, an additional incentive of ₹200 (Rupees Two Hundred only) per connection shall be payable to plumbers for PNG connections executed at Second Floor and above.

ii. The incentive shall be disbursed directly by the Contractor to the eligible Plumbers through any traceable electronic mode.

iii. Reimbursement of the incentive amount by the Owner shall be made under the relevant SOR item(s), subject to submission of the following documents by the Contractor:

a) Plumber-wise statement indicating the number of RFC installations executed during the month;

b) Floor-wise details of connections executed under the Working-at-Height incentive category, wherever applicable;

c) Proof of payment to the concerned Plumbers, including UTR number/ bank transaction details or any other acceptable evidence of payment;

d) Acknowledgement from the respective Plumbers confirming receipt of the incentive amount.

e) Certification by the TPI/Owner's Representative and verification by the Engineer-in-Charge (EIC).

iv. Incentive reimbursement shall be restricted to the actual number of eligible connections certified by the Engineer-in-Charge (EIC). No reimbursement shall be admissible for connections not meeting the eligibility criteria specified under this clause.

v. Owner reserves the right to verify any records, payment details, acknowledgements, or supporting documents submitted by the Contractor. Any discrepancy, false claim, or misrepresentation shall render the claim ineligible for reimbursement and may attract appropriate contractual action.

**Note:**

Incentive reimbursement shall be payable only against the respective SOR item(s) provided in the Schedule of Rates and shall not be considered part of normal labour wages, overheads, or any other contractual payment.

Bidders shall compulsorily pay the incentive amount to eligible plumbers and claim reimbursement against the same as per relevant SOR item.

## 24.0.0 EVALUATION OF CONTRACTORS' PERFORMANCE

### METHODOLOGY

### 1.1 Measurement of Performance

Standard format attached as **Annexure-A & B** shall be used for evaluating Contractors' performance. The performance of the contractor would depend upon the total marks obtained.

**1.2 Stages of Evaluation**:

The performance evaluation of the Contractor shall be carried out at the end of contractual completion period or at any stage beyond contractual completion period as deemed suitable by EIC.

## 1.3 Allocation of Marks

1.3.1 Allocation of marks shall be based on parameters and weightages as per format attached as **Annexure B.**

1.3.2 Maximum marks reflects the maximum weightage assigned for the corresponding activity considering a total score of 100. In case certain activities are not applicable, scores shall be computed on a reduced total and then absolute score shall be reworked to 100.

## 1.4 Performance Rating:

Depending upon the total marks obtained by the contractor, the performance rating of the contractor shall be finalized as per following:

| Sl.No. | %age of Marks obtained | Performance Rating |
|---|---|---|
| 1 | > 40% | Satisfactory |
| 2 | ≤ 40% | Unsatisfactory |

## 1.5 Action in case of Unsatisfactory Performance

a) In case of Unsatisfactory Performance rating, the contract shall be short closed without any liability on either side.

**Annexure-A**

**FORMAT FOR**

## EVALUATION OF CONTRACTORS' PERFORMANCE -

1.0 Name of Contractor & SAP vendor code :

2.0 Work Order No. & Date :

3.0 Name of Work :

4.0 Contract Value (Rs.) :

5.0 Scheduled Completion Period :

6.0 Date of Start :

7.0 Contractual Completion Date :

8.0 Execution Amount :

## 9.0 Total Marks as allocated to Contractor:

| SN | DESCRIPTION | MAXIMUM MARKS | SCORE |
|---|---|---|---|
| 1 | **Safe work practices** | **10** | |
| 2 | **Job schedule related** | **70** | |
| A | Mobilisation Time (Actual handing over at Site) | 5 | |
| B | Deployment of manpower etc | 15 | |
| C | Compliance of labour related commitments | 10 | |
| D | Instances of work stoppage due to reason attributable to contractor | 15 | |
| E | Completion of milestone target | 25 | |

| SN | DESCRIPTION | MAXIMUM MARKS | SCORE |
|---|---|---|---|
| 3 | **Quality of work** | **10** | |
| 4 | **Contract closure & other Contract related obligations** | **10** | |
| A | Timely Submission of Financial instruments (BGs/SDs/BG extensions etc) | 5 | |
| B | Statutory authorities complaints | 5 | |
| | Grand Total | **100** | |

## 10.0 Performance Rating of Contractor:

Performance rating chart:

| SN | %age of Marks obtained | Performance Rating |
|---|---|---|
| 1 | > 40% | Satisfactory |
| 2 | ≤ 40% | Unsatisfactory |

Depending upon the total marks as obtained by the contractor at 10.0 above, the Performance Rating of the contractor is rated as.....

**Site Engineer**
**(Name, Designation, Signature, Date)**

| | |
|---|---|
| **Engineer In-charge** | **Approving Authority** |
| **(Name, Designation, Signature, Date)** | **(Name, Designation, Signature, Date)** |
| **Reviewed by** | **Approved by** |

## Contractor Performance Annexure B

## Evaluation Sheet

| S.No. | Description | Max Marks | Computation Philosophy | | | | | | Score |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **Safety Related Performance Evaluation** | **10** | No Mobilisation Zero Marks shall be awarded | Violation of applicable health, safety and environment related norm with warning/caution letter issued by EIC:<br>0.5 marks deduction for each instance | Violation of applicable health, safety and environment related norm with imposition of penalty<br>2 marks deduction for each instance of imposition of penalty | Physical Injury:<br>3 marks deduction for each instance | Fatal Accident:<br>Full marks (10) Deduction | | |
| 2 | **Job Schedule Related** | **70** | | | | | | | |
| a | Mobilization of contractor at site | 5 | No Mobilisation Zero Marks shall be awarded | As per schedule mentioned in Work Order/Specific Notice/as instructed by EIC<br>Award 5 Marks (5) | Delay upto 7 days<br>Award 4 Marks | Delay more than 7 days but upto 15 days<br>Award 3 Marks | Delay more than 15 Days and upto 30 days<br>Award 2 Marks | More than 30 days -<br>Award 1 mark | |
| b | Deployment of adequate man-Power, material and other resources to meet the progress as per desired schedule | 15 | No Mobilisation Zero Marks shall be awarded | All deployments adequate<br>Award Full marks (15) | letter issued to contractor by EIC during execution to ensure sufficient deployment<br>Deduction of 2 mark per week of delay | IOCL forced to arrange manpower, material or any other Resources<br>Full marks (15) Deduction | | | |
| c | Compliance of labour related commitments and all statutory requirements, i.e., payment of minimum wages, submission of PF, etc within time. | 10 | No Mobilisation Zero Marks shall be awarded | All commitments made on time<br>Award Full marks (10) | Delay in payment to Labour & PF etc<br>Deduction of 1 Mark Per Occasion | Direct payment by IOCL to sub- contractor/ Labour:<br>Deduction of 2.5 Marks Per Occasion | | | |
| d | Instances of work stoppage due to reason attributable to contractor | 15 | No Mobilisation Zero Marks shall be awarded | Nil slowdown / stoppages<br>Award 15 Marks | 1 incidence ( More than 1 working day each)<br>Award 10 marks | 2 incidences ( more than 1 working day each)<br>Award 4 marks | More than 2 incidences<br>Award Nil Marks | | |
| e | Completion of milestone target (Prorata PNG | 25 | No Mobilisation Zero Marks shall be | Within time including Extensions granted | Achievement of milestone above 75% | Achievement of milestone above 50 % | Achievement of milestone above and equal 25 % | Achievement of milestone less than 25 % | |

| S.No. | Description | Max Marks | Computation Philosophy | | | | | | Score |
|---|---|---|---|---|---|---|---|---|---|
| | connections/PE Laying) as per schedule | | awarded | Award 25 marks | Award 20 marks | Award 15 marks | Award 10 marks | Award Nil marks | |
| 3 | **Job Quality Related** | **10** | | | | | | | |
| a | Quality of work | 10 | No Mobilisation Zero Marks shall be awarded | Quality of work is acceptable and no-rework is done<br><br>Award Full Marks (10) | Communication issued by EIC to contractor regarding concerns on quality<br><br>Uniform Deduction of 0.5 mark per occasion | | | | |
| **4** | **Other Contract related obligations** | **10** | | | | | | | |
| a | Timely Submission of Financial instruments (BGs/SDs/BG extensions etc) | 5 | No Mobilisation<br><br>Zero Marks shall be awarded | Within time as per Contract requirement<br><br>Award 5<br><br>Marks | Delay upto 1 week<br><br>Award 4 Marks | Delay upto 2 weeks<br><br>Award 3 Marks | Delay more than 2 weeks.<br><br>Deduction of 1 mark per week. | | |
| b | Violation of Statutory compliance | 5 | No Mobilisation Zero Marks shall be awarded | No Penal action– Award 5 Marks | Penalty imposed – Award Nil marks | | | | |

## 25.0.0 ECLMS PORTAL

Successful contractor shall adhere to maintain the details of engaged contract manpower on e-CLMS Portal of IOCL as per guidelines. The detailed guideline is available on IOCL Portal https://associates.indianoil.co.in/Vendor/. Bidder to refer to the website mentioned above for further details."

## 26.0.0 MANPOWER DEPLOYMENT

Bidder shall meet the requirement regarding deployment of minimum skilled manpower as specified in the table below.

**NUMBER OF SKILLED MANPOWER TO BE DEPLOYED**

| S. No | Description | Requirement per contractor for contract award value up to ₹25 lakh. | Requirement per contractor for contract award value up to ₹50 lakh. |
|---|---|---|---|
| 1 | Resident Construction Manager / Section In charge | 1 | 1 |
| 2 | Mechanical Engineer/Planning / Engineer (QA/QC) | As required | As required |
| 3 | Safety supervisor | 1 | 1 |
| 4 | Foreman/Supervisor | 1 | 1 |
| 5 | Document Controller | As required | As required |
| 6 | Store-Keeper/ Store in-charge | As and when required | As and when required |
| 7 | Fusion Operation/ Jointer | 1 | 2 |
| 8 | Skilled Workers (GI Plumber) | 5 | 10 |
| 9 | NG Conversion Team | 1 | 2 |
| 10 | Skilled Workers (Moling Team) | As and when required | As and when required |
| 11 | Unskilled Workers (Labour) | 10 | 20 |

The above proposed list of skilled manpower is the minimum to be deployed by Contractor.

**NOTES: -**

1. The details of minimum manpower required to be mobilized by the execution contractor to complete the work within schedule is given above and is not exhaustive. Contractor is required to augment the above list with additional numbers/categories of workmen as required and directed by Engineer-In charge to complete the work within the completion time schedule.

2. The Manpower as identified above should have required qualification and adequate relevant experience.
3. The minimum no. of skilled manpower to be deployed may however vary (increase/decrease) depending on availability of work front. The decision of EIC in this regard shall be final.

*********

INDIAN OIL CORPORATION LIMITED

# TECHNICAL SPECIFICATION

FOR

LAYING & CONSTRUCTION OF PE

PIPELINE NETWORK ALONG WITH LAST MILE

CONNECTIVITY & DIRECT MARKETING SERVICES FOR CITY GAS DISTRIBUTION

**TENDER NO. : BD/CONT/26-27/SCM/04**

DOCUMENT NO. : IOCL-CGD-PE-LMC-DMA-SPEC

Rev. 0 dated 18.07.2023

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# SECTION-I

# TECHNICAL SPECIFICATIONS

## CHAPTER-1

## 1. GENERAL

### 1.1. DEFINITIONS

Definition of Terms

The terms used in the technical document must be understood as follows:

| | |
|---|---|
| "Approval" | : Means written approval. |
| "Owner" or "Client" | : Is the principal requesting the works to which the Agreement relates, i.e. INDIAN OIL CORPORATION LIMITED (IOCL). |
| "Owner's Representative" Or "PMC" or "EPMC" | : Shall mean Owner's CONSULTANT. |
| "Contractor" | : The natural person or legal entity with whom the Owner has concluded Agreement. |
| TPIA | : Third Part Inspection Agency |
| "Equipment" | : Means all apparatus, tools and machineries of any kind whatsoever that are necessary for the construction, execution and maintenance of the Works specified in the Agreement. |
| "Goods and/or Services" | : Depending on the specific case, all or part of the Construction materials, equipment, constructions, appliances, tools, machines, works, etc. that are to be built, assembled, adapted or brought into operation by the Contractor pursuant to the Agreement, including all studies, performances, works and services specified within the Agreement. The terms Goods or Services can be used interchangeably according to the context. |
| "HDD" | : Horizontal Directional Drilling |
| "EIC" | : Engineer-in-charge |
| Pre-Commissioning | : It includes tightness/leak test, cleaning and inertization, filling the Nitrogen (if required), of pipeline system for making it ready for commissioning. |
| CGD | : City Gas Distribution |
| CNG | : Compressed Natural Gas |

| | |
|---|---|
| DRS | : District Regulating Station |
| GA | : Geographical Area |
| OISD | : Oil Industry Safety Directorate |
| OLS | : On-line Station |
| PNGRB | : Petroleum & Natural Gas Regulatory Board |
| PNG | : Piped Natural Gas |
| RO | : Retail Outlet |
| SCMH | : Standard Cubic Meter per Hour |
| SCMD | : Standard Cubic Meter per Day |
| Commissioning | : It includes commissioning of system with gas, gas-in activity and final acceptance dossier. |

## 1.2. REFERENCE CODES, STANDARDS AND SPECIFICATIONS

Reference has been made in this specification to the latest edition of the following codes, standards and specifications and any other relevant codes/standards,

| S. No. | Code No. | Description |
|---|---|---|
| 1 | ASME B.31.8 | "Gas Transmission and Distribution Piping Systems" – Latest edition and all Codes it refers to. |
| 2 | OISD 226 | "Natural Gas Transmission Pipelines and City Gas Distribution Network" |
| 3 | PNGRB T4S - CGD | Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Regulations, 2008 - G.S.R. 612(E) latest edition |
| 4 | IS 14885 or ISO 4437 | Specifications for PF Pipes |
| 5 | ISO 4437 Part 3 OR EN 1555 Part 3 | Specifications for PF Fittings |

Should the contractor find any discrepancy, ambiguity or conflict in or between any of the Standards and the contract documents, then this should be promptly referred to the Engineer-in-Charge (EIC) for his decision, which shall be considered binding on the contractor. For the purpose of this specification the following definitions shall hold:

- The words "Shall" and "Must" are mandatory.
- The works "Should, "May" and "Will" are non-mandatory, advisory or recommended.

## CHAPTER 2

## 2. ACTIVITIES

This specification refers to the preliminary activities to be taken prior to digging the trenches.

Prior to construction, CONTRACTOR shall submit a detailed methodology statement for OWNER's approval for installation of pipeline and cable conduit including, but not limited to the following:

- Job procedures for all activities of construction, testing and commissioning of PE pipeline.
- Job procedures for all activities of construction, testing and commissioning of GI/Cu Piping
- Inspection & Testing Plans for all activities

### 2.1. EQUIPMENT

The Contractor shall supply all equipment necessary for the execution of the Works, from survey until tests and commissioning operation, including all safety devices necessary to meet worker as well as public safety standards.

### 2.2. DRAWINGS

The contractual documents indicate the streets where pipelines are to be laid. In order to set up the pipelines routs, the Contractor shall draw-up the following documents.

2.2.1. Survey

The contractor shall carry out a complete topographical survey of each street, in accordance with the general specification "Drawings" showing in particular.

- The limits of public and private lands
- The limits of carriage-ways and side walks
- The above-grounds obstacles.

2.2.2. Construction Drawings

Onto the above mentioned survey drawings, the Contractor shall draw-up:

a) The underground obstacles

The Contractor shall carry out a subsurface inspection in order to locate the underground obstacles and the utilities in the total width of the streets, carriage-ways and sidewalks.

The Contractor shall get all available information and drawing from the authorities in charge of underground utilities such as water, electricity, communications, etc.

The Contractor shall carry out the subsurface inspection using a pipe locator and by digging trial-holes.

b) The proposed pipelines routes Public land

The pipeline shall normally be laid in public land, as follows:

- Basic grid

The basic grid pipelines shall be under the carriage-ways, except where they can be laid under the sidewalks, as are the distribution networks pipelines.

- Distribution network

The distribution network pipelines shall be under the sidewalks, not closer to the building line than one meter and to the other utilities than 0.40 meter. If not possible, as proved by trail-holes, they shall then be laid under the carriageways as close as possible to the sidewalks but not under the gutters.

Private land

In case a pipeline section would have to be laid in private land, the Contractor shall obtain from the owner the necessary written authorization on behalf and in liaison with the company, while the construction drawing is being drawn-up.

c) Pipeline equipment locations

The pipeline equipment such as valve chambers, buried valves, connecting box chambers, etc. shall be installed in public land. The pipeline equipment locations shall be shown on the construction drawings.

Whenever possible, the sight holes shall be situated at sidewalk surface level.

The drawing shall be submitted to the Engineer for approval of the survey and of the construction drawings.

The drawings shall be submitted, in the number stipulated by the special specifications at least one month before starting excavation of the streets concerned.

Approval of the drawings shall be needed for obtaining the digging permit.

Such an approval will not prevent the Engineer from ordering a change of route if unexpected above ground or underground obstacles, or any other difficulties are encountered later on.

## 2.3. PERMITS

2.3.1. Installation Permits

The Contractor shall obtain form the concerned Authorities such as the Municipality, Administrations, etc the installation permits for installing:

- stores and workshops
- material stock yards
- backfill material yards
- earth spoil dumps
- etc.

2.3.2. Circulation Permit

The Contractor shall obtain from the concerned Authorities the circulation permit for the heavy equipment (cranes, lorries, trucks, etc.) that he may wish to use during the construction of the Works.

Any damage resulting from the use of heavy equipment shall be charged to the Contractor.

2.3.3. Digging Permit

Before any occupation of public land, the Contractor shall request in writing the digging permit from the appropriate authorities, in the way and time stipulated by the special conditions and/or specifications.

2.3.4. Trial-Hole Permit

The Contractor shall request in writing the necessary trail-hole permits from the appropriate authorities in the way and time stipulated by the special conditions and/or specifications.

Moreover the Contractor shall appoint a representative who shall settle any problem raised by the occupation of public land and private land if any. In particular, he shall be in charge of making all necessary arrangements with the traffic police prior to the starting of the work and of dealing with all conflicts arising from the work process. He shall also be in change of dealing with all problems raised by the different utilities, authorities and private persons.

## 2.4. STAKING OUT

The Contractor shall give notice to the Engineer, before staking out the pipelines routes.
The pipelines routes shown on the construction drawings shall be confirmed by digging trail-holes.
The final pipeline route set-up, taking consideration of the spotted underground obstacles, shall be marked on the street surface with due agreement of Engineer-in-charge.
The staked out pipeline route shall not be altered without the prior authorization of the Engineer.

**CHAPTER-3**

# 3. SPECIFICATIONS FOR LAYING OF POLYETHYLENE MAIN AND SERVICE PIPELINE FOR PNG DOMESTIC, INDUSTRIAL AND COMMERCIAL CONNECTIONS.

## 3.1. SCOPE OF WORK

The main scope of work comprises laying, testing, and commissioning of underground Polyethylene (PE) main and service pipelines network of sizes ranging from 20mm up to 180mm Dia.

Generally the following shall constitute the Contractor's scope of work:

- Plan and prepare a schedule for execution and work implementation as per QA/QC plans to be issued by Client /PMC. Contractor has to submit the Construction/ Execution procedures before commencement of work.
- Obtaining permissions from land owing agencies for road cutting for laying of PE pipelines. Liaisoning with concerned authorities during execution of the job.
- Prior to start of Construction activities , Contractor shall carry out area and crossings survey and prepare drawings for proposed gas pipe line laying and submit to Owner /PMC for approval.
- Receipt of free issue items from clients designated stores, loading, transportation, unloading, at Contractor's stores near project sites.
- Proper storing, stacking, identification, providing security, and insurance, during storage, laying and up to handing over of pipelines.
- Making trial pits to determine the underground utilities /services such as existing pipelines, Cables (Electrical/Communication), Conduits, U/G drainage, Sewers, tunnels, Subways foundations etc, and deciding optimum routes and depths for laying the pipelines based on the layout prepared during preliminary survey.
- Obtaining the approval for optimum route and ROU from the concerned authority and EIC. Grading the ROU as per requirement for proper movement of workmen, equipment and QA/QC personnel.
- Wherever required the grass/ turfing, pavement, linings, drains roads and other such 'pucca' area shall be locally removed to facilitate trenching and pipe laying works. The same is to be reinstated as original.
- Supply & Installation of Safety/ Warning Signs, barricading of the entire route to be trenched. Pits to be similarly barricaded along the warning sign.
- To make trenches with stable slopes but restricting minimum disturbance to above ground/underground services/ installation as per specifications and approved route plans; keep the trenches free from water and soil till placement of pipes;
- Uncoiling/ stringing the PE pipes of required sizes (i.e. 20, 32, 63, 90, 125 & 180 mm) pipes into trenches as per specification.
- Joining the pipe ends with fittings and valves by approved electro-fusion techniques as per specification.

- Installation of pipe fittings/installation like elbow, tee, reducers, tapping saddles, joints, connectors, transition fittings, valves, sleeves etc. including construction of supports, valves pits, inspection chambers etc. as per specification.
- Laying pipeline using trench less technology methods with or without casing pipes as per specification and as directed by EIC.
- Supply & Laying of HDPE duct as casing pipe wherever applicable, along with PE Pipe.
- Supply of good quality GI sleeves, MS enamel coated sleeves, concrete casing pipes, sand and other material, fittings to be supplied by the Contractor as per provisions of tender.
- Back filling and compaction by jumping jack compactor using approved 'good' soil or using excavated earth or borrow earth as per requirement and specification and replacement of tiles, slabs removed during the excavation. Cleaning all unserviceable material, debris, excess earth near trenches etc. to designated disposal area.
- Carrying out pneumatic testing and purging as per specifications and approved procedures; providing all tools, tackles, instruments, manpower and other related accessories for carrying out the testing of pipes.
- Nitrogen purging (including supply), commissioning & gas charging of tested pipeline as per approved procedure.
- Restoration of existing ground features such as grass/ turfing, paving, roads, drains, concrete, floral beds, fencing, titles, flooring masonry etc. to original condition and to match with adjoining conditions- functionally and aesthetically upto the entire satisfaction of Client/MECON any other third party agency designated by Client and local authorities, failing which, it will be done at the risk and cost of the contractor. Obtaining satisfactory completion certificates for the restoration work from the concerned authorities.
- Installing of permanent site markers, warning signs, valve & valve chamber etc.
- Returning surplus material to Clients stores, reconciliation of free issue material/ consumables if supplied by Client and obtaining 'no objection certificates' from Client/PMC.
- Handing over the completed works to Client for their operation/ use purposes.
- Maintaining the completed pipelines/installation for any defect, failures during defect liability period.
- Preparation and submission of As–built drawings, details of crossings, utility graphs, measurement sheets and deviation statements on completion / commissioning of work by way of drawing, sketches and tables.
- Any other activity not mentioned/ covered explicitly above, but otherwise required for satisfactory completion/ operation/ safety/ statutory/ maintenance of the works shall also be covered under the Scope of work and has to be completed by the Contractor within specified schedule at no extra cost to Client.

The pipeline is generally laid in the ROU alongside roads. The RoU/pipeline laying permissions will be arranged by the contractor. Contractor shall carry out all necessary survey work as per requirements of site conditions. It will be the responsibility of the Contractor to maintain the ROU until completion of the work

In case of encroachment on the ROU or extra land needed during construction, it will be the sole responsibility of the Contractor to relocate all issues (including any compensation) with the relevant landowner, tenant or authorities. All related cost will be borne by the Contractor.

## 3.2. MATERIAL, MANPOWER, EQUIPMENT AND MACHINERY.

### 3.2.1. Material to be supplied by Owner as Free Issue

Unless otherwise specified, Owner will only supply material such as

- PE Pipes of sizes from 20mm up to 180mm Dia. along with meters & Regulators, DRS, MRS, SR without cover box and metering skid.
- Supply of Powder coated GI Pipes size from ½", ¾", 1", 1.5" & 12mm copper pipe
- Supply of Isolation valves: as required
- Supply of ¼" Appliance valve: as required
- Supply of Meter & regulators

All materials other than above shall be supplied by contractor as per attached technical specification to complete the laying of gas main and service pipelines.

The free issue material shall not be procured from any other source by contractor. Material reconciliation statement of free issue material duly certified by Owner/PMC shall be submitted to IOCL on monthly basis.

### 3.2.2. Material to be supplied by the contractor:

The supply of items as indicated in SOR but not limited to shall be strictly as per relevant technical specifications, Datasheet and QAP enclosed with the Tender and as per guidelines of various clauses of SCC and SOR.

Items to be Supplied by the contractor

- Supply of PE valves & fittings and transition fittings of all sizes from 180 mm to 20 mm, GI sleeves and Half Concrete Sleeves / HDPE crash guard.
- Supply of warning mat.
- Supply of HDPE duct and its associated accessories.
- Supply of all types of Powder coated GI & Copper Fittings, Brass Fittings, GI sleeves, clamps, screw, Teflon tape, meter bracket and all consumables.
- Supply of Corrugated Flexible Metal Hose (Anaconda), if required
- Supply of meter adaptors/bushes for connection if required.
- Rubber hose, clamps and all materials required for natural gas conversion.
- All PPE materials required for safe execution of projects.
- All other materials except owner supplied items required for smooth execution of project over and above as mentioned.

All materials shall be handled safely and stored in a permanent, covered, lockable store/ ware house preferably near site in such a manner as to prevent any damage to the materials from scratching, gouging, indentation, excessive heat or by contact with any sharp objects or chemicals. The PE pipes and fittings shall be stored in covered storage to protect material from sunshine, rain etc. Pipe should be stacked with clearance from ground level.

All above supply quantity as per relevant SOR item and shall be procured from owners approved vendors only after approval from IOCL/EPMC & as per instruction of Engineer-in-charge (EIC). Standard Quality assurance plans (QAP) are given in technical specifications, contractor shall take approval of QAP of contractor supplied items from Engineer-in-charge before placing PO to approved vendor(s).

### 3.3. Backfilling Material

The contractor shall be responsible to arrange the supply of approved coarse sand (size 0.6- 2 mm as per IS 383) free from any impurities like clay, mica, and soft flaky pieces, as per the instructions of EIC /Owner's representative. For supply of sand in trench for rocky terrain, no separate charges are payable and is included in rates. Also supply of sand in valve chambers, Normal surface & built up surface, if required, as per the instructions of EIC is not separately payable.

In case specified trench, depths are not achieved or if directed by Engineer-In Charge Contractor has to provide concrete casing pipes/ slabs or cement concrete, without any cost implication to Owner.

Other materials: The contractor shall supply the following items wherever required:

- All materials required for framework, trench support and temporary trench Crossings.
- All sign boards, barricades, tin sheets, lighting arrangement and protective equipment.
- All minor items not mentioned in the specification but necessary for the satisfactory completion and performance of the work.
- Material required for installation of valve chambers.
- GI, Half Round Concrete Sleeves, HDPE/Concrete Crash guard.
- Permanent markers
- Warning Mat

### 3.4. Manpower

The contractor shall provide the skilled labour, tools, material and equipment necessary for the proper execution of the work.

### 3.5. Equipment, Machinery &Tools

This will include but is not limited to the list of specialized items included in Annexure# I

All vehicular type machinery shall be in good working order and shall not cause spillage of oil or grease. To avoid damage to paved surfaces, the Contractor will provide pads of timber or thick rubber under the hydraulic feet or outriggers of machinery.

Contractor must also have to arrange his own equipment for restoration work like water tanker and jumping jack compactor for compaction of backfilled trenches and roller and other required equipment/ machinery for asphalting/ road works.

In case there is non-availability of approved equipment's, tools and tackles during the work at site, suitable penalties, as per special terms and conditions of the contract, will be levied and deducted from the running bills.

### 3.6. Acquisition, Receipt & Storage of Materials

The Contractor shall collect all materials from IOCL during stores working hours following all documentation procedures laid down and as directed by the EIC. The Contractor shall carry pipe in such a manner as to preclude damage during transportation and handling. PE pipes supplied in straight lengths may be carried in straight pipe racks.

The contractor shall at the time of receipt of material physically examine all materials and notify the EIC immediately of any damage or defect noticed by the contractor. Any damage not so recorded will be deemed not to have existed at the time of receipt of material by the contractor and the cost of repair or replacement or rectification shall be borne by the contractor. Any material once issued from IOCL store, if found in non-working condition at site shall be brought to the notice of EIC with PO reference in written within 15 days and after subsequent approval shall return defective material in IOCL stores within 30 days.

If delay is more than 30 days and material is under warranty, the material will be accepted with a penalty, else the material will not be reconciled and amount of the same will be deducted from bills. Penalty shall be levied as per SCC. The contractor shall ensure that no defective material shall be returned to store at the time of closure of contract. The format for defective materials returning to stores will be made available by EIC. The contractor shall maintain locked store preferably near at site so that all the materials are stored in such a manner so as to prevent any damage to the materials from scratching, gouging, indentation, excessive heat or by contact with any sharp objects or chemicals. The PE pipes and fittings shall be stored in covered storage to protect material from sunshine, rain, water logging etc. The contractor shall make adequate security arrangements for the stacked material & any loss to the material on account of theft on improper storage is attributable to the contractor.

The Contractor shall maintain log book at their respective stores stating issue and availability of free issue material at a given day. Further, it is mandatory that the contractor is required to undertake and submit inventory details of free issue and purchased materials on monthly basis to Owner/ Owner's representative as per the approved format of the owner. The inventory details shall be in correlation with the Daily progress chart and material reconciliation sheet.

In case of non-submission of material reconciliation on first week of every month, applicable penalties shall be levied as per SCC from the running bills. In case if shortage in free issue material is observed at the time

of quarterly physical verification by IOCL, equivalent value of material found short shall be withheld from running bills, same shall be released after settlement of free issue material.

### 3.7. PROGRESS OF WORK

The contractor shall proceed with the work under the contract with due expedition and without delay. The EIC may direct in what order and at what time, the various stages or parts of the work under the contract shall be performed. Contractor has to regularly submit daily progress reports, weekly progress reports, graphs with utilities, testing reports, material consumption and inventory reports, deviation statements, completion schedule etc.

### 3.8. APPROVALS & PERMISSIONS FOR PIPELINE LAYING

Contractor has to coordinate for obtaining permissions from statutory bodies for laying of pipelines. Statutory bodies in this case are ,Municipality PWD, NHAI, CPWD, AAI, Indian railways, Local development authority, RWA, Individual housing and any other government agencies who maintain the public lands and accord permissions for laying of the utilities. The contractor shall obtain demand note (road restoration charges) from these statutory bodies. Contractor shall ensure that the road restoration charges are to the minimum against the work to be carried out. IOCL may return back the demand note, if the Road Restoration charges are not found reasonable then OWNER shall not be liable to pay any Road Restoration Charges against the same to Concern Authority.

However, IOCL will pay the Statutory charges like permission charges / Departmental charges / security deposit/ Bank guarantees for getting the clearances from statutory bodies. It is the contractor's responsibility to inform and co-ordinate the concerned local authorities and also other utility agencies before and after the commencement of work at site. To ensure smooth execution of the work on a day-do-day basis, the contractor has to liaison with respective authorities. The contractor shall plan and ensure that work taken up under a single permission shall be completed within the stipulated time period and revalidation process is avoided. No separate liaison charges are liable to OWNER for revalidation cases.

It is the responsibility of the contractor to obtain "No Objection Certificate" (NOC) from land owing agencies/ Statutory bodies after completion of the restoration to their satisfaction and getting released the security deposit/ bank guarantees submitted by IOCL for obtaining permissions on production of documentary evidence. Separate payment in running meters will be made on account of approvals/ permissions as per the SOR. In case of any deviation/ additional laying, IOCL shall pay the additional Road Restoration Charges only after receiving of revised estimate and further to written confirmation from the Engineer in- charge.

On behalf of the Owner, contractor shall prepare in advance and submit the proposed route plan complete in all respect and well ahead of time so that the actual construction work is not delayed because of approval/ inspection/ permission by concerned authorities. Further, the contractor shall also coordinate with the relevant authorities for necessary approvals of these proposed pipeline route drawings/ certificates. The inspection of work by statutory authorities shall be the responsibility of the contractor without any extra cost to IOCL.

In case contractor delays laying of pipeline work under a single permission, the work or part of work may be offloaded to some other contractor on his risk and cost. Any change / addition required to made to meet the requirements of the statutory authorities shall be carried out by the contractor without any extra cost to IOCL. The inspection and acceptance of the work by statutory authorities shall however, not absolve the contract from any of his responsibilities under this contract.

### 3.9. REFERENCE SPECIFICATION, CODES AND STANDARD

The contractor shall carry out the work in accordance with the requirement of latest relevant applicable standards, this specification, Owner's Engineering Standards; relevant Oil Indian Safety Directorate (OISD) norms, PNGRB Regulations, ASME B31.8-Gas Transmission and Distribution Piping Systems; Australian Standard 3723-Installation and Maintenance of Plastics Pipe Systems for Gas; and the American Gas Association Document - Purging Principles and Practice. IS0-4437/JS: 14885 for underground polyethylene pipes and OWNER’s approved procedures.

Should the contractor find any discrepancy, ambiguity or conflict in or between any of the standards and the contract documents, then this should be promptly referred to the Engineer-In-Charge (EIC) for his decision, which shall be considered binding on the contractor.

### 3.10. QUALITY OF WORK

All works carried out under this contract shall confirm to applicable standards, codes of practice, construction procedures and other technical requirements as defined in the technical specifications.

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

Fusion operators and other skilled personnel shall be approved by Owner/ Owner’s representative and identification cards duly signed by EIC shall be issued to them. Only those personnel who are approved by shall be allowed to execute the critical activities like electro fusion jointing of MDPE pipes & fittings. IOCL may provide training and certification on chargeable basis where the cost shall be borne by contractor.

### 3.11. SAFETY

The Contractor shall conform to the safety requirements outlined elsewhere in the tender document. In addition, the Contractor shall observe safe working practices in the storage and handling of cleaning fluids, flammable fluids, etc., and ensure smoking or naked flames are not permitted in the vicinity when these materials are being used.

Trench walls shall be battered with sufficient slope in order to minimize a trench collapse. Where there is a danger of an earth slide or collapse, the trench shall remain open for the minimum time possible with proper barricading. The Contractor is to ensure that no person enters a trench, which is of a depth of 1.5 meters of greater, unless the trench has adequate shoring or the sides are battered to such an extent as to prevent a trench collapse.

The Contractor shall also protect all work sites with warning signs, barricades and night lighting. The Contractor shall inspect all fenced excavations daily, and maintain them in good order.

The trenches/ pits shall not be kept open in night times. However, in case the same is essential the same shall be properly barricaded with proper lighting arrangements & manned.

The Contractor shall provide PPE's like helmets, safety shoes, etc. to the labour which are necessary for safe working practice.

Any accident causing injury to any person or damage to property or equipment shall be reported to the EIC and the cost of repair / replacement of the damage equipment shall be borne by the contractor.

Where the EIC determines that the work is being performed by the Contractor in an unsafe manner, he may suspend the Work until corrective action is taken by the Contractor.

PPE, Continuous Barricades and caution tapes along the trenches as per approved drawing in tender, Use of Safety Boots, Hand gloves, Reflective jackets, Hard hats(helmets), Safety shoes, eye and ear safety equipment, Fire extinguishers and as per the detailed scope of work & HSE specifications. Contractor shall be paid as per SOR, measurement sheet of PE laying should also include length of barricading. Refer relevant drawing attached in this tender . For further details Refer "Special conditions of Contract" & SOR.

## 3.12. ROUTE SURVEY

Planning, detailing the size, route survey drawings, identification of underground utilities, foreign pipelines, crossings, and location of valve chamber, DRS as well as service line location is in scope of contractor.

**Mainlines**

The final alignment of mainlines will be worked out at site in consultations with the Owner/ Owner's representatives after route survey and trial pits, at contractor cost. Any change in routing from the approved plans due to site constraint will be notified to EIC & his specific written approval shall be obtained before carrying out the job.

**Service lines**

Consultant/ Third Party Inspection Agency and the contractor will conduct a joint survey at each probable premise/ housing colony/ pockets/ area to be supplied with Natural Gas. The survey record will note customer's detailed potential gas supply points, proposed regulator positions and estimates of material quantities. The contractor's representatives will make sketch of the agreed pipe routes.

The contractor will be responsible for contacting the customer and making the necessary arrangements for access and appointments to carry out the work. Contractor shall maintain job card and complaint books at site. Owner will not be responsible for time lost due to failed appointments or disputes with customers.

## 3.13. ORGANISATION STRUCTURE

Contractor shall designate Project Manager / Coordinator who will be responsible to interact with EIC/ Consultant/ TPIA and authorized to attend review meetings, receive material, authorized to sign documents, claims and receive payments etc. Contractor shall employ a Project Manager Coordinator on company roll. Project manager / coordinator & Site Engineers on company roll. The Project Manager/ Coordinator must have qualification of BE Mech. /Diploma in Mech. Engg. with min. 2-5 years & Site Engineer must have minimum Diploma in Mechanical Engineering with 3 years of work experience in gas pipe line job. He shall be single point of contact for all the works and must represent company in the review meetings.

All construction work will be carried out as per direction of EIC, and this will be the primary point of contact between the contractor and Owner on site. All work will be issued and sanctioned through the EIC and site control exercised by Site Engineers. The contractor shall ensure that technical quality standards are maintained that construction is carried out cost effectively and that a good customer and public image is maintained for Owner.

The contractor will deploy his own supervisors as directed by site engineers/EIC. These personnel will be reporting to the Site Engineer for monitoring construction standards and for ensuring that all technical requirements are met for the job being carried out. The contractor's supervisor(s) will have day-to-day liaison with the Site Engineer and will provide the Site Engineer with technical reports and audits, and other management information as is required on work progress and construction quality standards.

The contractor's supervisor shall have mobile telephones to ensure that they can be contacted at all times. The contractor will also nominate one person who can be contacted if necessary, in odd hours, for the duration of the works. The contractor's supervisor will have access to transport at all times to allow them to visit sites and attend meetings with Owner. Supervisor shall attend to normal day-to-day issue of work instructions, communication between Owner and the contractor's supervisor and the Site Engineer.

Contractor shall maintain a Customer Care Centre, Project Site Office, and Material Store in their allotted site with following facilities:

- Telephone, Mobile Phones, Fax machines, Printers/ Scanning/ Xerox machines, Computers with internet facility.

- One Nos. - Four-wheeler with driver, he shall be well equipped with tools and tackles for attending any emergency complaints and ongoing execution work.

- On award of the contract, the contractor shall establish and submit documentary evidence for above, which will be verified by the owner before award of the work order.

**STRUCTURES, SERVICES AND OTHER PROPERTY**

### 3.14. Location of Underground Utilities

The contractor shall locate all buried utility pipes, underground cables, water mains and other obstructions intersecting or adjacent to the Works and shall make available the necessary labour to expose and record the depth of cover over all obstructions in advance of excavation. This shall be done far enough in advance of excavation to facilitate gradual change in grade or position found necessary to clear any obstructions.

In addition, the contractor shall excavate trial pits as necessary to determine the pipe route. The number of trial pits will be agreed with the Site Engineer in advance of any excavation. In any event, trial pits shall be made at intervals of a maximum of 30 meters. Restoration of the abandoned trial pits and trenches shall be the contractor's responsibility. No payments shall be made for such type of jobs. The trial pits shall be excavated to minimum depth of 1.5 meters so as to locate any utilities present in the trench.

It is contractor's responsibility to interact with other utility agencies regarding their existing utilities and finalize the route along with these agencies and Owner/ Owner's representative.

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

Contractor must ensure that before starting the execution of lying of pipeline, the intimation/information must cascade to all utility's agencies seeking the information about the existing utility in the proposed route.

### 3.15. Protection of Structures and Utilities

The Contractor shall at his own cost support and protect all buildings, walls, fences or other structures and all utilities e.g. Electrical cables, Telephone Cables, Water pipelines, Sewer pipelines etc., and property which may be damaged as a result of the execution of the works. He shall also comply with the requirements in the specification relating to protective measures applicable to particular operations or kind of work. Special care shall be taken while laying of pipelines near the trees.

### 3.16. Interference with Traffic, Street Drainage and General Public

The Work shall be executed in such a manner so as to cause a minimum inconvenience to persons using public or private roads, lanes, thoroughfares, walkways, rights-of use or passages through which the Works are to be executed. The trench shall be back filled; compacted, leveled and extra soil shall be removed immediately after laying of pipeline to avoid public inconvenience. Closure of roads, etc., shall not be permitted without the approval of the EIC.

The Contractor shall comply with all local Authorities requirements to traffic and keep roads open to traffic and maintain access to and within any private property.

Wherever the pipe route crosses driveways, access tracks or entrances to private properties the Contractor shall give the owner, occupier or relevant authority at least 24 hours prior notice of intended commencement of excavation and shall be restricted to pass through.

The Contractor shall not use a private driveway, access track or entrance without the prior approval of the EIC in any circumstance.

The Contractor shall provide suitable access wherever necessary in the form of temporary bridges, culverts, flumes, etc., of a size and type approved by the EIC.

The Contractor shall comply with all relevant road Laws. Where limits and/or speed limits have been placed in the vicinity of the Works, the Contractor shall provide for the necessary movement of plant and equipment in accordance with the requirements of the relevant authority.

The Contractor shall not obstruct any drainage pipes or channels in any road but shall divert them wherever necessary and use all proper measures to provide for the free passage of water.

The Contractor shall handover the completed works after proper cleaning of the site.

The contractor shall conduct his operation at all times, with a view to minimize as far as practicable noise and other objectionable nuisances (e.g. oil leakage, spillage, debris etc.)

## 3.17. TRENCHING

The schematic drawing with the details of trench is enclosed in the tender.

The Contractor shall perform the excavation works so as to enable the pipe to be laid in conformity with the levels, depths, slopes, curves, dimensions and instructions shown in the Drawings, Specifications or as otherwise directed by the EIC.

Contractor shall excavate and maintain the pipeline trench on staked center line as per approved drawing taking into account the horizontal curves of the pipelines.

While trenching, care shall be taken to ensure that all underground structures and utilities are disturbed to the minimum. Suitable crossing shall be provided and maintained over the ROU wherever necessary to permit general public, property owners or his tenants to cross or move stock or equipment from side of the trench or another.

Trenching shall be made with sufficient slopes on sides in order to minimize collapsing of the trench. On slopes wherever there is danger of landslides, the pipeline trench shall be maintained open only for the time strictly necessary. Owner may require excavation by hand, local route and detouring and limiting the period of executing of the works. Before trench cuts through water table, proper drainage shall be ensured, both near the ditch and ROU in order to guarantee the soil stability.

The Contractor shall ensure that trench bottom is maintained in the square form as far as possible, with equipment, so as to avoid/minimize the hand grading at the bottom of the trench. The Contractor shall do all such handwork in the trench as required to free the bottom of trench from loose rock, pebbles and to trim protruding roots the bottom and sidewalls of the trench.

### a) Depth of Trench

The minimum depth of cover shall be measured from top of pipe to the top of undisturbed surface of the soil or top of the graded working strip or top of road or top of rail, whichever is lower.

In case of crossing of water bodies, the minimum depth shall be measured from the top of the pipe to the bottom of Scour level.

The depth of the trench will be such as to provide minimum cover as stipulated below: For Distribution main and service lines Minor Water Crossing/Canal

| Location | Minimum Depth of Cover |
|---|---|
| Minor Water Crossing/Canal | 2.0 Meter |
| Uncased/Cased Road Crossing | 1.2 Meter |
| Rail/Road Cased Crossing | 2.0 Meter |
| Normal Areas | 1.0 Meter |

The minimum depth may be greater than as mentioned above as may be required by Government/Public authorities under jurisdictions. The Contractor shall perform such work without extra compensation, according to the requirement of concerned authorities/PNGRB.

In case of Drains/ Culverts/ Utilities crossing through open cut where excavation cut is more than 1.5m, the extra excavation is inclusive in the laying rates. No separate payment is chargeable for extra excavation and includes backfilling as well.

In case, the depth could not be achieved due to practical problems and the same is demonstrated, EIC after examining thoroughly and considering the codes and standards may allow the contractor to provide suitable protection by way of concrete casing pipes or slabs. No separate payment will be done.

**b) Width of Trench**

The width of the trench shall be wide enough to provide bedding around the pipe as specified and to prevent damage to the pipe inside the trench. Unless otherwise directed by the EIC and where ground conditions permit, the minimum distance from the inside edge of the trench wall to the outside of the pipe shall be as per relevant drawing attached in this tender..

**c) Trench Base**

The trench bottom shall be cut or trimmed to provide a uniform bedding for the pipe and shall be free from stones, metal, wood, vegetation, clods of earth or other debris before placement of the pipe.

In case trenching is done in rocky terrain, a bedding of soft soil or sand shall be provided in the trench base at no extra cost to the satisfaction of EIC.

**d) Hard Rock:**

Hard rock is defined as trench material with a single piece of rock, dimension exceeding 1.0 m in any direction, which requires cutting only by use of chisel/ pneumatic chisel/ drill or sledge hammer or removal of the same by additional excavation technique approved by EIC. Additional rates shall be payable for hard rock excavation as per the SOR over and above the pipeline laying rates. Excavation through soil mixed with

small boulders that have been used for a road base will not be considered as hard rock for the purpose of payment.

**e) Clearances**

Unless otherwise approved, the following clearances shall be maintained between the external wall of the gas pipe and the external surface of other underground assets/utilities in the vicinity of the Works.

- 150 - 300 mm where the gas pipe crosses other assets/utilities, etc., for electric cables, the clearance shall be 300mm minimum or special protection shall be provided as per approval of EIC.

- 300mm where the gas pipe is on a similar alignment to the other assets/utilities. Where the above clearances cannot be achieved, or in other special circumstances, the EIC may approve/specify protection with concrete/MS coated pipe, etc. The protective material shall be supplied and installed by the Contractor at his cost subject to discretion of EIC.

**f) Under Ground Interferences**

The Contractor shall locate and expose manually all underground facilities if any during trenching. Safety barriers shall be erected along the trench to prevent any damages or accident. On locations where pipeline is laid under the existing facilities and near the approaches of the crossing, the trench shall be gradually deepened to avoid sharp bends.

All sewers, drains, ditches and other natural waterways encountered while trenching shall be maintained open and functional by providing proper temporary installations if required. Suitable dewatering pumps shall be deployed to dewater, if required.

Whenever it is permitted by Authorities and /or Owner to open cut paved road crossing, or where the line is routed within the road pavement, the Contractor shall remove the paving in accordance with the restrictions and requirements of the authorities having jurisdiction thereof as directed by Owner. After laying the pipeline, backfilling shall be immediately performed, and all the areas affected connected with the excavation works shall be temporarily restored.

In case of damage to any of above referred structures/utilities the Contractor shall be responsible for repairs/replacement at his own cost, which shall be carried out to the satisfaction of concerned authorities, resident and Owner.

**g) Others**

Throughout the period of execution of such work, the Contractor shall provide and use warning signs, traffic lights or lanterns, barricades, fencing, watchman etc. As required by the local authorities' jurisdiction and/or Owner.

For all roads, paths, walkways etc. which are open-cut, the Contractor shall provide temporary diversions properly constructed to allow the passage of normal traffic with the minimum inconvenience and interruptions.

The paving shall be resorted to its original condition after the pipeline is installed.

The Contractor shall excavate to additional depth at all the points where the contour of the earth may require extra depth, or where deep trench is required at the approaches to crossings of roadways, railroads, rivers, streams, drainage and ditches without any extra cost implication to Owner.

The Contractor shall excavate all such aforesaid depths as may be required at no extra cost to Owner. The trench shall be cut to a grade that will provide a firm, uniform and continuous support for the pipe.

The Contractor shall take conducive measures to ensure the protection of underground utilities as per the instructions of Owner or relevant authorities.

Where the pipeline crosses underground utilities/structures, Contractor shall first manually excavate to a depth and in such a manner that the utilities/structures are located, then proceed with the conventional methods.

The locations, where the pipeline has to be laid more or less parallel to an existing pipeline cable and/or other utilities in the Right-of-way the Contractor shall perform the work to the satisfaction of the Owner of the existing pipeline/cable/utility. In such locations, the Contractor shall perform work in such a way that even under the worst weather and flooding conditions, the existing pipeline/utilities remain stable and shall neither become undermined nor have the tendency to slide towards the trench.

**h) Bedding**

The Contractor shall ensure that the pipe when placed in the trench is supported and surrounded by a bed of screened excavated soil, which shall be stone free and have a maximum grit size of 5mm, in order to ensure no damage occurs to the pipe. However, in case of rocky soil the bedding shall be done with approved good quality packing sand subject to the approval of the Site Engineer. The packing sand shall be placed to a minimum thickness of 150mm around the pipe in case of rocky terrain.

Unless directed by the EIC the quantity of bedding and surrounding sand shall confirm specifications. There shall be no void space in the packing sand around the pipe.

## 3.18. LAYING

**a) PE Lines**

Laying of PE pipelines shall be commenced only after ensuring proper dimensions and clean surface of the trench. The trench bottom shall be free from the presence of cuts, stones, roots, debris, stakes, rock projections up to 150mm below underside of pipe and any other material, which could lead of perforation/tearing of the pipe wall. After ensuring above, the PE pipe coil shall be uncoiled smoothly through proper equipment's/care before laying pipe inside the trench ensuring no damage to pipe.

The contractor must ensure that Pipe caps are provided before lowering of Pipeline. The trench after this can be released for back filling leaving adequate lengths open at the ends for jointing.

Contractors shall ensure open ends of pipe placed in the trench shall be securely capped or plugged to prevent the ingress of water or other matter. The Contractor is to ensure that nothing enters inside the pipe during the laying process as this could cause a future blockage or regulator malfunction due to dust, etc.

In case of open cuts and moiling, where two pipes are to be laid parallel in same trench or same pits, 30% of the respective SOR of the lower size pipe for the laid length shall be paid additionally to the rates applicable to the higher pipe size.

As per PNGRB, Valves are to be provided at every Km in PE main pipeline. The above spacing, however, may be increased or decreased based on risk assessment and to allow location of valve at an easily accessible location as directed by the EIC.

Valves shall be installed at locations shown in the Design Plan or as directed by the EIC and joined with PE pipes by electro fusion techniques. The valves shall be placed on a concrete square block at the bottom to achieve equivalent support of the incoming and outgoing pipe.

Laying graphs/As-graphs with details of depth, length, offsets from minimum three (03) fixed different references, other utility crossings, fittings, sizes of the casing pipe used for the pipeline shall be prepared on daily basis and to be submitted to IOCL representative/ EIC for approval. These details will further be incorporated in to As-Built Drawings.

Pipe may pass through an open drain or nallah with prior approval from EIC. Where this is permitted, the PE pipe shall be installed inside a casing pipe (i.e. HDPE, GI concrete ) for protection. Payment will be made as per relevant SOR item The Casing material shall be procured and laid by the Contractor as per technical specification with prior inspection and approval of the EIC for the quality of material. In general, the GI Sleeve material specification shall be confirming to IS 1239 (Heavy Duty) specification of reputed make under the vendor list attached in tender & approved by EIC; In case of service line laying, where the excavated pit for mainline is used for laying of service line, the length of service pipe laid in the same pit and vertical pipe which rises out of the ground with transition fittings shall be paid as per SOR. The contractor shall excavate a minimum pit of size 0.5 meter x 0.5 meter (L X W) on any kind of surface along the wall at the customer premises for the service pipe which rises out of the ground with transition fittings through GI pipe sleeve/ Half Round Concrete sleeve. This excavation along with other work necessary to break through the walls of the obstruction, insertion of PE pipe, sealing of the annulus between the pipe and the sleeve, sleeve and the wall, installation of sleeve, making of pedestal as per relevant Drawing No min. Size 300 x 150 x 150 mm for GI Sleeve, min. Size 550 x 230 x 150 mm for Half Round Concrete Sleeve. and simultaneous restoration of these pits shall be deemed included in the laying rates of pipes respectively. GI Sleeve / Half round concrete sleeve rates are included in PE Laying rates of relevant SOR item ,No separate payment shall be paid by the owner . The material shall be inspected by TPIA / Consultant before installation. Also, the material test certificates, inspection reports approved by TPIA/ Consultant shall be submitted at the time of submission of bill. Any installation without inspection & approval may lead to penalties as per Special Conditions of Contract.

In case of service lines, EIC shall decide either half round concrete sleeve or GI pipe sleeve shall be installed at any particular site depending upon site condition. The half round concrete sleeve shall be preferred over GI Sleeve, however in case where the installation of half round Concrete Sleeve is not possible due to

technical feasibility and site conditions, GI sleeves shall be installed only after written approval from EIC. The rate of GI Sleeve / half round concrete sleeve shall be included in laying of 20/3232 mm dia. As per SOR depending upon surface conditions. The details are mentioned below:

**b) GI Sleeve**

The contractor shall supply the minimum dia. Size of 2.5" & 3", 300 mm in length, GI sleeves (Heavy Duty reputed make) respectively for domestic & commercial / industrial installations. The material shall be inspected by TPIA / Consultant before installation. The material test certificates/ inspection reports shall be submitted at the time of submission of bill. The material shall be inspected by TPIA/ PMC before installation.

A bending tool shall be used to bend the GI sleeve pipe so that it has the appropriate curvature and is free of kinks. The installation of GI sleeve for service lines shall be done by sealing the annulus between pipe and sleeve, firm fixing of the GI sleeves by concrete mix pedestal, clamping, sand filling, etc.

The vertical portion of the sleeves shall be fixed to the wall of the premises in a secure manner. The Service lines shall be installed in accordance with the drawing enclosed in the tender.

**c) Half Round Concrete Sleeve**

The installation of Half Round Concrete sleeve for service lines shall be done by sealing the annulus between pipe and sleeve, firm fixing of the Concrete sleeves by concrete mix pedestal, clamping, sand filling, etc. Half round concrete sleeve shall be made as per attached drawing and as per instruction of EIC. The dimensions shown are tentative and may vary depending upon the site conditions. The material shall be inspected by TPIA / Consultant at the fabrication stage & prior to final dispatch at site for installation. The material test certificates/ inspection reports shall be submitted at the time of submission of bill.

**d) Crash Guard/Crush Guard/ Half Round Concrete Sleeve: - (For O&M and Project)**

The installation of pre-cast RCC crush guard/HDPE Crash Guard over Half Round Concrete Sleeve/ Pedestal shall be done by installing it resting on wall of building by fixing it with grouting nut and bolts in wall that may be detached during the event of leakage/testing. The material shall be inspected by TPIA / Consultant at the fabrication stage & prior to final dispatch at site for installation. The material test certificates/ inspection reports shall be submitted at the time of submission of bill.

The Crush Guard shall be installed in accordance with the drawing enclosed in the tender as per instruction of EIC.

## 3.19. LAYING OF SERVICE LINE IN PROJECT AND O&M AREA:

O&M area shall be defined as those areas where PE line is already charged and handed over to owner.

Laying of pipeline (for 20 & 32mm) in all type of surface i.e. all kinds including Kuccha, metal, concrete (PCC/RCC), bituminous, tiled, brick lined etc. after racking up of hard surface of any type by any methodology. Roads, Pavement, Footpaths etc. shall be made memorable once the pipeline is laid. Supply & installation of GI Sleeve / Half round Concrete sleeve is included in laying rates of 20mm/32mm. The rate

includes liasoning with statutory bodies and no separate rates are payable. Wherever service lines are to be laid after dismantling nallah / drain, additional cost for dismantling and repairing shall be payable under the relevant SOR.

### 3.20. PE PIPELINE LAYING (20MM / 32 MM / 63MM) IN ALREADY EXCAVATED TRENCH IN BUILDER SEGMENT

Scope includes laying of MDPE pipeline in already excavated trench with or without casing; insertion of the carrier pipe in casing pipe (on case to case basis) laying of warning mat electro-fusion of joints and re-installation of pre-cast slabs as per specification after instruction of EIC / Site Engineer of Owner.

In Case sand filling is also required, shall be done as instructed by EIC/IOCL representative and paid as per relevant SOR item.

### 3.21. JOINTING OF POLYETHYLENE PIPE

The procedure for jointing of PE pipe, valves and fittings machines as per Standard Specification for ELECTROFUSION FOR PE PIPES AND FITTINGS which is a part of tender document. **Only Bar coded into electro-fusion machines (Automatically Readable) which can read the bar code of the fittings and valves automatically shall be used for joining of the PE pipes/ Valves & fittings**. Manual feeding Electro-fusion machines are not acceptable for jointing purpose. The contractor has to submit the certificate of calibration of electro-fusion machine at the time of start of work and at fixed intervals as per the instructions of Owner. Contractor shall ensure that the machines are always available at site. No stoppage of work due to the non-availability of machines shall be allowed.

The contractor shall flush the Pipeline with air to remove dust, water, mud etc. before fusing the joints. Before jointing, the Contractor shall place packing sand under the pipes on both sides of the joint to keep the pipes in line and at the correct alignment during the jointing process. The jointing process shall start only after Alignment clamps with the correct size are aligned with the pipe and coupler during the electro-fusion cycle.

The Contractor shall ensure that polyethylene pipe is only cut with an approved plastic pipe- cutting tool (refer Annexure-I). Before fusion is attempted, the contractor shall remove the oxidized surface of the pipe using Universal Scrapper up to 63mm/ Rotary Peeler for 63 mm and above before inserting into the electro-fusion coupler. The tool must remove a layer of 0.1mm to 0.4mm from the outer surface of the polyethylene pipe. The pipe shall be cleaned for all grease/scale/dust using acetone and cloth. **No fusion will be allowed without clamping device and the approved cutting tools (Hack saw shall not be allowed for cutting the pipe).**

The contractor has to supply all the consumables required for carrying fusion of the joints (like tissue paper, napkin, acetone etc.).

If, upon inspection, the EIC determines a joint is defective, Contractor shall remove the joint by an approved method. The cost of replacing joint shall be borne by the Contractor including the cost of pipe and fittings removed.

For electro-fusion joining, the contractor must bring own tools, tackles and equipment. Only, approved Jointers shall carry out fusion of all joints. Contractors shall provide the list of jointers to be used on the job and make arrangements for Qualification Testing of the jointers in presence of Owner / Owner's representative as per the standard procedures. All approved Jointers shall bear identity cards signed by Owner / Owner's representative during fusion job and shall furnish the same on demand by Owner / Owner's representative. Applicable penalties shall be levied, in case; it is found that fusion is being carried by non-qualified jointers as per the provisions made in Special Conditions of the Contract.

Contractor shall arrange generator along with voltage stabilizer for power supply to fusion machine. Taking power connection form electric poles, connections without written permission from the concerned authorities or residential premises is strictly not permitted.

Electro-fusion jointing machine of approved make & model shall be used by contractor. Contractor shall take approval of EIC for jointing machine proposed to be used in the project. Electro-fusion jointing machine shall be calibrated annually or as recommended by OEM. **In no case Electro-fusion jointing machine without calibration validity shall be used for Electro-fusion jointing.**

### 3.22. BACKFILLING

Backfilling shall be done after ensuring that appurtenance have been properly fitted and the pipe is following the trench profile at the required depth that will provide the required cover and has a bed which is free of extraneous material and which allows the pipe to rest smoothly and evenly. Dewatering shall be carried out prior to backfilling. No backfilling shall be allowed if the trench is not completely dewatered.

Prior to backfilling it should be ensured that the post padding of compacted thickness 150 mm is put over and around the pipe immediately after lowering where required.

Backfilling shall be carried out immediately after the post padding where required has been completed in the trench, inspected and approved by Owner/ Owner's representative, so as to provide a natural anchorage for the pipe avoiding sliding down of trench sides and pipe moment in the trench. If immediate backfilling is not possible, a padding of at least 300mm of earth, free of rock and hard lumps shall be placed over and around the pipe and coating.

The backfill material shall contain no extraneous material and/or hard lumps of soil, which could damage the pipe and/or coating or leave voids in the backfilled trench. In case, it is required and directed by EIC screening of the backfill material shall be carried out with specified equipment before backfilling the trench.

The surplus material shall be neatly crowned directly over the trench and the adjacent excavated areas on both sides of the trench to such a height which will, in Owner/Owner's representative opinion of provide adequately for future settlement of the trench backfill during the maintenance period and thereafter. The down shall be high enough to prevent the formation of the depression in the soil when backfill has settled into its permanent position should depression occur after backfill, Contractor shall be responsible for remedial work at no extra cost to Company. Surplus material, including rock left from this operation shall be disposed off to the satisfaction of landowner or authority having jurisdiction at no extra cost to Owner.

Where rock, gravel, lumps of hard soil or like materials are encountered at the time of trench excavation, sufficient earth, sand or select backfill materials shall be placed around and over the pipe to form a protective cushion extending at least to a height of 150 mm above the top of the pipe. Select backfill materials for padding that area acceptable shall be soil, sand, clay or other material containing no gravel, required selected backfill material has been placed, provided the rock or lumps of hard soil. The padding earth shall not contain any stones, i.e. the earth shall be screened for sand padding of the Pipeline in order to avoid damage to the pipeline. Contractor shall carry out all these works at no extra cost to Owner. Loose rock may be returned to the trench after the required selected backfill material has been placed, provided the rock placed in the ditch will not interfere with the use of the land by landowner, or tenant.

In case where hard rock is encountered or as desired by EIC / site engineer sand padding is to be provided up to height of 150 mm around the pipe.

When the trench has been dug through driveways or roads, all backfilling shall be executed with sand/ suitable material in layers as approved by Owner /Owner's representative and shall be thoroughly compacted. Special compaction methods as specified may be adopted. All costs incurred there upon shall be borne by the Contractor. Trenches excavated in dikes which are the properties of railways or which are parts of main roads shall be graded and backfilled in their original profile and condition. If necessary, new and/or special backfill materials shall be supplied and worked-up to.

PE Warning Grid/ Mat shall be placed on distribution main and service line inside premises, after backfill of the trench up to a height of 300mm on the top of the carrier pipes. The warning grid is to be unrolled centrally over the pipe section and thereafter further backfilling will commence.

Backfilling activity shall include proper compaction by jumping jack compactor, wherever required and as per instruction of EIC, and watering in layers of 150mm above the warning mat. Proper crowning of not more than 150mm shall be done. All the excavated material that could be used during the Restoration process shall be stacked and kept separately and properly. Wherever Road cutting/Tiles removal/PCC cutting has been done during excavation for laying, the area shall be back filled and compacted immediately so that no inconvenience is caused to the general public.

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

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

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

### 3.23. MOLING

The Manual Moling shall be carried out as per the requirement specified by Owner / Owner's representative and approved procedures. The contractor has to carry out survey of the underground utilities before going for the Moling to avoid any damage to other utilities. No extra payment will be made for any trial/abandoned pits made during the survey. The supply of all equipment required for carrying out moling work is in

contractor's scope. The type of moling to be carried out i.e. with or without casing shall be at the discretion of Owner and prior approval is to be taken before starting the Moling.

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

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

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

### 3.24. HORIZONTAL DIRECTIONAL DRILLING (HDD)

The primary method of laying of PE line should be by open cut or moling.

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

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

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

The length of the Hole (excluding the sizes of the pits on both ends) shall be considered for the measurement of HDD length. The rates for HDD, as indicated in relevant SOR item i, as applicable on the site conditions, are payable as per the size of the carrier pipe and inclusive of excavation of pits, jointing, pilot boring, bentonite cleaning, reaming, insertion of carrier pipe, backfilling, compaction, etc.

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

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

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

### 3.25. CASING PIPE

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

| S. No. | MDPE Carrier Pipe Dia. size (mm) | Min. Dia. of HDPE Casing Pipe (mm) | Max. Dia. of HDPE Casing Pipe (mm) |
|---|---|---|---|
| 1 | 20/32 | 63 | 75 |
| 2 | 63 | 125 | 160 |
| 3 | 90 | 180 | 200 |
| 4 | 125 | 200 | 250 |
| 5 | 180 | 300 | 350 |

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

### 3.26. RESTORATION

Wherever the restoration to the original surface condition is in the scope of Owner or as directed by EIC, all roads, footpaths (including roads and footpaths inside colonies) shall be restored to its original condition and the same shall be done as per CPWD/IRC norms and to the satisfaction of the concerned local Authority/Third Party Agencies designated by Owner. To retard curing of the installed concrete, wet sackcloth is to be placed on the finished surface and kept damp for a period of 7 days.

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

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

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

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

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

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

Payment to the restoration shall be paid as per Relevant SOR item n. Further, the rate of restoration includes WBM, Asphalted /Bituminous, concrete pavement, Agra Stone/ Kota stone/ Tiles (Chequered / any other type of tiles), interlocking paver blocks, Dry brick pavements etc. and payable under one SOR.

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

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

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

### 3.27. TESTING

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

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

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

**For main line/service lines the test duration shall be 24 Hrs.** with these tests, the pressure should be allowed to stabilize for a period of 30 minutes after pressurization. The holding period may then commence and continue for 24 hours. Measuring instruments shall have been calibrated and their accuracy and sensitivity confirmed before the start of testing, wherein, calibrated pressure gauges of suitable range shall be supplied by the contractor. The pressure gauges shall be calibrated from time to time as desired by EIC. All testing shall be witnessed and approved by the EIC or his delegated representative. Tie-in joints may be tested at working pressure following commissioning. In special cases, where the mainline and service line length is less than 500 mtrs, holding period for testing may be reduced to 4 hrs. with stabilization period of 15 minutes.

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

### 3.28. PURGING

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

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

In addition, the Contractor shall submit purging plan and get approval from Owner / Owner representative before commencing any purging work. The Plan shall include, but not be limited to the provision of the following materials and equipment:

Personal Safety Equipment, Fire Extinguisher, Purging Adaptor, Purge stack with flame trap and gas sampling point, Gas sampling equipment (may be gas leak detector), Squash-off tool, Polyethylene connecting pipe.

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

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

### 3.29. VALVE PITS/ CHAMBERS

Valve pits/ chambers shall be constructed as per enclosed relevant drawing in the tender document. Pre-fabricated valve chambers with same dimensions are also allowed however the final designing and specifications shall be approved by EIC/ PMC before start of production, without any extra cost to owner.

If required, it may also be instructed for construction of new valve chambers on existing gas charged pipeline before or after Gas charging for extensions or new pipeline network.

Payment for the valve pit/ chamber construction shall be done as per relevant SOR. The construction of the valve chambers shall be taken up immediately after installation of valve, before commissioning of the pipeline network.

**a) Material for Valve Pit**

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

**b) Workmanship**

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

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

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

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

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

## 3.30. CONSTRUCTION OF TRENCHES AND OTHER SCOPE OF WORK IN BUILDER SEGMENT

**a) Construction of dedicated trench (as per approved drawing)**

Trench Dimension- 0.6m x 0.66m x 1.1m (D x W x L)

Scope includes excavation of trench in any type of surface, construction of brick wall, waterproofing of trench (If required), removal of surplus malba, plastering of walls, watering and curing including supply & installation of precast RCC slab covers Site cleaning and restoration of all damaged surfaces during construction activity. Contractor should submit NOC through concerned RWA/Builder/Authority. For other details please refer drawing

**b) Construction of dedicated trench (as per approved drawing)**

Trench Dimension- 0.375m x 0.66m x 1.1m (D x W x L)

Scope includes excavation of trench in any type of surface, construction of brick wall, waterproofing of trench(If required), removal of surplus malba, plastering of walls, watering and curing including supply & installation of precast RCC slab covers Site cleaning and restoration of all damaged surfaces during construction activity. Contractor should submit NOC through concerned RWA/Builder/Authority. For other details please refer drawing attached in the tender.

**c) Excavation of trench and installation of casing pipe by any method (Open cut /Moling)**

Scope includes excavation of trench/ moiling in any type of surface and installation of casing pipe casing pipe, restoration for road crossing inside society and obtaining NOC through concerned RWA/Builder/Authority.

**d) Sand Filling in any type of trenches in builder segment only;**

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

## 3.31. PERMANENT ROUTE MARKERS

Permanent Route Markers (As per Drawings enclosed with the tender document) shall be fabricated, supplied and installed on the ROU at regular intervals as per the instructions of the EIC immediately after laying of the Pipeline. The installation of the type of the Permanent Marker shall be decided by the EIC depending on the site condition. The contractor shall also ensure that a sample of all type of markers shall be inspected and approved by Owner / Owner representative before shipment of the lot at site and prior to installation at the site. The inspection of all types of markers shall be carried out lot wise.

The RCC Route Markers shall be painted before installation as per the approved procedure. Whereas the Pole marker (Markers with foundation) and plate marker are to be supplied with powder coated Golden Yellow paint The supply of the paint as per reference drawing and application. The supply of paint and application as per the specification is in contractor's scope. Payment shall be paid as per relevant SOR. Contractor shall obtain the approval lot wise & before installation at site from the Consultant / TPIA.

## 3.32. GUIDELINES FOR PERMANENT MARKER INSTALLATION:

- The installation of these markers shall be such that in between two pole markers two RCC route markers are installed with spacing of 50 mtrs on either side. However, Pole markers shall be installed at all the Tapping /Branching points in the mainline.

- Interval between any two RCC Route markers for mainline (125mm to 63mm) shall not be more than 50m.

- A Pole marker shall be installed near to valve chambers on Mainline & inside the pockets respectively for indication.

- Pole markers with foundations (As per the Drawings in Tender document) shall be installed after two RCC route markers.

- The entry and exit pits for laying of pipeline by HDD / Moling for Road crossings shall be marked by Pole markers or RCC Route markers depending upon the site conditions.

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

• For the service distribution network 32mm & 20mm pipe, RCC route marker/ plate markers shall be installed as per the site conditions and directions of the Site-in-Charge.

• The artwork is typical for all the markers, with Owner's logo on it. The contractor must take prior approval for the artwork from EIC before installation of Markers. The lot wise approval shall be attached with bills.

### 3.33. ASSISTANCE IN COMMISSIONING

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

### 3.34. STANDARD OF WORK

All work carried out under this contract shall be to standards, codes of practice construction procedures and other technical requirements as defined in the technical specifications. The manpower deployed on the respective work shall be adequately trained and shall have necessary skills to execute/supervise the work. However, the assessment on the qualification of the personal shall be at the discretion of EIC.

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

### 3.35. DOCUMENTATION (AS-BUILT DRAWINGS)

The following points shall be taken care to the preparation of as built drawings.

• The as built drawings should be in the scale of 1:200 and shall be submitted in an A-0 sheet. The drawings shall be in layers according the AUTOCAD features category.

• Pipeline feature shall be shown as a continuous line, breaks only at joints, fittings, valves, tee point, etc. Diameter, Pipe material, length, and location of pipeline whether on the road or footpath, should be clearly indicated.

• Minimum three (03) offsets of every joint, from permanent structure shall be recorded on As Built.

• Distance of pipeline from permanent property/structure should be provided at least every 20 mtrs. If there is any change in alignment / orientation and offset distances etc. Of the pipeline in between the above said 20 mtrs, the same shall be dearly mentioned in the as laid. Gas objects (off valves, tees, elbows, couplers, transition fittings etc.,) shall be shown as block objects (which form a single node to connect) with respect to Owner symbols / legend. The As laid drawings shall be as per the approved legends provided by EIC.

• Details & offset distances from other utilities present (e.g. MTNL, NDPL, BSES, DJB etc.) should be given in as laid drawing. If there is any change in depth of the pipeline, the same shall be clearly marked

with details in the as laid drawings. The details (material, size &.Length) of additional protection provided to pipeline shall also be clearly indicated.

- Details of the PE stop off valves &. Other fittings used (i.e. tees, elbows, couplers, transition fittings, etc.) should be shown with adequate information orientation &. Offsets from permanent structures in the immediate vicinity.

- Technical deviations (if any) should be provided with reference to the buildings permanent structures around, and the same should be cited clearly with all the relevant details, including separate sketches/Blowups / sectioned drawings / exploded view.

- Total as laid-length (size wise), bill of materials should be mentioned in each sheet.

- Complete details of nallah crossings should be shown in a separate sketch.

- Names of roads, major landmarks and buildings should be mentioned appropriately for reference.

- Proper chainage shall be mentioned on all the drawings to be referred with continuation reference.

- Direction of gas flow shall be indicated in each of the drawings.

- Text on the as laid drawing should be clearly visible.

- Land base features shown on the drawing shall match the exact distance as they were on real ground with respect to scale (1:200).

- As built drawings shall be duly signed & stamped by area TPIA / Consultant.

- The details shall be prepared in standard format using MAP INFO/AUTOCAD MAP and submitted CD RAM. Contractor shall also make the item wise material consumption report for the respective areas in a soft copy and to be submitted along with the as- built drawings.

### 3.36. CIVIL WORKS

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

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

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

### 3.37. GIS MONITORING

GIS is an integrated set of hardware and software tools which is used to update and manage the digital spatial (geographic) and related attribute data. GIS solution provides the standard, central applications for engineering, operations, and asset management and is mandated by PNGRB. Contractor has to collect the data as per the format attached.

| S no | Feature Class Name | Required Field collected From Survey | Remarks |
|---|---|---|---|
| 1 | Network Valve(PE valve) | GPS and Location Description | |
| | | Set_Pressure | |
| | | Valve Material | |
| | | Bonded Indicator | |
| | | Ground Level Indicator | |
| | | Insulated Indicator | |
| | | Manufacturer | |
| | | Valve Function | |
| | | Gas Valve Manufacturing Specification | |
| | | Gas Valve Body Material | |
| | | Valve Size | |
| | | Maximum Operating Pressure | |
| | | Maximum Allowable Operating Pressure | |
| | | | |
| 2 | Distribution Point | Location | |
| | | Building_ID | |
| | | RegulatorStationID | |
| | | Connection Type | |
| | | DP_ID | |
| | | Subtype(Cust-Type) | |
| | | Guard-Type | |
| | | Premise | |
| | | Owner | |
| | | | |
| 3 | GasFittings | Fitting Diameter | |
| | | Material | |
| | | Fitting Type | |
| | | Fitting End | |
| | | Fitting Orentation | |
| | | Protection Type | |
| | | Ground Status | |
| | | Owner | |
| | | Manufacturer | |
| | | | |

| | | | |
|---|---|---|---|
| 4 | DistributionMain | Nominal Diameter | |
| | | Nominal Diameter units | |
| | | Design Pressure-Unit of measure | |
| | | LineDepth | |
| | | Operating Pressure | |
| | | Coating Type | |
| | | Status of pipe | |
| | | Outside Diameter | |
| | | Gas Pipe Type | |
| | | Pipe Testing Type | |
| | | Surface_Type | |
| | | Pipe Ground Status | |

Note : GPS coordinate of joints of MDPE, each fittings and valves to be submitted.

GPS coordinated of bends and tappings to be submitted.

## 3.38. RESTORATION PROCEDURE/GUIDELINES FOR ROAD CUTS OF MCD AND OTHER LANDOWNING AGENCIES

**PURPOSE AND OBJECTIVE**

The main purpose and objective of this document is to ensure that all the work are carried out with proper specifications and standards with high quality and timely accomplishment, and the restoration of infrastructure is according to standards Aimed at achieving the original condition of the road infrastructure.

**DOCUMENTS/FILES TO BE MAINTAINED:**

The following documents shall be maintained during execution of the job and shall be handed over to OWNER/Consultant/TPI after completion of the job;

- Copy of permission letter obtained from MCD.
- Drawing/Sketch showing the details of stretch to be cut, highlighting the type of surfaces and its chainage/length (area)
- Stage wise Photographs of the stretch.
- Test Certificates of the Construction materials to be used.
- Routine Test Certificates for construction materials during progress of job.

**RESTORATION OF TRENCHES/PITS:**

After laying pipeline, backfill material without containing extraneous material or hard lumps of soil or stones shall be filled and watered in layers of 150mm. Warning mats shall be placed as per specification. Earth shall be filled watered and compacted in layers with the help of earth compactor (Jumping jack compactor where ever space is available). After backfilling, the crown of the earth shall be between 50mm and 100mm above road surface and shall be free from sharp-edge stone and boulders.

After consolidation of backfill, the surplus earth shall be removed and disposed at place directed by OWNER (at suitable locations, as per direction of road authority)

All trenches to be restored to original condition as per the specifications of road owning agency/authority. In case specifications are not available, depending upon the Surface types of following specification shall be adopted:

| Sl. No. | Surface Types | Specification Recommended |
|---|---|---|
| 1 | Cement Concrete Surface | Top Surface – PCC 1:2:4, 100 mm Thick Compacted with Plate Vibrator shall be laid over base course.<br>Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth. |
| 2 | Brick Soiling | Top Surface – Brick Soiling (as per original type) shall be laid over base course.<br>Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth. |
| 3 | Interlocking CC Paver Block | Top Surface – Interlocking CC Paver Blocks (as per original type) shall be laid over compacted fine sand 50 mm Thick over base course.<br>Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth. |
| 4 | Chequered Cement Concrete Tiles/Pre- cast CC Tiles/Kota Stone Floor/Red Stone Floor | Top Surface – Tiles/Floor (as per original type) shall be laid over Cement Sand Mortar 1:6, 20mm Thick over base course, Joints shall be pointed/finished to match colour. Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth. |

| | | |
|---|---|---|
| 5 | Bituminous Surface (for Category D Roads i.e.; Roads less than 13.70 M width) | Top Surface – 40mm Thick Bituminous Concrete (as per original type) shall be laid over PCC 1:2:4, 100 mm Thick over base course.<br>Base Course – PCC 1:5:10, 75 mm Thick laid over compacted backfilled earth. |
| 6 | Bituminous Surface (for Category C Roads i.e.; Roads less than 18 M width but greater than 13.70 M width.) | Top Surface – 40mm Thick Bituminous Concrete (as per original type) shall be laid over PCC 1:2:4, 150mm Thick over base course.<br>Base Course – PCC 1:5:10, 150 mm Thick laid over compacted backfilled earth. |

**TESTING OF CONSTRUCTION MATERIALS**

**For the different construction materials proposed to be used the following tests are required to be carried out for approval:**

| Sl.No. | Material | Test | Method of | Frequency of Test |
|---|---|---|---|---|
| 1 | Cement | Setting time, soundness, compressive strength and fineness | As per IS: 4031 | Once for each consignment or as and when required/directed |
| 2 | Bricks | Compressive strength, water absorption and efflorescence | As per IS: 3495 | Minimum five samples or as per IS: 5454 |
| 3 | Coarse Aggregates | Sieve analysis, flakiness index, estimation of deleterious materials, organic impurities, moisture contents and specific gravity | As per IS: 2386 | One test per source of supply and routine test regularly as directed |
| 4 | Fine Aggregates | Sieve analysis, clay silt and moisture contents and specific gravity | As per IS: 2386 | One test per source of supply and routine test |

In addition to the above construction materials such as inter locking paver blocks, chequered cement concrete tiles, Pre-cast CC tiles, Kota/Red Stones Flooring samples shall be arranged for approval before use and if required testing shall be arranged.

For Cement concrete works the minimum frequency of sampling of concrete(CC cubes) shall be as follows:

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

**INSPECTION BY THIRD PARTY INSPECTION (TPI) AGENCIES NOMINATED BY LAND OWNING AGENCIES**

It is the responsibility of the contractor to give inspection call, at least one week in advance to OWNER, to arrange for inspection by TPI nominated by land owning agencies along with the file containing all relevant documents mentioned in Clause 2 of Annexure 3 Before inspection by TPI nominated by land owning agencies, contractor has to arrange for the inspection of the restored area by OWNER/Consultant/TPI and get the work certified. Contractor has to arrange for all necessary equipment, tools & tackles, labour for carrying out the inspection of the restored area. It is the responsibility of the contractor to obtain "No Objection Certificate" (NOC) from the TPI nominated by the land-owning agencies and further NOC from Land Owning Agencies and to get the securities/ Bank Guarantees paid to them, for obtaining the permissions.

**ANNEXURE # 1**

**TOOLS & EQUIPMENTS TO BE PROVIDED BY THE CONTRACTOR FOR PE LAYING**

| Sl. No. | Equipment Details | Indicative Requirement (in Nos.) |
|---|---|---|
| 1 | Automated Electro Fusion Machine of approved make | 2 |
| 2 | Voltage Stabilizer | 2 |
| 3 | Generator (5.5 KVA) | 2 |
| 4 | Moling Equipment (for all sizes) | As and when required |
| 5 | HDD Machines & Equipment (for all types & sizes) | As and when required |
| 6 | Squeeze Tools (Manual) up to 63 mm. certified as per GIS/PL2 part 7 by TPIA accredited to NABCB and approved by IOCL | 4 |
| 7 | Squeeze Tools (Hydraulic) from 63 mm up to 180 mm. certified as per GIS/PL2 part 7 by third part inspection agency accredited to NABCB and approved by IOCL | 4 |
| 8 | Rotary Peelers | 2 |
| 9 | Hand Scraper (Aluminium Handle with blade) certified as per GIS/PL2 part 5 by TPIA accredited to NABCB and approved by IOCL | 3 |
| 10 | Top loading Tapping Tools/Allen Keys certified as per GIS/PL2 part 5 by TPIA accredited to NABCB and approved by IOCL | Three sets of all sizes |
| 11 | Pipe Cutter (Guillotine)as per GIS/PL2 part 5 by TPIA accredited to NABCB and approved by IOCL | 5 |
| | Test Ends for pressure test as per GIS/PL2 part 5 by TPIA accredited to NABCB and approved by IOCL | One set of all sizes |
| 13 | Gas Detection Unit | As and when required |
| 14 | Cable and Pipe Locator | As and when required |
| 15 | Pipe Alignment Clamps (32 - 90 mm) as per GIS/PL2 part 5 by TPIA accredited to NABCB and approved by IOCL | 3 |
| 16 | Pipe Alignment Clamps (90 - 180 mm) as per GIS/PL2 part 5 by TPIA accredited to NABCB and approved by IOCL | 3 |
| 17 | Pipe Straightener | 2 |
| 18 | Re-rounding Tools as per GIS/PL2 part 5 by TPIA accredited to NABCB and approved by IOCL (All Sizes) | 2 |
| 19 | Jumping Jack Compactor | As and when required |
| 20 | Roller for Asphalting | As and when required |
| 21 | Calibrated Pressure Gauges (0-10 Bar)* | 10 |
| 22 | Water Tankers/air compressor | As and when required |
| 23 | Heating Element for HDPE Butt Joint along with clamping, roller and other accessories. | As and when required |

***Note: Pressure Gauges (0-10 Bar) shall be calibrated at every Six months. Approval Certificate of all tools to be submitted by contractor.**

## CHAPTER-4

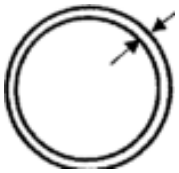
# 4. SPECIFICATION FOR ELECTRO FUSION JOINTING OF PE PIPES, FITTINGS & VALVES

## 4.1. Electro Fusion Fitting Jointing

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

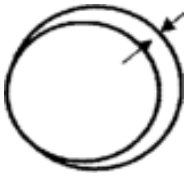
- The effectiveness of this technique depends on attention to the preparation of the jointing surfaces, in particular the removal of the oxidized surface of the pipe over the socket depth and ensuring the jointing surfaces area clean. Also, the pipe should be checked for ovality. If ovality causes a gap between concentrically located pipe and the fitting to exceed l% of the pipe OD, the pipe must be re-rounded to ensure correct welding. If the gap still exceeds 1% of the pipe OD after re-rounding then a check should be made of the pipe OD dimensions to determine if it meets specification.

**Max gap 1% of pipe OD**



**Concentrically Located**

**Max gap 2% of pipe OD**



**Eccentrically Located**

- The maximum gap between eccentrically located pipe and fitting i.e. Pipe touching fitting at one point, must not exceed 2% of the pipe OD.
- Sometimes coiled pipes may be too oval to fit into couplers, or the end of the pipe may make the alignment of the ends impossible. In such circumstances the use of a mechanical pipe straightener or rounding tool is necessary.
- The equipment and procedures following relate to fittings with center stops. If fittings without center stops are used, the maximum insertion depth must be clearly marked on the pipe ends prior to joining (felt tip pen).

**Equipment**

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

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

**WARNING:** Control boxes are not intrinsically safe and must therefore not be taken into the trench.

- A mechanical pipe surface preparation tool is to be used before fusion is attempted.
- The tool is to be capable of removing the oxidized surface of the pipe in excess of the insertion depth. The tool is to remove a layer of surface material0.20.4 mm thick from the outer surface of the pipe preferably in a continuous strip of swarf over that length and round of the pipe.
- Pipe clamps for restraining, aligning and re-rounding the pipes in the fusion process are to be used.
- Pipe cutters with saw and saw guide.
- Protection against adverse weather conditions.
- **Only Bar coded into electro-fusion machines (Automatically Readable) which can read the bar code of the fittings and valves automatically shall be used for joining of the PE pipes/ Valves & fittings**. Manual feeding Electro-fusion machines are not acceptable for jointing purpose. The contractor has to submit the certificate of calibration of electro-fusion machine at the time of start of work and at fixed intervals as per the instructions of Owner. **NOTE**- Electrofusion machines should have inbuilt GPS System which will automatically capture GPS coordinates of the fusion points.

## 4.2. ELECTRO FUSION JOINTING METHOD / PROCEDURE

**Preparation**

- Ensure there is sufficient space to permit access to the jointing area. In a trench, a minimum clearance of 150 mm is required.
- Check that the pipe ends to be jointed are cut square to the axis of the pipe and any burrs removed.
- Wipe pipe ends using clean lint-free material to remove traces of dirt or mud, etc.
- Mark the area over which the oxidized pipe surface is to be removed, i.e. In excess of the insertion depth, on each pipe to be joined by placing the socket of the bagged fitting alongside the pipe end. Trace a line round the circumference at the appropriate distance from the end of the pipe using a felt tip pen or similar.
- **Note that the fitting should not to be removed from the packaging at this stage.**
- Connect the electro fusion control box input leads to the generator.
- Check that the reset stop button, if fitted on the control box, is in the correct mode.
- Using the pipe end preparation tool, remove the entire surface of the pipe uniformly, preferably in continuous swarf over the area identified, i.e. In excess of the insertion depth.
- A mechanical scraper could be used however; there is a considerable risk that the end preparation will not be adequate with the use of such a tool.
- **Note that the prepared pipe surface should not be touched by hand.**
- Remove the fitting from its packing and clean the scraped area of the pipe surface and the bore of the fitting with a disposable wipe impregnated with Iso-propanol/Acetone. Ensure the prepared surfaces are completely dry before proceeding.

- **Note that while Iso-propanol is a suitable cleaner, its use is subject to local Health and Safety Regulations.**
- Check that the pipe clamps are of the correct size for the pipes to be jointed.
- Insert the pipe ends into the fitting so that they are in contact with the center stop.
- Using the pipe clamps, secure the pipes so that they cannot move during the fusion cycle. Check that the pipe ends and the fitting are correctly aligned.
- Check that there is sufficient fuel for the generator to finish the joint. Start the generator and check that it is functioning correctly.
- Switch on the control box.
- Connect the control box output leads to the fitting terminals and check that they have been fully inserted.
- **The jointing time is indicated on the fitting. Check the correct time is shown on the control box display.**
  **Note 1:** Automatic control boxes are available which obviate the need to enter the fusion time. **Note 2: Gloves and goggles should be worn during the Fusion process**.
- Press the start button on the control box and check that the heating cycle is proceeding as indicated on the display.
- On completion of the heating cycle, the melt indicators should have risen. If there is no apparent move in the melt indicators, the joint should be cut out and a fresh joint made (See note 3below).
- If a satisfactory joint has been made, the joint is to be left in the clamps for the cooling time specified on the fitting or the automatic control box.
  **Note 3: If the fusion cycle terminates before completion of the countdown, check for faults as indicated by the control box warning lights and check that there is adequate fuel in the generator. DO NOT attempt a second fusion cycle within one hour/cooling of joint at Ambient Temperature of the first attempt.**

### 4.3. RECORDS

Records of appropriate servicing and calibration shall be kept.

### 4.4. TRAINING

It is necessary that operators, inspection and supervisory personnel acquire the skills of electro fusion fitting fusion. The necessary training should be carried out by a qualified instructor with the objective of enabling participants to;

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

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

**4.5. ELECTRO FUSION SADDLE JOINTING**

- With electro fusion saddle jointing, an electrical resistance element is incorporated in the base of the saddle which, when connected to the appropriate power supply, melts and fuses the material of the fitting and the pipe together.
- The success of the technique depends on effective preparation of the jointing surfaces, in particular the removal of the oxidized surface of the pipe over the area equivalent to the area of the saddle base, and cleaning of the pipe surfaces.
- Methods of holding the tapping tee saddle during the fusion cycle are used namely, top loading and under clamping. The general parameters are similar. In some cases, if the manufacturer's procedure for holding the fitting is provided, then the same should be followed during the fusion cycle.

**4.6. ELECTRO FUSION SADDLE JOINTING METHOD/ PROCEDURE**

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

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

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

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

• Connect the electro fusion control box input leads to the generator.

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

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

**Note again that while Isopropanol is a suitable cleaner, its use is subject to local Health and Safety Regulations.**

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

• Check that there is sufficient fuel for the generator to complete the joint. Start the generator and check that it is functioning correctly.

• Switch on the control box if applicable.

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

• The jointing time is indicated on the fitting. Check the correct time is shown on the control box display.

**Note 1:** Automatic control boxes are available which obviate the need to enter the fusion time.

**Note 2:** Gloves and goggles should be worn during the jointing process.

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

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

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

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

**Note 4:** The connection of the service pipe to the fitting outlet should be carried out in accordance with the procedure of the appropriate section of this Item.

**Note 5:** DO NOT attempt to tap the main with the integral cutter for at least I0 minutes after completion of the cooling cycle.

### 4.7. RECORDS

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

### 4.8. TRAINING

As per clause 4.6 above, Note that some form of assessment and certification should be associated with the training. The certificate should detail the pipe and fitting size range and the equipment used. A register of successful participants should be kept.

### 4.9. STOPPING THE GAS FLOW

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

### 4.10. SQUEEZE-OFF

• To control the gas flow a special tool may be used to squeeze the pipe walls together.

Hydraulic jacks are used to supply the necessary force to compress the pipe walls for sizes 90 mm and above.

- It will be seen the squeeze-off equipment comprises two bars to apply pressure to the outside of the pipe. The bars are brought together, either manually or hydraulically, squeezing the pipe material together until a seal is formed where the upper and lower walls meet.

- The hydraulic machines should have a spring return for the jack and locking to prevent accidental release of pressure during operation. All squeeze-off machines should be fitted with check plate or stops to avoid over compression of the pipe.

- Where the pipe walls are compressed the polyethylene pipe will be severely deformed in the regions of maximum compression. The pipe will eventually regain its original shall after squeezing but there will be some reduction in the pressure bearing properties.

- A complete stop may not always be obtainable because of wrinkling of the inside of the pipe. If a complete stop is required then a second squeeze can be used, with an intermediate vent to remove the gas which passes the first squeeze from say the trench area. A second squeeze-off procedure should be a minimum of three pipe diameters and right angles to the initial squeeze.

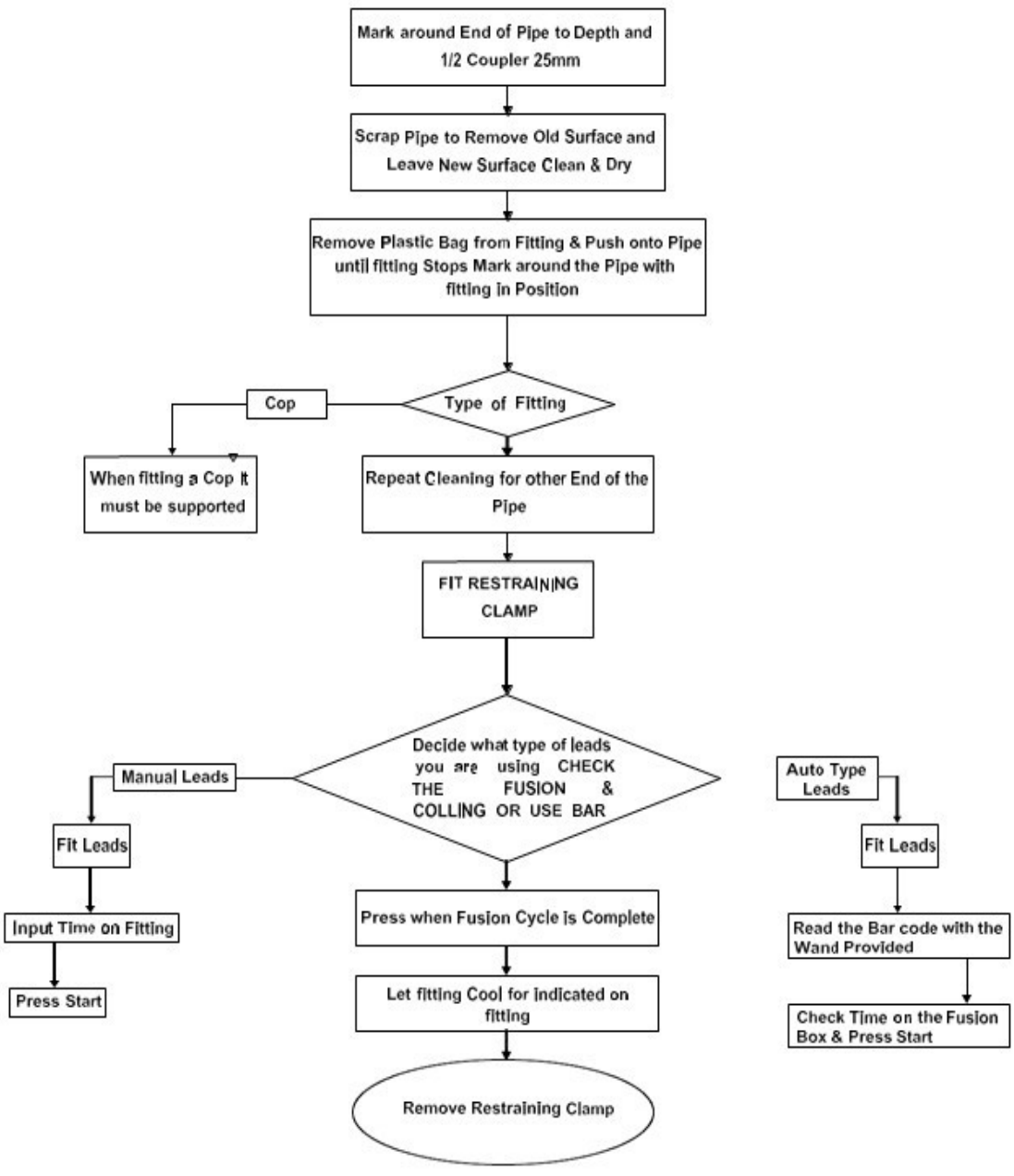
- While not essential it would be good practice to fit a reinforcing stainless steel band do not squeeze again adhesive tape around the pipe upon the completion of a squeezing operation.

## 4.11. BENDING-BACK

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

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

ANNEXURE # 1


FUSION COUPLERS FORM 20MM TO 180MM
Mark around End of Pipe to Depth and 1/2 Coupler 25mm
Scrap Pipe to Remove Old Surface and Leave New Surface Clean & Dry
Remove Plastic Bag from Fitting & Push onto Pipe until fitting Stops Mark around the Pipe with fitting in Position
Type of Fitting
Cop
When fitting a Cop It must be supported
Repeat Cleaning for other End of the Pipe
FIT RESTRAINING CLAMP
Decide what type of leads you are using CHECK THE FUSION & COLLING OR USE BAR
Manual Leads
Fit Leads
Input Time on Fitting
Press Start
Press when Fusion Cycle is Complete
Let fitting Cool for indicated on fitting
Remove Restraining Clamp
Auto Type Leads
Fit Leads
Read the Bar code with the Wand Provided
Check Time on the Fusion Box & Press Start

## CHAPTER-5

## 5. SPECIFICATION FOR WARNING MAT

### 5.1. REFERENCE CODE

IS 10889 High Density Polyethylene Films

ASTM D - 638 Standard test method for tensile properties of plastics.

### 5.2. FEATURES

- **Material**

Raw material of the warning mat shall be Virgin material.

The material grade of Warning Mat shall be HDPE with warning sticker / stamp.

a. Mechanical properties

b. Tensile strength at break (Machine direction) - 300 Kgf /cm2(minimum)

c. Elongation in machine & Transverse direction (%)- 300 (minimum)

- **Colour**

The Mat shall be of bright golden yellow colour. This colour must not take any appreciable alteration in the course of time.

- **Dimensions**

Warning Mat shall have following dimensions: Width 300 mm ± 5 mm Thickness 1 mm (Minimum) Negative tolerance on thickness is not allowed.

- **Marking**

a. Marking on the Mat shall be approved by owner. The warning Mat shall be provided with Chainage marking and the warning mat must be engraved with "Caution: High pressure gas pipeline below" in both English and Hindi along with OWNER's Logo at a frequency of every meter.

b. Vendor shall submit proposed Artwork to be marked on the Mat for the approval from Owner / Owner's Consultant.

- **Tests**

a. Colour- Fast test

Test specimen 100 mm to 150 mm wide shall be immersed in a 20% solution of ammonium sulfide at 15 to 20 ºC temperature for 15 days. The colour fastness shall be evaluated by comparing the test specimen with a sample specimen. The comparison shall be made by placing the two specimens on a white back ground in day light, but without exposing them directly to sun light. Test shall be accepted satisfactory, if the colour of the strip remains intact.

b. Other tests shall be carried out as per relevant national / international standard enclosed in QAP.

- **Packing**

The warning mat shall be delivered in rolls of 50meters. Packing size to be mentioned to ensure uniformity in delivery conditions of the materials being procured. Bidder shall submit the packing details during offer and also compiled with at the time of delivery.

### 5.3. QUALITY ASSURANCE (QA)

Manufacturer shall prepare detailed QAP and submit for the approval from EIC /PMC.

### 5.4. DEFECT LIABILITY

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

### 5.5. APPENDIX - I

Vendor to submit the following Data.

| SR.NO. | DESCRIPTION | UNIT | DATA | REMARKS |
|---|---|---|---|---|
| 1. | Average gravimetric Thickness | mm | | |
| 2. | Tensile strength at Break (in machine direction) | Kg / cm2 | | |
| 3. | Tensile strength at Break (in Transverse direction) | Kg / cm2 | | |
| 4. | Elongation at Break (in Transverse direction) | % | | |

| | | | | |
|---|---|---|---|---|
| 5. | Elongation at Break<br>(in Transverse direction) | % | | |
| 6. | Color bleeding | - | | |
| 7. | Dimensional stability | % change | | |

**5.6. RECOMMENDED MANUFACTURER FOR RAW MATERIAL**

- SOLVAY
- BOREALIS
- TOTAL PETROCHEMICALS
- DOW
- ELENAC
- RELIANCE
- GAIL
- IOCL
- HALDIA

However, any other reputed national or international Manufacturer may also be considering for supply of Raw material with approval of Owner/ Owner's representative.

## CHAPTER-6

## 6. SPECIFICATION FOR MEDIUM DENSITY POLYETHLENE BALL VALVE

### 6.1. SCOPE

This technical specification along with datasheet specifies the minimum requirements for design, selection, manufacture, inspection, testing and supply of MDPE Ball Valves and its component made from extruded or injected moulded polyethylene (PE).

This specification elaborates the requirement of MDPE Ball Valve for natural gas distribution systems at operating pressure and operating temperature 4 barg and 250C respectively.

This specification is limited to valves with a nominal diameter (de/do) up to and including 180 mm. Material of grade shall be PE 100 & SDR 11.

### 6.2. APPLICABLE CODES, SPECIFICATIONS AND STANDARDS

EN 1555-1: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 1: General

EN 1555-2 / ISO 4437-2 / IS-14885: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE)

EN 1555-3: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 3: Fittings

EN 1555-4: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 4: Valves

EN 1555-5: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 5: Fitness for purpose of the system

EN 1555-7: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 7: Guidance for assessment of conformity

ISO TR 13950:1997 or latest edition: Plastics pipes and fittings - Automatic recognition systems for Electro fusions

ISO/IEC 16390:1999 or latest edition: Information technology – Automatic identification and data capture techniques – Bar code symbology specification- Interleaved 2 of 5

ISO 12176-4: Plastics pipes and fittings - Equipment for fusion jointing polyethylene system - part

4: Traceability coding

ISO 17778: Plastics piping systems- Fittings, valves and ancillaries - Determination of gaseous flow rate/pressure drop relationships.

EN ISO 1133, Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics

ISO 3126: Plastics piping systems -- Plastics piping systems — Plastics piping components — Measurement and determination of dimensions

**PNGRB and other referrals in the above applicable codes.**

### 6.3. ABBREVIATIONS & TERMINOLOGY

dn / do : Nominal Outside Diameter
en : Nominal Wall Thickness
SDR : Standard Dimension Ratio = dn / en
LTHS : Long Term Hydrostatic Strength (at 20°C for 50yrs)
LCL : Lower Confidence Limit – Stress value (MPa) of mean LTHS
MRS : Minimum Required Strength – min. value (in MPa) for LTHS of material
C : Design Co-efficient – As per ISO: 12162 Table-2
σs : Design Stress (= MRS/C)
MFR : Melt Mass Flow rate – Value related to viscosity of the molten material at a specified temp. and rate of shear. (expressed in g/10min.)
Df : De-rating Co-efficient (Refer Table A.1, Annex A – EN 1555-5)
MOP : Maximum Operating Pressure = (20 x MRS) / {(SDR-1)x C x Df}
EF : Electrofusion

### 6.4. TECHNICAL REQUIREMENT

a) Design of valve shall be as per European Standards EN 1555-4 and the complementary particular requirement.
b) Valves shall be leak proof and it is intended to be use in gas distribution networks made of PE pipes and accessories.
c) The valves are laid and to be welded by means of electrofusion method.
d) The internal and external surfaces of valves shall be smooth, clean and free from scoring, cavities or other surface defects to an extent that would prevent conformity to EN 1555-4.
e) No component of valve shall show any damage, scratches, pitting, bubbles, blisters, inclusions or crack.

**f) Mechanical characteristics of assembled valves:**

1. Valve shall have mechanical characteristics conforming to the requirements given in Table-1 of standard EN 1555-4.
2. Unless otherwise specified by the applicable test method, the test pieces shall be conditioned at (23 ± 2) °C before testing.
3. Testing of valve shall be in accordance with the test methods as specified in Table-1 of standard EN 1555-4 using the indicated parameters.
4. Hydrostatic test pressure and minimum test period shall be as per Table-2 of EN 1555-4.

**g) Physical characteristics of assembled valves:**

a) Valve shall have physical characteristics conforming to the requirements given in Table-3 of standard EN 1555-4.
b) Thermal stability test shall be done at 200 deg. C by means of differential scanning

calorimetry (DSC), considering oxygen induction time (OIT) ≥ 20 min.

c) Melt mass flow rate shall be calculated at 190 deg. C by applying 5 Kg of load on test specimen. It shall be expressed in g/ 10min.
d) Unless otherwise specified by the applicable test method, the test pieces shall be conditioned at (23 ± 2) °C before testing.
e) Testing of valve shall be in accordance with the test methods as specified in Table-3 of standard EN 1555-4 using the indicated parameters.

**h) Performance requirements:**
When valves are assembled to each other or to components conforming to other parts of EN 1555, the joints shall conform to EN 1555-5.

i) Allowable pressure drop shall be as per the standard ISO 17778.
j) Color of valve shall be black.

## 6.5. MATERIAL

I. The PE compound from which the valve body with electrofusion socket is made shall conform to EN 1555-1.
II. The PE compound of the valve shall be made only from virgin material conforming to EN 1555-1. PE compound shall be cadmium free pigment compound.
III. All parts of the valve in contact with the gas stream shall be resistant to the gas, its condensates and other occurring substances such as dust.
IV. The PE valves bodies made from below listed material are forbidden:

1. Use of recycled materials

2. Mixture of different materials
3. Addition of complementary materials

V. The material and constituent elements used in marking of valve (including elastomers, greases and any metallic part, if used) shall be resistant to the external and internal corrosion and shall have life expectancy under following conditions at least equal to the PE pipes with which they are intended to be used.

1. During storage
2. Under the effect of the gas conveyed
3. With respect to the services environment and operating conditions

VI. The seals shall be homogeneous without any inner cracks, inclusion or impurities. It can not contain any component that can alter the properties of the materials they are in contact with.

1. The nitrile rubber ring shall comply with standard EN 682.
2. Other seals shall comply with the relevant standard and be suitable for gas service.

VII. Operating key or extension spindle shall me made of PVC and non-corrosive.

**6.6. DESIGN**

a) Valve will be designed for a maximum operating pressure (MOP) equal to 10 barg.
b) The wall thickness of the PE valve body shall be equal or greater than the minimum wall thickness of the corresponding SDR 11 series pipes.
c) Valve shall be bi-directional.
d) Specified End to End dimension in the Data-Sheet is minimum requirement.
e) The design of valve shall be such that, when assembling the valve into the pipe or other components, the electrical coil and/ or seals or any other ancillary parts are not displaced.
f) Valve ends shall have extended pipes at both plain ends. Pressure rating and thickness of extended pipes shall be compatible with the pipe in the network.

g) Valve ends shall be welded to pipes or fittings by means of electrofusion jointing using coupler.
h) Electrofusion socket shall have sufficient fusion compatibility to the pipe to which it is fused to meet the requirement of standard EN 1555-4 and EN1555-5.
i) PE valves bodies and their PE electrofusion socket / ends shall have a pressure rating of at least that of the pipe to which they are assembled.
j) Valve body and valve ends shall not be bolted and screwed and shall also designed that it cannot be dismantled.
k) Operating Cap/ Head of valve shall be “non-blow out” type. Size of operating cap shall be 50 mm square socket and 40 mm height as per EN 1555-4.

l) The running torque of valve shall be as per standard EN 1555-4. Valve shall be designed in such a way that it cannot be easily operated by hand.
m) Operating Key or Extension spindle shall be provided for valve operation as per client requirement. Operating key or extended spindle shall be compatible with operating cap.
n) The valve should be equipped with a base plate. In order to achieve this, the valve body will be designed with a flat base or with an attached base plate or an integrated one.
o) The operating mechanism and the stop wedges will be protected against water intrusion.
p) The valve body is completely sealed except a passage for the spindle mechanism.

## 6.7. DIMENSIONS & TOLERANCE

a) The dimensions will be in conformity with the standard EN 1555-3 and EN 1555-4.
b) Dimensions shall be measured in accordance with ISO 3126 at (23 ± 2) OC, after being conditioned for at least 4 hrs. The measurement shall not be made less than 24 hrs after manufacture.
c) Each valve shall be characterized by its dimensions and associated end connections.
d) Technical data given by the manufacture shall include at least following information:
   - the dimensional characteristics, by working drawings
   - the assembly instruction
e) The dimensions of electrofusion socket shall conform to EN 1555-3, Table-1.
f) Pressure rating or thickness of ends shall confirm to interconnecting pipes specification.
g) Tolerance for operating cap of valve shall be (50+0.5) mm square for socket and (40 ± 2) mm for height.

## 6.8. DOCUMENT REQUIREMENT

### a) TO BE SUBMITTED

All relevant documents like detailed technical catalogue, technical deviations list (if any) along with quoted price.

### b) TECHNICAL FILE

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

1. Raw material used.
2. Drawings, dimensions and tolerances, including for the accessories. c) Application range (temperature and pressure limits).
3. Running torque and initiating torque.
4. Pressure drop and flow diagram.
5. Test results and Data proving the conformity of the valve in accordance with ENl555-4 and ENl555-7.
6. The pipe elements used during valves testing.

7. The assembly pipes/valves realized during testing shall be in conformity with the manufactures instructions and the extreme installation conditions.
8. For the test assembly due consideration should be taken regarding the fabrication tolerances and the variation of the outside ambient temperature.

### 6.9. QUALITY ASSURANCE PLAN

The Quality Assurance Plan (QAP).
Inspection shall be carried out as per QAP and the vendor is to submit the plan accordingly. Vendor to submit their own QAP along with offer based on standard QAP enclosed in this tender for approval to the Owner / Owner's representative.

### 6.10. MARKING

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

a) Owner's name as IOCL.
b) Manufacturer's name and/or trademark c) Material and Designation
d) Design application series e) Nominal diameter
f) Internal fluid gas
g) Direction of flow
h) Traceability code (valve and component) as per standard ISO 12176-4.
i) Number of the system standard. This information can be printed/formed directly on the valve or on a label associated with the valve or on an individual bag
j) Production period, year and month

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

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

### 6.11. PACKAGING

The valve and its accessories shall be packaged individually in plastic bags in order to prevent them from deterioration. The valves ends shall be protected with external caps.
The cartons and/or individual bags shall bear at least one label with the manufacturer's name, type and dimensions of the part number, number of units in the box and, any special storage conditions and storage time limit.

| | | |
|---|---|---|
| **Item** | : | PE BALLVALVE |
| **Application** | : | Natural Gas Distribution Services |
| **Code** | : | ASME B16.40 / EN1555-4 |
| **Rating** | : | PE100 SDR11 |
| **OperatingPressure** | : | 6 bar (g) |
| **OperatingTemperature** | : | 0°C to60°C |
| **EndConnection** | : | PE materials (SpigotType) |
| **StemExtension** | : | NotRequired |
| **ValveDesign** | : | FullBore |
| **BallpositionIndicator** | : | Open/Close Limitsrequired |

**INSPECTION / DOCUMENT**

i) Inspection shall be carried out as per client/consultant's approved Inspection Plan /QAP.

ii) Thirdparty inspection agency appointed by vendor on prior approval of owner shall carry out stage wise inspection during manufacturing / finalinspection.

iii) Vendor shall furnish all the material test certificates, proof of approval /licence from specified authority as per specified standard, if relevant, internal test / inspection reports as per owner Technical Specification and specified code for 100% material, at the time of final inspection of each supply lot ofmaterial.

**PACKING** Packingsize to be mentioned to ensure uniformityin deliverycondition of the material being procured. Bidder shall submit the packaging details during QAP and also compiled with at the time delivery

## CHAPTER-7

## 7. SPECIFICATION FOR PLB HDPE DUCT

### 7.1. INTRODUCTION

An Optical Fiber (OFC) system for the Telecommunication requirements has been most suitable for City Gas Distribution pipeline project.

For operation and maintenance of the OFC network, it is desired to purchase double layered permanently lubricated (PLB) HDPE duct for use as underground Optical Fiber Cable conduits. The HDPE duct shall be either laid in a trench at a depth of 1.65meters or shall be laid through HDD (Horizontal direction drilling) and Optical Fiber cable shall be installed using blowing techniques.

### 7.2. SCOPE

Objective of this specification is to establish minimum requirements to manufacture and supply of HDPE pipes used for laying OFC. This specification covers the minimum generic requirement of permanently self-lubricated high Density Polyethylene ducts (PLB HDPE ducts) for use as underground conduits for optical fiber cables, suitable for installation of OFC by blowing technique.

The scope of the tender will include manufacture/ supply, Inspection / testing / marking / packing / handling and dispatch of HDPE pipes as per following specification: per the specification/ requirements given in this document.

| | |
|---|---|
| Material Grade | 50/42, PLB duct as per TEC specifications No. GR/CDS-08/02 Nov 04 or Latest |

However Optical Fiber Cable shall be laid in a permanently lubricated HDPE pipe using blowing technique.

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

### 7.3. REFERENCE DOCUMENTS

Unless otherwise specified, this document requires to the latest standards of the following:

| | |
|---|---|
| TEC/GR/TX/CDS-008/03/MAR-11 | Permanently lubricated HDPE telecom Ducts for use as underground optical fiber cable conduits |
| IS 2530 | Method for test for Polyethylene Molding Material and Polyethylene compounds |
| IS 4984 | High Density Polyethylene Pipes for water supply |

| | |
|---|---|
| IS 7328 | High Density Polyethylene materials for molding and extrusion |
| IS 9938 | Recommended colors for PVC insulation for LF wires and cables |
| IS 12235 (Part – 9) | Methods of test for un-plasticized PVC pipes for potable water supplies – Impact strength at 0°C |
| IS 14151 (Part – 1) | Polyethylene pipes for sprinkler irrigation systems (Part – I Pipes) |

### 7.4. Construction

**Outer Layer**

The base HDPE rein used for the outer layer of the PLB HDPE duct shall conform to any designation of IS – 7328 or to any equivalent standard meeting the following requirements, when tested as per IS – 2530. However, the manufacturers shall furnish the designation for the HDPE resin as permanently IS – 7328 as applicable.

| | |
|---|---|
| Density | 0.940 to o.958g/cc at 27ºc, when tested as per IS: 2530 or IS: 7328 |
| Melt Flow Rate | 0.2 to 1.1 g/10 minute at 190ºc &5 kg load, when tested as per IS:2530 |

### 7.5. Inner Layer

The inner lubrication material shall be of friction reducing, polymeric material which shall be integral with HDPE layer. The lubricant materials shall have no toxic or dermatic hazards for safe handling. In the finished PLB HDPE duct, the co-extruded layer of solid permanent lubricant shall be integral part with HDPE and shall be white in colour and clearly visible in cross-section of duct.

The density of inner layer material shall be white in colour & clearly visible in cross- section of duct. The density of inner layer material shall be between 0.940 and 0.958g/cc at 27ºc.

The inner layer of solid permanent lubricant shall be continuous all through and shall not come out during storage, usage and throughout the life of the duct.

### 7.6. Raw Material

The raw material (s) used for the duct shall meet the following requirements:

- The antioxidants used shall be physically harmless.

- None of the additives shall be used separately or together in quantities as to impair long term physical and chemical properties of the duct.

Single pass rework material of the same composition produced from the manufacturer's own production shall be used and it shall not exceed 10% in any case.

- The raw material used for extrusion shall be dried the moisture content to less than 0.1%.

- Suitable UV stabilizers shall be used for manufacturer of the duct to protect against ultra violet degradation, when stored in open for a minimum period of 8 months.

- The raw material used in the manufacturer of the duct shall be such that the service life of the duct can be expected to be more than 50 years including the life of permanent lubricant.

### 7.7. INSPECTION ANDACCEPTANCE TESTS:

Bidder shall submit Quality Assurance Plan (QAP) immediately after receipt of order for client's approval. The test and inspection shall be carried out as per the QAP in accordance with the codes and standards outlined in the specification. Following test shall be conducted as a minimum as per the codes and standards indicated in this document in the manufacturer's premises. Test results must comply with specifications as per TEC GR Nos. TEC/GR/TX/CDS-008/03/MAR-11, including all the other requirements, which are necessary

IOCL reserves the right to carry out inspection at vendor place, as per approved QAP, By IOCL representative or representative of the any third party agency nominated by IOCL. Notice for inspection shall be given to Engineer-in-charge at least one week in advance.

#### a) Visual Inspection

The ducts shall be checked visually for ensuring good workmanship that the ducts shall be free from blisters, shirks hole, flaking, chips, scratches, roughness, break and other defects. the ducts shall be smooth, clean, round. The ends shall be cleanly cut and shall be square with axis of the duct.

The colour of the duct shall be green and uniform throughout. Each duct shall contain 4 approximately equi-spaced continuous longitudinal stripes of width 3-mm minimum in white colour. These stripes shall be co-extruded during manufacturing. The material of the stripes shall be same as that of base compound for the duct.

In the case of two-layer construction the inner layer (Soil Lubricant) shall be white in colour.

The colours of the duct, stripe and inner layer (in the case of two-layer construction) shall be identifiable under normal lighting conditions and generally conform to IS-998.

**b) Dimension of Ducts**

Please refer technical data sheet

**c) Tensile Strength and Elongation**

The samples removed from the PLB HDPE ducts when tested as permanently IS- 14151 (Part –I)

**d) Reversion Test**

The test shall be carried out as per IS-4984. For this purpose, a duct length of 200 mm shall be placed horizontally in an air-oven or a suitable liquid bath on a support at 110 ± 2°C for 60 ± 1 minutes so that the dimensional change in duct section are not impeded. After cooling to room temperature, the dimensional change of the duct section shall be measured in the longitudinal direction and the deviation from the initial length shall be calculated and stated in percentage. The dimensions shall not change by more than 3% in the longitudinal direction.

**e) Environmental Stress Crack Resistance Test**

The specimen cut from the PLB HDPE ducts shall meet the environmental stress cracking as described in ASTM D-1693.

**f) Impact Strength Test**

The test has to be carried as per IS-12235 (Part – 9). A sample duct 150 mm in length shall be placed on heavy rigid block whose faces are at an angle of 120°. A striker with a hemispherical nose of 13 mm radius and loaded to a total weight of 10 kg shall be allowed to fall freely in a suitable vertical guide through a height of 1.5 m before striking the duct. The line of fall of the striker shall coincide with the diameter of the duct. The duct shall not crack or split.

**g) Crush Resistance Test**

Samples of duct of 150 mm ± 2 mm in length shall be subjected to a dead load of not less than 50 kg for one minute and shall be allowed to recover for 5 minutes. The deflection with load on and after recovery period shall not exceed 10% and 2% respectively.

**h) Mandrel Test**

A 150-mm long mandrel of diameter, 3 mm less than the internal diameter of the duct shall be passed through a 5-meter length of duct, freely throughout the length, when the duct is bent to a radius of 5 meters.

**i) Ovality Test**

Ovality is the difference between maximum outside diameter and the minimum outside diameter at the same cross-section of the duct, at 300 mm away from the end.

**j) Coil Set Test:**

The PLB HDPE duct shall unroll of the drums without snaking or waving having zero coil set. Thus, the duct shall lay straight into the trench without re-coiling. For this purpose, when a minimum length of 50 meters" duct taken from the coil and laid on the ground, it shall be straight without any bends or kinks and without deformation, except 5 meters from each end.

**k) Oxidation Induction Test:**

The induction time in oxygen when tested with a copper pan as per method specified in IS_4984 and, shall not be less than 30 minutes.

**l) Hydraulic Characteristics:**

The duct shall be tested for internal pressure creep rupture test as per IS-4984. For this purpose, a sample length of 10 times the outside diameter of the duct shall be taken. At the end of the test, the sample shall not show signs of localised swelling or leakage and shall not burst during the test duration. The test showing failure within a distance equivalent to the length of end cap from the end shall be disregarded and the test repeated.

**m) Internal Co-efficient of Friction:**

The internal Co-efficient of Friction when tested as permanently method, shall not exceed 0.06 when tested with respect to Nylon jacketed unarmoured Optical Fiber Cable i.e., 48 F Fiber as required.

**n) Optical Fiber Cable Blowing Test:**

For this test an Optical Fiber Cable of a diameter nearest to the diameter indicated in this specification, relevant to the size of duct under test shall be installed by blowing of the cable in a length of 1 km of the duct. The duct shall be laid with bends in the horizontal and vertical planes and a raise in the middle. The 1 km section shall include two couplings at suitable locations.

The OFC shall then be blown out. It shall be inspected for any visual damage. The OFC shall then be blown in again.

It shall be possible to blow in the Optical Fiber Cable through the 1 km duct, each time in not more than 30 minutes. There shall be no visible damage to OFC. The test will be conducted on two samples out of the five submitted for Type Approval.

## 7.8. IDENTIFICATION MARKINGS

The duct shall be prominently marked with indelible link, with the following information at intervals every meter to enable identification of the pipe. The size of ink markings shall be distinct, clearly and easily visible.

- INDIAN OIL CORPORATION LIMITED
- IOCL Logo
- Manufacturer's Name
- Name of the duct with size
- Designation of the Pipe
- Date of manufacturing
- Sequential length marking at every meter.

Marking shall be done in continuous length of pipe as per TEC. In addition to the above the pipe shall be marked as "IOCL" in continuous lengths at interval of 1 m.

### 7.9. INSTRUCTION OF TENDERER

**a) Length of Pipe:**

Length of the Pipes and their supply will be as per following: - DN 50mm-In coils of 500 Mtrs. each

**b) Protection:**

The ends shall be protected by proper end caps to prevent from shocks and ingress of the foreign body.

**c) Documents to be submitted**

- The successful bidder shall submit following for approval of Purchaser/ Consultant after placement of order
- The quality Assurance Plan (QAP & Sampling Plan)
- Material Test report as per TEC
- Performance Requirements (TEC)
- Type Test (as per TEC)

**d) Bidder shall submit following documents at the time of bidding,**

- BIS Certification

• List of current orders in hand for similar items with full details such as specification, name of purchaser etc.

• Details of the largest supply executed

• Name and address of proposed test laboratories along with their credentials /

past records for carrying out all required tests.

## 7.10. TYPE APPROVAL AND ACCEPTANCE TEST:

All the tests mentioned in this document shall be carried out on the 5 standard lengths of ducts and the samples must pass these tests before according the type approval. The supplier shall furnish 5 standard length for carrying out these tests for according type approval. Bulk manufacturer and supply shall start only after issue of type approval. The type approval certificate shall clearly be indicated the type/ grade/ source of high-density polyethylene raw material, the size of the duct and the construction of the duct i.e., Two layer of Homogenous.

**Acceptance Test**

The acceptance tests shall be carried out on samples from the lot for Dimensional and Visual requirements. The requirements for Tensile Strength & Elongation, Reversion Test, Environmental Stress Crack resistance, Impact Strength, Crush resistance, Oxidation Induction Test, Hydraulic Characteristics and internal Coefficient of Friction shall be carried out.

## 7.11. PACKAGE AND DELIVERY

The store shall be supplied in coils of suitable size for delivery in such a manner that they arrive at their distribution in a safe and undamaged condition and will permit the loading, unloading and handing the stores using standard moving equipment. The minimum inner bending diameter of technical coiled duct shall be 25 times the outer diameter of the cut. The material used for packaging wrapping sealing, moisture, resistant, corrosion prevents etc. as per applicable shall be of recognized brands and shall conform to best standards for packaging. The packing shall protect the material from impact vibration rough handling rain, dust, damp, insects, rodents etc., Each packing should have packing slip and test dispatch clearance documents.

## 7.12. QUALITY ASSURANCE PLAN

1. Vendor shall submit the details for Quality Assurance Plan followed by them, beginning with raw materials, fabricated components, assemblies, etc., to finished product (As Applicable).

2. The Owner reserves the right to inspect and test duct at all stages of production and testing. The inspection and testing shall include but not be limited to materials, subassemblies, prototypes, produced units, guaranteed, performance specifications etc.

3. For factory inspection and testing, vendor shall arrange all the requirement e.g., quality assurance personnel spaces, test gear etc., for successful carrying out of the job by the Owner's respectively at vendor "s cost at the vendor "s/ Manufacturer „s works

4. Vendor shall invite the Owner, at least 30 days in advance, of the date on which material shall be ready for inspection and testing. All relevant documents and manuals approved engineering drawings, etc. shall be provided to the Owner well in advance of the start of inspection and Testing.

5. Owner shall, after completion of inspection and testing to their satisfactory, issues factory acceptance certificate to release duct for shipment. No Duct shall be shipped under any circumstances unless a factory acceptance certificate has been issued for it, unless agreed otherwise by Owner.

6. The observation and test results obtained during various tests conducted shall be complied and documented to produce test reports by vendor. The test reports shall be given for each equipment / items and system as a whole.

## CHAPTER-8

## 8. SPECIFICATION FOR MEDIUM DENSITY POLYETHLENE FITTTINGS

This specification along with applicable codes and standards describes the minimum requirements for design, selection, manufacture, inspection/ testing and supply of "MDPE FITTINGS".

This specification elaborates the requirements for Electrofusion fittings in the nominal size range 16 mm to 180 mm made from PE compound used with PE pipes for supply of natural gas and to be used at operating pressure 4.0 bar(g) & operating temperature 25°C.

The material grades shall be PE100 and SDR 11.

### 8.1. APPLICABLE CODES, SPECIFICATIONS AND STANDARDS

- EN 1555-1: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 1: General
- EN 1555-2 / ISO 4437-2 / IS-14885: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE)
- EN 1555-3: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 3: Fittings
- EN 1555-5, Plastics piping systems for the supply of gaseous fuels -Polyethylene (PE)- Part 5: Fitness for purpose of the system
- EN 1555-7: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 7: Guidance for assessment of conformity
- EN 1716, Plastics piping systems — Polyethylene (PE) tapping tees — Test method for impact resistance of an assembled tapping tee
- ISO TR 13950:1997 or latest edition: Plastics pipes and fittings - Automatic recognition systems for Electro fusions
- ISO/IEC 16390:1999 or latest edition: Information technology – Automatic identification and data capture techniques – Bar code symbology specification- Interleaved 2 of 5
- EN ISO 17778, Plastics piping systems — Fittings, valves and ancillaries' — Determination of gaseous flow rate/pressure drop relationships
- EN ISO 1133, Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics
- EN ISO 3126, Plastics piping systems — Plastics piping components — Measurement and determination of dimensions
- ISO 228-1, Pipe threads where pressure-tight joints are not made on the threads —Part 1: Dimensions, tolerances and designation

PNGRB and other referrals in the above applicable codes.

### 8.2. ABBREVIATIONS & TERMINOLOGY

$d_n$ / $d_o$ : Nominal Outside Diameter

$e_n$ : Nominal Wall Thickness

SDR : Standard Dimension Ratio = dn / en

LTHS : Long Term Hydrostatic Strength (at 20°C for 50yrs)

LCL : Lower Confidence Limit – Stress value (MPa) of mean LTHS

MRS : Minimum Required Strength – min. value (in MPa) for LTHS of material

C : Design Co-efficient – As per ISO: 12162 Table-2

$\sigma_s$ : Design Stress ( = MRS/C)

MFR : Melt Mass Flow rate – Value related to viscosity of the molten material at a specified temp. and rate of shear. (expressed in g/10min.)

$D_f$ : De-rating Co-efficient (Refer Table A.1, Annex A – EN 1555-5)

MOP : Maximum Operating Pressure = (20 x MRS) / {(SDR-1) x C x Df}

EF : Electrofusion

## 8.3. TECHNICAL REQUIREMENTS

The design of fittings shall be as per European Standards EN 1555-3 and the complementary particular requirement.

The fittings are intended to be use in gas distribution networks made of PE and Steel/GI pipes.

No component of the fitting shall show any signs of damage, scratches, pitting, bubbles, blisters, inclusions or cracks to an extent that would prevent conformity of the fittings to the requirements of this standard.

Color of the PE parts of fittings shall be black as per PNGRB. Allowable pressure drop shall be as per the standard ISO 17778.

Any melt exudation shall not cause wire movement in electrofusion fittings such that it leads to short-circuiting, when jointed in accordance with the manufacturer's instructions. There shall be no excessive creasing of the internal surfaces of the adjoining pipes.

Fittings joints shall conform to EN 1555-5 and shall be leak proof.

**Electrical characteristics**

a. For voltages greater than 25 V, direct human contact with energized parts shall not be possible when the fitting is in the fusion cycle during assembly in accordance with the instructions of the manufacturers of the fittings and of the assembly equipment, as applicable.

b. The manufacturer shall state the tolerance on the electrical resistance of the fitting at 23 °C. The resistance shall not exceed the following value: [nom. value ± 10 %] + 0.1 Ω.

c. Note: 0.1 Ω is the assumed value of the contact resistance.

d. The operating voltage of the fittings shall remain 40 +_ 0.5 V.

e. The surface finish of the terminal pins shall allow a minimum contact resistance in order to satisfy the resistance tolerance requirements. Electrofusion terminal connections shall be as per Annex A of EN 1555-3.

**Mechanical characteristics**

a. Fittings shall have mechanical characteristics conforming to the requirements given in Table 4 of standard EN 1555-3.

b. The technical descriptions of the manufacturer shall include the following information:

**a) field of application:**

- pipe and fitting temperature limits;
- pipe series or SDRs;
- ovality;

b) assembly instructions;

c) fusion instructions:

- fusion parameters with limits;

d) data for saddles and tapping tees:

- the means of attachment (tools and/or under clamp);
- Need to maintain the under clamp in position in order to ensure the performances of the assembly.

c. Unless otherwise specified by the applicable test method, the test pieces shall be conditioned at (23 ± 2) °C before testing.

d. Testing of fitting shall be in accordance with the test methods as specified in

Table 4 of standard EN 1555-3 using the indicated parameters.

e. Hydrostatic test pressure and minimum test period shall be as per Table-5 of

EN 1555-3.

**Physical characteristics**

a. Fittings shall have physical characteristics conforming to the requirements given in Table 7 of standard EN 1555-3.

b. Thermal stability test shall be done at 200 deg. C by means of differential scanning calorimetry (DSC), considering oxygen induction time (OIT) ≥ 20 min.

c. Melt mass flow rate shall be calculated at 190 deg. C by applying 5 Kg of load on test specimen. It shall be expressed in g/ 10min.

d. Unless otherwise specified by the applicable test method, the test pieces shall be conditioned at (23 ± 2) °C before testing.

e. Testing of fitting shall be in accordance with the test methods as specified in

Table 7 of standard EN 1555-3 using the indicated parameters.

**Performance requirements**

When fittings are assembled to each other or to components conforming to other parts of EN 1555, the joints shall conform to EN 1555-5.

In case of wall thickness design different from that according to Table-2 of EN 1555-3, fittings and associated joints shall additionally meet the performance requirement listed in Table-6, EN 1555-3.

**Electro Fusion Fitting Jointing**

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

b) The effectiveness of this technique depends on attention to the preparation of the jointing surfaces, in particular the removal of the oxidized surface of the pipe over the socket depth and ensuring the jointing surface are clean. If ovality causes gap between concentrically located pipe and the fitting to exceed 1% of the pipe OD after re-rounding to ensure correct welding. If the gap still exceeds

1% of the pipe OD after re-rounding then a check should be made of the pipe OD dimensions to determine if it meets specification.

c) The maximum gap between eccentrically located pipe and fitting i.e. pipe touching fitting at one point must not exceed 2% of the pipe OD.

d) Sometimes coiled pipes may be too oval to fit into couplers, or the end of the pipe may make the alignment of the ends impossible. In such circumstances the use of a mechanical pipe straightener or rounding tool is necessary.

**Electro-Fusion Saddle Jointing**

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

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

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

**Conditioning Period**

Refer below table (Table-1 of ISO 11413) for minimum conditioning required for joints.

| Nominal wall thickness, $\mathbf{e_n}$ **mm** | Minimum conditioning period **H** |
|---|---|
| $e_n < 3$ | 1 |
| $3 \leq e_n < 8$ | 3 |
| $8 \leq e_n < 16$ | 6 |
| $16 \leq e_n < 32$ | 10 |
| $32 \leq e_n$ | 16 |

## 8.4. MATERIALS

I. The PE compound from which the fittings with electrofusion socket are made shall conform to EN 1555-1.
II. The PE compound of the fittings shall be made only from virgin material conforming to EN 1555-1. PE compound shall be cadmium free pigment compound.
III. All parts of the fittings in contact with the gas stream shall be resistant to the gas, its condensates and other occurring substances such as dust.
IV. The PE fittings made from below listed material are forbidden:

a) Use of recycled materials

b) Mixture of different materials

c) Addition of complementary materials

V. The material and constituent elements used in marking of fittings (including elastomers, greases and any metallic part, if used) shall be resistant to the external and internal corrosion and shall have life expectancy under following conditions at least equal to the PE pipes with which they are intended to be used.

a) During storage

b) Under the effect of the gas conveyed

c) With respect to the services environment and operating conditions

d) Fittings material in contact with the PE pipe shall not adversely affect pipe performance or initiate stress cracking.

VI. All metal parts susceptible to corrosion shall be adequately protected.

VII. When dissimilar metallic materials are used which can be in contact with moisture, steps shall be taken to avoid the possibility of galvanic corrosion.

VIII. Greases or lubricants shall not exude onto fusion areas, and shall not affect the long- term performance of fitting materials. Other materials conforming to 4.2.1 of EN 1555-3 may be used provided that it is proven that the fittings conform to this standard.

**8.5. DESIGN**

Fittings shall be designed for system operation at the pressures given in below table.

| Material | M.R.S MPa | LCL (200C, 50Yrs 97.5%) MPa | Maximum Allowable Operating Pressure | Operating Voltage |
|---|---|---|---|---|
| PE 100 | 10.0 | 10.00≤ LCL≤ 11.19 | 7.0 bar | 40 +_ 0.5V |

Fittings shall be capable of being fusion jointed to pipes using control boxes. The fittings shall exhibit the strengths and fusion compatibility with pipes of respective sizes.

Each fitting shall be bar coded which shall conform to ISO/TR 13950:1997 & ISO/IEC

16390:1999 or latest edition's and shall have a permanent fusion indicator.

Heating coil design shall be such that it should not be damaged during assembly leading to short circuit of heating coil.

**8.6. Electrofusion Jointing:**

PE pipes, fittings and valves intended to be used for jointing by electrofusion shall be prepared and assembled in accordance with ISO 11413. The conditions for the preparation of the joints are given in clause 4.2.3 of EN 1555-5 for the assessment of fitness for purpose of electrofusion joints.

For joints with electrofusion saddle fittings, the electrofusion saddle fitting shall be fused to the pipe, while it is pneumatically pressurized to the allowable maximum operating pressure. The pipe shall be cut immediately after the manufacturer prescribed cooling time has elapsed.

These joints with electrofusion saddle fitting should be prepared taking into consideration national safety regulations.

For straight equal electrofusion socket fittings (couplers) test joints on selected diameters out of the product range shall be prepared with a gap of 0.05dn between the pipe end and the maximum theoretical depth of penetration of the fitting, where for diameters greater than 225 mm the adjoining pipes shall be arranged to provide the maximum angular deflection possible for the fitting, limited to 1.5°.

**1) Electrofusion Socket Fittings**

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

**Depth of penetration (L1) and Fusion zone length (L2) shall be as per figure-1 & Table-1.**

a) Elbow/Bends: Both ends of Elbow/Bends shall be electrofusion type with integral stop.

b) Coupler: Both ends of coupler shall be electrofusion type with integral stop.

c) Reducer: Reducer ends shall be electrofusion type with integral stop.

d) Cap: Caps shall be electrofusion end type for leak proof termination of line.

e) Equal Tee: Main/Header ends of tee shall be electrofusion type. Branch end shall be plain.

**2) Tapping Tees & Saddles**

Tapping Tees and Saddle shall be Wrap Around type for branch connection for ensuring proper alignment and better fusion process.

The tapping tees shall provide a means of cutting through the pressurized main pipe and allowing the gas flow into the outlet pipe. Internal cutter shall be of SS material.

Branch End shall be plain.

Dimensions H, H1, H2 and L shown in figure 2 of SS shall be as per manufacturer standard.

**3) Transition Fittings**

Transition fitting shall be seal tight, pull out resistant and have greater tensile value than that of PE part.

Ends for transition fittings other than electrofusion shall be as per below requirement:

Table – A1

| Transition | Size | PE End | Steel / GI End Connection | Min. Length (mm) End to End | Min. Reqd. Steel Length for BE |
|---|---|---|---|---|---|
| PE to SS | 20mm x 1/2” | EF | Threaded End | 80 | - |
| PE to GI | 20mm x ½” 32mm x 3/4” | EF | Threaded End | 80 | - |
| PE to CS | 32mm x 1” | EF | Threaded End | 80 | - |
| PE to CS | 63mm x 2” | Plain End | Bevel End | 470 | 400 |
| PE to CS | 125mm x 4” | Plain End | Bevel End | 570 | 480 |
| PE to CS | 180mm x 6” | Plain End | Bevel End | 590 | 485 |

**4) PE Pipes to Bevel Ends**

To make connection between steel pipe and MDPE pipe, specially fabricated transition pieces consisting of Steel and MDPE pipes should conform to the following requirements:

a) MDPE pipe with one end plain should conform to the specification (EN 1555-2 / ISO 4437-2 / IS-14885/ SDR 11).

b) MDPE end shall be compatible (thickness/ nominal size) to the interconnecting PE pipes of the network.

c) Steel end (CS/SS) shall be compatible (grade of material/ thickness/ nominal size) to the interconnecting steel pipes of the network.

d) Steel end of the fitting should be beveled for welding. Angle of bevel should be 30° + 5°.

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

f) Minimum required length of steel for transition fitting is specified in Table A1.

Vendor to provide adequate length so that the PE part of the fitting / pipe will not get effected during welding at site.

g) Joint between metallic and non-metallic part of transition fitting shall be leak- proof.

**5) PE Pipes to Threaded Ends**

a) Transition fitting for jointing of MDPE Pipes conforming to specification SDR 11, IS: 14855/ ISO: 4437/ EN1555-2.

b) The transition fittings shall be electrofusion type for PE connection, NPT Female threading conforming to ANSI B 1.20.1.

c) Steel end (CS/SS) / GI shall be compatible (grade of material/ thickness/ nominal size) to the interconnecting pipes of the network.

d) Joint between metallic and non-metallic part of transition fitting shall be leak- proof

## 8.7. DIMENSIONS AND TOLERANCES

Dimensions shall be measured in accordance with EN ISO 3126 at (23 ± 2) °C, after being conditioned for at least 4 h. The measurement shall not be made less than 24 h after manufacture.

**a) For Electro Fusion Socket Fittings**

For electrofusion sockets (see Figure 1) having a nominal diameter given in Table-1, the socket diameter and lengths shall be given by the manufacturer and shall conform to Table 1 with the following conditions:

a) $L3 \geq 5$ mm;

b) $D2 \geq dn - 2e_{min}$

Where,

$e_{min}$ is the minimum wall thickness specified for the corresponding pipe conforming to EN 1555-2;

D1 is the mean inside diameter in the fusion zone measured in a plane parallel to the plane of the mouth at a distance of L3 + 0.5L2 from that face;

D2 is the bore, which is the minimum diameter of the flow channel through the body of the fitting

L1 is the depth of penetration of the pipe or male end of a spigot fitting. In case of a coupling without stop, it is not greater than half the total length of the fitting;

L2 is the heated length within a socket as declared by the manufacturer to be the nominal length of the fusion zone;

L3 is the distance between the mouth of the fitting and the start of the fusion zone as declared by the manufacturer to be the nominal unheated entrance length of the fitting.

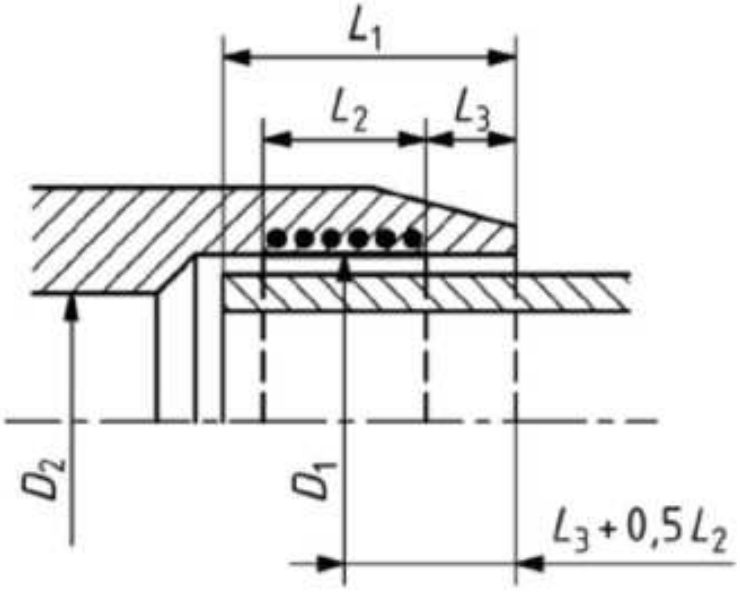



**Figure 1 — Dimensions of electrofusion socket fittings**

**Table – 1**

| Nominal Diameter r $d_n$ (mm) | Depth of Penetration $L_1$, min. Intensity Regulation | Voltage Regulation $L_1$, max. | | Fusion Zone $L_2$, min. |
|---|---|---|---|---|
| 16 | 20 | 2 | 41 | 10 |
| 20 | 20 | 2 | 41 | 10 |
| 25 | 20 | 2 | 41 | 10 |
| 32 | 20 | 2 | 44 | 10 |
| 40 | 20 | 2 | 49 | 10 |
| 50 | 20 | 2 | 55 | 10 |
| 63 | 23 | 3 | 63 | 11 |
| 75 | 25 | 3 | 70 | 12 |
| 90 | 20 | 2 | 41 | 10 |
| 110 | 32 | 5 | 82 | 15 |
| 125 | 35 | 5 | 87 | 16 |
| 140 | 38 | 6 | 92 | 18 |
| 160 | 42 | 6 | 98 | 20 |
| 180 | 46 | 7 | 105 | 21 |

The manufacturer shall declare the actual minimum and maximum values of D1 to allow the end-user to determine their suitability for clamping and joint assembly and fitness for purpose testing in accordance with EN 1555-5.

In the case of a fitting having sockets of differing nominal diameters, each one shall conform to the requirements for the nominal diameter of the corresponding component.

**b) Wall Thicknesses**

In order to prevent stress concentrations, any changes in wall thickness of the fitting body shall be gradual.

a) The wall thickness of the body of the fitting at any point, E, shall be greater than or equal to emin for the corresponding pipe at any part of the fitting located at a distance beyond a maximum of 2L1/3 from all entrance faces if the fitting and the corresponding pipe are made from a polyethylene having the same MRS

If the fitting is produced from a polyethylene having an MRS that is different from that of the corresponding pipe, the relationship between the wall thickness of the fitting, E, and the pipe, emin, shall be in accordance with Table 2.

b) In the case of a wall thickness design different from that according to a), fittings and associated fusion joints shall additionally meet the performance requirement given in Table6 of EN 1555-3.

c) When a fitting leaves the site of the manufacturer, the out-of-roundness of the bore of a fitting at any point shall not exceed 0.015dn.

d) The dimensional characteristics appropriate to each manufacturer such as the overall dimensions or mounting dimensions shall be specified in a technical file.

**c) For Electro Fusion Saddle Tapping Fitting**

Outlets from tapping tees and branch saddles shall have an electrofusion socket conforming to Clause 8.7 (a) of this specification. The manufacturer shall specify the overall dimensions of the fitting in a technical file. These dimensions shall include the maximum height of the saddle, H, and for tapping tees the height of the service pipe, H1 or H2 (see Figure 2).

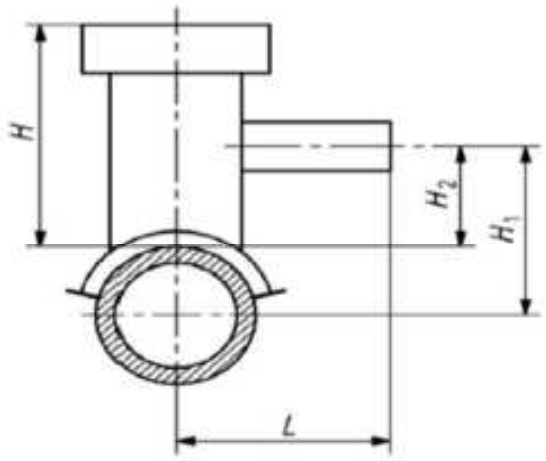



**Figure 2 — Dimensions of electrofusion saddle fittings**

Where,

| | |
|---|---|
| $H$ | height of the saddle, which comprises the distance from the top of the main pipe to the top of the tapping tee or saddle |
| $H_1$ | height of service pipe, which comprises the distance from the axis of the main pipe to the axis of the service pipe |
| $H_2$ | height of service pipe, which comprises the distance from the top of the main pipe to the axis of the service pipe |
| $L$ | width of the tapping tee, which comprises the distance between the axis of the pipe and the plane of the mouth of the service tee |

**d) Dimensional Stability:**

Couplers (including all forms of socket fittings):

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

**Tapping Tees and Branch Saddle:**

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

## 8.8. DOCUMENT REQUIREMENT:

**a) To Be Submitted Along with Bid**

All relevant documents like detailed technical catalogue, technical deviations list (if any) along with quoted price.

**b) Technical File:**

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

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

a) Field of appliance (pipe and fitting temperature limits SDR's and out of roundness).

b) Assembly instructions.

c) Fusion instruction (fusion parameters with limits). d) For saddles and tapping tee

The means of attachment (tools and/ or under clamp).

**The need to maintain the under clamp in position in order to ensure the performances of the assembly.**

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

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

## 8.9. QUALITY ASSURANCE PLAN

The Quality Assurance Plan (QAP). Inspection shall be carried out as per Annexure

– I and the vendor is to submit the plan accordingly. Vendor to submit their own QAP along with offer based on indicative QAP enclosed in this tender for approval to the Owner / Owner's representative.

## 8.10. MARKING:

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

a) Owner name as IOCL.

b) Manufacturer's name and/or trademark

c) Material and Designation

d) Design application series

e) The size of the fitting in mm

f) Fusion time in seconds g) Cooling time in minutes

h) Fusion parameters in BAR code

i) Traceability code (fittings) as per standard ISO 12176-4.

j) Number of the system standard. This information can be printed/formed directly on the fitting or on a label associated with the fitting or on an individual bag

k) Production period, year and month

The marking shall stay legible during normal manipulation, storage and installation. The marking shall not adversely influence the performance of the fitting and prevent the nonconformity of the fitting.

## 8.11. PACKAGING:

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

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

## CHAPTER-9

## 9. SPECIFICATION FOR GLOBAL NAVIGATION SATELITE SYSTEM (GNSS) SYSTEM

This specification shall be read in conjunction with the conditions of all specifications and documents included in the Contract between Owner and Contractor. Unless specified otherwise, all sections of this specification shall apply to all specifications referred in this specification.

### 9.1. TECHNICAL SPECIFICATION FOR GNSS SYSTEM

| Sl. No. | Particular |
|---|---|
| 1 | Software Based GNSS System |
| 2 | It should be simple installation and setup process |
| 3 | Multi Frequency Capable GNSS System which should support all global GNSS System |
| 4 | Multiple Signal Tracking System for Challenging<br>Conditions. GPS: L1C/A, L2C, L5<br>GLONASS: L1C/A, L2C/A<br>SBAS: L1C/A, L2C, L5<br>Galileo: E1,<br>E5A Beidou:<br>B1, B2A<br>QZSS: L1C/A, L2C, L5<br>ZSS: L1C/A, L2C, L5 |
| 5 | GNSS System should be Software controlled by using mathematical channels and it should be capable to work in Real Time Kinematic Mode (RTK Mode) |

| | |
|---|---|
| 6 | Accuracy: Accuracy should be user driven. User should have an option to choose the accuracy<br>With Real Time Service:<br>Horizontal Accuracy – 2 CM or<br>better Vertical Accuracy – 5 CM or<br>better With Network RKT:<br>Horizontal Accuracy – 1 CM or<br>better Vertical Accuracy – 2 CM or<br>**better With Single Base:**<br>Horizontal Accuracy – 2 CM or<br>better<br>Vertical Accuracy – 5 CM or better |
| 7 | Positioning Rate: It should be 1 Hz, 5 Hz, 10 Hz |
| 8 | Data protocols- Should support NTRIP, RTCM 3.x, VRS |
| 9 | Should support NMEA(LLH) position output |
| 10 | GNSS System should be capable of working in Android or iOS running field data collection applications. GNSS system should be capable of working in GIS and Survey applications like; Utility, Land Survey, GIS work, UAV etc. |
| 11 | Environment: GNSS System should be rugged enough to work in the field with IP 65 rating. This should be able to survive maximum 2 m tipping falls. Temperature:<br>Operating Temperature: -20 degree to 60 degree<br>Storage Temperature: -40 degree to 70 degree<br>Operating Altitude: It should be good enough to work in a challenging environment like 8500 meters etc |
| 12 | Weight: The GNSS System should be lightweight and should not be more than 350 gm |
| 13 | Battery: Battery should be replaceable in the field and it should work minimum 8 hours |
| 14 | Connectivity: Bluetooth is a must |

| Sl. No. | Field data Collection Software | |
|---|---|---|
| 1 | Survey Style Configuration | The Software should allow configurable survey style for RTK |
| 2 | Multitasking | The software should be capable of multitasking so that multiple operations can be opened at a time e.g., COGO, Stakeout, Point Manager etc. |
| 3 | Co-ordinate Systems Manager | Should have datum and projection support. Should support Grid coordinates. it shall be capable of taking local parameters & also support Datum transformation |
| 4 | Colour Graphical Support | The Software should have colour graphical support to visualize work while working. |
| 5 | Feature Coding | Should support Feature Coding with attributes for GIS data collection. Control Coding should be possible for automatic plot creation. |
| 6 | COGO | Should support COGO functionality. Should be able to Key in Lines, Sub-divide lines and creating parallel lines for staking out purpose. |
| 7 | Menu Driven | Should be User Friendly and Menu Driven for easy field operation. |
| 8 | Data Storage | Should be able to store GNSS data collected by the RTK system. |
| 9 | Transfer Data between Field and Office | Should be able to e-mail data collected in the field in case facility is available. Should be able import and export DXF files for effective GIS support. |
| 10 | Stake Out | Should support Graphical stakeout, not only for points but for Lines and DTM as well. Should be able perform Real Time Quality Control for stake out positions. |
| 11 | Background Map | Should be able to accept background maps |

**GIS report is to be sent to EIC as per the format attached in Annexure-1. The format may change as per the instruction of EIC.**

**The list of GNSS Rover Vendor make is as under:-**

| ITEM CODE / DESCRIPTION | GNSS DEVICE |
|---|---|
| VENDOR NAME | REMARKS |
| Leica FLX100 | |
| Trimble R2/DA2 | |
| Spectra SP60 | |
| Arrow Gold | |
| Javad | |
| Stonex | |

## ANNEXURE-1
## FORMAT FOR GIS REPORT

| S no | FeatureClassName | Required Field collected From Survey | Remarks |
|---|---|---|---|
| 1 | SqueezeOff | Location | |
| | | | |
| 2 | NetworkValve | Location | |
| | | Set_Pressure | |
| | | Valve Material | |
| | | Bonded Indicator | |
| | | Gas Pressure System Status | |
| | | Gas System Status | |
| | | Ground Level Indicator | |
| | | Insulated Indicator | |
| | | Operating Classification | |
| | | Manufacturer | |
| | | Valve Function | |
| | | Valve Series | |
| | | Gas Valve Manufacturing Specification | |
| | | Gas Valve Body Material | |
| | | Val_Size | |
| | | Maximum Operating Pressure | |
| | | Maximum Allowable Operating Pressure | |
| | | | |
| 3 | Distribution Point | Location | |
| | | Building_ID | |
| | | RegulatorStationID | |
| | | Connection Type | |
| | | DP_ID | |
| | | Subtype(Cust-Type) | |
| | | Guard-Type | |
| | | Premise | |
| | | Owner | |
| | | | |
| 4 | GasFittings | Fitting Diameter | |
| | | Section_ID | |
| | | Date of Replace | |
| | | Material | |
| | | Fitting Type | |
| | | Fitting End | |
| | | Fitting Schedule | |
| | | Fitting Orentation | |
| | | Protection Type | |
| | | Criticalindicator | |
| | | Gas Pressure System Status | |
| | | Gas System Status | |
| | | GroundStatus | |
| | | Owner | |
| | | Manufacturer | |
| | | | |
| 5 | DistributionMain | Nominal Diameter | |
| | | Nominal Diameter units | |
| | | Design Pressure Unit of measure | |
| | | PipeTestDuration | |
| | | PressureRating | |
| | | LineDepth | |
| | | Station id | |
| | | WallThickness | |
| | | Section_ID | |
| | | Operating Pressure | |
| | | Coating Type | |
| | | Status of pipe | |

| | | | |
|---|---|---|---|
| | | Outside Diameter | |
| | | GasPipeType | |
| | | PipeTestingType | |
| | | PE_Generation | |
| | | Surface_Type | |
| | | PipeGroundStatus | |
| | | Material | |
| | | Criticalindicator | |
| | | Manufacturer | |
| | | Status | |
| | | PipeType | |
| | | CP SystemStatus | |
| | | GasPipeMaterial | |

**Note** GPS coordinate of joints of MDPE, each fittings and valves to be submitted.
GPS coordinated of bends and tappings to be submitted.

## CHAPTER-10

# 10. SPECIFICATION FOR INSTALLATION OF ABOVE GROUD GI/COPPER PIPING & FITTINGS IN DOMESTIC, INDUSTRIAL & COMMERCIAL CONNECTIONS

### 10.1. SCOPE OF WORK

Generally, the following shall constitute the Contractor's scope of work but not limited to:

- Plan and prepare a schedule for execution and work implementation as per QA/QC plans to be issued by Owner/Owner's representative. Contractor has to submit the Construction/Execution procedures before commencement of work to Owner / Owner's representative for approval.

- Contractor shall submit the QCT/procedure/drawing etc. of all the material to be procured by him for approval before procuring the items. If, QCT/procedure/drawing etc. are not approved from client/consultant then owner has the authority to refuse /reject the same lot material.

- Receipt of regulators, domestic meters as a free issue items from Owner's stores, loading, transportation, unloads at project site. Proper storing, stacking, identification, providing security and insurance during and before installation and commissioning of pipelines. Obtaining the approval for optimum route and permission for work from the concerned authority and EIC.

- Selection of route with the EIC/Consultant and marking the same on walls/floors between 'transition fitting' to 'cooking oven/stove/appliance', making openings and making provisions for fixing clamps. Making temporary but stable platforms/scaffolding /rope ladder etc., required for installation of pipes/fittings at all heights/multi storied flats and locations.

- Contractor shall procure all material except free issue items for installation at the outlet of PE/ GI transition fitting up to the Domestic customers "Appliance /stove / oven for satisfactory completion to the owner/owner's representative.

- Installation of powder coated GI pipes of ½", ¾" dia. between transition fittings to customers kitchen appliances including NPT threading of GI pipes, supply of proper seal outs for threads to join fittings such as elbows, tees, connectors, appliances & isolation valves etc., as per laid procedures and specifications including clamping and sealing etc. The powder coated GI pipe shall be painted after the testing of the GI installation wherever touching is required to eliminate any coating defects during installation. Where all GI fittings shall be fully painted after testing as per defined Specification. Powder coated GI pipes of 1" and 1.5" dia. is for high rise building domestic connections and mainly for Commercial and Industrial connections.

- Installation of 12mm Copper tube including supply of lead free solder wire and flux to join fittings such as elbows, tees, connectors, valves etc., complete as per procedures and specifications including clamping and sealing etc.

- Supply of clamps for fixing pipes, Meters wherever required, painting of pipes and fittings. Providing consumables grout material, repair/restoration of walls/floors changes for the pipes including the materials required for conversions and tools and tackles etc. shall be completed as per specification.

- Conversion of all types of LPG kitchen appliances to NG based appliances & to take Sign on RFC card & Joint Meter Records (JMRs) of customer.

To demonstrate the Customer regarding use, safety and maintenance related aspects of NG based appliances and installations.

- Submit certified copies of RFC card to Projects & O&M after uploading the details in SAP/CRM/Fleet-Port/Any other software prescribed by Client.

- Cleaning, flushing, pneumatic testing and commissioning to the GI/Cu pipe & fittings, meters, valves etc. as per specification and hand over the same to Owner/Customer to the entire satisfaction of EIC/CONSULTANT.

- Dismantling of scaffolding/temporary structures and cleaning of site & restore the site as per its original condition.

- Restoration of walls, flooring and other damages while executing the above ground installation up to satisfaction of property owner.

- Preparation and submission of above ground installation card for each house indicating the laid GI/Cu pipe including fittings, mentioned the reasons, if connecting, testing, etc. is not provided to the customers and deviation statements on completion /commissioning of work.

- Following activities are also in Contractor's Scope:

 Receive Customer’s request and complaints logged on IOCL's portal / Offline.

 Carry out joint technical feasibility survey for requests received.

 Attend and resolve customer complaints within defined Turnaround time (TAT).

 Maintain and update the request and complaint status in IOCL's portal.

 Contractor should execute GI/Cu Installation works with following priority

 Online Domestic connections: Gas Supply is available in the locality and pipeline is available just outside kitchen – 20 days from date of receipt of registration

 Fresh Riser Installation in Domestic Connections: Gas available in an apartment/complex but pipeline installation pending in the concerned Tower (for building with less than G+14 floors) Or In case of Kothi /Bungalow, where gas pipeline is available outside the premises (where service line is already installed)– TAT-40 days

 Underground gas pipeline available across road : i.e. Where service line has to be laid (Laying of service line up to 20m)–TAT-60 days

 Connection rates in project areas; in High Rise segment (TAT-90 Days) & low-rise segment (TAT-75 Days)

- Maintain new connection tracking on IOCL's portal. Providing adequate manpower, minimum 2 no’s each such as data entry operator, customer care executive etc. for data logging like new connection request & GI tracking, attending complaints, day to day interaction with customers and residents so that work can be executed within defined time period (TAT) Turn Around Time.

Providing adequate manpower for carrying out laying for PNG installation for emergency cases as and when required. The TAT period for carrying out such emergency cases are defined in tender document.

- Printable material i.e. RFC book, sticker & safety Guidelines shall be provided by owner. All other printable materials like feasibility report etc. shall be in contractor's scope.

- All size of GI pipes shall be powder coated before installation and it is in the scope of contractors. Contractor shall submit powder coating procedure to EIC/ Consultants before powder coating of pipes.

- Any other activities not mentioned/covered explicitly above, but otherwise required for satisfactory completion/operation/safety/statutory/maintenance of the works in new & existing gas charged areas shall also be covered under the Scope of work and has to be completed by the Contractor within specified schedule at no extra cost to Owner.

## 10.2. MATERIAL, MANPOWER EQUIPMENT AND MACHINERY

### a) Material to be supplied as Free issue

Meter and Regulators, GI & Cu Pipe, Isolation and Appliance Valves shall be supplied as a free issue material to the contractor. The contractor shall not use any other material from any other source of supply other than owner's supplied material without any written approval from EIC.

### b) Material/Equipment & machinery to be supplied by contractor

Contractor shall procure/ purchase GI fittings, Brass fittings, Cu fittings, and Reinforced rubber hose , meter adaptor (if not available), union, hex-nut, Corrugated Flexible metal Hose (Anaconda) wherever connection using union/adaptor is not feasible etc. with other material which is required to satisfactory completion/safety/statutory of the works as per tender at no extra cost to Owner. The IOCL logo shall be marked on the material supplied by contractor. The contractor shall take approval from owner/owner representative for marking on the material to be procured by contractor before placement of order.

The Contractor shall provide labour, tools (such as Hammer Drill, Piston Drill, Pipe Cutters, Dies for threading, Pipe wrenches, spanners, conversion kits, solder torch, copper tube Cutters, tube benders, lacquering, thinner etc.) in specified numbers, all types of clamps, Plant and equipment necessary for the proper execution of the work. This will include but not limited to list of specialized tools and tackles indicated in Annexure #1.

Special tools shall be required at site for carrying out drilling work in walls other than Brick or RCC (Ex. Granite, Marble, Wooden, Glass Cutting etc.)

The contractor has to ensure the availability of DG sets for continuous power supply. In case the power supply is availed at the site from societies, individual residents, contractor shall settle the claims raised by the electricity providers without any cost implication to OWNER. In case contractor doesn't settle the claims for using the electricity from societies/individual residents, on demand by the providers, OWNER will settle the claims and the same will be deducted from the contractor's bills. The progress of work shall not hamper due to non- availability of power supply.

The contractor has to submit the valid calibration certificate for Pressure gauges.

Contractor shall submit the manufacturer test certificate slab test certificate for all items procured by him for approval before commencing the execution.

No hiring of equipment's, tools and tackles by the contractors is allowed at the site. In case any contractor is found not in possession of enlisted required tools and tackles, penalty will be levied as per the SCC which shall be deducted from the running bills.

**c) Plant and Equipment**

All vehicular type machinery shall be in good working condition and shall not cause spillage of oil or grease. To avoid damage to paved surfaces, the contractor will provide pads of timber or thick rubber under the hydraulic feet or outriggers of machinery.

**d) Sealant, Grout**

The contractor shall be responsible to arrange the supply of any consumable sealant or ready mix grout material required for restoration of holes. The sealant/grout supplied by the contractor shall be compatible with the area to be restored/ rectified. No separate payment for the supply of sealant and grout shall be made to the contractor.

**e) Clamps, Rawal Plugs, Screws and etc.**

The Clamps, Brackets for meter, Rawal Plugs, SS-304 Screws (2" length), Nozzles, etc. shall be approved lot wise by EIC prior to installation. Re-drilling of existing appliance (burners) nozzles is strictly not permitted. The quality of materials procured will be got approved and will be as directed by EIC.

The indicative sketch of the Brackets for Meter, and GI/Copper Pipe Clamps is enclosed with the tender. No separate payment for the supply of Meter Brackets and GI/Copper clamps shall be made to the contractor.

**f) Consumable Items**

- Special Consumables such as Teflon Tapes, solder wire, flux, lacquer, thinner shall be supplied by the contractor and are included in installation rates.
- These consumables shall be of reputed make companies and required grades/class

g) **Other Materials**

The contractor shall supply the following items where required:

- All materials required for work, NPT threading, copper pipe jointing, testing etc.
- All signs, barricades, lights and protective equipment.
- All material required for working at higher floor levels (i.e., scaffolding, Ladder, Safety Belts, Self-Locking Safety Harness Belts etc.).
- Special consumable such as grease for maintenance of domestic appliances, all paints for painting of GI Pipes, Consumables such as Teflon Tapes, Solder- wire, Flux, Lacquer, Thinner,

Petrol, Diesel, Fuels and Oils required are to be supplied by the contractor and are included for within the rates.

- All minor items not expressly mentioned in the contract but which are necessary for the satisfactory completion and performance of the work under this contract.

**h) Acquisition, Receipt and Storage of Materials**

The Contractor shall collect MRS/ Metering skid, Service Regulator, Domestic/ Commercial/ Industrial meter and Regulators, GI & Cu Pipes, Isolation & Appliance Valves from Owner's designated stores in between the hours to be advised by the EIC.

The contractor shall carry out assessment of material required for GI/ Copper installation in allocated area. After approval from Owner, contractor shall place order for purchasing of GI fittings, Copper fittings, Brass Fittings, and Reinforced Rubber hose, Corrugated Flexible metal Hose (Anaconda) etc. (Technical specifications attached in the tender document) to anyone of approved vendors as per the vendor list attached in the tender document. The contractor shall also ensure that the QCT for these materials shall be approved before the start of production activity. Once QCT is approved, contractor shall forward inspection call to the Owner depending upon the material requirement at the site. The inspection of these materials shall be carried out by Owner/consultant approved third party inspection agency. It is contractor's responsibility for document submission, arranging dispatch clearance, handling, loading, transportation and unloading of these materials at their own respective store.

Any other activity not mentioned/ covered, explicitly, but otherwise required for satisfactory completion/operation/safety/statutory/maintenance of works shall also be covered under scope of work and has to be completed by contractor within specified schedule at no extra cost to Owner. The Contractor shall carry free issue material in such a manner as to preclude damage using transportation and handling.

The Contractor shall physically examine all materials at the time of acceptance the material in store and notify the EIC immediately of any damage or defect noticed by the Contractor. The IOCL representative shall duly note any damage or defect in a site instruction book and both parties shall counter sign the entry.

Any damage not so recorded will be deemed not to have existed at the time of acceptance of material in store by the Contractor and the cost of repair or replacement or rectification shall be borne by the Contractor.

All materials shall be stored in contractor's stores near site in such a manner so as to prevent any damage to the materials from scratching, gouging, indentation, excessive heat or by contact with any sharp objects or chemicals.

The Contractor shall be required to submit inventory details of materials every month.

The Contractor shall maintain log book at their respective stores stating issue and availability of free issue material at a given day. Further, it is mandatory that the contractor is required to undertake and submit inventory details of free issue and purchased materials on monthly basis to Owner/ Owner's representative as per the approved format of the owner. The inventory details shall be in correlation with the Daily progress chart and material reconciliation sheet. Material reconciliation indicating issue of material, consumptions and defective material shall be submitted on every three months basis.

### 10.3. ISSUE OF WORK INSTRUCTIONS

- The contractor will be required to carry out GI installation in the areas where PE laying is under progress and in area where PE laying is expected to be laid , as per the direction of EIC. A general scheme of distribution to domestic consumer is indicated in enclosed drawing for reference. It may vary in case of individual and multi storied flats.

- All skilled personnel like jointers, conversion technicians will be approved and certified by EIC. The technicians who will carry out joining of copper material and conversions will undergo a test by Owner. Those who clear the test will be issued identity cards duly signed by EIC. These technicians shall be only authorized to take up respective jobs. In case it is found that contractor personnel other than authorized are carrying out these works, applicable penalty will be levied to the contractor as per contract.

- The rates to be quoted by contractor shall be inclusive of all preparatory/bye works, platform materials, labour, supervision, tools, taxes, duties, levies, salaries, wages, overheads, profits, escalations, fluctuations in exchange rates and no change in the rates shall be admissible during tenancy of the contract.

- The schedule of items of GI/Cu installations have been described in brief and shall be held to be completed in all respect including safety requirements as per Standard Specification of HSE, tests, inspection, QA/QC works, enabling and sundry works. The payment shall be made against completed and measured works only. No extra works whatsoever shall be considered in execution of these items.

### 10.4. PROGRESS OF WORK

The contractor shall proceed with the work under the contract with due expedition and without delay. Contractor shall assess the material requirement of the allotted area and submit the schedule plan for execution & purchasing before start of actual work.

The EIC may direct in what order and at what time the various stages or parts of the work under the contract shall be performed. Weekly progress reports shall be submitted in the formats approved by Owner, indicating broadly the laying, testing, RFC, conversions and extra piping.

### 10.5. WORK SHEETS

- The quantities of GI/Cu pipe and other details will be checked by Owner's site engineer and the same shall be incorporated in RFC cards, signed & dated as certified, on site. The cards will then be approved by the EIC.

- Measurement sheets shall be prepared based on the RFC cards and checked and certified by the site engineers for billing purpose.

- If measurement sheets submitted are illegible, incomplete or incorrectly booked they will be returned to the contractor.

### 10.6. PERMISSIONS / APPROVALS

- Contractor shall be responsible for obtaining permissions from society management, RWA, individual residents and any other concerned authority, if required, for completion of the work. Contractor must take the prior appointment from the residents for carrying out the work.

- The prospective bidder shall work in close consultation/coordination with the EIC

- The prospective bidder shall not sign/execute any agreement and/or undertaking on any such documents which amounts to be under taken by Owner. The same shall only be signed and executed by Owner; however, the prospective bidder shall also liaison and coordinates for the same.

- The necessary coordination, liaison and arrangements for inspection and approval shall be the contractor's responsibility. Inspection and acceptance of the work by authority shall not relieve the contractor from any of these responsibilities under this contract. The contractor shall plan the execution of work in such a manner so that all the registered customers are attended in phased manner. However, it is the contractor's responsibility to fix a firm appointment with the consumer for carrying out the work.

- A log book/job card for such appointments with Consumer/any other agencies shall be maintained and the schedule/appointment once taken shall be adhered to by the contractor. PMC/EIC shall review the records every week. The contractor shall submit the detailed list of RFC/Conversions and balance work on Registrations at least once a week as per approved format.

- The contractor is also required to obtain a "Labour License" from the Assistant Labour Commissioner of respective Administration/Central Govt.

- It will be the contractor's responsibility to familiarize himself and comply with, any other local rules, regulations or statutory requirements applicable to the work.

- The contractor has to take responsibility of the action of supervisors, plumbers and helpers provided by him.

## 10.7. REFERENCE SPECIFICATION, CODES AND STANDARDS

The contractor shall carry out the work in accordance with Owner's Engineering Standards: this specification, and ASME B31.8 - Gas Transmission and Distribution Piping Systems; Oil Indian Safety Directorate Norms (OISD), the American Gas Association Document - Purging Principles and Practice and PNGRB Guidelines.

If the contractor find any discrepancy, ambiguity or conflict in between any of the Standards and the contract documents, then this should be promptly referred to the Engineer -in-Charge (EIC) for his decision, which shall be considered binding on the contractor.

## 10.8. RIGHT-OF-USE SERVEY AND MARKING

The route of the pipeline to be installed shall be decided with consent of the consumer and Site Engineer/EIC. Contractor must ensure that the persons/workers/supervisors/ working at site shall have proper identity cards prior to entering the premises of the consumer.

No temporary or permanent deposit of any kind of material resulting from the work shall be permitted in the approach or any other position, which might hinder the passage and/ or natural water drainage, or any area where there is objection from consumer.

The contractor shall obtain necessary permissions from land Owners and tenants and shall be responsible for all damages caused by the construction and use of such approaches, pavements, gardens, rooms, walls, roof etc., at no extra cost to Owner.

Owner/Consultant and the contractor at each premises or housing colony to be supplied with gas will conduct a joint survey. The survey record will note Customer details, the potential gas supply points and proposed meter positions and estimates of material quantities. The contractor's representatives will make as sketch of the agreed pipe routes, if necessary.

The contractor will be responsible for contacting the Customer and making the necessary arrangements for access and appointments to carry out the work. Owner will not be responsible for any time lost due to failed appointments or disputes with Customer.

The contractor shall confine its operations within limits of the Right in use. The contractor shall restore any damage to property outside ROU.

The contractor shall also carry-out all necessary preparatory work if needed to permit the passage of men and equipment. Lights, Curbs, signs shall be provided wherever and/or required by the Owner necessary to protect the public.

## 10.9. PROTECTION OF STRUCTURES AND UTILITIES

The contractor shall at his own cost, support and protect all buildings, walls, fences or other structures and all utilities and property which may, unless so protected, be damaged as a result of the execution of the works. He shall also comply with the requirements in the specification relating to protective measures applicable to particular operations or kind of work.

While painting, contractor must take care of the consumer premises while carrying out the job such as spillage on floor, walls, ceilings, sun shades etc. If the same does occur, the contractor has to immediately make things to original.

## 10.10. INSTALLATION OF POWDER COATED GI ABOVE GROUND SERVICE PIPE

The powder coated GI service pipe installation work includes all work necessary to connect from the PE/GI transition fitting on the down-stream of the PE service, to the Customers appliance, including the installation of GI Pipes & associated fittings, Copper pipes & fittings, Brass Fittings, Isolation and appliance valves, , meters and regulators, and Reinforced Rubber hose, Corrugated Flexible metal Hose (Anaconda) clamps etc. The contractor shall be required to provide all equipment, tools and materials necessary to execute the work in an efficient and effective manner. Along with ladders, scaffolding pipe, dies, tripods, vices, fittings and Teflon tape, drills for concrete and other masonry, drills for timber, Granite, Marble Stones and laminated surfaces inside Customers property, bending tools, clamps, sleeves to facilitate the pipe passing through floors and walls, paint for marking etc.

All powder coated GI risers at the outside of buildings shall be fully supported to carry the weight of piping. A flanged foot or similar device, capable of supporting the total weight of the riser, shall support risers. The riser shall be installed in a vertical line from its point of support to its highest point with a minimum of changes in direction. The threading of GI pipe shall be NPT and conforming to ANSI B 1 20.1

Contractor has to supply different types/sizes of approved powder coated clamps (Mild Steel) for fixing GI pipes suiting to the site conditions. The contractor shall get approval from EIC for every fresh lot of the clamps, brackets, regulator boxes and other consumables, prior to start of

installation. The detailed cross sectional of GI Pipe Clamps/Meter brackets are as per relevant Drawing;

All riser and lateral pipe shall be clamped to the building at intervals not exceeding 1.5 mtrs. Maximum distance between clamps shall be 1.0 - 1.5m when pipe goes to the straight, if any tee or fittings lies in between the pipe then clamp shall be placed 150 mm far away from center line of fittings at every sides. However, the same may be changed as per site conditions/as directed by EIC. Minimum gap between pipe & wall shall be 25 mm. The joints/ fittings of the GI installation shall be painted only after carrying out testing of the installation.

Where pipe passes through the balcony and the surface is slightly elevated around the service pipe or its surrounding sleeve to prevent the accumulation of water at that point. Where a short piece of sleeve is used around the gas pipe, the sleeve should be embedded in the concrete with a mix of mortar and the void between the pipe and sleeve filled with a suitable sealant. The sealant should be beveled such as to prevent an accumulation of water. Supply of clamps for all sizes of the GI pipes is in contractor's scope. Contractor has to take prior approval for design/types of clamps, paintings etc. Pipe shall preferably be entered into building above ground and remain in a ventilated location. The location for entry shall be such that it can be easily routed to the usage points by the shortest practicable route.

The Pipe installation includes all type of Pipe & Fittings (GI Pipe & Fittings, Isolation valve etc.).

Except GI Pipe/Cu Pipe/ Isolation Valve/Appliance Valve/Regulator//Meter, Contractor shall procure all other materials (i.e. GI fittings, Brass Fittings. Copper Fittings, Flexible Hose ( Anaconda, only if required), clamps, Consumables, unions, adaptors, hex-nuts, end plugs etc.) as per IOCL specification for installation and to the entire satisfaction of EIC/consultant.

The contractor shall also ensure that gas supply shall not be provided to the customer in any Concealed Piping.

***Scheme for GI Piping for Domestic Customer when gas supply is through service regulator (100mbar)***

1. **TF to Riser Isolation Valve (RIV)**: Powder coated GI pipe of ½" / ¾"/1" dia. installed of length up to 1.5m from transition fitting up to inlet of RIV. Its length may very as per site situation subject to prior approval from Site In-Charge or as per instruction of EIC. The Laying of GI Pipe from the transition fittings to regulators shall be payable as per relevant SOR.

2. **Riser for Bungalow /Apartments having floors up to G+5**: Powder coated GI riser pipe of ½'' dia shall be installed from transition fitting up to inlet lateral isolation valve(s) & ½'' dia shall be installed from lateral isolation valve to meter regulator.

3. **Riser for Bungalow/Apartments having floors from G+6 to G+8**: Powder coated GI riser pipe of ¾" dia shall be installed from transition fitting up to inlet lateral isolation valve(s) & ½'' dia shall be installed from lateral isolation valve to meter regulator.

4. **Riser for Bungalow/Apartments having floors from G+9 to G+14**: Powder coated GI riser pipe of 1" dia shall be installed from transition fitting up to inlet lateral isolation valve(s) & ½'' dia shall be installed from lateral isolation valve to meter regulator.

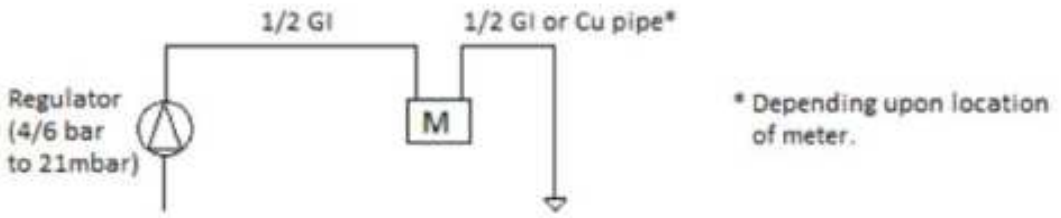
5. **Riser for Bungalow/Apartments having floors from G+15 to G+25**: Powder coated GI/CS riser (welded) pipe of 1.5" dia shall be installed from transition fitting up to inlet lateral isolation valve(s) & ½'' dia shall be installed from lateral isolation valve to meter regulator

***Scheme for GI Piping for Domestic Customer when gas supply is through regulator (4bar to 21mbar)***

**Regulator piece**: Powder coated GI pipe of 1/2'' dia. installed of length 1.5m from transition fitting up to inlet of regulator. Its length may very as per site situation subject to prior approval from Site In-Charge or as per instruction of EIC.

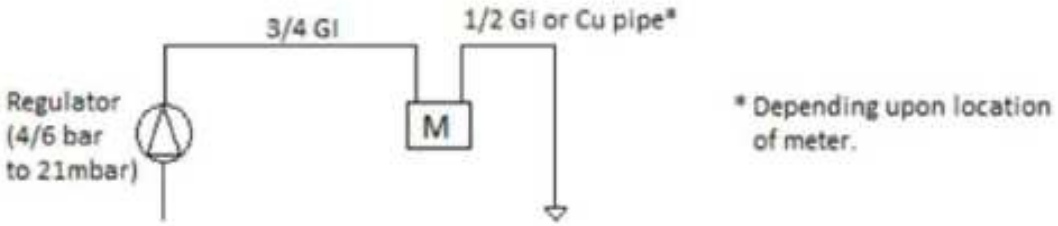
**Riser:**

- **Scheme 1- For Independent house upto G+2:**




  - Regulator shall be of range from 4/6 bar to21mbar.
  - Pipe from outlet of regulator to inlet of meter shall be 1/2" GI pipe.
  - From outlet of meter, 1/2" GI pipe or Copper pipe shall be used depending upon the location of installation of domestic meter.

- **Scheme 2- For High-Riser society from G+3 to G+7:**




  - Regulator shall be of range from 4/6 bar to21mbar.
  - Pipe from outlet of regulator to inlet of meter shall be 3/4" GI pipe.
  - From outlet of meter, 1/2" GI pipe or Copper pipe shall be used depending upon the location of installation of domestic meter.

**Powder Coating/ Painting of GI Pipes**

The entire lengths of the pipeline along with fittings are to be painted/ powder coated after proper surface preparation as follows:

PAINTING (for scratched powder coated pipes and fittings only)

- One coat of Primer Application (Appropriate Zinc based primer)
- Two coats of synthetic enamel paint canary yellow of minimum of 30 microns per coat of reputed make like Asian, Berger, Nerolac. (No other make shall be used for painting).

All painting materials including primers and thinners brought to site by contractor for application shall be procured directly from manufacturers/dealers as per specifications and shall be accompanied by manufacturer's test certificates. Paint formulations without certificates are not acceptable. The contractor shall ensure that smooth finish is attained after carrying out painting.

Engineer-in-Charge at his discretion may call for test for paint formulations. Contractor shall arrange to have such tests performed including batch wise test of wet paints for physical and chemical analysis.
All costs there shall be borne by the contractor.
The painting work shall be subject to inspection and certification by Engineer-in-Charge at all times.
Painting of GI pipe shall be paid with installation of GI pipes.
POWDER COATING
Contractor will be required to install Powder coated GI pipes and shall submit detailed procedure of powder coating for approval to Consultant. After installation of the entire piping system, final touching with paint shall be done to the satisfaction of EIC.

## 10.11. INSTALLATION OF COPPER ABOVE GROUND SERVICE PIPE

The Copper service pipe installation work includes all work necessary to connect from the downstream of Meter upto the isolation/appliance valve and flexible hose prior to the customer appliance, including the installation of valves, including application of lacquer paint etc. The contractor shall be required to provide all equipment, tools and material necessary to execute the work in an efficient and effective manner. Amongst other things he will be required to provide ladders, scaffolding pipe, drills for concrete and other masonry, drills for timber and laminated surfaces inside customers property, bending tools, clamps, sleeves to facilitate the pipe passing through floors and walls, etc.

During installation the Copper pipe is to be cut to proper length with tube Cutter, the burrs removed with a file, cleaning of outside surface of pipe & inside surface of fitting, applying flux to the tube and fitting around the outer/inner ends, inserting the tube into the fitting, applying heat to the assembled joints using conventional blow torch to melt solder wire. Contractor shall submit the joining procedure of Cu pipe & Fitting to the approval or as per the instructions of EIC.

Lacquer is to be applied to the copper tubes by mixing lacquer with thinner in approved proportions and applied by dipping method or with brush. It should be applied only once at a time and drying time of minimum one hr. is to be given.

Contractor has to supply different types/sizes of approved clamps (PE 80/PVC) for fixing Copper pipes suiting to the site conditions Contractor has to take prior approval of EIC for quality of the clamps, solder, flux, lacquer, thinner etc. The approval shall be taken for every fresh lot of clamps from EIC before installation at site.

The GI/Cu/brass fittings shall not be counted separately & shall be measured along with GI & Cu pipe.

Except Meter and Regulator, GI & Cu Pipes, Isolation & Appliance Valves Contractor shall procure all other materials (i.e. fittings, clamps, etc.) as per attached specification for installation and to the entire satisfaction of EIC/consultant.

The contractor shall also ensure that gas supply shall not be provided to the customer in any Concealed Piping.

The Copper service pipe installation work includes all work necessary to connect downstream of the meter to the Customers appliances. The contractor shall be required to provide all equipment, tools and materials necessary to execute the work in an efficient and effective manner. Along with these, he will be required to provide ladders, scaffolding pipe, drills for concrete and other masonry, special drills for timber, Granite, Marble Stones and laminated surfaces inside Customers property, bending tools, sleeves to facilitate the pipe passing through floors and walls, etc. Copper pipes & fittings shall be provided by Contractor.

All copper piping shall be clamped to the walls at intervals not exceeding 500 mm. The solder wire shall be of reputed company of diameter size 3.25mm, Lead free as per BS 29453:1994 (Soft solder alloys) and supplied in coils. The detail specification is attached in tender for reference. Solders for use with copper tube & fittings generally melt within the temperature range 180°C- 250°C. The contractor has to furnish the certificate of confirmation of standards before start of work.

### 10.12. Installation of Meter

Installation of domestic meters with associated inlet and outlet connections (GI & Brass fittings), on the wall with approved powder coated meter brackets and angles in new areas ensure a clear gap between meter and wall.

The contractor shall supply approved powder coated meter brackets and angle brackets. It is required that one sample of each type of bracket is approved before the work is started. The installation of meter is preferred using meter adaptor(s)/bush over anaconda connection. Anaconda connection is only to be done if it is absolutely essential due to site constrains in installing meter without anaconda. Fittings/anaconda shall be supplied by contractor as per actual connection requirement only.

Firmly secure the meters on the wall with good quality Rawal Plugs, screws etc. In case the Rawal Plugs are not holding then wooden blocks or other fixing arrangements like cement etc. to be used for proper grouting.

Note : Installation of meter should be done at height of approx. 04 to 06 feet.

The Meter installation will be preferred in open/ventilated space so as to prevent Gas accumulation and easy dispensation of gas to atmosphere in case of any smell/leakage of gas. The Meter installations will not be provided in any fixed enclosures, cabinets (below or above the slab) or confined space in the customer premises.

The Contractor shall ensure that GI installations and rubber hoses shall not be exposed to direct heat of Gas burners. The installation should have minimum clearance of about 1 meter from electric

point mains& switches. Minimum distance between Appliance Valve & Gas Burners shall be 0.3 Meters. The isolation valve shall be installed after entering the customer premises/kitchen but before the meter/regulator installation.

The above activities along with restoration of the area to original shall be carried out to the complete satisfaction of consumer and EIC.

Powder Coating /Painting of GI Pipes

The entire lengths of the pipeline along with fittings are to be painted / powder coated after proper surface preparation as follows:

(a) Painted (for scratched powder coated pipes and fitting only):

- One coat of Primer Application (Appropriate Zinc based primer)

- Two coats of synthetic enamel paint- canary yellow of minimum of 30 microns per coat of reputed make like Asian, Berger, and Nerolac. (No other make shall be used for painting).

All painting materials including primers and thinners brought to site by contractor for application shall be procured directly from manufacturers/dealers as per specifications and shall be accompanied by manufacturer's test certificates. The contractor shall ensure that smooth finish is attained after carrying out painting.

Engineer-in-Charge at his discretion may call for test for paint formulations. Contractor shall arrange to have such tests performed including batch wise test of wet paints for physical and chemical analysis. All costs there shall be borne by the contractor.

The painting work shall be subject to inspection and certification by Engineer- in-Charge at all times. Painting of GI pipe shall be paid with installation of GI pipes.

(b) Powder coating (refer attached Specification for powder coating)

Contractor will be required to install powder coated GI pipes shall submit detailed procedure of powder coating for approval to Consultant prior to supply of GI pipes. After installation of the entire piping system, final touching shall be done to the satisfaction of EIC.

## 10.13. TESTING OF GI / COPPER INSTALLATION

A. TEST PRESSURE IN CASE OF DIRECT REGULATOR SUPPLY (04 bar TO 21 mbar)

- The GI installation from PE/GI transition fitting up to regulator shall be tested at the pressure of 6.0bar (g) for a holding period of 2 hour with no pressure drop.
- The testing of GI shall be done with the isolation valve in open condition and open end plugged.
- The GI installation from regulator outlet to Meter Inlet valve (except meter) shall be tested at a pressure of 2.2 bar (g) for a holding period of 2 hour with no pressure drop.
- The GI installation from meter outlet to appliance valve (except meter) shall be tested at a pressure of 2.2 bar (g) for a holding period of 30 minutes with no pressure drop.
- The Copper installation from meter outlet to appliance valve shall be tested at a pressure of 80-100 mbar (g) for a holding period of 30 minutes with no pressure drop.
- All the joints in the installation shall be checked with soap solution.

- The meter shall be removed while carrying out the testing at 2.2 bar (g) and joints of the meter shall be tested online at 100mbar with soap solution after completion of the work.

B. TEST PRESSURE IN CASE OF SERVICE REGULATOR SUPPLY (100-110 mbar)

- The installation from PE/GI transition fitting up to meter inlet (except regulator/meter) shall be tested at the pressure of 2.2bar (g) for a holding period of 2 hour with no pressure drop.
- The testing of GI installation shall be done with the isolation valve in open condition and open end plugged.
- The GI installation from meter outlet to appliance valve (except meter) shall be tested at a pressure of 2.2 bar (g) for a holding period of 30 minutes with no pressure drop.
- The Copper installation from meter outlet to appliance valve shall be tested at a pressure of 80-100 mbar (g) for a holding period of 30 minutes with no pressure drop.
- All the joints in the installation shall be checked with soap solution.
- The meter shall be removed while carrying out the testing at 2.2 bar (g) and joints of the meter/regulator shall be tested online at 100mbar with soap solution after completion of the work.

For testing proper test ends shall be made along with gauges and subsequently approved by EIC. For the installation to be tested by manometer or diaphragm gauge the meter shall not be dismantled/removed and testing shall be carried out at 100 m bar with holding period of 30 min with no pressure drop.

• The contractor shall supply the Calibrated Pressure Gauges/ Manometer/Diaphragm Gauges of suitable range for testing of GI/Copper Installations ranging from 0-4 bars/0-150 m bar/0-250 m bar respectively. The calibration certificate shall be submitted before the start of the execution work.

• The pressure gauges shall be calibrated from time-to-time as desired by EIC but positively once in every six months.

• The details of testing shall be properly recorded in the GI/Copper cards.

• The ends/joints shall be painted only after carrying out testing of the installation.
Powder coating to GI pipes shall be carried out in factory/ shop, and repair/
touching shall be carried out at site.

## 10.14. INSPECTION

The contractor to the entire satisfaction of EIC before proceeding further shall rectify any defect noticed during the various stages of inspection. Irrespective of the inspection, repair and approval at intermediate stages of work, contractor shall be responsible for making good any defects found during final inspection/guarantee period/defect liability period as defined in general condition of contract.

## 10.15. PURGING & COMMISSIONING

For purging & commissioning of the GI/Cu installations, care shall be taken to ensure that the outlet is so located that vent gas cannot drift into buildings.

The commissioning of the GI installation should be performed as follows:

- Ensure the method of purging is such that no pockets of air are left in any part of the Customer's piping.

- Ensure that all appliance connections are gas tight, all appliance gas valves are turned off and there are no open ends.

- Where possible, select an appliance with an open burner at which to commence the purge i.e., a hotplate burner.

- Ensure branches that do not have an appliance connected are fitted with a plug or cap.

- Ensure the area is well ventilated, and free from ignition sources.

- Turn on one burner control valve until the presence of gas is detected. A change in the audible tone and smell is a good indication that gas is at the burner. Let the gas flow for a few seconds longer, then turn off and allow sufficient time for any accumulated gas to disperse.

- Turn on one gas control valve again and keep a continuous flame at the burner until the gas is alight and the flame is stable.

- Continue to purge until gas is available at other appliances; Check availability of gas using Methane- detector.

- Internal piping i.e. Meter Inlet, Diaphragm Meter & copper pipe shall be tested pneumatically & with soap solution from inside of each domestic connection.

## 10.16. CONVERSION OF DOMESTIC APPLIANCES

The work in this section includes:

- The changing of nozzles and associated controls in accordance with manufactures instructions for both domestic and imported burners/ovens/grills/hotplate.

- The changing of old appliance connection Reinforced rubber hoses and nozzles and re-greasing taps as necessary.

- The contractor shall supply the Reinforced rubber hoses at the time of conversions.

- The contractor has to supply all types of nozzles/jets required for all types of appliances including imported burners, Grills, Ovens.

- Cleaning and performing minor maintenance of appliances.

- Testing for gas escapes, soundness and performance of appliances.

- Instructing the Customer for safe use of natural gas and for fixing of safety and conversion labels.

- Contractor must attend the complaints regarding appliances, leakage, fire etc. till the total area is handed over to Owner's operation and maintenance.

- All consumables (Nozzles, greases etc.) are in contractor's scope.

- Changing or repairing of any items damaged during conversion.

It may be noted that the rates as per applicable SOR item will apply to conversion of all type of domestic appliances under the rates, the contractor will have to provide both Pin gauges and standard sized nozzles. The payment shall be released only after submission of necessary documents i.e. RFC & JMR Card of the individual house to Owner.

### 10.17. RESTORATION

Contractor has to restore the area wherever he has carried out drilling, clamping etc. to its original condition to the satisfaction of the consumer and to ensure no passage to the premises and seepage. If the work was carried out in Govt. Flats (CPWD/NDMC/Institutional areas), contractor has to restore the area according to CPWD specifications and obtain a NOC/Clearance certificate from the concerned authorities maintaining the flats, after completion of the work.

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

Wherever any items of the consumer is damaged/broken during working, the same will

be made good or replace to the total satisfaction of the consumer.

The contractor will be responsible for the maintenance of all restoration carried out, for the duration of the contract guarantee period.

The contractor is to ensure the restoration work is properly supervised, and that the material used is suitable for the purpose. Wherever the required standards are not achieved the contractor will be required to replace the defective reinstatement work.

Note that Payment for GI/Copper installation will be released only after satisfactory restoration and clearing of the sites of all surplus materials etc.

### 10.18. SUBMISSION OF FINAL RECORDS

Contractor shall submit three sets each of the following documents in hard & soft copy:

- Total list of houses in the area allotted to him giving details of connections provided & reasons where connection could not be given completed.

- The details recorded in RFC cards of every domestic house.

- Details of houses where piping done along with materials used.

- Total material consumption report.

- Material reconciliation with respect to the materials issued.
- Test reports & calibration certificates of gauges etc.
- Any other documents/records required.
- Extra Piping details

### 10.19. COMPLIANCE TO HEALTH, SAFETY & ENVIRONMENT (HSE) FOR LOW RISE GI

Scope include use of Fall arrestor, Ascenders / descenders, PPE, Barricades/ Warning Boards (03 No's) connected with warning board & Caution tapes in areas where piping work is in progress, Use of Safety shoes, Walky talky, Hand gloves, Reflective jackets, Hard hats (helmets), eye and ear safety equipment, Fire extinguishers and as per the detailed scope of work in tender specifications. Contractor shall also prepare and submit duly certified Safety check list signed by TPIA/PMC. In case of non-compliance, penalty shall be applicable as per SCC clause.

This set-up is applicable up to 4th (G+4) floor and full body safety harness with accessories shall be of KARAM or equivalent make.

**ANNEXURE 1**

TOOLS & EQUIPMENT TO BE PROVIDED BY CONTRACTOR FOR GI/COPPER WORK

| S. No. | Hand Tools Description | Per Technician | Per Team |
|---|---|---|---|
| 1 | Pipe Wrench 250 mm | 1 | 4 |
| 2 | Pipe Wrench 350 mm | 1 | 4 |
| 3 | Pipe Wrench 450 mm | - | 2 |
| 4 | Adjustable Spanner 50 mm | - | 4 |
| 5 | Adjustable Spanner 150 mm | 1 | 2 |
| 6 | Adjustable Spanner 250 mm | 1 | 2 |

| | | | |
|---|---|---|---|
| 7 | Set of combination spanner 3/16”-11/4”AF | 1 | 1 |
| 8 | Set of combination spanners 5mm-30mm | 1 | 1 |
| 9 | Large tool boxes | 1 | 2 |
| 10 | Set flat – headed screw drivers | 1 | 2 |
| 11 | Set Philips screw drivers | 1 | 2 |
| 12 | Small hammer | 1 | 2 |
| 13 | Combination pliers/mole grips | 1 | 2 |
| 14 | Set of files | 1 | 2 |
| 15 | Drill bits for 1” pipe | - | 2 |
| 16 | Stocks and dies for NPT threading ½”, ¾”, GI pipe | - | 3 |
| 17 | Blowtorch | - | 1 |
| 18 | Hand drill 3/8” chuck | - | 2 |
| 19 | Portable electric drill 240v, heavy duty | - | 2 |
| 20 | Spare blades | 4 | 4 |
| 21 | Battery Powered torches | 2 | 2 |

| | | | |
|---|---|---|---|
| 22 | Measuring Tape 30m | 1 | 2 |
| 23 | Wire Brush | 1 | 2 |
| 24 | Portable Pipe vice & tripod | - | 2 |
| 25 | Set steel twist drills 0.5-2.0mm (for appliance conversion) | - | 1 |
| 26 | Set steel twist drill 1mm-10mm | - | 2 |
| 27 | Set masonry drills 1mm-10mm | 1 | 2 |
| 28 | Graphite based grease | As required | As required |
| 29 | Lubricating Oil | As required | As required |
| 30 | Hand Cleaner | As required | As required |

| | | | |
|---|---|---|---|
| 31 | GI Pipe Cutters ½”<br>Gas Detection Equipment Power Generator 2.5 KVA Pressure Gauge (0-10 bar)<br>Pressure Gauge (0-4 bar) Diaphragm Gauge (0-400m bar) Manometer (0-150m bar) | -<br>As required As required<br>2<br>2<br>1<br>1 | 2<br>-<br>-<br>4<br>8<br>2<br>1 |
| 32 | Automatic Thread Cutting Machine | - | 2 |
| 33 | GI Pipe Cutter | - | 2 |
| 34 | Soldering Iron | - | 2 |
| 35 | Copper tube Bending Machine | - | 2 |

## CHAPTER-11

## 11. SPECIFICATION FOR LOWERING IN

This specification refers to the lowering-in of the pipelines.

### 11.1. EQUIPMENT

The Contractor shall supply the equipment necessary for lifting, handling a lowering- in the pipelines and for protecting their coating; the list and the characteristics of the equipment shall be approved by the Engineer.

The lifting equipment shall be provided in sufficient quantity and having strength adapted to the characteristics of the pipeline and to the lowering-in methods in order that the pipelines suffer no unusually heavy stresses during the lowering operations.

The lifting equipment accessories such as roller cradles, slings, wedges shall be such that no damages are caused to the coating.

The dimension and type shall be approved by the Engineer.

Contractor shall provide fitness certificate of machineries proposed to be used for lowering of pipeline. Test certificates of lifting equipment accessories such as roller cradles, slings, wedges shall be submitted by Contractor to the IOC/PMC.

### 11.2. CAPPING PIPELINE SECTIONS

Before lowering-in a pipeline section, both ends shall be capped in such a way as to prevent stones and earth from entering the pipeline section during the lowering in operations. The caps shall be of a type approved by the Engineer and shall be removed just before jointing.

### 11.3. LOWERING-IN

The Contractor shall carry out the lowering-in immediately after the Engineer has checked:

- The quality and the quantity of lifting and handling machines and devices; width non-abrasive slings or bets shall be used for lowering-in the pipelines. All lowering-in devices and padded skids shall be subject to close inspection to ensure that the coating is not damaged before the pipe reaches the bottom of the trench.
- The good condition of the coating and its quality of insulation; when the pipeline is constructed with previously coated pipes, not lowered-in directly but placed on skids above or beside the trench the quality of the coating shall be systematically checked, and any necessary repairs shall be carried out in conformity with the specification.
- The good condition of the trench; when the coated pipeline is to be lowered-in the bottom shall be free of brushes, skids, piped, crops, rocks, hard lumps of earth or clay, sticks, so that the protective coating shall not be punctured nor abraded.

Before lowering-in the pipelines the trench shall be padded with a minimum 10 cm compacted padding such as sand or a soft material agreed by the Engineer.

Immediately after lowering-in the pipelines, the Contractor shall place 20 cm of soft material over them. Pipe Cover to be measured at each joint before backfilling and level sheet to be maintained for entire pipeline.

When a flexion laying of the pipeline is authorized the pipes shall be maintained in the middle of the trench by means of sandbags.

Whenever pipeline is laid under tension, as a result of assembly error (for example incorrect positioning of bends in trench), the trench shall be rectified or in exceptional cases a new assembly/pipeline section shall be prepared as per site situation, to be approved by IOCL/PMC, so that it fits the excavation and the laying bed without any stress in the pipe section.

Laying shall be carried out under safe conditions so as to avoid stresses and temporary deformations in the pipeline.

Contractor Shall deploy skilled riggers for lowering of pipeline in safe manner.

Contractor shall submit pipe book upto Joint coating part to Owner's Representative. After certification of the pipe book only lowering in can be started. Prior to lowering in; a complete check by a full circle holiday detector for pipe coating and field joint coating in presence of Owner's Representative shall be carried out and all damages noted shall be repaired at Contractor's cost.

Before pipeline lowering & pipe string, Holiday test shall be carried out at 25 KV

**11.4.** FLOODED TRENCH

When the trench contains water or mud the trench shall be dried and cleaned before lowering-in any of the pipeline sections.

However, for certain locations of a limited length the Contractor may propose for the approval of the Engineer a procedure which, without drying out the trench enables the pipeline sections to be normally laid in the bottom of the trench.

## CHAPTER-12

# 12. SPECIFICATION FOR WELDED RISER & GI/COPPER INSTALLATIONS FOR PNG CONNECTIONS IN HIGN RISE BUILDINGS

This specification refers to the backfilling of the trench after the lowering-in of the gas pipelines and to the reconditioning of the surface after the completion of the works.

## 12.1. SCOPE OF WORK

**Generally, the following shall constitute the Contractor's scope of work but not limited to:**

- Plan and prepare a schedule for execution and work implementation as per QA/QC plans to be issued by Owner / Owner's representative. Contractor has to submit the Construction/Execution procedures before commencement of work to Owner / Owner's representative for approval.

- Contractor shall submit the ITP/procedure/drawing etc. of all the material to be procured by him for approval before procuring the items. If, ITP/procedure/drawing etc are not approved from client/consultant then owner has the authority to refuse /reject the material.

- Receipt of GI & Cu Pipes, Service Regulators, Domestic Meters, Meter Regulators, Isolation and Appliance Valve as a free issue items from Owner's stores, loading, transportation, unloading at project site. Proper storing, stacking, identification, providing security and insurance during and before installation and commissioning of pipelines. Obtaining the approval for optimum route and permission for work from the concerned authority and EIC.

- Selection of route with the EIC /Consultant and marking the same on walls/floors between 'transition fitting' to 'cooking oven/stove/appliance' with preparation of isometric drawings, making openings and making provisions for fixing clamps. Making temporary but stable platforms/scaffolding/rope ladder etc., required for installation of pipes / fittings at all heights / multi storied flats and locations.

- Contractor shall procure all material except free issue items for installation at the outlet of PE/ GI transition fitting up to the Domestic customers "Appliance /stove / oven for satisfactory completion to the owner/owner's representative.

- Installation of Service Regulators as per attached drawing in the tender.

- Supply and Installation of Regulator Box including fabrication as per drawing attached in tender.

- Installation of ¾" to 2" Welded Riser from Transition Fittings to last floor : Assessment of material requirement for installation of riser & header at site, Procurement of GI Pipes (heavy duty) as per IS-1239 Part-I duly powder coated & wrought steel fittings(forged fittings) conforming to IS-1239 Part-II from any of the approved vendors of IOCL.

Scheduling, planning of material & forwarding inspection call, Getting Dispatch clearance from IOCL/PMC, Handling, loading, transportation and unloading of these materials at contractor's store / site.

Preparation and approval of sketches, schedules, execution procedures & WPS as per technical specification. All consumables e.g. electrodes, flux etc. for welding pipes and fittings are under contractor's scope. Finalizing optimum route in consent to IOCL representative from transition fitting to last floor of building including lateral piece with isolation valve as per Drawing.

Erection, Fabrication, Socket Welding, Testing & Installation of welded GI Pipes & Fittings etc., including NPT threading as per technical specification.

Supply & fixing of MS angle clamps, Ceiling clamps & dowel plugs with screws, grout material, suitable thread sealant i.e. Teflon Tape / lock tight, Supply and fixing of studs & bolts of various sizes ranging from ½" to 2" and 3/4" to 2", Jointing of transition fittings to above ground GI pipes, purging, testing and commissioning of the complete installation.

Welded riser shall be installed after successful testing at ground level. Riser shall be then pulled with pulley for vertical installation. Pneumatic testing shall be carried out for entire riser length after installation of riser as per technical specification. All the safety equipment's, tools and tackles required for satisfactory execution of welding/installation work are under contractor's scope.

Any other material & activities not mentioned/covered above, but otherwise required for satisfactory completion/safety of work as defined in tender has to be supplied / done by contractor within specified schedule at no extra cost to owner.

Installation of Powder Coated GI pipes of ½" to 2" dia. from welded riser tapping TEE (Isolation Valve) to customer's kitchen appliances including NPT threading of GI pipes, supply of proper seal outs for threads to join fittings such as elbows, tees, connectors, regulators, meters, appliance & isolation valves etc., as per laid procedures and specification including clamping and sealing etc. The Powder Coated GI pipe shall be finally touched up (painted) where the powder coating vanished and fitting joints after the testing of the GI installation.

- Installation of Copper pipes including supply of solder wire and flux to join fittings such as elbows, tees, connectors, meters, valves etc., complete as per procedures and specifications including clamping and sealing etc.

- Supply of clamps for fixing pipes, Meters wherever required, painting of pipes and fittings. Providing consumables grout material, repair/restoration of walls/floors changes for the pipes including the materials required for conversions and tools and tackles etc. shall be completed as per specification.

Cleaning, flushing, pneumatic testing and commissioning to the GI/Cu pipe & fittings, meters, valves etc. as per specification and hand over the same to Owner/Customer to the entire satisfaction of EIC/CONSULTANT.

- Conversion of all types of LPG kitchen appliances to NG based appliances. & to take Sign on RFC card & Joint Meter Records (JMRs) of customer.

- To demonstrate the Customer regarding use, safety and maintenance related aspects of NG based appliances and installations.

- Dismantling of scaffolding/temporary structures and cleaning of site & restore the site as per its original condition.

- Restoration of walls, flooring and other damages while executing the above ground installation.

- Preparation and submission of above ground installation card for each house indicating the laid GI/Cu pipe including fittings. Reason for not providing the connection to the customers and deviation statements/ consent form on completion/ commissioning of work in a particular society/ block.

- Any other activities not mentioned/covered explicitly above, but otherwise required for satisfactory completion/operation/safety/statutory/maintenance of the works shall also be covered under the Scope of work and has to be completed by the Contractor with in specified schedule at no extra cost to Owner.

- **Following activities are also in Contractor's Scope:**

a. Furnished office set up with internet facility and air conditioned work area for IOCL representatives

b. Receive Customer's request and complaints logged on IOCL's portal / Offline.

c. Carry out joint technical feasibility survey for requests received.
d. Attend and resolve customer complaints.
e. Maintain and update the request and complaint status in IOCL's portal.

f. Maintain new connection tracking on IOCL's portal.

- Providing adequate manpower, minimum 2 nos. such as data entry operator, customer care executive etc. for data logging like new connection request & GI tracking, attending complaints, day to day interaction with customers and residents so that work can be executed within defined time period (TAT) Turn Around Time.

- Providing adequate manpower for carrying out laying for PNG installation for emergency cases as and when required. The TAT period for carrying out such emergency cases are defined in tender document.

## 12.2. MATERIAL, MANPOWER, EQUIPMENT AND MACHINERY

- **Material to be supplied as a free issue material**

GI & Cu Pipes, Service Regulators, Domestic Meters, Meter Regulators, Isolation and Appliance Valves shall be supplied as a free issue material to the contractor. The contractor shall not use any other material from any other source of supply other than owner's supplied material without any written approval from EIC.

- **Material / Equipment & machinery to be supplied by contractor**

Contractor shall procure / purchase GI fittings, Wrought Steel Fittings (Forged Fittings), Brass fittings, Cu fittings and Reinforced rubber hose with other material which is required for satisfactory completion / safety / statutory of the works as per tender at no extra cost to Owner. IOCL logo/IOCL shall be marked on the material supplied by contractor. The contractor shall take approval from

owner / owner representative for marking on the material to be procured by contractor before placement of order.

The Contractor shall provide labour, tools (such as Hammer Drill, Piston Drill, Pipe Cutters, Dies for threading, Pipe wrenches, spanners, conversion kits, solder torch, copper tube Cutters, tube benders, lacquering, thinner etc.) in specified numbers, all types of clamps, Plant and equipment necessary for the proper execution of the work. This will include but not limited to list of specialized tools and tackles indicated in Annexure # 1.

Special tools shall be required at site for carrying out drilling work in walls other than Brick or RCC (Ex. Granite, Marble, Wooden, Glass Cutting etc.)

The contractor has to ensure the availability of DG sets for continuous power supply. In case the power supply is availed at the site from societies, individual residents, contractor shall settle the claims raised by the electricity providers without any cost implication to OWNER. In case contractor doesn't settle the claims for using the electricity from societies/individual residents, on demand by the providers, OWNER will settle the claims and the same will be deducted from the contractor's bills. The progress of work shall not hamper due to non-availability of power supply.
The contractor has to submit the valid calibration certificate for Pressure gauges. Contractor shall submit the manufacturer test certificate / lab test certificate for all
items procured by him for approval before commencing the execution.

No hiring of equipments, tools and tackles by the contractors is allowed at the site. In case, any contractor is found not in possession of enlisted required tools and tackles, penalty will be levied as per SCC which shall be deducted from the running bill.

- **Plant and Equipment**

All vehicular type machinery shall be in good working condition and shall not cause spillage of oil or grease. To avoid damage to paved surfaces, the contractor will provide pads of timber or thick rubber under the hydraulic feet or outriggers of machinery.

- **Sealant, Grout**

The contractor shall be responsible to arrange the supply of any consumable sealant or ready-mix grout material required for restoration of holes. The sealant/grout supplied by the contractor shall be compatible with the area to be restored / rectified. No separate payment for the supply of sealant and grout shall be made to the contractor.

- **Clamps, Rawal Plugs, Screws and Nozzles etc.**

The Clamps, Brackets for meter, Nylon Rawal Plugs, SS/Brass Screws, Nozzles, etc. shall be approved lot wise by EIC prior to installation. Re-drilling of existing appliance (burners) nozzles is strictly not permitted. The quality of materials procured will be approved by Owner/Owner's representative or as directed by EIC.

The indicative sketch of the Brackets for Meter, Regulator Boxes and GI/Copper Pipe Clamps is enclosed with the tender. No separate payment for the supply of Meter Brackets and GI/Copper clamps shall be made to the contractor.

**Consumables Items**

- Consumables such as Electrodes, Teflon Tapes, solder wire, flux, lacquer; thinner shall be supplied by the contractor and are included in installation rates.

- These consumables shall be of reputed make companies and required grades/ class.

- Other Materials

The contractor shall supply the following items wherever required:

- All materials required for work, NPT threading, copper pipe jointing, testing etc.

- All signs, barricades, lights and protective equipment.

- All material required for working at height (i.e. scaffolding, Ladder, Safety Belts).

- Self-Locking Safety Harness Belts PETZL make as mentioned in safety procedure are mandatory.). Contractor shall provide but not limited to ascender, descended and pulley system essentially to carry out work at height.

- Motorized suspended platform with skilled operator shall be preferred for installation above 25th storey building.

- Special consumable such as grease for maintenance of domestic appliances, all paints for painting of GI Pipes, Regulator Boxes, Consumables such as Teflon Tapes, Solder-wire, Flux, Lacquer, Thinner, Petrol, Diesel, Fuels and Oils required are to be supplied by the contractor and are included within the rates.

- All minor items not expressly mentioned in the contract but which are necessary for the satisfactory completion and performance of the work under this contract.

- Acquisition, Receipt and Storage of Materials

The Contractor shall collect Service Regulators, Domestic Meter, Meter Regulators, estimated for maximum one month from Owner's designated stores in between the hours to be advised by the EIC.

The Contractor shall carry out assessment of material required for GI/Copper installation in allocated area. After approval from Owner, contractor shall place order for purchasing of GI fittings, Wrought Steel Fittings (Forged Fittings), fittings, Brass Fittings and Reinforced Rubber hose (Technical specifications attached in the tender document), MS/PVC clamps using SS304/brass screws, super hold nylon rawl plug anchor to any of the approved vendors as per the list attached in the tender document. The contractor shall also ensure that the ITP for these materials shall be approved before the start of production activity. Once ITP is approved, contractor shall forward inspection call to the Owner depending upon the material requirement at the site. The inspection of these materials shall be carried out by Owner appointed third party inspection agency. It is contractor's responsibility to submit documents, arranging dispatch clearance, handling, loading, transportation and unloading of these materials at their own respective stores. In case of any defective material found shall be returned to IOCL store within one month of issue.

Any other activity not mentioned / covered, explicitly, but otherwise required for satisfactory completion / operation / safety / statutory / maintenance of works shall also be covered under scope of work and has to be completed by contractor within specified schedule at no extra cost to Owner. The Contractor shall carry free issue material in such a manner as to preclude damage during transportation and handling.

The Contractor shall physically examine all free issue materials at the time of acceptance of the material in IOCL' store.

Any damage not so recorded will be deemed not to have existed at the time of acceptance of material in store by the Contractor and the cost of repair or replacement or rectification shall be borne by the Contractor.

All materials shall be stored in contractor's stores near site in such a manner so as to prevent any damage to the materials from scratching, gouging, indentation, excessive heat or by contact with any sharp objects or chemicals.

The Contractor shall be required to submit material reconciliation statement every month/ before issuing any free issue material from IOCLs tore duly certified by IOCL representative.

The Contractor shall maintain stock register at their respective stores stating issue and availability of free issue material at a given day. Further, it is mandatory that the contractor is required to undertake and submit inventory details of free issue and purchased materials on monthly basis to Owner/ Owner's representative as per the approved format of the owner. The inventory details shall be in correlation with the Daily progress chart and material reconciliation sheet.

Material reconciliation indicating issue of material, consumptions and defective material shall be submitted on monthly basis.

## 12.3. ISSUE OF WORK INSTRUCTIONS

- The contractor will be required to carry out GI installation as per instructions of EIC.

- All skilled personnel like welders, jointers, conversion technicians will be approved and certified by Owner/Owner's Representative. The technicians who will carry out welding of Risers, joining of copper material and conversions will undergo a test by Owner. Those who clear the test will be issued identity cards duly signed by Owner/Owner's representative. Approved technicians shall be only authorized to take up respective jobs. In case it is found that contractor personnel other than authorized are carrying out these works, applicable penalty will be levied to the contractor as per contract.

- The rates to be quoted by contractor shall be inclusive of all preparatory/bye works, platform materials, labour, supervision, tools, taxes, duties, levies, salaries, wages, overheads, profits, escalations, fluctuations in exchange rates and no change in the rates shall be admissible during tenancy of the contract.

- The schedule of items of GI/Cu installations have been described in brief and shall be held to be completed in all respect including safety requirements as per Technical specification of HSE, tests, inspection, QA/QC works, enabling and sundry works. The payment shall be made against

completed and measured works only. No extra works whatsoever shall be considered in execution of these items.

## 12.4. PROGRESS OF WORK

The contractor shall proceed with the work under the contract with due expedition and without delay.

Contractor shall assess the material requirement of the allotted area and submit the schedule plan for execution & purchasing before start of actual work.

The EIC may direct in what order and at what time the various stages or parts of the work under the contract shall be performed. Daily and Weekly progress reports shall be submitted in the formats approved by Owner, indicating broadly the laying, testing, RFC, conversions and extra piping.

The penalty and incentives will be calculated and applied on basis of monthly target as per SCC of Tender.

## 12.5. WORK SHEETS

- The quantities of GI/Cu pipe and other details will be checked by Owner's site engineer and the same shall be incorporated in RFC cards, signed & dated as certified, on site. The cards will then be approved by the Owner/Owner's Representative.

- Measurement sheets shall be prepared based on the RFC cards and checked and certified by the site engineers for billing purpose.

- If measurement sheets submitted are illegible, incomplete or incorrectly booked, it will be returned to the contractor.

## 12.6. PERMISSIONS / APPROVALS

- Contractor shall be responsible for obtaining permissions from society management, RWA, individual residents and any other concerned authority, if required, for completion of the work. Contractor must take the prior appointment from the residents for carrying out the work.

- The Contractor shall work in close consultation/ co-ordination with the Owner/ Owner's Representative.

- The Contractor shall not sign/execute any agreement and/or undertaking on any such documents which amounts to be undertaken by Owner. The same shall only be signed and executed by Owner; however, the prospective bidders shall also liaison and coordinate for the same.

- The necessary coordination, liaison and arrangements for inspection and approval shall be the contractor's responsibility. Inspection and acceptance of the work by authority shall not relieve the contractor from any of these responsibilities under this contract. The contractor shall plan the execution of work in such a manner so that all the registered customers are attended in phased manner. However, it is the contractor's responsibility to fix a firm appointment with the consumer for carrying out the work.

- A log book/job card for such appointments with Consumer/any other agencies shall be maintained and the schedule/appointment once taken shall be adhered to by the contractor.

Owner/Owner's Representative shall review the records every week. The contractor shall submit the detailed list of RFC/Conversions and balance work on Registrations at least once a week as per approved format.

- The contractor is also required to obtain a "Labour License" and BOCW registration from the Assistant Labour Commissioner of respective Administration/Central Govt.

- It will be the contractor's responsibility to familiarize himself and comply with, any other local rules, regulations or statutory requirements applicable to the work.

- The contractor has to take responsibility of the actions of supervisors, plumbers and helpers provided by him.

## 12.7. REFERENCE SPECIFICATION, CODES AND STANDARDS

The contractor shall carry out the work in accordance with this specification, Owner's Engineering Standards: ASME B31.8 – Gas Transmission and Distribution Piping Systems; Oil Indian Safety Directorate Norms (OISD), the American Gas Association Document – Purging Principles and Practice and PNGRB Guidelines.

If the contractor find any discrepancy, ambiguity or conflict in between any of the Standards and the contract documents, then this should be promptly referred to the Engineer-in-Charge (EIC) for his decision, which shall be considered binding on the contractor.

## 12.8. RIGHT-OF-USE SURVEY

The route of the pipeline to be installed shall be decided with consent of the consumer and Owner/Owner's Representative. Contractor must ensure that the persons/workers/supervisors/ working at site shall have proper identity cards prior to entering the premises of the consumer.

No temporary or permanent deposit of any kind of material resulting from the work shall be permitted in the approach or any other position, which might hinder the passage and / or natural water drainage, or any area where there is objection from consumer.

The contractor shall obtain necessary permissions from land Owners and tenants and shall be responsible for all damages caused by the construction and use of such approaches, pavements, gardens, rooms, walls, roof etc., at no extra cost to Owner.

Owner/Owner's Representative and the contractor will conduct a joint survey at each premises or housing colony to be supplied with gas. The survey record will note Customer details, the potential gas supply points and proposed meter positions and estimates of material quantities. The Contractor will make a sketch of the agreed pipe routes.

The Contractor will be responsible for contacting the Customer and making the necessary arrangements for access and appointments to carry out the work. Owner will not be responsible for any time lost due to failed appointments or disputes with Customer.

The Contractor shall confine its operations within limits of the Right in use. The contractor shall restore any damage to property.

The Contractor shall also carry out all necessary preparatory work if needed to permit the passage of men and equipment. Lights, Curbs, signs shall be provided wherever and/or required by the Owner necessary to protect the public.

## 12.9. PROTECTION OF STRUCTURES AND UTILITIES:

The contractor shall at his own cost, support and protect all buildings, walls, fences or other structures and all utilities and property which may, unless so protected, be damaged as a result of the execution of the works. He shall also comply with the requirements in the specification relating to protective measures applicable to particular operations or kind of work.

During painting, contractor must take care of the consumer premises while carrying out the job such as spillage on floor, walls, ceilings, such shades etc. If the same does occur, the contractor has to immediately make things to original.

## 12.10. GI AND COPPER ABOVE GROUND SERVICE PIPE

- **Definitions:**

a. High Rise Buildings – A building having fourteen or more storey above ground level. (i.e. of G + 14 orientation)

b. Riser - A riser is the vertical section of a service pipe laid up a building which supplies a number of laterals.

c. Lateral-A lateral is a horizontal off-take from a riser, which supplies a single customer/dwelling.

d. Service Regulator (SR) – Service Regulator is a regulator installed on a gas service line to control the pressure from 4 bar to 100 mbar that, in an

emergency automatically assumes control of the pressure downstream of the station, in case that pressure exceeds a set maximum.

e. Meter Regulator (MR) – Meter regulator is a pressure regulator installed in series with another pressure regulator which reduces the pressure from 100 mbar to 21mbar.

f. Riser Isolation Valve (RIV) - Riser Isolation valve is fitted at the bottom of the riser to isolate the riser from the underground gas supply network.

g. Lateral Isolation Valve (LIV) – Lateral Isolation Valve is fitted on horizontal riser (lateral) after TEE to facilitate online Tapping's and other maintenance works.

h. Meter Control Valve (MCV) - A Meter Control Valve is fitted immediately upstream of the meter to enable the internal pipe work inside the property to be isolated from the upstream gas supply network. It must be fitted in a manner that the consumer can easily operate the valve handle.

- **Specification for Welding**

The requirements stated herein shall be followed for the fabrication of fillet type of welded joints of GI (IS 1239 heavy class) piping systems connected with pipe line and related facilities.

**The welded pipe joints shall include the followings:**

a. All line pipe joints of the Circumferential fillet welded type b. Attachments of fitting and other supports pipes

- **Welding Consumables:**

The Welding electrodes shall confirm to the class AWS E 6013. All electrodes shall be purchased in sealed containers stored properly to prevent deterioration. The electrodes shall be handled with care to avoid damage.

- **Welding Process**:

Welding of GI material under this specification shall be carried out using Shielded Metal Arc Welding Process (SMAW).

- **Welding Procedure & Welder Qualification.**

Root pass and final pass shall be done with 2.5 mm dia. 6013 structural Electrode. Contractor shall propose the WPS with recommended welding parameters. Welder and welding process shall be qualified based on visual inspection of joint and pressure test. Welding should be sound and free from visible defects such as external porosity, uneven bead, excessive undercut etc. The sample shall be tested at 06 bar for 30min hold period for qualification. Welding to be carried out in line with PQR / WPS approved by IOCL/PMC . Welding to be done by qualified welders only.

- **Planning and Design of GI Welded Riser**

a. Risers and laterals must be designed to run through the optimal possible route approved by IOCL representatives, taking into consideration potential meter positions, design regulations and access for future maintenance.

b. The riser and associated laterals must be constructed in the most economical manner using the minimum no. of fittings, minimum pipe and considering future maintenance requirements.

c. For buildings above 14 floors - for ease in construction and maintenance the

preferred method will be welded pipe –work laid in a purpose designed and built ventilated utilities shaft.

d. Risers and laterals must be laid a minimum of 300 mm from any electrical equipment or installations. On occasions where the pipe has to cross over a cable, this has to be done at right angles and a minimum gap of 25 mm must be maintained between the pipe and cable. Consideration may be given to wrapping the pipe with electrical insulation tape for protection against electrical short circuiting.

e. Provision for access to the riser for future maintenance must be made at the design stage & involved undertaking a risk assessment for undertaking future maintenance work.

f. The GI service pipe installation work includes all work necessary to connect from the PE/GI transition fitting on the down-stream of the PE service, to the Customers appliance, including the installation of service regulator, meter regulator, valves, fittings, meters, clamps etc. The contractor

shall be required to provide all equipment, tools and materials necessary to execute the work in an efficient and effective manner. Along with ladders, scaffolding pipe, dies, tripods, vices, fittings and Teflon tape, drills for concrete and other masonry, drills for timber, Granite, Marble Stones and laminated surfaces inside Customers property, bending tools, clamps, sleeves to facilitate the pipe passing through floors and walls, paint for marking etc.

g. All Welded GI risers at the outside of buildings shall be fully supported to carry the weight of piping. A flanged foot or similar device, capable of supporting the total weight of the riser, shall support risers. The riser shall be installed in a vertical line from its point of support to its highest point with a minimum of changes in direction. The threading of GI pipe shall be NPT and conforming to ANSI B1 20.1

h. Contractor has to supply different types/sizes of approved powder coated clamps (Mild Steel) for fixing GI pipes suiting to the site conditions. The contractor shall get approval from Owner/Owner's Representative for every fresh lot of the clamps, brackets, regulator boxes and other consumables, prior to start of installation.

i. All riser and lateral pipe shall be clamped to the building at intervals not exceeding 1.5 mtrs. Maximum distance between clamps shall be 1.0 - 1.5 m when pipe goes to the straight, if any tee or fittings lies in between the pipe then clamp shall be placed 150 mm far away from center line of fittings at every sides. However, the same may be changed as per site conditions/as directed by EIC. Minimum gap between pipe & wall shall be 25 mm. The joints/ fittings of the GI installation shall be painted only after carrying out testing of the installation.

j. Where pipe passes through the balcony and the surface is slightly elevated around the service pipe or its surrounding, sleeves to be provided to prevent the accumulation of water at that point. Where a short piece of sleeve is used around the gas pipe, the sleeve should be embedded in the concrete with a mix of mortar and the void between the pipe and sleeve filled with a suitable sealant. The sealant should be beveled such as to prevent an accumulation of water. Supply of clamps for all sizes of the GI pipes is in contractor's scope. Contractor has to take prior approval for design/types of clamps, paintings etc.

k. Pipe shall preferably be entered into building above ground and remain in a ventilated location. The location for entry shall be such that it can be easily routed to the usage points by the shortest practicable route.

l. For welded riser, riser length (excluding lateral tapping) shall be considered and averaged out among all the households, whereas the lateral piping shall be included only for one particular connection.

m. The rates of GI Pipe and Copper pipe including installation of valves and fitting etc. from Lateral isolation valve till home appliances are payable as per SOR Item.

n. Installation of Meter and Meter Regulators with associated inlet and outlet connections/fittings shall be connected with meter and the payment shall be done as per SOR Item. The rate also includes testing of joints till commissioning.

o. Installation of Service Regulator with support and supply and installation of regulator boxes having locking arrangement with base frame, including fabrication as per attached drawing.

p. Foundation works for service regulators includes providing and laying of Plain Cement Concrete (PCC– 1:2:4) as per attached drawing and the payment shall be done as per SOR Item.

q. Except Service Regulator, Meter, Meter Regulator, Isolation and appliance valve, Contractor shall procure all other materials (i.e. Pipe, fittings, clamps, SS screws etc.) as per attached specification for installation and to the entire satisfaction of Owner/ Owner's Representative.

r. The contractor shall also ensure that gas supply shall not be provided to the customer in any Concealed Piping.

s. The Copper service pipe installation work includes all work necessary to connect downstream of the meter (inside the kitchen) to the Customers appliances. The contractor shall be required to provide all equipment, tools and materials necessary to execute the work in an efficient and effective manner. Along with these, he will be required to provide ladders, scaffolding pipe, drills for concrete and other masonry, special drills for timber, Granite, Marble Stones and laminated surfaces, provisions for cutting glass of window inside Customers property, bending tools, sleeves to facilitate the pipe passing through floors and walls, etc. Copper fittings shall be provided by Contractor.

t. During installation the Copper pipe is to be cut to proper length with tube Cutter, the burrs removed with a file, cleaning of outside surface of pipe & inside surface of fitting, applying flux to the tube and fitting around the outer/inner ends, inserting the tube in to the fitting, applying heat to the assembled joints using conventional blow torch to melt solder wire. Contractor shall submit the joining procedure of Cu pipe & Fitting for approval or as per the instructions of EIC.

u. Contractor has to supply different types/sizes of approved clamps (PE 80/PVC) for fixing Copper pipes suiting to the site conditions. Contractor has to take prior approval of EIC for quality of the clamps, solder, flux, lacquer, thinner etc. The approval shall be taken for every fresh lot of clamps from EIC before installation at site.

v. All copper piping shall be clamped to the walls at intervals not exceeding 500 mm.
The solder wire shall be of reputed company of diameter size 3.25mm, Lead free as per BS 29453:1994 (Soft solder alloys) and supplied in coils. The detail specification is attached in tender for reference. Solders for use with copper tube & fittings generally melt within the temperature range 180°C - 250°C. The contractor has to furnish the certificate of confirmation of standards before start of work.

- **Riser and Laterals Fabrication, Installation and Testing: -**

Heavy class Galvanized Iron (GI) pipes, conforming to IS 1239- Part 1 duly Polyester powder Coated with 70 microns thickness and Wrought Steel fittings (Forged fittings) conforming to IS-1239 Part 2 shall be used for welded riser.

Powder and Galvanized (Zinc) coating shall be removed by light duty grinder or by any other suitable tool at both ends of riser pipe at about 25mm in length where welding is to be performed.

Pipe and required fittings shall be first coupled with threaded (NPT) joints. The threaded joints to be made using male tapered thread and female parallel thread fittings. Teflon/PTFE Tape or any other joining compound shall not be used in threaded joints for welded riser. Alternatively, plain ended pipes and fitting can also be used for welding in welded riser.

The entire riser assembly shall be fabricated with socket welds both for threaded riser assembly and plain ended pipes. Threaded joints are permitted after first isolation valve on laterals where riser is not approachable from balcony and in case if riser is in approach of balcony within 300 mm gap from balcony laterals may be threaded with tee of welded riser on account of workability and future maintenance considerations.

The Welding electrodes shall confirm to the class AWS E 6013 of reputed make such as Advani, Lincoln, ESAB or equivalent.

Welding to be carried out in line with PQR / WPS approved by IOCL/PMC. Welding to be done by qualified welders approved by IOCL / PMC only.

A riser must not be constructed so that the laterals face directly into the wall from the riser. All laterals must extend a minimum of 400 mm from the riser.

Ventilation is provided to prevent gas leaks from causing the atmosphere to become unsafe. Ventilation shall be natural. It is not permitted to use mechanical ventilation to achieve the required ventilation levels. Special Safety Harness and Protective equipment's of PETZL make are mandatory for riser installation. Details would be as per approved Safety Job Procedure. Ensure that all equipment's and safety devices used are inspected, certified by competent authority valid & suitable for use. Plumber deployed for riser installation for high rise buildings shall be certified and prequalified with medical tests as per Safety Job Procedure.

Only pretested riser shall be erected using pulley. Pretesting shall be done with compressed air @ 2.2 bar (g) for minimum duration of 30 minutes.

Risers and laterals up to Isolation Valves shall be Leak tested with compressed air @ 2.2 bar (g) for minimum 2 hrs after vertical installation.

Once testing is satisfactorily completed, uncoated portion (weldment) of risers and laterals shall be painted as per painting procedure.

For the laterals beyond eighth floor, shall be used in compliance to the material specification of SS316, fittings shall be used with brass connections conforming to IS 319, in order to account for the temperature induced stresses.

- **Meter & Meter Regulator Positions**

Meters will normally be located inside the property at approachable location. The kitchen / utility balcony is the preferred place to install the meter – thereby minimizing the length of the outlet pipe work.

The Meter installation will be preferred in open/ventilated space so as to prevent Gas accumulation and easy dispensation of gas to atmosphere in case of any smell/leakage

of gas. The Meter installations will not be provided in any fixed enclosures, cabinets (below or above the slab) or confined space in the customer premises.

Meter Regulators will be installed as per enclosed drawing in the tender..

- **Installation of Meter**

Installation of domestic meters with associated inlet and outlet connections (GI/Brass fittings), on the wall with approved powder coated meter brackets and angles in new & existing gas charged areas.

The contractor shall supply approved powder coated meter brackets and angle brackets. A sketch of the brackets is referred from the enclosed drawing for reference. It is required that one sample of each type of bracket is approved before the work is started.

Firmly secure the meters on the wall with good quality super hold nylon anchor Rawl Plugs, SS 304/brass screws etc. In case the Rawl Plugs are not holding then wooden blocks or other fixing arrangements like cement etc. to be used for proper grouting.

The Meter installation will be preferred in open/ventilated space so as to prevent Gas accumulation and easy dispensation of gas to atmosphere in case of any smell/leakage of gas. The Meter installations will not be provided in any fixed enclosures, cabinets (below or above the slab) or confined space in the customer premises.

The contractor shall ensure that GI installations and rubber hoses shall not be exposed to direct heat of Gas burners & chimney vents. The installation should have minimum clearance of about 1 meter from electric point mains & switches. Minimum distance between Appliance Valve & Gas Burners shall be 0.3 Meters. The isolation valves shall be installed after entering the customer premises/kitchen but before the meter installation.

The above activities along with restoration of the area to original shall be carried out to the complete satisfaction of consumer and EIC.

- **Laterals**

The lateral extending from the riser at right- angles must extend a minimum of 400 mm from the riser before passing through a wall.

- **Ventilation**

Ventilation is provided to prevent gas leaks from causing the atmosphere to become unsafe. Ventilation shall be natural. It is not permitted to use mechanical ventilation to achieve the required ventilation levels.

- **Pipes Passing Through Walls**

Where risers or laterals pass through walls the following requirements must be observed:

a. The pipe must be sleeved in a continuous non corrosive sleeve. Joints or any other part of a joint shall not be enclosed within the sleeve.

b. Pre-sleeved wall pieces are the preferred method for passing through walls and floors.

- Painting of GI Pipes

Contractor shall install powder coated GI pipes in consultation with EIC. Contractor shall submit detailed procedure of powder coating for approval to PMC prior to supply of GI pipes.

## 12.11. TESTING OF GI/COPPER INSTALLATION

Only pretested riser shall be erected using pulley arrangement. Pretesting shall be done with compressed air at 2.2 bar (g) for minimum duration of 30cminutes.

Risers and laterals shall be Leak tested with compressed air at 2.2bar (g) for minimum 2hrs after vertical installation.

Once testing is satisfactorily completed, uncoated portion (welded) of risers and laterals shall be painted as per painting procedure.

A. TEST PRESSURE IN CASE OF DIRECT REGULATOR SUPPLY (04 bar TO 21 mbar)

- The GI installation from PE/GI transition fitting up to regulator shall be tested at the pressure of 6.0bar (g) for a holding period of 2 hour with no pressure drop.
- The testing of GI shall be done with the isolation valve in open condition and open end plugged.
- The GI installation from regulator outlet to Meter Inlet valve (except meter) shall be tested at a pressure of 2.2 bar (g) for a holding period of 2 hour with no pressure drop.
- The GI installation from meter outlet to appliance valve (except meter) shall be tested at a pressure of 2.2 bar (g) for a holding period of 30 minutes with no pressure drop.
- The Copper installation from meter outlet to appliance valve shall be tested at a pressure of 80-100 mbar (g) for a holding period of 30 minutes with no pressure drop.
- All the joints in the installation shall be checked with soap solution.
- The meter shall be removed while carrying out the testing at 2.2 bar (g) and joints of the meter shall be tested online at 100mbar with soap solution after completion of the work.

B. TEST PRESSURE IN CASE OF SERVICE REGULATOR SUPPLY (100-110 mbar)

- The installation from PE/GI transition fitting up to meter inlet (except regulator/meter) shall be tested at the pressure of 2.2bar (g) for a holding period of 2 hour with no pressure drop.
- The testing of GI installation shall be done with the isolation valve in open condition and open end plugged.
- The GI installation from meter outlet to appliance valve (except meter) shall be tested at a pressure of 2.2 bar (g) for a holding period of 30 minutes with no pressure drop.
- The Copper installation from meter outlet to appliance valve shall be tested at a pressure of 80-100 mbar (g) for a holding period of 30 minutes with no pressure drop.
- All the joints in the installation shall be checked with soap solution.
- The meter shall be removed while carrying out the testing at 2.2 bar (g) and joints of the meter/regulator shall be tested online at 100mbar with soap solution after completion of the work.

The contractor shall supply the Calibrated Pressure Gauges / Manometer / Diaphragm Gauges of suitable range for testing of GI/Copper Installations ranging from 0-4bars / 0-500mbar respectively. The calibration certificate shall be submitted before the start of the execution work.

The pressure gauges shall be calibrated from time-to-time as desired by EIC but positively once in every six months.

The details of testing shall be properly recorded in the GI/Copper cards.

## 12.12. INSPECTION

The contractor to the entire satisfaction of EIC before proceeding further shall rectify any defect noticed during the various stages of inspection. Irrespective of the inspection, repair and approval at intermediate stages of work, contractor shall be responsible for making good any defects found during final inspection/guarantee period/defect liability period as defined in general condition of contract.

## 12.13. PURGING & COMMISSIONING

The rate for purging & commissioning shall be included in the GI/Cu installations. Care shall be taken to ensure that the outlet is so located that vent gas cannot drift into buildings.

The commissioning of the GI installation should be performed as follows:

- Ensure the method of purging is such that no pockets of air are left in any part of the Customer's piping.

- Ensure that all appliance connections are gas tight, all appliance gas valves are turned off and there are no open ends.

- Where possible, select an appliance with an open burner at which to commence the purge i.e., a hotplate burner.

- Ensure the area is well ventilated and free from ignition sources.

- Ensure branches that do not have an appliance connected are fitted with a plug or cap.

- Turn on one burner control valve until the presence of gas is detected. A change in the audible tone and smell is a good indication that gas is at the burner. Let the gas flow for a few seconds longer, then turn off and allow sufficient time for any accumulated gas to disperse.

- Turn on one gas control valve again and keep a continuous flame at the burner until the gas is a light and the flame is stable.

- Continue to purge until gas is available at other appliances.

## 12.14. CONVERSION OF DOMESTIC APPLIANCES

The work in this section includes:

- The changing of nozzles and associated controls in accordance with manufactures instructions for both domestic and imported burners/ovens/grills/hotplate.

- The changing and handing over old appliance connection Reinforced rubber hoses and nozzles to Customers and re-greasing taps as necessary.

- The contractor shall supply the Reinforced rubber hoses at the time of conversions.

- The contractor has to supply all types of nozzles/jets required for all types of appliances including imported burners, Grills, Ovens.

- Cleaning and performing minor maintenance of appliances.

- Testing for gas escapes, soundness and performance of appliances.

- Instructing the Customer for safe use of natural gas and for fixing of safety and conversion labels.

- Contractor must attend the complaints regarding appliances, leakage, fire etc. till the total area is handed over to Owner's operation and maintenance.

- All consumables (Nozzles, greases etc.) are in contractor's scope.

- Changing or repairing of any items damaged during conversion are in Contractor's scope.

- In case at the time of RFC if the customer is not getting the NG conversion done then the contractor shall obtain written consent about the same from customer and submit the same to IOCL.

## 12.15. RESTORATION

Contractor has to restore the area wherever he has carried out drilling, clamping etc. to its original condition to the satisfaction of the consumer and to ensure no passage to the premises and seepage. If the work was carried out in Govt. Flats (CPWD/NDMC/Institutional areas), contractor has to restore the area according to CPWD specifications and obtain a NOC/Clearance certificate from the concerned authorities/RWA maintaining the flats, after completion of the work.

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

Wherever any items of the consumer is damaged/broken during working, the same will be made good or replace to the total satisfaction of the consumer.

The contractor will be responsible for the maintenance of all restoration carried out, for the duration of the contract guarantee period.

The contractor is to ensure the restoration work is properly supervised, and that the material used is suitable for the purpose. Wherever the required standards are not achieved the contractor will be required to replace the defective reinstatement work.

Note that Payment for GI/Copper installation will be released only after satisfactory restoration and clearing of the sites of all surplus materials etc.

## 12.16. SUBMISSION OF FINAL RECORDS

Contractor shall submit three sets each of the following documents in hard & soft copy:

- Total list of houses in the area allotted to him giving details of connections provided & reasons where connection could not be given /completed.

- The details recorded in RFC cards of every domestic house.
- Details of houses where piping done along with materials used.
- Total material consumption report.
- Material reconciliation with respect to the materials issued.
- Test reports & calibration certificates of gauges etc.
- Any other documents/records required.
- Extra Piping details

**12.17. Compliance to Health, Safety & Environment (HSE) High Rise:**

Scope includes use of fall arrestor, Ascenders / descended, PPE, Barricades/ Warning Boards (03 No's) connected with warning board/Caution tapes) in areas where piping work is in progress, Use of Safety shoes, Wacky talky, Hand gloves, Reflective jackets, Hard hats (helmets), eye and ear safety equipment, Fire extinguishers and as per the detailed scope of work in tender specifications. Contractor shall also prepare and submit duly certified Safety check list signed by TPIA/PMC. In case of non-compliance, penalty shall be applicable as per SCC clause.

This set-up is applicable for more than 5th (G+5) and above including high rise. Above 4th floor full body safety harness & accessories of PETZL make is compulsory.

**ANNEXURE # 1**

**TOOLS & EQUIPMENT TO BE PROVIDED BY CONTRACTOR FOR GI/COPPER WORK**

| S.N0. | HAND TOOLS DESCRIPTION | PER TECHNICIAN | PER TEAM |
|---|---|---|---|
| 1 | Pipe wrench 250 mm | 1 | 4 |
| 2 | Pipe wrench 350 mm | 1 | 4 |
| 3 | Pipe wrench 450 mm | - | 2 |
| 4 | Adjustable spanner 50 mm | - | 4 |
| 5 | Adjustable spanner 150 mm | 1 | 2 |
| 6 | Adjustable spanner 250 mm | 1 | 2 |
| 7 | Set of combination spanner 3/16”-11/4” AF | 1 | 1 |
| 8 | Set of combination spanners 5mm - 30mm | 1 | 1 |
| 9 | Large tool boxes | 1 | 2 |
| 10 | Set flat-headed screw drivers | 1 | 2 |
| 11 | Set Philips screw drivers | 1 | 2 |
| 12 | Small hammer | 1 | 2 |
| 13 | Combination pliers/mole grips | 1 | 2 |
| 14 | Set of files | 1 | 2 |
| 15 | Drill bits for 1” pipe | - | 2 |
| 16 | Stocks and dies for NPT threading ½”,¾”, GI Pipe | - | 3 |

| | | | |
|---|---|---|---|
| 17 | Blowtorch | - | 1 |
| 18 | Soldering iron | - | 2 |
| 19 | Copper Pipe Bending Machine | - | 2 |
| 20 | Hand drill 3/8" chuck | - | 2 |
| 21 | Portable electric drill 240V, heavy | - | 2 |
| 22 | Spare blades | 4 | 4 |
| 23 | Battery powered torches | 2 | 2 |
| 24 | Measuring tape 30 m | 1 | 2 |
| 25 | Wire brush | 1 | 2 |
| 26 | Portable pipe vice & tripod | - | 2 |
| 27 | Set steel twist drills 0.5-2.0 mm (for appliance conversion) | - | 1 |
| 28 | Set steel twist drills 1mm-10mm | - | 2 |
| 29 | Set masonry drills 1mm-10mm | 1 | 2 |
| 30 | Graphite based grease | As required | As required |
| 31 | Lubricating oil | As required | As required |
| 32 | Hand cleaner | As required | As required |
| 33 | Copper pipe Cutter 12mm | - | 4 |
| | | | |
| 35 | Automatic Thread cutting machine | - | 2 |
| 36 | GI Pipe Cutter | - | 2 |
| 37 | Welding Equipment | 01 set per site | 01 set per site |
| 38 | Full Body Safety Harness like PETZL or Equivalent | 03 set per site | 03 set per site |
| 39 | Motorized Suspended Platform | As required | As required |

## CHAPTER-13

# 13. SPECIFICATION FOR SUPPLY GI FITTINGS

### 13.1 MATERIAL

The material used for the manufacturing of GI fittings shall conform to ISI 14329 – 1995 with latest amendments Grade BM 300. Relevant test certificates conforming to all the test agreements of IS 14329 shall be provided with fittings.

### 13.2 DIMENSIONS THICKNESS & DIMENSIONAL TOLERANCES

- Dimensions of various types of fittings shall be as specified in sections 2 to 10 of IS 1879 – 1987 with latest amendments, as applicable.

- Wall thickness of fittings and tolerances on them shall be as given in Table 1.2 of S1879 – 1987 with latest amendments,

- In case of reducing fittings, the dimensions at each outlet shall be those appropriate to the nominal size of the outlet.
- Elbows, Tees, Sockets and caps shall be of reinforced type.

### 13.3 WEIGHT

Weights of various types of fittings shall be as specified in sections 2 to 10 of S 1879 –1987 with latest amendments, as applicable.

### 13.4 THREADS

- Threads shall be NPT type and conforming to ASME B1.20.1.
- Outlets of fittings shall be threaded to dimensions & the tolerances as specified in ASME B1.20.1.
- All internal & external threads shall be tapered.
- For checking conformity of threads gauging practice in accordance with ASME B1.20.1 shall be followed.
- Chamfering: The outlet of fittings shall have chamfer.

### 13.5 FREEDOM FROM DEFECTS

On visual examination, the outside & inside surfaces of fittings shall be smooth & free from any defects such as cracks, injurious flaws, fine sand depth etc.

**13.6 GALVANIZING**

- Fittings shall be galvanized to meet the requirement of IS: 4759–1996with latest amendments.

- Zinc conforming to any grade specified in IS: 13229-1991 with latest amendments shall be used for the purpose of galvanizing.

- Galvanizing bath: The molten metal in the galvanizing bath shall contain not less than 98.5% by mass of zinc.

- Coating requirements: Mass of coating shall be 610 - 700gms/m2.

- Freedom from defect: The zinc coating shall be uniform adhered, reasonably smooth & free from such imperfections as flux, ash bare patches, black spots, pimples, lumpiness runs, rust stains, bulky white deposits &blisters.

- Samplings

a. All materials of the same type in coating bath having uniform coating characteristics shall be grouped together to continue a lot. Each lot shall be tested separately for the various requirements of the specification. The number of units to be selected from each lot for this purpose shall be given in Table 2 of IS 4759 – latest edition.

b. The sample selected according to Column 1 & 2 of Table 2, IS: 4759 – latest edition shall be tested for visual requirements as per Clause 6.2 of IS:4759 – latest edition

c. The sample found conforming to above requirements shall then be tested for mass of zinc coating in accordance with Clause 9.2 of IS: 4759 – latest edition.

d. Criteria for conformity: As per Clause 8.3 of IS: 4759-latestedition. e. Test procedure shall be as per Clause 9 of IS: 4759-latestedition.

**13.7 PRESSURE TEST**

Vendor shall carry out pneumatic pressure test as per Clause 11.1b of 1879 – 1987 with latest amendments on each &every fittings. Vendor to submit the Internal Quality control certificate for the same. Owner shall witness pneumatic testing as per the sampling procedure specified in 1879 – 1987 with latest amendments.

**13.8 COMPRESSION TEST**

This test shall be conducted to judge the malleability of the pipe fittings & shall be carried out as per Clause 12 of 1879 – 1987 with latest amendments.

**13.9 SAMPLING**

Owner Representative of Third Party Inspection Agency appointed by Owner shall witness the tests as per clause 14 of 1879 – 1987 with latest amendments. However, vendor to perform 100% inspection of visual, dimensional & pressure test. Vendor shall furnish Internal test certificates at the time of final inspection to the Owner.

**13.10 MARKING**

Each fitting shall be embossed with OWNER's logo, manufacturer's name or trademark and the size designation.

Each packing containing fittings shall carry the following embossed, stamped or written by indelible ink.

- Manufacturer's name or trademark.
- Designation of fittings.
- Lot number.

Each fitting conforming to this standard shall also be marked with BIS standard mark.

**13.11 PACKAGING**

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Packing size shall be approved by owner / owner's representative before packing the material. The vendor shall submit the packaging details during QAP and also complied with at the time of delivery.

**13.12 INSPECTION / DOCUMENTS**

- Inspection shall be carried out as per Owner Technical Specification.
- Owner Representative or Third-Party Inspection Agency appointed by Owner shall carry out stage wise inspection during manufacturing / final inspection.
- Vendor shall furnish all the material test certificates, proof of approval / license from specified authority as per specified standard, if relevant, internal test / Inspection reports as per Owner Tech Spec. & specified code for 100% material, at the time of final inspection of each supply lot of material.

## CHAPTER-14

## 14. SPECIFICATION FOR SUPPLY COPPER FITTINGS

This specification covers the requirements for 12 mm OD X 0.6 mm wall thickness Copper tube, Half Hard. Unless modified by this specification, requirement of BS EN 1057 (latest), Half Hard, shall be valid, with the recommended changes in physical properties to suit wrinkle free bend ability..

### 14.1. MATERIAL

The material used for the manufacturer of Copper tube shall confirm to BS EN 1057(latest), Grade Cu - DHP or CW024A.

- **Mechanical Properties:**

a. Ultimate Tensile Strength–250N/sq.mm(min)

b. Elongation – 30% (min)

c. Hardness - 75 to 100 on HV scale.

- **Chemical Properties:**

In Each heat one no. of the copper tube will be tested for chemical properties to confirm to non-arsenical Cu - DHP / CW024A as per BS EN 1057 to have the following chemical composition:

Copper Percentage including silver : Min 99.9% Phosphorus Percentage : 0.015 to 0.040%

### 14.2. DIMENSIONAL TOLERANCES

The mean outside Diameter of the tube shall not vary from the specified outside diameter by more than the amount of tolerances specified in table 4 of BS EN 1057. The tolerance on the wall thickness shall be as specified in table 5 of BS EN 1057.

The length of the tube shall be 3 m. Allowable tolerance shall be (-0, +0.5 mm).

### 14.3. MANUFACTURE

The tubes shall be solid drawn by the process of melting, extrusion and thereafter Bright annealing. The ends shall be cut clean & square with the axis of the tube in no case shall tubes be redrawn from old or used tubes.

### 14.4. FREEDOM FROM DEFECTS

- The tubes shall be free from internal & external fins, flaws, skin defects, blow holes etc. or other irregularities which might restrict the free flow of fluid and shall be so designed that resistance to the flow of fluid through the tubes is minimized.

- All tubes will be supplied 100% Eddy Current tested as per ASTM E243 and BS EN 1057.

Eddy Current testing is a computer aided test, wherein the tube passes through a probe

& an electromagnetic field is created around the peripheral of the tube to detect any flaw or blow hole which may not be visible to the naked eye. The manufacturer must

have in-house Eddy Current testing facilities to supply to Owner. Owner reserves the right to witness the Eddy Current facility at the manufacturer's factory premises.

### 14.5. PRESSURE TEST

All fittings shall be hydro tested & pneumatically tested as per EN 1057 (latest edition)/QAP.

### 14.6. DRIFT EXPANDING TEST

Drift expanding test shall be carried out as per EN 1057. The O.D. of the tube end shall be

expanded by 30% using a conical mandrel (at angle 45º) with no wrinkles, cracks, break or any form of defect should occur on the tube during & after the test.

### 14.7. CARBON FILM TEST

Copper tubes to be tested for carbon film test & the manufacturer will certify that the tubes meet the requirement of clause 8.5 of BS EN 1057.

### 14.8. CARBON CONTENT TEST

Copper tubes to be tested for carbon content test to ensure a carbon level to avoid the formation of carbon film during installation. Max. Carbon level shall be permitted as per clause 6.5 of BS EN1057.

### 14.9. STRESS CORROSION RESISTANCE TEST

A stress corrosion resistance is to be carried out as per method defined in ISO 6957 using test solution of pH 9.5 but without pickling.

### 14.10. MARKING

Each tube shall be permanently marked every meter with OWNER's Logo, manufactures name & size and specification of the tube.

Each packing containing tubes shall carry the following, stamped or written in indelible ink.

- Manufacturers name or trademark
- Designation of tubes (OD x wall thk)
- Lot number.
- No. of the standard (EN1057)

### 14.11. PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Packing size shall be approved by owner / owner's consultant before packing the material. The vendor shall submit the packaging details during QAP and also complied with at the time of delivery.

### 14.12. INSPECTION/ DOCUMENTS

- Inspection shall be carried out as per OWNER Technical Specifications, relevant codes/standard and Inspection Plan/ QAP. Vendor to prepare detailed QAP and submit the same for approval of OWNER / OWNER's Authorized Consultant.

- OWNER consultant or third-party inspection agency appointed by OWNER shall carry out stage wise inspection during manufacturing/ final inspection.

- Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports as per OWNER Technical Specification and specified code for 100% material, at the time of final inspection of each supply lot of material.

- Even after third party inspection, OWNER reserves the right to select a sample of tube randomly from each manufacturing batch and have these independently tested. Should the results of these tests fall outside the limits specified in OWNER Technical specification, then OWNER reserves the rights to reject all production supplied from the batch.

- For any control test or examination required under the supervision of TPIA/owner/owner's consultant, latter shall be informed in writing one (1) week in advance by vendor about inspection date & place along with production schedule.

## CHAPTER-15

## 15. SPECIFICATION BRASS FITTINGS

**SCOPE**

This specification covers the requirements for Brass Capillary fittings (End feed fittings). Unless modified by this specification, requirement of BS 864 / EN 1254 Part 1 shall be valid.

**MATERIAL**

- The material used for the manufacturer of Brass Capillary Fittings shall conform to EN 1254-1 (latest), Half Hard.
- Material used for the solder should conform to BS EN 29453 and should be lead free. Solder material shall be generally melting within the temperature range 180 ° C to 250 °C.
- Threading on the Brass fittings shall be done as per BS21.

### 15.1. DIMENSIONAL TOLERANCES

Dimensions tolerances of various types of brass capillary fittings (End feed fittings). shall be as per EN 1254 Part 1.

The tolerances at the end shall be as per EN 1254 Part I in nominal diameter which is as follows (Ref. table below)

| Diameter | Tolerance on the mean diameter with respect to the nominal diameter | | Resulting Diametrical difference | |
|---|---|---|---|---|
| D | Outside Dia of male end (mm) | Inside Dia of socket (mm) | Max (mm) | Min (mm) |
| 12 mm | +.0.04 | + 0.15 | 0.20 | 0.02 |

The minimum wall thickness of a fitting shall be in accordance as given below (Ref Table 3 of EN 1254 Part 1)

| Nominal Dia mm D | Minimum Wall thickness (mm) Brass |
|---|---|
| 12 | 1.1 |

END CONNECTION

End connection of the fitting must be capable of end feeding to the NPT x 12 mm. Internal solder ring type fitting is not acceptable.

### 15.2. CHEMICAL PROPERTIES

Chemical composition of Brass shall be as mentioned in EN 1254 PART I. Dezincification- resistant brass material CuZn36Pb2As or CW602N.

Cu 61.0-63.0 % Pb

01.7-02.8 % As

0.02 -0.15% Remaining is zinc.

### 15.3. CARBON IN BORE

The internal surface of brass capillary fittings for soldering or brazing shall not contain any detrimental film nor present a carbon level high enough to allow the formation of such a film during installation. The maximum total carbon level on internal surfaces shall not exceed 1.0 mg/dm2 when tested in accordance with the specification. This test shall be carried out as per clause no. 5.4 of EN 1254 -1.

### 15.4. RESISTANCE TO DEZINCIFICATION

The fittings shall be manufactured from alloys containing more than 10% Zinc. So fittings shall be required to be resistant to dezincification. It shall be carried out as per Cl. 5.5 of EN 1254 -1.

### 15.5. STRESS CORROSION RESISTANCE TEST

A stress corrosion resistance is to be carried out as per method defined in ISO 6957 using test solution of pH9.5 but without pickling.

### 15.6. FREEDOM FROM DEFECT

The fittings shall be free from internal fins, blow holes, skin defects etc. or other irregularities which might restrict the free flow of fluid, and shall be designed that resistance to the flow of fluid through the fittings is minimized.

### 15.7. HYDROSTATIC PRESSURE TEST

All fittings shall be leak tightness tested at 1.5x25 bars for a period of 15 minutes and no leakage is permitted. This test shall be performed on each size of the fittings.

### 15.8. PNEUMATIC PRESSURE TEST

All fittings shall be leak tested at 6 bars for a period of 10 seconds and no leakage is permitted.

### 15.9. MARKING

Each fittings shall be embossed with OWNER' s logo, manufacturers name and trade mark

BS 864 / EN 1254 Part– I and designation of fittings.

Each packing containing fittings shall carry the following stamped or written in indelible ink.

### 15.10. PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Bidder shall submit the packaging details during QAP and also complied with at the time of delivery.

### 15.11. INSPECTION/ DOCUMENTS

- Inspection shall be carried out as per design codes/standards, OWNER Technical Specification and Inspection Plan/ Vendor's detailed QAP duly approved by owner/owner's consultant.

- OWNER's consultant or third-party inspection agency appointed by OWNER shall carry out random inspection during manufacturing/ final inspection.

- Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports as per OWNER Technical Specification, at the time of final inspection of each supply lot of material.

- Even after third party inspection, OWNER reserves the right to select a sample of tube randomly from each manufacturing batch and have these independently tested. If the results of these tests fall outside the limits specified in OWNER Technical specification, then OWNER reserves the rights to reject all production supplied from the batch.

- Vendor shall prepare and submit the detail drawings of required brass fitting for approval by OWNER before starting production.

- For any control test or examination required under the supervision of TPIA/owner/owner's consultant, latter shall be informed in writing one (1) week in advance by vender about inspection date & place along with production schedule.

## CHAPTER-16

# 16. SPCIFICATION FOR STEEL REINFORCED RUBBER HOSE

## SCOPE

This present document covers the technical specification for the procurement of steel reinforced rubber hose, Type 4 used in distribution systems. It describes the general requirements, controls, tests, QA/QC examination and final acceptance criteria which need to be fulfilled.

This specification covers the requirements for steel reinforced rubber hose unless modified by this specification, requirements of IS: 9573 shall be valid.

## 16.1. SPECIFICATION FOR POWDER COATING

| | |
|---|---|
| Owner | Shall mean Indian Oil Corporation Limited (IOCL) |
| Manufacturer | Means the Manufacturer of the Steel Reinforced Rubber Hose. |
| PTS | Means the present <<Particular Technical Specification>> and its appendix, if any. |
| TPIA | Means the Inspection Agency to be appointed by OWNER. |
| Type 4 | Wire Reinforced hose for domestic / commercial installations |

## 16.2. MATERIAL

- Lining: - It shall be nitrile – butadiene rubber (NBR) or chloroprene rubber (CR) compound. It shall be smooth in bore, uniform in thickness and free from air blisters, porosity and splits.

- Reinforcement material: - It shall have wire reinforcement in braided form in between the lining & cover.

- Cover: - It shall be manufactured out of synthetic rubber compound resistant to abrasion, weather and natural gas. The cover color shall be orange.

• The whole shall be consolidated by wrapping or any other suitable method and uniformly vulcanized to give good adhesion between reinforcement plies and the rubber lining of the cover.

### 16.3. DIMENSIONS & TOLERANCES

• Bore size

| Nominal base (mm) | Minimum base diameter (mm) | Minimum bend radius (mm) |
|---|---|---|
| 8mm | 7.9 | 95 |

The Nominal bore size of the hose shall be accordance to table # 1 of IS 9573: 1998 shall be as given above table. It shall be tested/ checked as method defined in IS 4143.

• The Minimum thickness so lining & cover shall be 2 mm & 1 mm respectively.

• Length of hose shall be as defined in M.R. & the tolerances on length shall be permitted ±1%.

### 16.4. FEATURES

• Mechanical properties

Tensile Strength (Lining & Cover) at break - 10 MPa (minimum)

Elongation (Lining & Cover) in at break (%) - 200 & 250 respectively (minimum)

• **Resistance of Lining to n-pentane**

The n-pentane absorbed and the n-pentane extractable matter as determined Clause no. 5.4.3.2 of IS 9573: 1998 shall not exceed 10% & 5% respectively to the initial mass of lining.

• **Adhesion**

The minimum adhesion between rubber lining & reinforcement, between layers of reinforcement and between reinforcement & cover shall be 2KN/m.

• **Low temperature flexibility**

Flexible hose is conditioned at - 40 ° C for at least 5 hrs. and then bent at 180° around a mandrel with a diameter 12 times the nominal bore diameter of the hose, no cracks or breaks shall be shown.

- **Flexibility of Hose**

The hose shall be capable of being bent empty to the radius 95 mm without flattening and suffering structural damages.

- **Ozone resistance**

It shall be carried out as per clause no. 5.5 of IS 9573: 1978

- **Hydro static test**

All hoses shall be leak tightness tested at 2 MPa for a period of 1 minutes and no leakage is permitted. This test shall be performed on each size of the hoses as per clause no. 5.5.5.1 of IS 9573: 1978.

- **Bursting pressure**

It shall be carried out as per Clause 5.5.2 of IS 9573. The minimum burst pressure shall be 5 Mpa.

- **Grip strength test**

The hose shall comply to the requirement of Clause no. 5.5.7 of IS 9573.

- **Burning behavior**

The burning test shall be carried out on hose as per clause no. 5.5.8 of IS9573. The hose at least shall not burn till 45second.

## 16.5. MARKING

Each hose shall be indelibly marked as follows:

- Manufacturer's name or trademark., if any
- Nominal bore
- Batch no. / Lot no.
- Month and year of manufacturer
- Type of hose i.e. Type 4

- BIS marking

### 16.6. PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Bidder shall submit the packaging details during offer and also complied with at the time of delivery.

### 16.7. INSPECTION/ DOCUMENTS

- Inspection shall be carried out as per design codes/standards, OWNER Technical Specification and Inspection Plan/ Vendor's detailed QAP duly approved by owner/owner's consultant.

- For all test's purposes, the minimum time between vulcanization & testing shall be16h.

- OWNER's consultant or third-party inspection agency appointed by OWNER shall carry out random inspection during manufacturing/ final inspection.

- Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports as per OWNER Technical Specification, at the time of final inspection of each supply lot of material.

- Even after third party inspection, OWNER reserves the right to select a sample of hose randomly from each manufacturing batch and have these independently tested. If the results of these tests fall outside the limits specified in OWNER Technical specification, then OWNER reserves the rights to reject all production supplied from the batch.

- Vendor shall prepare and submit the detail drawings of required steel reinforced rubber hose for approval by OWNER before starting production.

- For any control test or examination required under the supervision of TPIA/owner/owner's consultant, latter shall be informed in writing one (1) week in advance by vender about inspection date & place along with production schedule.

## CHAPTER-17

# 17. SPECIFICATION FOR PURE POLYSTER POWDER COATING

**SCOPE**

This Specification specifies the requirements for powder coating (Pure Polyester) of GI Pipes & fitting suitable to use for carrying Natural Gas directly expose to sunlight.

**SPECIFICATION FOR POWDER COATING**

Powder Material : Pure Polyester.

Application : Electrostatic Spraying (40 — 90 KV Manual/ Automatic)

Backing Schedule : 180 $^{0}$C to 200 $^{0}$C for 10 mm (Metal Temperature) Coating

Thickness : 50-60Microns

## 17.1. TESTING

| | | |
|---|---|---|
| Film Type | : | Glossy/Satin 86 |
| Gloss600 | : | 95% |
| Cross Hatch Adhesion (ASTM D-5870) | : | GT = 0/100 |
| Cylindrical bending Test (ASTM D -522) 5mm Rod dia | : | Passes |
| Enrichsen cupping (min) | : | 8 Passes |
| Pencil Hardness(mm) | : | 2H |
| Scratch Resistance (Kg. Mm) | : | 3 |
| Impact Resistance Kg. Min (ASTM D- 2794) | : | Direct 150<br>Indirect 150 |
| Salt Spray Resistance (ASTM B-117) | : | 1000 Hrs. (min) |
| Porosity (DIN 53161) | : | Passes |
| Humidity Resistance | : | 1000 Hrs. (min) |

## 17.2. MARKING

Each fitting shall be embossed with manufacture's name or trademark and the size designation. Each packing containing fittings shall carry the following stamped or written by indelible ink.

- Manufacturers name or trademark.
- Designation of fitting.
- Lot number.

Each fitting conforming to this standard shall also be marked with BIS standard mark.

**17.3. INSPECTION/ DOCUMENTS**

- Inspection shall be carried out as per OWNER Technical Specification.
- OWNER representative or Third-Party Inspection Agency appointed by OWNER shall carry out stage wise inspection during manufacturing/final inspection.
- Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test inspection reports as per OWNER Tech Spec. &- specified code for 100% material, at the time of final inspection of each supply lot of material
- Even after third party inspection, OWNER/ OWNER's Consultant reserves the rights to select a sample of fittings randomly from each manufacturing batch & have these independently tested. Should the results of these tests fall outside the limits specified in OWNER technical specification, then OWNER/ OWNER's Consultant Reserves the rights to reject all production supplied from the batch. (ASTM D-2247)

Weathering : 60-70% Gloss retention after 1000Hrs. (sun test with water immersion, Xenon 150K.lux)

Colour : Light colour as approved by OWNER/CONSULTANT

## CHAPTER-18

## 18. SPCIFICATION FOR MDPE O&M JOB

### 18.1. SCOPE

The main scope of the Contractor is to provide manpower services for operation, maintenance, repair and monitoring of CGD network consisting of underground PE main pipelines, service pipeline and GI/Cu installations. The scope also covers all the activities associated with providing specified consumables and tools & tackles as specified in attached annexure.

**GENERAL SCOPE**

The scope is to carry out following activities as described herein below:

a) Operation & maintenance of PE pipeline network consisting of 20mm to 180mm size of MDPE pipes. It also includes excavation, laying, shining, jointing, testing, commissioning, backfilling and restoration etc.

b) Modifications/ Dismantling/ Repair/ Testing of GI/ Copper pipeline system including meter and regulator for Domestic and Industrial/Commercial connections.

c) Domestic meter readings and Regulators re-setting as and when required.

d) Operations & Maintenance of GI/Copper Installations including attending & resolving customer complaints etc.

e) Emergency services which include gas pipe line damage, GI leakage, Liasioning with statutory authorities, conversion of burner (emergency cases).

f) Cleaning & Painting of FRS/MRS/valve Chambers.

g) To attain the flame related problem and meter related complaints. h) Transportation of free issue materials from IOCL store.

i) Surveillance of existing pipeline network using gas detectors provided by IOCL. j) Testing of existing pipeline network as per direction of EIC.

k) Providing and maintaining all tools & tackles related to GI/Cu and MDPE work as per attached Annexure-I & 2.

l) Calibration of measuring equipment's / instruments /devices as per discretion of EIC. m) Providing additional manpower as and when required as per instruction of EIC.

Apart from above mentioned scope, other activities required for satisfactory completion of O&M job shall also be in Contractor's scope.

**Other O&M activities required for completion of the jobs: -**

• Contractors shall be responsible to attend complaints viz. Leakage, No Gas Supply, Flame Problem, NG Conversion (Old/ New), Modification of GI, Rubber tube replacement, meter replacement, regulator replacement, Anaconda Replacement, Temporary disconnection, Permanent disconnection & Restoration of temporary disconnection.

• Plan & prepare a daily schedule for attending customers service request as per defined TAT period in accordance to QA/QC plans to be issued by owner/ representative. Contractor should execute complains closure as per TAT policy of IOCL in the time framed manner to avoid penalties.

• Contractor shall submit the QAP/ procedure/ drawing etc. of all the material to be procured by him for approval before procuring the items. If QAP/ procedure/ Drawings etc. are not approved from client / consultant, then owner has the authority to reject the material.

• Receiving regulators, domestic meters, isolation & appliance valves, PE Pipes & Fittings, as free issue material from owner's store, loading, transportation, unloading at project site. Proper storing, stacking, identification, providing security and insurance during and before modification, Installation & pre-commissioning of pipelines, obtaining approval for optimum route and permission for work from concerned authority & EIC.

• Selection of route for modification, repair with EIC and marking the same on walls/ floors anywhere between "transition fittings" to "cooking oven/ stove/ appliance", making openings and provisions for fixing clamps. Making temporary but stable platforms/ scaffolding/ ladder etc. required for installation of pipes/ fittings at all height/ multistoried flats and locations.

• Supply and installation for modification go GI pipes of ½" & ¾" dia. anywhere between transition fittings to customer's kitchen appliance including NPT threading of GI pipes, supply of proper seal outs for threads to join fittings such as elbows, tees, connectors, unions, plugs, sockets, regulators etc. as per laid procedures and specification including clamping and scaling. GI pipe shall be painted after the testing of GI installation.

• Supply and installation of Cu pipes, solder wires and flux to join fittings such as elbows & connectors etc. as per procedure and specifications.

• Supply and installation of clamps for fixing pipes, meter brackets supply of paints for painting of GI pipe & fittings. Providing consumables grout material, repair/ restoration of walls/ floors changes for the pipes including the material required for the conversions and tools and tackles etc. complete as per specification.

• Carry out testing f GI riser and internal kitchen piping (GI or Copper) installed in the kitchen till appliance valve.

• Carrying out removal & dismantling of all sizes of GI/Copper of pipes on customers/ Owner's request.

• Conversion of all types of LPG kitchen appliances to PNG based appliance also taking signatures on GIRM/ Maintenance cards & joint meter records(JMR's) of customer, changing side of appliance (i.e. left to

right or vice versa), disconnecting n PNO connection, SS-316 Anaconda, steel reinforced rubber hose, other related request/ complaints.

- To maintain material inventory, emergency tools & tackles for attending all types of complaints.

- To demonstrate customer regarding use, safety and maintenance related aspects of NO based appliances & installations.

- Cleaning, Flushing, pneumatic testing & re-commissioning of GI/Cu pipe & fittings, meters valves, etc. as per specification and hand over the same to owner/ Customer to the entire satisfaction of EIC.

- Dismantling of scaffolding and temporary structure and cleaning of site & restore the site as per its original condition.

- Preparation & submission of above ground installation card for each house/

commercial establishment indicating the laid qty. of GI/Cu pipe including fittings.

- Any other activities not mentioned/ covered explicitly above but otherwise required for satisfactory completion of customer service requests / operation/ safety/ maintenance of the works in existing gas charged areas shall also be covered under the scope of work and has to be completed by the contractor within the specified schedule at no extra cost.

- Contractor shall be responsible for any misconduct/ unethical activities of his personnel if reported by customer and a penalty well be levied on the contractor as per Terms of contracts. Contract may also be terminated at the sole discretion of EIC.

- Field mobility solution shall be in contractor's scope. i.e. providing of team at site with Android smartphone to close the complaints in IOCL portal through an application provided by the IOCL.

- Uploading of complaints closure by Fleet port shall be in contractor's scope.

- Supply of warning mat shall be in contractor's scope.

- Supply of stone markers, new brass fittings and associated fittings in place of "Anaconda"

Replacement of anaconda with new fittings shall be done as per instruction of EIC.

- Contractor shall store all the dismantled material in his store. Such material kept at contractor's store shall be verified, reconciled and returned to IOCL on half yearly basis or as per Owners requirement.

## 18.2. IOCL ITEMS/MATERIAL INCLUDED IN CONTRACTOR'S SCOPE

Contractor shall provide uniform and identity cards to all his manpower.

Contractor shall provide jhulla (ladder) /handling arrangement, safety harness belts with fall arrestor and 02nos. Polyamide ropes, ascender, descender, helmets, safety shoes, fire extinguishers GI/Cu Pipe and

Fittings, warning tapes, HDPE pipes, Isolation and Appliance Valves, etc. or any other safety equipment not mentioned herein however required for safe operations for each C/R.

Contractor shall provide proper means of communications like Mobiles to his staff (Technician & Skilled manpower). No separate payment shall be made towards maintenance of mobile handsets & their charges and shall be included in manpower supply under various categories.

Contractor shall provide proper means of transport with valid license as applicable for movement of his stall along with tools/tackles as mentioned in Annexure-I & 2 for

attending day to day customer complaints. No separate payment towards maintenance and running of conveyance shall be made.

All consumables such as gas stove jets, Teflon tape, clamps, Hacksaw, blades, drill bits, Acetone, shall be readily available for emergency purposes and shall maintain minimum quantity of these items as decided by the IOCL. Any other tools or consumable not mentioned above but necessary for satisfactory completion of the work shall also be provided by the Contractor.

### 18.3. ITEMS/MATERIAL TO BE PROVIDED BY IOCL

All MDPE Pipe, Meters and Regulators shall be supplied by IOCL as free issue material. Contractor shall maintain the records of items issued by IUL and make these items available for any O&M activity. The reconciled record of these items shall be provided by the Contractor on monthly basis.

In case any IOCL's equipment/materials are damaged/lost by the Contractor, the responsibility of the same lies solely with the Contractor and will replace the same otherwise cost shall be recovered from the Contractor's RA Bills.

### 18.4. SAFETY CODE

The Contractor shall strictly follow the HSE requirement.

**Annexure-1**

MINIMUM TOOLS & EQUIPMENT TO BE PROVIDED BY CONTRACTOR FOR GI/COPPER MODIFICATION WORK

| S.No. | Category | HAND TOOLS DESCRIPTION | Qty. |
|---|---|---|---|
| 1 | C | Pipe wrench 250 mm | 2 |
| 2 | C | Pipe wrench 350 mm | 2 |
| 3 | C | Pipe wrench 450 mm | 2 |

| | | | |
|---|---|---|---|
| 4 | C | Adjustable spanner 50 mm | 2 |
| 5 | C | Adjustable spanner 150 mm | 2 |
| 6 | C | Adjustable spanner 250 mm | 2 |
| 7 | B | Set of combination spanner 3/16"-11/4" AF | 1 |
| 8 | B | Set of combination spanners 5mm - 30mm | 1 |
| 9 | C | Large tool boxes | 2 |
| 10 | C | Set flat-headed screw drivers | 2 |
| 11 | C | Set Philips screw drivers | 2 |
| 12 | C | Small hammer | 2 |
| 13 | B | Combination pliers/mole grips | 2 |
| 14 | C | Set of files | 2 |
| 15 | B | Drill bits for 1” pipe | 2 |
| 16 | B | Stocks and dies for NPT threading ½”,3/4”, 1” GI Pipe | 1 set each |
| 17 | C | Blowtorch | 2 |
| 18 | C | Soldering iron | 2 |
| 19 | B | Copper Pipe Bending Machine | 1 |
| 20 | B | Hand drill 3/8" chuck | 2 |
| 21 | A | Portable electric drill 240V, heavy duty | 2 |
| 22 | C | Spare blades | 4 |
| 23 | C | Battery powered torches | 2 |
| 24 | C | Measuring tape 30 m | 2 |

| | | | |
|---|---|---|---|
| 25 | C | Wire brush | 2 |
| 26 | B | Portable pipe vice & tripod | 2 |
| 27 | C | Set steel twist drills 0.5-2.0 mm (for appliance conversion) | 1 |
| 28 | C | Set steel twist drills 1mm-10mm | 2 |
| 29 | C | Set masonry drills 1mm-10mm | 2 |
| 30 | C | Graphite based grease | As required |
| 31 | C | Lubricating oil | As required |
| 32 | C | Hand cleaner | As required |
| 33 | C | Copper pipe Cutter 12mm | 2 |
| 34 | B | GI pipe cutters ½"-1"<br>Calibrated Pressure Gauge (0-4 bar) Calibrated Diaphragm Gauge (0-400m bar) Calibrated Manometer (0-150m bar) | 2<br>4<br>2<br>1 |
| 35 | C | Rubber Hose Cutter | 2 |
| 36 | C | Foot Pump | 2 |
| 37 | C | Soap Solution | As required |

Note - Any other tools & tackles not mentioned above but required for satisfactory completion of work shall also be provided by the Contractor without any cost implication to IOCL.

**Annexure – 2**

**MINIMUM TOOLS & EOUIPMENTS TO BE PROVIDED BY THE CONTRACTOR FOR PE LAYING, MAINTENANCE JOBS**

| Sl.No. | Category | Equipment Details | Qty. (Nos.) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | A | Electro Fusion Machine<br>(Automatically readable) | 1 |
| 2 | B | Voltage Stabilizer | 1 |
| 3 | A | Portable Generator (5.5 KVA)- Honda make | 1 |
| 4 | B | Squeeze Tools (Manual) upto 63 mm | 2 sets |
| 5 | A | Squeeze Tools (Hydraulic) 63mm to | 2 sets |
| 6 | B | Rotary Peelers for PE pipes of 63mm to<br>125 mm dia. | 2 |
| 7 | C | Universal Scrapers | 2 |
| 8 | B | Tapping Tools/Allen Keys | Two set of all sizes |
| 9 | B | Pipe Cutter upto 63mm | 2 |
| 10 | A | Pipe Cutter (Guillotine) | 1 |
| 11 | B | Pipe Alignment Clamps | 1 set |
| 12 | C | Joining Clamps for Coupler | 2 sets |
| 13 | C | Joining Clamps for Saddle | 2 sets |
| 14 | B | Re-rounding Tools | 1 set |
| 15 | B | Calibrated Pressure Gauges (0-10 Bar) | 4 |
| 16 | A | First Aid Kit | 1 set |

**CHAPTER-19**

## 19. SPCIFICATION FOR STANDARD SPECIFICATION – FORGED FITTINGS (WROUGHT STEEL FITTINGS) FOR USE AT PRESSURE UP TO 100 MBAR (G).

This specification covers the requirements for Wrought Steel Fittings for Natural Gas for use at pressures up to 100 mbar (g). Unless modified by this specification, all the requirements of IS 1239 Part 2: 1992 and the latest editions of the standards mentioned herein this specification, including all revisions, shall apply.

### 19.1. MATERIAL

The material used for the manufacturing of wrought steel fittings shall confirm to IS 1387:1967 generally, and IS 1239 Part 2: 1992

### 19.2. DIMENSIONS & TOLERANCES

- Dimensions of various types of fittings shall be as specified in the table 1 to 31 of IS 1239 Part 2: 1992.
- Wall thickness on fittings & tolerances on them shall be as given in table 1 to 31 of IS 1239 Part 2: 1992.
- In case of reducing fittings, the dimensions at each outlet shall be those appropriate to the nominal size of the outlet.

### 19.3. THREADS

- Outlet of fittings shall be threaded to dimensions & the tolerances as specified in IS 554: 1999.
- All internal & external threads shall be tapered.
- After threading, the pipe body may be hot dip galvanized as per normal practice followed by cold galvanizing (spraying) of the threaded portions. The threaded portions shall be protected using end caps, etc.
- For checking conformity of threads gauging practice in accordance with IS 8999: 2003 shall be followed.
- Chamfering: The outlet of fittings shall have chamfer. The chamfer shall have an included angle of 900 ± 50 for internal threads & 700 ± 100 for external threads.

### 19.4. FREEDOM FROM DEFECTS

On visual examination the outside & inside surfaces of fittings shall be smooth & free from defects such as cracks, injurious flows, fine sand depth, etc. Other workmanship shall be as per Clause 14 of IS 1239 Part 2: 1992.

### 19.5. .GALVANIZING

- Fittings shall be galvanized to meet the requirements of IS 4759: 1996.

• Zinc conforming to any grade specified in IS 209: 1992 or IS 13229: 1991 shall be used for the purpose of galvanizing.

• Galvanized Bath: The molten metal in the galvanizing bath shall contain not less than 98.5% by mass of zinc.

• Coating requirements: Mass of coating shall be 610 gms/ m2. In case of pipe nipples (manufactured in accordance with the requirements of IS 1239 Part 1: 2004), the mass of coating of 400 gms/m2 shall also be acceptable.

• Freedom from defects: The zinc coating shall be uniformly adhered, reasonably smooth & free from such imperfections as flux, ash bare patches, black spots, pimples, lumpiness runs, rust strains, bulky white deposits & blisters; otherwise the pipes shall be liable for rejection.

• Sampling Plan for galvanizing

a) All materials of the same type in a coating bath having uniform coating characteristics shall be grouped together to constitute a lot. Each lot shall be tested separately for the various requirements of the specification. The number of units to be selected from each lot for this purpose shall be as given in Table 2 of IS 4759: 1996.

b) The sample selected according to Column 1 & 2 of Table 2, IS 4759: 1996 shall be tested for visual requirements as per Para 8 of IS 4759: 1996. Vendor shall have appropriate correspondence between galvanizing lot number and pipe manufacturing lot number for identification / traceability.

c) The sample found conforming to above requirements shall then be tested for mass of zinc coating in accordance with Clause 9.2 of IS 4759: 1996.

d) Criteria for conformity: As per Clause 8.3 of IS 4759: 1996.

e) Test procedure shall be as per Clause 9 of IS 4759: 1996. All galvanizing test

results shall be included in the Manufacturer's Test Certificate.

**19.6. PRESSURE TEST**

Pneumatic pressure test shall be carried out on each & every fittings as per procedure given in IS 1239 Part 2: 1992.

**19.7. COMPRESSION TEST**

As per IS 1239 Part 2: 1992.

**19.8. SAMPLING**

Owner's consultant or Third-Party Inspection Agency appointed by Owner shall witness the tests as per procedure for sampling plan given in IS 4711: 1974. However, vendor to perform 100% inspection of visual,

dimensional & pressure test. Vendor shall furnish Internal test certificates at the time of final inspection to the Owner.

### 19.9. MARKING

Each fitting shall be embossed with Owner's logo, manufacturer's name or trademark and the size designation.

Each packing containing fittings shall carry the following embossed, stamped or written by indelible ink.

- Manufacturer's name or trade mark.
- Designation of fittings.
- Lot number.

Each fitting conforming to this standard shall also be marked with BIS standard mark.

### 19.10. PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured. Packing size shall be approved by owner / owner's representative before packing the material. The vendor shall submit the packaging details during QAP and also complied with at the time of delivery.

### 19.11. INSPECTION / DOCUMENTS

- Inspection shall be carried out as per Owner Technical Specification.
- Owner's Consultant or Third-Party Inspection Agency appointed by Owner shall carry out stage wise inspection during manufacturing / final inspection.
- Vendor shall furnish all the material test certificates, proof of approval / license from specified authority as per specified standard, if relevant, internal test / Inspection reports as per Owner Tech Spec. & specified code for 100% material, at the time of final inspection of each supply lot of material.
- Even after third party inspection, Owner reserves the rights to select a sample of fittings randomly from each manufacturing batch & have these independently tested. Should the results of these tests fall outside the limits specified in Owner technical specification, then Owner reserves the rights to reject all production supplied from the batch.

## CHAPTER-20

## 20. SPCIFICATION FOR SPECIFICATION FOR EARTHING INSTALLATION

**ABBREVIATION**

| | |
|---|---|
| BIS/IS | Bureau of Indian standards |
| IEC | International Electro-Technical Commission |
| BS | British Standards |
| IEEE | Institute of Electrical and Electronics Engineers |
| NEMA | National Electrical Manufacturers Association |
| OISD | Oil Industries Safety Directorate |
| CCE | Chief Controller of Explosive |
| DGMS | Director General Mines Safety |
| IE Rules | Indian Electricity Rules |
| CPRI | Central Power Research Institute |
| GI | Galvanized Iron |
| MS | Mild Steel |

**SCOPE**

This specification defines the requirements for the supply of earthing and lightning protection materials and installation of the earthing and lightning protection systems.

### 20.1. REFERENCE DOCUMENTS

The work shall be carried out in the best workman like manner in conformity with this specification, consultant installation standards, layout drawings, the latest edition of relevant specifications, codes of practice of Bureau of Indian standards and OISD standards listed below:

| | |
|---|---|
| SP: 30 (BIS): | Special Publication-National Electrical Code |
| IS: 2309: | Protection of buildings and allied structures against lightning. |
| IS: 3043: | Code of practice for earthing. |
| IS: 7689: | Guide for control of undesirable static electricity. |
| OI SD 110: | Recommended practices on static electricity |
| OI SD 147: | Inspection and safe practice during electrical installation. |

**In addition to the above it shall be ensured that the installation conforms to the requirements of the following as applicable:**

a. Indian Electricity Act and Rules.

b. Regulations laid down by CEA/Electrical Inspectorate.

c. Regulations laid down by CCE/DGMS (as applicable).

d. The petroleum rules (Ministry of Industry Government of India).

e. Any other regulations laid down by central/state/local authorities and Insurance agencies.

## 20.2. DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

OWNER / COMPANY OWNER of the particular Project (Project Specific). CONSULTANT The party which is doing engineering, procurement, construction, pre commissioning and assistance for commissioning, monitors and controls the overall project management.

**BIDDER / SUPPLIER/ VENDOR**

The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.

## 20.3. MATERIALS

**MATERIAL SPECIFICATIONS**

All materials and hardware to be supplied by the contractor shall be new, unused and of best quality and shall conform to the specifications given here under and to latest Specifications of Bureau of Indian Standards. Contractor shall bring material samples to site and get it approved by engineer-in-charge before installation.

The main earth grid conductor shall be hot dip galvanized M.S. flat unless otherwise specified. Sizes for main conductors shall be as indicated on the earthing layout drawing. Amount of galvanizing shall be 610gm per sq meter. Earth electrodes and Earth plate shall be as per job specification.

## 20.4. DESIGN

**EARTHING NETWORK**

This consists of main earth conductor (grid conductor) forming a closed ring network with required number of earth electrodes connected to it to provide a common earth for electrical devices and metallic

structures. From each earth electrode two distinct connections shall be made to the main earth conductor. The earth plates shall be used for taking multiple earth connections to two or more equipment.

The earth conductor shall be laid along cable trays/cable trench/pipe racks as indicated on the earthing layout drawing. Where lined cable trenches are available, the earth conductor shall be laid in the trenches and shall be firmly cleated to the sidewall of concrete trenches using GI clamps at interval of 400 mm to 500 mm and near to the termination end. The earthing conductor shall run along one of the cable trays along a cable route. The earthing conductor shall be suitably cleated and electrically bonded to all the other cable trays on the same cable route at a regular interval of 25 to 30 meter. The earthing for equipment shall be tapped from the main earth conductor and not from cable tray support structure. Earth conductor when laid underground shall be at a depth of 500mm below finished grade level.

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 grade shall be welded and shall be suitably protected by giving two coats of bitumen and covering with hessian tape. Earth strip laid above ground shall be welded across straight through joints and joints shall be suitably protected by giving two coats of bitumen to avoid oxidation and insulation film formation of the strip surface. When two earth strips are to be joined by means of welding, lap welding with an overlapping of strip equivalent to double the width of the strip and all four sides shall be continuously welded. All joints at tappings above ground shall be by mean of connector/lugs. A minimum of two bolts of adequate size shall be used for this purpose. Earthing strip joints at earth plate and equipment shall be through GI bolts, nut etc.

## 20.5. INSTALLATION

### a) INSTALLATION OF EARTH ELECTRODE

- Earth Electrode shall be installed as shown on installation standard and layout drawings. The location shown on the layout drawings are indicative.
- The exact location of earth electrodes in the field shall be determined by contractor in consultation with the Engineer-in-charge, depending on the soil strata and resistivity. Earth electrodes shall be located avoiding interferences with road, building foundation, column, pipelines etc. The civil area drawings shall be referred for this. The distance between two electrodes shall not be less than twice the depth of electrode.
- Electrodes shall preferably be located in a moist soil which has a fine texture, grain size and distribution. Wherever practicable the soil shall be dug up, all lumps broken and stones removed from the immediate vicinity of the electrodes and soil packed by watering and ramming as tight as possible.
- The electrodes shall have a clean surface, not covered by paint, enamel, grease or other materials of poor conductivity.
- All earth electrodes shall be tested for earth resistance by means of standard earth test meter. The tests shall take place in dry months, preferably after a protracted dry spell.
- The disconnect facility shall be provided for the individual earth electrode to check its earth resistance periodically.
- Location of earth electrodes shall be marked by permanent markers for easy identification. All earth Electrodes shall be serial numbered and also marked on `As Built' drawing for future reference.
- Individual earth electrodes shall be provided for each lightning arrestor and flood light mast.

- Earthing system provided for concrete paved area by other agency where applicable; shall be connected to the plant earthing system below ground by minimum two earth connections.

**b) CONNECTION**

**The earth system connections shall generally cover the following:**

a. Equipment earthing for personnel safety

b. System neutral earthing

c. Static and lightning protection

d. System neutral

e. Current and potential transformer secondary neutral

f. Metallic non-current carrying parts of all electrical apparatus such as transformers, switchboards, bus ducts, motors, neutral earthing resistors, capacitors, UPS, battery charger panels, welding receptacles, power sockets, lighting/power panels, control stations, lighting fixtures etc.

g. Steel structures/columns, rail loading platforms etc.

h. Cable trays and racks, lighting mast and poles

i. Storage tanks, spheres, vessels, columns and all other process equipment.

j. Fence and Gate for electrical equipment (e.g. transformer, yard etc.)

k. Cable shields and armor.

l. Flexible earth provision for Wagon, Truck

m. Shield wire

c) Conductor size for branch connection to various equipment shall be as per consultant Installation Standards unless otherwise stated on earthing layout drawings.

d) All process pipelines shall be bonded and earthed at the entry and exist points of battery limit of hazardous area. Earth continuity conductors across pipe line flanges shall not be provide das per OISD 110.

e) Steel pipe racks in the process units and offsite area shall be earthed at every 24 meters.

f) Equipment / street light pole etc. located remote from main earth network may be earthed by means of individual earth electrode and earth conductor unless otherwise stated in Job Specifications.

g) Lightning protection shall be provided for the equipment, structures and buildings as shown on layout drawing. Self conducting structures shall not require separate aerial rod and down conductors. These shall however be connected to the earthing system at two or more points as shown on layout drawing. An independent earthing network shall be provided for lightning protection and this shall be bonded at least at two points with the main earthing network below ground. Lightning down conductor shall be brought to earth electrode in shortest straight path as feasible to minimize surge impedance.

h) The main earthing network shall be used for earthing of equipment to protect against static electricity.

i) All medium and high voltage equipment (above 250V) shall be earthed by two separate and distinct connections with earth.

j) Plant instrument system clean earthing, UPS system clean/safety earth shall be separate from the electrical earthing system.

k) All paint, scale and enamel shall be removed from the contact surface before the earthing connections are made.

l) All earthing connections for equipment earthing shall be preferably from the earth plate mounted above ground wherever provided.

m) Equipment foundation bolts shall not be used for earthing connection.

n) Earth connections shall be made through compression type cable lugs/by welded lugs.

o) All hardware used for earthing installation shall be hot dip galvanized or zinc passivated. Spring washers shall be used for all earthing connections and all connections adequately locked against loosening.

p) Lighting fixtures and receptacles shall be earthed through the extra core provided in the lighting circuit/cable for this purpose.

q) The reinforcements of sub-station building and the sub-station floor shall be connected to main earth grid.

## 20.6. INPSPECTION AND TESTING

i. Field inspection, testing and commissioning of electrical installation shall be done as per specification Earthing systems/connections shall be tested as follows:
ii. Resistance of individual earth electrodes shall be measured after disconnecting it from the grid by using standard earth test meggar.
iii. Earthing resistance of the grid shall be measured after connecting all the earth electrodes to the grid. The resistance value of an earth grid to the general mass of earth shall be as follows:

a. For the electrical system and equipment a value that ensures the operation of the protection device in the electrical circuit but not in excess of 4 ohm. However for generating stations and large sub-systems the value shall not be more than 1 ohm.

b. For lightning protection, the value of 5ohms as earth resistance shall be desirable, but in no case it shall be more than 10 ohms.

iv. The resistance to earth shall be measured typically at the following points.

a. At each electrical system earth or system neutral earth.

b. At each earth provided for structure lightning protections.

c. At each point on earthing system used to earth electrical equipment enclosures.

d. At one point on earthing system used to earth wiring system, enclosures, such as metal conduits and cable sheaths or armor.

e. At one point on fence enclosing electrical equipment.

v. All earthing layout drawing shall be marked by contractor for 'AS BUILT STATUS' and two sets of copies shall be submitted to consultant.

## CHAPTER-21

## 21. SPCIFICATION FOR LIGHTING INSTALLATION

CONTRACTOR shall restore the ROW and all sites used for the construction of pipelines, water crossing and other structures in accordance with COMPANY's instructions, and deliver them to the satisfaction of COMPANY.

**SCOPE**

This specification defines the requirements for the supply of equipment; materials, installation, testing and commissioning of the lighting system (lighting fixtures, lighting power distribution, telephone wiring etc.).

**REFERENCE DOCUMENTS**

The work shall be carried out in the best workmanlike manner, in conformity with this specification, and the relevant specifications/codes of practice of the bureau of Indian standards.

In addition to the above it shall be ensured that the installation conforms to the requirements of the following as applicable:

a. Indian Electricity Act and Rules.

b. Regulations laid down by CEA/Electrical Inspectorate. c. Regulations laid down by CCE/DGMS (as applicable).

d. The petroleum rules (Ministry of Industry Government of India).

e. Any other regulations laid down by central/state/local authorities and Insurance agencies.

### 21.1. FABRICATION (EQUIPMENT SPECIFICATION)

All materials, fittings and appliances to be supplied by the contractor shall be new, unused and of the best quality and shall conform to the specifications given hereunder. These shall be manufactured in accordance with the latest revision of the specifications of Bureau of Indian 'Standards/International Standards. In the absence of any specifications for a particular item contractor shall bring material samples along with proven track record to site and get the same, approved by Engineer-in- Charge/Owner before installation.

### 21.2. LIGHTING AND POWER PANELS

a) Lighting and power panels (general purpose panels for safe area) shall be made of 1.6mm thick sheet steel and shall be dust and vermin proof. All metal surfaces shall be cleaned free of rust, given a coat of red-oxide primer and finished with two coats of epoxy based paint of shade 632 of IS 5. Panels shall be indoor/outdoor type as specified. Indoor type panels shall have IP42 degree of protection and shall be suitable for surface or flush mounting on wall surface as specified. Lighting and power panels located outdoor shall be IP55 weather protected and shall also

preferably have integral canopy for additional weather protection. The canopy shall be made of 2mm thick galvanized sheet steel or FRP where these are separate from the equipment.

b) Lighting and Power panels shall have TPN incoming feeder and single phase outgoing feeders. Lighting circuit feeders shall be rated for 10 amps and power circuit feeders shall have current rating of 16Amps.In power panels for window Air conditioning units, power circuit feeder shall be rated for 20 amps. Panels shall be equipped with phase and neutral bus bars of required current carrying capacity. The outgoing feeders shall be provided with single pole miniature circuit breakers (MCBs) for safe areas and double pole MCBs for hazardous areas. The incomer shall be with MCB and ELCB unit unless otherwise specified. Miniature circuit breakers shall be mounted in such a way that the operating levers project outside the front bakelite covers plates for ease of operation. A hinged door to cover the operating knobs shall be provided. In addition, a circuit diagrams indicating incomer details and outgoing details viz. Circuit number, circuit rating, and load connected and details of the load shall be pasted inside the panel. Also a laminated copy of the diagram shall be provided inside the panel in a suitably designed pocket. Two external earthing studs for connection to the plant earthing grid shall be provided on the panel. Further, the panel shall be provided with an earth bus bar with terminal studs for connection to the third core of each outgoing circuit. Each circuit phase and neutral shall be given ferrule numbers. Complete wiring inside the panel, shall be neatly bunched with PVC tape and button. Sufficient terminals shall be provided in the terminal block so as to ensure that not more than one wire (core) is connected to a terminal. The panel shall have knock out holes or removable gland plate for the entry of incoming and outgoing conduits or cables. The panels shall be complete with requisite number of cable glands as specified.

c) The Main distribution board (MDB) where used, shall be made of 2mm thick sheet steel panel, dust and vermin proof similar-in construction to Lighting and Power panels but with TPN MCB incoming and TPN outgoings (MCB with ELCB units and MCB without ELCB unit as applicable) of required numbers as specified.

d) All MCBs shall be of M9 category as per IS 8828 and sensitivity of ELCBs shall be 100 mA unless otherwise specified.

e) Wherever the size of incoming cable to lighting, power panels/MDB is more than 35 sqmm a suitable cable adapter box shall be provided and attached .to the panel. The incoming cable leads shall be connected to terminal block (bolted type terminals) of required size. This terminal block shall be connected to TPN incomer unit through separate PVC insulated copper conductor wires/bus bars. Sufficient space shall be provided (200 to 250mm) between gland plate and the bottom of terminal block for easy termination.

## 21.3. LIGHTING FIXTURES

The types, Makes and catalogue numbers of various types of lighting fixtures shall be as given in Fixture schedule job Data Sheet. HPMV/HPSV lighting fixtures shall be complete with ballast, starters and

capacitor, as required. Control gears shall be integral or non-integral as specified in lighting layout drawings. Unless-otherwise specified all fixtures shall be supplied complete with lamps. Ballast for fixture shall be copper wound or electronic type. The fixtures shall be of high power factor type i.e. at least 0.9 or more.

### 21.4. SWITCHES

Switches, manufactured in accordance with IS: 13947 shall be used for non hazardous areas. Switches in areas where concealed wiring has been adopted, shall he flush mounting piano type unless otherwise specified. For surface conduit wiring, piano type switches in surface mounted box shall be provided. Industrial Type switches (Weather protected) shall be used for outdoor areas.

### 21.5. RECEPTACLES

Three pin type 5A/15A receptacles manufactured in accordance with IS:1293 shall be used for non hazardous areas. The receptacles and the controlling ON/OFF switch shall be mounted in the same enclosure box but these shall be in separate units to facilitate replacement by parts. Flush mounting type receptacles shall be used in areas where concealed wiring has been adopted and surface type shall be used in other areas. For exhaust fans and wall mounted air circulators, socket and switch enclosures shall be separate. In buildings such as sub-station, D.G. shed, Workshop, maintenance shop etc. industrial type metal clad socket outlets and plugs shall be provided. These sockets shall be supplied complete with plugs.

### 21.6. OUTLET BOXES

The outlet boxes used as point outlets shall be prefabricated type 65mm deep junction boxes. Outlet boxes custom fabricated for sockets, switches, fixtures and fan regulators etc. shall be made of M.S. Sheet having minimum thickness of 1.6mm. Outlet boxes shall be galvanized after fabrication. These shall be complete with terminal block suitable for connection of wires up to 4 sq. mm Front cover plate shall be of 3mm thick back elite/PE sheet. The colour shall suit the shade of the walls or shall be white if the shade of the walls is not finalized. The sheet shall extend at least

2 cm on all sides of outlet box. Cover plate shall be fixed by cadmium plated brass screws and cup washers. Outlet boxes shall be provided with adequate number of knock outs on all the sides for ease of wiring either with conduits or without conduits.

### 21.7. CONDUIT AND ACCESSORIES

Conduits for Electrical installations shall conform to IS:9537. The type of conduit (steel/GI/PVC) shall be as specified on drawing. Black enameled-steel or GI conduit shall be of 1.6mm thick and the minimum wall thickness of PVC conduit shall be 1.6mm. Generally PVC conduits shall be used in concealed wiring and for surface wiring GI conduit (in plant buildings) and black enameled steel conduit (in-non plant buildings) shall be used.

### 21.8. LIGHTING POLES

Lighting poles shall be fabricated from ERW steel tubular pipes of specified section, with joints, swaged together when hot and beveled on outside edges. Poles shall be coated with bituminous

preservative solution on the ground portion of the outside surface. Remainder of the outside surface shall be given one coat of red oxide primer and finished with two coats of aluminum paint. The pole shall have, a marshalling, box near the bottom to contain HRC fuses, a neutral link earth stud and terminal block.

### 21.9. LIGHTING MAST

Lighting masts (Lattice tower) where used. They shall be complete with 2 nos. MS flats provided at the base plate for connection to the plant earthing grid. A ladder, platform, handrail, a weather protected TPN switch (at 1500mm from ground-level) and ;a weather protected distribution board fabricated out of sheet steel shall be provided at the top of mast. The TPN Switch and the distribution board shall also have a canopy for additional weather protection. The TPN switch shall be suitable for looping one more lighting mast from the same incoming, power supply. The distribution board shall have TP&N bus bars of 30 Amps. rating and 12 Nos. outgoing circuits each with a 6A single pole MCB. The distribution board shall have cable entries from bottom. Necessary space provision and suitable mounting arrangement shall be made on top of the tower for mounting of ballast (choke) and condensers for all the circuits and the lighting fixtures. The masts shall be given one coat of red oxide primer and two coats of aluminum paint. Distribution board shall he fabricated out of 2mm thick sheet steel and shall be painted with two coats of enamel over a basecoat of red oxide.

Unless otherwise specified the flood lighting high masts shall be telescopic type.

### 21.10. WIRES

Wires shall be PVC insulated and shall be of 660 Volts grade as per IS694. Conductor shall be of stranded copper and size shall be minimum1.5 Sq. mm for lighting, 2.5

Sq. mm for 15A power socket circuits and 4 sq. mm for split A/C power socket

circuits. Red/Yellow/blue wires for phases, black wire for neutral and green wire for earth shall be used (size of earth wire shall be same as for phase and neutral size). Wire size for air conditioning circuit feeders shall be as indicated in the panel schedule.

### 21.11. CEILING FAN/EXHAUST FAN

Ceiling fans shall be of 1200mm sweep unless otherwise specified with double ball bearing and regulator. The suspension down rod shall be sturdy mild steel rod of adequate diameter and of minimum length of 300mm with shackles suspension arrangement as per IS. For exhaust fans, the sweep dia. and air CFM shall be as specified in job specification. Exhaust fans for battery room shall be with anticorrosive blades suitable for use in acidic fumes.

### 21.12. DECORATIVE SWITCHES AND SOCKETS

Decorative lighting switches and sockets where specified, shall be modular in design. All these items shall fit into the same frame with overall standard dimensions. Frames shall be suitable for surface and flush mounting in brick / concrete wall. The frames shall be suitable for conduit entry from all the sides. Switches and sockets shall match colors of the frame and cover plates to obtain a combination which shall match decor of the interiors of Control Room, Administrative buildings, offices rooms etc.

## 21.13. INSTALLATION

Lighting system installation shall be as per follows.

**GENERAL**

a) The lighting fixtures in the plant shall be fed from lighting panel. All outdoor lighting shall be group controlled manually or through synchronous timer or photocell. Lighting wiring between panel and lighting fixtures shall be done with PVC insulated 3core (phase, neutral and earth) copper conductor armored cable for hazardous areas. Wiring in the building shall be done by means of 3core copper, conductor. PVC insulated, un-armored cables, or PVC insulated copper conductor wires in conduit/Metsec channel as specified. All joints of conductors in Switch boards/JBs Fittings shall be made only by means of approved mechanical connectors (nylon/PVC connectors). Bare twisted joints shall not be permitted anywhere in the wiring system.

b) The lighting layouts furnished by Owner will indicate approximate locations of lighting fixtures. The electrical contractor shall determine, with approval of Engineer-in-Charge, The exact location of each fixture in order to avoid interference with the piping or other mechanical equipment and also with a view to obtain as much uniform illumination as practicable, and to avoid objectionable shadows. Conduits shall be laid out by the contractor to suit field conditions and as per directions of the Engineer-in-Charge.

c) On walkways, platforms and other outdoor area, lighting fixtures shall be located nearer to landing of stairs or ladders, gauges, flow meters, panel boards and other equipment to provide proper illumination.

d) The minimum height of any lighting fixture shall be preferably not less than 2.5 meters above the floor level.

e) All outdoor cable terminations to outdoor junction boxes, panels, socket outlets etc. shall be through bottom or from side. Top entries for cables shall be avoided to avoid water entry. All cable glands for outdoor terminations shall be double compression type and the gland shall be covered with PVC or rubber boot shroud. All unused cable entries shall be plugged with suitable blanking plugs.

**f) Mounting height of equipment shall be as under: -**

- Top of Switch Box 1200 mm from FFL(Finished floor level)
- Top of Lighting/Power Panel 1800mm from FFL
- 5/15 Amp. Receptacle 300mm from FFL unless otherwise specified (1200 mm for process areas and industrial sheds)
- Lighting fixture As indicated in layout drawing
- Exhaust fan In the cutout provided / as indicated in Layout drawings.

g) Fixtures shall be firmly supported from the structures. Support (clamps etc. may be bolted or welded to the existing steel work or metal inserts. In case of concrete, structures, where metal inserts are not available, fixtures shall be suspended from concrete surfaces with the help of anchor fasteners. In such cases special care shall be taken to see that anchoring is firm. In places where ceiling fans are provided, lighting fixtures shall be suspended below the level of fan to avoid shadow effect.

h) Circuit cables in a group shall be cleated to structure by using galvanized strip clamps or cable run in cable trays wherever trays are available. Spacers and cleats shall be of required size to accommodate the cables. All hardware shall be galvanized or zinc passivated. Underground lighting cables (in paved areas), shall be taken in suitable G I sleeves buried at a minimum depth of 300 mm from FFL. GI pipe sleeves shall be extended to 300mm above. FFL Exact termination/layout of pipes (for protection of cables) shall be decided at site as per site convenience in consultation with Engineer-in charge.

i) Wiring for all outlet sockets shall be done with 3 cores of equal sizes for, phase, neutral and earth. The terminals of switch sockets shall be suitable to receive the size of wire specified.

j) All lighting fixtures shall be provided with terminal block with required terminals suitable for connection of wire up to 2.5 sq mm copper conductor.

k) The cable shall be straightened after unwinding it from the drum. All cables be clamped/laid in straight run without any sag and link.

l) For location where fan points are shown, fan hooks with junction box during concreting.

m) Where fan hooks and JB's are provided separately JB shall be located within a distance of 300mm from hook for mounting of ceiling rose.

n) Industrial type plug sockets with 20A MCB or rating as per job specification shall be provided at a height of 500mm from FFL for window AC units.

o) Socket outlets and plugs for installation in Substation building, DG shed, workshop, and maintenance shop etc. shall be of industrial metal clad type.

p) Wiring for exhaust fans shall be terminated in receptacles as specified in layout drawing and the connection from receptacle to the exhaust fan shall be by means of a flexible cord equivalent in size to the main run of wires. Switch for exhaust fan shall be located in a separate switch board along with other switches.

**21.14.** CONDUIT SYSTEM

a) Surface or concealed conduit system of wiring shall be adopted, as specified in the drawings. Required number of pull boxes shall be used at intervals to facilitate easy drawing of wires. Separate conduit shall be run for lighting and power circuits. Further, conduits for Normal lighting/Emergency lighting/DC critical lighting shall be separate. Conduit layout shall be decided at site as per site conditions. Drop conduits for switch boards shall be decided by contractor as per wall locations shown in Architectural drawings. All exposed run of conduits on surface, shall be vertical or horizontal.

b) Only threaded type conduit fittings shall be used for metallic conduit system. Pin grip type or clamp type fittings are not acceptable. Conduit ends shall be free from sharp edges or burrs. The ends of all conduits shall be reamed and neatly bushed.

c) Conduit shall be of minimum 25mm dia. Maximum number of wires permissible in a conduit shall be seven/nine for wire size of 2.5 sq mm/1.5 sq mm. respectively.

d) The exposed outer surface of the conduit pipes, including all accessories forming part of the conduit system, shall be adequately protected against rusting. In all cases, bare threaded portion of conduit pipe shall not be exposed unless such bare threaded portion is treated with anti-corrosive preservative or covered with approved plastic compound.

e) Conduit connection to outlet boxes shall be by means of screwed hubs or check nuts on either side. Where concealed wiring is done, junction boxes (65mm deep) shall be used so as to rest on shuttering properly. Conduits shall be laid above reinforcement. All conduit connections shall be properly screwed and Junction box covers shall be properly fitted so as to avoid entry of concrete slurry.

f) Conduit pipes shall be fixed by I.6mm thick G.I. saddles on 3mm thick G.I. saddle bars of required width in an approved manner at intervals of not more than 50cms for straight run. At places near junction boxes, bends, or similar fittings, saddle and bars shall be provided on either side

g) Where concealed wiring is to be adopted, conduits shall be laid in time before concreting of the slab. Pull wire (GI or steel) shall be provided inside conduit .for the ease of wire pulling. The contractor shall coordinate his work with other agencies involved in the civil works in, such a way, that the work of the other agencies is not hampered or delayed. Vertical conduit runs shall be made in wall before plastering is done so as to avoid chasing. Where chases are made for conduit run contractor shall fill these chases or any other openings made by them after completing the work and patch the surface. During installation, care shall be taken to see that proper covers are provided to prevent rusting of conduits. Locations of all point outlets, junction boxes shall be marked with brick powder or sand so that these are easily identified after shuttering removal. As built conduit layout drawing shall be submitted by contractor after completion of the work.

h) All junction boxes, bends and other accessories shall be of the same material as that of conduit and shall have the same protective coatings.

i) After erection, the entire conduit system shall be tested, for mechanical and electrical continuity and shall be permanently connected to earth by means of approved type of earthing clamps.

## 21.15. HAZARDOUS AREA INSTALLATION

a) Wiring in hazardous area shall be done by using minimum 2.5mm copper conductor armored cable. Circuit wiring feeding hazardous areas shall be controlled by two pole switches/MCBs (for phase as well as neutral isolation).

b) Correct type of lighting equipment (fixtures and JBs) with regard to hazardous protection as specified in the drawing shall be installed for the areas classified as Zone 1, Zone 2 etc.

c) The terminations in the junction boxes and the lighting fittings shall be done avoiding possibility of loose connections due to vibrations. After the terminations are made the cover of the junction boxes and the lighting fittings shall be closed properly with all bolts and hard wares in correct position, retaining its explosion and weather protections. In fixtures having double cable entries, both the entries shall be used for looping in and looping out connection, thus minimizing the use of separate junction box wherever separate control gear boxes (C.G. box) are provided looping in and looping out, connections shall be through CG-box, thus avoiding the use of a additional junction box. All unused cable entries shall be sealed with suitable plugs.

d) Circuit cables shall be firmly cleated in a group along, columns/ beam/ladders/side channels/platform using 1.6 mm thick GI saddles on, 25x3 mm GI saddle bar at intervals of 400mm to 500mm for straight run and on either side close to bending and at both termination ends as per the direction of Engineer-in-charge. Where required 3 or more of cables may be taken in slotted channel tray after getting the approval of Engineer-in-charge. Cables shall not be routed along hand rails.

e) Where fire proofing column/structures are encountered, all cabling shall be taken in GI pipes of required size and both ends shall be sealed, well before fire proofing is done. Similarly equipment such as lighting fixture, control gear box, lighting/ power panels, field call stations, junction-boxes etc. shall be installed on suitable steel mounting frame/distance bracket, thereby direct contact with the concrete used for fire proofing.

f) Cable glands for terminating cable on flameproof equipment shall be of double compression FLP type. Any material/equipment specified to be supplied by contractor for installation in hazardous areas, shall be tested by CMRI and duly approved by C.C.E. Nagpur or DGMS Dhanbad or any other applicable statutory authority. All indigenous FLP equipment shall also have valid BIS license as required by statutory authorities.

## 21.16. BUILDING LIGHTING

a) The type of wiring system shall comprise surface/concealed conduit system or cable wiring as specified on layout drawings.

b) Mounting details of fixtures shall be indicated on the drawings. If specified on the drawings, a group of fluorescent lighting fixtures which are to be mounted end to end shall be fixed to mild steel cold Tolled sections of 50mm x 50mm and of 1.2mm thick (Met sec channel). The entire assembly shall be fixed to the ceiling with necessary number of supports which may be by means of steel conduit or chromium plated chain link as required. The 'Metsec' Channel shall run

continuous in suitable sections from one end to other end of wall. The complete channel shall be spray painted, with approved colour as per the directions of Engineer-in-Charge. All wires inside channel shall be neatly bunched by nylon tape & buttons.

c) Wiring in areas above false ceiling shall be done in Surface Conduit (25mm dia GI conduit) suitably clamped to the true ceiling. Vertical drops from true ceiling for panels, switches, receptacles etc. shall be taken in 25mm dia PVC conduit concealed in walls upto switchboards/panels. Lighting fixtures shall be supported from true ceiling. Exact location of fixtures shall be finalized in co-ordination with air- conditioning duct-diffuser layout, panels layout and false ceiling grid layout. To facilitate easy maintenance Looping back system' of wiring shall be followed throughout. Accordingly supply tappings and other interconnections including for earthing are made only at fixture connector blocks or at switch boards. Required number of junction boxes shall be used at intervals for wire pulling and inspection.

## 21.17. MAST LIGHTING

a) The lattice structure masts shall be installed on concrete foundations with the base plate bolted on to the anchor bolts. The lattice structure shall be painted with a coat of primer and two coats of aluminum paint, the second coat to be given just before handing over to the owner. The masts shall be numbered as per drawings. The masts shall be connected to the plant earth grid at two points.

b) The main feeder upto the distribution board of lighting Mast shall be through PVC insulated armored cable of size as specified in the respective drawing. Wiring from Distribution Board to each flood-light fixture shall be by means of a 3core 2.5sqmm, copper conductor PVC insulated armored cable. All the cables shall be neatly clamped to the structure at interval snot exceeding 25 cms.

c) Exact orientation of flood lighting fixtures shall be decided at site to achieve optimum utility of these fixtures.

d) All wires in conduit shall be colour coded as specified. Each circuit shall have independent phase neutral and earth wire. However when group of circuits are run in a single conduit the earth wire can be common.

e) Building conduit lighting system of wiring where measurement is done on point wiring basis generally consists of two parts. The first part is the circuit wiring which includes the work necessary from lighting panel up to switch box and from switch box to another switch box. The second part is the point wiring which shall include the work necessary from tapping point in the switch box up to various fixtures or fan outlets/ceiling roses.

f) In no case, two different sources or two different phases of supply shall be combined in one switchboard.

g) Switches for light fixtures/exhaust fans in battery room shall be provided outside the Battery room.

h) Lighting layouts for non-plant buildings (such house, cement go down, gate house, workshop, service building, rest room, etc.) shall be prepared by installation contractor.

i) Based on the above input, contractor shall prepare and submit lighting layout drawings, panel schedules, conduit layout drawings for concealed wiring, design calculations wherever required, for review by purchaser before erection work is started. The lighting layout drawing shall show the location, type and mounting details of lighting fixtures, receptacles, junction boxes, layout of circuit indicating number of wires etc. The number of points in a circuit shall not exceed ten and the load in each circuit shall be less than 1000 Watts.

j) The panel schedule shall include rating of incoming and outgoing feeders, number of outlets, load for each outgoing circuit, etc.

k) All drawings shall be prepared preferably in AO and Al size. Panel schedules shall be in A4 size drawings (Final submission of drawings shall be in soft copies and in bound volumes together with one transparency of each document).

## 21.18. STREET LIGHTING

a) Street lighting poles to be located on road side shall be installed at a minimum distance of 300mm from the edge of the walkway of the road (road berm). Size of wires from marshalling box up to fixture shall be 1.5mm2/2.5mm2, copper conductor PVC insulated.
b) Each pole shall be earthed at two points by connecting to the plant earth grid as shown on Installation standards.
c) Street lighting fixture shall be mounted on steel tubular poles as per standard drawings. The foundation for the street lighting poles will be made by electrical contractor Street lighting poles shall be supplied with a base plate.
d) The poles shall be numbered as per the drawings/ directions of Engineer-in-charge.

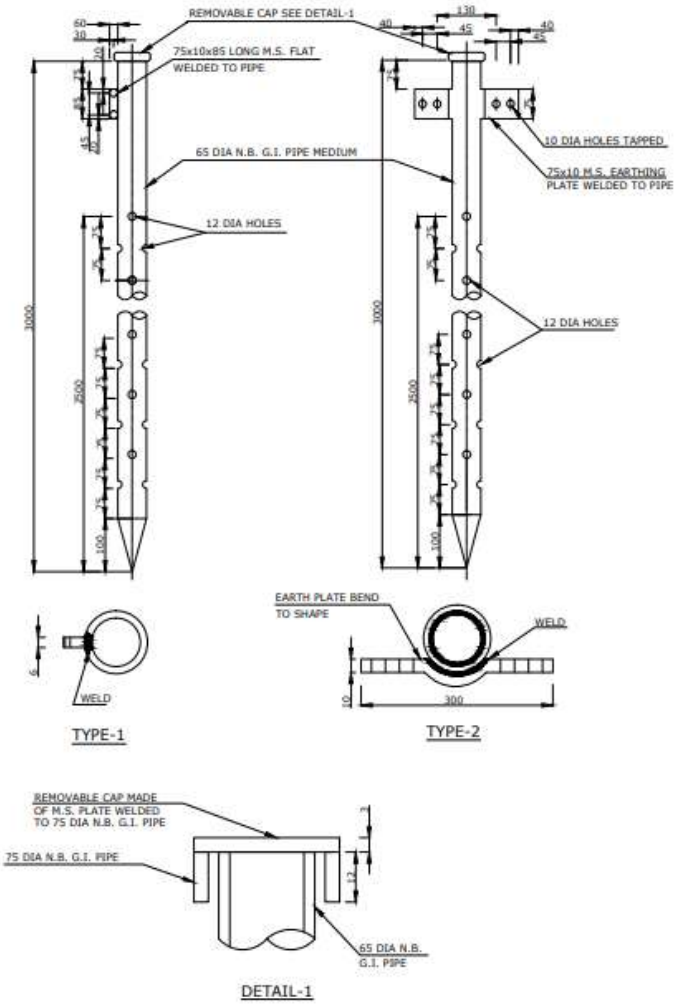
## 21.19. TELEPHONE WIRING

a) Conduits for telephone wiring in buildings shall be of 1.6mm thickness. 25mm dia black enameled steel conduit/PVC as per IS 9537, installed on wall surface or concealed or as specified in job specification.
b) Conduit installation system shall comply to the requirements given in conduit system. Required number of pull boxes shall be provided at interval for easy drawing of wires. The telephone wiring shall be done with 0.63mmdiaannealed copper conductor PVC insulated 660V grade, twin flat wire, unless otherwise specified in Job Specification. One telephone socket outlet shall be provided for connection to telephone instrument.

## 21.20. INSPECTION &TESTING

a) Lighting installation shall be tested and commissioned by installation contractor as per Specifications. Pre commissioning checks and tests shall include but not be limited to the following:
b) The insulation resistance of each circuit without the lamps (load) being in place shall be measured and it should not be less than 500,000 ohms. (Between phases, phases to neutral, phase /neutral to earth).
c) Current and voltage of all the phases shall be measured at the lighting panel bus bars with all the circuits switched on with lamps. If require load shall be balanced on the three phases.
d) The earth continuity for all socket outlets shall be checked. A fixed relative position of the phase and neutral connections inside the socket shall be established for all sockets.
e) After inserting all the lamps and switching on all the circuits, minimum and maximum illumination level shall be measured in the area and recorded.
f) It shall be ensured that switch provided for ON/OFF control of point (light/fan/socket) is only on LIVE side.
g) Operation of ELCB's shall be checked Contractor shall duly fill in all the above test results and submit the test reports to Engineer-in-Charge in triplicate.
h) All lighting layout drawings shall be marked by contractor for `AS BUILT STATUS' and two sets of copies shall be submitted to the consultant.

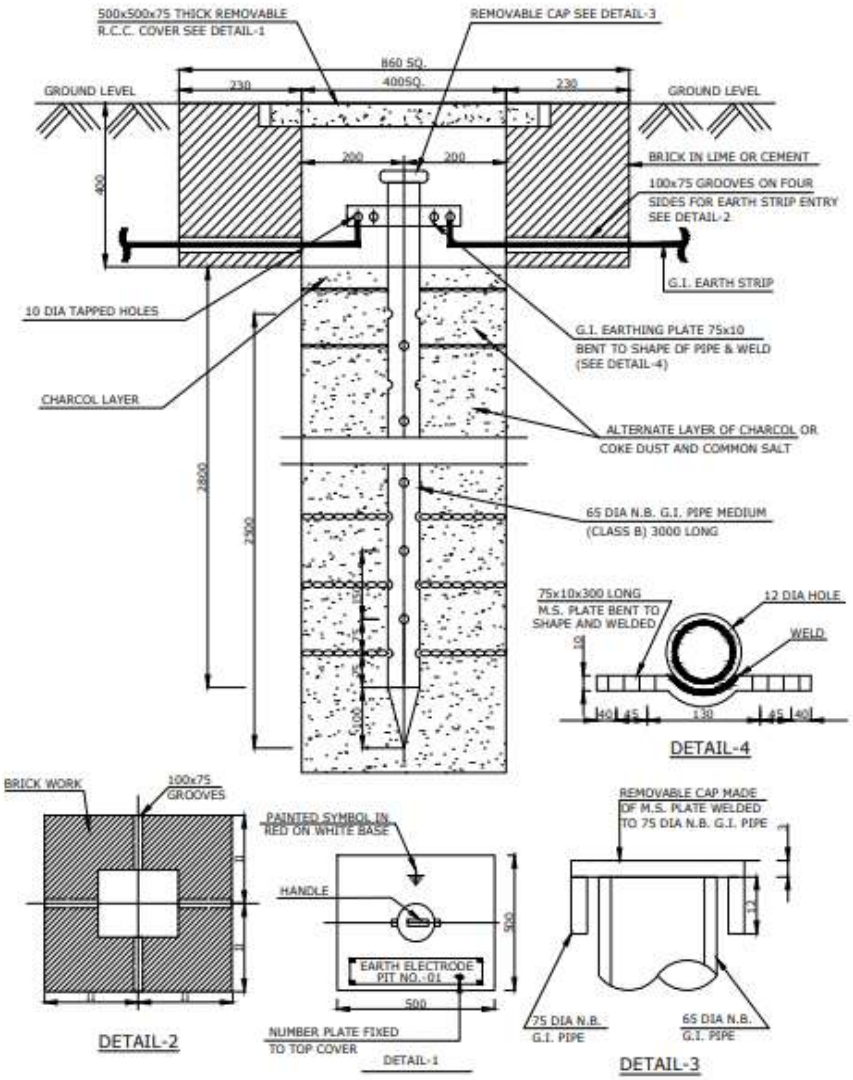
# ELECTRODE FOR EARTHING SYSTEM




NOTES:

1. THE PIPE ASSEMBLY SHALL BE HOT DIP GALVANISED AFTER FABRICATION.
2. UNLESS STATED OTHERWISE ON PLAN DRAWINGS, ONLY TYPE-2 SHALL BE USED.

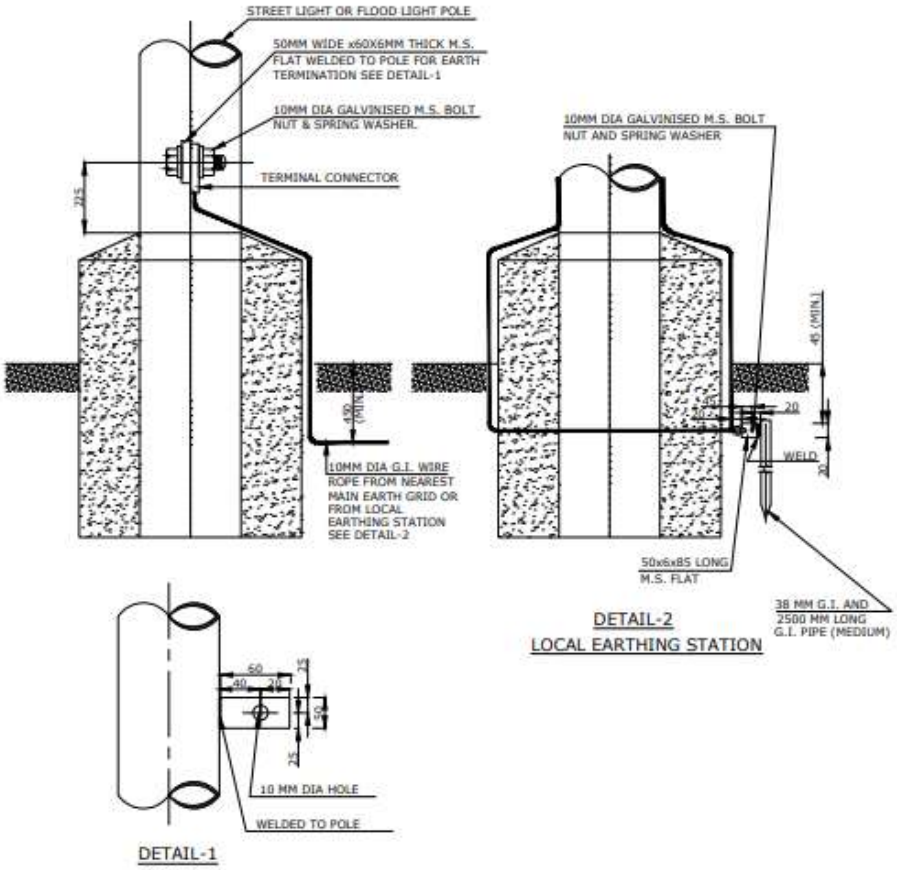
# EARTH ELECTRODE IN TEST PIT




NOTES:

1. THE PIPE ASSEMBLY SHALL BE HOT DIP GALVANISED AFTER FABRICATION.
2. BRICK WORK SHALL BE DONE AFTER COMPACTING THE SOIL.

# TYPICAL EARTH CONNECTION FOR STREET LIGHT POLE

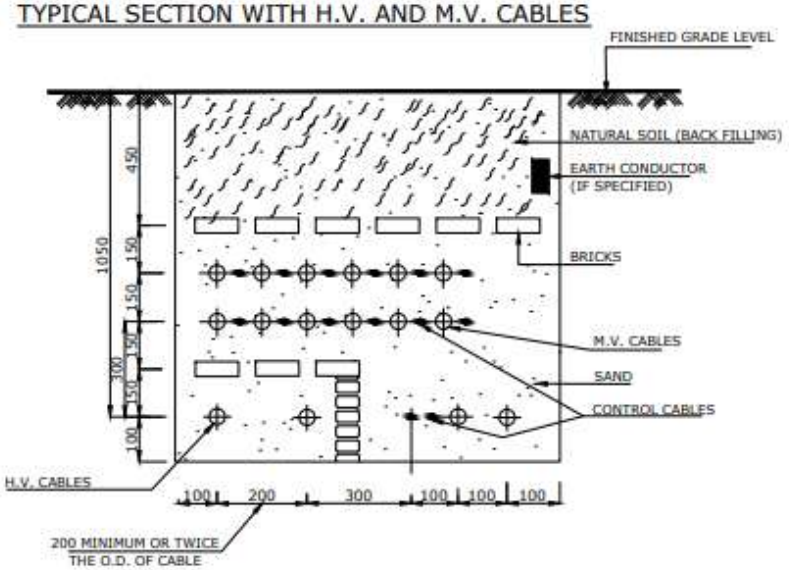



NOTES:

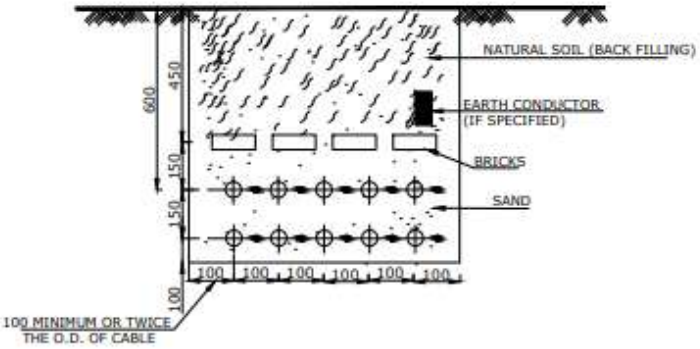
1. USE TWO EARTH WIRES IF VOLTAGE IN THE POLE JUNCTION BOX IS 415 VOLTS.

# TYPICAL SECTION OF CABLE TRENCH IN UNPAVED AREAS

## TYPICAL SECTION WITH H.V. AND M.V. CABLES



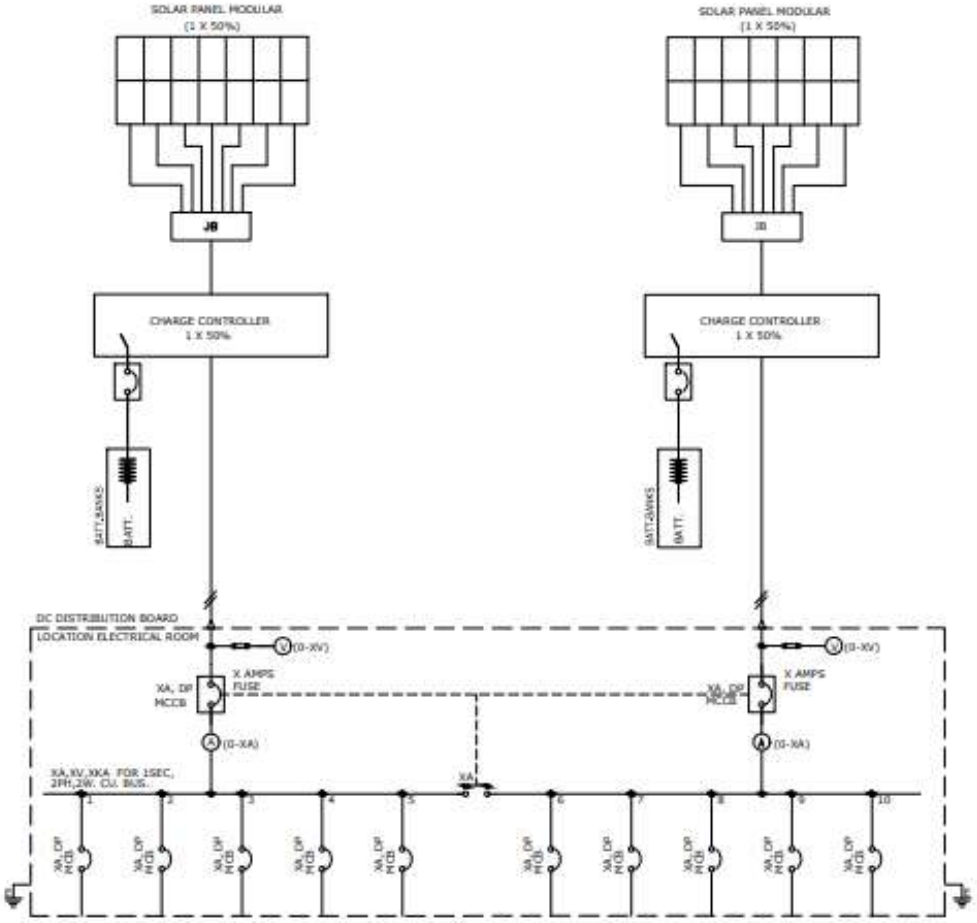

## TYPICAL SECTION WITH M.V. CABLES ONLY




NOTES:

1. LEAVE SPACE FOR LATER ADDITION OF AT LEAST 2 CABLES OR 15% AVERAGE SPARE SPACE REGARDLESS OF FUTURE EXPANSION.
2. IF FIRE ALARM AND COMMUNICATION CABLES ARE LAID IN THE SAME TRENCH A CLEARANCE OF 300mm (MINIMUM) AWAY FROM

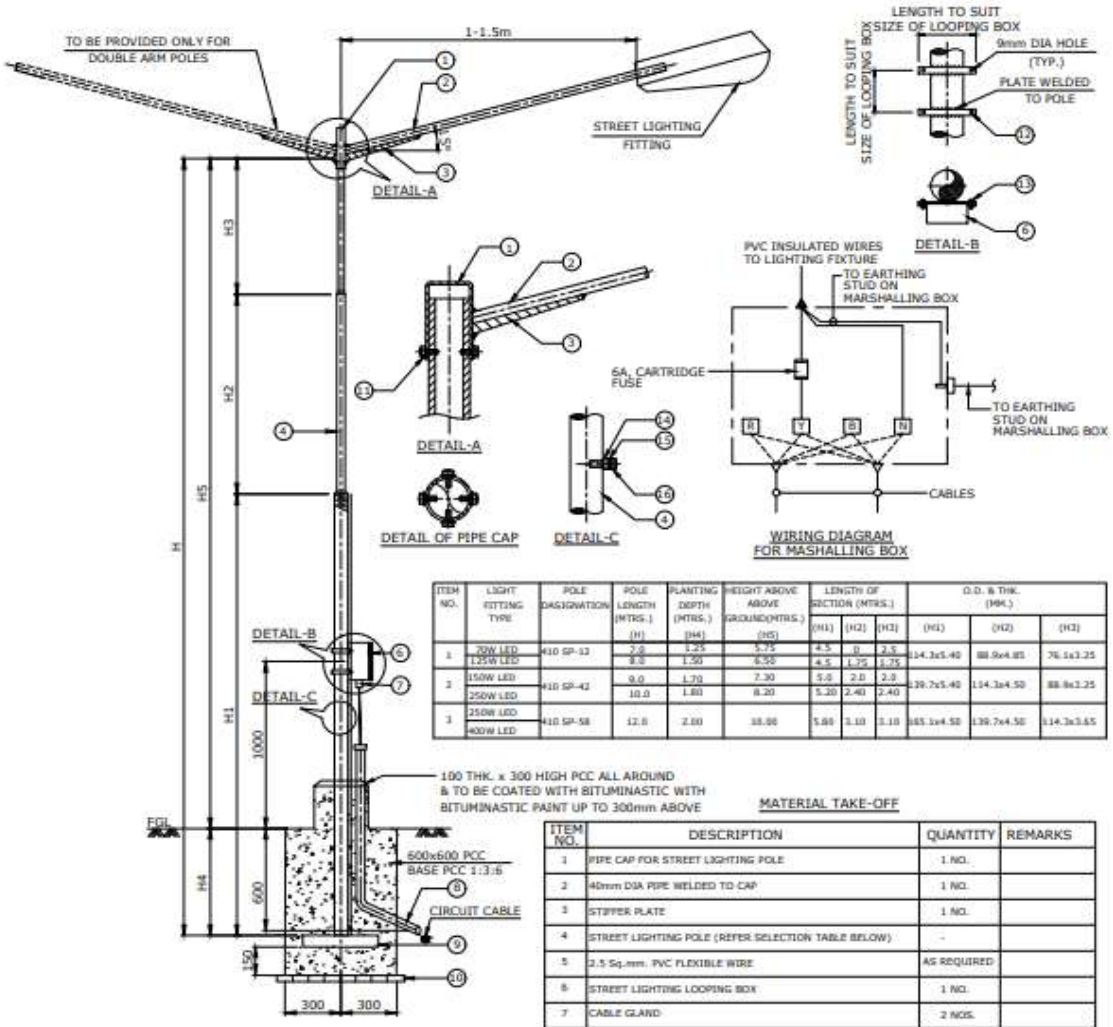
# SOLAR POWER SYSTEM




NOTES:

1. ALL ELECTRICAL EQUIPMENT BE TROPICALISED IN COMPLIANCE WITH LOCAL SITE CONDITION.
2. THE SIZE OF ALL INSTRUMENT SHALL BE 95mm FOR FULL & HALF SIZE MODULES AND 72mm x 72mm FOR LOWER SIZE MODULES
3. ALL AMMETER & VOLTMETER SHALL BE DIGITAL TYPE AND OF CLASS 1.5 ACCURACY.
4. POWER & CONTROL CABLES SHALL BE 1.1kV GRADE , STRANDED COPPER CONDUCTOR, PVC INNER SHEATH & PVC OUTER SHEATH WITH FRLS CHARACTERISTICS CABLE SHALL CONFIRM TO IS:7000.
5. THE CABLE SIZE ARE CALCULATED ACCORDING TO CABLE SIZING CALCULATION SHEET.
6. ALL INDOOR DB'S SHALL BE PROVIDED WITH IP53 PROTECTION AND FOR OUTDOOR IP55.
7. TWO (2) NOS OF BATTERY BANKS WITH 3 DAYS BACK UP SHALL BE PROVIDED.
8. MCCB'S AND MCB'S SHALL BE DP, 10kA

# TYPICAL MOUNTING DETAILS OF STREET LIGHTING FITTING




| ITEM NO. | LIGHT FITTING TYPE | POLE DESIGNATION | POLE LENGTH (MTRS.) (H) | PLANTING DEPTH (MTRS.) (H4) | HEIGHT ABOVE ABOVE GROUND(MTRS.) (H5) | LENGTH OF SECTION (MTRS.) (H1) | (H2) | (H3) | O.D. & THK. (MM.) (H1) | (H2) | (H3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 70W LED | 410 SP-13 | 7.0 | 1.25 | 5.75 | 4.5 | 0 | 2.5 | 114.3x5.40 | 88.9x4.85 | 76.1x3.25 |
| | 125W LED | | 8.0 | 1.50 | 6.50 | 4.5 | 1.75 | 1.75 | | | |
| 2 | 150W LED | 410 SP-42 | 9.0 | 1.70 | 7.30 | 5.0 | 2.0 | 2.0 | 139.7x5.40 | 114.3x4.50 | 88.9x3.25 |
| | 250W LED | | 10.0 | 1.80 | 8.20 | 5.20 | 2.40 | 2.40 | | | |
| 3 | 250W LED | 410 SP-58 | 12.6 | 2.00 | 10.60 | 5.60 | 3.50 | 3.50 | 165.1x4.50 | 139.7x4.50 | 114.3x3.65 |
| | 400W LED | | | | | | | | | | |

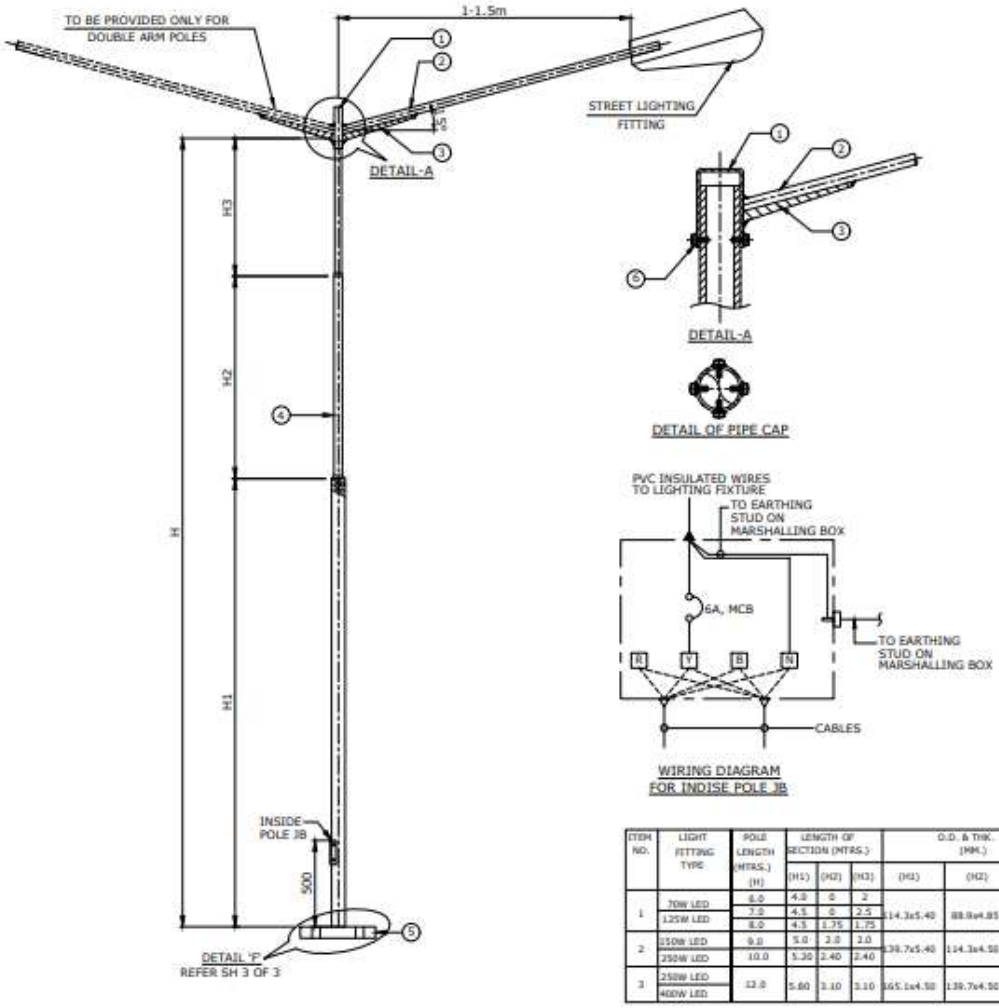
## NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. POLE MATERIAL SHALL BE G.I. OR M.S AS PER PROJECT CONTRACT REQUIREMENTS.
3. AFTER INSTALLATION THE ASSEMBLY IS TO BE PREPARED, PRIMED AND PAINTED IN ACCORDANCE WITH THE PROJECT PAINTING SPECIFICATION IF MATERIAL IS M.S.
4. LIGHT FITTING FIXING DETAILS TO BE FURNISHED BY SITE.
5. EARTHING TERMINAL ARE LOCATED DIAMETRICALLY OPPOSITE.
6. ALL NUTS, BOLTS AND WASHERS SHALL BE GALVANISED AND ZINC PASSIVATED.
7. MOUNTING DETAILS OF CONTROL GEAR BOX AND LOOPING BOX REFER INSTALLATION DETAILS.
8. ALL SHARP EDGES AND BURRS SHALL BE REMOVED.
9. POLE SHALL BE MADE FROM TUBULAR STEEL PIPES SWAGED AND WELDED CONFORMING TO DESIGNATION AS MENTIONED IN ABOVE TABLE- AS IS-2713 (PART III) – 1980.
10. DOUBLE ARM SHALL BE EITHER AT 180° OR 30° AS PER THE LOCATION OF THE LIGHTING FITTING & SITE REQUIREMENT.

## MATERIAL TAKE-OFF

| ITEM NO. | DESCRIPTION | QUANTITY | REMARKS |
|---|---|---|---|
| 1 | PIPE CAP FOR STREET LIGHTING POLE | 1 NO. | |
| 2 | 40mm DIA PIPE WELDED TO CAP | 1 NO. | |
| 3 | STIFFER PLATE | 1 NO. | |
| 4 | STREET LIGHTING POLE (REFER SELECTION TABLE BELOW) | - | |
| 5 | 2.5 Sq.mm. PVC FLEXIBLE WIRE | AS REQUIRED | |
| 6 | STREET LIGHTING LOOPING BOX | 1 NO. | |
| 7 | CABLE GLAND | 2 NOS. | |
| 8 | 80 NB G.I. PIPE FOR CABLES | AS REQUIRED | |
| 9 | 250 x 250 x 6mm THK. BASE PLATE | 1 NO. | |
| 10 | BRICK SOLING (SIZE 230x115x75mm) | 15 NOS. | |
| 11 | M10 x 30mm LONG FULL THREADED BOLT | 8 NOS. | |
| 12 | 50x8mm THICK G.I. STRIP WELDED TO POLE | 2 NOS. | |
| 13 | M8 x 30mm LONG THREADED BOLT, NUT & WASHER | 4 NOS. EACH | |
| 14 | M10, NUT WELDED TO LIGHTING POLE | 2 NOS. | |
| 15 | PLAIN AND SPRING WASHER SUITABLE FOR M10 BOLT | 2 NOS. EACH | |
| 16 | M10 FULL THREADED BOLT 40mm LONG | 2 NOS. | |

# TYPICAL MOUNTING DETAILS OF STREET LIGHTING FITTING




| ITEM NO. | LIGHT FITTING TYPE | POLE LENGTH (MTRS.) (H) | LENGTH OF SECTION (MTRS.) (H1) | (H2) | (H3) | O.D. & THK. (MM.) (H1) | (H2) | (H3) |
|---|---|---|---|---|---|---|---|---|
| 1 | 70W LED | 6.0 | 4.0 | 0 | 2 | 114.3x5.40 | 88.9x4.85 | 76.1x3.25 |
| | 125W LED | 7.0 | 4.5 | 0 | 2.5 | | | |
| | | 8.0 | 4.5 | 1.75 | 1.75 | | | |
| 2 | 150W LED | 9.0 | 5.0 | 2.0 | 2.0 | 139.7x5.40 | 114.3x4.50 | 88.9x3.25 |
| | 250W LED | 10.0 | 5.30 | 2.40 | 2.40 | | | |
| 3 | 250W LED | 12.0 | 5.80 | 3.10 | 3.10 | 165.1x4.50 | 139.7x4.50 | 114.3x3.65 |
| | 400W LED | | | | | | | |

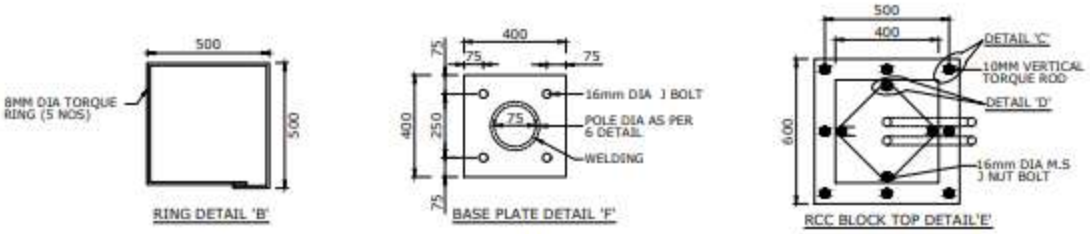
MATERIAL TAKE-OFF

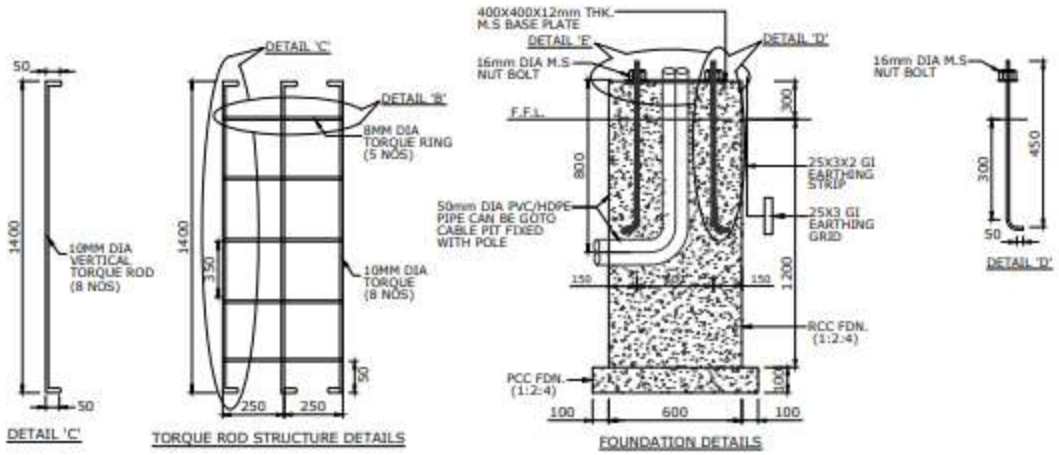
| ITEM NO. | DESCRIPTION | QUANTITY | REMARKS |
|---|---|---|---|
| 1 | PIPE CAP FOR STREET LIGHTING POLE | 1 NO. | |
| 2 | 40mm DIA PIPE WELDED TO CAP | 1 NO. | |
| 3 | STIFFER PLATE | 1 NO. | |
| 4 | STREET LIGHTING POLE (REFER SELECTION TABLE BELOW) | - | |
| 5 | 400x400x12mm THK. M.S. PLATE WITH 1 Nos. 20mm Ø HOLES | 1 NO. | |
| 6 | M10 x 30mm LONG FULL THREADED BOLT | 4 NOS. | |

**NOTES:**

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. AFTER INSTALLATION THE ASSEMBLY IS TO BE PREPARED, PRIMED AND PAINTED IN ACCORDANCE WITH THE PROJECT PAINTING SPECIFICATION.
3. LIGHT FITTING FIXING DETAILS TO BE FURNISHED BY SITE.
4. EARTHING TERMINAL ARE LOCATED DIAMETRICALLY OPPOSITE.
5. ALL NUTS, BOLTS AND WASHERS SHALL BE GALVANISED AND ZINC PASSIVATED.
6. MOUNTING DETAILS OF CONTROL GEAR BOX AND LOOPING BOX REFER INSTALLATION DETAILS.
7. ALL SHARP EDGES AND BURRS SHALL BE REMOVED.
8. POLE SHALL BE MADE FROM TUBULAR STEEL PIPES SWAGED AND WELDED CONFORMING TO DESIGNATION AS MENTIONED IN ABOVE TABLE- AS IS-2713 (PART III) - 1980.
9. DOUBLE ARM SHALL BE EITHER AT 180° OR 30° AS PER THE LOCATION OF THE LIGHTING FITTING & SITE REQUIREMENT.

# TYPICAL MOUNTING DETAILS OF STREET LIGHTING FITTING



## CHAPTER-22

# 22. SPECIFICATION FOR INSTALLATION OF MRS & INTERNAL PIPING FOR COMMERCIAL & INDUSTRIAL CUSTOMERS

## 22.1. APPLICABLE CODES & STANDARDS

**GENERAL**

Piping works shall be carried out in accordance with the requirement of this specification and other National/international relevant applicable standards like Oil India Safety Directorate (OISD) norms, PNGRB, ASME B 31.3-Process Piping Systems, ASME B 31.8 "Gas transmission and distribution piping systems."

Minimum requirement shall be as per latest edition of following codes and standards

**ASME STANDARDS**

| | |
|---|---|
| ASME B 16.5 | Pipe flanges and flanged fittings up to 24" |
| ASME B16.34 | Valves-flanged and Butt welding ends |
| ASME B 31.8 | Gas transmissions and distribution piping system |
| ASME VIII, DIV-I | Boiler and Pressure Vessel code |
| ASME B 16.9 | Factory-made wrought steel butt welding fittings |
| ASME B 31.3 | Process piping |

**ASTM STANDARDS**

| | |
|---|---|
| ASTM A 53/A 53 M | Pipe steel black and hot dipped, Zinc-Coated, Welded and seamless |
| ASTM A 105/A 105 M | Forgings, Carbon steel, for piping components |
| ASTM A193/A 193 M | Alloy steel and stainless steel bolting materials for high temperature services. |
| ASTM A194/A194 M | Carbon and alloy steel nuts for bolts for high temperature Services |
| ASTM A234/A 234 M | Piping, fitting, of wrought carbon steel and alloy steel for moderate and elevated temperature |
| ASTM A 370 | Mechanical testing of steel product |
| ASTM A 515 | Pressure vessel plate, carbon steel for intermediate and higher temperature services |

ASTM A 516 Pressure vessel plate, carbon steel for intermediate and higher temperature services

ASTM A 707/A 707 M Flanges, forged, carbon and alloy steel for low temperature Service

**API STANDARDS**

API 5L Specification for line pipe

API 1104 Specification for welding pipeline and related facilities

API 6D Specification for pipeline valves (Ball, Gate, Plug Ball and Check Valves)

API 6 FA (Spec 6 FA) Specification for fire Test for valves

BS 5351 Specification of small size valves (Below 2")

**ISO STANDARDS**

ISO 148 Determine the impact strength of steel and energy absorbed by charpy.

ISO 9001 Quality Management Standards

**OIL INDUSTRY SAFETY DIRECTORATE (OISD STANDARDS)**

OISD-GGN-115 Guidelines on fire fighting, Equipment and appliances in Petroleum industry

OISD-standard-113 Hazardous area classification OISD-Standard-163 Process Control Room Safety In case of contradiction, the most stringent will apply

### 22.2. SYSTEM OF UNITS

The international system of Units (SI), also known as the "Metric system" shall be used. The international Gas union (IGU) has also recommended, generalizing the use of the

SI system in all matters relating to Gas and Gas facilities.

### 22.3. PROCESS PARAMETERS

Inlet pressure : Max. 4 barg

Out let pressure : 0.1 barg-4 bar (Variable)

Operating temp : 0 – 450C Design

Pressure : 19 barg

Design temp. (min/max) : 0/+600C

Hydro test Pressure (MRS) : 1.5 x Design Pressure (Hydrostatic Test) with minimum test duration of 4 hrs.

Pneumatic Leak Test : 6 bar for minimum 4 hrs.

Flow (m3/hr) : Up to 250 m3/hr (at 2 barg 750 SCMH)

Process Fluid : Natural Gas

## 22.4. MATERIAL SPECIFICATION OF PIPING SYSTEM

Materials to be used for piping system shall comply with the minimum requirements of relevant standards & codes.

| | |
|---|---|
| Pipes | ASTM A106 Gr. B (Seamless)/API 5L Gr.B/ IS-ASTM A 53/A53 M Gr.B/ 1239Heavy |
| Flanges | ASTM A105/ A 105 |
| Restricting Orifice* plate | SS 304 |
| Rubber Gasket (washer) | High Nitrile Synthetic Rubber Grade 215 |
| Fittings | ASTM A234 Gr WPB |
| Ball Valves | A 105/A 216 Gr WCB |
| Insulation | NA |
| Insulating gasket | Same as Pipe (Ring A 105) |
| Spiral Wound Gasket (washer) | ANSI B 16.20 |
| Nuts and Bolts | AS per PMS |
| Rubber hose | Type-4 as per IS:9573 |
| Painting | As per enclosed “ |

The size of orifice of restricting orifice plate shall be 11 mm for G10/G16/G25, 13mm for G40 and 15mm for G65 RPD meter.

The size of orifice of rubber gasket (washer) shall be 5mm for G4, 8mm for G6, 10mm for G10 & G16 and 13mm for G25 Diaphragm meter.

Note: - Over and above these specifications and materials, Please refer below the specifications.

1. For Piping material refer " PMS-1C1"

2. All stud bolts and nuts shall hot dipped galvanized as per ASTM A53.

### 22.5. SITE ENVIRIONMENTAL DATA/CONDITIONS

Environmental/ climatic conditions for various sites are given below

Typical Temperature : (Min/Max.)01.70C/48.50C

Rain fall : *

Wind : *

Seismic Zone : *

Relative humidity : 90%

Elevation from Mean Sea Level : 205 met.

Hazardous Area Classification : *

### 22.6. PIPE DESIGN/ SIZING

- Coding of Piping Classes

**Each Class is named by a code consisting in three of four parts:**

**First parts:**

A figure designating the material:

1= 1500 lbs ANSI - PRESSURE – 18.75 bar g

3= 300 lbs ANSI - PRESSURE – 49.00 bar g

6= 600 lbs ANSI - PRESSURE - 98.00 bar g

9= 900 lbs ANSI -

**Second part:**

A letter designing the material:

A= Allot steel

C= Carbon steel

F= Fiberglass reinforced plastic/epoxy (FRP)

G= Galvanized

P= Plastic (HDPE)

S= Stainless steel

V= PVC

**Third part:**

A sequential number to differentiate two or more piping classes of the same rating and same material but presenting some differences related to the handled fluid.

**Fourth part:**

A letter designing the underground:

U= Underground

AG= Above Ground

### 22.7. Wall Thickness

The wall thickness of pipe shall be as follows:

Wall thickness of pipe shall be calculated as specified in the applicable sections of:

- ANSI B 31.8 for classes covering the main process and auxiliary gas lines.
- ANSI B 31.3 for classes covering utilities lines.

### 22.8. Corrosion Allowance

The minimum corrosion allowances used to calculate wall thickness as follows:

- Carbon steel and ferrite alloys in classes calculated following ANSI B 31.8 : 1.6 mm
- Carbon steel and ferrite alloys in classed calculated following ANSI B 31.3 : 1.6 mm
- Stainless steel : 0 mm

- Plastic and PRP pipes : 0 mm

### 22.9. Wall Thickness Calculation

a) Pipes for natural gas shall comply with ASME/ANSI B 31.8 code. Pipe wall thickness will be calculated as follows:

$$t = \frac{PD}{2xSxFxExT} + C$$

T = nominal wall thickness (mm)
P = design pressure (MPa)
S = minimum yield strength (Mpa)
F = design factor = 0.40
E = longitudinal joint factor
= 1.0 for API 5L (seamless or ERW or SAW)

T = temperature de-rating factor = 1.0
C = corrosion allowance (mm)

b) Pipes for Utilities lines have a wall thickness complying with ASME/ANSI B 31.3 code:

$$t = \left\{\frac{PD}{2xSxFxExT} + C\right\} x (1+a)$$

T = Nominal wall thickness (mm)
S = Allowable stress (MPa)
P = Design pressure (MPa)
E = Longitudinal joint factor
Y = Coefficient as per table 304.1.1 of ANSI 31.3
C = Corrosion allowance (mm)
A = Negative fabrication tolerance (%)

### 22.10. Wall Thickness Calculation

1.0 Nitrogen at 7kg/cm2

2.0 Above utility data may change according site condition and availability of resources.

### 22.11. SAFETY

All required Personal Protective Equipment's (PPEs) for carrying out the jobs safely to be provided to the workers.

The agency has to ensure that potential safety factors, health and environment effects are assessed before execution of the job and necessary actions required for ensuring safety of human and environment are taken care of.

Jobs at customer locations are to be carried out as per safety Work Permit System of IOCL- i.e, permit will be issued at site every day after ensuring all safety precautions and execution of the job to be done in presence of representatives of IOCL's Technical, Fire & Safety and designated Contract Supervisor.

## 22.12. FABRICATION OF MRS AND INTERNAL PIPING:

This part covers fabrication, erection and installation of MRS, Common header for MRS installation, internal pipeline with fittings for supply natural gas to commercials and Industrial units from MRS till customer's appliances. Work for internal Piping shall be carried out as per instructions and after allotment of work by EIC. The Indicative diagram is shown in bid documents.

On allotment of work, Contractor shall carry out join survey along with IOCL/IOCL's representative of the customer's premises for finalization of location of MRS/Common header or route of internal Piping and as per requirement and shall subsequently submit construction plan to IOCL for Procurement of material (Pipe, fittings, consumables etc.), Inspection, Fabrication Erection Installation Testing and Commissioning of MRS, Common header & Internal Piping as enclosed at Annexure – 3. The material procurement plan includes make of pipes & fittings to be procured as per the approved make list
(enclosed in tender document at) for approval from EIC.

After approval of plan from EIC and before start of fabrication, Contractor shall procure material and submit material test certificates (MTC'S) of all materials including pipes, fittings ball valves, consumables (incl. Electrodes) etc.. for review of EIC and shall subsequently arrange their physical inspection. Contractor shall also submit documents for welding procedure specifications (WPS) for the similar kind of job for IOCL's approval.

IOCL may instruct the contractor to carry out survey of proposed customer and shall in turn submit the estimate for material and execution along with drawing without any changes Welder shall be qualified for proposed WPS according to the applicable codes. If the same welder is doing the similar kind of job continuously for the last six months and qualified by reputed consulting organizations like EIL/MECON/TEPL, the welder shall be allowed to work on submission of welders qualification Certificate.

Only E6010/E7018 electrodes of reputed make (LINCOLN, ESAB etc.) shall be used for welding of piping joints. The electrode E7018 shall be baked in mother oven before usage at site. All flanges used shall be of welded neck type. No plate flanges made by Gas cutting shall be used. Flanges dimensions, ratings, facing, face finish and manufacturing shall be as per ANSI B16.5 unless otherwise specified.

All fittings shall be seamless in construction unless otherwise specified. All fittings of size 1" and above shall have butt-welded ends and shall comply with attached piping class.

Mitre joint shall not be used and the same shall be replaced with a Standard Elbow with short radius (<_1D). Piping Spools (If required), Supports etc. shall be pre-fabricated or shop fabricated. Pipe shall be supported on walls or Suitable supports (clamps, steel supports etc.) (refer drawing in tender document at Annexure – 4) and at adequate interval of space not less than 2 meters. The material and size of angles shall be MS and of minimum size 75 x 75x 8 mm.

End Preparation, alignment and fit up of the pipe length to be welded, pre heating, welding, post heating and heat treatment (if required) shall be as per IOCL welding specification/design codes and standards. Pipe joints shall be butt-welded. However as per site requirement, flanged joints (if necessary) may also be used Contractor to ensure provision for locking/sealing arrangement for meter/valves to avoid misuse.

All (100%) root joints alignment & fit up shall be witnessed by IOCL/IOCL representative followed with a mandatory DP (Dry penetrate) test. In addition to the DP test. RT will be carried out in presence of IOCL's representative on at least 10% of joints in single MRs using unique joint no. The dimension tolerances for piping fabrication shall be as per IOCL's standards design codes and standards.

Contractor shall carry out Hydro test for each MRS in their factory and shall carry out installation only after duly certification from IOCL/IOCL's representative. The test reports/certificates (DP test RT, Hydro test, NDT) issued against a single MRs shall be presented to IOCL's site representative for verification and before start of installation. The format FPR DPT, RT, Hydro test, Welding inspection & NDT is attached at Annexure – 5, 6, 7,
8 & 9 respectively.

For MRS, dimensions tolerance of 100% both ways against pre-defined length (refer drawings attached in tender) shall be included in fabrication & installation rates (payable as per relevant SOR.) and no separate charges shall be claimed in case of any additional joints, fittings etc.. used for completion of installation. The bidder shall quote rates
against each SOR in correlation with drawings, tentative BOM (Bill of Materials) attached in tender document. Any installation/piping in excess/ short to predefined length of MRS shall be payable/deductible through relevant SOR item as per size of pipe used. The length of the MRS shall be measured after installation and RFC and shall duly be certified in RFC card for payments. Contractor shall provide suitable locking arrangement in MRS with isolation valve by wire sealing as per instruction of Engineer In-charge.

The rates for internal piping (downstream of MRS) are payable through relevant SOR and includes procurements, fabrications, welding and installation till commissioning. No separate charges are payable for any repair & modifications (on customer's request)
even after installation & testing however before commissioning and are inclusive in rates.

The ball valves installed in common header/Internal piping shall be payable separately through relevant SOR item, depending upon the size of pipeline.

Laying of concealed pipeline in the cavity of the walls/ceiling/basement shall be avoided. In locations where the pipeline has to be laid in a covered trench or below ground level, it should be avoided however considering the minimal alternatives/ constraints at site, the laying is possible after written approval from EIC, cold wrap & coating shall be applied on the surface of the pipe followed by Holiday test. The pipe shall be properly supported on clamps/I supports with minimum clearance of 4" from ground level. IOCL may also instruct the contractor for installation/laying of MDPE pipeline and transition fittings for such below ground sections which shall be laid in correlation of technical specification of MDPE pipeline laying and payable as per the respective pipe SOR's.

In case where MRs fabrication & installation is carried out considering twin metering and single regulation (in a single MRS), the payment against the installation of both streams shall be made as per relevant SOR for one of the stream and as per relevant SOR for the other stream depending upon the type and size of the CS Pipeline used for MRs fabrication. Also, in case of twin metering and twin regulation, the payment against the installation of either of the streams shall be made as per relevant SOR and for loop line
connecting both streams in running meter as per relevant SOR depending upon the type and size of the CS pipeline used for MRS fabrication.

Any preparation of the threads for installation, completion of MRS, common Header & internal piping is inclusive in rates. All the MRS shall be fabricated in the Contractors workshop and tested in presence of IOCL's representative before installation. After complete installation of the MRS at the allocated locations; the flange joints shall be tested online along with Meter & Regulator before commissioning.

The branches of the pipeline shall be using standard fittings. Also, branching on common header will be payable in running meters.

## 22.13. ERECTION OF MRS SKID

### a) Cleaning of piping before erection.

Before erection, all pre-fabricated spool pieces, pipe, fittings etc. shall be cleaned inside and outside by suitable means (Mechanical or chemical). The cleaning process shall include

• Removal of all foreign materials such as scale, sand, weld spatters, cutting chips etc. by wire brush, cleaning tools and blowing out the foreign material with compressed air and/or flushing out with water.

• Special cleaning requirements (if any), shall be carried out as per IOCL specification/piping design codes/standards.

### b) Pipe routing and Layout

Pipe routing and lay-out shall be as per IOCL approved pipe route, GAD, P&IDs and piping support drawings and applicable design code and standards. In case of fouling of a line with other piping, structure, equipment etc. The matter shall be brought to the notice of Engineer-in-charge and corrective action shall be taken as per his instructions. Above ground pipeline shall be laid either on MS clamps fixed on the wall or on the pipe supports with BOP more than 2 meter height.

The selection of route of installation gas pipeline connection in the premises of the industry/ commercial establishment is key to safety and integrity of gas installation and public. It should be installed above ground having in well-ventilated area and having easy approach.

All risers and lateral piping should be clamped to the building at intervals not exceeding one meter. Laying of concealed pipeline inside the cavity of the walls, ceiling, basement etc. should be avoided, Platform and cross-over shall be provided for ease of operation and maintenance of pipeline if required. All supports shall be installed strictly as per approved support drawing/instruction of engineer- in-charge.

While laying the pipeline, care should be taken that valves installed on the pipeline should be approachable for easy operation and maintenance.

**c) Flanges Connections**

While lilting up mating flanges, care shall be taken to properly align the pipe and to check the flanges for trueness so that the faces of the, flanges can be pulled together without inducing any stresses in the pipe and the equipment.

The assembly of the flange joint shall be done in such a way that the spiral wound gasket between the two flange faces is uniformly compressed to achieve this bolt shall be tightened in a' proper sequence. Copper strips/ jumpers shall be installed on all flange joints in order to provide earth continuity to MRS & internal piping.

**d) Vents**

Venting facilities shall be provided for any emergency evacuation of gas from the pipeline. Vent line shall be fitted with a flapper and shall be at 3 meter height from the nearest operating platform, with ends at open space.

**e) Painting**

Alter installation of the above ground MRS & Internal piping system, painting of MRS/piping shall be done after RFC with propel' surface preparation and application of primer and finish coat of paints as per IOCL painting specifications enclosed in Annexure I, to prevent atmospheric corrosion, The

standard colour code for Natural gas piping shall be 'Canary yellow'. The gas flow direction shall be marked "in Red" on the MRS or Internal Piping.

**f) Valve Installation**

Valve shall be installed in a position as specified in the valve manufacturer installation and O&M manual. Care shall be exercised to ensure that all hL11 bore ball valve shall be installed with the "Gas now direction arrow" marked on the valve body pointing in the right
direction after written consent from EIC.

**g) Instruments**

All the required instruments (PG, TG, flow control valves, interlocks, control panel etc..) shall be installed on the pipeline as per attached MRS Drawings, Owner's approved installations procedure, applicable design code and standards, manufacturer's installation, O&M Manual after proper calibration, testing and inspection of the instruments as per manufacturer's calibration procedures. It is mandatory to install pressure gauges on the downstream internal piping at start and end point. Any installation of additional pressure gauge will be payable as per relevant SOR and subsequent fillet welding of sockets &
installation of pressure gauge will be payable as per relevant SOR.

**h) Rubber Hose**

The Steel Pipe and Appliances connect to Hose shall be in the same 1'00111. The length of' hose should be kept minimum but shall not exceed 1.50 meters. Hose shall be easily accessible to inspect. Hose shall not be used in conditions where ambient temperature exceeds its design temperature. Hose shall be so installed [hat it is not twisted, looped or kinked in and should be free from external pressure. Design and Construction of Hose shall be Type IV as per IS: 9573 (Latest revision).

**i) Supports**

Pipeline for PNG supply to Commercial/Industrial connection shall be adequately supported at suitable intervals as per piping design code and standard and good engineering practices. There are various types of clamp supports for supporting and suspending horizontal as well as vertical/riser pipes. The support's schematic drawing for piping are attached with the tender documents at Annexure -- 4. The material & size of the angle shall be MS & minimum size ---75 x 75 x 8 mm.

**j) Electrical Equipment's**

All the required Electrical equipment shall be installed as per Owner's approved installation procedure, applicable design code (OISI). 149) and standards, manufacturer's installation / O&M Manual after proper calibration, testing and inspection of the equipments as per manufacturer's calibration procedures.

## 22.14. INSPECTION AND TESTING

### a) Material Inspection

All materials, items and their parts shall be subjected to all mandatory as well as supplementary (wherever specified) inspection, testing and checks called for in the respective codes/standards/data sheets/IOCL approved manufacturer's QAP of Vendor at manufacturer's workshop/factory as well construction site. All fit-ups shall be checked for proper Root gap, surface cleaning and orientation etc. before starting the welding and inspected by IOCL's representative.

Dye-penetrate test shall be done after root welding for all the butt & Socket weld joints. As per the instruction of EIC/PMC, Radiography test may be performed randomly on joints for 10% (percentage) on random selection basis.

### b) Execution Inspection

- Ensure availability of Work Permit and Fire permit
- Visual Inspection of installation of carious equipments, instruments and their associated components, electrical equipments, pipe fitting and valves etc..
- Dimensional checking of equipment, pipe, fitting and valves etc..
- Inspection of Calibration of instruments
- Inspection of testing and commissioning or pipeline system

- Inspection and checking of DFT of painting of equipment, pipe, pipe supports etc..

- Inspection and checking of Mechanical completion of pipeline system with the approved construction drawing and work procedures for installation and erection of various equipment/pipeline
- Ensure availability of First AID Box, PPE and fire extinguishers.
- Inspection of flushing, cleaning and Hydro testing of Piping system

- All welded joints shall be subjected to visual inspection according to ASME 1.3/31.8 and radiography according to API1104.
- Inspection test plan shall be as per ANNEXURE-2

- Verification/Inspection of all the mill and workshop test certificates applicable to related material. spare, equipment, pipe, fittings, valves, supports, paints, IJ etc..
- The entire piping system shall be subjected to hydrostatic testing or pneumatic strength testing.
- 10% RT shall be done for all the Butt joints on random selection basis. Overall decisions rests with the EIC to increase %( percentage) of RT on joints, in case of any additional RT (on instruction of EIC) rates shall be payable as per relevant SOR item.
- The test pressure should be 1.5 times of design pressure in case of Hydrostatic testing or

1.1 times or the design pressure in case of Pneumatic testing. However test pressure and time duration may vary depending upon the application and flow.

- Before commencement of strength Test, calibration reports of pressure gauges and equipments shall be reviewed by IOCL/IOCL's representative.
- Pressure gauge range shall be minimum1.5 times and maximum 4 times of test pressure.

- Before starting hydrostatic testing, testing and inspection reports shall be submitted to IOCL for verification and only after getting formal clearance from IOCL, testing shall be carried out.
- The test pressure for the piping system shall be kept on hold for 4 hr with no pressure drop. For internal piping with pipe length less than 25 meters, the test pressure shall be kept on hold for 4 hrs. Whereas if length more than 25 meters, minimum test pressure duration shall be minimum 12 hr to max. 24 hrs. depending upon customers/ site requirement.
- After hydro testing proper dewatering and purging shall be carried out.
- Care should be taken to ensure that the purge outlet is so located that vent gas cannot drift in the building.
- The method of purging should be such that no pockets of air left in any part of the piping.

- It should be ensured that the area is well ventilated and free from ignition source.

- Inspection and testing of Electrical, Civil and Instrumentation work shall be carried out by quality control inspector of related Engineering disciplines.
- All the MTC/TC, Inspection and test reports for mandatory as well as supplementary(wherever specified) shall be submitted to IOCL.

## 22.15. PRE-COMMISSIONING AND COMMISSINING

The various acceptance criteria and handover of the MRS system shall comprise of the following 2 stages.

- Pre commissioning
- Commissioning/Start-up

### a) Pre-Commissioning

IOCL representative shall carry out the following minimum check (including other relevant checks as may consider describe by manufacturer of meter, regulator, valves, etc.. to ensure that the MRS has been mechanically completed in all respect for pre- commissioning.

- A schedule of required activities for pre- commissioning /commissioning/ performance guarantee test/handover shall be readily available.
- Prior to pre-commissioning of MRS and associated facilities (piping, valves, instrumentation, electrical system) shall be mechanically completed to be ready for commissioning

- All the consumables, tools and tackles, utilities, etc. bare available.
- Fire fighting system and PPE are readily available.

- All the statutory permits are available.
- The emergency management plan is available.

Following are the minimum required pre-commissioning checks but not limited to:

**b) System Check**

**Checking of piping /Mechanical System**

The entire facilities/system shall be checked against the IOCL's/IOCL's representative latest approved P & Id, GADs and other relevant design specified and codes.

**Checking of utilities**

Checking of all relevant utilities like, service water, compressed air, nitrogen, power, power back-up system etc.. to facilitate commissioning and safety.

**c) Pneumatic testing**

**Air Flushing**

The entire MRS and associated facilities shall be flushed and air cleaned to ensure readiness of the system for pneumatic test. Chemical cleaning may also be considered as per site requirements

**Pressure Testing**

Pneumatic testing shall be carried out a pressure of 6 bar (g) by mean so of compressed air. The test pressure shall be maintained to permit through inspection of all joints for leakage or signs of failure.
Any joint found leakage during the pressure test shall be re-tested to the specified pressure after repair.

**d) Completion of Testing and Drying**

After pneumatic test are completed, the pressure is released gradually without damaging the equipment, facilities and maintaining personnel safety measures. All vents and drains shall be kept opened till the entire system is completely drained. After draining, the system shall be completely dried using dry air.

**e) Insertion**

The insertion operation should start immediately after drying is complete. The contractor shall submit a detailed purging procedure for approval of IOCL/IOCL's representative prior to its

implementation. During the insertion operation, the air left in the piping system shall be replaced by nitrogen before admitting the natural gas into the pipe system. The maximum allowable oxygen content inside the piping system shall be less than 1% by volume. No extra payment shall be made for nitrogen cylinders and is included in SOR.

**f) Test Records**

Records in triplicate shall be prepared and submitted by the contractor to the IOCL/IOCL's representative for each piping system/ facilities for the test performed.

**g)** Safety Review before start-up of commissioning

A pre-start up safety review shall be carried out of the entire piping system before permitting natural gas into the new facility.

The following minimum safety review is envisaged: Availability of all relevant design documents, welding Availability of all relevant design documents, welding.

**h) Commissioning**

Once all pre-requisite activities (safety and pre-commissioning) test have been completed, clearance for commissioning the system shall be obtained from IOCL/IOCL's representative.

• The commissioning operation shall be controlled and supervised by authorize personnel who are fully known to their responsibilities during commissioning.

• The pipeline system shall be slowly charged with natural gas and pressurized gradually up to its operating conditions/parameters.

• The contractor shall obtain the IOCL/IOCL's representative approval of his commissioning procedure prior to starting commissioning operation.

• The pipeline system shall be slowly charged with natural gas and pressurized gradually up to its operating conditions / parameters.

• Commissioning of MRS system shall be considered completed and acceptable when the piping system is charged with natural gas at operating pressure and the MRS system is operated at normal operating conditions with all instruments/controls working satisfactorily at normal operating conditions.

## 22.16. GAS CHARGING IN INTERNAL PIPING

From safety point of view gas should be taken to the burners, section wise namely:

- Gas charging in internal piping

- Gas Charging in gas train burner

| Sr. No | Activities | Precautions |
|---|---|---|
| 1 | Confirm the closure of gas train inlet | Observe carefully closing mark |
| 2 | Crack open the MRS outlet valve and raise the section pressure to 1 or 2 bar g or as required | Keep valve key ON position and a man with walky-talky |
| 3 | Crack open the pressure gauge tapping valve near gas train Intel valve and vent out nitrogen | Do not inhale nitrogen gas Ensure No spark. No naked flame. Methane concentration in atmosphere should not increase more than 2% if required, do venting/draining intermittently |
| 4 | Measure methane percentage. It should match feed gas composition | |
| 5 | Close the pressure gauge tapping valve completely | |
| 6 | Open the MRS outlet valve fully and observe the system for 5-10 minutes | |

## 22.17. CONVERSION

**Conversion of Burners & supply of Rubber Hose**

The work in this section shall be carried out along with the internal piping or on request i.e. case to case basis and includes:

The changing of nozzles and associated controls in accordance with manufactures instructions for canteen, T-type, RV, imported burners/ovens/grills/hotplate etc.. the and imported burners/ovens/grills/hotplate. The contractor shall supply the Reinforced rubber hoses at the time of conversions, Minimum size 8 mm dia. per connection -- 1.5 meters with fixing clamps, however the size may vary for type of burners converted on NG. The contractor has to supply all types of nozzles/jets required for all types or appliances including canteen, T-type, RV, imported burners, Grills, Ovens, without any extra charges to IOCL, All activities arc inclusive and arc payable through relevant SOR.

Cleaning and performing minor maintenance of appliances, during the tenure of the contract. Attend all complaints related to propel' working of appliances, testing for gas escapes, soundness and performance of appliances. Instructing & educating customer for safe use of natural gas and for fixing of safety and conversion labels. Contractor must attend the complaints regarding appliances, leakage, fire etc. till the total area is handed over to Owner's operation and maintenance.

All consumables (Nozzles, greases etc..), changing or repairing of any items damaged during conversion arc in contractor's scope, The contractor will have to provide both pin gauges and standard sized nozzles, The payment will be released by IOCL only after submission of necessary documents i.e. JMR card of the individual commercial/ industrial connection.

## 22.18. MODIFICATION IN EXISTING MRS

It includes taking shutdown of existing MRS, dismantling meters/ regulators, replacement/Fixing of meters/regulators with associated inlet and outlet connections/fittings supply of pipes & fittings, pipe cutting, threading, welding & firmly fixing with approved meter clamps/ brackets and other supports by proper grouting. Restoring the area to the original condition as per the specifications and (0 complete satisfaction of consumer and me is also included in the scope.

Modifications / replacements (of meter or regulator or both) in MRS using threaded fittings/ flanged end (same size or bigger) shall be payable through relevant SOR item depending upon the types and unit of meters and regulators replaced, The rates includes all as above along with testing of joints till re- commissioning. Wherever, there is modifications in MRS which can be carried out only through welding for same length of MRS or bigger upto 3.00 mtrs in addition to MRS length, the work is payable only through no. or joints welded tor completion of modifications and no separate payments is applicable for additional pipe/fitting used and payable as per relevant SOR item. In case erected length after modification is more than 3.00 mtrs of original length of MRS, then the running meters shall be applicable and payable through relevant SOR item.

ANNEXURE – 01

PAINT SYSTEM FOR ABOVE GROUND PIPING

| Paint system Nr. | Substrate | Exposure conditions | Surface preparations | 1st Coat | 2 nd coat | 3rd coat | 4th coat | 5th coat | Nominal Total DFT |
|---|---|---|---|---|---|---|---|---|---|
| 201 | Bare carbon steel & ferritic alloys | T up to 65°C | Sa3 | Zinc rich eithyl silicate primer 75(µm) | Epoxy Sealer polyamide/ C 50 (µm) | High Build epoxy polyamide U/C recoatable 80(µm) | PU finish recoatable 50(µm) | | 255µm |
| 201P | As above but site touch-up | T up to 650C | Sa3 (spot blast)S03 only when blasting is not possible | Zinc rich two pack epoxy primer 50(µm) | Epoxy M.I.O . recoatable 80 (µm) | Epoxy HB U/C. recoatable 60 (µm) | PU finish 50µm | | 240µm |
| 201 W | Bare carbon steel to be welded | T up to 650C | Sa 2.5 min. | Welding primer two components epoxy 20 (µm) | 6 to 9 months after welding procedure cleaning of weld With 3rd coat Touch-up If needed | HB M.I.O Epoxy Modified U/C 80µm | HB M.I.O Epoxy Modified U/C 80µm | PU finish 50µm | 230µm |
| 202 | Bare carbon steel & ferritic alloys | T up to 650C | Sa3 | Zinc rich ethyl silicate primer 75(µm) | Heat resist. Silicone Acrylic White 30µm | Heat resist. Silicone Acrylic White 30µm | | | 135µm |
| 202 P | As above but site touch-up | T up to 65°C | Sa3 (spot blast) | Zinc ethyl silicate primer 75(µm) | Heat resist. Silicone Acrylic White 30µm | Heat resist. Silicone Acrylic White 30µm | | | 135µm |
| | | | | | | | | | |

## ANNEXURE - 02

| Sr. | Particulars | Type of Inspection | % of Inspection | Scope | |
|---|---|---|---|---|---|
| 1 | Material Test Certificate verification | TC verification (Raw Material) | 100% | Contractor | IOCL/TPI |
| 2 | Welding Procedure Specification | Document verification /approval | 100% | P | R |
| 3 | Welders qualification Test | Document verification/ witness | 100% | P | R |
| 4 | DP Test | DP rest on root | 100% | P | R/W (in case of new welder |
| 5 | Welding Inspection | Visual inspection | 100% | P | RW(min 10%) |
| 6 | Radiography | Review of films | 100% | P | RW(min 10%) |
| 7 | Hydro/Pneumatic Testing | Hydro/Pneumatic testing of entire pipeline | 100% | P | W |
| | | | | | |

Legend:

P- Perform, R-Review, RW- Random Witness (min 10%), W-Witness, TPI- Third Party Inspector

## ANNEXURE – 03

### ANNEXURE-3

### CONSTRUCTION PLAN

| S.No | Work Allotted for | Type of work | | | Route Survey/Feasibility Status | | | Availability of Material Under Contractors Scope | Any Deviation | Schedule of completion | | | Approval from zonal In-charge |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | PE Laying | MRS | Internal Laying | PE Laying | MRS | Internal Laying | | | PE Laying | MRS | Internal Laying | |
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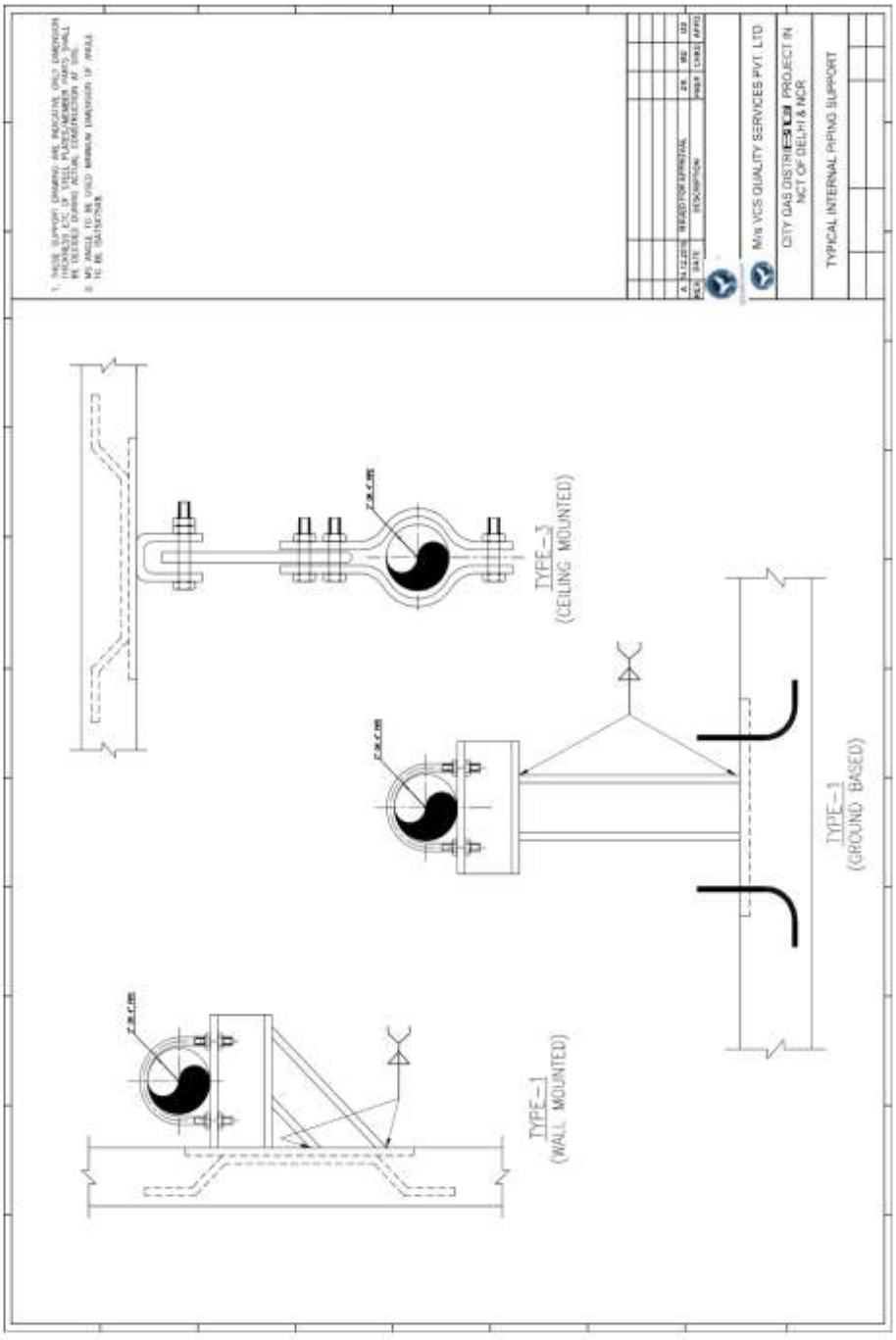
M/s VCS QUALITY SERVICES PVT. LTD.
CITY GAS DISTRIBUTION PROJECT IN NCT OF DELHI & NCR
TYPICAL INTERNAL PIPING SUPPORT
TYPE-3 (CEILING MOUNTED)
TYPE-1 (GROUND BASED)
TYPE-1 (WALL MOUNTED)

**ANNEXURE - 05**

| DP TEST REPORT | | | | | |
|---|---|---|---|---|---|
| Client: | INDIAN OIL CORPORATION LIMITED | | | REPORT NO. | |
| Project: | | | | DATE | |
| MRS No. | | | | PIPE MATERIAL | |
| S. No | Size | JOINT NO. | SEGMENT | INSPECTED BY | REMARKS |
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| CONTRACTOR's (Name & Signature) | | TPIA (Name & Signature) | | PMC (Name & Signature) | IGL (Name & Signature) |

**ANNEXURE - 06**

| RADIOGRAPHY TEST REPORT | | | | | |
|---|---|---|---|---|---|
| Client: | INDIAN OIL CORPORATION LIMITED | | | REPORT NO. | |
| Project: | | | | DATE | |
| | | | | SITE | |
| S. No | JOINT NO. | PIPE SIZE | WELDING REPORT NO | RADIOGRAPHY REPORT NO | REMARKS |
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| CONTRACTOR's (Name & Signature) | | TPIA (Name & Signature) | | PMC (Name & Signature) | IGL (Name & Signature) |

**ANNEXURE – 07**

| HYDROTEST REPORT | | | | | | |
|---|---|---|---|---|---|---|
| Client: | INDIAN OIL CORPORATION LIMITED | | | REPORT NO. | | |
| Project: | | | | DATE | | |
| | | | | SITE | | |
| S. No | TIME | PRESSURE (kg/cm2) | TEMPERATURE (deg.C) | PRESSURE RELEASED (kg/cm2) | PRESSURE DROPPED/INCREASED | REMARKS |
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| CONTRACTOR's (Name & Signature) | | TPIA (Name & Signature) | | | PMC (Name & Signature) | IGL (Name & Signature) |

**ANNEXURE – 08**

**WELDING INSPECTION REPORT**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Client: | INDIAN OIL CORPORATION LIMITED | | | | | REPORT NO. | | | |
| Project: | | | | | | DATE | | | |
| MRS NO | | | | | | PIPE MATERIAL | | | |
| S. No | SIZE | PIPE / FITTINGS | HEAT NO | LENGTH | JOINT NO | FIT UP CHECK | WELDER NO | VISUAL INSPECTION | REMARKS |
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| CONTRACTOR's (Name & Signature) | | TPIA (Name & Signature) | | | PMC (Name & Signature) | | | IGL (Name & Signature) | |

**ANNEXURE – 09**

| NDT REPORT | | | | | |
|---|---|---|---|---|---|
| Client: | INDIAN OIL CORPORATION LIMITED | | | REPORT NO. | |
| Project: | | | | DATE | |
| | | | | SITE | |
| S. No | SIZE | JOINT NO | SEGMENT | INSPECTED BY | REMARKS |
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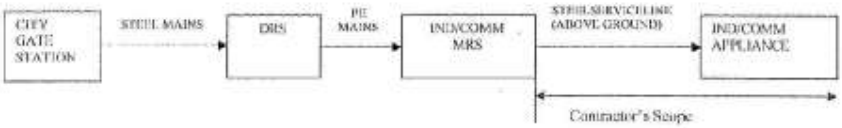
| CONTRACTOR's (Name & Signature) | | TPIA (Name & Signature) | | PMC (Name & Signature) | IGL (Name & Signature) |

## ANNEXURE -10

(TYPICAL PNG DISTRIBUTION SYSTEM FOR INDUSTRIAL / COMMERCIAL CUSTOMERS)



## CHAPTER-23

# 23. SPECIFICATION FOR SPECIFICATION–FABRICATION, SUPPLY AND INSTALLATION OF WIRDED CAGES

## 23.1 SCOPE OF WORK

Installation of single entry key lock arrangement in MRS and wall mounting meter installation Including structure fabrication, supply and installation with material and hardware, single key lock etc.

- Material for MRS cages used shall be as follows:

| Sr. No. | Item | Material | Dimensions/size |
|---|---|---|---|
| 1 | Angle | MS | 65 X 65 X6 |
| 2 | Flat | MS | 50 X 6 |
| 3 | Wire mesh | MS | 75 X 30 X 4 |

Material for wall Mounted cages used shall be as follows:

| Sr. No. | Item | Material | Dimensions/size |
|---|---|---|---|
| 1 | Angle | MS | 40 X 40 X 5 |
| 2 | Flat | MS | 25 X 4 |
| 3 | Wire mesh | MS | 75 X 30 X 4 |

The MRS shall be enclosed by MS wire net fencing. The fencing shall be supported by adequate angle iron frame work and shall have iron bracings of the angle iron frames. Framework of gates of the MRS skid shall be made up of M.S. plate and angles. Angles are jointed with nuts and bolts. The corner of the fencing joints must be permanent (welded). The complete fencing work shall be painted with two coats of primer and two coats of suitable weatherproof plaint.

- As per the requirement of fabrication & installation of fencing, the contractor will visit different sites for measurement /accessibility of the jobs. Once the measurement is done, fabrication and installation of fencing in proper size with reference to the skid, is the responsibility of the contractor.

At certain MRS skids where cages are already in place but require little modification shall also be in contractor's scope and payment shall be made accordingly.

- For fabrication of fencing (cage) structure, all the essential jobs viz. cutting, welding, grinding, finishing, painting including all materials like Angle, channel, wire net, support sheet, hardware ,electrode, grinding, wheel, gas cylinder, paint, primer, grouting, equipment, tools, generator for power welding machine, accessory etc.is under contractor's scope.

- All activities related to offsite fabrication of structure will be carried out contractor's work shop. Only after complete fabrication and painting (red oxide primer plus two coat of Canary yellow paint on wire mesh and green bus colour paint on angle and flats).

- Transportation and installation of fabricated structure/ fencing on different sites is under contractor's scope.

- All loading and unloading related jobs are to be carried out by the contractor.

- Contractor shall arrange own transport for movement of welding equipment, generator and man power.

- All necessary PPE's (personal protective equipment) required for carrying out jobs at sites as per the safety norms of IOCL shall be provided by the contractor to their welder and helpers.

- The contractor shall inform well in advance after completion of cage fabrication at the workshop, the date of installation of cage to the IOCL representative in order to arrange a shutdown of MRS at the customer's premises.

- The contractor has to complete all site jobs in one day at one site (Site jobs i.e. grouting of MRS cage /structure, fastening, installation, finishing, final painting, removal and disposal of waste items) after completion of jobs from customer's premises.

- The cage shall cover the MRS from all four sides and top also. Door is to be provided of the size 2400x1000 mm to approach the MRS. Wall mounted installation doors will be of size by 600x600 mm.

- In the MRS Cage ,following materials need to be used:

Welding of heavy duty handle with black color Teflon covers for opening and closing the door to the locking arrangement.

Installation of single entry key type lock (Harrison make 8 mm 5 lever lock with computerize key only).

Bolting of roof fame and side frame by 10 MM HT bolt and nut & washer and welded after fastening.

- Installation charges also includes providing 2 seats of welding machine, two welder teams And DG sets for site work.
- The complete cage should be well grouted and stable.

## 23.2 TECHNICAL SPECIFICATION

Civil, Structural & finishing works contents

- Civil & Structural Works
- Plain and reinforced cement concrete
- Structural steel works
- Synthetic enamel paint

Civil & Structural Works Material Specifications

**Material Specifications**

- **Brick**

Bricks for masonry work shall confirm to IS: 1077 specification for common burn clay building bricks and crushing strength not less than 75 kg/cm2.Specific requirement like dimensions, tolerances and other common requirements shall confirm to IS: 1077. Bricks shall have smooth rectangular faces with sharp corners and shall be well burn, sound hard, tough and uniform in color. These shall be free from cracks, chips, flaws and Florence. All tests shall confirm as per the requirements of IS 5454 and IS 3495.Water absorption shall not more than 20% by its dry weight when soaked in cold water for 24 hours.

- **Cement**

Cement to be used for civil & structural work shall be of 43 grade/53 grade ordinary Portland Cement confirming to IS: 88112/IS: 12269 respectively.

- **Steel**

All steel bars, sections, plates and other miscellaneous steel materials shall be free from rust, oil, mud, paint or other coatings. Reinforcement bars to be used for civil & Structural work shall be of high strength deformed steel bars of grade FE 415 confirming to IS: 1786.

- **Aggregate**

Coarse & fine aggregates for civil & structural work shall confirm in all respects to IS: 383 latest.

- **Water**

Water used for Civil & structural work shall be cleaned and free from injurious amount of oil, acids Alkalis, organic matters or other harmful substances which may be deleterious to concrete, masonry or steel. Potable water shall be considered satisfactory.

Tests on water samples shall be carried out in accordance with IS: 3025 and they will fulfill all the guide lines and requirements given in IS: 456:2000.

- **Excavation & Backfilling for foundation, pits, walls etc.**

Excavation shall be carried out to true line and levels in all types of soil and shall be carried out for all lifts as required by the work.

The Contractor shall provide suitable drainage arrangement to keep the pits dry. Contractor shall also carry out all de-watering required within the quoted rate.

If excavation is made in excess of the depth required, the contractor shall at his own expenses fill up the required level with lean concrete of mix 1:5:10 (1 cement: 5 coarse sand: 10 aggregate) or as decided by site-in-charge.

The contractor shall make necessary arrangements for lighting, fencing and other suitable measures for protection against risk of accidents due to open excavation at his own expense.

All shoring and strutting required holding the sides of excavation from collapse are included in the quoted rates.

No excavated material shall be deposited within 1.5M of edge of excavation. The contractor shall not undertake any concreting in foundation until the excavation pit is approved by the site-in-charge.

The contractor shall not back fill around any work until it has been approved by the site-in-charge.

Backfilling shall be carried out of selected earth coming out of excavation. Backfilling shall be carried out in layers of 150 mm and compacted to achieve 95% maximum dry density of the soil being used. Any surplus earth generated shall be transported to areas designated by the Engineer-in- charge.

- **Sand filling in Plinth/Foundations**

Filling shall be carried out in layers not exceeding 15 cams and shall be compacted mechanically or by saturation to specified grade and level and to obtain 90% laboratory maximum dry density or as specified in schedule of rates.

Compaction by flooding may be accepted at the discretion of the Engineer-in- charge, provide the required compaction is achieved.

The Contractor shall not commence filling in around any work until it has been permitted by the Engineer-in-charge.

- **Plain and Reinforced Cement Concrete.**

The cement and steel reinforcement is in the contractor's scope of supply. Engineer-in-charge may require tests to be carried out by the contractor's as a part of his quoted rates to ensure conformity with the relevant standards. Engineer-in-charge may rejects such of the cement supplied in the event of either unsatisfactory tests or in the event of deterioration due to age ,bad storage etc. Decision of Engineer-in-charge shall be final in this regard.

Water used for concreting work shall be suitable for drinking and shall conform to

IS: 456:2000. It shall be free from injurious substances.

- **Source of Coarse and find aggregates shall be approved by Engineer-in-charge.**

- Contractor shall store each type and grade of aggregate separately. He shall maintain at site of work adequate quantities to ensure conformity of work. Wet aggregate delivered to site shall be stored for 24 hrs to facilitate drying before being to be used.

- Admixtures shall be used only with the specific permission of Engineer-in- charge and where used shall be conforming to the instruction of the manufacturer of such extent as being undesirable the engineer-in-charge may reject the work totally and his decision shall be binding on the contractor. No extra payment shall be made for rectifying these defects. All burs and uneven faces shall be rubbed smooth by carborundum stone.

- The Surface of non-shuttered faces shall be smoothed with a wooden float to give a finish equal to that of the rubbed down shuttered faces. Concealed concrete faces shall be left as from the shuttering except that honey combed surface shall be made good as detailed above. The floating shall not be executed to the extent of bringing excess fine material to the surfaces. The top faces of slab intended to be covered with screed, granolithic or similar surface shall be left with a rough finish. Sides and soffits to be later covered with plaster shall be suitably roughened.

### 23.3 Structure steel works

**Steel works**

All finished steel unless otherwise specified shall be well and clearly rolled to dimensions and weight as specified by ISI subject to permissible tolerances as per IS-1852-1973.

Material shall be free from cracks, surface, flaws, laminations, rough and imperfect edges and other harmful defects like excessive rust, scaling and pitting etc. Structural steel work shall conform to requirements depending upon the designation of steel that is being selected to be used for particular structural function as specified in drawings.

All structural steel girders, channels, plates and other rolled section shall confirm to IS: 2062 grade-A Pipes shall confirm to IS: 1161 – YST 240 MPa.

Electrodes required for metal arc welding shall be covered electrodes conforming to IS 814 – 1970. 88

Fabrication Steel section as required shall be straightened and cut to square and exact lengths. Cut ends exposed to view shall be finished smooth. No two pieces shall be otherwise welded or joined to make up the required length of the number. If straightening, flattening or bending is necessary, shall be done in process that will not damage the material or impair its strength. Shearing, flame cutting or chipping shall be done carefully and accurately. Finished member shall be free

from undue twists, bends, wrapping, distortion or other irregularities. Holes, where required shall be drilled to required size and not made nor enlarged by burning. Holes shall have their axis perpendicular

to surface bored through. Any fabricated assembly shall be without the member being strained or forced into position and components shall meet at perfect angles. Where practicable, welds should preferably be made in flat position. Welds shall be free from cracks, discontinuity in welding or other defects categorized as such in relevant standards. Welds will be inspected and cost of the same shall be deemed to be included in the quoted rates. A defective weld, harmful to structural strength, shall be cut out and re-welded. All welds shall be cleaned of slag and other deposits after completion.

All structural steel works for canopy and other structures shall have butt welds between adjacent surfaces ground smooth. Items concealed from view need not require grinding of welds. Architectural metal work shall be well formed to shape and size with sharp lines, angles and true curves. Drilling and punches shall produce clean true line and surface. All site connections shall be preferably by permanent bolts. Welding at Site shall be done with the prior permission of engineer-in- charge. Exposed weld shall be ground smooth, exposed surfaces shall have smooth finish. Joints shall be milled to close fit and corner joints shall be well formed and in true alignment. Work shall be accurately fastened in place.

Painting shall be as described under the head "Painting".

**23.4 Painting on Metal Work: Painting shall be done to meet the following specification,**

- ON STEEL MEMBERS
- Surface preparation as per grade St – 2 according to Swedish Standard SIS055900.
- Two coats of zinc phosphate in phenolic alkyd medium (DFT 35u / coat)
- Two coats of synthetic enamel (DFT 25u / coat) conforming to IS: 2932-1974.

**Surface Preparation & Primer**

One coat of primer shall be applied on shop. The shop coated surface shall be rubbed down thoroughly with abrasive paper to remove dust, rust, other foreign matters and degreased cleaned with warm fresh water and air dried.

Primer coat of zinc phosphate primer shall be applied by brushing/spraying over the shop coat in a manner so as to ensure a continuous and uniform film throughout.

- **Final Paint**

After the primer is hard dry, the surface shall be dusted of and one coat of synthetic enamel paint of approved colour and shade (conforming to IS:

2932) shall be applied by brushing/ spraying to achieve the required DFT. Second coat will be applied after drying of previous one to give a uniform surface. Paints can be diluted by means of thinner as approved by paint manufacturer only.

**White Washing with Whiting.**

- **Preparation of mix:**

Whiting (ground white chalk) shall be dissolved in sufficient quantity of warm water and thoroughly stirred to form thin slurry which shall then be screened through a clean coarse cloth. Two kg of gum (DDL) and 0.4 kg of copper sulphate dissolved separately in hot water shall be added for every cum of the slurry which shall then be diluted with water to the consistency of milk so as to make a wash ready for use.

- **Preparation of surface**

Before new work is white washed, the surface shall be thoroughly brushed free from mortar droppings and foreign matter.

- **Application:**

The white wash shall be applied with moonj brushes to the specified number of coats. The operation for each coat shall consist of a stroke of the brush given from the top downward, another from the bottom upwards over the first stroke, and similarly one stroke horizontally from the right and another from the left before it dries.

Each coat shall be allowed to dry before the next one is applied. Further each coat shall be inspected and approved by the engineer-in-charge before the subsequent coat is applied. No portion of the surface shall be left out initially to be patched up later on.

For new work, three or more coats shall be applied till the surface

presents a smooth and uniform finish through which the plaster does nit show. The finished dry surface shall not show any signs of cracking and peeling nor shall it come off readily on the hand when rubbed.

- **Synthetic Enamel Paint**

The shop coated surface shall be rubbed down thoroughly with abrasive paper to remove dust, rust. Other foreign matters and degreased cleaned with warm fresh water and air dried.

Primer coat of red-oxide zinc chromate primer conforming to IS: 2074 shall be applied by brushing/spraying over the shop coat in a manner so as to ensure a continuous and uniform film throughout.

- **Final Paint**

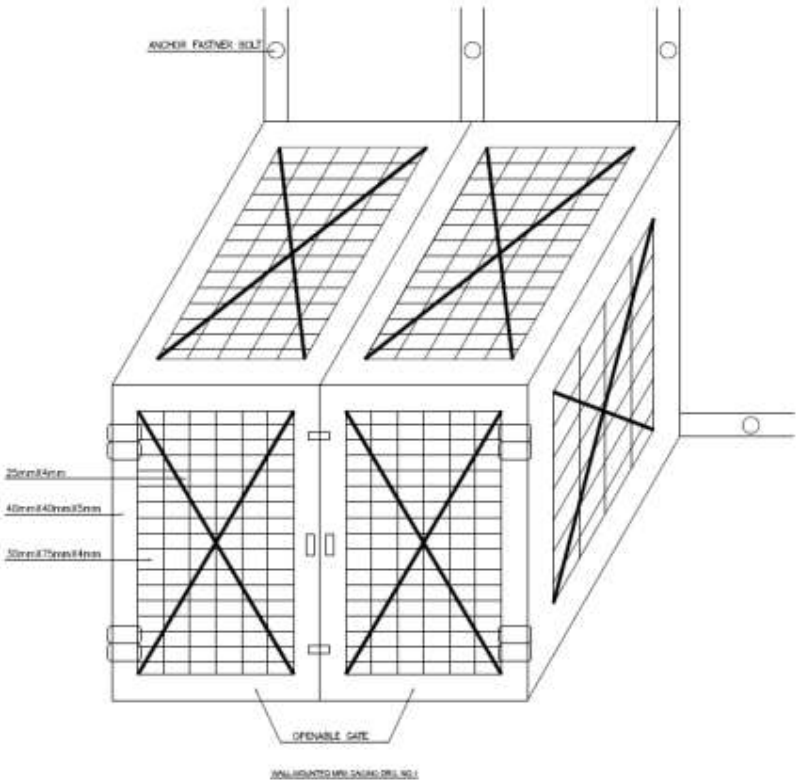
After the primer is hard dry the surface shall be dusted off and one coat of synthetic enamel paint of approved colour and shade (conforming to IS:

2932) shall be applied by brushing/spraying. The coats are applied after drying one after another to give a uniform surface. Paints can be diluted/thinning by means of thinner only as per the requirements of the finished paint surface.

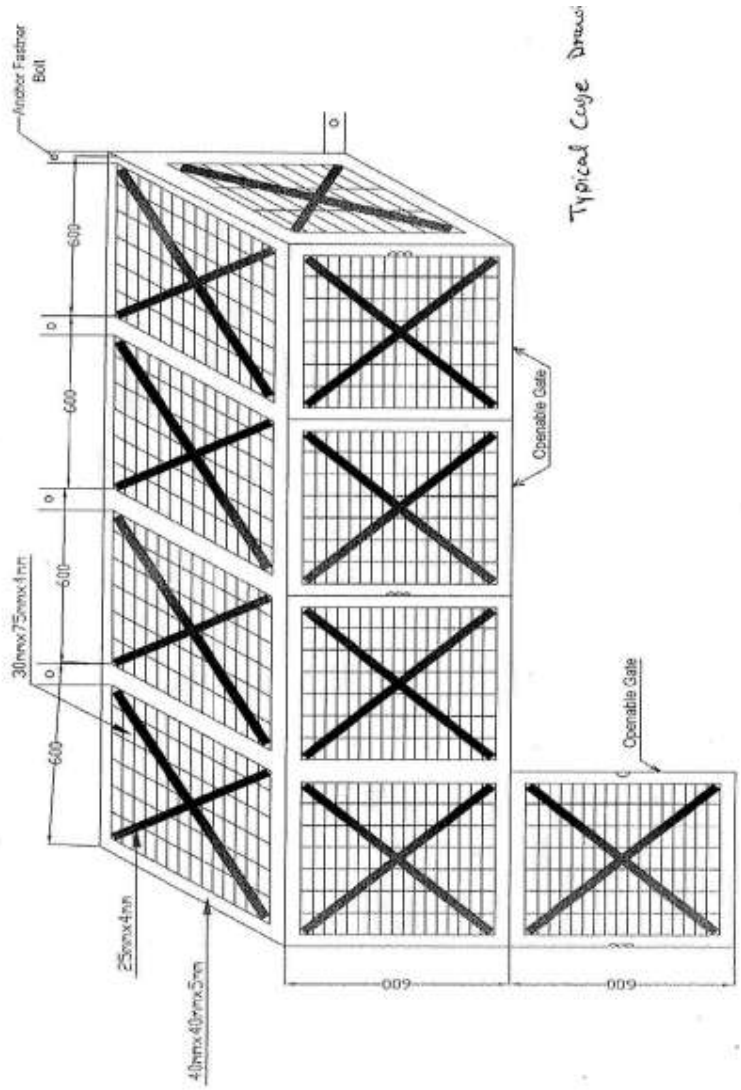
**LIST OF APPROVED MAKES FOR CIVIL WORK**

- Ordinary Portland Cement (OPC)-ACC,DLF,JK,& Sarvshaktiman

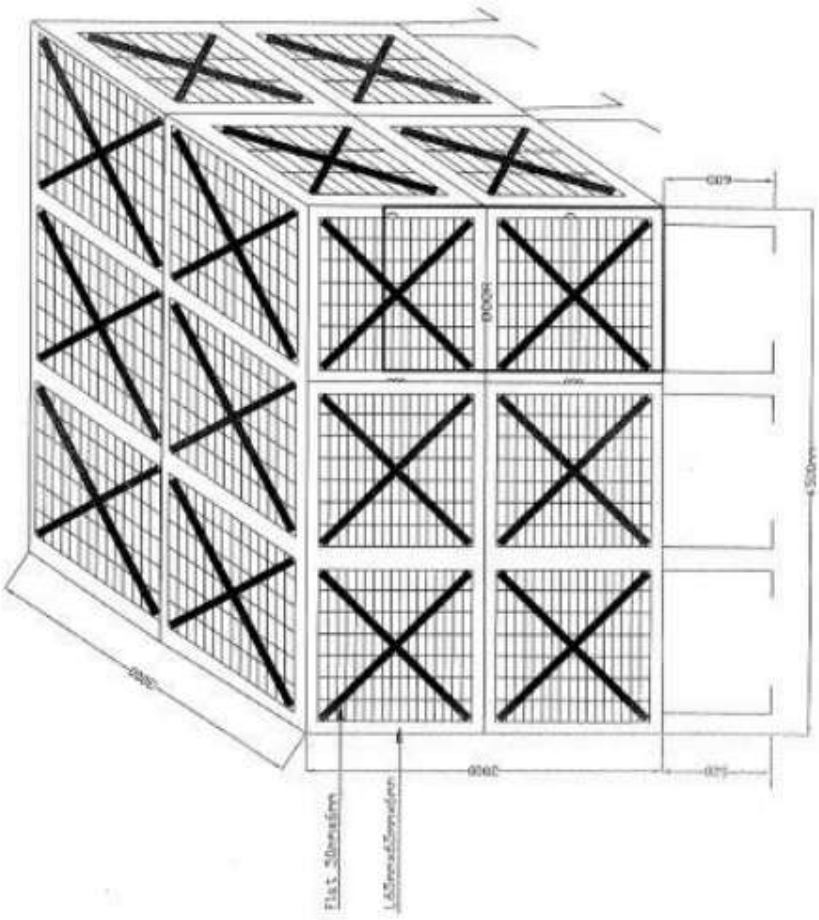
- Pozolona Portland cement (PPC) – Ultratech
- Steel (Tor Steel) – Sail,Tisco & Rathi
- Steel (Structural Steel) – Sail & Tisco
- Bolts – Unbrako, TVS & GKW
- Electrodes – ESAB, Advani, D&H
- GI / MS Pipes (IS: 1239,IS : 3589) – Tata, Jindal,Prakash,Surya & TISCO
- Paint – Asian Paints,ICI, Shalimar & Berger
- Construction Chemicals – CICO,FOSROC,ROFFE,ST,MC & Pidilite
- Ceramic Tiles – Kajaria ,Orient, Bell & Somani
- Vitreous Tiles – Diamond , Granamite, Spartek & Somani (gravity)
- Grout – ACC, Roffe, Fosroc & Unitile




DRAWING – 01




WALL MOUNTED 2 BAR MRS CAGING
DRAWING- 02



SKID CAGING
DRAWING- 03

## CHAPTER-24

## 24. SPECIFICATION FOR CHAIN LINK FENCING

This specification specifies the requirements of chain link fence for security purposes. The height of the fence shall be approximately 2.0 m to the top of the chain link fencing at the posts and approximately 2.5 m in vertical height at the top line of barbed wire attached to the cranked tops of the posts.

### 24.1 REFERENCES

IS: 278 Specification for galvanized steel barbed wire for fence fabric

IS: 383 Specification for coarse and fine aggregates for concrete

IS: 456 Plain and Reinforced Concrete - Code of Practice

IS: 2721 Specification for Galvanized Steel Chain Link Fencing

NOTE: - Latest Edition of all Codes and Standards shall be followed.

### 24.2 REFERENCE OF SPECIFICATIONS / STANDARDS

- Refer Chapter 25 to Chapter 30 of this specification
- Civil Work Specifications

### 24.3 CEMENT CONCRETE FOR FOUNDATION & SILL

Refer chapter 27 of this specification

### 24.4 CEMENT CONCRETE IN PRECAST POSTS/STRUTS

(Straining posts, intermediate posts and struts)

Pre-Cast Cement concrete shall be of M25 grade for moderate environment exposure condition and M30 grade for severe environment exposure condition with 20mm and down size crushed stone aggregates conforming to IS: 383.

The work shall be carried out as per IS: 456 in all respects.

Necessary moulds shall be provided for casting the concrete posts and the same shall be smooth finished with 1:3 cement sand mortar as directed by the Engineer-in- Charge.

### 24.5 REINFORCEMENT

Refer chapter 27 of this specification

**a) MATERIALS**

**CHAIN LINK FENCING**

The material requirement shall conform to IS: 2721 latest edition. The chain link fencing shall be woven from 3.15 mm dia wire with mesh size of 75 sq mm. The mesh wire shall not vary from the specified dia by more than ± 0.05 mm.

**GALVANIZED WIRES**

a. All steel wires shall be hot dipped galvanized wire and dia of the wire shall be 3.15 mm over the galvanized coating.

b. The line wire shall be 4.0 mm dia Mild Steel.

c. The stirrup wire for securing the line wires to the concrete intermediate posts shall be 3.15 mm diameter Mild Steel.

d. The tying wire for securing the chain link fencing to the line wire shall be 2.50 mm diameter Mild Steel.

e. Hair pin staples for fastening down the bottom of galvanized chain link fencing to the concrete sill shall be of 3.15 mm wire. The ends shall be bent outwards to secure anchorage.

**Cleats for eye bolts shall be of uniform size and shall consist of Mild Steel angle of 75 x 50 x 6mm.**

**EYE BOLT STRAINERS**

a. The eye bolt strainer shall consist of bolts with welded eye sufficiently threaded and fitted with a nut and washer.

Two-way eye bolt strainer shall have suitable ring nuts, fitted after wires have been strained on one side.

- Stretcher bar shall consist of Mild Steel flats 25 mm x 4.75 mm. They shall be secured to the cleats by steel bolts.
- Droppers for barbed wire shall be of Mild Steel not less than 25mm x 4.75 mm thick with 38mm x 4.85mm half round staples for fastening the barbed wire to them.

**BARBED WIRE**

a. Barbed wire shall conform to IS: 278. The galvanized barbed wire shall be manufactured from galvanized Mild Steel wire conforming to IS: 280. The coating on the wire shall be smooth and relatively free of lumps, globes or points, wires with excessive roughness, blisters, Sal ammoniac spots shall be rejected. A galvanized steel barbed wire of Type A-1 IS: 278 shall be made from two strands of galvanized, twisted 2.5 mm steel wire with 4 points of barbs. Each barb shall have two turns tightening around both line wires making altogether four complete turns. The barbs shall be so finished that four points are set and looked at right angles to each other.

b. Bracing of the rows of barbed wire shall be as shown in Standard drawing.

c. The barbs shall have a length of not less than 13mm and not more than 18mm.

**b) ERECTION**

Straining posts shall be provided at all ends and corners of fences, at changes in direction or acute variations in level and at intervals not exceeding 60m on straight lengths of fence. Intermediate posts shall be spaced at regular intervals not exceeding 3M.

Struts shall be fitted to all straining posts behind the chain link fabric in the direction of the line of fence.

**FIXING CHAIN LINK FENCING**

a. There shall be four evenly spaced rows of line wire. The top wire shall be doubled, making five line wires in all. The bottom wire shall be close to the ground.

b. Each line wire shall be strained tightly by means of eyebolt strainers or winders at each straining point.

c. Each line wire shall be secured to each intermediate post by a wire stirrup passed through a hole in the posts and secured to the line wire by three complete turns on each side of the post.

d. The chain link fencing shall be strained between each pair of straining posts and secured to each straining post by means of a Stretcher bar. One of the top line wires shall be threaded through the appropriate adjacent rows of mesh, care being taken that no meshes in the rows are bypassed by the line wire except where deviation is necessary at the straining posts. The second top line wire shall be strained in front of the fencing. The fencing shall be attached to the top and bottom line wire by wire ties spaced 150mm apart and to the other line wires by wire ties spaced 450 mm apart.

e. The bottom of the fencing shall be treated as follows:

Continuous concrete sill 230 mm wide x 300 mm high for full length between posts shall be cast with the top 25 mm above G.L. and 25mm below the chain link fencing. Hair pin staples shall be threaded through the bottom row of mesh at 0.75m c/c and set in the sill to a depth of 150 mm.

**FIXING BARBED WIRES FOR ANTICLIMBING DEVICE.**

a. Three lines of barbed wire shall be provided as shown in drawing . The wires shall be attached by eye bolts to the cranked tops of the straining posts. On concrete intermediate posts they shall be secured to cranked tops with stirrup wires. The barbed wire shall be fitted with one dropper at the center of each bay, secured to the wires so that they cannot be bunched together

**24.6 PAYMENT**

This clause shall apply to item rate tenders only.

**a) EARTHWORK**

Payment for earthwork shall be made on cubic meter basis

**b) CEMENT CONCRETE (CAST-IN-SITU AND PRE-CAST)**

Payment shall be made on cubic meter basis and the rate shall include labour, materials, mixing placing, leaving pockets, fixing chain link fencing, line wires, barbed wires inserts in concrete post while casting as

shown in the drawing or as per the directions of Engineer-in-Charge, keeping the concrete post in the proper position while concreting, scaffolding, all moulds, curing etc. complete including handling & transportation from pre-casting yards to place of fixing, preparation of pre-casting yards etc. but excluding cost of reinforcement.

**c) REINFORCEMENT**

Payment for reinforcement shall be made on metric ton basis including transportation of steel to site of work, straightening, cleaning, cutting, bending to required shapes and lengths, placing, binding with soft annealed wire as per drawings, specifications and instruction of Engineer-in-Charge.

**d) CHAIN LINK FENCING**

Payment for chain link fencing shall be made on running meter basis for bottom 2.0meter height of the total height including supply of chain link fencing in 1.9meter width roll, fixing in position true to line and as per drawing. The rate shall also include supplying and fixing necessary galvanized line wires, stirrup wires, tying wires, hair pin staples for fixing the fence in cons sill, etc. tensioning the line wire and fencing, all materials and labour etc. required to complete the job as per drawings and direction of Engineer-in-Charge.

**e) BARBED WIRE FENCING**

Payment for barbed wire shall be made on running meter basis. The rate shall included supply and fixing necessary droppers, straining bolts tensioning the barbed wire etc. and all materials and labour etc. required to complete the job.

## CHAPTER-25

## 25. SPECIFICATION FOR MATERIALS

### 25.1 SCOPE

a) This specification establishes and defines the requirements of various materials to be used in Civil and Structural works.

b) Whenever any reference to BIS Codes is made, the same shall be taken as the latest revision (with all amendments issued thereto) as on the date of submission of the bid.

c) Apart from the BIS Codes mentioned in particular in the various clauses of this specification, all other relevant codes related to specific job under consideration regarding quality, tests, testing and/or inspection procedures shall be applicable. Reference to some of the Codes in the various clauses of this specification does not limit or restrict the scope of applicability of other referred or relevant codes.

d) In case of any variation/contradiction between the provision of BIS Codes and this specification, the provision given in this specification shall be followed.

e) All materials shall be of standard quality and shall be procured from renowned sources/ manufacturers approved by the Engineer-in-Charge. It shall be the responsibility of the Contractor, to get all materials/ manufacturers approved by the Engineer-in-Charge prior to procurement and placement of order.

f) Whenever called for by the Engineer-in-Charge all tests of the materials as specified by the relevant BIS Codes shall be carried out by the Contractor in an approved laboratory and test reports duly authenticated by the laboratory, shall be submitted to the Engineer-in-Charge for his approval. If so desired by the Engineer-in-Charge, tests shall be conducted in the presence of the Engineer-in-Charge or his authorized nominee.

g) Quality and acceptability of materials not covered under this specification shall be governed by the relevant BIS Codes. In case BIS code is not available for the particular material, other codes e.g. BS or DIN or API/ASTM shall be considered. The decision of Engineer-in-Charge, in this regard, shall be final and binding on the Contractor.

h) Whenever asked for, the Contractor shall submit representative samples of materials to the Engineer-in-Charge for his inspection and approval. Approval of any sample does not necessarily exempt the Contractor from submitting necessary test reports for the approved material, as per the specification/relevant BIS Codes.

i) The Contractor shall submit manufacturer's test reports on quality and suitability of any material procured from them and their recommendation on storage, application, workmanship etc. for the intended use. Submission of manufacturer's test reports does not restrict the Engineer-in-Charge from asking fresh test results from an approved laboratory of the actual material supplied from an approved manufacturer/source at any stage of execution of work.

j) All costs relating to or arising out of carrying out the tests and submission of test reports and or samples to the Engineer-in-Charge for his approval during the entire tenure of the work shall be borne by the contractor and included in the quoted rates.

k) Materials for approval shall be separately stored and marked, as directed by the Engineer-in-Charge and shall not be used in the works till these are approved.

l) All rejected materials shall be immediately removed from the site by the Contractor at his own cost

## 25.2 REFERENCES

As mentioned in the respective clauses.

## 25.3 WATER

1) Water used in construction for all civil & structural works shall be clean and free from injurious amount of oil, acids, alkalis, organic matters or other harmful substances which may be deleterious to concrete, masonry or steel. The pH value of water sample shall be not less than 6. Potable water shall be considered satisfactory. Underground water can also be used with the prior approval of Engineer-in-Charge, if it meets all the requirements of IS: 456.
2) Tests on water samples shall be carried out in accordance with IS: 3025 and they shall fulfill all the guidelines and requirements given in IS: 456.
3) The Engineer-in-Charge may require the Contractor to prove, that the concrete prepared with water, proposed to be used, shall have average 28 days compressive strength not lower than 90% of the strength of concrete prepared with distilled water.
4) The Engineer-in-Charge may require the Contractor to get the water tested from an approved laboratory before starting the construction work and in case the water contains any oil/organic matter or an excess of acid, alkalis or any injurious amount of salts etc., beyond the permissible maximum limits given in IS: 456, the Engineer-in- Charge may refuse to permit its use. In case the water is supplied by the owner, contractor shall get himself satisfied regarding its quality before using the same in his works at his own expense. In case there is any change in source of water, water samples shall be tested again to meet the specified requirements.
5) Water shall be stored in tin barrels, steel tanks or water-tight reservoirs made with bricks / stone or reinforced concrete. Brick/stone masonry reservoirs shall have RCC base slab and shall be plastered inside, with 1 part of cement and 4 parts of sand and finished with neat cement punning. These reservoirs shall be of sufficient capacity to meet the water requirement, at any stage of construction.
6) Water for curing shall be of the same quality as used for concreting and masonry works. Sea water shall not be used for preparation of cement mortar, concrete as well as for curing of plain/reinforced concrete and masonry works. Sea water shall not be used for hydro testing and checking the leakage of liquid retaining structures also.

## 25.4 AGGREGATE

### GENERAL

a) Coarse and fine aggregates for Civil and Structural Works shall conform in all respects to IS: 383 (Specification for coarse and fine aggregates from natural sources for concrete). Aggregates shall be obtained from an approved source known to produce the same satisfactorily. Aggregates shall consist of naturally occurring (crushed or uncrushed) stones, gravel and sand or a combination thereof. These shall be chemically inert, hard, strong, dense durable, clean and free from veins, adherent coatings, injurious amount of alkalis, vegetable matter and other deleterious substances such as iron pyrites, coal, lignite, mica, shale, sea shells etc.

b) Source and type of aggregates shall be got approved by the Engineer-in-Charge prior to procurement. Change in source and type of aggregates, at later stage, shall not be generally permitted; but under specific circumstances, Engineer-in-Charge can allow a change in source and type of aggregate. Contractor shall produce necessary test certificates from approved laboratories regarding the quality and suitability of the proposed aggregates and submit fresh mix design for approval of the Engineering- Charge. Any such change, if permitted by the Engineer-in-Charge, shall be without any time and cost implication to the owner.

c) Aggregates which may chemically react with alkalis of cement or might cause corrosion of the reinforcement shall not be used. If so desired by the Engineer-in- Charge, the Contractor shall carry out alkali reactivity tests and submit the results to him for approval.

d) The maximum quantities of deleterious materials in the aggregates as determined in accordance with IS: 2386 - Part II (Methods of Test for aggregates for concrete), shall not exceed the limits defined in IS: 383. No special test is required to prove the absence of such deleterious matters if the aggregates are from a known source with satisfactory prior data on the properties of concrete made with them. In case of newly developed quarry sites, the contractor shall submit necessary test results as per IS: 383 and IS: 2386 to the Engineer-in-Charge prior to his acceptance and approval. The method of Sampling shall be in accordance with the requirements given in IS: 2430.

e) Coarse and fine aggregates shall be batched separately. All-in-aggregate shall be used only where specifically permitted by the Engineer-in-Charge.

f) Separate sieve analysis and grading curves shall be prepared by the Contractor for any/all batches of coarse and fine aggregates, and submitted to the Engineer-in- Charge, whenever asked for, to ensure conformity with those submitted along with the mix design.

g) Whenever required by Engineer-in-Charge, the aggregates(coarse/fine) shall be washed and/or sieved by the contractor before use in the works to obtain clean and graded aggregate at no extra cost to the owner.

h) Aggregates not in conformity with the specifications shall be rejected and the Contractor shall immediately remove them from the site of work.

## 25.5 COARSE AGGREGATES

a) Coarse aggregates are the aggregates, which are retained on 4.75mm BIS Sieve. It shall have a specific gravity not less than 2.6 (saturated surface dry basis).

b) These may be obtained from crushed or uncrushed gravel or stone as per clause 3.1 and may be supplied as single sized or graded. The grading of the aggregates shall be as per IS: 383 or as required by the mix design, to obtain densest possible concrete. For this purpose, the contractor shall submit to the Engineer-in-Charge at least three sets of mix design and test results, each with different grading of coarse aggregates, proposed to be used. The Engineer-in-Charge may allow "All-in-aggregates" to be used provided they satisfy the requirements of IS: 383.

## 25.6 FINE AGGREGATES

Fine aggregates are the aggregates which pass through 4.75mm BIS sieve but not more than ten percent (10%) pass through 150 micron BIS sieve. These shall comply with the requirements of grading zones I, II

and III of IS: 383. Fine aggregates conforming to grade zone IV shall not be used for reinforced concrete works.

Fine aggregates shall consist of material resulting from natural disintegration of rock and which has been deposited by streams or glacial agencies, or crushed stone sand or gravel sand. Sand from sea shores, creeks or river banks affected by tides, shall not be used for filling or concrete works.

### 25.7 SAMPLING AND TESTING

The Contractor shall carry out all tests including mix designs of concrete, at his own expense, at the start of work as well as during any stage of construction as required by the Engineer-in-Charge. Test shall be carried out in accordance with IS: 516-Methods of test for strength of concrete and IS: 2386-Methods of test for aggregates for concrete. Testing shall be carried out from laboratories approved by the Engineer-in-Charge. The method of sampling shall be in accordance with the requirements given in IS: 2430.

### 25.8 STORAGE OF AGGREGATES

Storage of all types of aggregates at site of work shall be at contractor's expense and risk and shall be stored as specified in IS: 4082. Aggregates shall in no case be stored near to the excavated earth or directly over ground surface.

The Contractor shall maintain sufficient quantities of aggregates, near to the place of work, required for the continuity of the work. Each type and grade of aggregate shall be stored separately on hard, firm surface having adequate slope for drainage of water.

Aggregates delivered at site in wet condition or becoming wet due to rain or any other means, shall not be used for at least 24 hours. The Contractor shall obtain prior approval of the Engineer-in-charge for the use of such aggregates and shall adjust the water content in accordance with IS: 2386 to achieve the desired mix. In the absence of test results, and to allow variation in mass of aggregates and water content on account of moisture content, the Contractor can make suitable adjustment in the masses as per IS: 456, for preparation of nominal mix concrete only.

### 25.9 SAND

**a) SAND FOR MASONRY MORTARS**

- The sand shall consist of natural sand, crushed stone sand or crushed gravel sand or a combination of any of these. The sand shall be hard, durable, clean and free from adherent coatings and organic matter and shall not contain the amount of clay, silt and fine dust more than specified in IS: 2116.
- The sand shall not contain any harmful impurities such as iron pyrites, alkalis, salts and coal or other organic impurities, mica, shale or similar laminated materials, soft fragments, sea shells in such form or in such quantities as to affect adversely the hardening, strength or durability of the mortar.
- Unless found satisfactory as a result of further tests as may be specified by the Engineer-in-Charge, or unless evidence of such performance is offered which is satisfactory to him, the maximum quantities of clay, fine silt, fine dust and organic impurities in the sand, when tested in accordance with IS: 2386, shall not be more than 5% by mass in natural sand, or crushed gravel sand or crushed

stone sand. For organic impurities, when determined in accordance with IS: 2386, colour of the liquid shall be lighter than that indicated by the standard solution specified in IS: 2386.

**b) GRADING OF SAND**

The particle size grading of sand for use in mortars shall be within the limits as specified below:

**GRADING OF SAND FOR USE IN MASONRY MORTARS**

| IS SIEVE DESIGNATION | PERCENTAGE | REF.TO |
|---|---|---|
| IS: 460(PART I) | PASSING BY MASS | METHOD OF |
| 4.75 mm | 100 | IS: 2386(Part I) |
| 2.36 mm | 90 to 100 | |
| 1.18 mm | 70 to 100 | |
| 600 micron | 40 to 100 | |
| 300 micron | 5 to 70 | |
| 150 micron | 0 to 15 | |

In case of a sand whose grading falls outside the specified limits due to excess or deficiency of coarse or fine particles, this shall be processed to comply with the standard by screening through a suitably sized sieve and/or blending with required quantities of suitable sizes of natural sand particles or crushed stone screenings which are by themselves unsuitable. Based on test results and in the light of practical experience with the use of local materials, deviation in grading of sand may be considered by the Engineer-in-Charge. The various sizes of particles of which the sand is composed shall be uniformly distributed throughout the mass.

**c) SAMPLING AND TESTING**

The method of sampling shall be in accordance with IS: 2430. The amount of material required for each test shall be as specified in relevant parts of IS: 2386. Any test which the engineer-in-charge may require in connection with this shall be carried out in accordance with the relevant parts of IS: 2386.

If further confirmation as to the satisfactory nature of the material is required, compressive test on cement mortar cubes (1:6) may be made in accordance with IS: 2250 using the supplied material in place of standard sand and the strength value so obtained shall be compared with that of another mortar made with a sand of acceptable and comparable quality.

**d) SAND FOR FILLING**

Sand for filling shall meet the requirements of IS: 383 and shall be natural sand, hard, strong and free from any organic and deleterious materials. Any sand proposed for filling, shall be used only after it is approved by the Engineer-in-Charge. Sand obtained from sea shores, creeks or river banks affected by tides shall not

be used for filling. Fine aggregates suitable for concreting works shall be suitable for filling also. No sand below grading zone-III as per IS: 383 shall be allowed for filling.

**25.10 CEMENT**

Cement to be used for civil and structural works shall be one of the following. Specific requirement for the type of cement to be used shall be as shown in the drawings or as specified in the contract or as directed by the Engineer-in-Charge.

| | |
|---|---|
| Specification for 33 grade ordinary Portland cement | IS: 269 |
| Specification for Portland slag cement | IS: 455 |
| Specification for Portland pozzolana cement (fly ash based) | IS: 1489 Pt.1 |
| Specification for Portland pozzolana cement (calcined clay based) | IS: 1489 Pt.2 |
| Specification for Masonry Cement | IS: 3466 |
| Specification for high alumina cement for structural use | IS: 6452 |
| Specification for rapid hardening Portland cement | IS: 8041 |
| Specification for 43 grade ordinary Portland cement | IS: 8112 |
| Specification for 53 grade ordinary Portland cement | IS: 12269 |
| Specification for Sulphate Resisting Portland cement | IS: 12330 |

**a) STORAGE AT SITE**

- The storage of cement (lifted from the Owner's godown or procured by the Contractor himself) at the site of work shall be at contractor's expense and risk and shall meet the requirements of IS: 4082. The cement shall be stored above ground in a suitable weather tight building or godown and in such a manner as to permit easy access for proper inspection and also to prevent deterioration due to moisture. In the event of any damage occurring to the quality of cement due to faulty storage or on account of negligence on the part of the contractor, such damages shall be borne by the contractor himself.

- All approved cement shall be arranged in batches with type, brand and date of receipt fagged on them. A maximum of eight bags shall be stacked one over the other. Cement bags shall be used in the same order as received from the manufacturer/owner. The contractor shall maintain a register, on day to day basis, giving the details of the receipt/consumption, source of supply and type of cement etc. The register shall always be accessible to the Engineer-in-Charge for verification.

**b) TESTS AFTER DELIVERY**

Each consignment of cement supplied by Owner or contractor, shall, after delivery at site and at the discretion of the Engineer-in-Charge, be subjected to any or all of the tests and analyses, required by the relevant Indian Standard Codes. In case the cement is supplied by the owner, the contractor shall get himself satisfied regarding its quality before using the same in his works at his own expense. The contractor shall carry out and bear the cost of all tests and analyses required to ensure quality of cement before using in actual works, irrespective of the fact whether the cement is supplied by the Owner or procured by him.

**c) REJECTION**

The Engineer-in-Charge may reject at his discretion any cement, notwithstanding the manufacturer's certificate or failing to meet the requirements of relevant BIS Codes for testing of cement. He may similarly reject any cement which has deteriorated owing to inadequate protection from moisture or due to intrusion of foreign matter or any other cause. Any cement which is considered defective shall not be used and shall be promptly removed from the site by the contractor.

**25.11 STEEL**

**a) GENERAL**

All steel bars, sections, plates, and other miscellaneous steel materials, etc shall be free from loose mill scales, rust as well as oil, mud, paint or other coatings. The materials, construction specifications such as dimensions, shape, weight, tolerances, testing etc, for all materials covered under this section, shall conform to respective BIS Codes.

**b) REINFORCEMENT BARS**

Reinforcement bars, to be used for civil and structural works shall be one of the following or in combination thereof.

- Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement (grade I). IS: 432
- Specification for hard drawn steel wire fabric for concrete reinforcement. IS: 1566
- Specification for High strength deformed steel bars and wires for concrete reinforcement. IS: 1786
- Steel for general structural purposes (Grade A). IS: 2062

**c) STRUCTURAL STEEL**

Structural steel to be used for general structural purposes shall be one of the following or in combination thereof.

Structural steel sections shall conform to following BIS Codes.

- Steel tubes for structural purposes. IS: 1161
- Mild Steel Tubes, tubulars and other wrought steel fittings. IS: 1239
- Steel for general structural purposes (Grade A). IS: 2062
- Hollow steel sections for structural use. IS: 4923

**d) MISCELLANEOUS STEEL MATERIALS**

Miscellaneous steel materials shall be conforming to the following BIS Codes.

- Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement (grade I) (For mild steel bars of anchor bolts, rungs, metal inserts, grating etc.) IS: 432
- Hexagonal head bolts, screws & nuts of product grade C. IS: 1363
- Technical supply conditions for threaded steel fasteners. IS: 1367
- Plain washers IS: 2016
- Steel wire ropes for general engineering purposes IS: 2266
- Mild Steel Tubes, tubulars and other wrought steel fillings. (For Hand rail tubular sections). IS: 1239
- Steel chequered plates. IS: 3502
- Hexagonal bolts and nuts (M42 to M150). IS: 3138

**e) ANCHOR BOLTS**

Material for Anchor Bolts such as MS bars, washers, nuts, pipe sleeves and plates etc. shall be as per relevant BIS Codes mentioned above.

**f) STORAGE**

The storage of all materials at site of work shall be at the contractor's expense and risk and shall be done as per the requirements given in IS: 4082. The contractor shall maintain the proper records of receipt/consumption. The records shall always be accessible to the Engineer-in-Charge for verification.

The reinforcement bars, structural steel sections and other miscellaneous steel materials etc, shall be stored in such a way as to avoid and prevent deterioration, corrosion, bending, twisting and wrapping. In case of any damage occurring to the material on account of faulty storage or negligence by the contractor, same shall be borne by the contractor himself.

**g) TESTS AFTER DELIVERY**

Materials supplied by the Owner or Contractor, shall, after delivery at site and at the discretion of Engineer-in-Charge, be subjected to any or all of the tests, required by the relevant BIS Codes. The Contractor shall carry out and bear the cost of such tests irrespective of the fact whether the material is procured by the Owner

or the contractor. In case steel is supplied by the Owner, the Contractor shall get himself satisfied regarding its quality before using the same in his works at his own expense.

**h) REJECTION**

The Engineer-in-charge may reject at his discretion any material, not withstanding the manufacturer's certificate or failing to meet the requirements of relevant BIS Codes for testing of materials. He may similarly reject any material, which has deteriorated or corroded etc., due to improper storage, handling or transport. Defective materials shall not be used and removed from the site by the contractor at his own expense.

## 25.12 BRICK

**a) GENERAL**

Bricks for masonry works shall conform to IS: 1077 - Specification for common burnt clay building bricks and shall be of class 5.0 (with minimum compressive strength of 5.0N/mm2). Specific requirement for any other class of bricks shall be as shown in drawings or as described in the contract for a particular site or type of work. Physical requirements, quality, dimensions, tolerances etc. of common burnt clay building bricks shall conform to the requirements of IS: 1077.

Bricks shall be hand - moulded or machine moulded and shall be made from suitable soils. The bricks shall have smooth rectangular faces with sharp corners and shall be well burnt, sound, hard, tough and uniform in colour. These shall be free from cracks, chips, flaws, stone or humps of any kind.

**b) TESTS AFTER DELIVERY**

The Contractor shall take samples of each type of brick as directed by the Engineer-in- Charge as per the requirements of IS: 5454 and tests shall be carried out as per IS: 3495. The cost for carrying out any or all the tests shall be borne by the Contractor. The bricks, when tested, as per IS: 3495 shall have a minimum average compressive strength, as given in the Code, for a particular class of brick. Water absorption shall not be more than 20% by its dry weight, when soaked in cold water for 24 hours.

Brick samples so approved, shall be deposited with the Engineer-in-Charge. All subsequent deliveries shall be up to the standards of the approved samples.

**c) STACKING OF BRICKS**

Bricks shall be stored at site as per the requirements given in IS: 4082 and shall not be dumped at site. They shall be unloaded from trucks to a place on a leveled surface near to the work site. They shall be stacked in regular tiers even as they are unloaded, to minimize breakages and defacement of bricks. The supply of bricks shall be so arranged that as far as possible, at least two days' requirements of bricks are available at site at any time. Bricks, of different class, shall be stacked separately.

**d) LOCAL BRICKS/CLASS 3.5 BRICKS.**

Where shown on drawings, locally available bricks of nonmodular size (230mm x 115mm x 75mm) in place of bricks of modular size (190mm x 90mm x 90mm) can be used in case the bricks satisfy the other requirements of IS: 1077. Minimum compressive strength of these bricks shall not be less than 3.5N/mm2.

## 25.13 STONE

### a) GENERAL

All Stones used for masonry works shall conform to the requirements of following BIS Codes.

- Method of identification of natural building stones. IS: 1123
- Recommendations for dimensions and workmanship of natural building stones for masonry work. IS: 1127
- Recommendations for dressing of natural building stones. IS: 1129

### b) QUALITY OF STONES

Stones shall be of approved quality, hard, dense, strong, sound, durable, clean and uniform in colour. They shall also be free from veins, adherent coatings, injurious amount of alkalis, vegetable matters and other deleterious substances such as iron, pyrites, coal, lignite, mica, sea shells etc. Unless otherwise approved, stones from one single quarry shall be used for any one work. The strength of stones should be adequate to carry the imposed load and shall meet all the requirements of IS: 1905, taking into account the appropriate crushing strength of stone and type of the mortar used. The percentage of water absorption, when tested in accordance with IS: 1124 shall not exceed 5 percent.

Stones normally used, shall be small enough to be lifted and placed by hand. The length of the stone shall not exceed 3 times the height. Width of stone on base shall not be less than 150 mm and in no case exceed 3/4th thickness of the wall. Height of the stone shall not be more than 300mm.

### c) UNLOADING/STACKING

The stones shall be unloaded from the trucks to a site near to the place of work as defined in IS: 4082 and shall be stacked on a firm ground having adequate stop for drainage. The supply of stones shall be so arranged that as far as possible, at least two days' requirements of stone are available at site at any time.

## 25.14 ADMIXTURES

### a) GENERAL REQUIREMENTS FOR ADMIXTURES

All concrete admixtures shall in general comply with the following BIS Codes unless otherwise stipulated in this specification.

- Specification for integral cement water proofing compounds. IS: 2645
- Specification for other admixtures for concrete. IS: 9103

Generally, admixtures shall have ISI certification marks. However, even in case of BIS certified admixtures, Engineer-in-Charge may require the Contractor to carry out and submit any or all the tests (as specified in relevant BIS Codes), from approved laboratories, over and above the manufacturer's test certificate, before giving his final approval.

In case, admixtures certified by BIS are not available, the contractor shall submit to the Engineer-in-Charge the type and/or proprietary brand of the admixture from only reputed manufacturers along with necessary test certificates from recognized and approved laboratories or any other document directed by Engineer-in-Charge for the latter's final approval. In such cases, names of at least two manufacturers shall be submitted to the Engineer-in-Charge for his selection. In case, both the names are rejected, the contractor shall submit a fresh list of two manufacturers for approval by the Engineer-in-Charge.

The Engineer-in-Charge may direct the contractor to submit test results as required by IS: 2645 or IS: 9103 for any admixture proposed to be used in the concrete in any approved laboratory at his discretion at any stage of the work. The cost of any/all tests required to satisfy compliance with this specification shall be borne by the Contractor.

In case of non-availability of any BIS code for testing and acceptability criteria, relevant American, British or German Code shall be applicable.

Prior approval of the Engineer-in-Charge shall be obtained while using water reducing admixtures in the concrete (PCC/RCC) or mortar. Other type of admixtures such as accelerating admixtures, retarding admixtures or air entraining admixtures, shall not be used unless specified on the design drawings or prior approval taken from the design approving authority. Once approved, utmost care shall be exercised, at site by the Contractor to maintain the consistency in the quality of admixture and the concrete/ mortar so produced.

The suitability and effectiveness of any admixture shall be verified by trial with the designed concrete mixes using cement, aggregates together with any other materials to be actually used in the works as per the direction of Engineer-in-Charge. If two or more admixtures are to be used simultaneously in the same concrete mix, the Contractor must submit necessary test results from an approved laboratory to show their interaction and compatibility. Any/all tests specified in BIS Codes shall be carried out only with the type of material and mix design, to be actually used in the work site.

No admixture shall impair the durability of the concrete nor combine with the ingredients to neither form harmful compounds nor increase the risk of corrosion of reinforcement. Use of admixtures shall not reduce the dry density of concrete. Once the proportion of admixture has been established, strict check shall be maintained not to alter the proportions of ingredients and water-cement ratio of the Design Mix during execution.

The chloride contents in admixtures shall not exceed 2% by mass of the admixture or 0.03% by mass of the cement.

Admixtures which do not meet the requirements stipulated in this specification shall be rejected and shall not be used.

**b) WATER PROOFING COMPOUNDS**

Water proofing compounds shall be mixed with only ordinary Portland cement of grade 33, conforming to IS: 269.

The permeability of the specimen with the admixture shall be less than half of the permeability with similar specimen without the use of these compounds. These compounds shall be used in such proportion as recommended by manufacturer but in no case it shall exceed 3% by weight of cement.

The initial setting time of the cement with the use of these compounds shall not be less than 30 minutes and final setting time shall not be more than 10 hours. Test shall be carried out in accordance with IS: 4031.

Compressive strength of specimen at 3 days shall not be less than 160kg/sq.cm nor 80% of the 3 days compressive strength of mortar cubes prepared with same cement and sand only, whichever is higher. Similarly compressive strength at 7 days shall not be less than 220 kg/sq.cm nor less than 80% of the 7 days compressive strength prepared with the same cement, and sand only, whichever is higher. The test to determine the compressive strength shall conform to IS: 4031.

### 25.15 WATER BARS (WATER STOPS)

PVC water bars shall be used in reinforced concrete construction of liquid retaining structures or any other structure to safeguard them from hydrostatic pressure and water leakage and any relative movement between two parts of the structure due to thermal loading shrinkage or differential movement of foundations. Wherever desired or shown in the drawings, they shall be used at expansion/contraction/construction joints. These shall be pre-formed and shall provide a permanent water tight seal along the entire joint in the poured concrete structures. These shall also be flexible enough to withstand deflection/displacements at joints arising due to variation of temperatures or settlement of foundations. The minimum thickness of water bar shall be as shown on drawings or described in the schedule of rates and unless otherwise mentioned, these shall be able to withstand a water head of at least 12 meters.

Performance requirements of P V C water bars shall meet the requirements of IS: 12200. These shall be of approved make and of ribbed/serrated/plane type with a bulb at the center. The thickness and width of water bars shall be as per schedule of rates/ drawings but in no case the thickness shall be less than 5mm and width less than 150mm. The joining of the water bars shall be carried out by vulcanizing strictly as per the manufacturer's specifications. Lapped joints shall not be allowed under any circumstances.

### 25.16 BITUMEN/BITUMINOUS MATERIALS

Bitumen to be used for various types of work shall meet all the requirements of relevant BIS Codes as given below:

- Specification of Paving Bitumen. IS: 73
- Specification for bitumen mastic for flooring. IS: 1195
- Specification for Bitumen felts for water proofing and damp proofing. IS: 1322
- Specification for Bituminous compounds for water proofing and caulking purposes. IS: 1834
- Specification for preformed fillers for expansion joint in concrete pavements and structures. IS: 1838
- Specification for bitumen mastic for use in water proofing of roofs. IS: 3037
- Specification for bitumen primer for use in water proofing and damp proofing. IS: 3384
- Specification for Bitumen Mastic for Tanking and Damp proofing. IS: 5871
- Specification for Glass fiber base coal tar pitch & bitumen felts. IS: 7193
- Code of practice for damp proofing using bitumen mastic. IS: 7198

- Specification for bitumen Mastic, Anti Static and electrically conducting grade. IS: 8374

The type and grade shall be as shown on the drawings or as indicated in schedule of quantities or as directed by Engineer-in-Charge. Tests and acceptable criteria shall be as per relevant BIS Codes.

### 25.17 PVC PIPES

PVC Pipes shall conform to the requirements of IS: 4985.

### 25.18 WOOD/TIMBER

Wood recommended for platforms of cold vessels or below cold vessels/ exchangers shall be hard and shall be of group A, grade I, and shall have safe permissible stress of 7N/mm2 in compression, perpendicular to grains on outside location as per IS:883. General characteristics like durability, treatability etc. shall conform to IS: 883 and IS: 3629.

Timber required to be used for formwork shall be fairly dry before use. It should maintain its shape during the use and even when it comes into contact with moisture from the concrete. Storage of Wood/Timber shall be as per the requirements of IS: 4082.

For proper identification and selection of suitable timber for formwork, following codes shall be referred.

- Classification of commercial timbers and their zonal distribution IS: 399
- Specification for ballies for general purposes. IS: 3337
- Specification for Plywood for concrete shuttering work. IS: 4990
-

### 25.19 ANTITERMITE COMPOUNDS

Chlorpyrifos emulsifiable concentrates (1%) conforming to IS: 8944 shall be used for treatment of soil for protection of buildings against attack by subterranean termites.

### 25.20 POLYSULPHIDE SEALANTS

Polysulphide Sealants shall conform to IS: 12118 and be of approved make. Test conditions and requirements shall be as given in the above referred BIS code.

## CHAPTER-26

## 26. SPECIFICATION FOR EARTHWORK IN FOUNDATIONS

- This specification deals with earth work in excavation and filling.

### 26.1 REFERENCES

**SPECIFICATIONS**

VCS-SS-CS-6002 Earthwork in Site Grading

VCS-SS-CS-6003 Earthwork for underground piping

### 26.2 CLASSIFICATION OF SOIL

**SOFT / LOOSE / HARD / DENSE SOIL AND MUD**

Generally any soil which yields to the application of pick and shovel or to phawra, rake or other, ordinary digging implement such as vegetable or organic soil, turf, gravel, sand, silt, loam, clay, peat, cobble stone, mud etc.

**SOFT / DISINTEGRATED / WEATHERED ROCK (NOT REQUIRING BLASTING)**

Rock or boulder which may be quarried or split with crowbar. This will also include laterite and hard conglomerate.

**HARD ROCK (REQUIRING BLASTING)**

Any rock or boulder for the excavation of which blasting is required.

**HARD ROCK (BLASTING PROHIBITED)**

Hard rock requiring blasting as described under cl. No. 3.3 above, but where blasting is prohibited for any reason(s), breaking up of rock shall be done by chiseling, wedging or by using Hydraulic Splitter and chemical substances mixed in an appropriate proportion.

### 26.3 BACKFILLING MATERIAL

- Backfilling material shall be as approved by the Engineer-in-Charge.
- Backfilling of excavation in trenches, foundations and elsewhere shall consist of one of the following materials as shown on drawing or directed by the Engineer-in-Charge.

a. Soil
b. Selected earth from heaps or brought from borrow areas.

- In case a. or b. are not available, the Engineer-in-Charge may approve use of any of the following: Stone/gravel

c. Sand
d. CNS material.

- The material shall be free from rubbish, roots, hard lumps and any other foreign organic material

**26.4 SETTING OUT**

The Contractor shall be responsible for the true and proper setting out of the work in relation to original point's lines and levels of reference and for the correctness of the levels, dimensions and alignment of all parts of the work. If at any time during progress of the work any error appears or arises in the position of level, dimension, or alignment of part of the work, the Contractor at his own expense shall rectify such errors to the satisfaction of the Engineer-in-Charge. The checking of any line or level by the Engineer-in-Charge shall not in any way relieve the Contractor of his responsibilities.

The Contractor shall lay out and construct one or more permanent bench marks in some central place before the start of the work, from which all important levels for the excavations will be set.

These permanent bench marks shall consist of masonry pillars with top neatly plastered and levelled as per the directions of the Engineer-in-Charge. Bench marks shall be well connected with triangular grid system or any other bench mark approved by the Engineer-in-Charge.

**26.5 EARTHWORK IN EXCAVATION**

a) Excavation shall be carried out in any material met on the site to the lines, levels and contours shown on the detailed drawings and the Contractor shall remove all excavated materials to spoil heaps on site or transport for use in filling on the site or stack them for reuse as directed:
b) Excavated material shall not be deposited within 1.5m from the top edge of the excavation.
c) The sides of the excavation may be cut sloping, or shored and strutted to hold the face of earth as per site requirements and as directed by the Engineer-in- Charge.
d) Foundation pits/trenches shall not be excavated to the full depth unless construction is imminent. The last fifteen (15) cm depth of the excavation shall not be done until concreting work is imminent. The full depth may at the discretion of the Engineer-in- Charge be excavated and the bed covered with a fifty (50) mm (minimum) thick (or as indicated on drawing) layer of lean concrete 1:5:10 mix (1 cement: 5 coarse sand: 10 crushed stone aggregate) or as specified in schedule of rates/shown on drawing, after watering if required, and consolidating the bed.
e) If the bottom of any excavation has been left exposed by the Contractor and in the opinion of the Engineer-in-Charge, that has become badly affected by the atmosphere or by water, then the Contractor shall remove such portions of the deteriorated material as the Engineer-in-Charge may direct and shall make good with lean concrete 1:5:10 mix (1 Cement: 5 Coarse Sand: 10 Crushed Stone Aggregate). All expenses for such additional concrete and excavation shall be borne by the Contractor.
f) Where excavation is made in excess of the depth required, the Contractor shall, at his own expense, fill up to required level with lean concrete 1:5:10 mix (1 Cement : 5 Coarse Sand : 10 Crushed Stone aggregates) or as decided by Engineer-in-Charge.
g) The Contractor shall provide suitable drainage arrangement to prevent surface water from any source entering the foundation pits at his own cost.

h) The Contractor shall make all arrangements for dewatering during excavation and subsequent works, the accumulated water from any source (including subsoil water) in the excavated pits/trenches and keeping the excavated pits/trenches dry for subsequent works.
i) The Contractor shall make necessary arrangements for lighting, fencing and other suitable measures for protection against risk of accidents due to open excavation.
j) Where the excavation is to be carried out below the foundation level of an adjacent structure, the precaution to be taken such as under pinning, shoring and strutting etc. shall be determined by the Engineer- in-Charge. No excavation shall be done unless such precautionary measures are carried out as per directions of the Engineer-in- Charge. The payment for such precautionary measures shall, however, be made separately.
k) Loose or soft bed ground encountered in excavation at the required depth shall on the Engineers-in-Charge's instructions be excavated to a firm bed and difference made up to the required level with lean concrete 1:5:10 mix (1 Cement: 5 Coarse Sand: 10 Crushed Stone Aggregates).
l) In those cases where during excavation, side slips occur for reasons not attributable to the Contractor (e.g. side slips which take place on their own but not due to surcharge of earth kept near the edge of excavation and cracking of excavation top strata due to clay drying out leading to collapse of excavation sides), the Engineer-in-Charge shall admit payment at his discretion.
m) Any obstacle encountered during excavation shall be reported immediately to the Engineer-in-Charge and shall be dealt with as instructed by him. Removal of buried pipes or cables shall not be done without prior permission of the Engineer-in-Charge and the Contractor shall provide all measures to protect the same. Costs of such protective measures are deemed to be included in the rates for various items of excavation.
n) The Contractor shall not undertake any concreting in foundation until the excavation pit/trench is approved by the Engineer-in-Charge.
o) The specification for earth work shall also apply to excavation in rock in general.
p) In case of hard rock requiring blasting, the provisions mentioned below shall be strictly followed.

**1) GENERAL**

Where hard rock is met with and blasting operations are considered necessary, the Contractor shall intimate about the same to the Engineer-in-Charge, and obtain his approval in writing for resorting to blasting operation.

The Contractor shall obtain license from the district authorities for undertaking blasting work as well as for obtaining and storing the explosive as per Explosive Rules 1983, corrected up to date. He shall purchase the explosives, fuses, detonators etc. only from a licensed dealer. He shall be responsible for the safe custody and proper accounting of the explosive materials. The Engineer-in-Charge or his authorized representative shall have the access to check the Contractor's store of explosive and his accounts.

In case where explosives are required to be transported and stored at site, relevant clauses of the Explosive Rules, 1983 as amended subsequently, shall apply.

The Contractor shall be responsible for any accident to workmen, public or property, due to blasting operations.

**2) PRECAUTIONS**

Blasting operations shall be carried out under the careful supervision of a responsible, authorized and licensed blaster of the Contractor (referred subsequently as "blaster" only) during specified hours, as approved in writing by the Engineer-in-Charge. The blaster shall be fully conversant with the rules of blasting.

Proper precautions for safety of persons shall be taken. Red flags shall be prominently displayed around the area to be blasted and all the people on the work except those who actually light the fuses shall withdraw to a safe distance of not less than 200 meters from the blast. Precautions as per Explosive Rules 1983 with amendment shall be followed.

**3) FUSES**

All fuses shall be cut to the lengths required before being inserted into the holes. Joints in fuses shall be avoided. Where these are unavoidable, a semicircular niche shall be cut in one piece of fuse about 2 cm. deep from the end and the end of other piece inserted into this niche, and the two pieces then wrapped together with a string. All joints exposed to dampness shall be wrapped with rubber tape. Fuse and detonators shall be kept separated from the explosives.

**4) BLASTING WITH GUN POWDER**

Blasting shall normally be done with gun powder. Dynamite, gelatin or any other high explosive shall only be used in special cases with the written permission of the Engineer-in-Charge.

In case of blasting with gun powder, the position of all bore holes to be drilled shall be marked out in circles with white paint. The bore holes shall be jumped or drilled in the rock face. The depth of bore hole shall be about the same as that of the line of least resistance and its size shall be such that the cartridges can easily pass down to the bottom. The bore holes must be dried before being charged and these shall be inspected by the Contractor's agent.

Gun powder may be used in the form of pellet blasting cartridges or as powder or granules. Cartridges are provided with tapered central hole. One end of fuse is passed through the narrow end of the hole and a sufficient length of the fuse is doubled back so that when the fuse is pulled, it is held tight in the tapered hole of the cartridge. Other cartridges are then inserted in the fuse to make up the required charge. The cartridge along with the fuse is lowered down in the bore hole, placed in position and gently filled and pressed home with dry hay or turf. The rest of the bore shall then be filled with dry clay, which shall be tamped with copper or brass rod until it becomes compact. Care shall be taken to avoid any possibility of an air space around the fuse. The safety fuses shall be taken to the required distance so as to allow the blasting to take place after the person lighting the fuse has withdrawn to a safe distance.

Where gun powder is used in the form of powder or granules it shall be introduced in the bore hole by means of funnel or copper tube. The bore holes shall be loaded with two thirds of the quantity of charge required, and safety fuse then directly introduced over the charge. Remaining one third charges shall then be introduced, and gently filled and pressed home with dry hay or turf. The rest of the bore hole shall be filled with dry clay in the same way as for cartridges, and the safety fuse taken to the required distance.

The charges shall be fired by igniting the fuse. The number of charges to be fired and the actual number of shots heard shall be compared, and the Contractor's blaster shall satisfy himself by examination that all the

charges have exploded, before workmen are permitted to approach the site. The charge which has not exploded shall not be permitted to be withdrawn.

The tamping and charge shall be flooded with water and the holes marked with a red cross (X) over it. Another hole shall be jumped at a distance of about 45 cm from the old hole and fired in the usual way. This operation shall be continued, till the original and any subsequent unfired charges are exploded.

**5) BLASTING WITH DYNAMITE OR ANY OTHER HIGH EXPLOSIVE**

In case of blasting with dynamite or any other high explosive the position of all bore holes to be drilled shall be marked out in circle with white paint. These shall be inspected by the Contractor's blaster. Bore holes shall be of a size that the cartridge can easily pass down. After the drilling operation, the blaster shall reinspect the holes to see that the holes marked out by him have been drilled. He shall then prepare all charges necessary for the bore holes. The bore holes shall be thoroughly cleaned before a cartridge is inserted. Wooden tamping rods (not pointed but cylindrical throughout) shall be used, in charging holes. Metal rods shall never be used for tamping. One cartridge shall be first placed in the bore hole, gently pressed and not rammed down. Other cartridges shall then be added as may be required to make up the necessary charge for the bore hole. The top most cartridges shall be connected to the detonator which shall in turn be connected to the safety fuse of required length.

The maximum of eight bore holes shall be loaded and fired on each occasion. The charges shall be fired successively and not simultaneously.

Immediately before firing a blast, due warning shall be given and the blaster shall see that all persons have retired to a place of safety. The safety fuses of the charged holes shall be ignited in the presence of the blaster, who shall see that all the fuses are properly ignited.

Careful count shall be kept by him and others of each blast as it explodes. After the blast the blaster shall inspect the work and ascertain that all the charged holes have been exploded. In case of misfired holes, he shall inspect the same after half an hour and mark red crosses (X) over the holes. During this interval of half an hour, no body shall approach the misfired holes. None of the drillers shall work near such holes, until one of the two following operations has been done by the blaster.

a. Either the Contractor's blaster shall very carefully (when the tamping is of damp clay) extract the tamping with a wooden scraper and withdraw the fuse, primer and detonator, after which a fresh detonator, primer and fuse shall be placed in the misfired holes and fired.

OR

b. The hole shall be cleaned for 30 cm of tamping and its direction ascertained by placing a stick in the hole. Another hole shall then be drilled 15 cm away and parallel to it. This hole shall be charged and fired. The misfired hole should also explode along with the new one

Before leaving the work, the blaster of one shift shall inform another blaster relieving him for the next shift, of any cases of misfire, and shall point out their positions denoted by red crosses and also state the action, if any, to be taken in the matter.

The Engineer-in-Charge shall also be informed by the blaster of all cases of misfire, their causes and steps taken in that connection.

**6) CONTROLLED BLASTING**

Whenever required by the Engineer-in-Charge, rock blasting shall be carefully controlled so that vibrations generated during the blasting do not cause damage to the buildings and installation around. Similarly, the rock pieces should not fly off and endanger the buildings and installations around. Apart from the general precautions mentioned in the preceding paragraphs, following protective measures and limits for use of explosive are suggested as guidelines. Tenderers are requested to carefully check the site conditions and submit details of the scheme they propose to adopt for controlling the blast.

Following protective measures shall be adopted while carrying out blasting operations.

The hole shall be covered with mild steel plate of minimum 12mm thickness.

Reinforcement rod meshes not less than 20mm dia. at 150mm center in both directions shall be placed over the steel plates.

Steel plate and reinforcement shall be inspected after every blasting operation and all twists shall be removed before reuse to the satisfaction of the Engineer-in- Charge.

Sand filled bags of 6 to 8 layers shall be placed over the mesh suitably covering the whole region under blasting operation.

The thickness of covering plate and the kind of dead weight is to be duly approved by the Engineer-in-Charge.

Hard rock requiring blasting as described under cl.no. 2.3 above, but where blasting is prohibited for any reason(s) breaking up of rock can be done by using Hydraulic Splitter and chemical substances of approved manufacturer (Lifton or equivalent) mixed in an appropriate proportion. The method involves drilling holes into rock and then inserting/injecting hydraulic splitter/chemical solvents into the holes. The breaking-up of rock takes place in a controlled fashion without much noise and spark.

**26.6 SHORING AND STRUTTING**:

a) The shoring and strutting of the sides to withhold the face of excavation pits/trenches shall be done when approved or directed by the Engineer-in-Charge.

b) The shoring shall be of close or open timbering type depending upon the site requirements and as directed by the Engineer-in-Charge whose decision shall be final and binding as to the type of shoring to be used.

c) The arrangement of the shoring and strutting shall be sound and safe and shall be got approved from the Engineer-in-Charge before installation. The approval shall not absolve the Contractor of his responsibilities of safety and any other requirements of the contract.

d) The shoring and strutting shall be kept in position till all the relevant work in the excavated area is completed and approved. It shall be dismantled and removed only after the permission to do so is obtained from the Engineer-in-Charge.

## 26.7 BACK FILLING AROUND FOUNDATIONS AND IN PLINTH

- Back filling around completed foundations, structures, trenches and in plinth shall be done to the lines and levels shown on the drawings including any trimming of the surfaces, as may be necessary. This shall be done with selected and approved earth from excavation or otherwise with materials described under clause 3.2 as directed by the Engineer-in-Charge. Where sufficient suitable material is not available from the excavation, the Engineer-in-Charge may direct to import suitable earth from other sources. The filling shall be done in layers of thickness not exceeding 15 cm with watering, rolling and ramming by manual methods/mechanical compactors to grade and level as shown on drawings to obtain 90% laboratory maximum dry density.
- The Contractor shall not commence filling in and around any work until it has been permitted by the Engineer-in- Charge.
- Backfilling around liquid retaining structures and pipes shall be done only after approval of the Engineer-in- Charge is obtained.

## 26.8 TRANSPORTATION OF SURPLUS EARTH

a) Surplus earth and soil from excavation shall be removed from construction area to the area demarcated by the Engineer-in-Charge.

## CHAPTER-27

## 27. SPECIFICATION FOR PLAIN AND REINFORCED CEMENT COCNRETE

This specification is applicable for Concrete Grade up to M55 and establishes the requirements of materials, mix proportioning, placing, curing, etc. of all types of cast- in-situ and precast concrete used in foundations, underground and over ground structures, floors, pavements etc. Any special requirements as shown or noted on the drawings shall supersede over the provisions of this specifications.

### 27.1 REFERENCE

Apart from this specification, construction of plain and reinforced concrete works shall be in accordance with the Indian Standard Code of Practice for "Plain and Reinforced Concrete" IS: 456 and other relevant codes mentioned therein.

- For Liquid Retaining Structures relevant Specification shall be applicable.
- For Structural Steel works Specification No. VCS-SS-CS-6024 & 6026 shall be applicable.
- In case of conflict between the clauses mentioned in this specification and those in the Bureau of Indian Standards (BIS), this specification shall govern.

### 27.2 MATERIALS

- Refer Chapter 25 of this specification.

### 27.3 GRADES OF CONCRETE

Characteristic Compressive strength for different grades of concrete shall be as per Table-1.

**TABLE – 1 GRADES OF CONCRETE**

| Grade Designation | Specified Characteristic Compressive Strength of 150 mm cube at 28 days (N/mm2 |
|---|---|
| M 15 | 15 |
| M 20 | 20 |
| M 25 | 25 |
| M30 | 30 |
| M35 | 35 |

Note for Table - 1: The characteristic strength is defined as the strength of material below which not more than five (5) percent of the test results are expected to fall.

### 27.4 TYPE OF CONCRETE MIX

Unless otherwise noted on drawings, all lean/plain and reinforced concrete shall be nominal mix and design mix types, respectively.

**NOMINAL MIX CONCRETE**

This concrete shall be made (without preliminary tests) by adopting nominal concrete mix with proportions of materials as specified in clause no. 9 of IS: 456.

**DESIGN MIX CONCRETE**

The mix shall be designed as per IS: 10262 & SP: 23 to produce the grade of concrete having the required workability and characteristic strength not less than appropriate values given in Table-1. The target mean strength of concrete mix shall be equal to the characteristic strength plus 1.65 times the standard deviation.

As long as the quality of materials does not change, a mix design done earlier but not prior to one year may be considered adequate for later work. However, in case the quality of materials changes or there is a break in the continuity of construction and the same work is allocated to a new contractor, the Engineer-in-Charge shall ask for a new design mix.

Irrespective of the grade of concrete required to be produced as per characteristic strength criteria, the minimum cement content and maximum free water cement ratio in the design concrete shall be strictly maintained as stipulated in Table 2 for the corresponding grade of concrete.

## 27.5 CONCRETE MIX PROPORTIONING

Proportioning, as used in this specification, shall mean the process of determining the proportions of the various ingredients to be used to produce concrete of the required workability when fresh/green and strength, durability and surface finish, when hardened. The following information shall be collected prior to design of the concrete mix:

a. Grade designation.

b. Type of cement.

c. Maximum nominal size of aggregate.

d. Minimum cement content.

e. Maximum free water cement ratio

f. Workability requirements.

g. Exposure condition as per Table 3 & Table 4 of IS: 456

h. Maximum temperature of concrete at the time of placing.

i. Method of Placing.

The Engineer-in-Charge shall verify the strength of the concrete mix, before giving his sanction of its use. However, this does not absolve the Contractor of his responsibility as regards achieving the prescribed

strength of the mix. If during the execution of the work, cube tests show lower strengths than required, the Engineer-in-Charge shall order fresh trial mixes to be made by the Contractor. No claim to alter the rates of concrete work shall be entertained due to such changes in mix variations. Any variation in cement consumption shall be taken into consideration for material reconciliation. Preliminary mix designs shall be established well ahead of start of work.

**a) MAXIMUM DENSITY**

Suitable proportions of sand and the different sizes of coarse aggregates for each grade of concrete shall be selected to give as nearly as practicable the maximum density. This shall be determined by mathematical means, laboratory tests, field trials and suitable changes in aggregate gradation. The contractor shall submit to the Engineer-in-Charge at least three sets of mix design and corresponding test results after varying the mix proportions and / or grading of aggregate so as to establish the maximum density of any particular grade of concrete.

**b) CONSISTENCY**

The concrete shall have a consistency such that it shall be workable in the required position and when properly vibrated it flows around reinforcing steel, all embedded fixtures, etc.

**c) WORKABILITY**

"Workability of Concrete" shall be as per clause no. 7 of IS: 456.

**d) DURABILITY**

For achieving sufficiently durable concrete, strong, dense aggregates, low water- cement ratio and adequate cement content shall always be used. Workability of concrete shall be such that concrete can be completely compacted with the means available. Leak-proof formwork shall be used so as to ensure no loss of cement-slurry during pouring and compaction. Cover to reinforcement shall be uniform and as shown on drawings. Concrete mix design shall always take into account the type of cement, minimum cement content irrespective of the type of cement and maximum free water

cement ratio and minimum grade of concrete conforming to the exposure conditions as given in Table-2.

**TABLE-2**

**MINIMUM CEMENT CONTENT, MAXIMUM FREE WATER CEMENT RATIO AND MINIMUM GRADE OF CONCRETE FOR DIFFERENT EXPOSURE CONDITIONS**

| Exposure | Plain Concrete | | | Reinforced Concrete | | |
|---|---|---|---|---|---|---|
| | Minimum Cement Content (kg /m3) | Maximum Free Water Cement Ratio | Minimum Grade of Concrete | Minimum Cement Content (kg / m3) | Maximum Free Water Cement Ratio | Minimum Grade of Concrete |

| | | | | | | |
|---|---|---|---|---|---|---|
| Mild | 220 | 0.6 | M 15 | 300 | 0.55 | M 20 |
| Moderate | 240 | 0.6 | M 15 | 300 | 0.50 | M 25 |
| Severe | 250 | 0.5 | M 20 | 320 | 0.45 | M 30 |
| Very Severe | 260 | 0.45 | M 20 | 340 | 0.45 | M 35 |
| Extreme | 280 | 0.4 | M 25 | 360 | 0.4 | M 40 |

Note: Cement prescribed in this table is irrespective of grade of Cement and it is inclusive of pozzolanas, Fly Ash, Ground Granulated Blast Furnace Slag may be taken into account in the concrete composition within respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolona and slag specified in IS: 1489 (part-1) and IS: 455 respectively.

Generally, the following types of cement shall be used for Plain and Reinforced concrete works:

a. 33 Grade Ordinary Portland Cement conforming to IS: 269.

b. 43 Grade Ordinary Portland Cement conforming to IS: 8112.

c. Rapid hardening Portland Cement conforming to IS 8041.

d. Portland Slag Cement conforming to IS: 455.

e. Portland Pozzolana Cement (fly ash based) conforming to IS: 1489(Part 1)

f. Portland Pozzolana Cement (calcined clay based) conforming to IS: 1489(Part-2).

g. Sulphate Resisting Portland Cement conforming to IS: 12330

Sulphate Resisting Portland Cement shall be used only for specific requirements depending on environmental and process exposure conditions to which the structures may be subjected to like high sulphate concentrations, processes involving sulfur handling etc.

**e) FREE WATER CEMENT RATIO**

Once a mix, including its free water cement ratio, has been determined and approved for use by the Engineer-in- Charge, that free water cement ratio shall be maintained. The Contractor shall determine the water content of the aggregates frequently as the work progresses, and the amount of mixing water shall be adjusted so as to maintain the approved free water cement ratio. Maximum free water-cement ratio shall be as per Table-2 for different exposure condition.

The minimum cement content as mentioned in Table-2 shall be adjusted for aggregates other than 20mm nominal maximum size. The minimum cement content in the concrete mix shall be increased by 40kg/m3 and decreased by 30 kg/rn3 for 10mm and 40mm nominal maximum size aggregates respectively.

For maximum cement content refer clause no. 8.2.4.2 of IS: 456.

**f) LIMITS TO DELETERIOUS CONSTITUENTS**

Careful selection of the mix and the constituent materials shall be made to limit the presence of deleterious constituents in concrete. The total acid soluble chloride content calculated from the mix proportion and the measured chloride content of each of the constituents shall not exceed 0.6 kg/m3 at the time of placing of concrete. The total water soluble sulphate content of the concrete mix shall not exceed 4 percent by mass of the cement in the mix.

**27.6 BATCHING**

Refer clause no. 10.2 of IS: 456.

**a) CONCRETE MIXING**

The mixing of concrete shall be strictly carried out in an approved type of mechanical concrete mixer. The mixer shall be fitted with water measuring devices. The mixing shall be continued until there is a uniform distribution of the material and the mass is uniform in colour and consistency. If there is segregation after unloading from the mixer, the concrete shall be remixed.

Use of Ready Mixed Concrete supplied by Ready Mixed Concrete Plants or from on/off- site batching plants (IS: 4926) shall be preferred for structural concrete.

All records and charts for the batching and mixing operations shall be prepared and maintained by the contractor as per the instructions of Engineer-in-Charge.

**b) MIXER**

Mechanical Mixers shall comply with IS: 1791 and 12119 and shall be maintained in satisfactory operating condition. These shall be used only for producing lean/ plain concrete and/ or nominal mix concrete wherever permitted.

**MIXING TIME**

Mixing time shall be as indicated in the following table. Excessive mixing requiring additions of water shall not be permitted. Time shall start when all solid materials are poured in the revolving mixer drum, provided that all of the mixing water shall be introduced before one-fourth of the mixing time has elapsed. The Engineer-in-Charge may, however, direct a change in the mixing time, if he considers such a change necessary.

**MINIMUM MIXING TIME FOR MIXERS**

| Capacity of mixer | Minimum mixing time |
|---|---|
| 2 m3 or less<br>Above 2 m3 | 2 minutes<br>3 minutes or as recommended by the mixer manufacturer. |

**c) HAND MIXING**

Hand mixing of concrete shall not be permitted. However, for non-critical applications namely foundations for crossovers, isolated operating platforms etc., using concrete of maximum grade M20 and located at far away isolated places, this may be permitted by the Engineer-in-charge as a special case. Ten percent (10%) extra cement shall be added to the design proportion. Mixing shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. No extra payment shall be made to the Contractor for mixing by hand or for using extra cement due to hand mixing.

**d) ADDITIVES**

Additive in concrete shall be used only with the prior approval of the Engineer-in- Charge and shall comply with clause no. 5.5 of IS: 456. Any additive used for obtaining proper workability or leak-proofness of concrete or repair/rendering works of concrete due to non-conformance to the specifications, shall not be measured and paid for. All costs relating to such usage shall be borne by the Contractor.

## 27.7 TRANSPORTATION, PLACING AND COMPACTION

**a) GENERAL**

The entire concrete placing program including transportation arrangements, deployment of equipment, layout, proposed procedures and methods, shall be submitted to the Engineer-in-Charge 24 hours prior to concreting for approval. No concreting shall be placed until his approval has been received. Approval of the Engineer-in-Charge for pouring concrete shall be taken as 'conveyed', when the concrete pour card is signed by him.

**CHUTING**

The use of long troughs, chutes and pipes for conveying concrete from the mixer to the forms shall be permitted only on written authorization from the Engineer-in-Charge. In case an inferior quality of concrete is produced by the use of such conveyors, the Engineer-in-Charge may order discontinuance of their use and the substitution of a satisfactory method of placing the concrete. Open troughs and chutes shall be equipped with baffles and be in short lengths to avoid segregation. Chutes shall be designed so that the concrete is, to some extent, remixed at the lower end by passing down through a funnel shaped pipe or drop chute. Alternatively, they shall discharge into a storage hopper from which the concrete shall be transported to the point of placing by wheel barrows or other means. Where drop chutes are used, a sufficient number of these must be provided, so that the concrete discharged from the chute is not required to flow laterally more than

1.0 meter. Where a drop chute is swung from the vertical, the bottom two sections must be maintained in a vertical position to avoid segregation. The addition of water at any point in the system of transportation, to facilitate the movement of concrete shall not be permitted. All chutes, troughs and pipes, shall be kept clean and free from coatings of hardened concrete by thoroughly flushing them with water after each run; water used for flushing shall be discharged clear of the structure. Concrete shall not be normally permitted to fall freely from a height of more than 1.5 meter nor to strike the forms at an angle. However, a deviation from this normal practice may be allowed provided proper precaution is taken, while placing concrete into the forms to avoid segregation, to the satisfaction of the Engineer-in- Charge.

**VIBRATORS**

a. Concrete shall be compacted with mechanical vibrating equipment supplemented, if necessary to obtain consolidation, by hand spreading, rodding and tamping. The vibrators shall be of immersion type with operational frequency ranging between 8,000 to 12,000 vibrations per minute. All vibrators shall comply with IS: 2505. Screed board concrete vibrators or concreting vibrating tables or form vibrators conforming to IS: 2506, 2514 and 4656, respectively, shall be used where specifically required and directed by Engineer-in-Charge.

b. Immersion type vibrators shall be inserted in a vertical position at intervals of about 600mm, depending upon the mix, the equipment used, and experience on work. The vibrators shall be withdrawn slowly. The spacing shall provide some overlapping of the area vibrated at each insertion. In no case shall vibrators be used to transport concrete inside the forms. Over vibration or under vibration shall not be permitted as both are harmful. Hand tamping in some cases may be allowed subject to the approval of the Engineer-in-Charge.

c. In placing concrete in layers which are advancing horizontally as the work progresses, great care shall be exercised to ensure adequate vibration, bonding and molding of the concrete between the succeeding batches.

d. The vibrator shall penetrate the layer being placed and also penetrate the layer below while the under layer is still plastic to ensure good bond and homogeneity between the two layers and prevent the formation of cold joints.

e. Care shall be taken to prevent contact of vibrators against all embedded reinforcing steel or inserts. Vibrators shall not be allowed to come in contact with forms.

f. The use of form vibrators shall not be permitted for compaction of in-situ concrete without specific authorization of the Engineer-in-Charge.

g. The use of surface vibrators of screed board type shall not be permitted for consolidation of concrete under ordinary conditions. However, for thin slabs (of thickness less than 200mm) surface vibration by such vibrators may be permitted, upon approval of the Engineer-in-Charge.

h. Whenever vibration has to be applied externally, the design of formwork and the disposition of vibrators shall be carefully planned to ensure efficient compaction and to avoid surface blemishes.

**b) TRANSPORTATION**

All concrete shall be conveyed from the mixer to the place of final deposit such as formwork as rapidly as possible using suitable buckets, dumpers, pumps, transit mixers containers or conveyors which shall be mortar leak tight. Care shall be taken to prevent the segregation or loss of the ingredients and maintaining the required workability. For structural concrete produced from Ready Mixed Concrete Plants as per clause no. 8.1, concrete shall be transported from the plants to the sites only by transit mixers.

During hot or cold weather, concrete shall be transported in deep containers. Other suitable methods to reduce the loss of water by evaporation in hot weather and heat loss in cold weather may also be adopted. All equipment used for transporting and placing of concrete shall be maintained in clean condition. All buckets, hoppers, chutes, dumpers and other equipment shall be thoroughly cleaned after each use.

**c) PLACING AND COMPACTION**

- Before placing concrete, all soil surfaces upon which or against which concrete is to be placed shall be well compacted and free from standing water, mud or debris. Soft or yielding soil shall be removed and replaced, with lean concrete or with selected soils/sand and compacted to the density as directed by Engineer-in-Charge. The surface of absorptive soil (against which concrete is to be placed) shall be moistened thoroughly so that moisture is not drawn from the freshly placed concrete. Similarly, for concrete to be placed on formworks, all chippings, shavings and sawdust etc. shall be removed from the interior of the forms before the concrete is placed.
- Concrete shall not be placed until the formwork, the placement of reinforcing steel, embedded parts; pockets etc. have been inspected and approved by the Engineer- in- Charge. Any accumulated water on the surface of the bedding layer shall be removed by suitable means before start of placement. No concrete shall be placed on a water covered surface.
- Concrete shall be discharged by vertical drop only and the drop height shall not normally exceed 1.5 meter throughout all stages of delivery until the concrete comes to rest in forms. For continuous concreting operation windows of suitable size shall be kept in the formwork or chutes shall be used to avoid segregation of concrete.
- Concrete shall be deposited as near as practicable in its final position to avoid rehandling. Concrete shall be placed in successive horizontal layers. The bucket loads, or other units of deposit, shall be placed progressively along the face of the layer with such over-lap as will facilitate spreading the layer of uniform depth and texture with a minimum of hand shoveling. Any tendency to segregation shall be corrected by shoveling coarse aggregates into mortar rather than mortar on the coarse aggregates. Such a tendency for segregation shall be corrected by redesign of mix, change in process or other means, as directed by the Engineer-in-Charge.
- All struts, stays and braces (serving temporarily to hold the forms in correct shape and alignment pending the placing of concrete at their locations) shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. These shall not be buried in the concrete. Concrete shall be thoroughly compacted with vibrators and fully worked around the reinforcement, embedded fixtures and into corners of formwork before setting commences and shall not be subsequently disturbed. Methods of placing shall be such as to preclude segregation and avoid displacement of reinforcement or formwork. The formation of stone-pockets or mortar bondage in corners and against face forms shall not be permitted. Should these occur, they shall be dug out, reformed and refilled to sufficient depth and shape for thorough bonding as directed by the Engineer-

in-Charge. Care shall be taken to avoid displacement of reinforcement and embedded inserts or movement of formwork.

- Unless otherwise approved, concrete shall be placed in single operation to the full thickness of foundation rafts, slabs, beams and similar members. Concrete shall be placed continuously until completion of the part of the work between approved construction joints or as directed by the Engineer-in-Charge.
- The method of placing and compaction employed in any particular section of the work shall be to the entire satisfaction of the Engineer-in-Charge.
- During hot weather (atmospheric temperature above 40 degree Celsius) or cold weather (atmospheric temperature less than 5 degree Celsius, the concreting shall be done as per the procedure set out in IS: 7861).

Concrete that has set standing and becomes stiffened shall not be used in the work.

**d) ITEMS EMBEDDED IN CONCRETE**

Concreting shall not be started unless the electrical conduits, pipes, fixtures etc., wherever required, are laid by the concerned agency. The Contractor shall afford all the facilities and maintain co-ordination of work with other agencies engaged in electrical and such other works as directed by the Engineer-in-Charge.

Before concreting, the Contractor shall provide, fabricate and lay in proper position all metal inserts, anchor bolts, pipes etc. (which are required to be embedded in concrete members) as per relevant drawings and directions of Engineer-in-Charge.

All embedment,inserts etc. shall be fully held and secured in their respective positions by the concerned agencies to the entire satisfaction of Engineer-in-Charge so as to avoid any dislocation or displacement during the concreting operations. The Contractor shall take all possible care during concreting to maintain these embedment/inserts in their exact locations

## 27.8 CONSTRUCTION JOINTS

- Construction joints shall be provided in position as shown or described on the drawings or as directed by the Engineer-in-Charge. Such joints shall be kept to the minimum. These shall be straight and at right angles to the direction of main reinforcement and shall be placed at accessible locations to permit cleaning out of laitance, cement slurry and unsound concrete. Construction joints shall comply with IS: 11817
- In a column, the joint shall be formed about 100mm to 150mm below the lowest soffit of the beams framing into it. Concrete in a beam and slab shall be placed throughout without a joint but if the provision of a joint is unavoidable, the joint shall be vertical and located within 1/3 to 1/4 of the span, unless otherwise shown on the drawings.
- When stopping the concrete on a vertical plane in slabs and beams, an approved stop board shall be placed with necessary slots for reinforcement bars. The construction joints shall be keyed by providing a triangular or trapezoidal fillet nailed on the stop board. Inclined joints shall not be permitted. Any concrete flowing through the joints of stop board shall be removed soon after the initial set. When concrete is stopped on a horizontal plane, the surface shall be roughened and cleaned

after the initial set and a triangular or trapezoidal groove shall be provided for keying with the new concrete later.

- When the work has to be resumed on a surface which has hardened, such surface shall be cleared of any foreign materials and roughened to expose the tips of the coarse aggregate. This may be done by manual chipping of concrete, with a high pressure water jet or by any other appropriate means as per Engineer-in-Charge's directions. It shall then be swept clean and thoroughly washed and wetted before any new concrete is poured. Any set mortar or concrete sticking to the exposed reinforcing rods in and around such joints shall be thoroughly removed. The reinforcements shall be wire brushed and washed just before pouring any cement slurry or mortar. For vertical joints neat cement slurry shall be applied on the surface before it is dry. For horizontal joints the surface shall be covered with a layer of mortar about 10 to 15mm thick composed of cement and sand in the same ratio as the cement and sand in concrete mix. This layer of cement slurry or mortar shall be freshly mixed and applied immediately before placing new concrete.
- Where the concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of particles of aggregate. The surface shall be thoroughly wetted and all free water removed. The surface shall then be coated with neat cement slurry. On this surface layer of concrete not exceeding 150mm in thickness shall first be placed and shall be well rammed against old work, particular attention being paid to corners and close spots; work thereafter shall proceed in normal way.

### 27.9 SEPARATION JOINT

Separation joint shall be obtained by using an approved alkathene sheet stuck on the surface against which concrete shall be placed. Adequate care shall be taken to cause no damage to the sheet.

### 27.10 EXPANSION JOINTS/ISOLATION JOINT

Expansion/ isolation joints in structures shall be formed in the positions and to the shapes shown in the relevant drawings. Joints shall be filled with joint filling material as stipulated in the drawings/schedule of rates. Isolation joints shall be provided around all equipment foundations, columns, pedestals, trenches etc. on grade.

### 27.11 WATER STOPS

PVC water stops as per Specification No. SS-CV-021 for materials shall be accurately cut, fitted and integrally joined as per manufacturer's specifications to provide a continuous, watertight diaphragm at all points.

The water stops shall be located and embedded at expansion/contraction/ construction joints as indicated in the drawings or directed by the Engineer-in-Charge.

Adequate provision shall be made for the support and protection of water stops during the progress of the work. Damaged water stops shall be replaced and/or repaired as directed.

## 27.12 PROTECTION OF FRESHLY LAID CONCRETE

Newly placed concrete shall be protected, by approved means, from rain, sun and wind. Concrete placed below the ground level shall be protected from falling earth during and after placing. Surface shall be kept free from contact with such ground or with water draining from such ground during placing of concrete for a period of at least 3 days, unless otherwise directed by the Engineer-in-Charge. The ground water around newly poured concrete shall be kept to an approved level by pumping or other approved means of drainage and adequate steps shall be taken to prevent floatation and flooding. Steps shall be taken to protect immature concrete from damage by debris, loading, vibration, abrasion, mixing with deleterious materials that may, in the opinion of the Engineer-in-Charge, impair the strength and/or durability of the concrete.

## 27.13 CURING

Concrete shall be cured by keeping it continuously moist wet for the specified period of time to ensure complete hydration of cement and its hardening. Curing shall be started after 8 hours of placement of concrete in normal weather, and in hot weather after 4 hours. The water used for curing shall be of the same quality as that used for making of concrete.

Curing shall be assured by use of an ample water supply under pressure in pipes, with all necessary appliances such as hose, sprinklers etc. A layer of sacking, canvas, hessian, or other approved material, which will hold moisture for long periods and prevent loss of moisture from the concrete, shall be used as covering. Type of covering which would stain, disfigure or damage the concrete, during and after the curing period, shall not be used. Only approved covering shall be used for curing.

Exposed surfaces of concrete shall be maintained continuously in a damp or wet condition for at least the first 7 days after placing of concrete.

The Contractor shall have all equipment and materials required for curing on hand and ready to use before concrete is placed.

For curing the concrete in pavements, floors, flat roofs or other level surfaces, the ponding method of curing shall be used. For the first 24 hours after concreting the concrete shall be cured by use of wet sacking, canvas, hessian etc. The minimum water depth of 25mm for ponding shall be maintained. The method of containing the ponded water shall be approved by the Engineer-in-Charge. The ponded areas shall be kept continuously filled with water, and leaks, if any, shall be promptly repaired. Areas cured by ponding method shall be cleared of all debris and foreign materials after curing period is over.

Alternatively, membrane curing may be used in lieu of moist curing with the permission of the Engineer-in-Charge. Such compounds shall be applied to all exposed surfaces of the concrete by spraying or brushing as soon as possible after the concrete has set. Minimum film thickness of such curing compounds shall be as per the recommendation of the manufacturer so as to obtain an efficiency of 90% as specified by BS-8110. This film of curing compound shall be fully removed from the concrete surface after the curing period specified earlier. Engineer-in-Charge may not allow curing by curing compounds for those surfaces where use of curing compound may be detrimental to application of future finishes over the concrete. Impermeable membranes such as polyethylene sheeting closely covering the concrete surface may also be used.

For concretes containing Portland Pozzolana cement or Portland slag cement, the curing period as given in clause no. 15.1 shall be doubled. Curing by ponding shall, however, commence after the first 24 hours of concreting.

### 27.14 FIELD TESTS

**Grading Test**

Grading test on fine and coarse aggregates shall be carried out as per IS: 2386 at intervals specified by the Engineer-in-Charge.

The mandatory tests and their frequencies shall be done on sand and stone aggregates as given in Table-3

TABLE - 3

TESTS ON SAND & STONE AGGREGATES

| S.No | MATERIAL | TEST | FIELD/LAB TEST | MIN. QTY. OF MATERIAL/WORK FOR CARRYING OUT THE TEST | FREQUENCY OF TESTING |
|---|---|---|---|---|---|
| 1. | Sand | (a) Bulking of sand | Field | 20 m3 | Every 20 m3 or part thereof or more frequently as decided by the Engineer-in-Charge |
| | | (b) Silt content | Field | 20 m3 | |
| | | (c) Particle size distribution | Field or Lab as decided by the Engineer-in- Charge | 40 m3 | 1) Every 40 m3 of fine aggregate/ sand required in RCC works only 2) Every 80 m3 of fine aggregate/sand required for other items |
| 2. | Stone aggregate | a) Percentage of soft or deleterious materials | General visual inspection, laboratory test where required by the Engineer-in-Charge or as specified | As required by Engineer-in- Charge | For all quantities |

| | | | | | |
|---|---|---|---|---|---|
| | | b) Particle size | Field or lab. as required by Engineer-in- Charge | 45 m3 | For every 45 m3 or part thereof as decided by Engineer-in- Charge |
| | | c) Ten percent value | Laboratory | 45 m3 | Initial test and subsequent test as & when required by Engineer-in- Charge |

## 27.15 VEE-BEE TEST/SLUMP TEST OF CONCRETE

For structural quality concrete (excluding pavements, flooring etc.) at least one Slump Test shall be made for every compressive strength test carried out. More frequent tests shall be made if there is a distinct change in working conditions or if required by the Engineer-in-Charge.

For structural quality concrete for pavements & floorings, measurement of workability shall be by determination of compacting factor. Value of compacting factor of 0.75 to 0.8 shall generally be acceptable.

**STRENGTH TEST OF CONCRETE**

Samples from fresh concrete shall be taken as per IS: 1199 and cubes shall be made, cured and tested at 28 days in accordance with IS: 516.

In order to get a relatively quicker idea of the quality of concrete, optional tests on beams for modulus of rupture at 72±2 hours or at 7 days, or compressive strength tests at 7 days may be carried out in addition to 28 days compressive strength tests. For this purpose, the values shall be arrived at based on actual testing. In all cases, the 28 days compressive strength specified in Table-1 shall alone be the criterion for acceptance or rejection of the concrete.

**PROCEDURE**

A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested, that is the sampling should be spread over the entire period of concreting and cover all mixing units.

**FREQUENCY OF SAMPLING**

The minimum frequency of sampling of concrete for each grade shall be in accordance with Table-4.

TABLE - 4

**FREQUENCY OF CONCRETE SAMPLING**

| Quantity of concrete in the work in m3 | Number of samples |
|---|---|
| 1-5 | 1 |
| 6-15 | 2 |
| 16-30 | 3 |
| 31-50 | 4 |
| 51 & above | 4 plus one additional sample for each additional 50m3 or part thereof. |

At least one sample shall be taken from each shift. Where concrete is produced at continuous production units such as ready mixed concrete plants, frequency of sampling may be agreed upon mutually by Engineer-in-Charge.

**TEST SPECIMEN**

Three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for various purposes such as to determine the strength of concrete at 7 days or at the time of striking the formwork or to check the testing error. Additional samples may also be required for testing samples cured by accelerated methods as described in IS: 9013. The specimen shall be tested as described in IS: 516.

**IDENTIFICATION MARK ON CONCRETE TEST CUBES:**

The following numbering system shall be adopted on each 150mm cube: First line: ZZ (Alpha code assigned by the Engineer -in-Charge to the Contractor for a particular contract starting with AA and progressing to AB, AC and so on).

Second line: XXXX (Unique integer in ascending order starting from 1). Third line: DD-MM-YY (Date of casting of cube).

**TEST RESULTS OF SAMPLE**

The test results of the sample shall be the average of the strength of three specimens. The individual variation should not be more than ± 15 percent of the average. If the individual variation is more than ± 15 percent, the test results of the sample shall be considered invalid

**STANDARD DEVIATION**

a. Standard deviation based on test results of samples:

i. The total number of test samples required to constitute an acceptable record for calculation of standard deviation shall be not less than 30. Attempts shall be made to obtain the 30 samples, as early as possible, when a mix is used for the first time.

ii. For design of mix in the first instance, the value of standard deviation given in Table-8 of IS: 456 may be assumed.

iii. As soon as sufficient results of samples are available, actual calculated standard deviation shall be used and the mix design revised/ updated.

**ACCEPTANCE CRITERIA**

**a. Compressive Strength**

The concrete shall be deemed to comply with the strength requirement when both the conditions as given in Table-11 of IS: 456 for that particular grade of concrete are simultaneously met. For working out standard deviation compressive test result of date wise serially logged 30 sample test result will be used.

**b. Flexural Strength**

The concrete shall be deemed to comply with flexural strength requirements when both the following conditions are simultaneously met:

i. The mean strength determined from any group of four consecutive test results exceeds the specified characteristic strength by at least 0.3 N/mm2.

ii. For non overlapping consecutive compressive test result any one alternate set of four samples shall be used for verification of compliance to clause no 16.1.a of IS 456.

iii. The strength determined from any test result is not less than the specified characteristic strength less 0.3 N/mm2

c. Quantity of Concrete Represented by Strength Test Results

The quantity of concrete represented by group of four consecutive test results shall include the batches from which first and last samples were taken together with all intervening batches. Acceptance of concrete shall be applicable for serially logged 30 samples. In case serially logged samples are less than 30 then standard deviation of adjoining previous sample sets standard deviation will be used for establishing acceptance criteria as per clause no 16.1.a of IS 456.

For the individual test result requirements given in Table 11 of IS: 456 or in item (ii) of 16.3.9 (b), only the particular batch from which the sample was taken shall be at risk.

Where the mean rate of sampling is not specified, the maximum quantity of concrete that four consecutive test results represent shall be limited to 60m3.

d. If the concrete is deemed not to comply pursuant to 16.3.9 (c), the structural adequacy of the parts affected shall be investigated and any consequential action as needed shall be taken (Refer clause no. 17.0 & 18.0).

e. Concrete of each grade shall be assessed separately.

f. Concrete is liable to be rejected if it is porous or honey-combed, its placing has been interrupted without providing a proper construction joint, the reinforcement has been displaced beyond the tolerances specified, or construction tolerances have not been met. However, the hardened concrete may be accepted after carrying out suitable remedial measures and tests to the fullest satisfaction of the Engineer-in-Charge.

## 27.16 INSPECTION AND TESTING OF STRUCTURES

### INSPECTION

To ensure that the construction complies with the design, an inspection procedure shall be set up by the contractor and duly approved by Engineer-in Charge covering materials used, receipt of materials, their test results, records, workmanship and construction etc.

Immediately after stripping the formwork, all concrete shall be carefully inspected and any defective work or small defects either removed or made good before concrete has thoroughly hardened.

### TESTING

In case of doubt regarding the grade or soundness of concrete used, either due to poor workmanship or based on results of cube strength, compressive strength tests of concrete on the basis of clause no. 17.4 and/or load test as per clause no. 17.6 of IS: 456 shall be carried out.

The Engineer-in-Charge shall be the final authority for interpreting the results of all tests and shall decide upon the acceptance or otherwise. The decision of the Engineer- in-Charge shall be final and binding on the contractor. In case the results of the tests are unsatisfactory, the Engineer-in-Charge may instruct the contractor to demolish and reconstruct the structure or part thereof without any extra cost to the Owner.

### MEMBERS OTHER THAN FLEXURAL MEMBERS

Members other than flexural members like columns etc. shall be referred to the designer to investigate the structural adequacy. The decision of the designer shall be final and binding on the contractor.

### NON - DESTRUCTIVE TESTS

Non-destructive tests using Ultrasonic Pulse Velocity and Rebound Hammer methods shall be resorted to for checking the soundness of concrete placed and shall be as per the directions of Engineer-in-Charge. The testing shall be based on IS: 13311, Part-1. However, the Rebound Hammer test (IS: 13311, Part-2) shall only be used in combination with other tests (Destructive or Non-Destructive) for checking the concrete quality

## 27.17 FINISHING OF CONCRETE

- striking the formwork, all surface defects such as bulges, ridges and honey-combing etc. observed shall be brought to the notice of the Engineer-in-Charge. The Engineer- in-Charge may, at his discretion allow rectification by necessary chipping and packing or grouting with concrete or cement mortar. However, if honey-combing or sagging is of such extent as being undesirable, the Engineer-in-Charge may reject the work totally and his decision shall be binding. No extra payment shall be made for rectifying these defects, demolishing and reconstructing the structure. However, quantity of cement actually used for this purpose may be considered for reconciliation of materials. All burrs and uneven faces shall be rubbed smooth with the help of carborundum stone.
- The surface of non-shuttered faces shall be smoothened with a wooden float to give a finish similar to that of the rubbed down shuttered faces. Concealed concrete faces shall be left as from the formwork except that honey-combed surface shall be made good as specified above. The top faces of slabs not intended to be covered shall be levelled and floated to a smooth finish to the rises or falls shown on the drawings or as directed. The floating shall not be executed to the extent of bringing excess fine materials to the surface. The top faces of slabs intended to be covered with screed, granolithic or similar finishes, shall be left with a rough finish.

**REPAIR AND REPLACEMENT OF UNSATISFACTORY CONCRETE**

- Repair shall be made as soon as possible after the forms are removed and before the concrete becomes too hard with prior permission from the Engineer-in-Charge, in writing. Stone pockets, segregation patches and damaged areas shall be chipped out and the edges undercut slightly to form a key. All loose material shall be washed out before patching. No excess water shall be left in the cavity, but the concrete shall be damp. A good bond between the patch and parent concrete shall be obtained by sprinkling dry cement on the wet surface or by throwing mortar with force on to the wetted concrete, or by brush in a coat of thick cement grout of about 1:1 ( 1 cement: I sand) just before applying the patching material. Before this has dried, the remainder of the patch shall be filled with mortar or concrete, depending on the extent of the repair.
- Cement concrete/mortar used in repair of exposed surfaces shall be made with cement from the same source as that used in concrete and blended with sufficient amount of white Portland cement to produce the same colour as in the adjoining concrete. The proportions of ingredients shall be same as those used in parent concrete. The mortar shall be as dry as possible and well compacted into the cavity. All filling shall be tightly bonded to the concrete and shall be sound, free from shrinkage cracks after the filling has been cured and dried.
- For larger repairs to hardened concrete, necessary formwork bearing tightly at the edges of the cavity shall be provided. Concrete shall be chipped out to a depth of at least 100mm and preferably 150mm. Mortar shall be scrubbed into all surfaces with a wire brush before placing the concrete. Damaged reinforcement shall be adequately spliced with new steel so as to maintain the original strength. Additional reinforcement, if required in the patch, shall be provided as per the instructions of Engineer-in-Charge.
- In case in the opinion of the Engineer-in-Charge defects in the concrete is excessive or beyond repair, the contractor shall either redo the structure or take other remedial measures as instructed by the Engineer-in-Charge. The decision of the Engineer-in- Charge shall be final and binding to all in this respect.

- Approved epoxy formulation for bonding fresh concrete used for repairs with already hardened concrete shall be used by the Contractor if asked by the Engineer-in-Charge. Epoxy shall be applied in strict accordance with instructions of the manufacturer.
- All repair works due to non-conformance or non-adherence to specification, if allowed by the Engineer-in-Charge, shall be carried out free of cost to the owner.

**CURING OF PATCHED WORK**

Immediately after patching is completed, the patched area shall be covered with an approved non-staining water saturated material which shall be kept wet and protected against sun and wind for a period of 12 hours. Thereafter, the patched area shall be kept continuously wet by a fine spray or sprinkling for not less than 10 days.

**27.18 CEMENT WASH**

If not otherwise provided with protective coating due to architectural and/ or geo- technical requirements, all concrete elements (whether cast-in-situ or precast) exposed to atmosphere shall be provided with three coats of cement based waterproof paint as per IS: 5410. Prior to application of the paint, the surface shall be prepared to remove all foreign particles, loose materials, extra deposited concrete lumps, etc. using appropriate mechanical/ manual means.

**27.19 FORM WORK**

**a) General**

- Forms for concrete shall be of plywood conforming to IS: 6461 or steel or as directed by the Engineer-in-Charge and shall give smooth and even surface after removal thereof.
- If it is desired by the Engineer-in-Charge, the Contractor shall prepare, before commencement of actual work, design and drawings for formwork and get them approved by the Engineer-in-Charge. For details regarding design, detailing etc., reference may be made to IS: 14687.
- Form work and its supports shall maintain their correct position and be to correct shape and profile so that the final concrete structure is within the limits of dimensional tolerances specified below, unless required otherwise, for functional/aesthetic reasons. The decision of the Engineer-in-Charge shall be final and binding in this regard.

**a. Deviation from specified dimensions of cross section of columns and beams. - 6mm to +12mm**

**b. Deviation from dimensions of footings (see Note below)**

i. Dimensions in plan -12mm to +50mm

ii. Eccentricity 0.02 times the width of the footing in the

1. direction of deviation but not

2. More than 50 mm.

iii. Thickness ±0.05 times the specified thickness.

Note: These tolerances apply to Cast-in-situ concrete dimensions only, not to positioning of vertical reinforcing steel or dowels.

**c. Deviation in length (major dimension of single unit)**

up to 3m ±6mm

3m to 4.5m ±9mm

4.5m to 6m ±12mm

Additional deviation for every subsequent 6m. ±6mm

**d. Deviation in straightness or bow (deviation from specified line) for a single or continuous member) e.g. beam, column or slab edge.**

Up to 3m 6mm

3m to 6m 9mm

6m to 12m -12mm

Additional for every subsequent 6m. -6mm

**e. Deviation in squareness shall be measured taking the longer of two adjacent sides as the base line.**

The shorter side shall not vary in its distance from a perpendicular so that the difference between the greatest and shortest dimensions exceeds 6mm. For this purpose, any error due to lack of straightness shall be ignored. Squareness shall be checked with respect to the straight lines that are most nearly parallel with the features being checked. When the nominal angle is other than 90 degree, the included angle between check lines shall be varied accordingly.

f. Deviation in twist shall be within a limit such that any corner shall not be more than the limit given below from the plane containing other three corners:

Up to 600mm wide and up to 6m in length-6m Over 600mm wide and for any length -12mm

g. Maximum deviation in flatness from a 1.5m straight edge placed in any position on a nominally plain surface shall not exceed 6mm.

h. The tolerance limits for concrete columns/pedestals shall be same as given in part A of ANNEXURE-A of Specification No. VCS-SS-CS-6024.

- **FORM REQUIREMENT:**

The formwork shall be true, rigid and adequately braced both horizontally as well as diagonally. The forms shall have smooth and even surface and be sufficiently strong to carry, without deformation, the dead weight of the green concrete, working load, wind load and also the side pressure exerted by the green concrete. As far as practical, clamps shall be used to hold the forms together. Where use of nails is unavoidable minimum number of nails shall be used. Projected part of nail shall not be bent or twisted for easy withdrawal.

Where through tie rods are required to be put to hold the formwork and maintain accurate dimension, they shall always be inserted through a precast concrete block (of same mix proportion as is to be used for concreting) with a through hole of bigger diameter. The Precast block shall tightly fit against in inner faces of formwork. The holes left after the withdrawal of tie rods shall be fully grouted with cement-sand mortar of same proportion as that used for concrete. However, use of such precast block shall in no case impair the desired appearance or durability of the structure. No such tie rods shall be used in any liquid retaining or basement structure.

Tie wires shall be permitted only upon approval of the Engineer-in-Charge and shall be cut off flush with the face of the concrete or counter sunk, filled and finished in the manner specified in clause 18.

Form joints shall not permit any leakage. The formwork shall be strong enough to withstand the effect of vibrations practically without any deflection, bulging, distortion or loosening of its components.

Forms for beams and slabs (span more than 6.0m) shall have camber of 1 in 500 so as to offset the deflection and assume correct shape and line after deposition of concrete. For cantilevers, the camber at free end shall be 1/100th of the projected length. Where architectural considerations and adjunctive work are critical, smaller form cambers shall be adopted as decided by the Engineer-in-Charge.

All vertical wall forms may be designed and constructed for the following minimum pressure. The pressures listed in Table-5 are intended as guide only and the Contractor shall ensure that the formwork is adequately strong and sturdy.

**TABLE-5**

**MINIMUM DESIGN PRESSURE FOR WALL FORMWORK**

| Rate of pour in meter/hour | Pressure | in KN/m2 |
|---|---|---|
| | at 10° (in Celsius) | at 24° (in Celsius) |
| 0.6 | 36.0 | 29.0 |
| 0.9 | 40.0 | 32.0 |
| 1.2 | 44.0 | 35.0 |
| 1.5 | 46.0 | 37.0 |

All horizontal forms shall be designed and constructed to withstand the dead load of the green concrete, reinforcement, equipment, material, embedment and a minimum live load of 2.0 kN/m2.

- **INSPECTION OF FORMS**

Temporary openings shall be provided at the base of column and wall forms and other places necessary to facilitate cleaning and inspection. Before concrete is placed, all forms shall be carefully inspected to ensure that they are properly placed, sufficiently rigid and tight, thoroughly cleaned, properly treated and free from foreign material. The complete

form work shall be inspected and approved by the Engineer-in-Charge before the reinforcement bars are placed in position. When forms appear to be unsatisfactory in any way, either before or during the placing of concrete, the work shall be stopped until the defects have been corrected as per the instructions of the Engineer-in-Charge.

- **CLEANING AND TREATMENT OF FORMWORK**

The surfaces of forms that would come in contact with concrete shall be well treated with approved non-staining form release agents such as soft soap, oil, emulsions etc. Release agents shall be applied so as to provide a thin uniform coating to the forms without coating the reinforcement.

- **CHAMFERS AND FILLETS**

All comers and angles shall be formed with 45 degree moldings to form chamfers or fillets on the finished concrete. The standard dimensions of chamfers and fillets, unless otherwise detailed or specified shall be 25x25mm. For heavier work chamfers or fillets shall be 50x50mm. Care shall be exercised to ensure accurate moldings. The diagonal face of the molding shall be planed or surfaced to the same texture as the forms to which it is attached.

- **REUSE OF FORMS**

Before reuse, all forms shall be thoroughly scrapped, cleaned, examined and when necessary, repaired and retreated, before resetting. Formwork shall not be reused, if declared unfit or un-serviceable by the Engineer-in-Charge.

- **REMOVAL OF FORMS/STRIPPING TIME**

In the determination of time for removal of forms, consideration shall be given to the location and character of the structures, the weather and other conditions including the setting and curing of the concrete and material used in the mix.

Forms and their supports shall not be removed without the approval of the Engineer-in- Charge. Forms shall not be released until the concrete has achieved strength of at least twice the stress to which the concrete may be subjected at the time of removal. The formwork shall be removed without shock and methods of form removal likely to cause over stressing or damage to the concrete, shall not be adopted. Supports shall be removed in such a manner as to permit the concrete to uniformly and gradually take the stresses due to its own weight.

In normal circumstances when average air temperature exceeds 15 degree Celsius during the period under consideration after pouring of concrete and where ordinary Portland cement is used, forms may generally be removed after expiry of following periods.

a. Walls, columns and vertical faces of all 16 to 24 hours as may be decided structural members by the Engineer-in-Charge.

b. Slabs (props left under) 3 days.

c. Beam Soffits (props left under) 7 days.

d. Removal of props under slabs:

Spanning up to 4.5m. 7 days.

Spanning over 4.5m. 4 days.

e. Removal of props under beams and arches: Spanning up to 6m 14 days.

Spanning over 6m 21 days

f. Cantilever Construction Formwork shall remain till structures for counter acting or bearing down have been erected and have attained sufficient strength (minimum 14 days).

Notes:

1. For other cements, the stripping time recommended for ordinary Portland cement shall be suitably modified as per the instructions of the Engineer- in-Charge.

2. The number of props left under, their sizes, supporting arrangement, and disposition shall be such as to be able to safely carry the full dead load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.

3. Where the shape of the element is such that the formwork has re-entrant angles, the form work shall be removed as soon as possible after the concrete has set, to avoid shrinkage cracking occurring due to the restraint imposed.

4. For rapid hardening cement, 3/7 of the above mentioned periods shall be considered subject to a minimum of 16 hours.

- **STAGING/SCAFFOLDING**

Staging/Scaffolding shall be properly planned and designed by the Contractor. Use of only steel tubes is permitted for staging/scaffolding. The Contractor shall get it reviewed by Engineer-in-Charge before commencement of work. While designing and during erection of scaffolding/staging, the following measures shall be considered:

a. Sufficient sills or under pinning's in addition to base plates shall be provided particularly where scaffolding are erected on soft grounds.

b. Adjustable bases to compensate for uneven ground shall be used.

c. Proper anchoring of the scaffolding/staging at reasonable intervals shall be provided in each direction with the main structure wherever available.

d. Horizontal braces shall be provided to prevent the scaffolding/staging from rocking.

e. Diagonal braces shall be provided continuously from bottom to top between two adjacent rows of uprights.

f. The scaffolding/staging shall be checked at every stage for plumb line.

g. Wherever the scaffolding/staging is found to be out of plumb line it shall be dismantled and re-erected afresh and effort shall not be made to bring it in line with a physical force.

h. All nuts and bolts shall be properly tightened and care shall be taken that all clamps/couplings are firmly tightened to avoid slippage.

i. Erection work of a scaffolding/staging under no circumstances shall be left totally to semi-skilled or skilled workmen and shall be carried out under the supervision of a technically qualified civil engineer of the Contractor.

20.8.2 For smaller works or works in remote areas, wooden ballies may be permitted for scaffolding/staging by the Engineer-in-Charge at his sole discretion. The contractor must ensure the safety and suitability of such works as described under clause 20.8.1 above

**27.20 EXPOSED/ARCHITECTURAL CONCRETE WORK**

**FORM WORK**

Other things remaining same as per clause no. 20.0, formwork shall be of high quality. Care shall be taken to arrange the forms so that the joints between forms correspond with the pattern indicated in the drawings. The forms shall be butting with each other in straight lines, the corners of the boards being truly at right angles. The joints between the forms shall cross in the two directions at right angles. The size of forms shall be so selected as to exactly match with the pattern of forms impression on the concrete face indicated in the drawings. Maximum care shall be taken to make the form work watertight. Burnt oil shall not be used for treatment of forms. The Contractor shall be permitted reuse of forms brought new on the work for exposed concrete work as specified below.

Such reuses shall be permitted only if forms are properly cared for, stored, repaired and treated after each use.

a. Plywood Forms 6 Reuses (max.)

b. Steel Forms 10 Reuses (max.)

The Engineer-in-Charge may, at his absolute discretion, order removal of any forms considered unfit for use in the work irrespective of the number of uses specified above.

**FINISHING**

Repairing to exposed concrete work shall be avoided. Rendering and plastering shall not be done. Minor repairing, if unavoidable shall be done as specified in clause 18.0 with the written permission of the Engineer-in-Charge.

**27.21 REINFORCEMENT**

The Contractor shall develop the bar bending schedule for all RCC structures/ structural parts at no extra cost to the Owner and shall get it reviewed by the Engineer-in-charge. Reinforcement shall be cut and bent to shape as per dimensions shown in the bar bending schedule/drawings.

If protective fusion bonded epoxy coating is required to be applied on reinforcement bars, the same shall be done as per IS: 13620. All repairs to applied protective coating required due to mishandling and/ or bending of reinforcement bars shall also be done as per relevant clauses of IS: 13620.

**STRAIGHTENING, CUTTING AND BENDING**

Procedure for cutting and bending shall be as given in IS: 2502. In case bars are supplied in coils, they shall be smoothly straightened without any kinks.

Cold twisted deformed bars shall be bent cold. Bars larger than 25mm in size (except cold twisted deformed bars) may be bent hot at cherry red heat to a temperature not exceeding 850° Celsius as per the instructions of the Engineer-in-Charge. The bars shall be allowed to cool gradually without quenching.

Bars shall be bent in a slow and regular movement to avoid fractures. Bars which develops cracks or splits after bending shall be rejected. A second bending of reinforcement bars shall be avoided but when reinforcement bars are bent aside at construction joints and afterwards bent back into their original position, care should be taken to ensure that at no time is radius of the bend less than 4 times bar diameter for plain mild steel or 6 times bar diameter for high strength deformed bars. Care shall also be taken when bending back bars to ensure that concrete around the bars is not damaged. All bars shall be properly tagged for easy identification.

**PLACING AND FIXING**

All reinforcement shall be cleaned to ensure freedom from loose mill scale, loose rust, oil, form releasing agents, grease or any other harmful material before placing them in position. Reinforcement shall not be surrounded by concrete unless it is free from all such materials. Rough handling and dropping of reinforcement from a height shall be avoided.

All reinforcement shall be fixed in the correct position and shall be properly supported to ensure that displacement will not occur when the concrete is placed and compacted.

The uncoated reinforcement bars shall be tied at every intersection by two strands of 16 SWG black soft annealed binding wire. The Epoxy coated reinforcement bars shall be tied with 2 strands of PVC coated GI 18 SWG wire at every intersection. Crossing bars shall not be tack welded for assembly of reinforcement. The reinforcement bars shall be kept in position by using the following methods:

a. In case of beam and slab construction, precast cover blocks (having the same sand contents as the concrete which shall be placed) of size 40 x 40 mm and thickness equal to the specified covers shall be placed firmly in between the bars and forms so as to secure and maintain the specified covers over the reinforcement.

When reinforcement bars are placed in two or more layers in beams, the vertical distance between the horizontal bars shall be maintained by introducing spacer bars at 1 to 1.2m center to center.

b. In case of thick rafts & pile caps having two or multilayer's of reinforcement, the vertical distance between the horizontal bars shall be maintained by introducing suitable chairs, spacers, etc.

c. In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them. The templates shall be removed after the concreting has been done below it.

d. Exposed portions of reinforcement bars shall not be subjected to impact or rough handling and workmen will not be permitted to climb on extending bars until the concrete has attained sufficient strength so that no movement of the bars in the concrete is possible.

**SPECIAL REQUIREMENTS FOR HANDLING, STACKING, PLACING OF EPOXY COATED REINFORCING BARS.**

Epoxy coated reinforcing bars shall be carefully handled and it shall be ensured that these do not rub on any hard surface or against another epoxy coated/uncoated reinforcing bar whether during conveying/transportation, stacking or placing.

During transportation and while stacking the epoxy coated reinforcing bars shall be placed on wooden planks not spaced farther than 600mm. When placed in stacks the epoxy coated reinforcing bars shall be neatly tied in bundles using PVC binding material.

The cut ends of bars shall be touched up with special touch up material of specifications as provided by the coating agency. After cutting of the bar the application of touch up material shall be completed within four hours.

While bending the bars the pins of work bench(s) shall be provided with a PVC or plastic sleeve. Each bending operation on epoxy coated reinforcing bar shall be completed in time not less than 90 seconds.

Epoxy coated reinforcing steel bar shall not be directly exposed to sun rays or rain, and shall be protected with opaque polyethylene sheets or similar means as approved by the Engineer in Charge.

While doing concreting the workmen or machinery shall not rest or move on the epoxy coated reinforcing bars. Wooden planks shall suitably be placed to create proper gang-way.

**SPLICING/OVERLAPPING**

Only bars of full length shall be used as shown in the drawings. But where this cannot be done, overlapping of bars shall be done as directed by the Engineer-in- Charge. Where practicable, the overlapping bars shall not touch each other, but these shall be kept apart by 25mm or 1.25 times the maximum size of the coarse aggregate whichever is greater. But where this is not possible, the overlapping bars shall be tied with two

strands of 16 SWG black soft annealed binding wire for uncoated bars and with PVC coated GI 18 SWG wire for Epoxy coated bars. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending moment is maximum.

**WELDED JOINTS**

Welding of reinforcing bars shall not be permitted without the written permission of the Engineer-in- Charge. If Fusion Bonded Epoxy coated bars are used, welding of reinforcing bars shall generally not be permitted. However, if permitted, the joint shall be coated with epoxy as per BS: 7295. Where welding of uncoated reinforcing bars is permitted, it shall be in accordance with the recommendations of IS: 2751 and IS: 9417. Welded joints shall be located at suitable staggered positions. Tests shall be made as directed by the Engineer-in-Charge to prove that the joints are of the full strength of the bars. Maximum one welded joint shall be allowed per bar.

**MECHANICAL CONNECTIONS**

The mechanical splices in reinforcement by means of couplers, clamps etc. shall be used (as per manufacturer's specifications) with the written approval of the Engineer-in-Charge. However, tests shall be made as directed by Engineer-in- Charge to prove that such connections are of the full strength of the bars on trial joints. Mechanical connections for Fusion Bonded Epoxy coated bars shall not be used.

**TOLERANCES ON PLACING OF REINFORCEMENT**

Unless otherwise directed by the Engineer-in-Charge, reinforcement shall be placed within the following tolerances:

a. For effective depth 200mm or less ± 10mm

b. For effective depth more than 200mm ± 15mm

**SUBSTITUTION**

When indicated diameter of reinforcement bar is not available, the Contractor shall use other diameter of reinforcement bars on written approval of the Engineer-in-Charge.

**TOLERANCE TO COVER**

The actual concrete cover shall not deviate from the required nominal cover by - 0 mm to +10 mm measured over the steel reinforcement including links.

**27.22 PRECAST CONCRETE**

- Specifications contained in clauses above regarding concrete, formwork and reinforcement shall apply in addition to the clauses given as under. The Contractor shall get the precasting bed approved by the Engineer-in-Charge.
- Necessary lifting hooks of suitable (but not less than 12mm dia) diameter M.S. rounds shall be provided for handling, as indicated in drawings or as directed by the Engineer- in-Charge.

- Unless otherwise specified, the exposed surfaces of precast members shall be integrally finished smooth. For precast slabs or planks, the top surface shall be finished with 1:3 (1 cement: 3 sand) cement mortar. Surface used as walkways shall be given a non-skid finish.
- The precast concrete units shall be marked clearly on top surface with the letter "T" for identification of surfaces at the time of erection and shall be stored properly until required for erection. The precast units shall be handled and erected by methods approved by the Engineer-in-Charge to protect them from damage.
- Precast concrete elements shall not be removed from the casting bed until the concrete has developed its characteristic compressive strength based on cube test results.
- The units shall be suitably handled, transported, stored and placed taking all necessary safety precautions to avoid development of undue stresses caused by vibrations, impact or lateral forces. During shipment and while in storage, the units shall be placed on suitable blocks to provide clearance from bed/ground.
- The Contractor shall take all necessary precautions for safe handling during the course of erection. The Contractor shall replace at his own expense all such units which are damaged during the course of erection. Cement used for a damaged/rejected precast elements shall not be taken into account for material reconciliation.
- The inspection for precast concrete units during casting shall be same as applicable to normal concrete works. However, additional inspection checks shall be made during and after erection of units to ensure its suitability for the required service as a structural member. These checks shall include inspection to detect chipping, cracks, warpages in the precast units etc due to improper handling and storage, improper jointing (if required) of the precast unit with the structure and improper finishing.
- Fabricated precast concrete units containing defects originating due to use of improper materials or workmanship, excessive repair and not conforming to design drawings shall be rejected. Such rejected units shall not be taken into account for material reconciliation or payment.

## 27.23 CONTINUOUS CONCRETING

Where called out on the drawings, continuous concreting shall be done in a single operation as per the requirements of IS: 456 and IS: 2974. It shall be ensured that clause 8.3 of these specifications is not violated in case of continuous concreting. Sufficient "Windows" shall be left in the formwork for pouring & compaction of concrete and inspection. These windows shall be fixed tight once the level of concrete reaches their levels.

## 27.24 CONCRETING UNDER SPECIAL CONDITIONS

Work in extreme weather conditions during hot or cold weather, the concreting shall be done as per procedure set out in IS: 7861(Part 1) or IS: 7861 (Part2).

## UNDER WATER CONCRETING.

Concreting shall be as per clause no. 14.2 of IS: 456.

### a) FORM WORK

Unless otherwise specified, payment for form work shall be on square meter basis of the actual area in contact with the concrete cast. The rates shall be inclusive of keeping the formwork for the full period as specified in the above clauses and removing the same after the period is over. No extra payment shall be made for providing scaffolding/staging/access/stairways/ladders etc.

The rates shall be inclusive of any provision to be made or kept in the formwork for providing dowels, inserts etc.

Superior quality formwork for exposed/architectural concrete work shall be measured and paid separately under the relevant item in the schedule of rates.

### b) REINFORCEMENT

Payment for plain round mild steel reinforcement bars and high strength deformed steel bars shall be on the basis of weight of bare steel irrespective of any coating applied in metric tons. The weight of the bar shall be derived from the sizes and corresponding unit weights given in handbook of Bureau of Indian Standards. Standard hook lengths, chairs, spacer bars and authorized laps only shall be included in the weight calculated. Binding wire shall not be weighed nor otherwise measured. Measurements for weight shall not include cutting allowance etc.

Rate quoted for uncoated reinforcement shall include cost of supplying, decoiling, straightening, cleaning, cutting, bending, placing, binding, welding, if required, and providing necessary cover blocks of concrete.

Rate quoted for Fusion Bonded Epoxy Coated bars shall also include, apart from those mentioned in clause no. 26.3.2, cost of coating of the bars, all necessary tools and tackles and any repairs required due to damage to coating as per IS: 13620.

Payment for mechanical threaded couplers shall be made on number basis (each). The rate shall include supply of complete assembly, fixing, testing etc. all complete.

### c) WATER STOPS/WATER BARS & EXPANSION/ISOLATION JOINTS

Payment for PVC water bars shall be made on running meter (RM) basis of the water stops provided in position. Rate shall include supplying cutting, fixing, jointing by vulcanizing or any other approved method, wastage, etc. complete.

Payment for filler materials in Expansion/Isolation joints shall be made on running meter basis of the joint provided. For boards provided at expansion/isolation joints, the measurement shall be made on square meter basis. Rate shall be inclusive of supply, cutting, fixing, jointing, wastage etc. complete.

### d) PRE-CAST CONCRETE

Payment for precast concrete members shall be made on cubic meter basis of the volume of the finished member. The rate quoted shall include cost of formwork, preparation of casting yard, finishing as specified, curing, handling, fixing in position, breaking masonry and/or concrete surfaces and making good the same etc. Reinforcement shall be paid separately under relevant items. Lifting hooks shall be paid on the same

basis as reinforcement. Metal inserts shall be paid as per relevant clauses of Specification No. VCS-SS-CS-026 (Miscellaneous Steel Works).

The quoted rate shall be inclusive of providing pockets, openings, recesses of all sizes, chamfers, fillets grooves, holes, cement wash, curing (hot, cold or by using curing compounds). The rate shall be deemed to include complete cost of taking and testing concrete cubes and carrying out other tests including tests of various ingredients as per specification and as directed by the Engineer-in-Charge.

The rate shall however be exclusive of reinforcement, metal inserts, pipe sleeves. Where the strength of concrete mix as indicated by tests, lies in between the strengths of any two grades given in clause 3.0 and it is accepted by the Owner/Engineer-in- Charge, such concrete shall be classified as a grade belonging to the lower of the two grades between which it lies. In case the cube strength shows higher results than those specified for the particular grade of the concrete, it shall not be placed in the higher grade nor shall the Contractor be entitled for any extra payment on such account. The concrete giving lower strength than specified may be accepted at reduced rates after satisfying the safety of the structure by checking it with tests as specified or rejected entirely at the discretion of the Engineer-in- Charge. The rejected concrete shall be dismantled at no extra cost to the owner and no payment or extension of time shall be granted for the concrete so rejected and the formwork and reinforcement used for the same. In case the concrete of lower strength can be improved by carrying out some strengthening measures entirely at the discretion of the Engineer-in-Charge, then the said measures shall be carried out by Contractor at his own cost. If the Contractor is able to make up the strength to the required grade by such improvement measures to the entire satisfaction of Engineer-in-Charge, payment shall be made for the grade achieved. However, if the strength of concrete is not made up to the strength of required grade, payment shall be made only for the lower strength if accepted by the Engineer-in-Charge.

**e) CEMENT WASH**

No payment shall be made for cement wash separately and is deemed to be covered in clause no. 26.1.1 & 26.5.2.

**f) CONTINUOUS CONCRETING**

Payment shall be made as per clause no. 26.1 of this specification. The rate shall be deemed to be inclusive of all extra cost related to labor, shuttering, staging and making all other arrangements for such continuous casting e.g. provisions for adequate movement and storage spaces, special gangways, scaffolding, additional construction equipments, adequate lighting and supervision while the work continues round the clock etc. The rate shall also be inclusive of all costs related to concreting in any thickness, shape and position and at any height or depth so as to avoid any cold joint between specified construction joints.

## CHAPTER-28

## 28. SPECIFICATION FOR STRUCTURAL STEEL WORKS

This specification covers the requirements for material, storage, preparation of fabrication drawings, fabrication, assembly, tests/examinations, transportation, erection and painting of all types of bolted and/or welded structural steel works for general construction work. Fabrication of structures shall also include fabricating:

a. Built up sections/plate girders made out of rolled section and/or plates.

b. Compound sections made out of rolled sections.

### 28.1 REFERENCE

**BIS CODES**

**IS: 800** General Construction in steel-Code of practice

**IS: 816** Code of practice for use of Metal Arc welding for General construction in mild steel

**IS: 819** Code of practice for Residual spot welding for light assemblies in mild steel

**IS: 822** Code of practice for Inspection of welds

**IS: 919 (Part-I)** ISO system of limits and fits (Bases of tolerances, deviations and fits)

**IS: 919 (Part-II)** ISO system of limits and fits (Tables of tolerances, grades and limit deviation for hole and shafts)

**IS: 1024** Use of welding in bridges and structures subject to dynamic loading-Code of practice

**IS: 1261** Code of practice for Seam welding in mild steel

**IS: 1323** Code of practice for Oxy-Acetylene welding for structural works in mild steel

**IS: 1477** Code of practice for painting of ferrous metals in buildings

**IS: 1852** Specification for rolling and cutting tolerance for hot rolled steel products

**IS: 2074** Ready mix paint, Air draying, Red oxide Zinc Chrome, painting specification

**IS: 7205** Safety code for erection of Structural steel works

**IS: 7215** Tolerance for fabrication of steel structures

**IS: 7307** Approval tests for welding procedures

**IS: 7310** Approval tests for welders working to approved welding procedures IS: 7318 Approval tests for welders when welding procedures approval is not required

**IS: 9595** Metal Arc welding of carbon and Carbon manganese steel - Recommendations

**IS: 12843** Tolerance for Erection of Steel structure and other relevant BIS Codes.

SP: 6(1)

**SPECIFICATIONS**

In case of conflict between the clauses mentioned in this specification and those in the Indian Standards, this specification shall govern. Any special provision as shown or noted on the design drawings shall govern over the provisions of this specification.

## 28.2 MATERIALS

### a) GENERAL

All materials shall conform to their respective specifications given in Chapter 25 of this document. The use of equivalent or alternative materials shall be permitted only in very special cases and for all such cases prior written approval of the Engineer-in- Charge shall be obtained.

### b) RECEIPT & STORING OF MATERIALS

Each section shall be marked for identification and each lot shall be accompanied by manufacturer's quality certificate, chemical analysis and mechanical characteristics.

All sections shall be checked, sorted out and arranged by grade and quality in the store. Any instruction given by the Engineer-in-Charge in this respect shall be strictly followed.

All material shall be free from surface defects such as pitting, cracks, laminations, twists etc. Defective material shall not be used and all such rejected material shall be immediately removed from the store/site. The decision of the Engineer-in-Charge in this regard shall be final and binding.

Welding wires and electrodes (packed in their original cartons) shall be stored separately by quality and lots inside a dry and enclosed room in compliance with IS: 9595 and as per the instructions given by the Engineer-in-Charge. Electrodes shall be kept perfectly dry to ensure satisfactory operation and weld metal soundness.

Each lot of electrodes, bolts, nuts etc. shall be accompanied by manufacturer's quality/test certificates.

All bolts (including nuts & washers) shall be checked, sorted out and arranged diameter-wise by grade and quality in the store.

### c) MATERIAL TESTS

The Contractor shall submit manufacturers' quality certificates for all the materials supplied by him. In case, quality certificates are not available or are incomplete or when material quality differs from standard specifications, such materials shall not be used in the construction. However, the Contractor shall get all appropriate tests conducted in approved test houses for such materials as directed by the Engineer-in- Charge, at no extra cost, and submit the same to Engineer-in-Charge for his approval. The Engineer-in-Charge may approve the use of such materials entirely at his discretion.

The Contractor shall ensure that all materials brought to site are duly approved by the Engineer-in-Charge. Rejected materials shall not be used and shall be removed from site forthwith. Any material of doubtful quality for which specific tests are to be carried out as per the instruction of the Engineer-in-Charge shall be separately stacked and properly identified and shall not be used. These shall be removed from site forthwith.

### 28.3 FABRICATION DRAWINGS

- Fabrication and erection drawings shall be prepared by the Contractor on the basis of "Approved for Construction (AFC)" design drawings, Standards issued to the Contractor. These drawings shall be prepared by the Contractor or by an agency appointed by the Contractor and approved by the Engineer-in-Charge.
- Fabrication and erection drawings shall be thoroughly checked, stamped "Approved for Construction" and signed by the Contractor's own responsible Engineer irrespective of the fact that such drawings are prepared by the Contractor or his approved agency, to ensure accuracy and correctness of the drawings. Unchecked and unsigned drawings shall not be used for the purpose of proceeding with the work. The Contractor shall proceed with the fabrication and erection work only after thoroughly satisfying himself in this regard.
- All fabrication and erection drawings shall be issued for construction by the Contractor directly to his work- site. Six copies of such drawings shall simultaneously be submitted to the Engineer-in-Charge who may check/ review some or all such drawings at his sole discretion and offer his comments for incorporation in these drawings by the Contractor.

However, the Contractor shall not proceed with the fabrication of such structures whose fabrication drawings are required to be reviewed before taking up the fabrication work as noted on "Approved for Construction (AFC)" design drawings issued to the Contractor or as conveyed by the Engineer-in-Charge. The fabrication of such structures shall be done only as per the reviewed fabrication drawings.

**The review of such drawings shall be restricted to the checking of the following only:**

a. Structural layout, orientation and elevation of structures/members.

b. Sizes of members.

c. Critical joint details.

- Fabrication drawings shall be drawn to scale and shall convey the information clearly and adequately. Following information shall be furnished on such drawings:

a. Reference to design drawing number (along with revision number) based on which fabrication drawing has been prepared.

b. Structural layout, elevations & sections (with distinct erection marking of all members).

c. Framing plans, member sizes, orientation and elevations.

d. Layout and detailing of rain water pipes and gutters showing all necessary levels, connections and provisions wherever required.

e. Detailing of shop/field joints, connections, splices, for required strength and erection.

f. Location, type, size and dimensions of welds and bolts.

g. Shapes and sizes of edge preparation for welding.

h. Details of shop and field joints/welds.

i. Bill of materials/D.O.D. Lists.

j. Quality of structural steel, plates etc., welding electrodes, bolts, nuts and washers to be used.

k. Erection assemblies identifying all transportable parts and sub-assemblies with special erection instructions, if required.

l. Method of erection and special precautions to be taken during erection as required.

- The Contractor shall additionally ensure accuracy of the following and shall be solely responsible for the same:

a. Provision for erection and erection clearances.

b. Marking of members

c. Cut length of members

d. Matching of joints and holes.

e. Provision kept in the members for other interconnected members.

f. Bill of materials/D.O.D. Lists.

- Connections, splices and other details where not shown on the design drawings shall be suitably designed and shown on the fabrication drawings based on good engineering practice developing full member strength. Design calculations for such connections/splices shall be submitted to the Engineer-in-Charge along with the fabrication drawings.
- Any substitution or change in section shall be allowed only when prior written approval of the Engineer-in-Charge has been obtained. Fabrication drawings shall be updated incorporating all such substitutions/changes by the Contractor at no extra cost to the Owner.
- In case during execution of the work, the Engineer-in-Charge on review of drawings considers any modifications/substitutions necessary to meet the design parameters/good engineering practice, these shall be brought to the notice of the Contractor who shall incorporate the same in the drawings and works without any extra cost to the owner. The Contactor will be totally responsible for the correctness of the detailed fabrication drawings and execution of the work.
- Contractor shall incorporate all the revisions made in the design drawings during the course of execution of work in his fabrication drawings, and resubmit the drawings at no extra cost to the Owner. All fabrication shall be carried out only as per the latest AFC design drawings and corresponding fabrication drawings.

- The Contractor shall supply two prints each of the final/as built drawings along with their transparencies to Engineer-in-Charge for reference and record. The rates quoted shall include for the same.

**28.4 FABRICATION**

**a) GENERAL**

- Fabrication of structures shall be done strictly as per "Approved for Construction" fabrication drawings (prepared by the Contractor based on the latest design drawings) and in accordance with IS: 800, IS: 9595 & other relevant BIS Codes and BIS Hand Book SP: 6(1).
- Prior to commencement of structural fabrication, undulations in the fabrication yard, if any, shall be removed and area levelled and paved by the Contractor.
- Any defective material used in the work shall be replaced by the Contractor at his own expense. Necessary care and precautions shall be taken so as not to cause any damage to the structure during any such removal and replacement.
- Any faulty fabrication pointed out at any stage of work by the Engineer-in-Charge, shall be made good or replaced by the Contractor at his own cost.
- Tolerances for fabrication of steel structures shall be as per IS: 7215.

**b) FABRICATION PROCEDURE**

**STRAIGHTENING & BENDING**

All materials shall be straight and, if necessary, before being worked shall be straightened and/or flattened (unless required to be of curvilinear form) and shall be free from twists.

Bending of rolled sections and plates shall be done by cold process to shapes as shown on drawings.

**CLEARANCES**

The erection clearance for cleated ends of members shall be not greater than 2mm at each end. The erection clearance at ends of beams without web cleats and end plates shall be not more than 3mm at each end but where for practical reasons, greater clearance is necessary, suitably designed seating's approved by the Engineer-in-Charge shall be provided.

**CUTTING**

- Prior to cutting, all members shall be properly marked showing the requisite cut length/width, connection provisions e.g. location and dimensions of holes, welds, cleats etc. Marking for cutting shall be done judiciously so as to avoid wastages or unnecessary joints as far as practicable. Marking shall be done by placing the members on horizontal supports/pads in order to ensure accuracy. Marking accuracy shall be limited to + 1 mm.
- Cutting may be affected by shearing, cropping or sawing. Gas cutting by mechanically controlled torch shall be permitted for mild steel. Hand flame cutting may be permitted subject to the approval of the Engineer-in-Charge.
- Except where the material is subsequently joined by welding, no loads shall be transmitted into metal through a gas cut surface.

- Shearing, cropping and gas cutting shall be clean, square, free from any distortion & burrs, and should the Engineer-in-Charge find it necessary, the edges shall be ground afterwards, to make the same straight and uniform at no extra cost to the Owner.

**HOLING**

- Holes for bolts shall not be formed by gas cutting process.
- Holes through more than one thickness of material of members such as compound stanchions and girder flanges shall, where possible, be drilled after the members are assembled and tightly clamped/bolted together. Punching may be permitted before assembly, provided the thickness of metal is less than 16mm and the holes are punched 3mm less in diameter than the required size and reamed, after assembly, to the full diameter. Punching shall not be adopted for dynamically loaded structures.
- Holes may be drilled in one operation through two or more separable parts and burrs removed from each part after drilling.
- Holes in connecting angles and plates, other than splices, also in roof members and light framing, may be punched full size through material not over 12mm thick, except where required for close tolerance bolts or barrel bolts.
- All matching holes for black bolts shall register with each other so that a gauge of 2mm less in diameter than the diameter of hole shall pass freely through the assembled members in the direction at right angle to such members. Finished holes shall be not more than 2mm in diameter larger than the diameter of the black bolt passing through them, unless otherwise specified by the Engineer-in-Charge.
- Holes for turned and fitted bolts shall be drilled to a diameter equal to the nominal diameter of the shank or barrel subject to H8 tolerance specified in IS: 919. Parts to be connected with close tolerance or barrel bolts shall be firmly held together by tacking bolts or clamps and the holes drilled through all the thicknesses in one operation and subsequently reamed to size. Holes not drilled through all the thicknesses in one operation shall be drilled to a smaller size and reamed out after assembly. Where this is not possible, the parts shall be drilled and reamed separately.
- To facilitate grouting, holes shall be provided in column bases or seating plates exceeding 300mm in width for the escape of air.
- To avoid accumulation of water in gusseted column bases of laced, battened or box type stanchions, suitable reverse U-type holes shall be provided at the junction of base plate and column section in the vertical gussets for draining out of any water.

**ASSEMBLY**

The component parts shall be assembled and aligned in such a manner that they are neither twisted nor otherwise damaged, and shall be so prepared that the required camber, if any, is provided. Proper clamps, clips, jigs and other fasteners (bolts and welds) shall be placed in a balanced pattern to avoid any distortion in the members and to ensure their correct positioning (i.e. angles, axes, nodes etc.). Any force fitting, pulling/stretching of members to join them shall be avoided. Proper care shall be taken for welding shrinkage & distortion so as to attain the finished dimensions of the structure shown on the drawings.

**WELDING**

A. GENERAL

a. All joints shall be welded unless noted otherwise on the design drawings.

b. Welding shall be in accordance with IS: 816, IS: 819, IS: 1024, IS: 1261, IS: 1323 and IS: 9595 as appropriate.

c. The Contractor shall make necessary arrangement for providing sufficient number of welding sets of the required capacity, all consumables, cutting and grinding equipment with requisite accessories/ auxiliaries, equipment & materials required for carrying out various tests such as dye penetration, magnetic particle, ultrasonic etc.

d. Adequate protection against rain, dust, snow & strong winds shall be provided to the welding personnel and the structural members during welding operation. In the absence of such a protection no welding shall be carried out.

e. It shall be the responsibility of the Contractor to ensure that all welding is carried out in accordance with the terms of this specification and relevant BIS codes. The Contractor shall provide all the supervision to fulfill this requirement.

**B. PREPARATION OF MEMBER FOR WELDING**

**a. Edge Preparation**

Edge preparation/beveling of fusion faces for welding shall be done strictly as per the dimensions shown in the drawings. In case, the same are not indicated, edges shall be prepared (depending on the type of weld indicated in the drawing) as per the details given in IS: 9595. Beveling of fusion faces shall be got checked and approved by the Engineer-in-Charge. The tolerances on limits of gap, root face & included angle shall be as stipulated in IS: 9595.

**b. Cleaning**

Welding edges and the adjacent areas of the members (extending up to 20mm) shall be thoroughly cleaned of all oil, grease, scale and rust and made completely dry. Gaps between the members to be welded shall be kept free from all foreign matter.

**c. Preheating**

Preheating of members shall be carried out as per IS: 9595 when the base metal temperature is below the requisite temperature for the welding process being used. Preheating shall be done in such a manner that the parts, on which the weld metal is being deposited, are above the specified minimum temperature for a distance of not less than 75mm on each side of the weld line. The temperature shall be measured on the face opposite to that being heated. However, when there is access to only one face, the heat source shall be removed to allow for temperature equalization (1 minute for each 25mm of plate thickness) before measuring the temperature.

**d. Grinding**

i. Column splices & butt joints of struts and compression members (depending on contact for load transmission) shall be accurately ground and close-butted over the whole section with a tolerance not exceeding 0.2mm locally at any place. In column caps & bases, the ends of shafts together with the attached gussets, angles, channels etc., shall be accurately ground so that the parts connected butt over minimum 90% surface of contact. In case of connecting angles or channels, care shall be taken so that these are fixed with such accuracy that they are not reduced in thickness by grinding by more than 2mm.

ii. Ends of all bearing stiffeners shall be ground to fit tightly at both top and bottom. Similarly bottom of the knife edge supports along with the top surface of column brackets shall be accurately ground to provide effective bearing with a tolerance not exceeding 0.2mm locally at any place.

iii. Slab bases and caps shall be accurately ground over the bearing surfaces and shall have effective contact with the ends of stanchions. Bearing faces which are to be grouted direct to foundations need not be ground if such faces are true & parallel to the upper faces.

## C. WELDING PROCESSES

Welding of various materials under this specification shall be carried out using one or more of the following processes.

a. Manual Metal Arc Welding Process (MMAW)

b. Submerge Arc Welding Process (SAW)

c. Gas Metal Arc Welding Process (GMAW)

d. Flux Cored Arc Welding Process (FCAW)

The welding procedure adopted and consumables used shall be specifically approved by the Engineer-in-Charge. A combination of different welding processes or a combination of electrodes of different classes/makes may be employed for a particular joint only after qualifying the welding procedures to be adopted and obtaining the written approval of the Engineer-in-Charge.

## D. APPROVAL & TESTING OF WELDERS

The Contractor shall satisfy the Engineer-in-Charge that the welders are suitable for the work upon which they will be employed. For this purpose the welders shall have satisfied the relevant requirements of IS: 7318. If the welders will be working to approved welding procedures, they shall have satisfied the relevant requirements of IS: 7310.

Adequate means of identification shall be provided to enable each weld to be traced to the welder by whom it was made. The Contractor shall intimate the Engineer-in-Charge sufficiently in advance, the commencement of tests, to enable him to be present to witness the same.

## E. APPROVAL & TESTING OF WELDING PROCEDURES

The Contractor shall carry out procedure tests in accordance with IS:7307 to demonstrate by means of a specimen weld of adequate length on steel representative of that to be used, that he can make welds with the welding procedure to be used for the work to the complete satisfaction of the Engineer-in-Charge. The test weld shall include weld details from the actual construction and it shall be welded in a manner simulating the most unfavorable instances of fit-up, electrode condition etc., which are anticipated to occur on the particular fabrication. Where material analyses are available, the welding procedure shall be carried out on material with the highest carbon equivalent value.

After welding, but before the relevant tests given in IS: 7307 are carried out, the test weld shall be held as long as possible at room temperature, but in any case not less than 72 hours, and shall then be examined for cracking. The examination procedure shall be sufficiently rigorous to be capable of revealing significant defects in both parent metal and weld metal.

After establishing the welding method, the Contractor shall finally submit to the Engineer-in-Charge for his approval the welding procedure specification in standard format given in IS: 9595 before starting the fabrication.

## F. SEQUENCE OF WELDING

a. As far as practicable, all welds shall be made in a sequence that will balance the applied heat of welding while the welding progresses.

b. The direction of the general progression in welding on a member shall be from points where the parts are relatively fixed in position with respect to each other towards points where they have a greater relative freedom of movement.

c. All splices in each component part of a cover-plated beam or built up member shall be made before the component part is welded to other component parts of the member.

d. Joints expected to have significant shrinkage shall be welded before joints expected to have lesser shrinkage.

e. Welding shall be carried continuously to completion with correct number of runs.

f. The Contractor shall choose the welding sequence after carefully studying each case such as to minimize distortion and shrinkage & submit the same to the Engineer-in-Charge for comments and approval.

## G. WELDING TECHNIQUE

a. After the fusion faces are carefully aligned and set with proper gaps, the root pass of butt joints shall be executed properly so as to achieve full penetration with complete fusion of the root edges.

b. On completion of each run, all slag and spatters shall be removed and the weld and the adjacent base metal shall be cleaned by wire brushing and light chipping. Visible defects such are cracks, cavities and other deposition faults, if any, shall be removed to sound metal before depositing subsequent run of weld.

c. All full penetration butt welds shall be completed by chipping/gouging to sound metal and then depositing a sealing run of weld metal on the back of the joints. Where butt welding is practicable from one side only, suitable backing steel strip shall be used and joint shall be arranged in such a way as to ensure that complete fusion of all the parts is readily obtained.

d. While welding is in progress care shall be taken to avoid any kind of movement of the components, shocks, vibrations to prevent occurrence of weld cracks.

e. Any deviation desired from the recommended welding technique and electrodes shall be adopted only after obtaining written approval of the Engineer-in-Charge.

5.2.6.8 INSPECTION & TESTING OF WELDS

The method of inspection shall be according to IS: 822 and extent of inspection and testing shall be in accordance with the relevant applicable standard or, in the absence of such a standard, as specified by the Engineer-in-Charge. Welds shall not be painted or otherwise obscured until they have been inspected, approved and accepted.

The Engineer-in-Charge or his representative shall have access to the Contractor's work at all reasonable times and the Contractor shall provide him with all facilities necessary for inspection during all stages of fabrication and erection without not limited to the following objectives.

a. To check the conformity with the relevant standards and suitability of various welding equipments and their performance.

b. To witness/approve the welding procedure qualification.

c. To witness/approve the welders performance qualification.

d. To check whether shop/field welding being executed is in conformity with the relevant specifications and codes of practice.

Inspection and testing of all fabricated structures shall be carried out by the Contractor by any, or, a combination of all the following methods as directed by the Engineer-in-Charge and no separate payment shall be made, unless otherwise mentioned, for inspection and testing of welds/fabricated structures:

A. Visual Inspection

All finished welds (i.e. 100 percent) shall be visually inspected for identification of the following types of weld defects & faults.

a. Weld defects occurring at the surface such as blow holes, exposed porosity, unfused welds etc.

b. Surface cracks in the weld metal or in the parent metal adjacent to it.

c. Damages to the parent metal such as undercuts, burning, overheating etc.

d. Profile defects such as excessive convexity or concavity, overlapping, unequal leg lengths, excessive reinforcement, incompletely filled grooves, excessive penetration beads, root grooves etc.

e. Distortion due to welding i.e., local shrinkage, camber, bowing, twisting, rotation, wariness etc.

f. Linear eccentric, angular and rotational misalignment of parts.

g. Dimensional errors.

B. Mechanical Tests

The mechanical testing (such as tensile load tests, bend tests, impact tests etc.) shall be done in accordance with the relevant standards and as per the instructions of the Engineer-in-Charge.

C. Magnetic Particle/Dye Penetration/Ultrasonic Examination:

The examination shall be done at random as directed by the Engineer-in-Charge. Whenever such tests are directed, the tests shall be carried out on joints chosen by him. The tests shall be carried out by employing approved testing procedure in accordance with IS: 822.

D. Radiographic Examination

Radiographic examination shall be carried out only in special cases for random joints as directed by the Engineer-in-Charge. The Contractor shall be paid extra for such examination except for penalty radiographic tests for which the cost shall be borne by him. The Contractor shall make necessary arrangement at his own expense for providing the radiographic equipment, films and all other necessary materials required for carrying out the examination. The tests shall be carried in the presence of the Engineer-in-Charge by employing approved testing procedure in accordance with IS: 822. The Contractor shall fulfill all the statutory safety requirements while handling X-ray and Gamma-ray equipment and provide the Engineer- in-Charge all the necessary facilities at site such as dark room, film viewer etc., to enable him to examine the radiographs.

**Repair of Faculty Welds**

No repair of defective welds shall be carried out without proper permission of the Engineer-in-Charge and his approval for the corrective procedure.

Welds not complying with the acceptance requirements (as specified by BIS Codes & the Engineer-in-Charge), as revealed during inspection & testing of welds or erection or in-situ condition shall be corrected either by removing & replacing or as follows:

a. Excessive convexity - Reduced to size by removal of excess weld metal.

b. Shrinkage cracks, - Defective portions removed down to sound

cracks in parent plates metal and re-welded. and craters

c. Under cutting. - Additional weld metal deposited.

d. Improperly fitted/ parts. - Welding cut & edges suitably prepared and misaligned parts.

e. Members distorted - Member straightened by mechanical means or the by heat of careful application of limited amount of heat, welding temperature of such area not to exceed 650 degree Centigrade dull red heat).

In removing defective parts of a weld, gouging, chipping, oxygen cutting or grinding shall not extend into the parent metal to any substantial amount beyond the depth of weld penetration, unless cracks or other defects exist in the parent metal. The weld or parent metal shall not be undercut in chipping, grinding, gouging or oxygen cutting.

Any fabricated structure or its component which, in the opinion of Engineer-in- Charge, is defective and/or beyond any corrective action shall be removed forthwith from the site as instructed by the Engineer-in-Charge without any extra claim. The owner reserves the right to recover any compensation due to any loss arising out of such rejections.

## H. BOLTING

All bolts shall be provided such that no part of the threaded portion of the bolts is within the thickness of the parts bolted together. Washers of suitable thickness shall be used under the nuts to avoid any threaded portion of the bolt being within the thickness of parts bolted together.

The threaded portion of each bolt shall project through the nut at least one thread.

Flat washers shall be circular and of suitable thickness. However, where bolt heads/nuts bear upon the beveled surfaces, they shall be provided with square tapered washers of suitable thickness to afford a seating square with the axis of the bolt.

## I. SPLICING

Splicing of built up/compound/latticed sections shall be done in such a fashion that each component of the section is joined in a staggered manner.

Where no butt weld is used for splicing, the meeting ends of two pieces of joist/channel/built up section shall be ground flush for bearing on each other and suitable flange and web splice plates shall be designed and provided for the full strength of the flange/ web of the section and welds designed accordingly

Where full strength butt weld is used for splicing (after proper edge preparation of the web and flange plates) of members fabricated out of joist/ channel/ angles/ built up section, additional flange and web plates shall be provided, over and above the full strength butt welds, to have 40% strength of the flange and web.

Where a cover plate is used over a joist/channel section the splicing of the cover plate and channel/joist sections shall be staggered by minimum 500mm. Extra splice plate shall be used for the cover plate and joist/channel section as per clause 5.2.8.2 or 5.2.8.3.

Prior approval shall be obtained by the Contractor for locations of splices where not shown on design drawings. Only a single splice at approved location shall be allowed for member's up to a length of 6 to 7m. Maximum two numbers of splices shall be allowed for members exceeding this length.

**MACHINING & GRINDING**

- All slab bases and slab caps shall be accurately machined over the bearing surfaces and shall be in effective contact with the ends of column sections (shafts).
- For slab bases and slab caps, ends of column shafts shall be accurately machined. However, for gusseted bases and caps, the column shafts shall be ground flush for effective contact with parts connected together.
- Gusseted bases and caps shall be ground flush for effective contact with ends of column sections.
- End of all bearing stiffeners shall be machined or ground to fit tightly at top and bottom without any air gap.
- While machining or grinding care shall be taken so that the length or thickness of any part does not get reduced by more than 2.0mm.
- For all machining or grinding works for gusseted base and cap plates, the clearance between the parts joined shall not exceed 0.2mm at any location.

## 28.5 MARKING FOR IDENTIFICATION

- Each component shall be distinctly marked (with paint) before delivery in accordance with the marking diagrams and shall bear such other marks as will facilitate erection.
- For small members which are delivered in bundles or crates, the required marking shall be done on small metal tags securely tied to the bundle.

## 28.6 SHOP ERECTION

The steel work shall be temporarily shop erected complete or as directed by the Engineer-in-Charge, so that the accuracy of fit may be checked before dispatch.

## 28.7 INSPECTION & TESTING OF STRUCTURES

- The Engineer-in-Charge (or his authorized representative) shall have free access at all times to those parts of the Contractor's works which are concerned with the fabrication of the steel work and shall be provided with all reasonable facilities for satisfying himself that the fabrication is being undertaken in accordance with the provisions of these specifications & other relevant BIS Codes.
- Should any structure or part of a structure be found not to comply with any of the provisions of this specification (or relevant BIS Codes as referred to), it shall be liable to rejection. No structure or part of the structure, once rejected shall be resubmitted for inspection, exception cases where the Engineer-in-Charge or his authorized representative considers the defect as rectifiable.
- Defects which may appear during/after fabrication/ erection shall be made good only with the consent of the Engineer-in-Charge and procedure laid down by him.

- All necessary gauges and templates shall be supplied free to the Engineer-in-Charge by the Contractor whenever asked for during inspection. The Engineer-in- Charge, may at his discretion, check the test results obtained at the Contractor's works by independent tests at a test house, and the cost of such tests shall be borne by the Contractor.

**28.8 SHOP PAINTING**

- All components and members of steel work shall be given one shop coat of primer (conforming to relevant BIS codes) or any other primer as specified, in the tender, immediately after the surfaces have been properly prepared (i.e. degreased, de-rusted, descaled & cleaned) in accordance with IS: 1477 or IS: 800, as applicable. The primer coat shall be applied over completely dry surfaces (using brushes of good quality) in a manner so as to ensure a continuous and uniform film without "holidaying". Special care shall be taken to cover all the crevices, corners, edges etc. However, in areas which are difficult to reach by brushing, daubers/mops shall be used by dipping the same in paint and then pulling/ pushing them through the narrow spaces. The primer coat shall be air dried and shall have a minimum film thickness as per table 29 of IS: 800 after drying, as applicable.
- Surfaces which are inaccessible after shop assembly, shall receive the full specified protective treatment before assembly (this shall not apply to the interior of sealed hollow sections).
- Steel surfaces shall not be painted within a suitable distance of any edges to be welded if the paint specified would be harmful to welders or impair the quality of the welds.
- Welds and adjacent parent metal shall not be painted prior to de-slagging, inspection and approval by the Engineer-in-Charge.
- Parts to be encased in concrete shall have only coat of primer and shall not be painted after erection.

**28.9 PACKING**

- All items shall be suitably packed in case these are to be dispatched from the fabrication shop to the actual site of erection so as to protect them from any damage/distortion or falling during transit. Where necessary, slender projecting parts shall be temporarily braced to avoid warping during transportation.
- Small parts such as gussets, cleats etc., shall be securely wired on to their respective main members.
- Bolts, nuts washers etc. shall be packed in crates.

**28.10 TRANSPORTATION**

Loading and transportation shall be done in compliance with transportation rules. In case, certain parts cannot be transported in the lengths stipulated on the drawings, the position details of such additional splice joints shall be got approved by the Engineer-in- Charge.

**28.11 SITE (FIELD) ERECTION**

**PLANT & EQUIPMENT**

The suitability and capacity of all plant and equipment used shall be to the complete satisfaction of the Engineer-in-Charge.

**STORING & HANDLING**

All steel work shall be so stored and handled at site so that the members are not subjected to excessive stresses and any damage.

**SETTING OUT**

Prior to setting out of the steel work, the Contractor shall get himself satisfied about the correctness of levels, alignment, location of existing concrete pedestals/columns/brackets and holding down bolts/pockets provided therein. Any minor modification in the same including chipping, cutting and making good, adjusting the anchor bolts etc., if necessary, shall be carried out by the Contractor at his own expense. The positioning and levelling of all steel work including plumbing of columns and placing of every part of the structure with accuracy shall be in accordance with the drawings and to the complete satisfaction of the Engineer-in-Charge.

**TOLERANCES**

Tolerances for erection of steel structures shall be as per Annexure 'A'

**28.12 SAFETY & SECURITY DURING ERECTION**

- The contractor shall comply with IS: 7205 for necessary safety and adhere to safe erection practices and guard against hazardous as well as unsafe working conditions during all stages of erection.
- During erection, the steel work shall be securely bolted or otherwise fastened and when necessary, temporarily braced/guyed to provide for all loads to be carried by the structure during erection till the completion, including those due to the wind, erection equipment & its operation etc. at no extra cost to the owner. For the purpose of guying, the Contractor shall not use other structure in the vicinity without prior written permission of the Engineer-in-Charge.
- No permanent bolting or welding shall be done until proper alignment has been achieved.
- Proper access, platform and safety arrangement shall be provided for working and inspection, (at no extra cost to the owner) whenever required.

**28.13 FIELD CONNECTIONS**

**FIELD BOLTING**

Field bolting shall be carried out with the same care as required for shop bolting.

**FIELD WELDING**

All field assembly and welding shall be executed in accordance with the requirements for shop assembly and welding. Holes for all erection bolt – where removed after final erection shall be plugged by welding. Alternatively erection bolts may be left and secured.

**28.14 GROUTING**

- Prior to positioning of structural columns/girders/trusses over the concrete pedestals/columns/brackets, all laitance & loose material shall be removed by wire brushing & chipping. The bearing concrete surfaces shall be sufficiently levelled, hacked with flat chisels to make them rough, cleaned (using compressed air) and made thoroughly wet. All pockets for anchor bolts shall also be similarly cleaned and any excess water removed. Thereafter, the structural member

shall be erected, aligned & plumbed maintaining the base plates/shoe plates at the levels shown in the drawings, with necessary shims/pack plates/wedges.

- After final alignment and plumbing of the structure, the forms shall be constructed around and joints made tight to prevent leakage. Grouting (under the base plates/shoe plates including grouting of sleeves & pockets) shall be done with non-shrink grout having compressive strength (28 days) not less than 40N/sq.mm Non shrink grout shall be of free flow premix type and of approved quality and make. It shall be mixed with water in proportion as specified by the manufacturer. Ordinary 1:2 cement/sand mortar grout shall be used only for small, isolated structures e.g. operating platforms not supporting any equipment, pipe supports, cross-over's, stairs & ladders. The thickness of grout shall be as shown on the drawings but not less than 25 mm nor more than 40mm in any case.
- The grout mixture shall be poured continuously (without any interruption till completion) by grouting pumps from one side of the base plate and spread uniformly with flexible steel strips and rammed with rods, till the space is filled solidly and the grout mixture carried to the other side of the base plate.
- The grout mixture shall be allowed to harden for a period as decided by the Engineer- in-Charge. At the end of this period, the shims/wedges/pack plates may be removed and anchor bolts tightened uniformly. The alignment of the structure shall now be rechecked and if found correct, the voids left by the removal of shims/wedges/pack plates (if removed) must be filled up with a similar mixture of grout. In case after checking, serious misalignment is indicated, the grout shall be removed completely and fresh grouting done after making appropriate correction of alignment.

## 28.15 SCHEME AND SEQUENCE OF ERECTION

The Contractor shall furnish the detailed scheme and sequence of erection to match with the project schedule and get the same approved by the Engineer-in-Charge. All necessary co-ordination and synchronization shall be done with the Civil contractor where Civil works are not included in the scope of structural contractor at no extra cost so as to match with the project schedule.

## 28.16 PAINTING AFTER ERECTION

### a) GENERAL

- The scope of painting after erection shall be at the sole discretion of the Engineer-in- Charge and the Contractor shall obtain written instruction in this regard sufficiently prior to taking up any procurement of paint and execution of painting work after erection of steel structures.
- The Contractor shall carry out the painting work in all respects with the best quality of approved materials (conforming to relevant BIS Codes or IS: 800, as applicable) and workmanship in accordance with the best engineering practice. The Contractor shall furnish characteristics of paints (to be used) indicating the suitability for the required service conditions. The paint manufacturer's instructions supplemented by Engineer-in- Charge's direction, if any, shall be followed at all times. Particular attention shall be paid to the following:

a. Proper storage to avoid exposure & extremes of temperature.

b. Surface preparation prior to painting.

c. Mixing & thinning.

d. Application of paint and the recommended limit on time intervals between consecutive coats.

18.1.3 Painting shall not be done in frost or foggy weather, or when humidity is such as to cause condensation on the surfaces to be painted.

18.1.4 Surface which shall be inaccessible after site assembly shall receive the full specified protective treatment before assembly.

18.1.5 Primers & finish coat paints shall be from the same manufacturer in order to ensure compatibility. Painting colour code shall be as per Annexure-'B'.

**b) RUB DOWN & PRIMER APPLICATION**

The shop coated surfaces shall be rubbed down thoroughly with emery/abrasive paper to remove dust, rust, other foreign matters and degreased, if required, in accordance with IS: 1477 or IS: 800, as applicable, cleaned with warm fresh water and air dried. The portions, from where the shop coat has peeled off, shall be touched up and allowed to dry.

Primer coat as per table 29 of IS: 800 shall be applied by brushing/ spraying over the shop coat in a manner so as to ensure a continuous and uniform film throughout. Special care shall be taken to cover all the crevices, corners, edges etc. The final primer coat shall be air dried and shall have a minimum film thickness as per IS: 800 after drying, as applicable.

In case a different cleaning procedure & primer specifications are specified in the drawing/Tender, the same shall be adopted.

**c) FINAL PAINT APPLICATION**

After the primer is hard dry, the surfaces shall be dusted off and one coat of synthetic enamel paint of approved colour & shade (conforming to IS: 2932) or any other paint as per IS: 800, shall be applied by brushing/spraying so that a film free from "holidaying" is obtained. The colour & shade of first coat of paint shall be slightly lighter than the second coat in order to identify the application of each coat. The second coat of paint shall be applied after the first coat is hard dry. The minimum thickness of each film shall be as per IS: 800 after drying.

In case a different type of paint & painting procedure are specified in the drawing/tender, the same shall be adopted.

Color coding for structural steel shall be as per ANNEXURE “B”.

**d) INSPECTION & TESTING OF PAINTING WORKS**

- All painting materials including primers & thinners brought to site by the Contractor for application shall be procured directly from reputed and approved manufacturers and shall be accompanied by manufacturer's test certificates. Paint formulations without certificates shall not be accepted.

- The Engineer-in-Charge at his discretion may call for additional tests for paint formulations. The Contractor shall arrange to have such tests performance including batch wise test of wet paints for physical & chemical analysis. All costs shall be borne by the Contractor.
- The painting work shall be subject to inspection by the Engineer-in-Charge at all times. In particular, the stage inspection will be performed and Contractor shall offer the work for inspection and approval at every stage before proceeding with the next stage. The record of inspection shall be maintained. Stages of inspection are as follows:

a. Surface preparation

b. Primer application

c. Each coat of paint

- Any defect noticed during the various stages of inspection shall be rectified by the Contractor to the entire satisfaction of the Engineer-in-Charge before proceeding further. Irrespective of the inspection, repair and approval at intermediate stages of work the Contractor shall be responsible for making good any defects found during final inspection/guarantee period/defect liability period, as defined in General Conditions of Contract. Dry film thickness (DFT) shall be checked and recorded after application of each coat. The thickness shall be measured at as many locations as decided by the Engineer-in-Charge. The Contractor shall provide standard thickness measuring instrument such as elcometer (with appropriate range for measuring dry film thickness of each coat) free of cost to the Engineer-in-Charge whenever asked for.

## ANNEXURE-'A'

**(Clause 12.4)**

Maximum Permissible Erection Tolerances

**A. Columns**

| | | |
|---|---|---|
| 1. | Deviation of column axes at foundation top level with respect to true axes. | |
| | i) In longitudinal direction | ±5mm |
| | ii) In lateral direction | ±5mm |
| 2. | Deviation in the level of bearing surface of columns at foundation top with respect to true level | ±5mm |
| 3. | Out of plumb (Verticality) of column axis from true vertical axis, as measured at top: | |
| | i) Up to and including 30m height | ±H/1000 or ±25mm Whichever is less. |
| | ii) Over 30m height | ±H/1200 or ±35mm Whichever is less. |
| 4. | Deviation in straightness in longitudinal & transverse planes of column at any point along the height. | ±H/1000 or ±10mm Whichever is less. |
| 5. | Difference in the erected positions of adjacent pairs of columns along length or across width of building prior to connecting trusses/beams with respect to true distance. | ±5mm |
| 6. | Deviation in any bearing or seating level with respect to true level. | ±5mm |
| 7. | Deviation in difference in bearing levels of a member on adjacent pair of columns both across & along the building. | ±5mm |

Note: 1. Tolerance specified under 3 should be read in conjunction with 4 & 5.
Note: 2. 'H' is the column height in mm.

| | | |
|---|---|---|
| **B.** | **Trusses** | |
| 1. | Shift at the centre of span of top chord member with respect to the vertical plane passing through the centre of bottom chord. | ±1/250 of height of truss in mm at centre of span or ±15mm whichever is less. |
| 2. | Lateral shift of top chord of truss at the centre of span from the vertical plane passing through the centre of supports of the truss. | ±1/1500 of height of truss in mm or ±10mm whichever is less. |
| 3. | Lateral shift in location of truss from its true position. | ±10mm |
| 4. | Lateral shift in location of purlin from true position. | ±5mm |
| 5. | Deviation in difference of bearing levels of truss from the true level. | ±1/1200 of span of truss in mm or ±20mm whichever is less. |
| **C.** | **Gantry Girders & Rails** | |
| 1. | Shift in the centre line of crane rail with respect to centre line of web of gantry girder. | $\pm\frac{[\{\text{web thickness (mm)}\}+2\text{mm}]}{2}$ |
| 2. | Shift of alignment of crane rail (in plan) with respect to true axis of crane rail at any point. | ±5mm |
| 3. | Deviation in crane track gauge with respect to true gauge. | |
| i) | For track gauge up to and including 15m. | ±5mm |
| ii) | For track gauge more than 15m. | ±[5+0.25 (S-15)] Subjected to maximum ±100mm, where S in Metres is true gauge. |
| 4. | Deviation in the crane rail level at any point from true level. | ±10mm |
| 5. | Difference in level between crane track rails (across the bay) at | |
| i) | Supports of gantry girders | 15mm |
| ii) | Mid span of gantry girders | 20mm |
| 6. | Relative shift of crane rail surfaces (at a joining) in plan and elevation. | 2mm |

## CHAPTER-29

## 29. SPECIFICATION FOR DEMOLITION AND DISMANTLING

This specification covers the procedure and safety requirements for demolition and dismantling of masonry (Brick & Stone), concrete (Plain /Reinforced), structural steel (sheeted / un sheeted) works.

### 29.1 GENERAL

a) Apart from this specification, the demolition and dismantling of structures (part or whole) shall be in compliance with all statutory safety regulations and any other special requirement as shown/noted on the drawings and General Conditions of Contract. Prior consent and approval of the Engineer-in-charge shall be obtained in writing before starting any dismantling works. Any restrictions imposed regarding working hours shall also be strictly followed by the Contractor.

b) All materials obtained from dismantling/demolition operations shall be the property of the Owner unless otherwise specified and shall be kept in safe custody until handed over to the Engineer-in-charge.

c) Where it becomes necessary to disconnect any existing service line(s) (such as electrical, piping etc.) during dismantling/demolishing operation and where so required by the Engineer-charge, suitable alternate arrangement shall be made by the Contractor to maintain the continuity and proper functioning of the affected service line(s) with the approval of the Engineer-in-charge at no extra cost to the Owner.

### 29.2 SAFETY PRECAUTIONS

a) The Contractor shall adhere to safe demolishing/dismantling practices at all stages of work to guard against accidents, hazardous and unsafe working procedures.

b) Necessary propping, shoring strutting and/or underpinning shall be done for the safety of all surrounding structures (whose safety is likely to be endangered) before taking up, the demolishing and dismantling work.

c) Temporary enclosures made out of GI sheets, fencings, danger lights etc. shall be provided by the Contractor and got approved by the Engineer-in-charge before start of work to prevent accidents.

d) Contractor must ensure the availability of adequate firefighting equipment / arrangements before starting actual demolishing/dismantling works. These facilities shall be made available throughout the entire operation of demolition and dismantling of structures.

e) All equipment's, pipes, fittings and instruments, underground utilities etc. located in the vicinity shall be protected by suitable means, as decided by the Engineer-in-charge, during demolishing, dismantling operations.

f) Roads and working spaces shall be kept free of any debris/dismantled materials at the end of day's work.

g) Necessary measures shall be taken to keep the dust and noise nuisance to minimum levels.

h) Dismantled elements/components shall not be dropped from a height or thrown from a distance. Dismantling of elements fixed by screws/bolts/hooks etc. shall be done by taking out the fixtures with proper tools only. Such fixtures may be allowed to be cut by sawing or flame cutting, in the event of their being stuck-up due to corrosion etc. however the decision of Engineer-in-charge in this regard shall be final and binding, Welds shall be removed by flame cutting. Tearing or ripping of elements shall not be resorted to under any condition.

### 29.3 PROCEDURE

a) Entire work of demolishing & dismantling shall be meticulously planned. Prior to start of work, the Contractor shall thoroughly understand the scope and nature of the work, and then prepare and submit the proposed work execution plan of demolishing & dismantling to the Engineer-charge for his review. Comments if any, shall be taken care by the contractor and execution of the work shall be done based on the revised execution plan.
b) Demolition and dismantling shall be restricted to the extent shown on drawings or as directed by the Engineer-in-charge.
c) Demolition of any structure shall be carried out in the sequence reverse to that followed at the time of its construction.
d) Dismantling shall be done in a systematic manner. All elements shall be carefully removed without causing any damage.
e) Blasting in any form shall not be permitted.
f) Chipping of concrete/grout shall be done with precision by chiseling. The finished surfaces shall be made true to the requisite size and shape.
g) Pockets/holes of specified size shall be made/cut by drilling/chiseling.

### 29.4 CLEANING & STACKING

All demolished/dismantled serviceable materials such as bricks, stones, reinforcement bars, structural steel, sheeting etc. shall be separated out, cleaned and stacked in separate lots within the plant boundary as directed by the Engineer-in-charge.

### 29.5 DISPOSAL

All unserviceable materials shall be disposed off in spoil heaps within or outside the plant boundary as per the directions of the Engineer-in-charge. Areas required outside the plant boundary for dumping of disposed material shall be arranged by the contractor and got approved by the Engineer-in- charge.

## CHAPTER-30

## 30. SPECIFICATION FOR HEALTH, SAFETY & ENVIRONMENT

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

### 30.1 APPLICABLE SYSTEMS AND PROCEDURES

The reference standard for setting Quality, Health, Safety and Environment Systems and procedures will be as linked below –

- Guidelines issued by PNGRB.
- ISO 9001 – 2008 - For Quality System.
- ISO 14001 – 2004 - For Environmental Management System
- (OSHAS) 18001-2007 -For occupational health and safety management Systems.

The Occupational Health & Safety Assurance Standard (OHSAS) 18001-2007 gives requirements for an occupational health and safety (OH&S) management system. It enables an organization to control its OH&S risks and improve its performance. It provides a basis for an organization to specify its OH&S performance criteria and design the management system.

OHSAS 18001 is compatible with the ISO 9001 (Quality) and ISO 14001 (Environmental) management systems standards. This facilitates integration of quality, environmental and occupational health and safety management systems by an organization.

Organization structure of the proposed CGD project includes a position for developing, installing and maintaining (with assistance by a specialist entity) Quality Assurance (QA) and Health, Safety and Environment (HSE) systems in line with ISO 9001-2008, OHSAS 18001-2007 and ISO 14001- 2004 Standards.

Documented Standard Operating Procedures (SOP) will be prepared by the Owner/Owner's representative for CGD entity for QA and HSE, for application across the organization. Development of the SOPs and implementation of the same at construction sites, control rooms, regional and corporate offices will be followed by an internal audit to verify conformance.

The CGD Network operating entity will thereafter regularly monitor, through periodic internal and mandatory external audits, effective implementation of the SOPs at the construction sites, control rooms regional and corporate offices as per systems and procedures.

### 30.2 REFERENCES

This document should be read in conjunction with following.

- General Condition of Contract (GCC)

- Special Condition of Contract (SCC)
- Job Specifications
- Relevant IS codes, OSHAS standard
- Reporting Formats

**30.3 RESPONSIBILITY & ORGANISATION**

Health, Safety and Environment activities at site shall be under Contractor's scope. Contractor shall be responsible for implementation of HSE provisions. The nominated or designated safety engineer/ officer shall assist and perform day to day HSE work as per his advice.

**30.4 GENERALREQUIREMENT**

5.1. The contractor should follow HSE policy of owner as applicable to construction site.

5.2. The contractor shall ensure that HSE requirements are clearly understood & faithfully implemented at all level, at each site.

5.3. The contractor shall organize safety awareness programs regularly.

5.4. The contractor shall ensure his participation in every HSE meeting called by owner/owner representative.

5.5. The contractor shall conduct daily tool box talk.

5.6. Contractor shall ensure that their safety supervisor must always be present at site.

5.7. Contractor shall take sufficient care in moving his plants, equipment's and materials from one place to another place so that they do not cause any damage to any person or the property of the owner or any third party.

5.8. Working after sunset is strictly prohibited.

5.9. Hygiene requirement must be met on site by providing fresh drinking water at each site

5.10. The contractor shall submit Monthly HSE reports (Form attached in ANNEXURES).

5.11. The contractor shall provide one four wheeler at site during working hour to meet any contingency.

5.12. The contractor shall adhere consistently to all provisions of HSE .In case of non- compliance or continuous failure the owner/ owner representative may impose stoppage of work for the serious HSE violation. All works shall be carried out in presence of Owner/Owner's Representative only.

**30.5 TRAINING**

The Contractor duties shall include conducting HSE training for all activities and personnel involved.

The Contractor shall ensure that their Personnel have been given the necessary HSE and work-related skills training in compliance with regulatory requirements prior to engaging the personnel for the work.

### 30.6 TOOL BOX TALKS

Contractor's Site Supervisor for specific work location shall conduct a tool box at the commencement of work on daily basis. If different team is working in different area, separate tool box talk covering location and hazard involved shall be carried out.

Each toolbox meeting shall cover the following agenda:

- Discuss safety issues of previous day
- Brief description of activities planned for the day &associated hazard
- Information & resources required to put controls in place
- Location specific hazard and instructions.
- Requirements Open

It is the responsibility of supervisor to convey PPE requirement to all workers and ensure compliance of the same and shall be checked during tool box talk before embarking on work.

Tool box talk report shall be prepared and kept at site within one hour of talk and it must be signed by all attendee to ensure participation of all in the talk. Tool box report shall be submitted to CONSULTANT/ OWNER

### 30.7 INCIDENT/ACCIDENT AND NEAR-MISS REPORTING, INVESTIGATION AND FOLLOW UP

8.1. Incident/Accident and Near-Misreporting

All incidents/accidents must be reported immediately. A report should be prepared by the Supervisor and submitted to the Site Manager within 12 hours of the occurrence and shall serve as a source for education of employee to prevent reoccurrence of similar incident/accident.

Contractor shall submit the Initial report of all Accidents/Incidents within 12 hrs.to Owner / Consultant and detail report within 24 hrs. For serious incidents and near misses, with the potential for fatality, serious injury or significant environmental or material damage, Contractor shall notify Owner/Consultant without delay and within twenty four (24) hours.

8.2. Incident/Accident Investigation

All incidents/accidents must be reviewed and analyzed to establish root causes and type of injury, trends and practices.

Investigation shall begin promptly after the occurrence of the incidents/accidents. The completed incidents/accidents investigation report shall be submitted to the Contractor Site Manager within 7 days of the occurrence. A copy shall be submitted to Owner/Consultant.

8.3. Follow-up

All incidents/accidents, including investigation results and recommendations, shall be discussed in the Site HSE meeting and shall be brought to the notice of employees in toolbox meetings.

Key Risks Identification and Management Risks

Working at height is a critical activity. Following hazards are associated with Working at height:

- Person Fall from height
- Material falling From height
- Slips, trips and falls
- Concealed utilities (i.e. electric cable Telephone cable, water line, Drainage line}
- Electric shock

## 30.8 HAZARD IDENTIFICATION AND RISK ASSESSMENT SYSTEM (HIRA)

The Contractor shall prepare and implement comprehensive HIRA as part of the HSE Management Plan prior to Commencement of the work or services and during the execution of the work also.

## 30.9 SITE HSE INSPECTION/AUDIT

All Site HSE checklists/Inspection reports shall incorporate a follow–up procedure to ensure that any recorded HSE violations have been promptly attended to in a satisfactory manner.

The Site HSE Inspections/Audit shall be planned by the Contractor.

## 30.10 FIRST AID FACILITY

The contractor shall provide the first aid box at all the sites. The content of the first aid box shall include the following items:

- Twenty-four small sterilized dressings.
- Twelve medium size sterilized dressings.
- Twelve large size sterilized dressings.
- Twelve large size sterilized burn dressings.
- Twelve (15 gin) packets of sterilized cottonwood.
- One (200 ml) bottle of certified solution (1 per cent) or a suitable antiseptic solution.

- One (200 ml) bottle of mercurochrome (2 per cent) solution in water. (viii) One (200 ml) bottle of salt-volatile having the dose and mode of administration indicated on the label.
- One pair of scissors
- One roll of adhesive plaster (6 cm x 1in).
- Two rolls of adhesive plaster (2 cm. x 1in).
- Twelve pieces of sterilized eye pads in separate sealed packets.
- One polythene wash bottle (500 cc) for washing eyes.
- Twelve roller bandages 10 cm wide.
- Twelve roller bandages 5 cowhide.
- Six triangular bandages.
- One tourniquet.
- A supply of suitable splints.
- Two packets of safety pins.
- Kidney tray.
- One copy of first-aid leaflet issued by the Directorate General of Factory Advice Service and Labor Institutes, Government of India, Bombay.

All the content shall be kept in clearly marked and easy to remove cartons stored in such a manner that there is no rattling or spilling over even when the container is being moved Whenever applicable the cartons shall bear instructions for use, dosage etc.

### 30.11 FITNESS TO WORK

The objective of Medical Assessment for Fitness to Work (FTW) is to assess health of employees in relation to their specific jobs such as working at height, to ensure they could perform required task without risk to health and safety.

The Contractors workers (as per the above category) shall under go through FTW prior to start work at site. It will be the responsibility of the Contractor to ensure compliance to this requirement.

12.1. Medical Examination requirement for working at height

Below specific requirements are must for Medical examination of Contractors employees working at height:

- History of Epilepsy.

- Blood Pressure.
- ECG+ any History of any Seizures.
- Vision Check.
- Blood Sugar (fasting &PP).
- And other general tests.
- Physical Examination- to confirm the person is physically fit.
- Blood Group (One time Test).
- General check about fear of Heights.

12.2. Other Requirements:

- Contractor to ensure that persons involved in working at height are trained, certified and having Valid I Card.
- Carry out tool box talk before starting of the work.
- Carry out site specific risk assessment and identify risk control measures for specific site work. (Ref doc).
- Ensure that persons are physically & mentally fit for working at height.
- Ensure that equipment shall be used as per approved standard for working at height.
- Ensure that equipment shall have facility of emergency rescue operation.
- Ensure person involved in working at height are trained in emergency rescue operation.
- Ensure that all equipment and safety devices used are inspected, certified by competent authority & valid & suitable for use.
- Quality conformance shall be carried out prior to start of work for working at height

equipment's.

- Life cycle of equipment shall be checked
- In case of any part of equipment is found damaged or defective, it will be destroyed. "Working at height equipment's shall never being repaired". The Records, showing reasons for all the defective and damaged material shall be available and shall be stored separately at Contractor's yards.
- Ensure that Personnel Protective Equipment are inspected & in good condition

- Ensure that equipment used is within Safe working load mentioned on equipment.
- Ensure all tools are secured or kept in Tool kit / bag and there are no loose objects or tools.

**30.12 PERSONNEL PROTECTIVE EQUIPMENTS**

The contractors shall provide sufficient numbers of following personnel protective equipment's

(PPEs) to workmen and supervisors/engineers to use them properly at work site.

Following five numbers of Personnel protective equipment's are identified as MANDATORY for all.

- Safety Helmet
- Coverall
- Safety shoes/footwear
- Safety Glasses
- Hand Gloves (as per job requirement) Other PPEs shall be as per job requirement like Work at height- Full body harness (PETZL or equivalent make), Life line, Safety Net Arc Welding – Welding face shield Grinding – Grinding face shield Height work – Full Body harness (above 2 meters) Contractor to ensure proper use and selection of protective clothing / equipment for specialized jobs.

PPE's to be used shall be as per following Specification:

IS : 2925 – 1984 : Industrial Safety Helmets.

IS : 4770 – 1968 : Rubber gloves for electrical purposes

IS : 6994 – 1973

(Part – I) : Industrial Safety Gloves (Leather& Cotton)

IS : 1989 – 1986

(Part – I & : Leather safety boots and shoes

IS : 3738 – 1975 : Rubber knee boots

IS : 5557 – 1969 : Industrial and Safety rubber knee boots

IS : 6519 – 1971 : Code of practice for selection, care and repair of

Safety footwear

IS : 11226 – 1985 : Leather Safety footwear having direct molding

sole

IS : 5983 – 1978 : Eye protectors

IS : 9167 – 1979 : Ear protectors.

IS : 3521 – 1983 : Industrial Safety belts and harness

Technical Standard for working at height equipment's shall be as per following standard: Quality Standards

| Sr. No. | Name of equipment's | EN Standard |
|---|---|---|
| 1 | Energy absorbers | 365 |
| 2 | Slings | 566 |
| 3 | Retractable type fall arresters | 360 |
| 4 | Guide Type fall arresters on a rigid | 353-1 |
| 5 | Connectors | 362 |
| 6 | Dynamic mountaineering rope | 892 |
| 7 | Descended device | 341 |
| 8 | Anchor device Type-A/B | 795 |
| 9 | Fall arrester harness | 361 |
| 10 | Sit harness | 813 |
| 11 | Lanyards | 354 |
| 12 | Pulleys | 12278 |
| 13 | Fall arrester system | 363 |
| 14 | Work positioning belt | 358 |

### 30.13 EQUIPMENT LIST AND INSPECTION CERTIFICATE

Equipment list must be made available and must be certified for safety as per the requirement of Factory Act. Tools and Tackles should be calibrated from the approved agency only.

List of Tools and Tackles

| Item | Inspection/Calibration Date |
|---|---|
| Full body harness | Once in six Month |
| Rope Grab fall arrestor | Once in six Month |

| | |
|---|---|
| First Aid Box | Once in Month |
| Fire Extinguisher (10 Kg.) | Once in a Year |
| Extension board(without cable Joint with Socket) with Circuit Breaker | Monthly |
| Nylon tie line for tools | Once in a day |

**30.14 HSE REQUIREMENTS AT SITE**

Contractor may conduct survey to assess the requirement of GI riser for high rise building. For Work at Height: Contractor shall provide PETZL or equivalent system/metallic scaffolding as a working platform and full body harness with self-locking arrangement. Full body harness with self-locking arrangement shall be used for ascending/descending/work rest.

PETZL system or equivalent system/metallic scaffold should comply with relevant IS/EN/BS standard.

Only certified trained plumber undergone practical training on work at height shall be deployed.

Any working at height related activities has to be carried out with Permit system.

Work at Height

Working at Height is performing work at height where workers can fall 1.8m or more from where they stand or sit to perform work. This includes gaining access to working at height if there is a risk of falling 1.8m or more.

Examples of Working at Height are:

- Working on temporary platform more than 1.8mhigh
- Working on top of vehicles/tankers or building more than 1.8 m high Risk of Working at Height
- Fall from height
- Falling objects

Safety net, fall arrest system and two lanyard full body harness when working at height While working at height, all loose tools shall be kept inside a container and good housekeeping shall be maintained.

All Working at Height shall comply with Working at Height Procedures Safety Net System.

"Safety net systems" Safety net systems and their use shall comply with the following provisions.

Safety nets shall be installed as close as practicable under the walking/working surface on which workers are working, but in no case more than 30 feet (9.1 m) below such level. When nets are used on bridges or similar kind, the potential fall area from the walking/working surface to the net shall be un obstructed.

| Vertical distance from working level to horizontal plan of net | Minimum required horizontal distance of outer edge of net from the edge of the working surface |
|---|---|
| Up to 5 feet | 8 feet |
| More than 5 feet up to 10 feet | 10 feet. |
| More than 10 feet | 13 feet |

- Safety nets shall be installed with sufficient clearance under them to prevent contact with the surface or structures below when subjected to an impact force.

- Safety nets and safety net installations shall be drop-tested at the jobsite after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at 6-month intervals if left in one place. If drop test not possible designated competent person shall certify that the net and net installation is in compliance with the requirement by preparing a certification record prior to the net being used as a fall protection system. The certification record must include an identification.

- Determined that the identified net and net installation were in compliance and the signature of the person making the determination and certification. The most recent certification record for each net and net installation shall be available at the jobsite for inspection.

- Defective nets shall not be used. Safety nets shall be inspected at least once a week for wear, damage, and other deterioration. Defective components shall be removed from service. Safety nets shall also be inspected after any occurrence which could affect the integrity of the safety net system.

- Materials, scrap pieces, equipment, and tools which have fallen into the safety net shall be removed as soon as possible from the net and at least before the next work shift.

- The maximum size of each safety net mesh opening shall not exceed 36 square inches (230 cm) nor be longer than 6 inches (15 cm) on any side, and the opening, measured center-to-center of mesh ropes or webbing, shall not be longer than 6 inches (15 cm). All mesh crossings shall be secured to prevent enlargement of the mesh opening.

- Each safety net (or section of it) shall have a border rope for webbing with a minimum breaking strength of 5,000 pounds (22.2kN).

- Connections between safety net panels shall be as strong as integral net components and shall be spaced not more than 6 inches (15 cm) apart.

Lifeline

- Horizontal or vertical life line shall be used while working on suspended platform or similar type of platform or working at thereof/edge

- Horizontal/Vertical lifelines shall be designed, installed, and used, under the supervision of a qualified person, as part of a complete personal fall arrest system, which maintains safety factor of at least two.

- Lanyards and vertical life line shall have a minimum breaking strength of 5,000 pounds (22.2kN).
- When vertical lifelines are used, each worker shall be attached to a separate lifeline.

Full Body Harness

- Ensure that the full body harness must be inspected prior tousle.
- Ensure that full body harness must be worn by the workmen while working at height.
- Full body harness lanyard must be anchored with a strong member.
- While climbing up or climbing down, one of the hooks of lanyard must be locked alternatively all the time.

Working Platform

Every working platform more than 1.8 mtr. High from which a person is likely to fall shall be of steel plates/planks/cage and shall be:

- Closely boarded, planked or plated.
- At least 700 mm wide if the platform is used as a footing only and not for the deposit/ keeping of materials.
- At least 900 mm wide if the platform is used for the deposit of materials.
- At least 1100 mm wide if the platform is used for the support of higher platform.
- Two metal/planks shall not have 25 mm gap between them the distance between two consecutive transoms or other supports on which a platform rests shall be fixed with due regards to the anticipated load and the nature of platform flooring. As a general rule such transoms shall not be placed more than 1.0 mtr. apart.

Scaffold

- ✓ Scaffold Inspector (Project Field Officer)

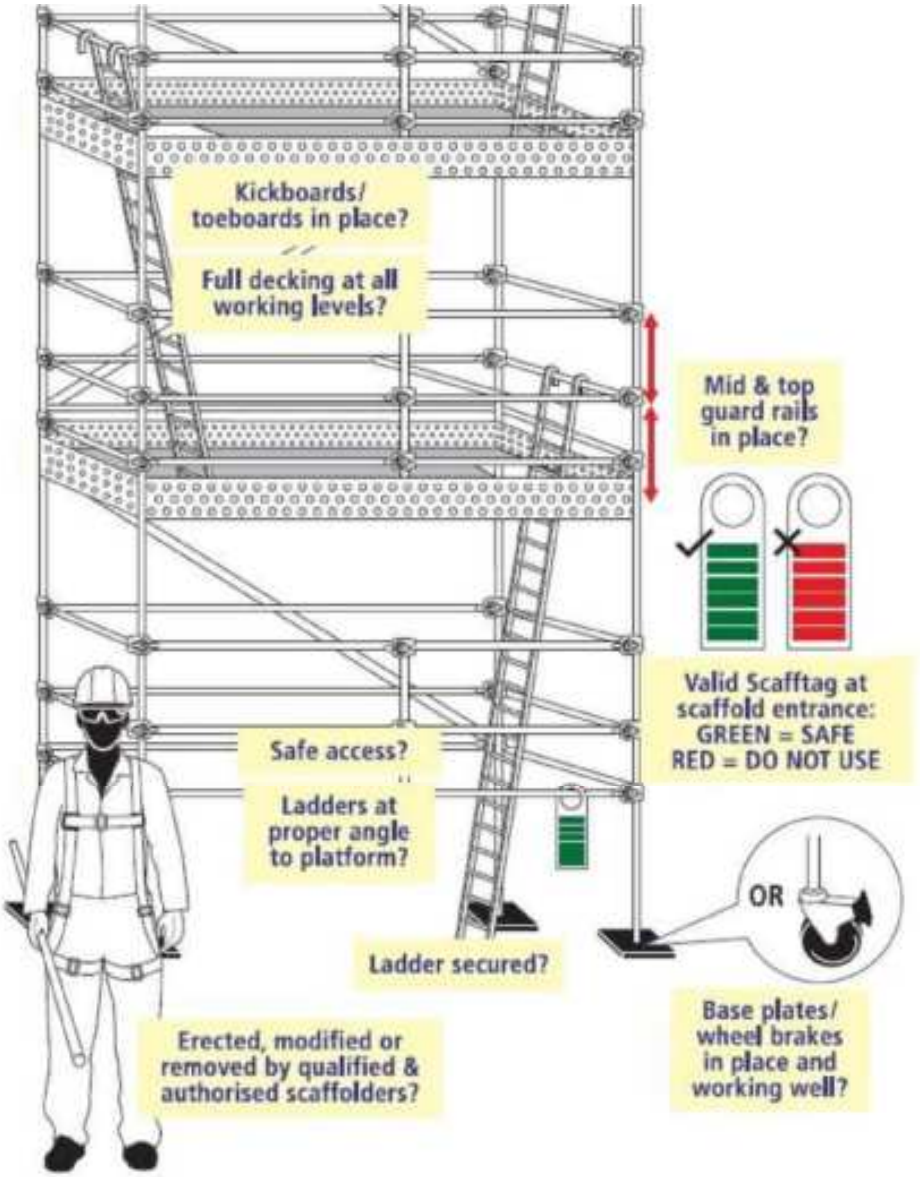
This is the competent individual who shall inspect scaffolding prior to each use and perform full inspections as per the Inspection procedure. He will accept the Scaffold after ensuring the followings;

- The scaffold erected complies with legislation.
- The permissible loads per deck and the working distance between the scaffold and the work surface are examined.
- Materials used for the scaffold are in a proper condition and in throughout the time it is in place.
- Existence and proper installation of collective protective equipment and means of access.
- Clear display of details of permissible loads on the scaffold.

- Acceptance is carried out prior to the scaffold being made available for the first time and is repeated after any alterations.
- Inspection is repeated at the frequency of 7 days. Issues scaffold tag (Green Tag) before its first use.

✓ Scaffold Contractor

This refers to the company involved in the installation (erection, dismantling and alteration) and/or design of the scaffolding on behalf of CONTRACTOR.




- The erection contractor shall ensure that the scaffolding is erected in compliance with the OHSAS/IS standards. Worksite specifications and considerations shall be incorporated into any such plan.

- Ensure availability of competent staff and certified material all the time.
- Scaffolding may be erected, dismantled or altered only under the supervision of a competent individual who has received adequate specific training for the intended operations, specifically including the following:
- Understanding the erection, dismantling and alteration plans for the scaffolding
- Ensure PPEs and Safety at work during erection ,dismantling and alteration of the scaffolding.
- Measures designed to prevent the risk of falling person's and objects.
- Safety measures applicable in the event of a change in weather conditions.
- Permissible structural load criteria.
- Any other risk that may be entailed by erection, dismantling and alteration operations.
- Scaffold material: Safe handling, and storage.

✓ Scaffold User

- The User shall ensure that acceptance of the scaffold has been properly carried out; green Tag is issued and provide notification of any alterations. Work from tagged scaffolds only. Comply with special conditions/additional controls noted on the access tag.
- It shall observe all restrictions on use (particularly permissible loads). Its requirements should be taken into consideration in the specifications during erection.
- Use scaffolds only for their intended purpose.
- Do not use unstable objects or makeshift devices to increase the working height of the scaffolds.
- Use portable ladders as a means of increasing the working height only after the competent person has determined that the stability of the structure has not been compromised, and adequate fall protection is in place.
- Do not straddles, stand on, or work outside of the guardrail.
- Use designed access means to descend or ascend a scaffold (stairs, attached ladder, or specially designed end frames). Do not uses cross bracing or side rail
- Keep only the tools and materials on the platform that are necessary to perform the task. Control all slipping and tripping hazards by removing or securing the tools/materials.
- Do not modify or remove a scaffold system/component or status tag.
- Notify supervision immediately if a scaffold is damaged, weakened, or otherwise deficient.

• Scaffold users/ Scaffold erectors shall use IS and EN standard double lanyard safety harness with absorbent.

✓ Inspection Points

To ensure the integrity and proper installation of scaffolding, a certain number of points shall be inspected. Inspection of these points ensures a basic level of safety. Following fundamental inspection points are as follows:

• Environment and location

• Supports and soleplates

• Structure and posts

• Decks

• Scaffold Capacity Standards

• Working levels

• Access

• Signs and signage

✓ Mobile Scaffolding

• Mobile scaffolds are identical in design to fixed scaffolds, except that their tubular structure is lighter and in terms of support, the wheels do not offer the same load-bearing area as footplates on fixed scaffolds.

• Erection is simple and shall be carried out using personal protective equipment. Lastly, during erection, dismantling and use, the brakes shall also be applied. Care should be taken to ensure that mobile scaffolds are installed on flat surfaces.

• Mobile scaffolds are highly practical for short jobs at relatively low heights.

• Acceptance is carried out after erection has been completed.

• They are moved as the work being carried out progresses. No fresh acceptance is required after each move, but the workstation shall be verified (working distance, brakes applied)

• A freestanding scaffold shall be considered safe when the total height is equal to or less than four times the minimum or least base dimension.

• Rules for use

• Do not extend the base to increase the height.

• Brace each frame level as per the manufacturer's instructions.

- Do not raise work surfaces by placing decks on rails or midribs.
- Do not climb on the guardrails or other structural components.
- Observe the manufacturer's guidelines governing the installation of brackets, material hoists etc.
- Stay clear of power lines and observe safety distances. (If any)

✓ Scaffold safety

The following safety tips are as guidelines in avoiding job-site situations that could prove dangerous to scaffold workmen.

- The Scaffold to the Building: Scaffolding should be tied to the structure using heavy wire or tie-in devices. The first vertical tie should be at the maximum height of 4 times the narrowest base dimension. Additional ties are not to exceed 26 feet vertically. Maximum horizontal distance between ties is not to exceed 30feet.
- Don't Overload Scaffolding: Follow the safe load capacities as given by the scaffold manufacturer. There's a limit even to what steel cansupport.A4-to- 1-safetyfactor must be figured on scaffolding.
- Use Metal Catwalks, Platforms; where available. If wood plank is used, it must be scaffold grade or better. Inspect thoroughly before every job to make sure it is free from breaks, knots, and cracks or warp age. Decking should be full width.
- All working platform must be constructed with the specific requirement of job.
- If the working platform is not permanent then safety belt must be used.
- There shall be firm foundation for all scaffoldings. All scaffolding shall be made of sound material.
- Scaffolding material shall be inspected and used, only if found in good condition.
- Provide metal base plate is used under all upright or standard scaffoldings. Correct type of couplers shall be used for all connections.
- Plumb and level scaffoldings as erection proceeds, so that braces will fit without forcing.
- Fasten all braces securely.
- Working platforms shall be provided with guards. This should consist of top rail, mid rail, and toe board. The toe board shall be of minimum height 100 mm, while the mid rail and top rail shall be at heights of 600 mm and 1200 mm respectively.
- Do not use ladders or makeshift devices on top of scaffoldings to increase the height.
- Shall be placed at least 75 deg. to the floor.
- Fall arrestor to be used where ever applicable.

- The following safety tips are as guidelines in avoiding job-site situations that could prove dangerous to scaffold workmen.

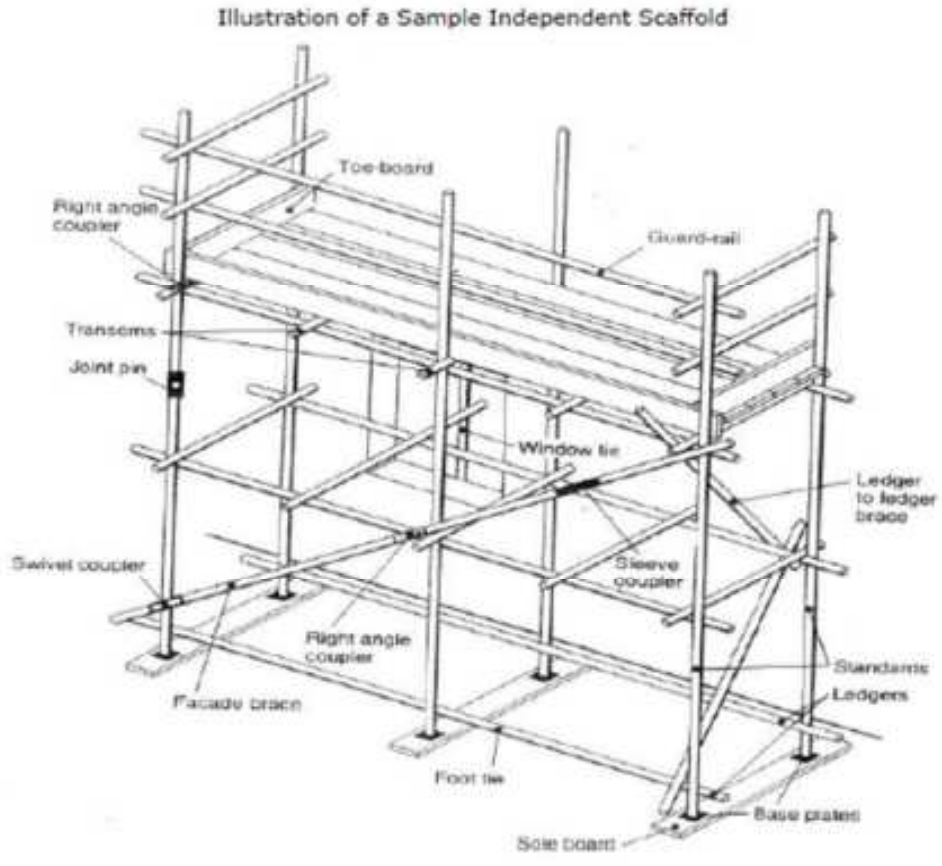
- Don't Ride Moving Scaffold; and remember scaffold units are limited in height to 4* times

- Their narrowest base dimension (unless base is widened by outriggers or more end frames; or tied into building.) Always keep casters locked. (except tore-spot)

- Don't Climb Braces: Use the steps provided on most steel scaffolds to climb up to or down from work levels. Use scaffold climbing ladders where required.

- Protect Working Levels: Use overhead canopies to protect workers on lower work levels when work is being done overhead. Rope off un safe areas underneath scaffold or provide wire mesh around work area.

- Use Double Guard Rails; and toe board so exposed side sat platform heights of 1.8 meter or more.




Ladders

- Fall protection is not needed when climbing up or down ladders less than 20 feet/6.1 meters, using 3 points of contacts.

- Portable ladders, steps and trestles should only be used for light duties of short duration. Otherwise, properly constructed means of access should be provided.

- Aluminum ladders can generate sparks when struck against rusty iron, so it must be used in Hazardous Areas with special care.

- Aluminum ladders must not be used in areas where they might be splashed with acids or alkalis ; e.g. Utilities Area

- Ladders with metal reinforced, Damaged or rotten stiles, Missed footing on ladder rungs must not be used.

- Over-reaching and over-balancing is not allowed.

- Every time before use, the user will carry out inspection of ladder.

- If the work to be done necessitates the use of both hands, a safety belt must be used.

- Tools and materials must not be hand carried by persons ascending or descending ladders. Where applicable light tools should be carried in pockets, tool belts or shoulder bags, provided they do not impair movement and are held securely.

- Rungs, stiles, or treads to be checked for bending, twisting or signs of abuse or undue wear.

- Feet to be fitted with various types of bases and in good order. Synthetic non-slip, wooden or metal.

- Non-slip stair treads mats of stepladders, should be fitted and in good condition.

- In case of moving ladders fitted with wheels, Hinges and locking devices to be secure and in good working order.

- All portable ladders must be in good condition as per the site norms.

- Ladder shall extend 3' to 4'above the point of Landing and topmost 3 rungs shall not be used.

- Ladder is checked visually for defects before every use.

- Ladders shall not be used in a horizontal position as runways or scaffoldings.

- Ladders shall not be placed in front of a door that opens toward the ladder unless the door is locked, blocked or guarded.

User Ladder Safety Checklist

The following check list specifies the main points to remember when using ladders:

- Do not erect:

- On sloping ground

- On top of movable objects

- In high wind
- In front of a door which may be opened
- Against a slippery or unstable surface
- At a shallow angle, or use horizontally as a plank or bridge
- Leaning to onside

Donor

- Drop things from ladder.
- Straddle from the ladder to a nearby foothold..
- Allow more than one person up a ladder at time.
- Use a ladder which is too short.
- Use a makeshift or 'home-made 'ladder.
- Over-reach (generally always keep hips within the stiles).
- Slide down ladder.
- No ladder should be used if it has: A missing, loose or defective rung or tread.
- A defective stile side member.
- A defective rope or associated fitting (rope operated extension ladders).
- Any sign of warping.
- Missing fastenings or rivets, guide or latching hooks.
- Always Return ladders to store as soon as they are finished with.
- Inspect a ladder immediately after any fall or overload.

Activities Allowed on Ladder

- A ladder is considered to be suitable for access of personnel to an elevated area only. No significant works may be carried out from a ladder. In particular, activities such as those below may not be carried out on ladder:

- Carrying tools (other than those which might clip onto a tool belt) up to an elevated level.
- Activities involving heavy manual labour.

- Activities requiring reaching or stretching such that the body is no longer centered over the ladder.
- For these types of jobs, a work platform such as a scaffold is required. The safe working position from a ladder is to have both thighs and hips within the styles.

Color code and inspection

- Color code of the year shall be painted on one style only and equal to one rung spacing.

Roof work

- All roof-work operations should be pre-planned and properly supervised.
- Roof work should only be undertaken by workers who are physically and psychologically fit and have the necessary knowledge and experience for such work.
- Work on roofs shouldn't be carried on in weather condition that threaten the safety of workers.
- Crawling boards, walkways and roof ladders should be securely fastened to a firm structure.
- Roofing brackets should fit the slope of the roof and be securely supported. Where it is necessary for a person to kneel or crouch near the edge of the roof, necessary precautions should be taken.
- On a large roof where work have to be carried out at or near the edge, a simple barrier consisting of crossed scaffold tubes supporting a tubing guardrail may be provided.
- All covers for openings in roofs should be of substantial construction and be secured imposition.
- Roofs with a pitch of more than 10 should be treated as sloping.
- When work is being carried out on sloping roofs, sufficient and suitable crawling boards or roof ladders should be provided and firmly secured imposition.
- During extensive work on the roof, strong barriers or guardrails and toe-boards should be provided to stop a person from falling off thereof.
- Where workers are required to work on or near roofs or other places covered with fragile material, through which they are liable to fall, they should be provided with suitable roof ladders or crawling boards strong enough and
- When spanning across the supports for the roof covering to support those workers.
- A minimum of two boards should be provided so that it is not necessary for a person to stand on a fragile roof to move a board or a ladder, or for any other reason.

Electrical Safety

- Only authorized electrical engineer / electricians are permitted to do the electrical work.
- Do not use extension cords or electric hand tools with exposed wires.

- To switch-off electrical supply in case of an emergency must be enabled at all times.
- All temporary electrical installations carried out on the site must be in accordance with the local regulations and specifications.
- The installations must be inspected regularly by a competent person (e.g. electrical engineer/supervisor) to ensure that they are in safe condition and working faultlessly.
- Each electrical power tools and electrical equipment must be under protection of earth leakage/residual current protective device(ELCB/RCCB).
- Portable power tools used on site must have protective insulation ("double insulation").
- All electrical machines, tools and appliances must be inspected by a competent person (e.g. electrician) to ensure that all equipment's are in safe condition and working faultlessly. To confirm that the inspection was conducted the equipment must be labeled or marked clearly and registered. The documentation must be submitted to TE for records.
- Assume that all circuits are live until they have been thoroughly checked and proven dead. Never work on a live circuit.
- When using electrical equipment in an environment with electrical conductivity (e.g. in confined spaces like case pipes, containers, towers) the voltage used may at maximum be 24 Volt AC. (fed from a safety low voltage transformer)
- Never use a fuse heavier than the capacity of the circuit. Also never attempt to bridge abuse.
- Never tamper with any electrical wiring or apparatus.
- Do the cable laying as per standard specifications and requirement; do not lay down power cables adjacent to secondary cables of welding machine.
- Assess overhead power line hazard and keep safe distance from it.
- All electrical equipment's, motors, transformers, welding machines, etc. to be

provided with earth connections.

<u>Power & Hand Tool Operation</u>

- All portable tools are to be connected through control bus with ELCB.
- All contractors should ensure proper Earthling of all electrical equipment's used by

them. Suitable earthling pits must be made if required.

- Examine electric cable for defects before use.
- Do not ever insert free ends of wires into sockets and hold them in place with matchsticks / other means. Always use industrial three pin plugs.

• Check the RPM rating of grinding wheels. The RPM rating must be greater than or same to that of the driver. Wheel guard should be used in proper position before grinding. Also proper PPEs must be ensured (goggles &hand gloves).

• Do not tie electric cords to metal rods or nails.

• No cable should run under the ground. It must run overhead at a 2 m height to avoid pinch point and creating trip hazard

• All tools and Tackles must be examined daily before commencing work and record to be maintained.

• Defective tools are to return to store.

• All electrical tools must be inspected at regular intervals by an authorized electrical person and record to be maintained.

• The weight, size & type of tool should be selected to suit the job carried out.

• The handles of tools should be intact and properly tightened. Split handles should be replaced. To avoid slippage, grease and oil should be wiped off.

• Insulated and non-conducting tools shall be tested for electrical resistance.

• Wrenches should not be pushed but pulled. Chisels struck by others should be held by tongs and not by hands.

• Chipping should always be done away from self.

• Hand tools should not be allowed to lie down on benches, scaffoldings etc. from where they can fall. They should be properly stored.

Welding

The metal frames and cases of mains-powered welding rectifiers, transformers and voltage regulators and of engine driven welding machines must be positively earthed locally throughout the work.

• Welding leads and return leads must be protected against physical damage.

• Insulated electrode holders and cable lugs / protectors must be used.

• The return lead must be attached to the work place as close as reasonably practicable to the welding point.

• If mains power is used, the work piece must be positively earthed using a well-

protected earth wire connected at both ends by bolted lugs or secure screw clamps.

- Bolted joints in pipelines and structures must not be relied upon to provide adequate electrical continuity for welding currents.

- Electric arc welding should not be carried out on equipment suspended from a crane because of the risk of damage to lifting wires from uncontrolled stray currents.

- Welders must not wear metal rings, bracelets or necklaces during the work as induced currents from the welding equipment might heat these.

- Dry, non-conductive gloves should be worn.

- The welder must always disconnect the electrode holder from the supply before attempting to replace an electrode.

- The welder should not lean against an earthed conductor whilst manipulating live electrodes.

- Welders working with electrodes fed from different phases of a three-phase supply should not work in close proximity to one another.

- Ensure that welding machine is in order and approved by site engineer.

- Ensure that welding cables are in order.

- Remove all combustible material from welding area to avoid fire.

- Place a fire extinguisher nearby welding premises.

- Ensure welding holder, cable and its lugs in good condition and use only industrial power socket and plugs (3 Pin) to avoid electricity risk.

- Make sure that weldingmachine is provided with ON/OFF switch and is earthed/grounding.

- Do not over load electrical appliances and cable, shocked pined.

Gas Cutting

- Gas cylinders must be secured in the vertical position to prevent them being knocked or pulled over.

- Long lengths of hose should be avoided, but;-

- Cylindersmustbekeptfarenoughawayfromtheweldingorcuttingoperationsto prevent contact with sparks, flames and metals platter

- Cylinders must be placed where they are unlikely to be damaged by stray electric currents or falling objects.

- Cylinders must not be taken into confined spaces.
- The torch must always be lit from a lighter provided for the purpose. There should be no attempt to light it from hot metal.
- Check the cylinder and its valve or leakage and move out any leaking cylinder immediately.
- Ensure that flash back arresters are installed with torch and NRV (Non return valve) on the gas cylinders side.
- Ensure cylinder is far away from fall of sparks and hot metal.
- Check the regulator and torches that they are inspected prior to every use.
- Check for leaks around regulators, hoses/fittings & nozzle with soap solution.
- Check the entire hose length if it is cracked or worn out cut that length of hose or replace the hose.
- Check that flash back arrester used for the purpose is of approved make/specification only.
- Place a fire extinguisher nearby welding premises.

Gas Cylinders

The handling of gas cylinders must comply with local legislation and TE's regulations as per particulars given below:

- Gas cylinders must be stored protected from excessive heat, fire, dangerous corrosion, mechanical damage or access by unauthorized.
- Gas cylinders must not be stored together with flammable materials.
- Gas cylinders must be secured to prevent them from falling over.
- Gas cylinders must be capped and operated upright.
- Use cylinder trolley / cage for the transportation of gas cylinders at site.
- Never use oil or grease on the regulator of a cylinder valve.
- Store gas cylinders in ventilated area.
- Don’t keep LPG cylinder in confine/below ground area.
- Gas stores must not be set up in critical areas such as stairways, corridors, emergency routes, garages or passages for person’s or vehicles.
- Never transport by rolling them on the ground or use them as rollers or supports.

- Never attempt to repair cylinder.
- Leaking regulators, cylinder valves, hose pipes or other equipment should be taken out of service.

Grinding Operation

- Grinding wheels should be stored in dry place.
- After expiry date, grinding wheel must be condemned, broken in to pieces.
- Power supply cable of adequate current carrying capacity shall be used and it should be in good workable condition without abrasions, cuts or puncture in outer insulation.
- Socket pin provided at supply end and On/off switch in working condition.
- Proper earthling of the body in case of metallic body.
- Wheel guard properly fitted imposition.
- Machine body without any damage like cricket.
- Moving part (wheel) must be properly fixed to the machine with the help of spanner.
- Grinding wheel must be of suitable size as per the speed of grinding machine.
- Grinding wheel without manufacturer's stickers having size, speed and expiry date must be condemned.
- Don't use portable grinding machine as bench grinder.
- Don't fit over size wheel than recommended size by machine/wheel manufacturer.
- Don't grind small, unstable object without fixing it in the vice.
- Don't over press the grinding wheel against the job for fast removal of metal.
- Put OFF the main switch, while machine is not in use (tea breakneck.).
- Don't chip off grinding/cutting wheel for achieving fast cutting rate.

PPEs:

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

Use of Power Tools and Cables

- All electrical equipment and tools used by the contractors and their employees shall

be properly checked by contractor's supervisor before use.

- All power tools must have proper guard at all-time.

- Leads /cables must be placed so that they do not create a tripping hazard.

Pressure / Leak Testing

Hydrostatic and Pneumatic Test

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

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

Barricades and Warning Signs

• Area where work is being carried out above man height or below 1' ground depth must be barricaded. Linked barrier with link chains must be provided by the contractor for cordoning the area at ground level, during GI work.

• Follow the instruction of all types of warning signs like "NO SMOKING" "NOENTRY" "DANGER" "Work at height", "Inconvenience to member of public regretted/work in progress","

• Name of the Contractor and contact details"

15.11. Basic Safety Rules For The Construction Site

• The construction site shall be considered a restricted area and unauthorized entry into the site is strictly prohibited. Anyone found trespassing should be asked to leave the site immediately.

• All persons of CLIENT/Consultant/Contractor shall be responsible for their own safety in plant or work sites.

• Nobody authorized to touch any valve, switch, or interfere with plant/site activities.

• Children below 18 years are not allowed inside plant / worksite.

• Never walk on the pipes, equipment, structure etc.

• Always use stairs, handrails & walkover platforms.

• Never carry sharp or pointed tools in pockets.

• Alcoholic beverages will not be consumed, brought into, or manufactured on the work sites or inside the plant.

• Drugs/intoxicant substances will not be used, brought into, or manufacture don't he site or plant.

• Cigarette, beedi smoking is not allowed except in the designated smoking booths.

• Firearms, explosives, knives or other types of weapons will not be allowed on the site.

• Gambling or any other form of betting games is prohibited.

• Discrimination on the basis of race, sex or national origin is prohibited.

• Horseplay, Fight, Practical jokes, Aggressive or abnormal behavior is prohibited.

• Individuals under the influence of alcohol or drugs will not be permitted entry to the site.

• Safety helmet, safety shoes, ear plug or ear muff, hand gloves, safety goggles, safety harness &clothing for body protection are mandatory in the plant or work site.

• Use other personal protective equipment as displayed in plan/site.

• It is strictly not allowed to use non-intrinsically safe equipment or instruments in the operational area of site.

• All vehicles for use on the site shall conform to the requirements of the Vehicle Entry Permit. Maximum Speed limit inside complex is 10km/Hr.

• In case of Emergency dial appropriate agency like Fire, Hospital, Security etc as displayed.

Violation of the Rules and Regulations might result in removing the person(s) concerned from the premises and denying the person(s) concerned from any future access to the site. The site in-charge will judge whether permanent removal of the individual from the premises is justified depending on the seriousness of the violation(s). All Indian laws shall be complied with at all the time.

Site Emergency Preparedness and Response

The CONTRACTOR shall establish, what are the arrangements in the event of an emergency.

The CONTRACTOR shall ensure that their Personnel are familiar with the essential emergency equipment, the use of which shall be demonstrated and practiced in drills.

The CONTRACTOR shall check the emergency procedures and the location and condition of the emergency equipment.

The CONTRACTOR personnel will be instructed of the actions to take in the event of serious personal injury, gas or toxic release, fire, explosion, heavy rains, wind storms, chemical spillage, land slide, scaffolding or structure collapse, critical damage to operating equipment, etc. and other emergency situations during the induction training and other ongoing training sessions.

These situations may demand adequate rescue and relief measure to handle such events quickly and effectively.

In an emergency, or on hearing the alarm, every supervisor shall ensure the following;

• All work is stopped atone.

• All equipment vehicles and tools are shut down (all sources of ignition).

• All men are evacuated to a pre-determined Muster point.

• A roll call is taken and every man is accounted for.

• No one is permitted to return to work until notification has been received from the CONTRACTOR representative that it is safe to dose.

✓ Emergency Preparedness

The basic and essential features of any emergency Preparedness are to analyses and plan for the potential risk. This includes;

- Establishing and maintaining effective communications.
- Liaison with local emergency services and authorities.
- Action Procedure (evacuation routes and assembly pointed.).
- Appointment of key personnel and specifying their duties and responsibility.
- Emergency Response Drills
  - ✓ Emergency Response Drills

Effectiveness and comprehensiveness of Emergency Response Plan must be tested on a regular basis. Drills which reflect the conditions induced from the more likely emergency occurrences must be conducted. CONTRACTOR should conduct such drill on periodic basis. All emergency drills, exercises and responses to actual incidents shall be fully documented and followed by a complete review and when necessary, procedure revision process.

Initiate any required procedural changes, and initiate the dissemination of any lessons learned through the Site HSE communication system.

Road Safety Norms

- For roadside working site to be barricaded..
- Only eligible driver can drive required vehicle inside site
- Speed limit norms of site must be followed
- No riding or travelling on the back of open end vehicle, fork lift or trailers should be done.

Environment

The CONTRACTOR shall pay due regard to the environment by preserving air, water, soil, animal and plant life from adverse effects of the CONTRACTOR's activities and minimizing any nuisance which may arise from such operations.

All waste generated by the CONTRACTOR shall be contained and disposed of in accordance with the legal requirement on waste management.

Labor Welfare &Legal Requirement

- All mandatory provisions with regard to safety as prescribed under contract Labor (Abolition & Regulation) Act 1970 and Rules made there under are applicable.
- Workmen compensation insurance and registration under ESI should be maintained.

• Time to time, all rules and regulations suggested by safety committee of site must be followed and implemented

ANNEXURE – A

RELEVANT IS-CODES FOR PERSONNEL PROTECTION

| | |
|---|---|
| IS : 2925 – 1984 | :Industrial Safety Helmets |
| IS : 4770 – 1968 | :Rubber gloves for electrical purposes |
| IS : 6994 – 1973 | :Industrial Safety Gloves (Leather & Cotton) |
| (Part – I) | |
| IS : 1989–1986 | :Leather safety boots and shoes |
| (Part – I & III) | |
| IS : 3738 – 1975 | :Rubber knee boots |
| IS : 6519 – 1971 | :Code of practice for selection, care and repair of Safety footwear |
| IS : 11226 – 1985 | :Leather Safety footwear having direct molding sole |
| IS : 5983 – 1978 | :Eye protectors |
| IS : 9167 – 1979 | :Ear protectors. |
| IS : 3521 – 1983 | :Industrial Safety belts and harness |

ANNEXURE – B

FORMAT – 1.0

1.0 : HEALTHY, SAFETY & ENVIRONMENT (HSE) PLAN

Project : ..... Contractor: .....

Date : ..... Owner: .....

(To be prepared & submitted by each Construction Agency)

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

PREPARED BY REVIEWED BY APPROVED BY

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

Project: _____ Contractor: _____

Date: _____ Owner: _____

Inspection By: _____

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

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

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

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

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

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

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

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

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

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

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

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

.....

Signature with Seal

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

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

Project:_____ Report No : _____

Name of the Contractor:_____ Status as on:_____

Name of work:_____

Name of safety officer_____

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

Remark

Date:_____/_____/_____

Safety Officer/RCM

(Signature and Name)

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

## SUPPLEMENTARY ACCIDENT, INCIDENT&NEAR MISS REPORT

Project:_____ Supplementary to report No._____

Site : _____ Date:_____

Contractor: _____

NAME OF THE INJURED.....

FATHER'S NAME.....

SUB-CONTRACTOR M/S.....

DATE & TIME OF ACCIDENT.....

LOCATION.....

BRIEF DESCRIPTION & CAUSE OF A ACCIDENT

NATURE OF INJURY / DAMAGE

COMMENTS FROM MEDICAL PRACTITIONER WHO ATTENDED THE VICITIM/INJURED

SUGGESTED IMPROVEMENT IN THE WORKING CONDITION IF ANY

LOSS OF MANHOURS AND IMPACT ON SITE WORKS

ANY OTHER COMMENT BY SAFETY OFFICER

Date:_____/_____/_____ SIGNATURE OF CONTRACTOR WITH SEAL

To : OWNER.....1 COPY

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

ACCIDENT REPORT

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

Report No._____ Date:___
Name of Site:_____ COTRACTOR_____

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

BRIEF DESCRIPTION OF ACCIDENT

CAUSE OF ACCIDENT

NATURE OF INJURY / DAMAGE

MEDICAL AID PROVIDED / ACTIONS TAKEN

INTIMATION TO LOCAL AUTHORITIES

Date :_____/_____/_____ SIGNATURE OF CONTRACTOR WITH SEAL

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

## CHAPTER-31

## 31. SPECIFICATION FOR SURVEY FOR UNDERGROUND SERVICES USING GPR

### 31.1 SCOPE

The intent of this specification is to cover the basic requirements for conducting the survey works for locating and tracing underground services at the location/ area identified in tender document or identified by the CLIENT to generate requisite information for the design and field engineering activities.

A. This specification covers the following works.

a) Establishment of base line for defining the co-ordinates of the various areas.

b) Mapping of location, elevation, properties, and size of underground pipeline, cables and other utilities (metallic and non-metallic) including, locating the change in direction of the facility using Ground Penetration Radar (GPR).

c) Preparation of surveys maps.

d) Two dimensional (2-D)/ three dimensional (3-D) AutoCAD file for the underground services as per project requirement/ schedule of rates.

B. The survey maps shall show all U/G pipes, cables, other utilities (metallic and non-metallic) etc.
C. The contractors shall identify Benchmark of the area and shall carry over level from Benchmark. This reference of BM shall be recorded on survey drawings.

### 31.2 DEFINITIONS

TRUE COORDINATE POSITION - The position of a point as determined by field survey originating on a known control survey marker and performed to the precision and adjusted as required for second order surveys (i.e. the horizontal error of closure shall not exceed 1 in 20,000 and the angular error of closure shall not exceed ten seconds times the square root of the number of instrument stations in the traverse, all before adjustment).

GPS (Global Positioning System) - Describes the survey procedure conforming to the U.S. Federal Geographic Data Committee standards as outlined in their publication FGDCSTD- 007.4-2002 for using GPS relative positioning techniques.

### 31.3 DELIVERABLES BY SURVEYORS

SURVEYOR shall produce the following:

**A. Drawings**

The final drawing shall be prepared and submitted in latest version of AUTOCAD in 2 sets of

USB Drive. In addition to the above, 3 sets of colored print of A3 Sheets of the drawing shall also be submitted.

**B. Electronic Media**

Electronic media on which topographic features and three dimensional surface data is delivered shall be provided in *.dwg & *.dgn format and the files shall be furnished on a USB Drive.

**C. Property of Maps**

Maps prepared by the contractor based on survey work carried out under this agreement shall be the sole property of Client. The contractor shall have no right to use, reproduce or pass on to the third party without prior written permission of Client.

**D. Maps & Drawings**

The survey maps shall be based on the survey work executed and shall show all relevant information pertaining to underground services; permanent bench mark etc.

**E. Check Prints**

Three copies of check prints of the plotted maps shall be supplied by the contractor to Client/Engineer-in-Charge for their approval along with original before submission of final deliverables.

## 31.4 PERFORMANCE REQUIREMENTS

The work shall be carried out by using Ground Penetration Radar (GPR) by qualified and competent surveyors under the direct supervision of qualified geophysicist.

The survey shall be carried out with reference to the existing permanent benchmarks.

The contractor shall be able to locate and map electrical and signal cables up to a depth of 2 Meters and Pipes (metallic and non-metallic) of sizes up to a depth of 6 Meters from ground level.

All measurements shall be in metric units.

The corrections arising from the standard errors shall be incorporated suitably.

The observations for the measurement of vertical distances on benchmarks and turning points shall be read nearest to 5 mm and for other nearest to 10mm.

## 31.5 METHODOLOGY OF SURVEY WORKS

Location Survey of Existing Control Points

a) A preliminary survey to identify existing control points shall be carried out and their correctness ensured.

b) All such control points shall be demarcated in the area plan.

c) The nearest available permanent benchmark shall be transferred to the area either on a permanent feature or on a concrete pillar specially erected for the purpose.

31.6 Map Contents

Limits of Mapping

The mapped area shall include the entire area of the property identified in the contract documents.

Details

a) General

• Show accurately all underground features within the limits of mapping including, but not limited to, the following:

• Underground pipe lines (Carbon steel, RCC, Plastic and other non-metallic):

Obtain location, elevation, properties, and size of underground pipelines and utilities at 10-meter intervals and at the change in direction of the pipelines.

• Underground electrical and instrumentation Cables.

• Other Underground utilities and structures.

b) Coordinate Grid System

Compile the map based on the plant grid system. Indicate on the drawing the permanent reference points to which the fieldwork is tied for horizontal control.

c) Drawing Scale

Survey contractor shall prepare drawings at a scale of 1:500.

31.7 Field Survey Requirements

General

The SURVEYOR shall perform survey work required to establish horizontal and vertical control sufficient to achieve the specified map accuracy. Perform sufficient supplementary field survey work to ascertain the true horizontal and vertical location of existing underground features.

Specification /Details along-with resolution of the GPR or equipment, to be used by contractor, shall be provided to Client for approval/information to ensure the competency of the GPR or equipment for application.

Accuracy

Perform field survey work with sufficient precision to ensure that the required accuracy of the finished drawing is achieved. The computed coordinate position of each horizontal control point used in compiling the drawing shall be correct within the limits of second order accuracy.

The accuracy level of pipe sizes shall be in the order of ±10%.

The accuracy level of depth of services shall be in the order of ±100mm.

31.8 Computer Graphics Data

- General Data Requirements

  An electronic design file shall be provided for each of the final maps. A composite of the total mapped area shall be produced in electronic *.dgn & *.dwg design file in addition to the individual maps. Additional survey data required by the contract document shall be incorporated into final electronic *.dgn & *.dwg design file and provided in *.ASC file format as follows:

  Point Number, Northing, Easting, Elevation, Description P, _N,_E,_Z,_DESC).

- 3-D Data

  All 3-D elements shall be at the actual Z value.

- 3-D Model

  Contractor shall provide 3-D model of the underground utilities after survey.

- Scale

  Record scale-dependent data (such as text, cells, symbols) at a scale factor suitable for display at the specified map scale.

- Text

  Text shall be a minimum of 2.5 mm in height when plotted.

- Working Units

  Set up data files on the basis of the following working units:

  (MU) Master Units = 1 meter

  (SU) Subunits = 1000 mm

- Global Origin

  Global origin of all design files shall be at the centre of the MicroStation/ AutoCAD design cube.

- Symbols and Patterns

Symbols and patterns incorporated into the map shall be of appropriate cells available to the SURVEYOR either of his own creation or as supplied by other software packages. All symbols and patterns used shall be clearly identified as such in the map legend on each drawing delivered.

31.9 SPECIFIC REQUIREMENTS

If, survey is carried out inside hydrocarbon plants / areas, all survey equipment to be used shall be intrinsically safe suitable for use in hazardous area.

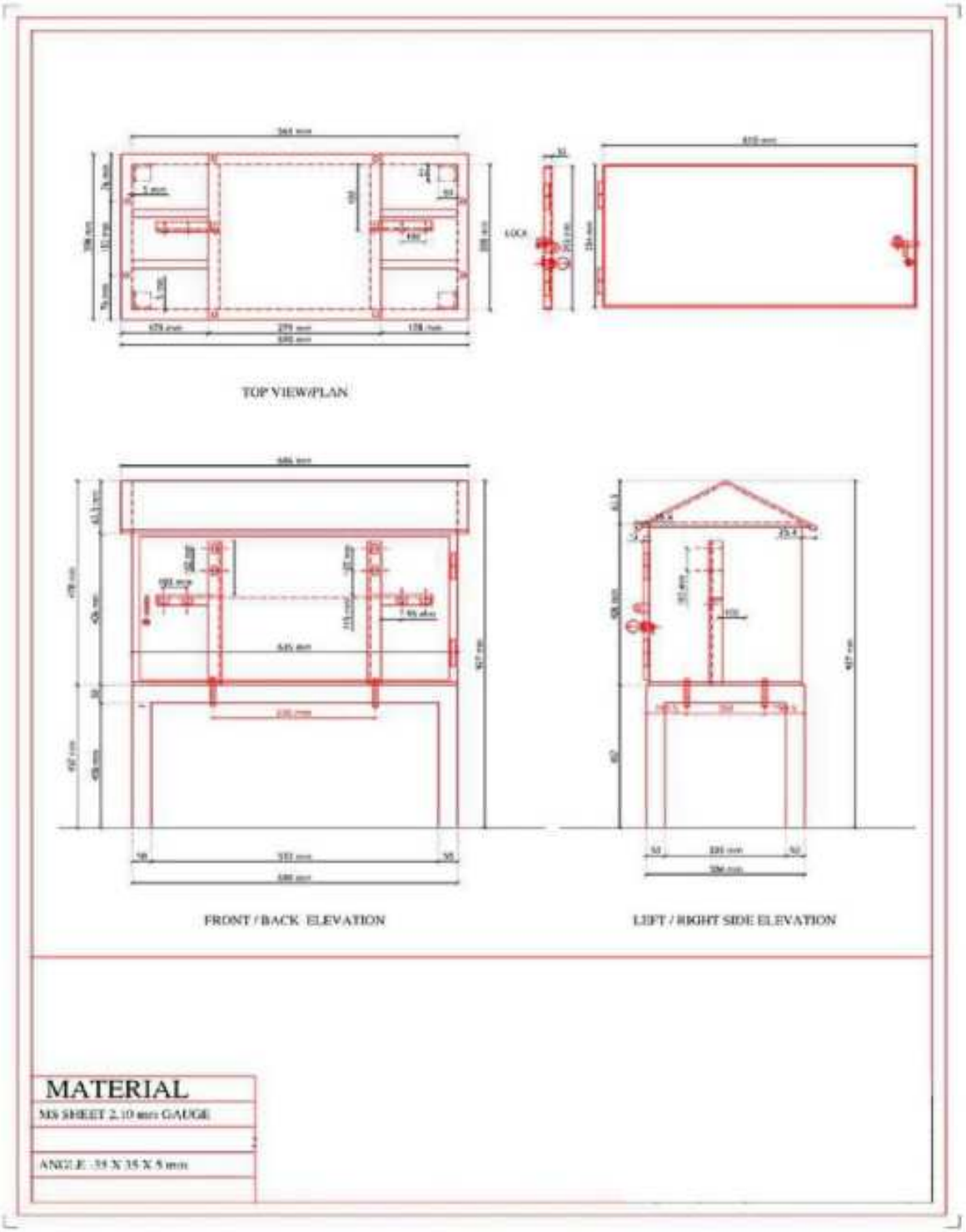
## CHAPTER-32

## 32. TECHNICAL SPECIFICATIONS FOR SERVICE REGULATOR BOX

- This specification covers the requirements for supply of Service Regulator Box which are used for protecting the Service Regulating skid.
- Dimensions of the Service Regulator Box shall be as per the drawing given in this document.
- A protecting cabinet should be provided to cover the Service Regulator and to avert the ingress of water. It should be constructed with durable, corrosion resistant and non-inflammable materials and should have adequate strength so that it should not get damaged / deformed during handling, transportation and installation preferably of steel of minimum 2.10 mm thickness.
- The cabinet supplied by the bidder should have free ventilation of at least 5% of the surface area. It should have front doors that open fully on either sides, and also be lockable from the outside by padlocks, and rear doors that are lockable from the inside. Box shall be supported by angles having dimensions of 35 x 35 x 5 mm.
- Before painting, surfaces shall be thoroughly cleaned to SA 2.5. Painting shall be carried out by application of one coat (DFT 25-35 microns) of zinc phosphate primer synthetic enabled paint followed by 2 coats (each of DFT 50 microns) of color “zinc yellow” (RAL 1018).
- Berger/Asian/Nerolac/Nippon make paint shall be used.
- On the Service Regulator box, the following instructions shall be inscribed in English, Hindi & Regional languages:
    - ❖ Danger: Inflammable Gas
    - ❖ IOCL Emergency Control Room Tel. Phone No.:
    - ❖ Fire Brigade Tel. Phone No.: 101
    - ❖ No Smoking or Spark Flame or Naked Flame within a radius of 1.5 meters.

Service regulator box shall be provided with locking facility and two sets of key and lock as shown in the drawing.

**Drawing**


TOP VIEW/PLAN
FRONT / BACK ELEVATION
LEFT / RIGHT SIDE ELEVATION
MATERIAL
MS SHEET 2.10 mm GAUGE
ANGLE :35 X 35 X 5 mm

**Proforma of Indemnity Bond for Work Orders**
**(Raw Materials)**

IndianOil Corporation Ltd.

_____
_____

Dear Sirs,
WHEREAS :
(i) (Indian Oil Corporation ( Pipelines Division) (hereinafter called "the Corporation" which expression shall include its successors and assigns) has awarded to_____(Name) (Constitution) (Address)
(hereinafter called "the Contractor" which expression shall include *its/*his/*their successors and assigns/*executors, administrators, representatives and assigns) a contract for the fabrication of on terms and conditions set out, interalia, in the Corporation's Letter No._____ dated_____to the Contractor and the General Conditions of Contract of the Corporation (hereinafter collectively referred to as "the said Contract" which expression shall include any formal contract entered into subsequent thereto and/or in supersession thereof and all amendments, modifications and/or variations thereto, in or of) ;
(ii) The Corporation has agreed to supply to the Contractor raw materials/components for incorporation in fabrication by the Contractor as aforesaid (the components/raw materials to be supplied by the Corporation to the Contractor for the said fabrication hereinafter for the sake of brevity referred to as 'the said material which expression shall include any item, thing or component that the same is fabricated into and any semifabricated material and material in the course of fabrication), upon the condition, interalia that pending fabrication and delivery at job-site of the completed fabricated work(s) incorporating the said material, the said material shall be under the custody and charge of the Contractor and shall be kept, stored, altered, worked upon and/or fabricated at the sole risk and expense of the Contractor ;
(iii) As a pre-condition to the supply of the said material by the Corporation to the Contractor, the Corporation has required the Contractor to furnish to the Corporation an indemnity and undertaking in the manner and upon terms and conditions hereinafter indicated:
NOW, THEREFORE, in consideration of the premises aforesaid the Contractor and I/We Son of resident of_____etc. (hereinafter collectively with the Contractor called "Indemnifiers" which expression shall include *its successors and assigns/*their respective heirs, executors, representatives and assigns ) hereby irrevocable and unconditionally, jointly and severally undertake to indemnify and keep indemnified the Corporation from/against all loss, damage and destruction ( inclusive but not limited to any or all loss or damage or destruction to or of the said material or any item or part or component thereof by theft, chemical or physical action or reaction, bending, warping, exposure, rusting, faulty workmanship, faulty fabrication or faulty method of technique of fabrication, riot, civil commotion, strike or lockout or other action of omission or commission whatsoever within or beyond the control of the Contractor), misuse and

misappropriation by the Contractor and the Contractor's servants and/or agents whatsoever to,of or in the said material or any part or item thereof between the date that the same or relative part or item thereof was supplied to the Contractor upto and until the date of return to the Corporation of the said material or relative part of item or component thereof or completed fabricated work (s) incorporating the said material AND

jointly and severally undertake to pay to the Corporation at_____ forthwith

on first demand in writing without protest or demur or proof or satisfaction the value of the said material or item or part thereof lost, damaged, destroyed misused and/or misappropriated, as the case may be, inclusive of the costs, charges and expenses (including but not Limited to handling, transportation, cartage, insurance, freight, packing and inspection costs and/or expenses) incurred by the Corporation as specified in the said demand.

AND the Indemnifiers hereby agrees with the Corporation that :-

(i) This Indemnity/Undertaking shall remain valid and irrevocable until the settlement of all claims of the

Corporation arising hereunder.

(ii) This Indemnity/Undertaking shall be in addition to any other indemnity, guarantee or security whatsoever

that the Corporation may now or at any time anywise have in relation to the Corporation's obligations / liabilities under and/ or in connection with the said contract inclusive for the said materials and Corporation shall have full authority to take recourse to or enforce this security in preference to the other security(ies) at its sole discretion, and no failure on the part of the Corporation in enforcing or requiring enforcement of any other security shall have the effect of releasing the Indemnifiers from their full liability hereunder.

(iii) The Corporation shall be at liberty without reference to the Indemnifiers and without affecting the full

liability of the Indemnifiers hereunder to take any other indemnity or guarantee of security in respect of the

Contractors obligations and/or liabilities under or in connection with the said contract inclusive of the said

material and to vary the terms vis-a-vis the Contractor of the said Contract or to grant time and/or indulgence to the Contractor or to reduce or to increase or otherwise vary the prices or the total contract value or the quantity, quality, description or value of the said material or to release or to forebear from enforcement of all or any of the rights of the Corporation or obligations of the Contractor under the said contract (inclusive in respect of said material) and/or the remedies of the Corporation under any other indemnity or guarantee or security(ies) now or hereafter held by the Corporation and no such dealing(s), variation(s), reduction(s), Increase (s), other indulgence (s) or arrangement(s) with the Contractor or release or forebearance whatsoever shall have the effect of releasing the Indemnifiers from their full liability to the Corporation hereunder or of anywise prejudicing rights of the Corporation against the Indemnifiers and the Indemnifiers hereby waive all rights, if any, at any time inconsistent with the terms of this Indemnity/Undertaking.

(iv) This Indemnity/Undertaking shall not be determined or affected by the liquidation or winding up,

dissolution, or change of Constitution or insolvency of the Contractor and the obligations of the Indemnifiers in terms hereof shall not be anywise affected or suspended by reason of any dispute or disputes having been raised by the Contractor (whether or not pending before any arbitrator, officer, Tribunal or Court) or any denial

Page 2 of 3

of liability by the Contractor or any other order or communication whatsoever by the Contractor stopping or preventing or purporting to stop or prevent any payment by the Indemnifiers to the Corporation in terms hereof.

(v) The mere statement or allegation made by or on behalf of the Corporation in any notice or demand or other writing addressed to the Indemnifiers or any of them as to any of the said material or item or part thereof supplied to the Contractor having been lost, damaged, destroyed, misused, or misappropriated while in the custody of the Contractor and/or prior to completion of the Completed fabricated work(s) incorporating the said material and delivery to job site thereof shall as between the Indemnifiers and the Corporation be conclusive of the factum of the said material or item or part thereof having been supplied to the Contractor and/or the loss, damage, destruction, misuse or misappropriation thereof, as the case may be, while in the custody of the Contractor and/or prior to the completion of the completed fabricated work(s) and delivery to job site thereof without necessity on the part of the Corporation to produce any documentary proof or other evidence whatsoever in support or proof thereof.

(vi) The amount stated in any notice of demand addressed by the Corporation to the Indemnifiers or any of them as the value of any of the said material lost, damaged, destroyed or misused or misappropriated, or of the costs, charges and/or expenses incurred by the Corporation in connection therewith shall as between the Indemnifiers and the Corporation be conclusive of the value of such said material and the said costs and expenses as also of the amount liable to be paid by the indemnifiers to the Corporation in terms and for the purpose hereof, without necessity for the Corporation to produce any voucher bill or other documentation or evidence whatsoever in support or proof thereof.

(vii) Shri _____who has signed this undertaking is duly authorised to sign this undertaking and to confer the authorities herein conferred for and on behalf of the Contractor.

Yours faithfully,

For _____

Place :

Date :

Note :

(i) This undertaking is to be stamped for the aggregate value of stamp duty payable on an agreement and on a general power of attorney in the State in which it is executed.

(ii) This undertaking is to be signed on behalf of the Contractor by a Director or other officer either authorized by the Board to execute this undertaking or generally authorized to execute contracts and powers of attorney on behalf of the Contractor.

(iii) The signature of this Undertaking is to be Notarially Attested.

Page 3 of 3

Annexure-10

## Hindrance Register

| Sl. No. | Nature of Hindrance | Period of Hindrance | | | Delay Attributed to Contractor/Owner | Signature | |
|---|---|---|---|---|---|---|---|
| | | From Day / Time in Hours | To Day / Time in Hours | Duration | | Site Representative | Contractor's Representative |
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INDIAN OIL CORPORATION LIMITED

# LIST OF APPROVED SUPPLIERS AND VENDORS

| APPROVED VENDOR LIST | |
|---|---|
| **S.No.** | **Powder Coated GI Pipe** |
| **1** | M/s Swastik Pipe Ltd. |
| **2** | M/s Jindal Industries Ltd. |
| **3** | M/s Vishal Pipes Ltd. |
| **4** | M/s Indus Tubes Ltd |
| **5** | M/s Advance steel Tubes Ltd. |
| **6** | M/s Good Luck Tubes Ltd. |
| **7** | M/s Surya Roshni Limited |
| **8** | M/s. APL Apollo Tubes Limited |
| **9** | M/s. Jindal Pipes Limited |
| **10** | M/s. Rama Steel Tubes |
| **11** | M/s P S Steel Tubes |
| **12** | M/s Fortune Pipes Ltd. |
| **13.** | M/s Indian Seamless Metals Tube Ltd. (Pune) |
| **S.No.** | **Electrofusion Fittings and Transition Fittings** |
| **1** | M/s AVK Valves India Pvt. Ltd. |
| **2** | M/s Georg Fischer Piping Systems Pvt. Ltd. |
| **3** | M/s Glynwed Pipe Systems (I) Pvt. Ltd. |
| **4** | M/s Jain Irrigation Pvt. Ltd., Jalagon |
| **5** | M/s RMG Autometers Gas Technologies |
| **6** | M/s Tega Muhendislik San Tic |
| **7** | M/s Kimplas Piping Systems Ltd. |
| **8** | M/s Aliaxis Utilities & Industry Pvt. Ltd. |
| **9** | M/s Friatech AG, Germany (represented by M/s Sherman Sales in India) |
| **10** | M/s Innogaz & M/s Frialen of M/s Aliaxis Utilities & Industry Pvt. Ltd. |
| **S.No.** | **GI fittings** |
| **1** | M/s Sarin Industries Ltd. |
| **2** | M/s Jupiter Metal Industries Ltd. |
| **3** | M/s Jainsons Industries Ltd. |

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|---|---|
| **4** | M/s Jinan Meide Casting Co. Ltd. |
| **5** | M/s. Green Malleable Pvt. Ltd. |
| **6** | M/s Chandan Enterprises(GI Clamps & Meter Clamps) |
| **7** | M/s Jay Banas |
| **8** | M/s Rajnesh Malleable Ltd., Delhi |
| **9** | M/s Industrial Valves & Components, Delhi |
| **10** | M/s Excel Metal & Engineering Industries, Mumbai |
| **11** | M/s Modern Stores & Engineering Concern, Kolkata |
| **12** | M/s Chokhawala Distributors (For Jinan Meide) |
| 13 | M/s Chokhawala Distributors (Make: MG Industries (MG/VNC Brand)) |
| **14.** | M/s Mehta Brother & Co., Mumbai- (Make: M/s Jinan Meide Casting Co.Ltd., Japan) |
| **S.No.** | **Forged fittings** |
| **1** | M/s Jainsons Industries Ltd Jalandhar |
| **2** | M/s Modern Stores & Engineering Concern Kolkata |
| **3** | M/s Bharat Forge & Press Industries Baroda |
| **4** | M/s B M Meters Pvt Ltd, Jalandhar |
| **S.No.** | **CS Pipe (ASTM A106 Gr B)** |
| **1** | M/s Maharashtra Seamless Limited (MSL) |
| **2** | M/s Indian Seamless & Metal Tubes (ISMT) |
| **3** | M/s HEAVY METAL & TUBES LTD., MEHSANA |
| **4** | M/s JINDAL SAW LTD. |
| **5** | M/s JFE STEEL CORPORATION |
| **6** | M/s ARCELORMITTAL TUBULAR PRODUCTS ROMAN SA |
| **7** | M/s SUMITOMO METAL IND.LTD |
| **8** | M/s NIPPON METAL INDUSTRY CO |
| **9** | M/s TENARIS |
| **S.No.** | **CS Fittings** |
| **1** | M/s Commercial Supplying Agency, Mumbai |
| **2** | M/s Dee Development Engineers Ltd |
| **3** | M/s Vivial Forge Pvt Ltd |

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| **4** | M/s A M Engineers |
| **5** | M/s Gujarat Infra Pipes Pvt Ltd, Vadodara |
| **6** | M/s. United Forge India Pvt. Ltd. |
| **7** | M/s M S Fittings Mfg. Co. Pvt Ltd, Kolkata |
| **8** | M/s Teekay Tubes Pvt. Ltd, Mumbai |
| **9** | M/s Pipe Fit, Baroda |
| **10** | M/s Sawan Engineers, Baroda |
| **11** | M/s Sky Forge Pvt. Ltd. , Palwal |
| **S.No.** | **Copper tubes & Fittings** |
| **1** | M/s Rajco metal |
| **2** | M/s Jay Banas Metals Pvt. Ltd. |
| **3** | M/s Mehta Tubes Limited- Trade Mark "MEXFLOW" |
| **4** | M/s.Paras Industries |
| **5** | M/S Mercure Metal & Alloys Pvt Ltd |
| **6** | M/s Chandan Enterprises |
| **7.** | M/s Mehta Tubes |
| **S.No.** | **Brass Fittings** |
| **1** | M/s Chandan Enterprises |
| **2** | M/s Paras Industries Ltd. |
| **3** | M/s Umesh Enterprise |
| **4** | M/s KPS Flexi Tubes |
| **5** | M/s. Chokhawala Distributors –Brass Adaptor |
| **6** | M/s Om brass Enterprises |
| **7.** | M/s Kabsons Gas Equipment Pvt. Ltd. |
| **8.** | M/s Fast Tech Engineers Pvt. Ltd. |
| **9.** | M/s Mehta Bros, Mumbai |
| **S.No.** | **Steel Re-inforced Rubber Hose(Type- 4)** |
| **1** | M/s Super Seal Flexible Hose Ltd. |
| **2** | M/s Suraksha Products Pvt. Ltd. |
| **3** | M/s Vansh Industries |
| **3** | M/s T & L Gases |

| S.No. | Warning Mat |
|---|---|
| 1 | M/s Sparco Multiplast Pvt. Ltd., |
| 2 | M/s Singhal Industries , Ahemdabad |
| 3 | M/s Puja Packing, Mumbai |
| 4 | M/s Bina Enterprises, Mumbai |
| 5 | M/s Shree Vijay Wire & Cable Industries |
| 6 | M/s Raychem RPG Ltd. |
| **S.No.** | **HDPE Pipes/Duct** |
| 1 | M/s Climax Synthetics (P) Ltd., Vadodra |
| 2 | M/s Indian Poly Pipes, Calcutta |
| 3 | M/s. Duraline India |
| 4 | M/s Jain Irrigation Systems Ltd., Jalgaon |
| 5 | M/s Kirti Industries (India) Ltd., Indore |
| 6 | M/s Ori Plast Limited, Calcutta |
| 7 | M/s Phoel Industries Limited, Delhi |
| 8 | M/s Sangir Plastics (P) Ltd., Mumbai |
| 9 | M/s Veekay Plast,Jaipur |
| 10 | M/s Kisan Irrigation |
| 11 | M/s Dutron Polymers Ltd. |
| 12 | M/s Parixit Irrigation Limited |
| 13 | M/s Dutron Polymers Ltd. |
| 14 | M/s Manikya Plastichem (P) Ltd |
| 15 | M/s Himalyan Pipe Industries |
| 16 | M/s Vishakha Irrigation Pvt. Ltd. |
| 17 | M/s Hari Plast |
| **S.No.** | **Corrugated Flexible Metal Hoses (Anaconda)** |
| 1 | M/s KPC Flex Tubes |
| 2 | M/s Vestas Hose Division |
| 3 | M/s Alpha Flexi Tubes |
| 4 | M/s Chandan Enterprises |

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| **5** | M/s Vikram & co. |
| **6** | M/s. Alfa Hoses & Bellows Mfg. Co. |
| **S.No.** | **MDPE Pipe** |
| **1** | M/s Hari Udyog Pvt. Ltd |
| **2** | M/s. Vedanta Polymers Pvt Ltd. |
| **3** | M/s Jain Irrigation Systems Ltd. |
| **4** | M/s Ori Plast Ltd. |
| **5** | M/s. Vishakha Irrigation Pvt. Ltd. |
| **6** | M/s Duraline Indian Pvt. Ltd. |
| **7** | M/s Kriti Industries (i) Ltd., Indore |
| **S.No.** | **PE(Fittings & Valves)** |
| **1** | M/s AVK Valves India Pvt. Ltd. |
| **2** | M/s Tega Muhendislik San Tic |
| **3** | M/s Georg Fischer Piping Systems Pvt. Ltd. |
| **4** | M/s Kimplas Piping Systems Ltd. |
| **5** | M/s Glynwed Pipe Systems (I) Pvt. Ltd. |
| **6** | M/s Aliaxis Utilities & Industry Pvt. Ltd. |
| **7** | M/s. RMG Autometers gas technologies |
| **8** | M/s Al-Aziz Plastics (P) Ltd. |
| **9** | M/s Jain Irrigation Pvt. Ltd., Jalagon |
| **10** | M/s Friatech AG, Germany (represented by M/s Sherman Sales in India) |
| **11** | M/s Innogaz & M/s Frialen of M/s Aliaxis Utilities & Industry Pvt. Ltd. |
| **12** | M/s Rhino Services Pvt Ltd ( Make: Daeyoun) – Only For PE Valves |
| **S.No.** | **Isolation & Appliance Valve** |
| **1** | M/s Enologas Bonomi S.P.A |
| **2** | M/s Ningbo Zhiqing industrial Co Ltd. |
| **3** | M/s Chandan Enterprises |
| **4** | M/s Jainsons Industries |
| **5** | M/s Inkal Ventures Pvt. Ltd. |
| **6** | M/s Zhejiang Valogin Technology Co. Ltd. |

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| **7** | M/s Umesh Enterprises |
| **8** | M/s Parker Hannifin S.P.A. |
| **9** | M/s Astron Valvetech Private Limited |
| **10** | M/s Mehta Brothers, Mumbai |
| 11 | M/s Chokhawala Distributors |
| **12** | M/s Inkal Ventures Pvt Ltd |
| **S.No.** | **GNSS Device** |
| **1** | M/s Leica FLX100 |
| **2** | M/s Trimble R2/DA2 |
| **3** | M/s Spectra SP60 |
| **4** | M/s Arrow Gold |
| **5** | M/s Javad |
| **6** | M/s Stonex |
| **S.No.** | **MDPE Ball Valve PE 100 (Without Stem)** |
| **1** | M/s Grorge Fischer Piping Systems Pvt. Ltd. |
| **2** | M/s Glynwed Pipe Systems (I) Pvt. Ltd. |
| **3** | M/s AVK Valves India Pvt. Ltd. |
| **4** | M/s Jain Irrigation Pvt. Ltd., Jalagon |
| **5** | M/s RMG Autometers Gas Technologies |
| **6** | M/s Grorge Fischer Piping Systems Pvt. Ltd. |
| **7** | M/s Kimplas Piping Systems Ltd. |
| **8** | M/s Aliaxis Utilities & Industry Pvt. Ltd. |
| **9** | M/s Tega Muhendislik San Tic |
| **10** | M/s Friatech AG, Germany (represented by M/s Sherman Sales in India) |
| **11** | M/s Innogaz & M/s Frialen of M/s Aliaxis Utilities & Industry Pvt. Ltd. |
| **S.No.** | **TPIA (Third Party Inspection Agency)** |
| **1** | M/s Tata Projects Ltd. |
| **2** | M/s American Bureau Services |
| **3** | M/s Bureau Veritas |

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| **4** | M/s Bax counsel Inspection Bureau Pvt. Ltd. |
| **5** | M/s Germanischer Lloyd |
| **6** | M/s ABS Industrial Verification Ltd., Mumbai |
| **7** | M/s Certification Engineers International Ltd. |
| **8** | M/s Dalal Mott MacDonald |
| **9** | M/s International Certification Systems |
| **10** | M/s SGS India Pvt. Ltd |
| **11** | M/s Intertek Moody |
| **12** | M/s TUV SUD South Asia |
| **13** | M/s TUV Rheinland (India) Pvt. Ltd. |
| **14** | M/s Vincott International India Assessment Service Pvt. Ltd. |
| **15** | M/s Meenar Global Consultants |
| **16** | M/s TUV Nord Group |
| **17** | M/s DET NORSE VERITAS (DNV) |
| **18** | M/s LLOYD Register |
| **19** | M/s Edlipse Engineering Global Pvt. Ltd |

**NOTE:**

AT THE TIME OF P.O. PLACEMENT, PROPOSED VENDOR/ SUPPLIER SHALL NOT BE IN HOLIDAY LIST OF IOCL.

# STANDARD QUALITY ASSURANCE PLAN

## Brass Fittings

QAP NO : IOCL/QAP/001

| | | | | | | INSPECTION BY | | |
|---|---|---|---|---|---|---|---|---|
| **SR. No** | **DESCRIPTION** | **QUANTUM OF CHECK** | **PROCEDURE** | **ACCEPTANCE CRITERIA (As per EN 1057/ PTS)** | **FORMAT OF RECORD** | **Manufacturer** | **TPIA** | **REMARKS** |
| **1** | **Raw material: Chemical/ Physical Requirement** | one in each heat | As per EN 12164 / PTS | As per EN 12164/ PTS | MTC | P | W | |
| **2** | **Final product** | | | | | P | W | |
| 2.1 | Resistance dezincification | one in each heat | As per EN 6509 / PTS | As per EN 6509 / PTS | Test Report | P | W | |
| 2.2 | Carbon bore test | one in each heat | As per ISO 6957 / PTS | As per ISO 6957 / PTS | Test Report | P | W | |
| 2.3 | Stress corrosion resistance test | one in each heat | As per ISO 6957 / PTS | As per ISO 6957 / PTS | Test Report | P | W | |
| 2.4 | Hydrostatic pressure test | 100% | As per EN 1254/EN 12164 | Min 37.5 bar @ 15 min. | Test Report | P | RW | Min 10 % by TPIA |
| 2.5 | Pneumatic pressure test | | As per EN 1254/ EN 12164/ PTS | Min 6 bar @ 15 second | Test Report | P | RW | Min 10 % by TPIA |
| 2.6 | Visual Inspection (Free from defect) | 100% | As per EN 12164/ EN 1254/PTS | As per EN 1254/ PTS | Test Report | P | RW | Min 10% by TPIA |
| 2.7 | Dimensional Inspection (O.D, Wall thk., Length etc.) | 100% | As per EN 12164/EN 1254/PTS | As per EN 1254/ PTS | Test Report | P | RW | Min 10 % by TPIA |
| **3** | **Marking** | 100% | EN 12164/ EN 1254 | As per EN 1254 | | P | RW | Min. 10% by TPIA |
| **4** | **Documentation** | - | PTS | PTS | Test Report | P | R | |

**LEGEND: R -** Review, **W -** Witness, **H -** Hold, **P -** Perform, **TPIA -** Third Party Inspection Agency, **MTC –** MATERIAL TEST CERTIFICATE

Notes: -

1. The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the applicable codes.
2. The TPIA shall use this QAP for inspection against subject tender and may consider this document as approved.
3. Procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more stringent condition shall be applicable.
4. Owner/ Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.
5. All reference Codes / Standards documents, PTS shall be arranged by vendor / supplier for reference of TPIA at the time of inspection.
6. At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC.

# STANDARD QUALITY ASSURANCE PLAN
# COPPER FITTINGS

QAP NO : IOCL/QAP/002

| | | | | | | INSPECTION BY | | |
|---|---|---|---|---|---|---|---|---|
| **SR. No** | **DESCRIPTION** | **QUANTUM OF CHECK** | **PROCEDURE** | **ACCEPTANCE CRITERIA (As per EN 1057/ PTS)** | **FORMAT OF RECORD** | **Manufacturer** | **TPIA** | **REMARKS** |
| 1 | Raw material: Chemical Requirement | One in each heat | As per EN 1254/ PTS | Material grade Cu-DHP/ CW 024A Cu + Ag: Min 99.9% P: 0.0015% to 0.040% | MTC | P | R | |
| 2 | Final product: Chemical Requirement | One in each heat | As per EN 1254/ PTS | Material grade Cu-DHP/ CW 024A Cu + Ag: Min 99.9% P: 0.0015% to 0.040% | Test Report | P | W | |
| 3 | Carbon in bore tests (Carbon film test, carbon content test) | One in each heat | As per EN 1254/ PTS | As per EN 1254/ PTS | Test Report | P | W | |
| 4 | Stress corrosion resistance test | One in each heat | As per EN 1254/ PTS | As per ISO 6957/ PTS | Test Report | P | W | Min. 10% by TPIA |
| 5 | Hydrostatic pressure test | 100% | As per EN 1254/ PTS | Min 37.5 bar @ 15 min. | Test Report | P | RW | Min. 10% by TPIA |
| 6 | Pneumatic pressure test | 100% | As per EN 1254/ PTS | Min 6 bar @ 10 second | Test Report | P | RW | Min. 10% by TPIA |
| 7 | Dimensional Inspection (O.D, Wall thk., Min. Length of engagement etc.) | 100% | As per EN 1254/ PTS | As per EN 1254/ PTS | Test Report | P | RW | Min. 10% by TPIA |
| 8 | Visual Inspection (Free from defect) | 100% | As per EN 1254/ PTS | As per EN 1254/ PTS | Test Report | P | RW | Min. 10% by TPIA |
| 9 | Marking | 100% | As per EN 1254/ PTS | As per EN 1254/ PTS | - | P | RW | Min. 10% by TPIA |
| 10 | Documentation | | As per EN 1254/ PTS | As per EN 1254/ PTS | Inspection Report | P | R | |
| | | | | | | | | |

**LEGEND: R -** Review, **W -** Witness, **H -** Hold, **P -** Perform, **TPIA -** Third Party Inspection Agency, **MTC –** MATERIAL TEST CERTIFICATE, **PTS-** PARTICULAR TECHNICAL SPECIFICATION

**Notes: -**

1.The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the applicable codes along with additional requirement of PTS.

2. The TPIA shall use this QAP for inspection against subject tender and may consider this document as approved.

3. Procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more stringent condition shall be applicable.

4. Owner/ Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.

5. All reference Codes / Standards documents, PTS shall be arranged by vendor / supplier for reference of TPIA at the time of inspection.

6. At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC.

# STANDARD QUALITY ASSURANCE PLAN
# CORRUGATED FLEXIBLE METAL HOSE (ANACONDA)

QAP NO : IOCL/QAP/003

| | | | | | | INSPECTION BY | | |
|---|---|---|---|---|---|---|---|---|
| **SR. No** | **Item/Description** | **Test Parameters** | **QUANTUM OF CHECK** | **PROCEDURE** | **ACCEPTANCE CRITERIA/ FORMAT OF RECORD** | **Manufacturer** | **TPIA** | **REMARKS** |
| 1 | **Raw Material** | | | | | | | |
| 1.1 | | Chemical & Mech. Test of material of SS hose | 100% | SS316 BS: 1449 PART -2 | SS316 BS: 1449 PART -2/ MTC | P | W | |
| 1.2 | | Chemical & Mech. Test of material of end fittings (Adaptors, Nuts, Washer) | 100% | As per PTS | As per PTS / MTC | P | W | |
| 1.3 | | Heat treatment | 100% | As per BS: 6501 PART 1 | As per BS: 6501 PART 1/ MTC | P | R | |
| 2 | **Final Product** | | | | | | | |
| 2.1 | Type test | Cyclic life/ static bend test at 1.5 x design pressure | One (1) per batch | As per Cl. No. 14 of BS: 6501 PART 1 | As per BS: 6501 PART 1<br>No cracks permissible/ T.C. | P | W | |
| 2.2 | Type test | Yield and Burst test | One (1) per batch | As per<br>Cl. No. 14 of BS: 6501 PART 1 | As per BS: 6501 PART 1 / T.C. | P | W | |
| 2.3 | Production test | Pressure test (Pneumatic Test) | 100% | As per<br>Cl. No. 15 of BS: 6501 PART 1 | As per BS: 6501 PART 1 / T.C | P | RW | Min. 10% by TPIA |
| 2.4 | Production test | Visual Inspection | 100% | As per BS: 6501 PART 1 | As per BS: 6501 PART 1/ TC | P | R | |
| 2.5 | Production test | Dimension | 100% | As per PTS | As per PTS/ IR | P | RW | Min. 10% by TPIA |
| 3 | **End fittings (Adaptors, nuts, washer)** | Visual & dimensional check | 100% | As per PTS | As per PTS/ IR | P | RW | Min. 10% by TPIA |
| 4 | **Marking** | - | 100% | As per BS: 6501 PART 1/ PTS | As per BS: 6501 PART 1/ PTS/ TR | P | RW | Min. 10% by TPIA |
| 5 | **Final Documentation** | - | - | As per the term & conditions of P.O. & PTS | As per the term & conditions of P.O. & PTS / IR | P | R | |
| | | | | | | | | |

**LEGENDS: R - Review, W - Witness, H - Hold, P - Perform, TPIA - Third Party Inspection Agency, RW - Random witness, PTS- Particular Technical Specification, TR- Test Report, MTC- Material Test Certificate, T.C.- Test Certificate, IR- Inspection Report**

**Notes: -**

1.The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the applicable codes along with additional requirement of PTS.

2. Mechanical & Chemical testing shall be done in NABL accredited lab.

3. Special manufacturing procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more stringent condition shall be applicable.

4. Owner / Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time

5. All reference Codes/ Standards, Documents, P.O. Copies shall be arranged by vendor / supplier for reference of TPIA/GGL at the time of Inspection

6. At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, despatch clearance note & MTC.

7. TPIA shall mention clause wise observations in IRN & IR.

# STANDARD QUALITY ASSURANCE PLAN

# GI FITTINGS

QAP NO : IOCL/QAP/006

| | | | | | | | | INSPECTION BY | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SR. No | Item / Description | COMPONENT | CHARACTERISTICS | QUANTUM OF CHECK | REFERENCE DOCUMENT | ACCEPTANCE NORMS | RECORD | Manufacturer | TPIA | REMARKS |
| 1 | Chemical composition of material | Test Bar | Marking and correlation with TC | As per IS: 14329 Grade BM 300 | IS: 14329 Grade BM 300, PO, PTS, Material specification | IS 14329/ PO, PTS Material specifications | Mill T.C. | R | R | |
| 2 | Chemical composition of Final product | Fitting | Chemical properties | As per IS: 14329 Grade BM 300 | IS: 14329 Grade BM 300, PO, PTS, Material specification | IS 14329, PO, PTS, Material specifications | T.C. | P | R | |
| 3 | Cleaning and Finishing | Fitting | Descaling/ Peel Off | 100% by Manufacturer | IS 14329 | IS 14329 | Inspection Report | P | RW | As per sampling procedure of IS 1879 Table no.29 |
| 4 | Destructive Testing (Tensile, Elongation & Hardness) | Fitting | Mechanical Properties | As per IS 14329 | IS 14329 | IS 14329 | Lab Report | P | W | |
| 5 | Compression Test | Fitting | Malleability | Three samples per Heat Treatment Batch | IS 1879 | IS 1879 | Inspection Report | P | W | As per sampling procedure of IS 1879 |
| 6 | Pressure Test | Fitting | Pneumatic | IS 1879 | IS 1879 | IS 1879 | Inspection Report | P | W | As per sampling procedure of IS 1879 |
| 7 | Alignments of Thread | Fitting | ASME B1.20.1/NPT | IS 1879 | IS 1879 | IS 1879 | Inspection Report | P | W | As per sampling procedure of IS 1879 |
| 8 | Galvanizing | Fitting | Integrity of galvanized coating | As listed in IS 4759 | IS 4759 | IS 4759 | Inspection / Lab Report | P | W | As per sampling procedure of IS 4759 |
| 9 | Final inspection | Fitting | Visual, Dimensions, Thread Gauge Alignment, Finish, weld bevel, Bore, Marking | IS 1879 | IS 1879 | IS 1879/ PTS | Inspection Report | P | W | |
| 10 | Marking | Fitting | Size, Owner & Manufacturer Logo | 100% | IS 1879/PTS | IS 1879/ PTS | Inspection Report | P | R | |
| 11 | Documentation | - | - | | As per the terms and conditions of the PO & PTS | As per the terms and conditions of the PO & PTS | Compliance certificate & TC | P | R | |

**LEGENDS: R - Review, W - Witness, H - Hold, P - Perform, TPIA - Third Party Inspection Agency, RW - Random witness, PTS- Particular Technical Specification, TR- Test Report, MTC- Material Test Certificate, T.C.- Test Certificate, IR- Inspection Report**

**Notes: -**

1.The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the applicable codes.

2.The TPIA shall use this QAP for inspection against subject tender and may consider this document as approved.

3.Mechanical & Chemical Testing shall be done in NABL Accredited Lab.

4.Procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications.

5.Owner/ Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.

6.All reference Codes / Standards documents, P.O. Copies shall be arranged by vendor / supplier for reference of TPIA / IOCL at the time of inspection.

7.At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IndianOil | **STANDARD QUALITY ASSURANCE PLAN**<br>**GI PIPES POWDER COATED CONFORMING TO IS:1239 (PART-1):2004 (Latest edition)** | | | | | | | QAP NO : IOCL/QAP/005 | | | |
| | | | | | | | | | **INSPECTION BY** | | |
| **SR. No** | **COMPONENTS /OPERATIONS** | **CHARACHTERISTICS** | **CLASSIFICATION** | **TYPE OF CHECK** | **QUANTUM OF CHECK** | **REFERENCE DOCUMENTS** | **ACCEPTANCE NORMS** | **FORMAT OF RECORD** | **Manufacturer** | **TPIA** | **REMARKS** |
| **1** | **Raw Material Inspection** | | | | | | | | | | |
| 1.1 | RAW MATERIAL (Steel tube Heavy Duty Class C) | IDENTIFICATION | Major | Co-relation with MTC. | 100% | IS:1239/P.O. Spec./PTS | IS:1239/P.O. Spec./PTS | T.C. | P | R | REMARKS |
| | | CHEMICAL COMPOSITION | Major | Chem. Analysis | One per Heat | IS: 1239 / P.O./ PTS | IS:1239/P.O. Spec./PTS | T.C. | P | R | |
| | | PHYSICAL PROPERTIES (T.S., Y.S., % Elongation) | Major | Lab. Test | One per Heat | IS:1239/P.O. Spec./PTS | IS:1239/P.O. Spec./PTS | T.C. | P | R | |
| | | VISUAL & DIMENSIONS | Major | Visual & Measurement | 100% | IS:1239/P.O. Spec./PTS | IS:1239/P.O. Spec./PTS | T.C. | P | R | |
| **2** | **IN PROCESS INSPECTION** | | | | | | | | | | |
| 2.1 | PIPE MANUFECTURING | SURFACE DEFECT | Major | Visual | 100% | IS:1239/P.O. | IS:1239/P.O. Spec./PTS | IIR | P | R | |
| | | DIMENSIONS (O.D., THK. LENGTH etc.) | Major | Measurement | As Per Relevant Std. | IS:1239/P.O. Spec./PTS | IS:1239/P.O. Spec./PTS | IIR | P | R | |
| | | MASS (Kg/Mtr) | Major | Measure. | As Per Relevant Std. | IS:1239/P.O. Spec./PTS | IS:1239/P.O. Spec./PTS | IIR | P | R | |
| 2.2 | END PREPARATION | END TYPE & DIMENSIONS | Major | Visual & Measurement | 100% | IS:1239/P.O. Spec./PTS | IS:1239/P.O. Spec./PTS | IIR | P | R | |
| 2.3 | PHYSICAL PROPERTIES | TENSILE Strength, ELONGATION & BEND Test/FLATTENING TEST AS APPLICABLE | Major | Lab. Test | As Per Relevant Std. | IS:1239/P.O. Spec./PTS | IS:1239/P.O. Spec./PTS | IIR | P | R | |
| 2.4 | LEAK TEST | HYDRAULIC | Critical | Leak Test | 100% | IS:1239/P.O. Spec./PTS | IS:1239/P.O. Spec./PTS | IIR | P | R | |
| 2.5 | GALVANIZING | ZINC COATING UNIFORMITY & MASS | Major | Galv. Test (Mass of Zinc Coating & Uniformity) | As per STD. | IS: 4736 | IS: 4736 & IS: 2633 | IIR | P | R | |
| 2.6 | FINISH, PAINTING & MARKING | OVERALL FINISH, PAINTING & MARKING | Major | Visual | 100% | IS:1239/P.O. Spec./PTS | IS:1239/P.O. Spec./PTS | IIR | P | R | |
| **3** | **POWDER COATING TEST** | | | | | | | | | | |
| 3.1 | POWDER COATING TEST | SALT SPRAY RESISTANCE | Major | Visual | 1000 Hrs (MIN.) | IS: 13871 | IS: 13871 | IIR | P | R | |
| 3.2 | | POROSITY | Major | Visual | - | IS: 13871 | IS: 13871 | IIR | P | R | |
| 3.3 | | HUMIDITY RESISTANCE | Major | Visual | 1000 Hrs (MIN.) | IS: 13871 | IS: 13871 | IIR | P | R | |
| 3.4 | | WEATHERING GLOSS RETENTION AFTER 1000 Hrs.(Sun Test with Water Impression , Xenon 150 K lux) | Major | Visual | 60 - 70% | IS: 13871 | IS: 13871 | IIR | P | R | |
| 3.5 | | COLOUR | Major | Visual | CANARY YELLOW | IS: 13871 | IS: 13871 | IIR | P | R | |
| **4** | **FINAL INSPECTION** | | | | | | | | | | |
| 4.1 | FINISHED PRODUCT | FINISH DIMENSIONS | Critical | Visual & Measurement. | Random As Per IS:47II | IS:1239/P.O. Spec./PTS | IS:1239/P.O. Spec./PTS | Dimensional IR | P | W | |
| | | PHYSICAL PROPERTIES (TENSILE STRENGTH, ELONGATION & BEND TEST/ FLATTENING TEST AS APPLICABLE) | Critical | Lab.Test | Random As Per IS 4711 | IS:1239/P.O. Spec./PTS | IS:1239/P.O. Spec./PTS | Physical IR | P | W | |
| | | MASS OF ZINC COATING, UNIFORMITY & ADHESION TEST | Critical | GALV. TEST(LAB Test) | AS PER IS: 4736 | IS 4736 | IS 4736 | GALV. REPORT | P | W | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LEAK TEST (HYDRAULIC TEST) | Critical | Leak Test | 100% by MFR. | IS:1239/P.O. Spec./Tender Spec | IS:1239/P.O. Spec./Tender Spec | IR | P | RW | (Min. 10% per lot by TPIA) |
| | | REVIEW OF ALL TEST CERTIFICATE / REPORTS & VENDOR'S IIR | Major | Review | All TC | IS:1239/P.O. Spec./Tender Spec., EN 10204 | IS:1239/P.O. Spec./Tender Spec , EN 10204 | R | P | R | |
| | | Coating Thickness | Major | Visual | Random as per IS: 13871 | IS: 13871/ PTS | IS: 13871/ PTS | IIR | P | W | |
| 4.2 | POWDER COATING TEST | GLOSS 60 DEG. | Major | VISUAL | AS PER IS: 4711/ IS:13871 | IS: 13871/ PTS | IS: 13871/ PTS | IR | P | W | |
| | | CROSS HATCH ADHESION | Major | VISUAL | AS PER IS: 13871 | IS: 13871/ PTS | IS: 13871/ PTS | IR | P | W | |
| | | CYLINDRICAL BENDING TEST | Major | VISUAL | AS PER IS: 13871 | IS: 13871/ PTS | IS: 13871/ PTS | IR | P | W | |
| | | ENRICHSEN CUPPING | Major | VISUAL | AS PER IS: 13871 | IS: 13871/ PTS | IS: 13871/ PTS | IR | P | W | |
| | | PENCIL HARDNESS | Major | VISUAL | AS PER IS: 13871 | IS: 13871/ PTS | IS: 13871/ PTS | IR | P | W | |
| | | SCRATCH RESISTANCE | Major | VISUAL | AS PER IS: 13871 | IS: 13871/ PTS | IS: 13871/ PTS | IR | P | W | |
| | | IMPACT RESISTANCE | Major | VISUAL | AS PER IS: 13871 | IS: 13871/ PTS | IS: 13871/ PTS | IR | P | W | |
| 4.3 | - | IDENTIFICATION & MARKING | Major | VISUAL | IS: 4711 | IS: 1239 / P.O. Spec./PTS | IS: 1239 / P.O. Spec./PTS | - | P | W | |
| 4.4 | - | WORKMANSHIP | Major | VISUAL | IS: 4711 | IS: 1239 / P.O. Spec./PTS | IS: 1239 / P.O. Spec./PTS | - | P | R | |
| 4.5 | - | PERFORMANCE OF INSTRUMENTS | Major | CALIBERATION | EACH INSTRUMENT | IS: 1239 / P.O. Spec./PTS | IS: 1239 / P.O. Spec./PTS | CALIBERATION CERTIFICATE | P | R | |
| 4.6 | - | Documentation | Major | | As per the terms and conditions of the PO & PTS | As per the terms and conditions of the PO & PTS | Compliance certificate & TC | | P | R | |

**LEGENDS: R - Review, W - Witness, H - Hold, P - Perform, TPIA - Third Party Inspection Agency, RW - Random witness, PTS- Particular Technical Specification, TR- Test Report, MTC- Material Test Certificate, T.C.- Test Certificate, IR- Inspection Report**

**Notes: -**

1.The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the applicable codes.

2.The TPIA shall use this QAP for inspection against subject tender and may consider this document as approved.

3.Mechanical & Chemical Testing shall be done in NABL Accredited Lab.

4.Procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications.

5.Owner/ Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.

6.All reference Codes / Standards documents, P.O. Copies shall be arranged by vendor / supplier for reference of TPIA / IOCL at the time of inspection.

7.At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC.

# STANDARD QUALITY ASSURANCE PLAN
# ISOLATION VALVE

QAP NO : IOCL/QAP/006

| SR. NO. | INSPECTION AND TESTING | QUANTUM OF CHECK / TEST | PROCEDURE | ACCEPTANCE CRITERIA AND CERTIFICATE | FORMAT OF RECORD | INSPECTION BY | | REMARKS |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Manufacturer | TPIA | |
| **1.0** | **Raw Material** | | | | | | | |
| 1.1 | Metallic Parts (Chemical / Physical Requirement) | One in each heat | As per ASTM B 283 (ALLOY UNS C37700) / EN 331 | As per ASTM B 283 (ALLOY UNS C37700) / EN 331 | MATERIAL TEST CERTIFICATE | P | R | |
| 1.2 | Seat & Stem Seal | One in each heat | As per EN 331/ ASME B16.33 | As per EN 331/ ASME B16.33 | MATERIAL TEST CERTIFICATE | P | R | |
| **2.0** | **Final Product** | | | | | | | |
| 2.1 | Gas Tightness Test | 100% | As per EN 331/ ASME B16.33 | As per EN 331/ ASME B16.33 | TEST REPORT | P | W | MIN 10% BY TPIA |
| 2.2 | Bending Test | One no. per Heat per Size | As per EN 331/ ASME B16.33 | As per EN 331/ ASME B16.33 | TEST REPORT | P | W | One no. per Heat per Size |
| 2.3 | Turning Torque Test | One no. per Heat per Size | As per EN 331/ ASME B16.33 | As per EN 331/ ASME B16.33 | TEST REPORT | P | W | One no. per Heat per Size |
| 2.4 | Temperature Resistance Test | One no. per Heat per Size | As per EN 331/ ASME B16.33 | As per EN 331/ ASME B16.33 | TEST REPORT | P | W | One no. per Heat per Size |
| 2.5 | Flow Capacity Test | One no. per Heat per Size | As per EN 331/ ASME B16.33 | As per EN 331/ ASME B16.33 | TEST REPORT | P | W | One no. per Heat per Size |
| 2.6 | Impact Test | One no. per Heat per Size | As per PTS | As per PTS | TEST REPORT | P | W | One no. per Heat per Size |
| **3.0** | **Visual Inspection ( Free from defects )** | 100% | As per EN 331/ ASME B16.33 | As per EN 331/ ASME B16.33 | INSPECTION REPORT | P | W | MIN 10% BY TPIA |
| **4.0** | **Dimension Tolerances ( Min. length of engagement , OD , wall thk. )** | 100% | As per Approved Drawing | As per Approved Drawing | INSPECTION REPORT | P | W | MIN 10% BY TPIA |
| **5.0** | **Marking** | 100% | As per EN 331/ ASME B16.33/PTS | As per EN 331/ ASME B16.33/PTS | INSPECTION REPORT | P | W | MIN 10% BY TPIA |
| **6.0** | **Final Documentation** | | As per PTS / Std. Specs. | As per PTS / Std. Specs. | EN 10204 3.2 CERTIFICATE | P | R | |

**LEGEND: R - Review, W - Witness, H - Hold, P - Perform, TPIA - Third Party Inspection Agency, PTS - Particular Technical Specification**

**Notes: -**

1. The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the applicable codes.
2. The TPIA shall use this QAP for inspection against subject tender and may consider this document as approved.
3. Mechanical Testing shall be done in NABL Acrreditted Labs.
4. Procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications.
5. Owner/ Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.
6. All reference Codes / Standards documents, P.O. Copies shall be arranged by vendor / supplier for reference of TPIA / IOCL at the time of inspection.
7. At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC.
8. All Tests shall be carried out as per EN-331 (Latest Edition).

# STANDARD QUALITY ASSURANCE PLAN
# MDPE Ball Valve PE 100 (Without Stem)

QAP NO : IOCL/QAP/007

| SL No. | Test Description | Type Of Check | Quantum Of Check | Ref. Document | Acceptance Norms | Format of Records | Inspection | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Vendor | TPIA | |
| 1 | Raw Materials | Test Certificate for Raw Materials | Each Batch | EN 1555-1/ PTS | EN 1555-1/PTS | MTR | P | R | |
| 2 | Test of raw material inspection | Raw material Characteristics check | Each Batch | Test Certificate for Raw Materials | As per material test cert. | MTR | P | R | |
| 3 | Hydrostatic Strength (PE100) (At 20 °c and 80 °c) | Strength Test | 100% | EN 1555- 4 & ISO 1167-1/4/PTS | As per EN 1555- 4 & ISO 1167-1/4/PTS (No failure and no leak during test period of any test piece) | Hydrotest Report | P | R | |
| 4 | Leak Tightness test | Mechanical Characteristics | 100% | EN 1555- 4/ MTR | As per Table-1, EN 1555-4/ PTS (No Leakage) | PTS | P | R | |
| 5 | Operating Torque | Mechanical Characteristics | 100% | EN 1555- 4/ PTS | As per Table-1, EN 1555-4/EN28233/ PTS | MTR | P | R | |
| 6 | Pressure Drop. | Mechanical Characteristics (Air flow rate) | 100% | ISO 17778/ EN 1555-3/ PTS | ISO 17778/ EN 1555-3/ PTS | IR | P | R | |
| 7 | Oxidation Induction Time (Thermal Stability) | Physical Characteristics | Each Batch | EN 1555-3/ EN 728/ ISO 11357-6/ PTS | As per EN 1555-3/ EN 728/ ISO 11357-6/ PTS | MTR | P | R | |
| 8 | Melt mass flow Rate | Physical Characteristics | Each Batch | EN 1553-3/ EN ISO 1133/ PTS | As per EN 1553-3/ EN ISO 1133/ PTS | MTR | P | R | |
| 9 | Dimensional % Check | Dimensional | Each Batch | EN 1555-3/PTS | As per EN 1555-3/ PTS | IR | P | RW | |
| 10 | Density | Physical Characteristics | 100% | ISO 1183/PTS | 0.926 to 0.94 g/cm3 | MTR | P | R | |
| 11 | Volatile Content | Physical Characteristics | Each Batch | EN 12099/PTS | ≤350mg/Kg | MTR | P | R | |
| 12 | Content Carbon Black | Physical Characteristics | Each Batch | ISO 6964/PTS | 2.50 ± 0.5% | MTR | P | R | |
| 13 | Appearance, Color | General Characteristics | 100% | EN 1555- 4/PTS | EN 1555- 4/PTS | IR | P | R | |
| 14 | Marking | Physical Characteristics | 100% | EN 1555- 3/ PTS | EN 1555- 3/ PTS | IR | P | RW | Min. 10 % by TPIA |
| 15 | Lot Release test | General Characteristics | Each Lot | EN 1555-7/PTS | EN 1555-7/PTS | IR | P | RW | |

| Legends: | | | | | |
|---|---|---|---|---|---|
| R Review | H Hold | TPIA Third Party Inspection Agency | PTS Particular Technical Specification | | |
| P Perform | W Witness | MTR Material Test Report | SS Standard Specification | | |

**Note:**

1. The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the additional
2. The TPIA shall use this QAP for inspection against subject tender and may consider this document as approved.
3. Special manufacturing procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more
4. Owner / Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.
5. All reference Codes/ Standards, Documents, P.O. Copies shall be arranged by vendor / supplier for reference of TPIA at the time of Inspection
6. At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note & MTC.

| | STANDARD QUALITY ASSURANCE PLAN<br><br>Electrofusion Fittings and Transition Fittings | QAP NO : IOCL/QAP/008 |
|---|---|---|

| | | | | | | | INSPECTION BY | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sr. No** | **Test Description** | **Type of Check** | **QUANTUM OF CHECK** | **REFERENCE DOCUMENT** | **ACCEPTANCE NORMS** | **Format of Record** | **Manufacturer** | **TPIA** | **REMARKS** |
| 1 | Raw Material | Review of test certificate | Each batch | EN 1555-1/ PTS | EN 1555-1/ PTS | MTR | P | R | |
| 2 | Hydrostatic Strength (PE100) (At 20 °c and 80 °c) | Strength Test | As per EN 1555-7 | EN 1555-3 / ISO 1167 / PTS | As per EN 1555-3 / ISO 1167 / PTS (No failure and no leak during test period of any test piece) | Hydro test Report | P | R | |
| 3 | Decohesive resistance for Electrofusion Socket fittings | Length of initiation of rupture ≤ L2/3 in brittle failure | As per EN 1555-7 | ISO 13954 / ISO 13955/ PTS | As per EN 1555-3 | IR | P | R | |
| 4 | Decohesive Strength for Electrofusion Saddle fittings | Surface of rupture ≤ 25% brittle failure | As per EN 1555-7 | ISO 13956 / PTS | As per EN 1555-3 | IR | P | R | |
| 5 | Impact Resistance for Electrofusion Saddle fittings | Mechanical Properties | As per EN 1555-7 | EN 1716/PTS | EN 1716/PTS | IR | P | R | |
| 6 | Tensile Strength for butt fusion | Mechanical Properties | As per EN 1555-7 | ISO DS 13953 / PTS | ISO DS 13953 / PTS | IR | P | R | Applicable for spigot end fittings |
| 7 | Pressure Drop. | Mechanical Characteristics (Air flow rate) | As per EN 1555-7 | ISO 17778 / EN 12117/ PTS | EN 12117/ EN 1555-3 | IR | P | R | |
| 8 | Electrical Resistance Test | Electrical Characteristics | As per EN 1555-7 | EN 1555-3 | EN 1555-3 | IR | P | R | |
| 9 | Oxidation Induction Time (Thermal Stability) | Physical Characteristics | As per EN 1555-7 | EN 1555-3/ EN 728/ ISO 11357-6/ PTS | OIT > 20 Min./ 200°C | MTR | P | R | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 10 | Melt mass flow rate (MFR) | Physical Characteristics | As per EN 1555-7 | EN 1553-3/ EN ISO 1133/ PTS | MFR 190°/5kg.0.20 – 1.20 gm./10 min. and after processing maximum deviation of ± 20% of the value measured on the batch used to manufacture the fitting | MTR | P | R | |
| 11 | Density | Physical Characteristics | 1 | ISO 1183 | 0.926 to 0.94 g/cm$^3$ | MTR | P | R | |
| 12 | Dimensional check | Dimensions | 1 | As per EN 1555-3/PTS | As per EN 1555-3/PTS | IR | P | R | |
| 13 | Appearance, Color | Visual | 1 | EN 1555- 3/ PTS | EN 1555- 3/ PTS | MTR | P | R | |
| 14 | Marking | Physical Characteristics | 1 | EN 1555- 3/ PTS | EN 1555-3 / PTS | IR | P | RW | Min. 10% by TPIA |
| 15 | Documentation | All Inspection Reports and Certificates | - | EN 1555 | All Inspection Reports and Certificates | IR | P | R | |

**Legends:**

**R Review** **H Hold** **TPIA Third Party Inspection Agency** **PTS Particular Technical Specification**
**P Perform** **W Witness** **MTR Material Test Report** **SS Standard Specification**

**Note:**

1.The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the additional requirements as per SS/ PTS along with applicable Codes & Standards.

2. The TPIA shall use this QAP for inspection against subject tender and may consider this document as approved.

3. Procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more stringent condition shall be applicable.

4.Owner/ Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.

5.All reference Codes / Standards documents, P.O. Copies shall be arranged by vendor / supplier for reference of TPIA at the time of inspection.

6. At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC.

| | STANDARD QUALITY ASSURANCE PLAN<br><br>WARNING MAT | QAP NO :IOCL/QAP/9 |
|---|---|---|

| | | | | | | | INSPECTION BY | | |
|---|---|---|---|---|---|---|---|---|---|
| Sr. No | Test Description | Type of Check | QUANTUM OF CHECK | REFERENCE DOCUMENT | ACCEPTANCE NORMS | Format of Record | Manufacturer | TPIA | REMARKS |
| | **Test on Warning Mat:** | | | | | | | | |
| 1 | Raw Material | Review of material test certificate | Each Batch | PTS | As per material test certificate / PTS | MTR | R | R | |
| 2 | Dimension & Tolerance Width & Thickness | Measurement | Four Samples From Each Lot / Batch | PTS | As per PTS Width:300mm_+5mm Thick:1mm(minimum) | TEST REPORT | P | W | |
| 3 | Test of Laying Characteristics (Flatness test) | Visual | Four Samples From Each Lot / Batch | PTS / EN 12613 | Deflection ≤ Wo/4 | TEST REPORT | P | W | |
| 4 | Material Identification by chemical method. | Measurement | One Samples To be tested from each Lot | Perform at Alekh Plastic Testing Centre (APTC) Ahmedabad | Test sample shall be tested & to be Confirmed PE / HDPE | TEST REPORT | W | R | |
| 5 | Text legend printing on Mat | Visual | Four Samples To be tested from each Lot. | PTS | Black & Red colour. Ink shall not be Removed | TEST REPORT | W | W | |
| 6 | Tensile strength at break | Measurement | Four samples from each lot. | PTS | Min. 200 kg/cm$^2$ | TEST REPORT | P | W | |
| 7 | Test of Virginity | Measurement | Four Samples To be tested from each Lot. | PTS | As PTS | TEST REPORT | P | W | |
| 8 | Colour Fastness test after 15 day at 15° C in 20% Ammonium sulphite solution. | Review of TC | (Type Test) | Performed at APTC Lab/NABL Lab | Satisfactory, while comparing the test specimen with a sample specimen in cool light. | TEST REPORT | R | R | |
| 9 | Colour Fastness test for 24 Hrs | Visual | Four Sample per Lot | PTS | No Colour change by immersion in 10 % nitric acid solution by mass | TEST REPORT | P | W | |
| 10 | Colour Fastness test for 24 Hrs | Visual | Four Sample per Lot | PTS | No Colour change by immersion in 20 % sodium carbonate solution by mass | TEST REPORT | P | W | |
| 11 | Colour Fastness test for 24 Hrs | Visual | Four Sample per Lot | PTS | No Colour change by immersion in 20 % ammonium sulphide solution by mass | TEST REPORT | P | W | |
| 12 | Performance of printing stability | Visual | Four samples from each lot. Lot. | PTS/ EN 12613 & IEC 60898:1995 | Pass. Marking shall be easily Legible after the test | TEST REPORT | P | W | |
| 13 | Visual Warning Characteristics | Visual | Four samples from each lot. Lot. | PTS/ EN 12613 | As per EN 12613 | TEST REPORT | P | W | |
| 14 | Anti-Rodent Test Non-Toxic, Non-Hazardous, Non-Biodegradable | Review of TC | Type Test | Testing at any independent Laboratory | 5 days / 30 days' attack test should pass.Document /certificate issued by supplier for anti-Rodent master batch as per PTS-Toxicology data, RoHS Compliance & Non-biocidal product | TEST REPORT | R | R | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | Colour | Each | PTS | As per PTS | Bright Yellow Colour | TEST REPORT | P | W | |
| 16 | Identification, Marking Art Work & Packing | Visual | Three samples from each Lot. | PTS | The warning mat shall be marked at intervals not exceeding 1 meter. The marking shall be legible and durable. The warning mat must be printed with "Caution: High Pressure Gas Pipeline Below" in both English and Hindi, marking shall include client name & logo, client's 24 Hours Emergency number, Warning Symbols with Safety Message. In addition, name or trademark of the manufacturer, year of manufacture, lot/batch no. and reference of code of manufacture of warning mat shall be included in the marking. Each roll of 100 meter long be packed in plastic woven sack. | TEST REPORT | W | W | |
| 17 | Documentation | | | PTS | PTS | Compliance Certificate, Test reports, MTC | P | R | |

**Legends:**

| | | | |
|---|---|---|---|
| **R Review** | **H Hold** | **TPIA Third Party Inspection Agency** | **PTS Particular Technical Specification** |
| **P Perform** | **W Witness** | **MTR Material Test Report** | **SS Standard Specification** |

**Note:**

1.The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the additional requirements as per SS/ PTS along with applicable Codes & Standards.

2. The TPIA shall use this QAP for inspection against subject tender and may consider this document as approved.

3. Procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more stringent condition shall be applicable.

4.Owner/ Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.

5.All reference Codes / Standards documents, P.O. Copies shall be arranged by vendor / supplier for reference of TPIA at the time of inspection.

6. At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC.

| | STANDARD QUALITY ASSURANCE PLAN<br><br>COPPER TUBING | QAP NO: IOCL/QAP/010 |
|---|---|---|

| | | | | | | INSPECTION BY | | |
|---|---|---|---|---|---|---|---|---|
| **Sr. No** | **DESCRIPTION** | **QUANTUM OF CHECK** | **PROCEDURE** | **ACCEPTANCE CRITERIA (As per EN 1057/ PTS)** | **FORMAT OF RECORD** | **Manufacturer** | **TPIA** | **REMARKS** |
| | | | | | | | | |
| 1 | Raw material: Chemical Requirement | As per EN 1057 | As per EN 1057/PTS | Material grade Cu-DHP/ CW 024A Cu + Ag: Min 99.9% P: 0.0015% TO 0.040% | MTC | P | R | |
| 2 | Final product: Chemical Requirement | As per EN 1057 | As per EN 1057/PTS | Material grade Cu-DHP/ CW 024A Cu + Ag: Min 99.9% P: 0.0015% TO 0.040% | Inspection Report | | | |
| 3 | Physical test (Tensile, Elongation, Hardness etc.) | As per EN 1057 | As per EN 1057/PTS | UTS- Min. 235 N/ Sq.mm Elongation - Min 30% Hardness- 75 TO 100 HV scale | Inspection Report | P | W | |
| 4 | Carbon film test | As per EN 1057 | As per EN 1057/PTS | As per EN 1057/ PTS (Maximum Residual carbon- 0.20 mm/ sq. dm) | Inspection Report | P | W | |
| 5 | Carbon content test | As per EN 1057 | As per EN 1057 | As per EN 1057/ PTS | Inspection Report | P | W | |
| 6 | Drift expanding test | As per EN 1057 | As per EN 1057 | As per EN 1057/ PTS | Inspection Report | P | W | |
| 7 | Hydrostatic test | As per EN 1057 | As per EN 1057 | Min 35 bar/ 10 second | Inspection Report | P | RW | Min 10 % by TPIA |
| 8 | Eddy current test | As per EN 1057 | As per EN 1057 | As per EN 1057/ PTS | Inspection Report | P | RW | Min 10 % by TPIA |
| 9 | Dimensional Inspection (O.D, Wall thk, Length etc.) | As per EN 1057 | As per EN 1057 | As per EN 1057/ PTS | Inspection Report | P | RW | Min 10 % by TPIA |
| 10 | Visual Inspection (Free from defect) | As per EN 1057 | As per EN 1057 | As per EN 1057/ PTS | Inspection Report | P | RW | Min 10 % by TPIA |
| 11 | Marking | As per EN 1057 | As per EN 1057 | As per EN 1057/ PTS | Inspection Report | P | RW | Min 10 % by TPIA |
| 12 | Documentation | - | As per EN 1057 | As per EN 1057/ PTS | Inspection Report | P | R | |

**Legends:**

| | | | |
|---|---|---|---|
| **R Review** | **H Hold** | **TPIA Third Party Inspection Agency** | **PTS Particular Technical Specification** |
| **P Perform** | **W Witness** | **MTR Material Test Report** | **SS Standard Specification** |

**Note:**

1.The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the additional requirements as per SS/ PTS along with applicable Codes & Standards.

2. The TPIA shall use this QAP for inspection against subject tender and may consider this document as approved.

3. Procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications more stringent condition shall be applicable.

4.Owner/ Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time.

5.All reference Codes / Standards documents, P.O. Copies shall be arranged by vendor / supplier for reference of TPIA at the time of inspection.

6. At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC.

# STANDARD QUALITY ASSURANCE PLAN

## APPLIANCE VALVE

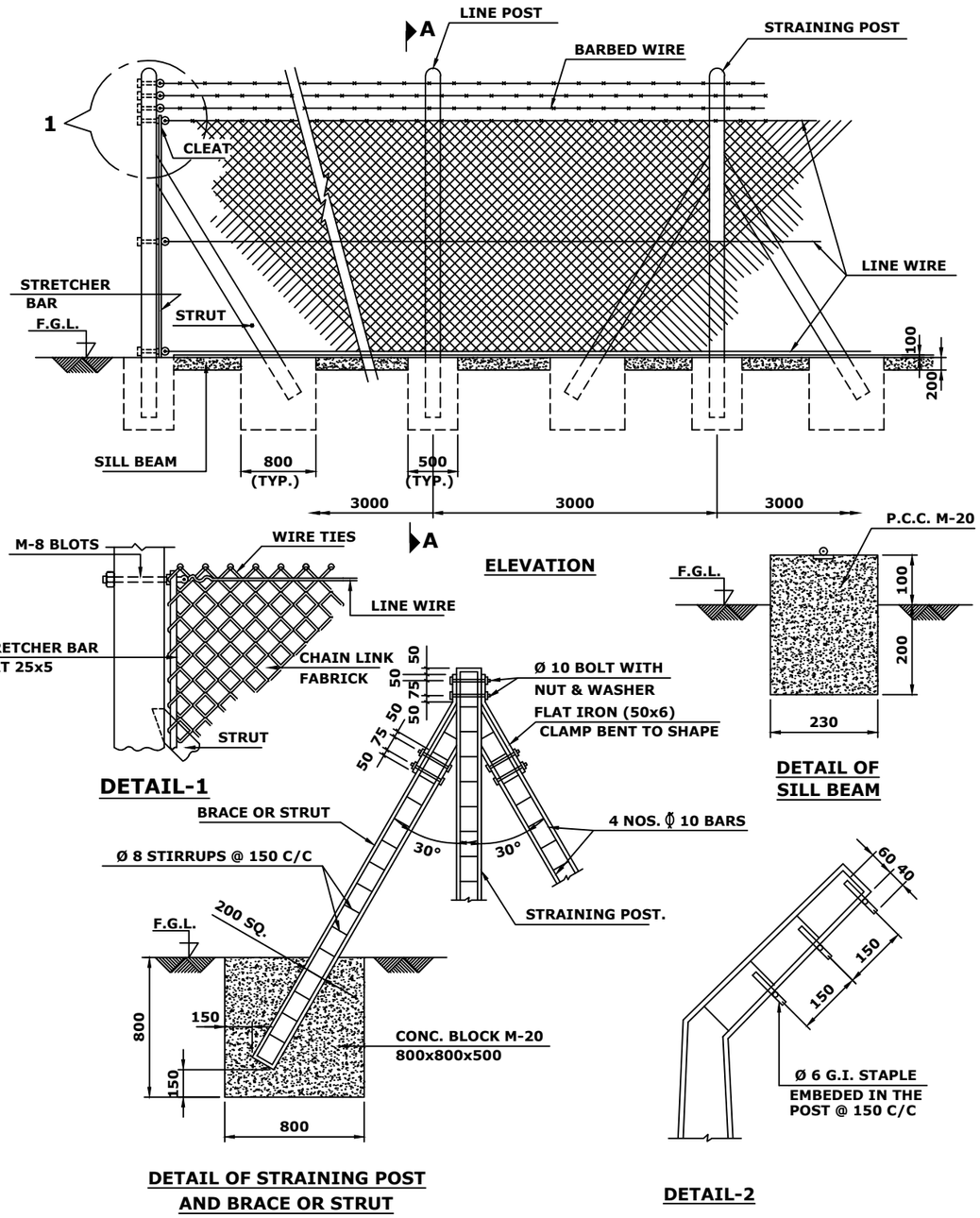
QAP NO : IOCL/QAP/011

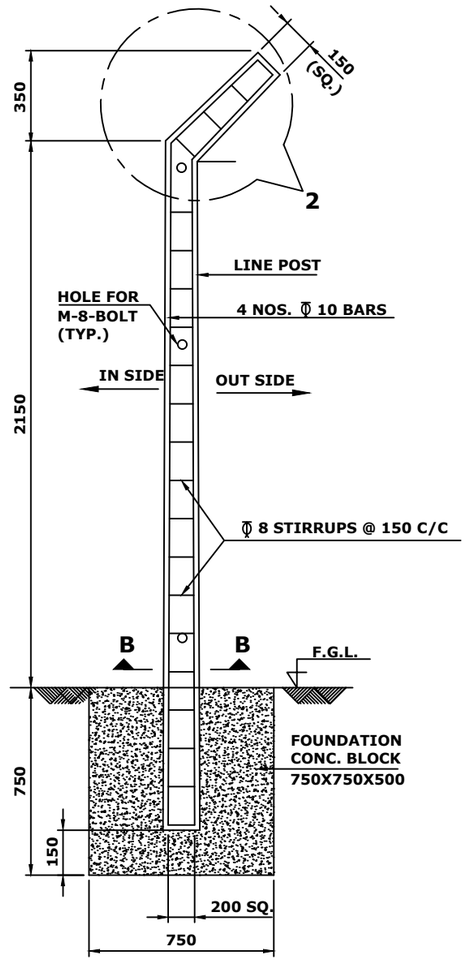
| SR. NO. | INSPECTION AND TESTING | QUANTUM OF CHECK / TEST | PROCEDURE | ACCEPTANCE CRITERIA AND CERTIFICATE | FORMAT OF RECORD | INSPECTION BY | | REMARKS |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Manufacturer | TPIA | |
| **1.0** | **Raw Material** | | | | | | | |
| 1.1 | Metallic Parts (Chemical / Physical Requirement) | One in each heat | As per ASTM B 283 (ALLOY UNS C37700) / EN 331 | As per ASTM B 283 (ALLOY UNS C37700) / EN 331 | MATERIAL TEST CERTIFICATE | P | R | |
| 1.2 | Seat & Stem Seal | One in each heat | As per EN 331 | As per EN 331 | MATERIAL TEST CERTIFICATE | P | R | |
| **2.0** | **Final Product** | | | | | | | |
| 2.1 | Gas Leak Tightness Test | 100% | As per EN 331 /PTS | As per EN 331 /PTS | TEST REPORT | P | W | MIN. 10% BY TPIA |
| 2.2 | Twist ( Torque ) Test | One No. per hear per size | As per EN 331 /PTS | As per EN 331 /PTS | TEST REPORT | P | W | One No. per hear per size |
| 2.3 | Bending Test | One No. per hear per size | As per EN 331 /PTS | As per EN 331 /PTS | TEST REPORT | P | W | One No. per hear per size |
| 2.4 | Impact Test | One per heat per lot by TPIA | As per PTS | As per PTS | TEST REPORT | P | W | One No. per hear per size |
| 2.5 | Turning Torque Test / Operating Torque test | One per heat per lot by TPIA | As per EN 331 /PTS | As per EN 331 /PTS | TEST REPORT | P | W | One No. per hear per size |
| 2.6 | Temperature Resistance Test | One per heat per lot by TPIA | As per EN 331 /PTS | As per EN 331 /PTS | TEST REPORT | P | W | One No. per hear per size |
| 2.7 | Flow Capacity Test | One per heat per lot by TPIA | As per EN 331 /PTS | As per EN 331 /PTS | TEST REPORT | P | W | One No. per hear per size |
| **3.0** | **Visual Inspection ( Free from defects )** | 100% | As per EN 331 /ASME B 16.33 | As per EN 331 /ASME B 16.33 | INSPECTION REPORT | P | W | MIN. 10% BY TPIA |
| **4.0** | **Dimension Tolerances ( Min. length of engagement , OD , wall thk. )** | 100% | As per Approved Drawing | As per Approved Drawing | INSPECTION REPORT | P | W | MIN. 10% BY TPIA |
| **5.0** | **Marking** | 100% | As per EN 331 / ASME B 16.33 Cl no. 2.4 / PTS | As per EN 331 / ASME B 16.33 Cl no. 2.4 / PTS | INSPECTION REPORT | P | W | MIN. 10% BY TPIA |
| **6.0** | **Final Documentation** | | As per PTS | As per PTS | EN 10204 3.2 CERTIFICATE | P | R | |

**LEGEND: R - Review, W - Witness, H - Hold, P - Perform, TPIA - Third Party Inspection Agency, CA - Control Authority**

Notes: -

| | |
|---|---|
| 1 | If order qauntity of a particular item is less than or equal to 100 nos. then vendor can go for TPIA inspection of buffer lot, which can be used further for different contractors but for same client. |
| 2 | The above testing and acceptance criteria are minimum requirements; however, manufacturer shall ensure that the product shall also comply to the applicable codes. |
| 3 | The TPIA shall use this QAP for inspection against subject tender and may consider this document as approved. |
| 4 | Mechanical Testing shall be done in NABL Acrreditted Labs. |
| 5 | Procedures have to be specially approved or only previously approved procedures have to be used, in case of conflict between specifications. |
| 6 | Owner/ Owner's representative including TPIA will have the right to inspect any activity of manufacturing at any time. |
| 7 | All reference Codes / Standards documents, P.O. Copies shall be arranged by vendor / supplier for reference of TPIA / IOCL at the time of inspection. |
| 8 | At the time of delivery of material in stores, vendor will submit copy of all related document of inspection along with release note, dispatch clearance note & MTC. |
| 9 | All Tests shall be carried out as per EN-331 (Latest Edition). However, other additional tests, which are not covered in EN-331, shall be carried out as per ASME B16.33. |




## NOTES:-

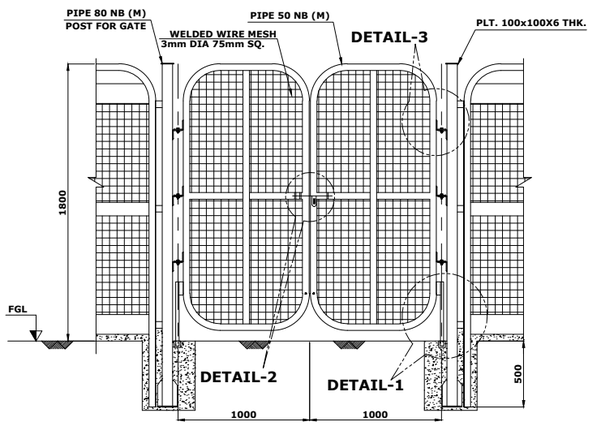
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. THE GALVANISED STEEL BARBED WIRE A1 TO IS:278 SHALL HAVE LINE WIRE OF Ø 2.5 MM POINT WIRE OF Ø 2.0 MM & MINIMUM WEIGHT OF COMPLETE BARBED WIRE SHALL BE 108gm/m WITH 75 MM DISTANCE BETWEEN TWO BARS.
3. LINE POST SHALL BE PLACED AT 3.0 M C/C.
4. STRUT SHALL BE PROVIDED AT EVERY 15 TH. POST LAST BUT ONE END POST & CORNER POST ON BOTH SIDE & END POST ON ONE SIDE ONLY.
5. REINF. STEEL SHOWN THUS Ø SHALL CONFORM TO IS:1786 LATEST & REINF. STEEL SHOWN THUS Ø SHALL CONFORM TO GRADE Fe 415 (MIN.) LATEST.
6. STRAINING BOLTS SHALL BE PROVIDED AT THE END POST & AT PLACES AS DIRECTED BY ENGINEER INCHARGE.
7. SIZE OF STRAINING POST SHALL BE SAME AS THAT OF LINE POST.
8. GRADE OF CONC. SHALL BE AS FOLLOWS:

| | MODERATE SOIL | SEVRE/ AGGRASSIVE SOIL |
|---|---|---|
| i) LINE & STRAINING POSTS | RCC M25 | RCC M30 |
| ii) FOUNDATION BLOCKS | PCC M20 | PCC M20 |
| iII) SILL BEAM | PCC M20 | PCC M20 |
| iv) BRACE OR STRUT | RCC M25 | RCC M30 |

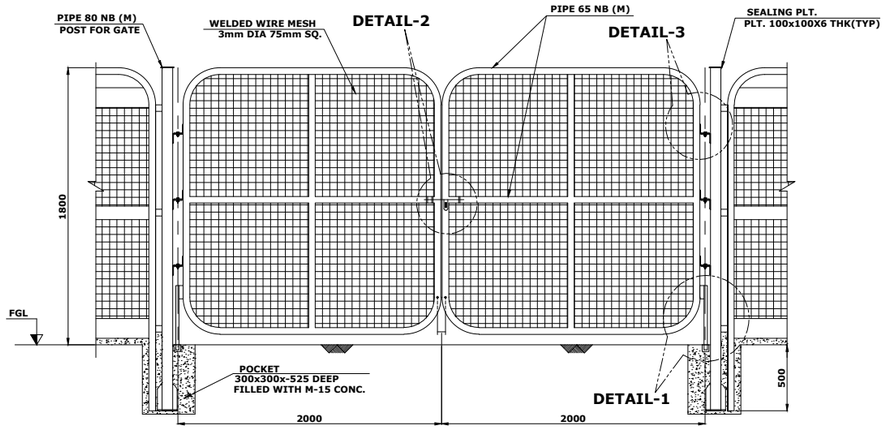
9. MANUFACTURE OF CONC. POSTS SHALL CONFORM TO IS:4996.
10. THE CHIAN LINK FABRIC SHALL CONFORM TO IS:2721.
11. STRETCHER BAR SHALL BE HOT DIP GALVANISED.
12. SUITABLE INSERTS SHALL BE PROVIDED ON THE TOP OF THE SILL BEAM TO TIE THE BOTTOM LINE WIRE WITH THE SILL BEAM.

DETAIL OF CHAIN LINK FENCING (WITH CONC. POST)

**TYPE-I**



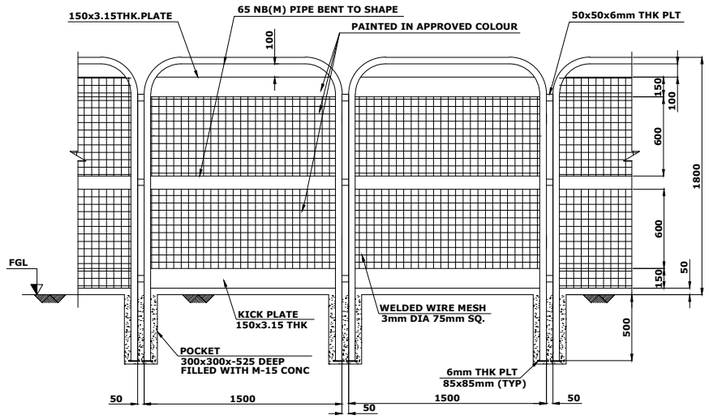

**2.0 WIDE GATE DETAIL**
**2100 HIGH**



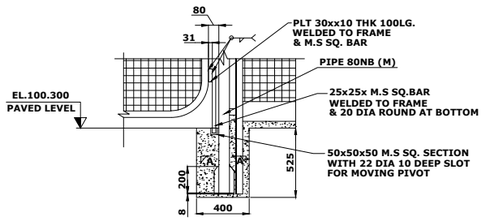

**4.0 WIDE GATE DETAIL**

**NOTES:-**

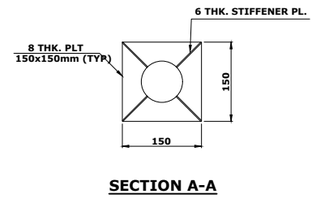
1. ALL DIMENSIONS AND LEVELS ARE IN mm. (UNLESS MENTIONED OTHERWISE)
2. ONLY FIGURED DIMENSIONS ARE TO BE FOLLOWED.
3. ALL STRUCTURAL STEEL SHALL CONFORM TO I.S :2062-2011 GRADE-A.
4. FABRICATION SHALL BE DONE IN ACCORDANCE TO I.S :800-2007
5. ALL WELD SHALL BE 6MM FILLET WELD UNLESS OTHERWISE STATED.
6. ALL SHOP JOINTS SHALL BE COMPLETELY WELDED WITH CONTINUOUS FILLET WELD FOR CONTACT LENGTH.
7. FABRICATION OF ALL MEMBERS TO BE DONE AFTER FULL SCALE SHOP LAYOUT BEFORE CUTTING MEMBERS.
8. FOR ACTUAL LAYOUT AND LOCATION OF CHAIN LINK FENCING AND GATE REFER PLOT PLAN.




**TYPICAL FENCING DETAIL**

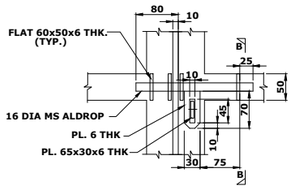



**DETAIL - 1**




**SECTION A-A**

DETAIL OF CHAIN LINK
FENCING & GATE (WITH STEEL POST)

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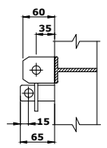
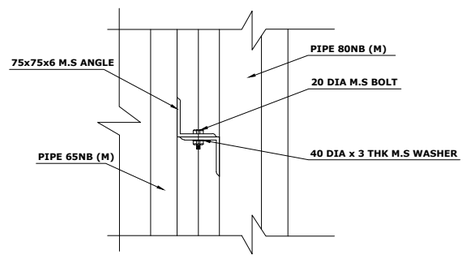
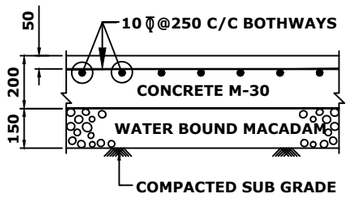



**SECTION B-B**



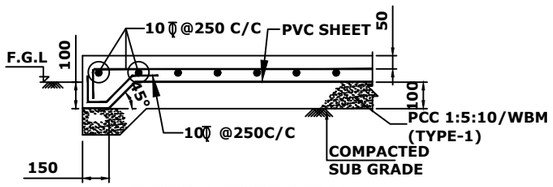

**DETAIL - 3**

**TYPE-II**



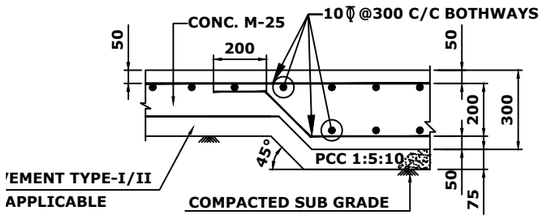

**TYPE - I**

(FOR VEHICULAR MOVEMENT AREA)



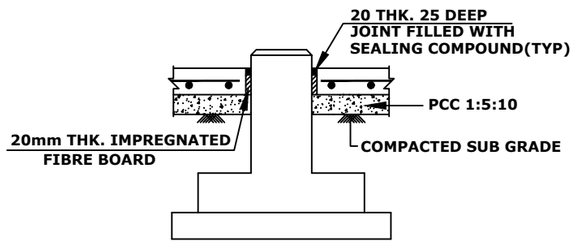

**TYPICAL EDGE DETAIL**

(WITHOUT KERB WALL)



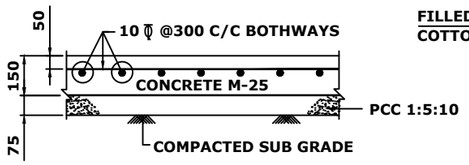

**X-SECTION OF THICKENED PAVEMENT**

(SEE NOTE 14)



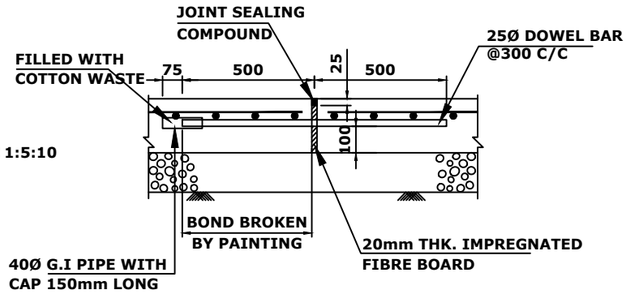

**TYPICAL DETAIL OF JOINT SEALING**

AROUND FOUNDATION




**TYPE - II**

(FOR UNIT PAVEMENT)

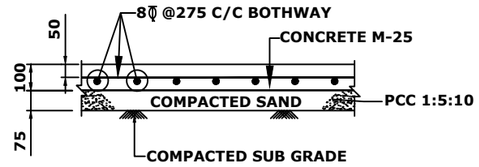



**DETAIL OF EXPANSION JOINT**

(FOR TYPE -I PAVEMENT)

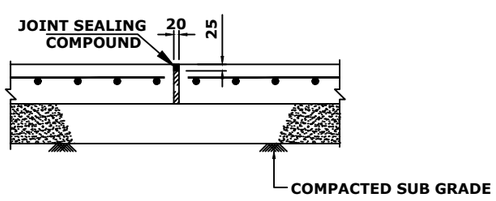
## NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
2. CONCRETE SHALL BE CONFIRM TO IS:456.
3. ϕ DENOTED HIGH YIELD DEFORMED BARS OF GRADE Fe415 (MIN.) CONFIRMING TO IS:1786. UNLESS OTHERWISE SPECIFIED.
4. JOINT SEALING COMPOUND IN PAVING AND AROUND EQUIPMENT FOUNDATIONS SHALL CONFIRM TO IS:1834 TYPE-B.
5. EXPANSION AND SEALING JOINT FILLER MATERIAL SHALL BE FILLERS OF BITUMEN PREFORMED FIBRES IMPREGNATED FIBRE, CONFIRMING TO IS:1838, PART-1.
6. CONCRETE PAVING SHALL BE SLOPED STEEPEST TO 1:100 UNLESS OTHERWISE SHOWN IN DETAIL ENGINEERING DRAWING. SLOPE OF THE SUB GRADE SHALL BE PREPARED TO MATCH WITH SLOPE OF PAVEMENT.
7. SUB GRADE BELOW PAVEMENT SHALL BE THOROUGHLY COMPACTED TO 95% OF LAB DRY DENSITY AS PER IS:2720, PART VIII.
8. CAST IN-SITU CONCRETE FOR PAVEMENT SHALL BE LAID IN ALTERNATE PANELS OF SIZES AS DEFINED IN THIS STANDARD DRAWING HOWEVER, THE PANEL SIZE SHALL BE ADJUSTED AROUND COLUMNS & FOUNDATION
9. EXPANSION JOINTS SHALL BE SPACED AT 14.0M (MAX.)FOR TYPE-I PAVEMENT & 13M C/C (MAX.)FOR TYPE-II PAVEMENTS.
10. EXPANSION JOINTS SHALL BE SPACED AT 15 M C/C & CONSTRUCTION JOINS SHALL BE SPACED AT 7.5M C/C (MAXIMUM) FOR TYPE-III PAVEMENTS.
11. THIS STANDARD NOT VALID FOR CAUSTIC HANDLING AREAS.
12. LIMITATION OF SINGLE AXLE LOAD ON RCC PAVEMENT:
    FOR TYPE-I PAVEMENT : MAX. UPTO 12.0 TONNE
    FOR TYPE-II PAVEMENT : MAX. UPTO 6.0 TONNE
    (FOR SMALL VEHICLES LIKE FORK LIFT)
13. CONSTRUCTION JOINTS MAY BE PROVIDED IN CASE PANEL SIZE IS LESS THAN THE REQUIRMENT OF EXPANSION SUIT SITE REQUIREMENTS.
14. FOR PIPE SUPPORT DETAILS COMING IN THICKENED PAVEMENT AREA REFER RELEVENT PIPING GAD / PIPING STANDARDS.



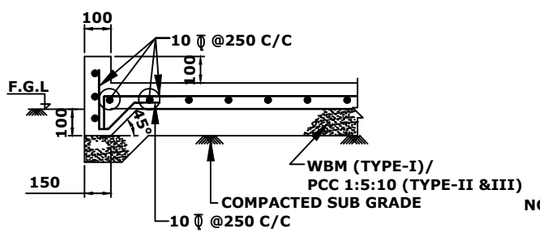

**TYPE - III**

(FOR OFFSITE PUMP STATION)



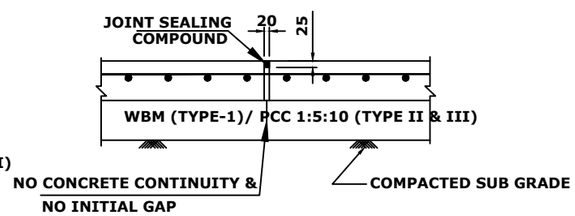

**DETAIL OF EXPANSION JOINT**

(FOR TYPE -II & III PAVEMENT)




**TYPICAL EDGE DETAIL**

(WITH KERB WALL)

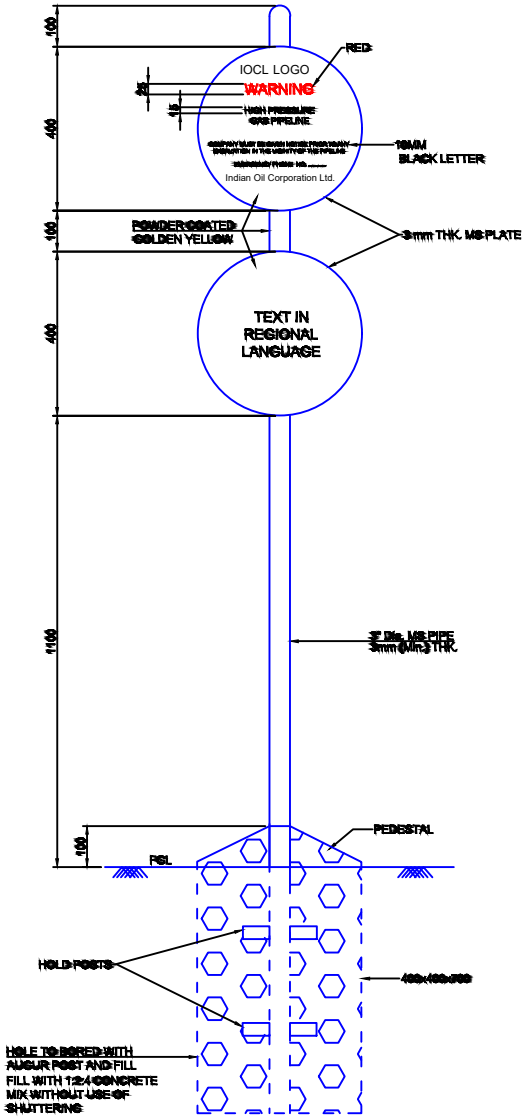



**DETAIL OF CONSTRUCTION JOINT**

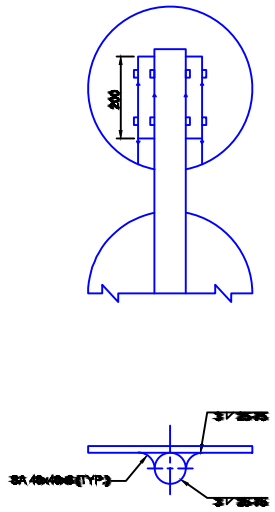
(SEE NOTE 13)

RCC PAVEMENT DETAILS

GEOTECHNICAL RECOMMENDATION SHALL BE FOLLOWED FOR SUBGRADE TREATMENT FOR PAVEMENTS IN BLACK COTTON SOIL AREAS/JOB SPECIFIC REQUIREMENT




## FIXING DETAILS




REFERENCE DRAWINGS

| DRAWING TITLE | DRAWING NUMBER |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. WARNING TEXT AND MARKER SIZES ARE INDICATIVE AND ARE SUBJECT TO THE APPROVAL BY OWNER / OWNERS REPRESENTATIVE BEFORE FABRICATION.
3. SCHEME FOR POWDER COATING AND COLORING : ONE COAT OF PRIMER & TWO COATS OF SPECIFIED PAINTS. ALL LETTERS EXCEPT 'WARNING' TO BE PAINTED BLACK.
4. APPROVAL OF WARNING MARKER DESIGN SHALL BE OBTAINED BEFORE THE COMMENCEMENT OF WORK.

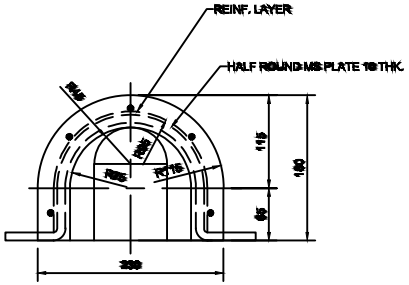
REFERENCE DRAWING

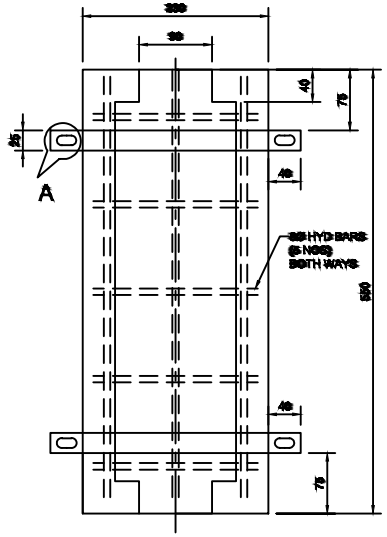
TITLE:

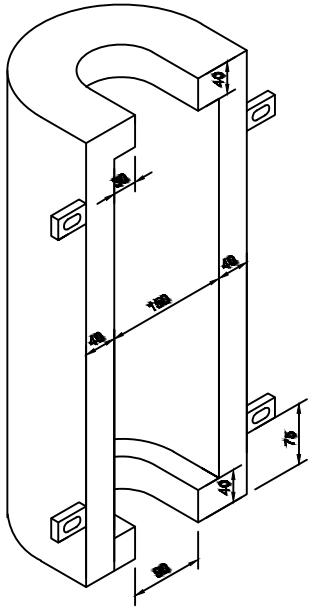
POLE MARKER WITH FOUNDATION

| SCALE: | NTS | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-008 | 0 |

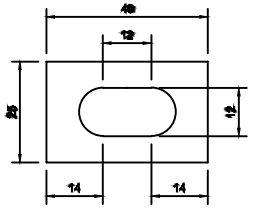
FORMAT NO C211050-FMT-005_00




ISOMETRIC VIEW




DETAIL-A
SCALE 1:1

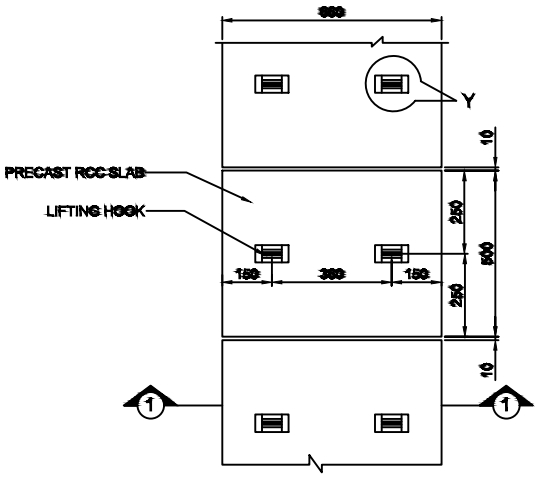
NOTES:-
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.
3. GRADE OF CONCRETE SHALL BE M35.
4. REINFORCEMENT IS HYD. TO IS:1786.
5. CONCRETE SLEEVE TO BE CLAMPED TO WALL WITH 10Ø ANCHOR BOLTS.

REFERENCE DRAWING

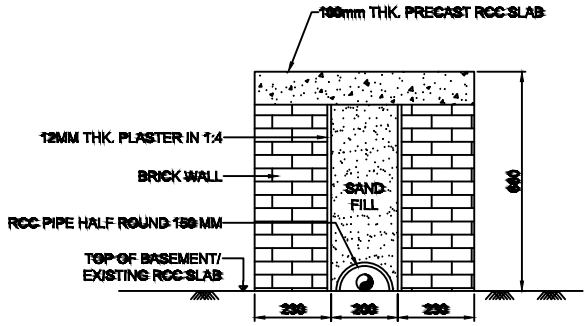
TITLE:
HALF ROUND CONCRETE SLEEVE FOR TF PROTECTION

| SCALE: SCALE | | TOTAL NO. OF SHTS: 1 OF 1 | |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-010 | 0 |

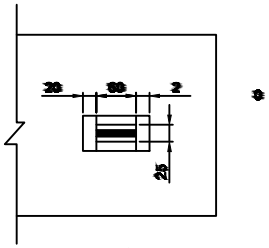
FORMAT NO C211050-FMT-005_00



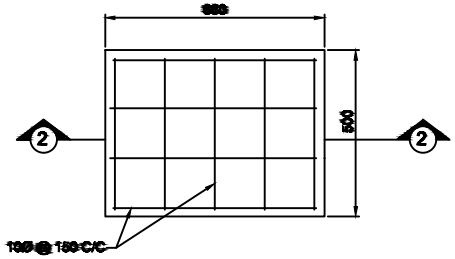

G.A PLAN OF COVER SLAB



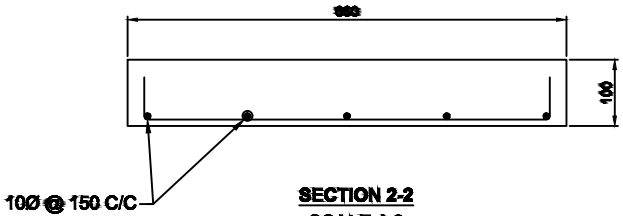

SECTION 1-1 THRU PIPE TRENCH



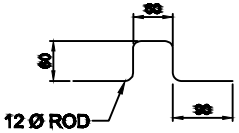
DETAIL - Y
SCALE 1:8




PRECAST RCC SLAB




SECTION 2-2
SCALE 1:8




LIFTING HOOK
SCALE 1:8

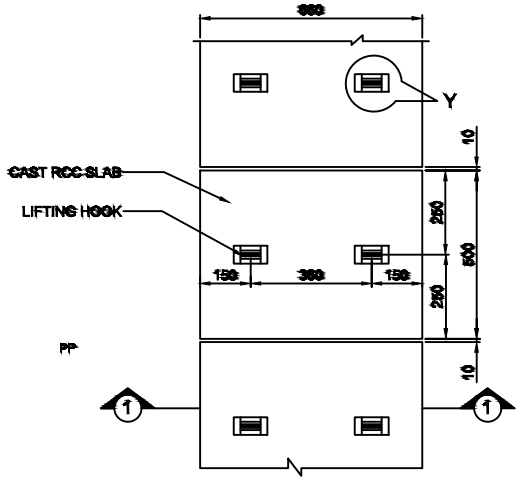
NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.

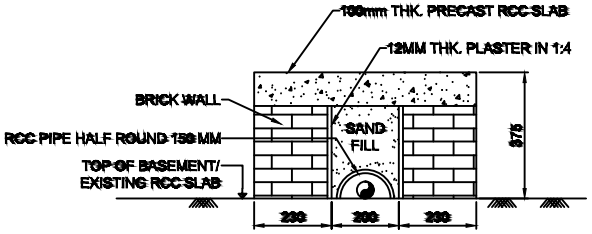
REFERENCE DRAWING

TITLE:
TYPICAL BRICKWALL TRENCH
(0.66 X 0.66 X 1.0)

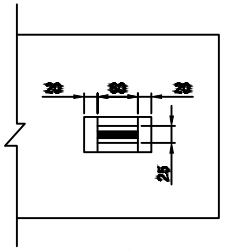
| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-011 | 0 |



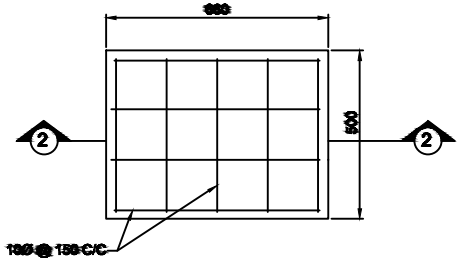

**G.A PLAN OF COVER SLAB**



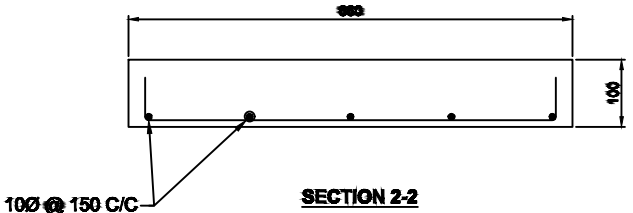

**SECTION 1-1 THRU PIPE TRENCH**



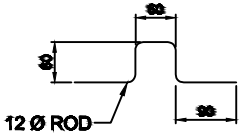

**DETAIL - Y**
**SCALE 1:8**




**PRECAST RCC SLAB**




**SECTION 2-2**
**SCALE 1:8**




**LIFTING HOOK**
**SCALE 1:8**

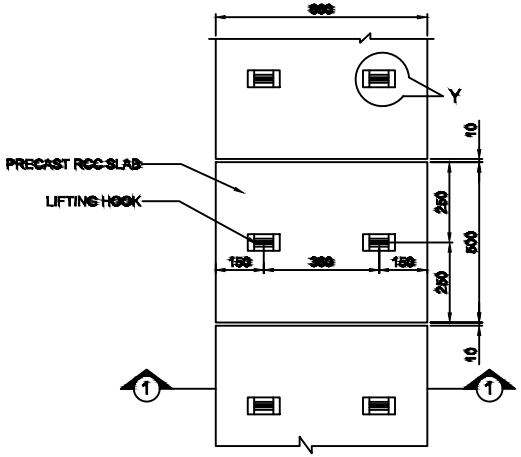
## NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.

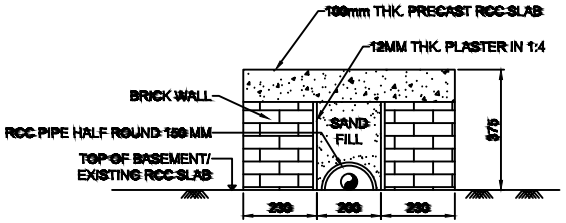
REFERENCE DRAWING

TITLE:
TYPICAL BRICKWALL TRENCH
(0.375 X 0.66 X 1.0)

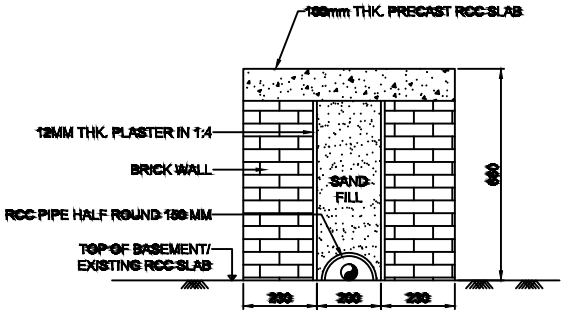
| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-012 | 0 |



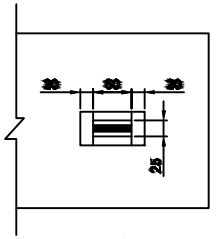

G.A PLAN OF COVER SLAB



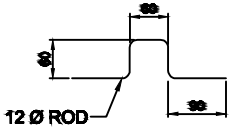

SECTION 1-1 THRU PIPE TRENCH



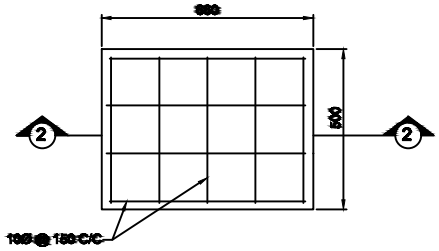

SECTION 1-1 THRU PIPE TRENCH



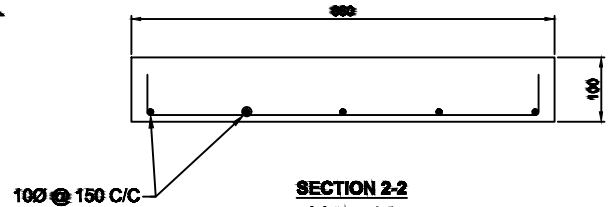

DETAIL - Y
SCALE 1:8




LIFTING HOOK
SCALE 1:8




PRECAST RCC SLAB




SECTION 2-2
SCALE 1:8

NOTES:-

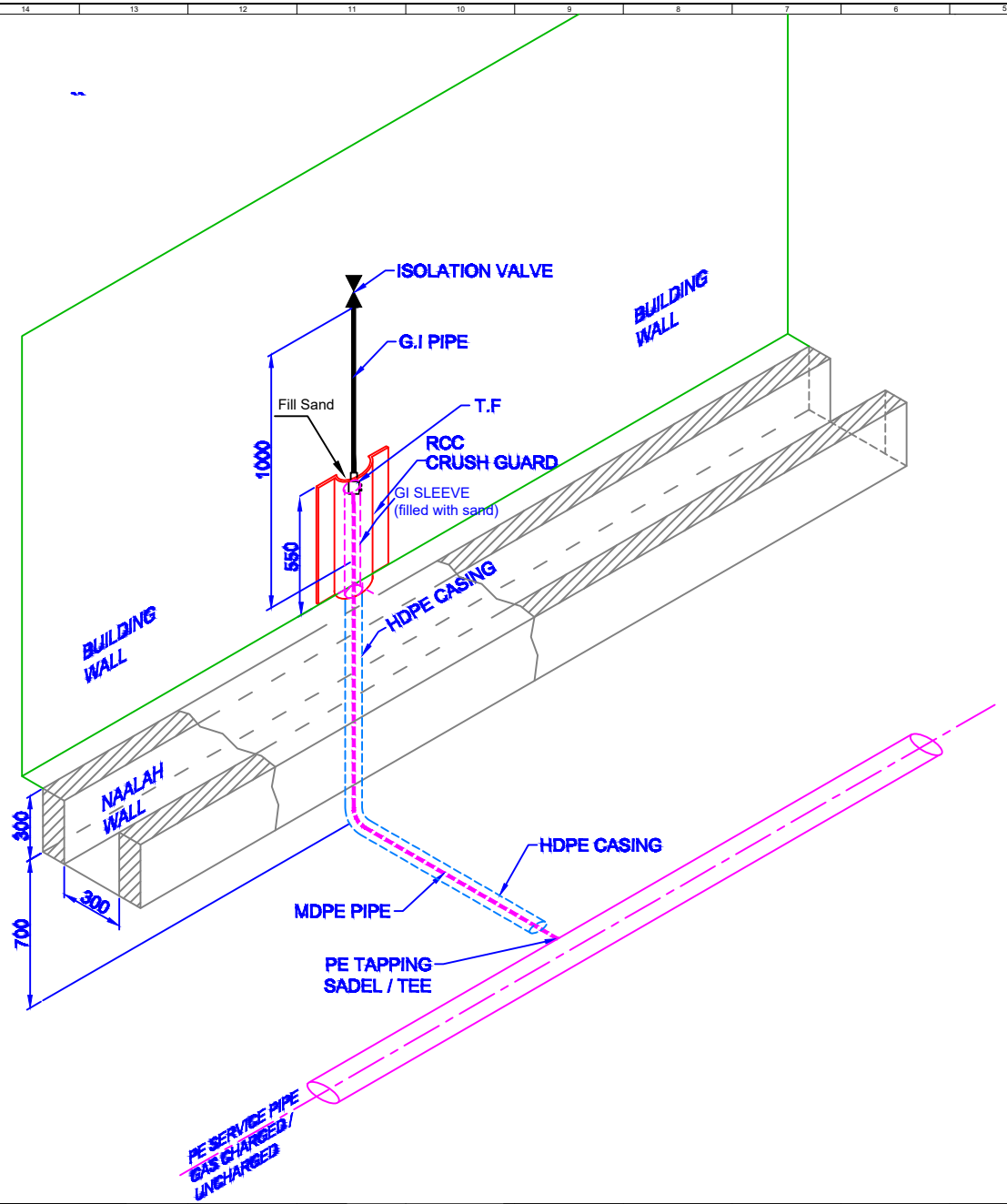
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.

0

REFERENCE DRAWING

TITLE:
TYPICAL BRICKWALL TRENCH
UPTO 7M ROAD CROSSING INSIDE SOCIETY

| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-013 | 0 |

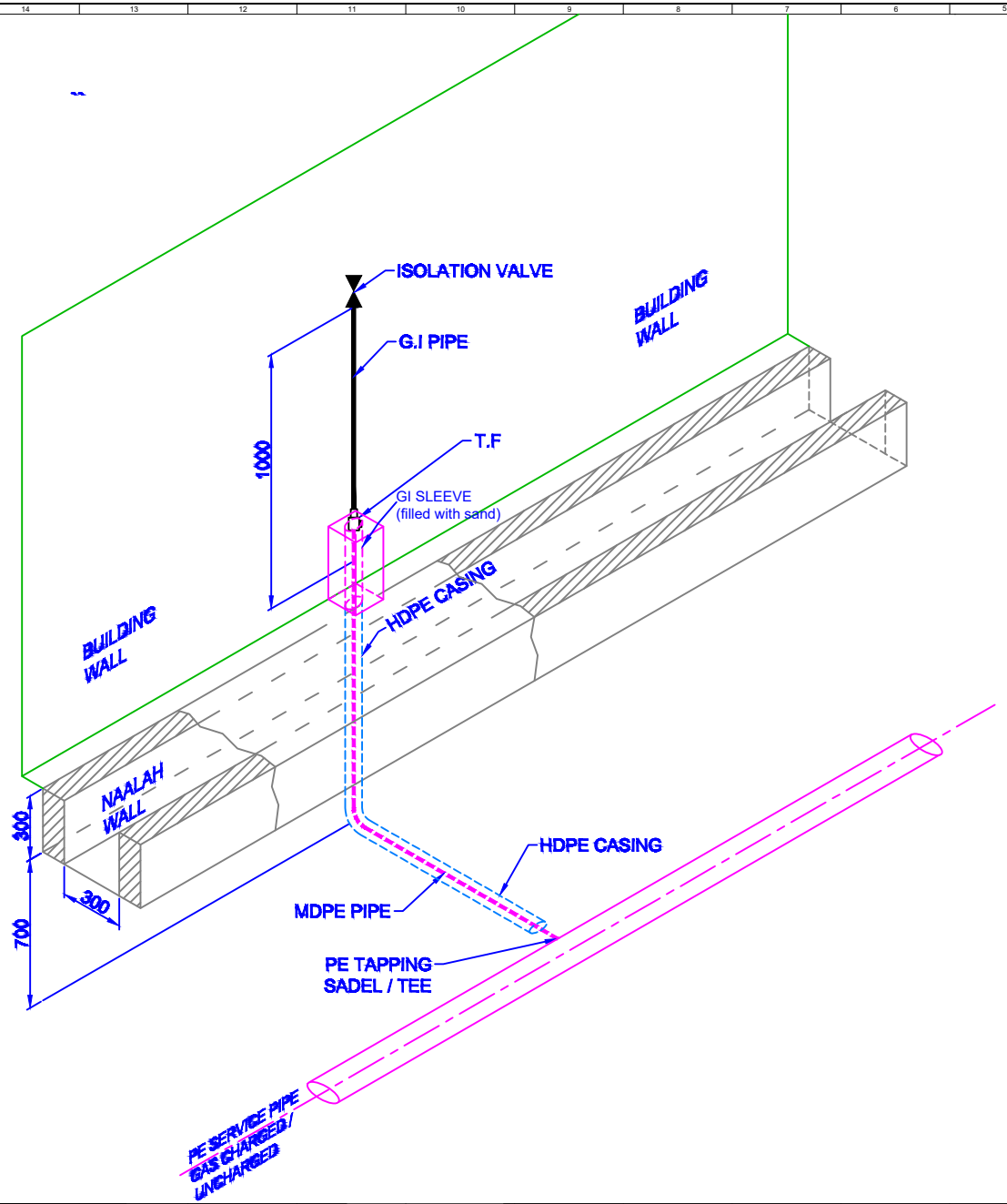



## NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.

REFERENCE DRAWING

| | | | |
|---|---|---|---|
| TITLE: DRAIN CROSSING FOR LAYING OF SERVICE LINES WHERE PEDESTAL IS NOT POSSIBLE | | | |
| SCALE: SCALE | | TOTAL NO. OF SHTS: | 1 OF 1 |
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-014 | 0 |




## NOTES:-

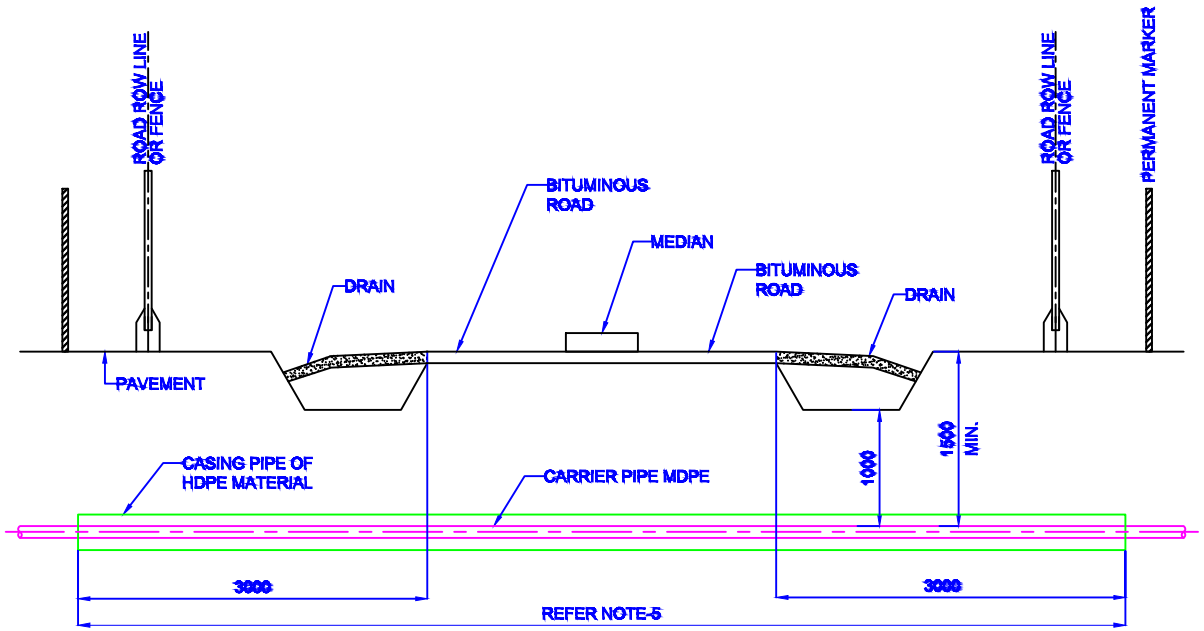
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.

REFERENCE DRAWING

TITLE:

DRAIN CROSSING FOR LAYING OF SERVICE LINES WHERE PEDESTAL IS POSSIBLE

| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-015 | 0 |




## TYPICAL SECTION

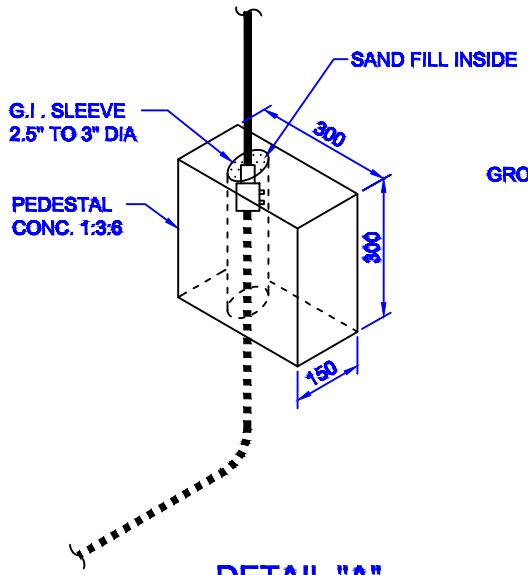
### NOTES.

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWINGS.
3. ROAD / HIGHWAY CROSSING SHALL BE RESTORED TO ORIGINAL CONDITION TO THE ENTIRE SATISFACTION OF OWNER AND CONCERNED AUTHORITIES HAVING JURISDICTION.
4. REFER API RP 1102 FOR OTHER DESIGN AND INSTALLATION REQUIREMENTS.
5. ANGLE OF INTERSECTION BETWEEN PIPELINE AND THE ROAD / HIGHWAY SHALL BE AS CLOSE TO 90° AS POSSIBLE BUT IN NO CASE LESS THAN 30°.
6. CONTRACTOR SHALL VERIFY THE ACTUAL DIMENSION WITH RESPECT TO SURVEY DETAILS OF EACH ROAD / HIGHWAY CROSSING AND PREPARE DETAILED DRAWINGS FOR INDIVIDUAL CROSSING TAKE ENGINEER-IN-C

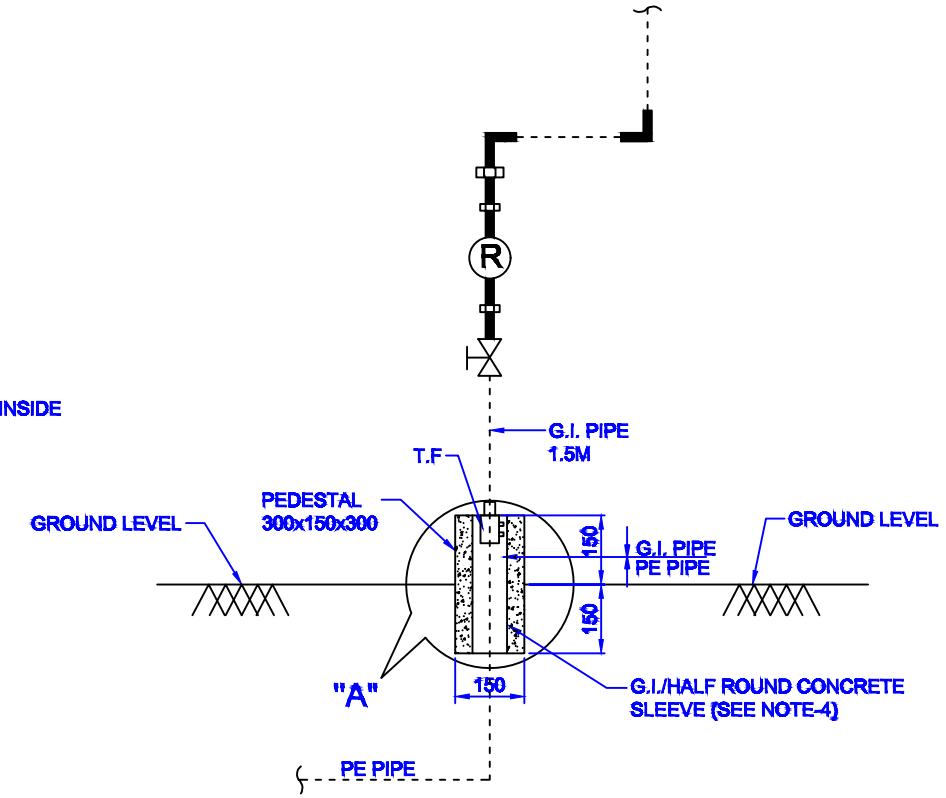
REFERENCE DRAWING

TITLE:
ROAD/ HIGHWAY CASED CROSSING FOR MDPE PIPE

| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-016 | 0 |




DETAIL "A"




PEDESTAL

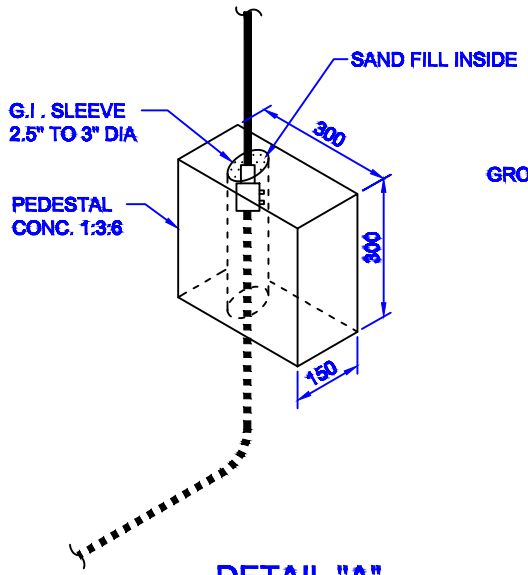
NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWINGS.
3. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED WHILE DETAIL ENGINEERING.
4. G.I. INSTALLATION / METER INSTALLATION SHALL BE DECIDED BY OWNER / OWNERS REPRESENTATIVE AS PER SITE CONDITION.

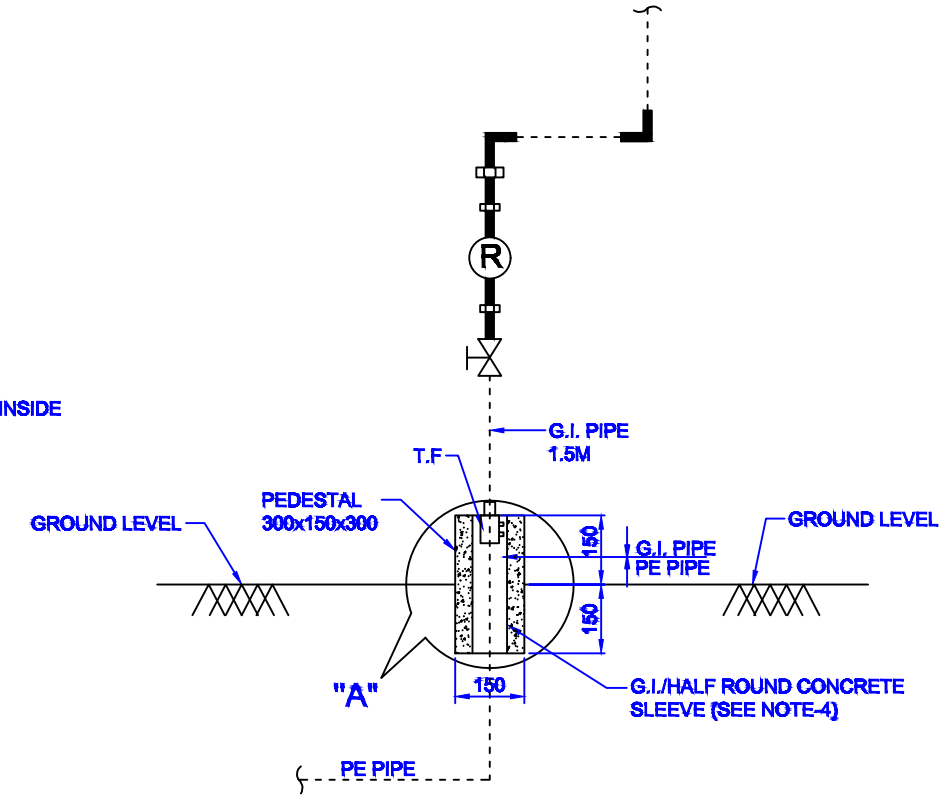
REFERENCE DRAWING

TITLE: CONCRETE PEDESTAL

| SCALE: SCALE | | TOTAL NO. OF SHTS: 1 OF 1 | |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-017 | 0 |




DETAIL "A"



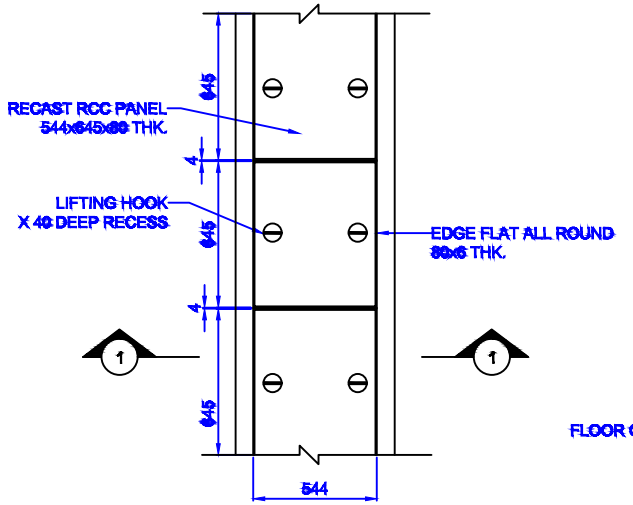

PEDESTAL

NOTES:-

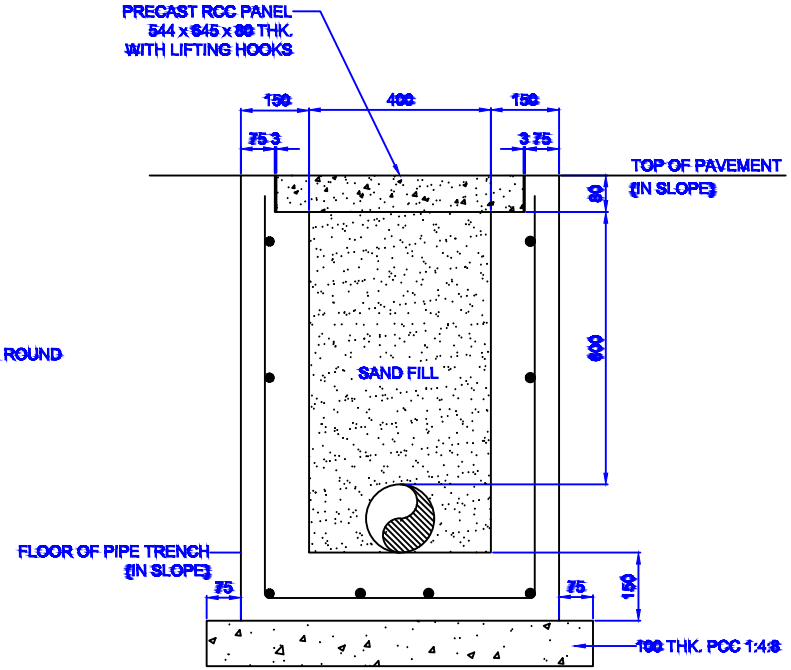
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWINGS.
3. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED WHILE DETAIL ENGINEERING.
4. G.I. INSTALLATION / METER INSTALLATION SHALL BE DECIDED BY OWNER / OWNERS REPRESENTATIVE AS PER SITE CONDITION.

REFERENCE DRAWING

| TITLE: | | | |
|---|---|---|---|
| G.I PIPE SLEEVE | | | |
| SCALE: | SCALE | REFERENCE DRAWING | 1 OF 1 |
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-017 | 0 |




G.A. PLAN OF COVER SLAB




SECTION 1-1 THRU PIPE TRENCH
(PIPE TRENCH BY OTHERS)
SCALE 1:10

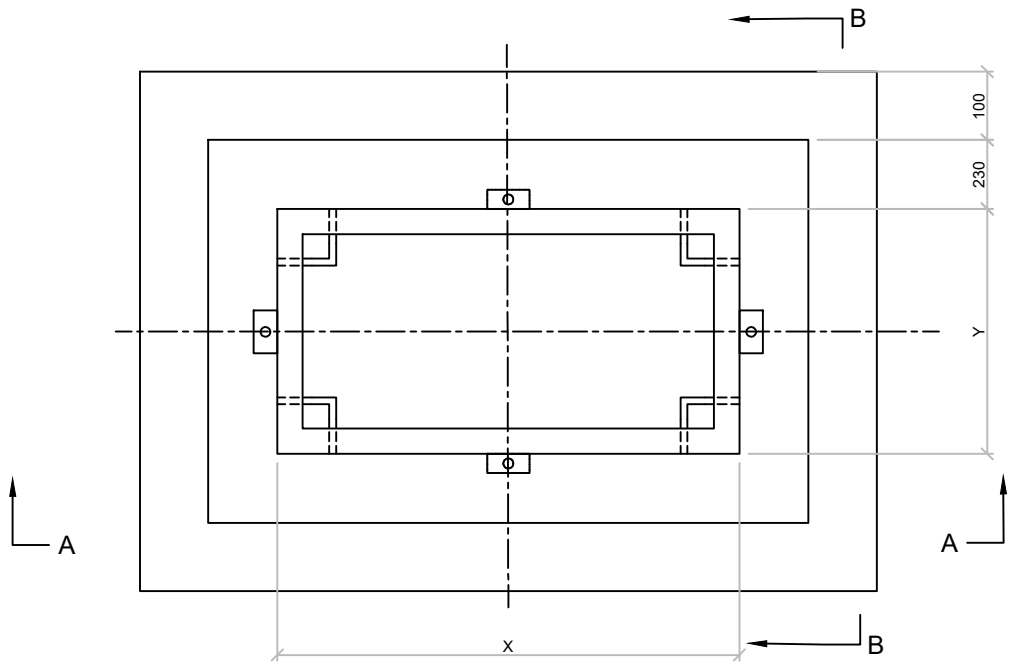
NOTES:-

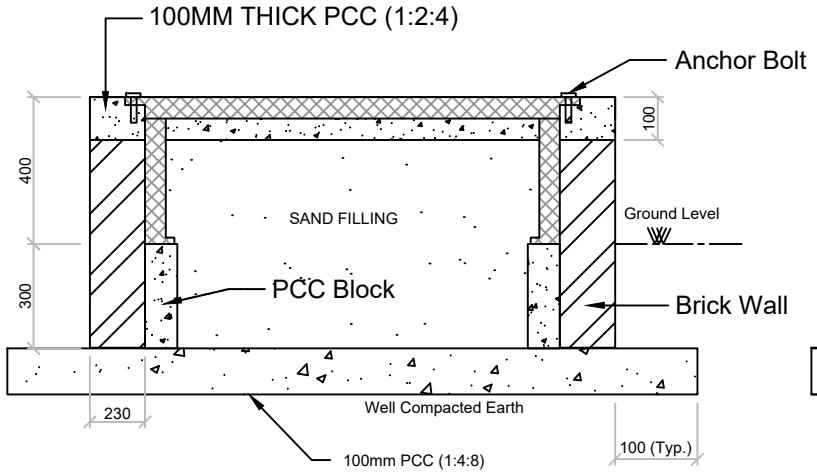
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOTE SCALE THE DRAWING.

REFERENCE DRAWING

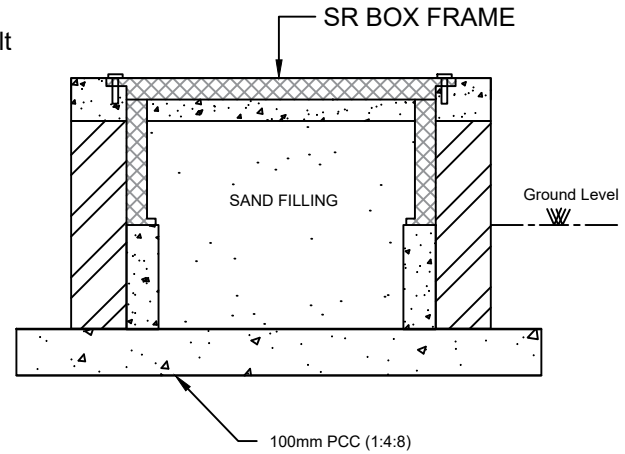
TITLE:
DETAILS OF PIPE TRENCH

| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOCL-STD-CGD-001 | 0 |




SECTION A-A



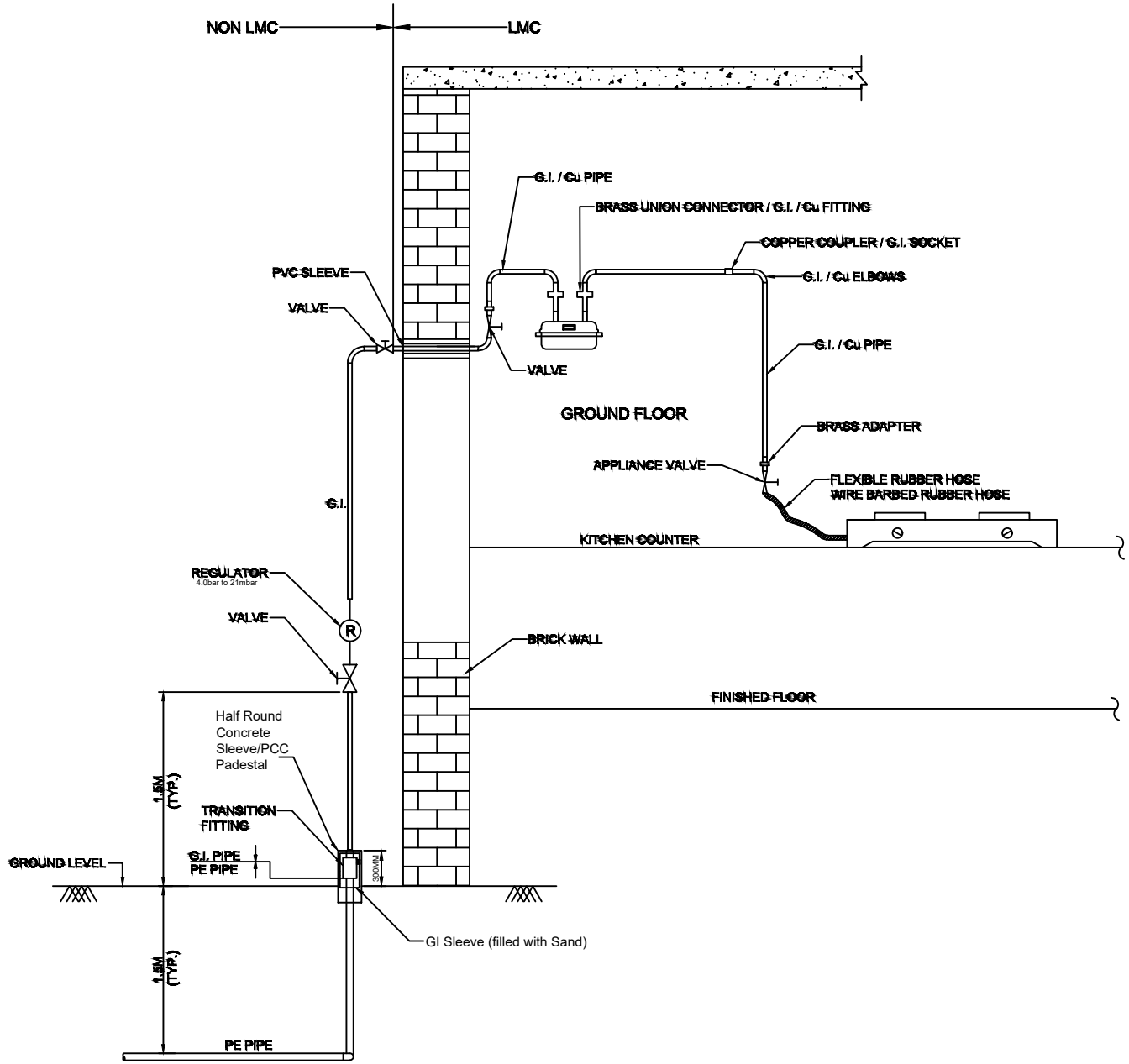

SECTION B-B

**NOTES:-**

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.
3. "X" & "Y" Dimensions to suit equipment size at site
4. External finish - Cement mortar plaster (1:6)
6. External Paint - Yellow paint

**REFERENCE DRAWING**

| | | | |
|---|---|---|---|
| TITLE: SCHEMATIC DIAGRAM OF FOUNDATION FOR SINGLE STREAM SERVICE REGULATOR | | | |
| SCALE: SCALE | | TOTAL NO. OF SHTS: | 1 OF 1 |
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-018 | 0 |



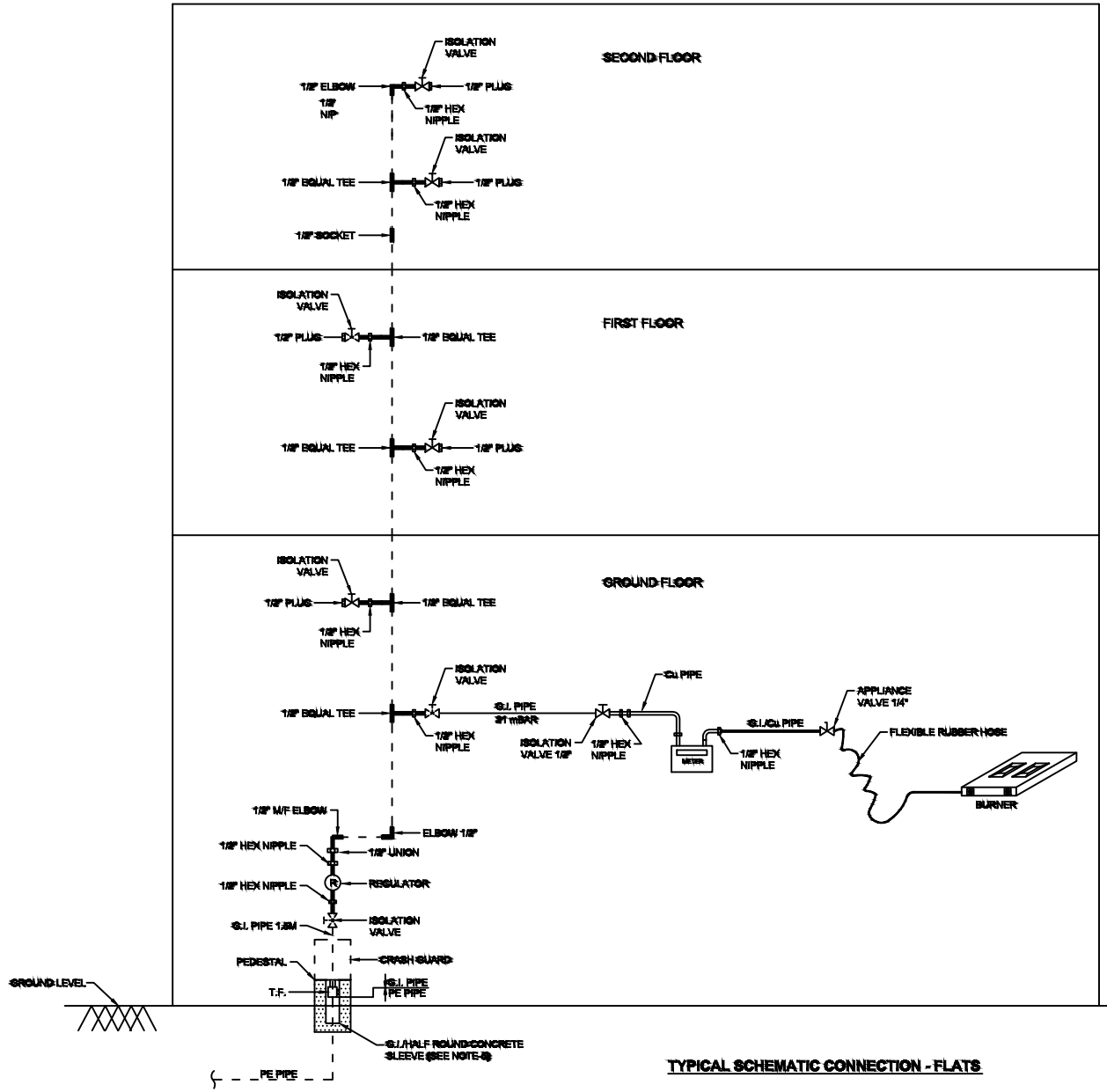

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. TENTATIVE RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.8M. ANY CHANGES IN RISER LENGTH SHALL BE AFTER APPROVAL FROM EIC.
5. G.I. INSTALLATION / METER INSTALLATION SHALL BE DECIDED BY OWNER / OWNER'S REPRESENTATIVE AS PER SITE CONDITIONS.
6. IF COPPER PIPE GOES TO THE APPLIANCE VALVE THEN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR IF G.I. PIPE GOES TO THE APPLIANCE VALVE THEN G.I. FITTING SHALL BE USED AT THE OUTLET OF THE METER.
7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.8M WHEN PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING IS USED IN BETWEEN THE PIPE THEN CLAMP SHALL BE PLACED 150 MM AWAY FROM CENTER LINE OF THE FITTING AT EVERY SIDE. HOWEVER, THE SAME MAY BE CHANGED AS PER SITE CONDITIONS / AS DIRECTED BY EIC.
8. TAPPING SHALL BE LEFT NEAR OUTSIDE THE KITCHEN AS DIRECTED BY OWNER / OWNER'S REPRESENTATIVE.

REFERENCE DRAWING

TITLE: TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION (DIRECT REGULATOR)
4.0bar to 21mbar

| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-019 | 0 |



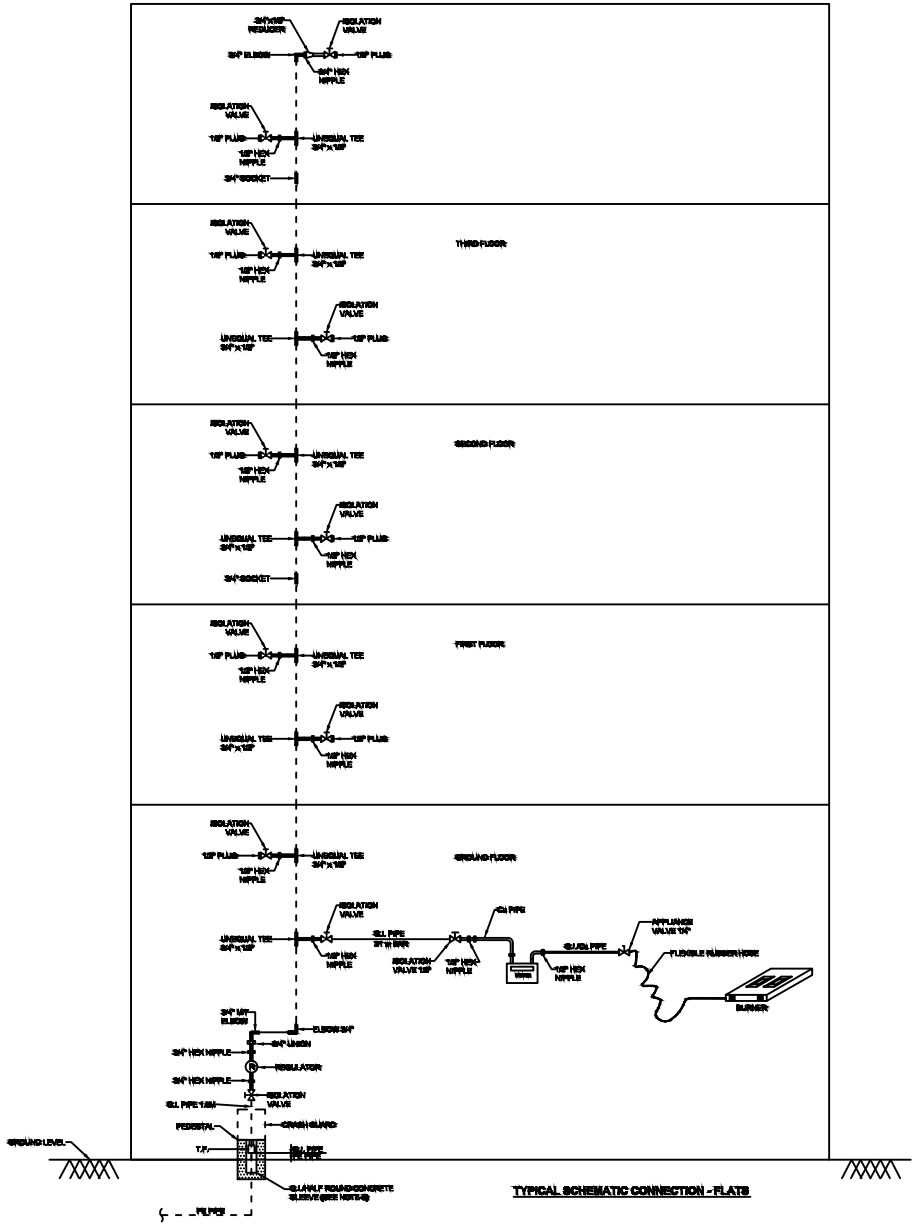

**TYPICAL SCHEMATIC CONNECTION - FLATS**

## NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. TENTATIVE RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.5M. ANY CHANGES IN RISER LENGTH SHALL BE AFTER APPROVAL FROM EIC.
5. G.I. INSTALLATION / METER INSTALLATION SHALL BE DECIDED BY OWNER / OWNER'S REPRESENTATIVE AS PER SITE CONDITIONS.
6. IF COPPER PIPE GOES TO THE APPLIANCE VALVE THEN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR IF G.I. PIPE GOES TO THE APPLIANCE VALVE THEN G.I. FITTING SHALL BE USED AT THE OUTLET OF THE METER.
7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.5M WHEN PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING IS USED IN BETWEEN THE PIPE THEN CLAMP SHALL BE PLACED 150 MM AWAY FROM CENTER LINE OF THE FITTING AT EVERY SIDE. HOWEVER, THE SAME MAY BE CHANGED AS PER SITE CONDITIONS / AS DIRECTED BY EIC.
8. METER CLAMP SHALL BE APPROVED FROM OWNER / OWNER'S REPRESENTATIVE..

REFERENCE DRAWING

| | | | |
|---|---|---|---|
| TITLE: | TYPICAL SCHEMATIC CONNECTION- FLAT GR. + 2 FLOORS<br>DIRECT REGULATOR (4.0bar to 21mbar) | | |
| SCALE: SCALE | | TOTAL NO. OF SHTS: | 1 OF 1 |
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-020 | 0 |




TYPICAL SCHEMATIC CONNECTION - FLATS

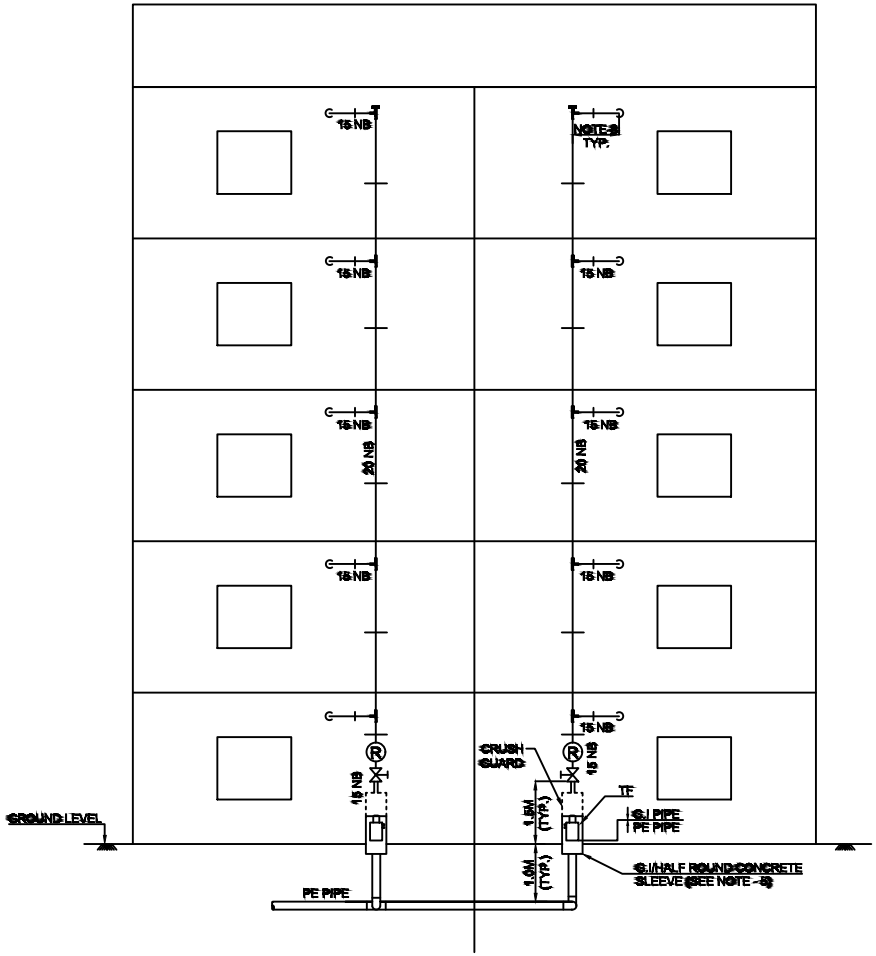
## NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. TENTATIVE RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.6M. ANY CHANGES IN RISER LENGTH SHALL BE AFTER APPROVAL FROM EIC.
5. G.I. INSTALLATION / METER INSTALLATION SHALL BE DECIDED BY OWNER / OWNERS REPRESENTATIVE AS PER SITE CONDITIONS.
6. IF COPPER PIPE GOES TO THE APPLIANCE VALVE THEN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR IF G.I. PIPE GOES TO THE APPLIANCE VALVE THEN G.I. FITTING SHALL BE USED AT THE OUTLET OF THE METER.
7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.6M WHEN PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING IS USED IN BETWEEN THE PIPE THEN CLAMP SHALL BE PLACED 150 MM AWAY FROM CENTER LINE OF THE FITTING AT EVERY SIDE. HOWEVER, THE SAME MAY BE CHANGED AS PER SITE CONDITIONS / AS DIRECTED BY EIC.
8. METER CLAMP SHALL BE APPROVED FROM OWNER / OWNERS REPRESENTATIVE.,

REFERENCE DRAWING

TITLE:
TYPICAL SCHEMATIC CONNECTION- FLAT
GR. + 3 FLOORS & ABOVE (UPTO 7 FLOORS)

| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-021 | 0 |



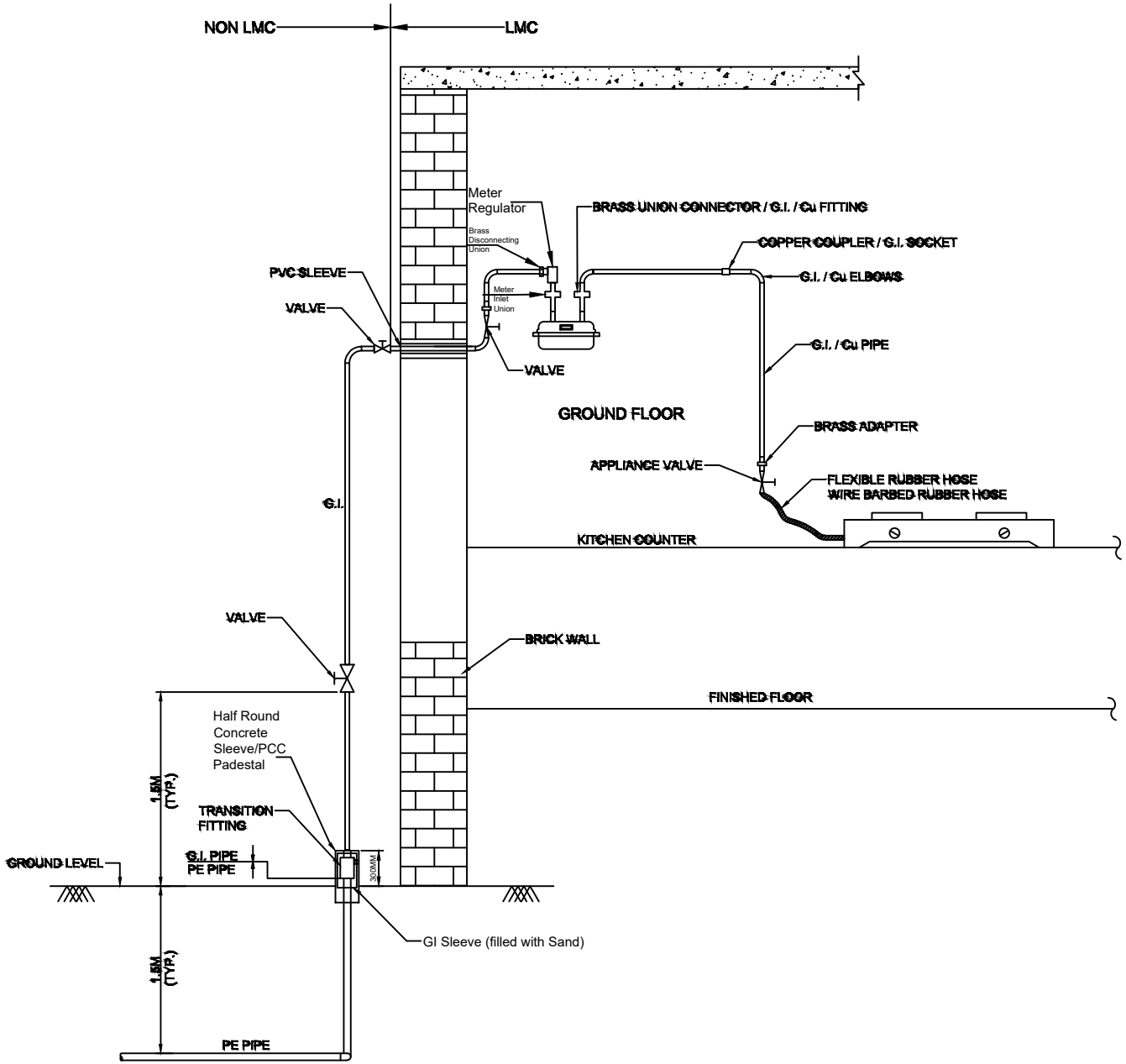

**INDICATIVE RISER ARRANGEMENT**
**(METER INSTALLED INSIDE THE KITCHEN)**

## NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. TENTATIVE RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.5M. ANY CHANGES IN RISER LENGTH SHALL BE AFTER APPROVAL FROM EIC.
5. G.I. INSTALLATION / METER INSTALLATION SHALL BE DECIDED BY OWNER / OWNERS REPRESENTATIVE AS PER SITE CONDITIONS.
6. IF COPPER PIPE GOES TO THE APPLIANCE VALVE THEN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR IF G.I. PIPE GOES TO THE APPLIANCE VALVE THEN G.I. FITTING SHALL BE USED AT THE OUTLET OF THE METER.
7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.8M WHEN PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING IS USED IN BETWEEN THE PIPE THEN CLAMP SHALL BE PLACED 150 MM AWAY FROM CENTER LINE OF THE FITTING AT EVERY SIDE. HOWEVER, THE SAME MAY BE CHANGED AS PER SITE CONDITIONS / AS DIRECTED BY EIC.
8. TAPPING SHALL BE LEFT NEAR OUTSIDE THE KITCHEN AS DIRECTED BY OWNER / OWNERS REPRESENTATIVE.
9. FROM TRANSITION FITTING TO THE ISOLATION VALVE, SHALL BE CONSIDERED IN THE OUTSIDE KITCHEN PIPING.

REFERENCE DRAWING

| | | | |
|---|---|---|---|
| TITLE: | TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION 4.0bar to 21mbar | | |
| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-022 | 0 |



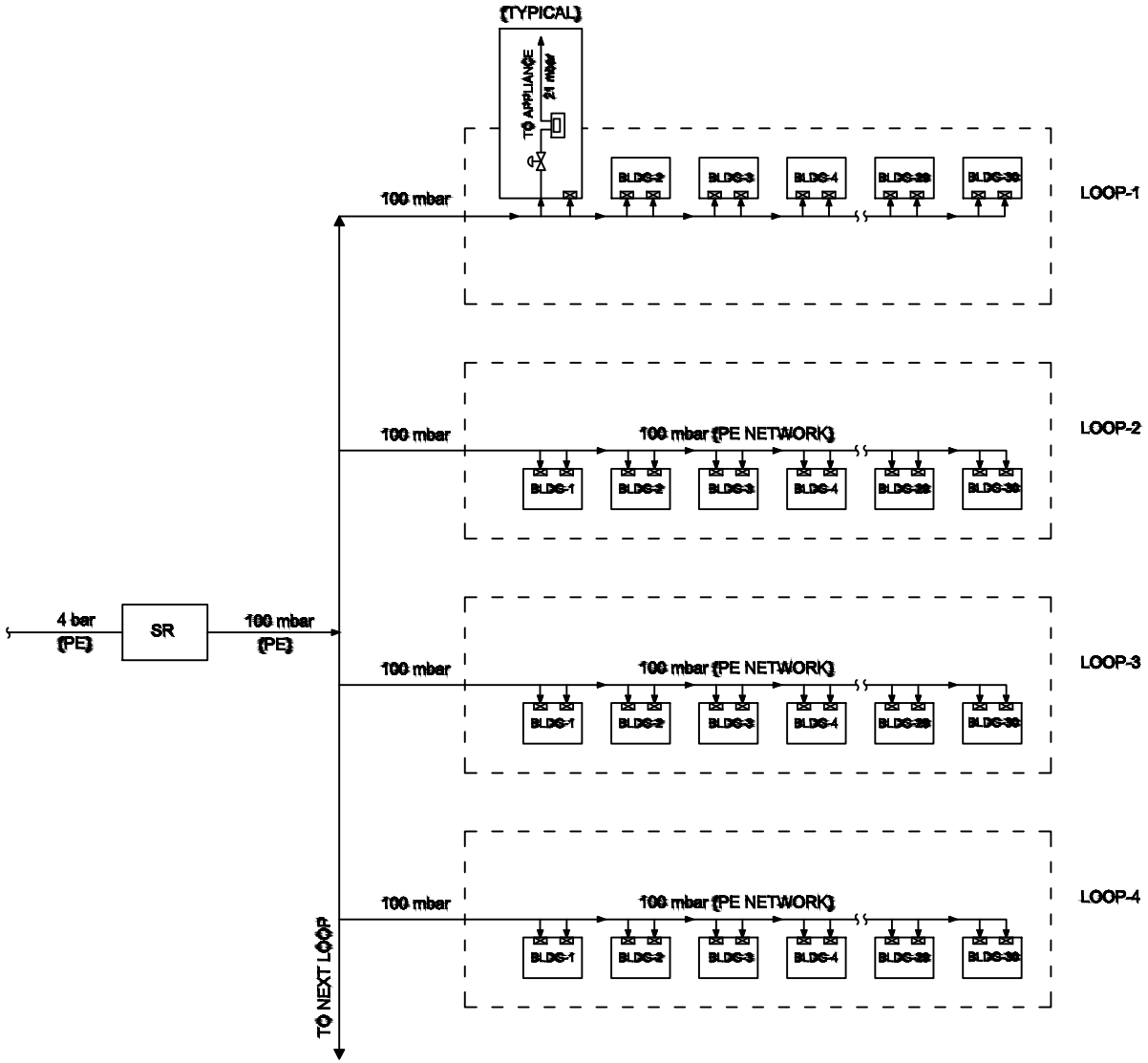

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. THE SIZES SHOWN IN THE DRAWING ARE TENTATIVE AND SHALL BE DECIDED AT THE TIME OF DETAIL ENGINEERING.
3. PIPING DOWNSTREAM METER SHALL BE COPPER IN CASE METER IS INSTALLED WITHIN THE KITCHEN.
4. TENTATIVE RISER LENGTH (FROM OUTLET OF TRANSITION FITTING TO INLET OF ISOLATION VALVE) SHALL BE 1.8M. ANY CHANGES IN RISER LENGTH SHALL BE AFTER APPROVAL FROM EIC.
5. G.I. INSTALLATION / METER INSTALLATION SHALL BE DECIDED BY OWNER / OWNER'S REPRESENTATIVE AS PER SITE CONDITIONS.
6. IF COPPER PIPE GOES TO THE APPLIANCE VALVE THEN BRASS FITTING SHALL BE USED AT THE OUTLET OF METER OR IF G.I. PIPE GOES TO THE APPLIANCE VALVE THEN G.I. FITTING SHALL BE USED AT THE OUTLET OF THE METER.
7. MAXIMUM DISTANCE BETWEEN CLAMPS SHALL BE 1.8M WHEN PIPE GOES IN THE STRAIGHT LENGTH, IF ANY TEE OR ANY FITTING IS USED IN BETWEEN THE PIPE THEN CLAMP SHALL BE PLACED 150 MM AWAY FROM CENTER LINE OF THE FITTING AT EVERY SIDE. HOWEVER, THE SAME MAY BE CHANGED AS PER SITE CONDITIONS / AS DIRECTED BY EIC.
8. TAPPING SHALL BE LEFT NEAR OUTSIDE THE KITCHEN AS DIRECTED BY OWNER / OWNER'S REPRESENTATIVE.

REFERENCE DRAWING

TITLE: TYPICAL DOMESTIC CONNECTION LAYOUT OF NG DISTRIBUTION (METER REGULATOR)
100mbar to 21mbar

| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-023 | 0 |



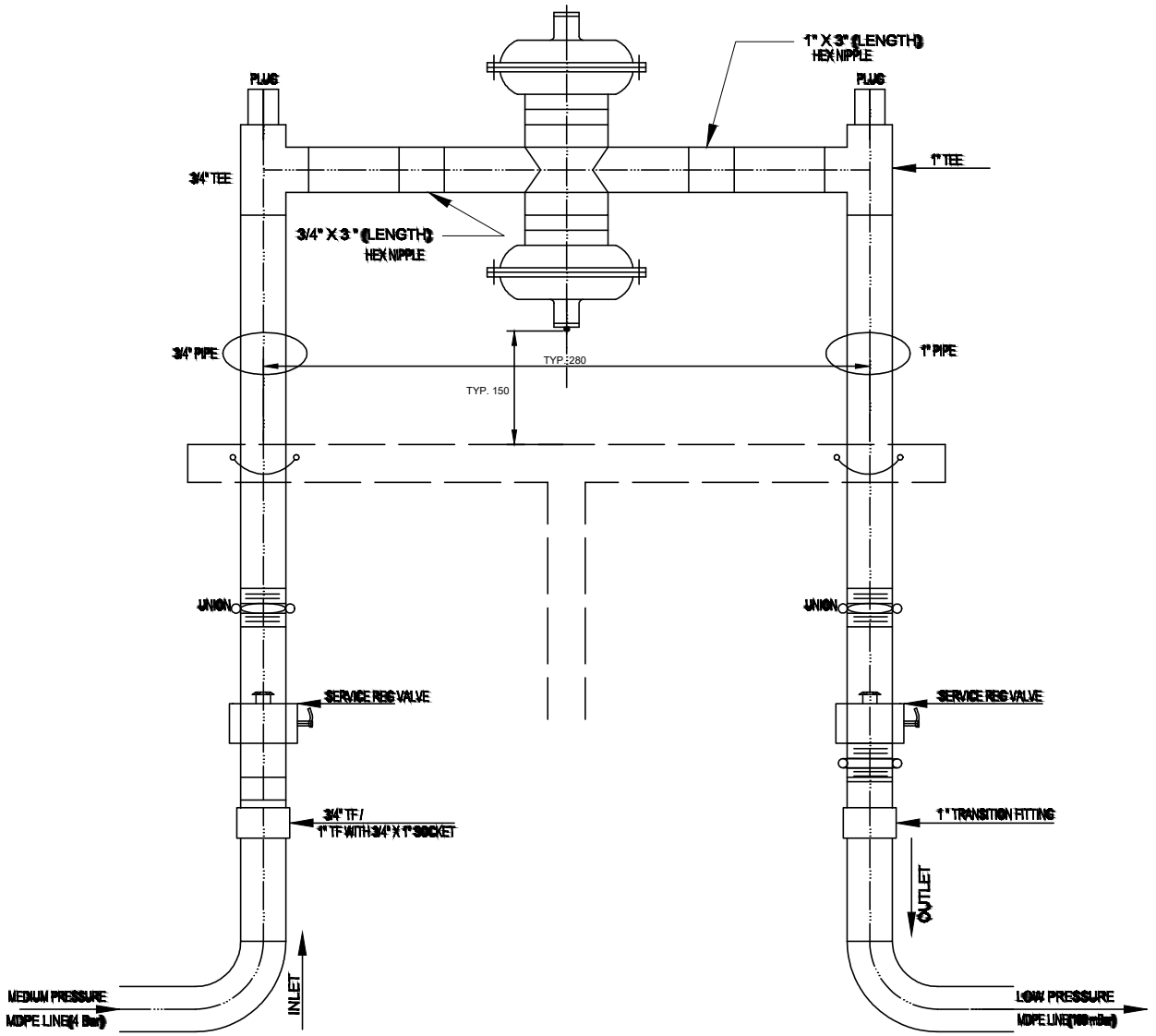

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.

REFERENCE DRAWING

TITLE:
SCHEMATIC DIAGRAM DESCRIBING DIFFERENT PRESSURE SYSTEM (SR TO APPLIANCE IN KITCHEN)

| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-024 | 0 |




SCHEMATIC FOR INSTALLATION OF SERVICE REGULATOR INSIDE ENCLOSURE

**NOTES:-**

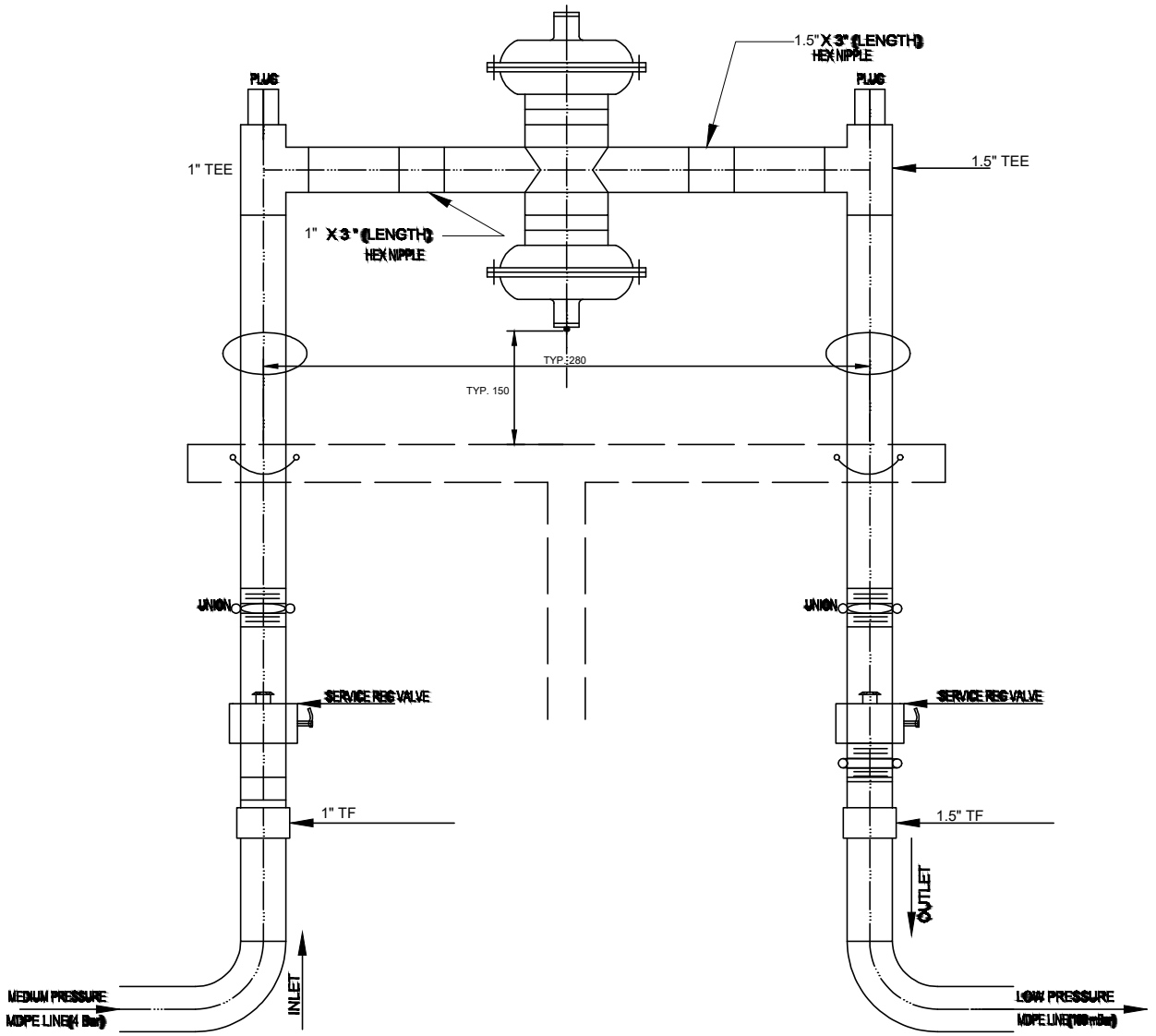
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. SAND FILLING TO BE DONE IN OPEN ANNULAR AREAS

**REFERENCE DRAWING**

TITLE:

**SCHEMATIC DIAGRAM FOR SERVICE REGULATOR - 25 SCMH**

| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-025 | 0 |




SCHEMATIC FOR INSTALLATION OF SERVICE REGULATOR INSIDE ENCLOSURE

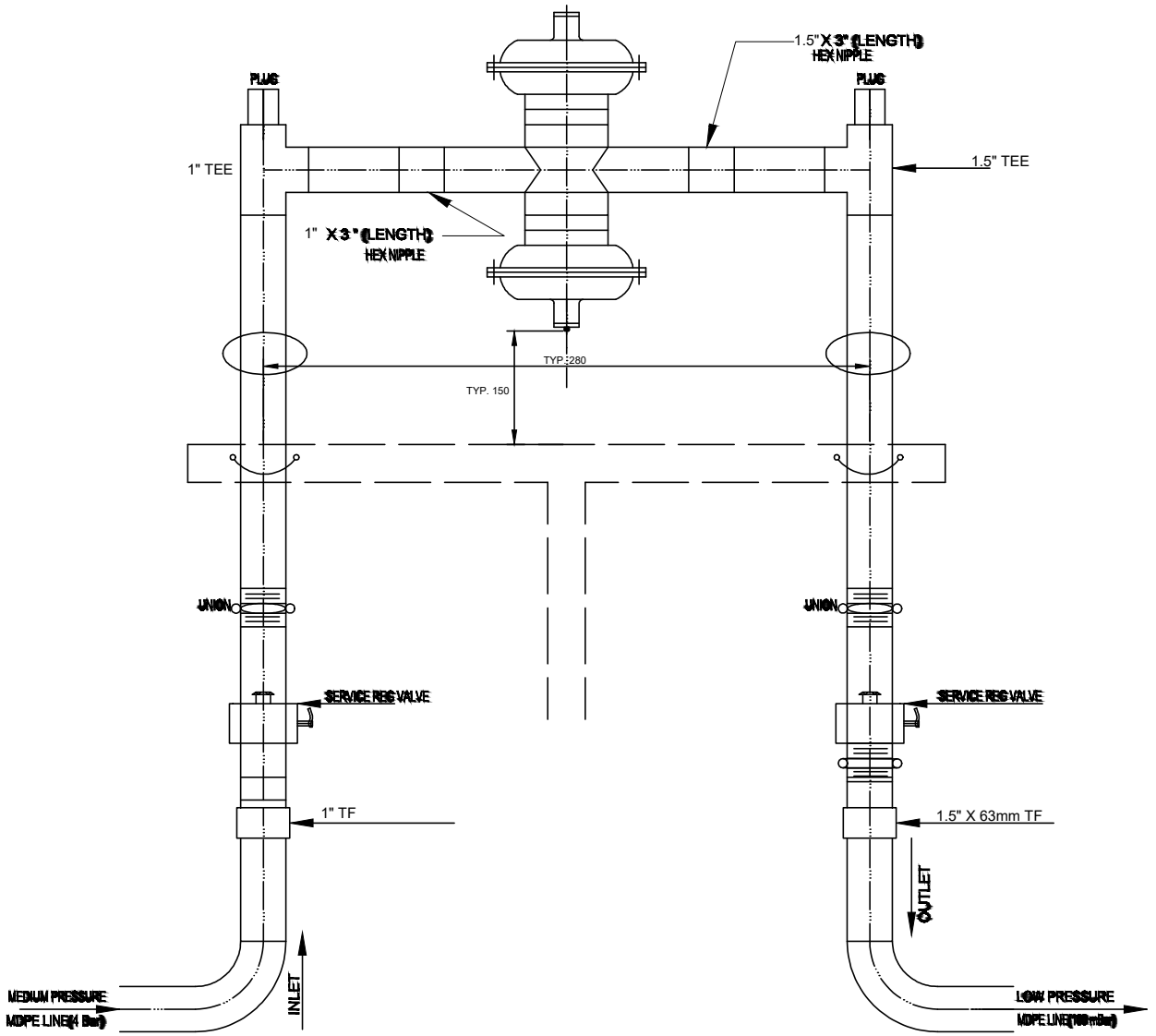
**NOTES:-**

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. SAND FILLING TO BE DONE IN OPEN ANNULAR AREAS

**REFERENCE DRAWING**

TITLE: **SCHEMATIC DIAGRAM FOR SERVICE REGULATOR - 50 SCMH**

| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-026 | 0 |




SCHEMATIC FOR INSTALLATION OF SERVICE REGULATOR INSIDE ENCLOSURE

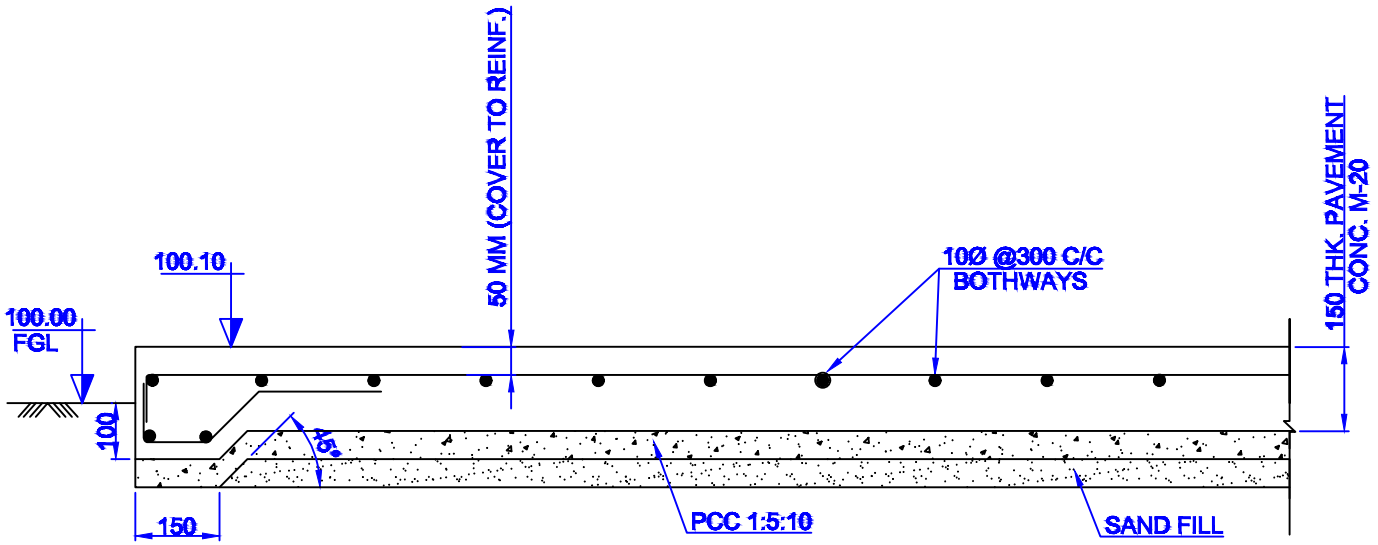
**NOTES:-**

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. SAND FILLING TO BE DONE IN OPEN ANNULAR AREAS

**REFERENCE DRAWING**

TITLE: **SCHEMATIC DIAGRAM FOR SERVICE REGULATOR - 100 SCMH**

| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-027 | 0 |




## RCC PAVEMENT DETAIL

NOTES:-

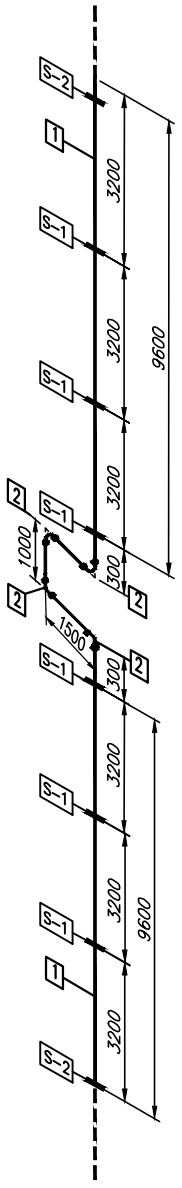
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOTE SCALE THE DRAWING.

REFERENCE DRAWING

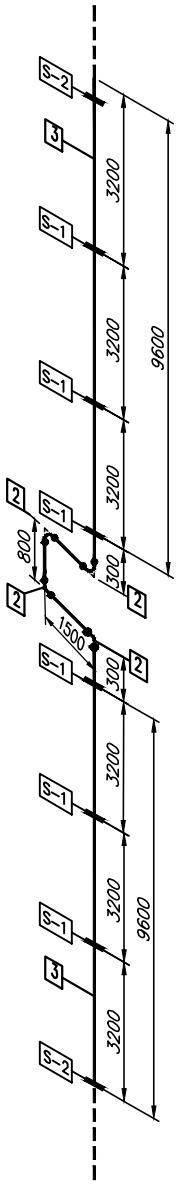
TITLE:
STANDARD DETAILS OF RCC PAVEMENT

| SCALE: | NTS | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOCL-STD-CGD-002 | 0 |

FORMAT NO C211050-FMT-005_00

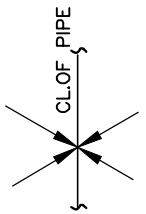



OPTION–A
(LOOP SIZE–1500X1000)

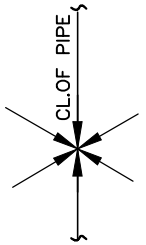



OPTION–B
(LOOP SIZE–1500X800)

## SUPPORT SYMBOLS




(GUIDE S–1.)




(ANCHOR S–2)

## BILL OF MATERIAL

| S.NO. | SIZE (NB) | DESCRIPTION | QTY. | UNIT / CODE |
|---|---|---|---|---|
| 1 | 50 | GI PIPE –IS–1239 PART–1 | 20.8 | M |
| 2 | 50 | ELBOW 90°, | 04 | Nos. |
| 3 | 50 | GI PIPE –IS–1239 PART–1 | 20.6 | M |

REFERENCE DRAWINGS

| DRAWING TITLE | DRAWING NUMBER |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.

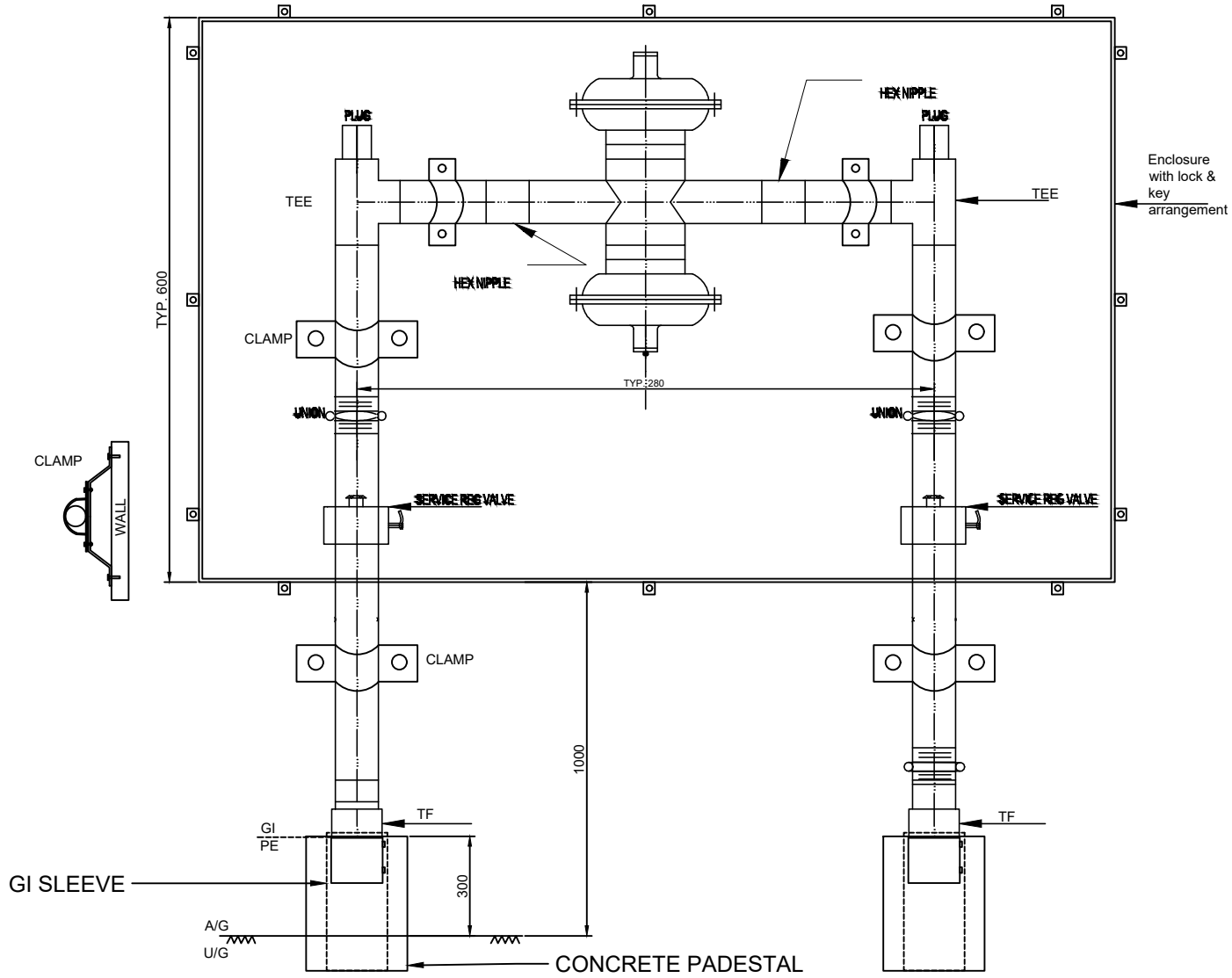
REFERENCE DRAWING

TITLE:

EXPANSION LOOP FOR RISER
IN HIGH RISE BUILDING

| SCALE: SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|

| SIZE | JOB NO. | DRAWING NUMBER | REV. |
|---|---|---|---|
| A3 | ----- | IOC-STD-CGD-029 | 0 |




SCHEMATIC FOR INSTALLATION OF SERVICE REGULATOR INSIDE ENCLOSURE (WALL MOUNTED)

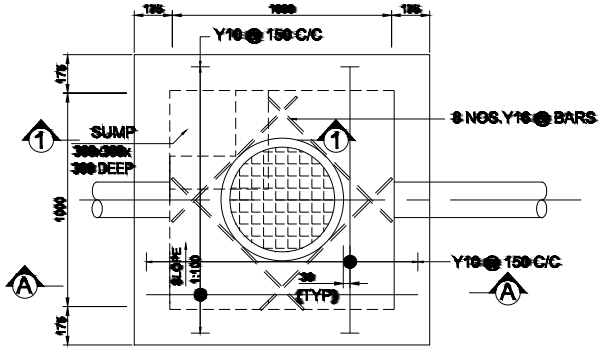
**NOTES:-**

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. SAND FILLING TO BE DONE IN OPEN ANNULAR AREAS
3. INLET & OUTLET GI PIPING SIZE AS PER SR SIZING

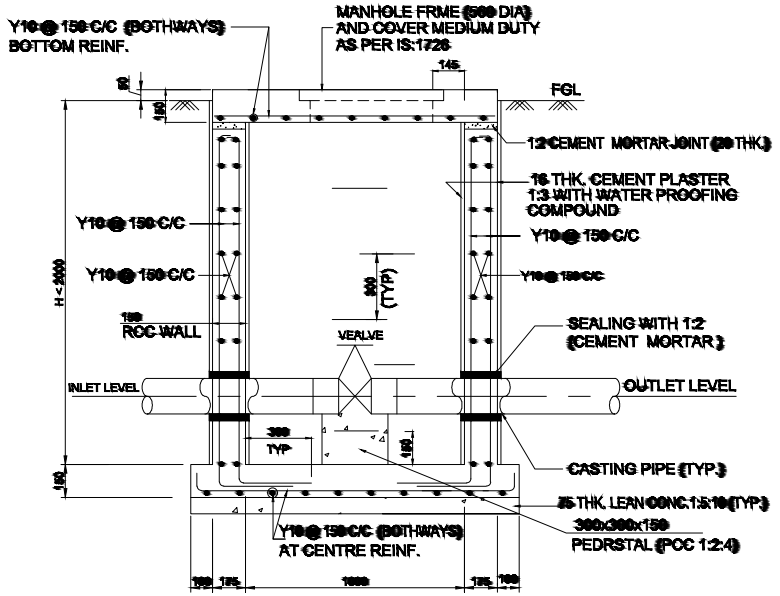
**REFERENCE DRAWING**

**TITLE:** SCHEMATIC DIAGRAM FOR SERVICE REGULATOR - WALL MOUNTED

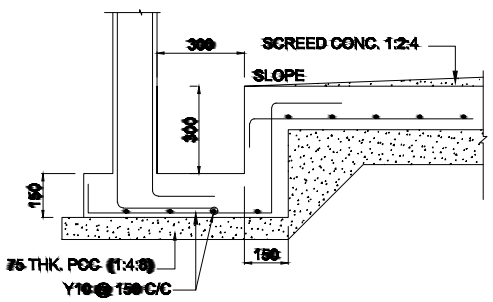
| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-028 | 0 |



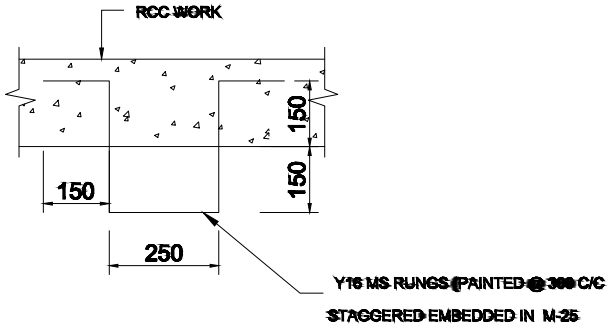

VALVE PIT PLAN
(SCALE 1:20)




SECTION A-A
(SCALE 1:20)




SECTION 1-1
(SCALE 1:10)




TYPICAL DETAILS OF MS RUNGS
(SCALE 1:10)

RCC VALVE CHAMBERS SIZES 1M x 1M

| REFERENCE DRAWINGS | |
|---|---|
| DRAWING TITLE | DRAWING NUMBER |
| | |
| | |
| | |
| | |
| | |

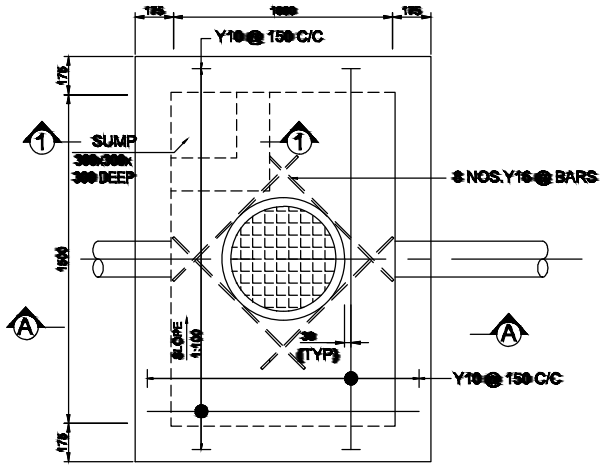
NOTES :

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.
3. CLEAR COVER TO MAIN REINFORCEMENT SHALL BE (a) SLAB 20mm
4. GRADE OF CONCRETE USED SHALL BE M-25 CONFORMING.
5. REINFORCEMENT SHALL BE HYSD BARS OF (GRADE Fe 415) CONFORMING TO IS:1786.

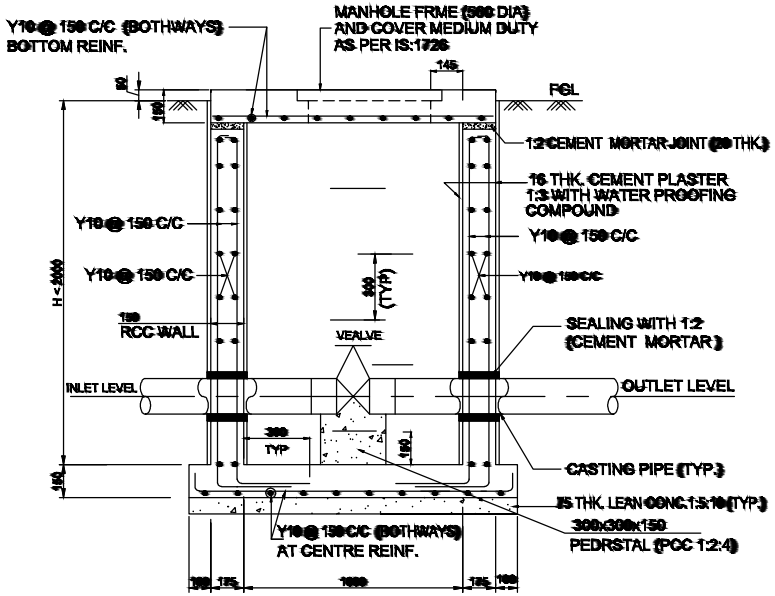
REFERENCE DRAWING

TITLE:
STANDARD DETAIL OF RCC
VALVE CHAMBER (1M x 1M)

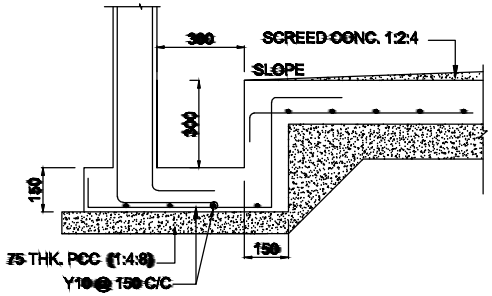
| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-029 | 0 |



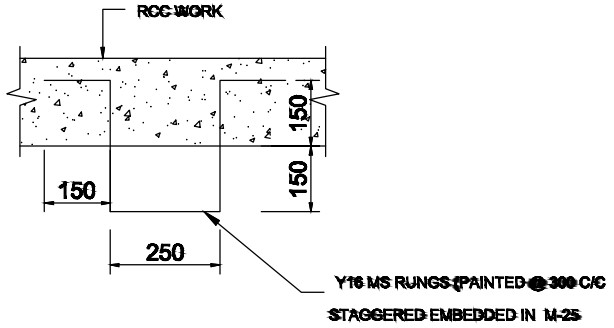

VALVE PIT PLAN
(SCALE 1:20)




SECTION A-A
(SCALE 1:20)




SECTION 1-1
(SCALE 1:10)




TYPICAL DETAILS OF MS RUNGS
(SCALE 1:10)

RCC VALVE CHAMBERS SIZES 1.5M x 1M

| REFERENCE DRAWINGS | |
|---|---|
| DRAWING TITLE | DRAWING NUMBER |
| | |
| | |
| | |
| | |
| | |

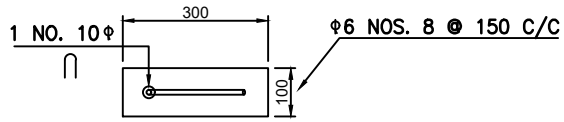
NOTES :

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.
3. CLEAR COVER TO MAIN REINFORCEMENT SHALL BE (a) SLAB 30mm
4. GRADE OF CONCRETE USED SHALL BE M-30 CONFORMING.
5. REINFORCEMENT SHALL BE HYSD BARS OF (GRADE Fe 415) CONFORMING TO IS:1786.

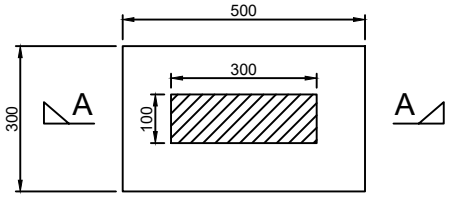
REFERENCE DRAWING

TITLE:
STANDARD DETAIL OF RCC
VALVE CHAMBER (1.5M x 1M)

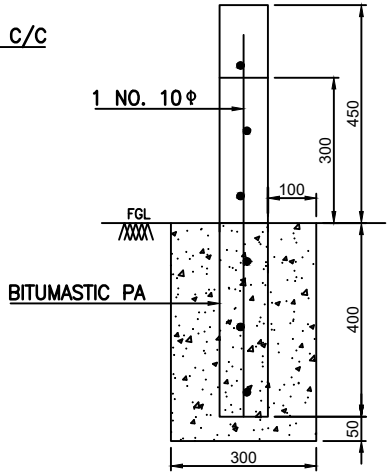
| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-030 | 0 |



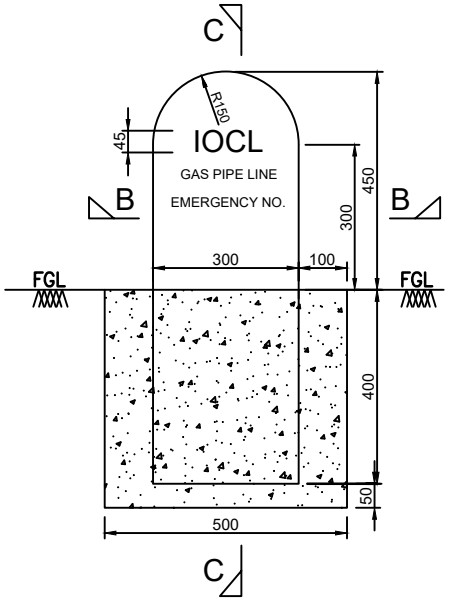

SECTION - B-B



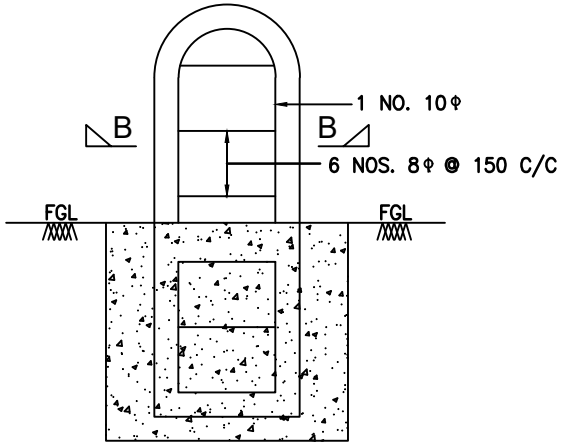

PLAN




SECTION - C-C




SECTION - A-A
(FOR DIMENSIONS)




SECTION - A-A
(FOR REINFORCEMENT)

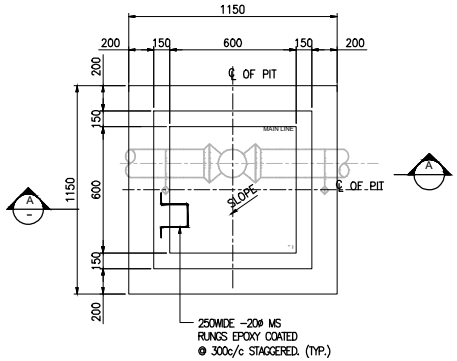
NOTES:-

1. DRAWING IS NOT SCALE.
2. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE.
3. MARKERS SHALL BE INSTALLED IN EVERY 50 METER INTERVAL AS PER INSTRUCTIONS OF ENGINEER-IN-CHARGE.
4. ALL BOUNDARY MARKERS SHALL BE PRESENT & INSCRIPTION SHALL BE ENGRAVED 5mm DEEP IN THE MOULD ON BOTH FACE.
5. CONCRETE FOR BOUNDARY MARKERS SHALL BE M-20.

REFERENCE DRAWING

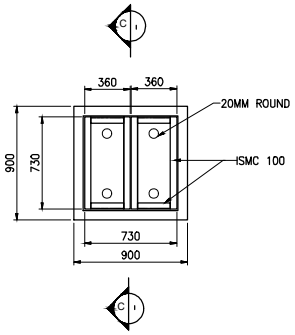
TITLE:
SKETCH FOR RCC ROUTE MARKER

| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-031 | 0 |




MDPE VALVE PIT BOTTOM PLAN

(SCALE 1:20)



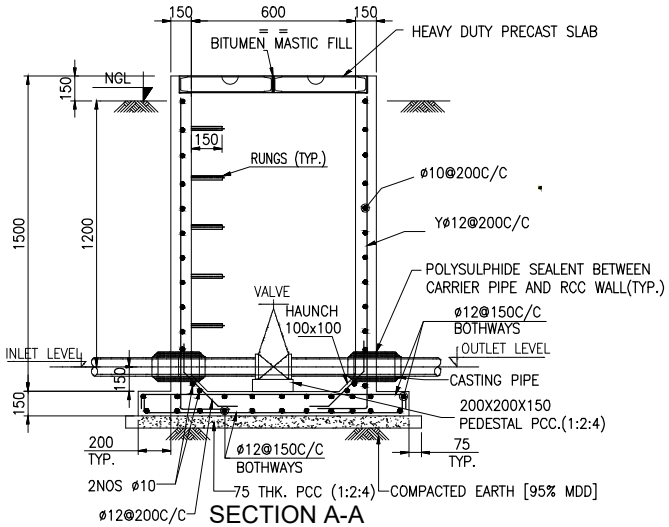

ARRANGEMENT OF PRECAST COVER SLAB

(SCALE 1:20)

1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
2. DO NOT MEASURE DIMENSIONS ON THE DRAWING. ONLY WRITTEN DIMENSION SHOULD BE FOLLOWED..
3. GRADE OF CONCRETE SHALL M25.
4. ALL REINFORCEMENT SHALL BE HIGH YIELD STRENGTH DEFORMED (HYSD) BAR OF GRADE FE500D CONFORMING TO IS:1786
5. MIN. NOMINAL COVER TO REINFORCEMENT IS AS FOLLOWS

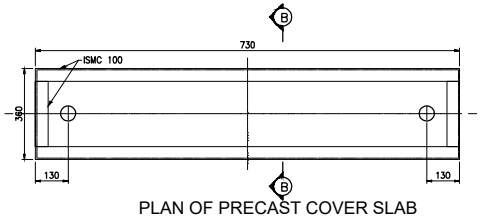
| | BOTTOM | TOP | SIDE |
|---|---|---|---|
| RAFT | – 75 | 50 | 50 |
| TOP SLAB | – 30 | 30 | 30 |
| WALL | – 50 (OUTER) | 30 (INNER) | |

6. LAP LENGTH SHALL BE 50 TIME DIA OF THE SMALLER BAR NOT MORE THAN 50% OF BARS SHALL BE LAPPED AT ANY SECTION.
7. DEVELOPMENT LENGTH (Ld) SHALL BE 45 TIMES DIA OF THE BAR.
8. NET SAFE BEARING CAPACITY AT 1.500M. BELOW FGL IS CONSIDERED AS 50 kN/M²
9. FOR RCC WALL AND BASE SLAB WATER PROOFING COMPOUND SHALL BE WELL MIX WITH DRY CEMENT IN PROPORTION OF 1% BY WEIGHT OF CEMENT OR AS RECOMMENDED BY MANUFACTURER.
10. EXTERNAL SURFACE IN CONTACT WITH SOIL (BELOW NGL) FOR ALL WALL & RAFT SHALL BE PROVIDED WITH MINIMUM TWO COATS OF BITUMINOUS PAINTING OF GRADE 85/25 CONFORMING TO IS:702 @ 1.7 KG/SQ.M (MINIMUM) FOR WATER/DAMP PROOFING AS PER SPECIFICATION.
11. PROVISION IN SOR AND CONTRACT SPECIFICATIONS BE FOLLOWED FOR ALL THE WORKS AND MATERIALS INFORM ENGINEER IN-CHARGE IF ANY DEVIATION FOUND DURING EXECUTION.




SECTION A-A

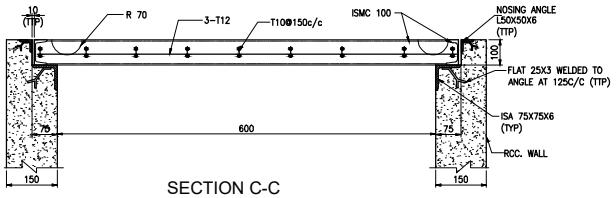
(SCALE 1:20)




PLAN OF PRECAST COVER SLAB

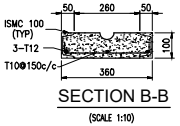
(FOR VEHICLE MOVING AREA)

(SCALE 1:10)



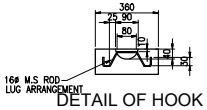

SECTION C-C

(SCALE 1:10)




SECTION B-B

(SCALE 1:10)




DETAIL OF HOOK

(SCALE 1:10)

REFERENCE DRAWINGS

| DRAWING TITLE | DRAWING NUMBER |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |

NOTES :

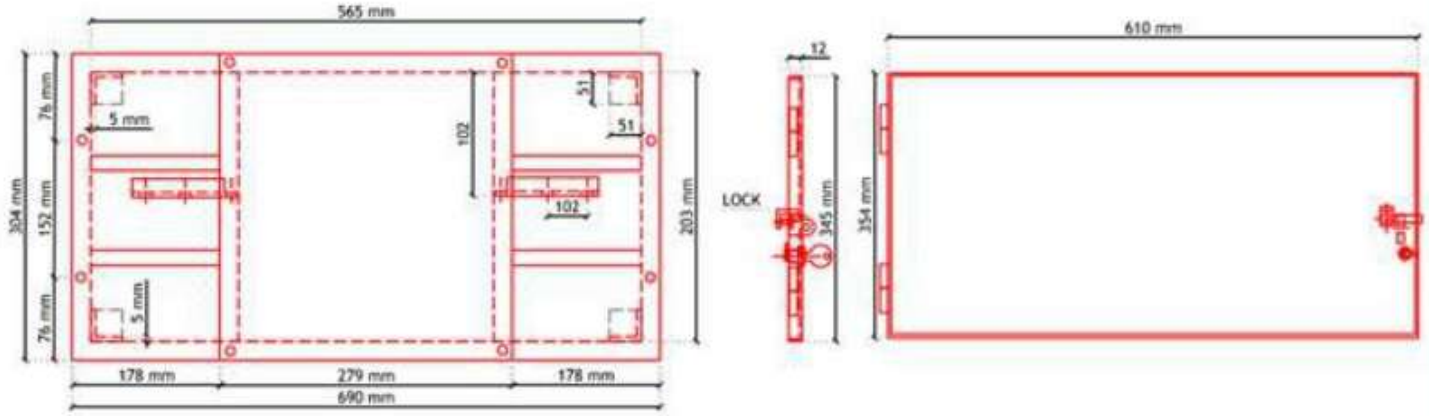
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.
3. CLEAR COVER TO MAIN REINFORCEMENT SHALL BE ◻ MM.
4. GRADE OF CONCRETE USED SHALL BE M ◻ CONFORMING.
5. REINFORCEMENT SHALL BE HYSD BARS OF GRADE Fe ◻ CONFORMING TO IS ◻.

REFERENCE DRAWING

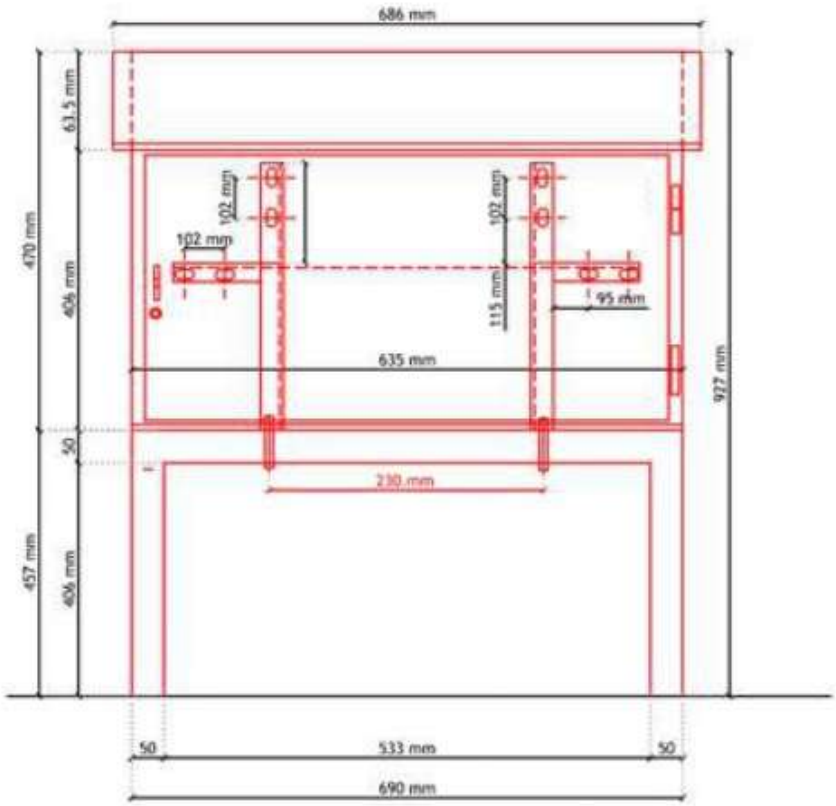
TITLE:

STANDARD DETAIL OF RCC
VALVE CHAMBER (0.6M x 0.6M)

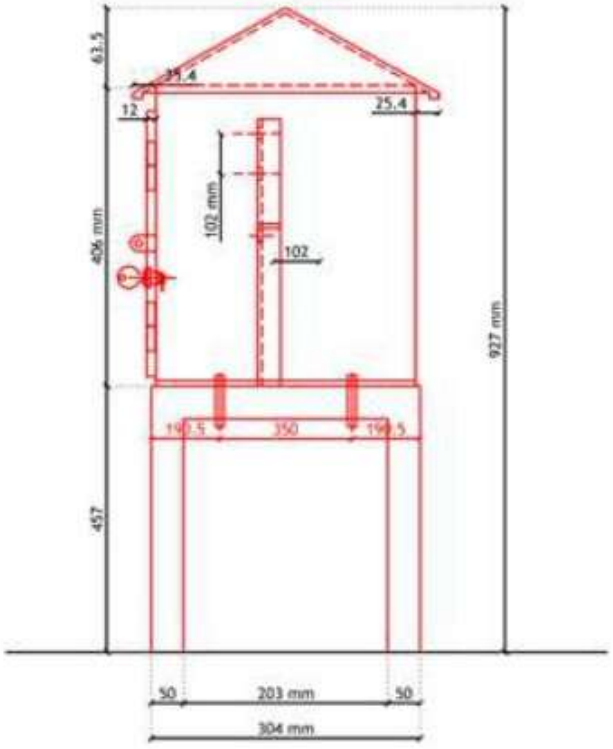
| SCALE: | SCALE | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-032 | 0 |




TOP VIEW/PLAN



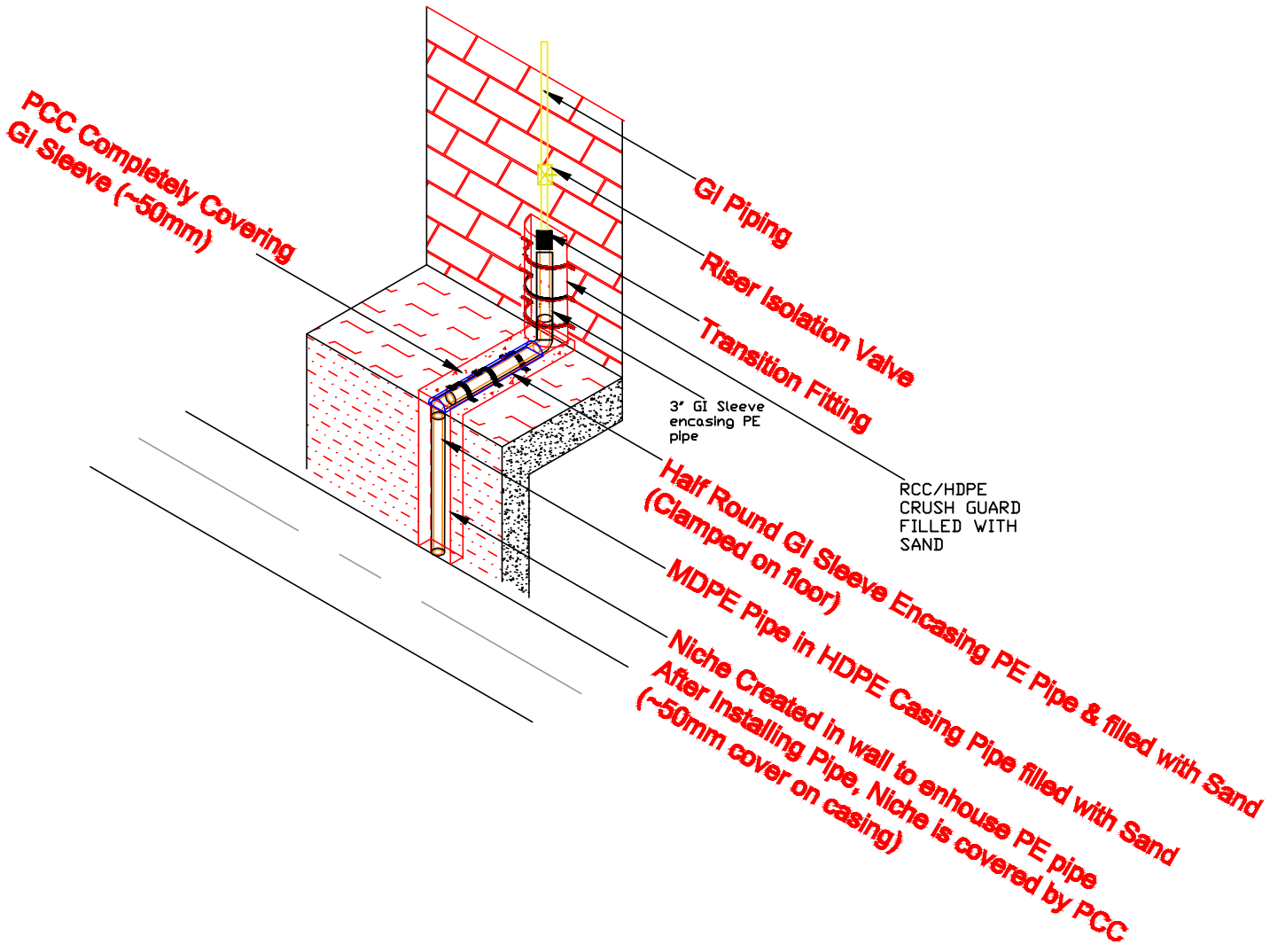

FRONT / BACK ELEVATION




LEFT / RIGHT SIDE ELEVATION

SERVICE
REGULATOR BOX

| MATERIAL |
| --- |
| MS SHEET 2.10 mm GAUGE |
| |
| ANGLE -35 X 35 X 5 mm |
| |

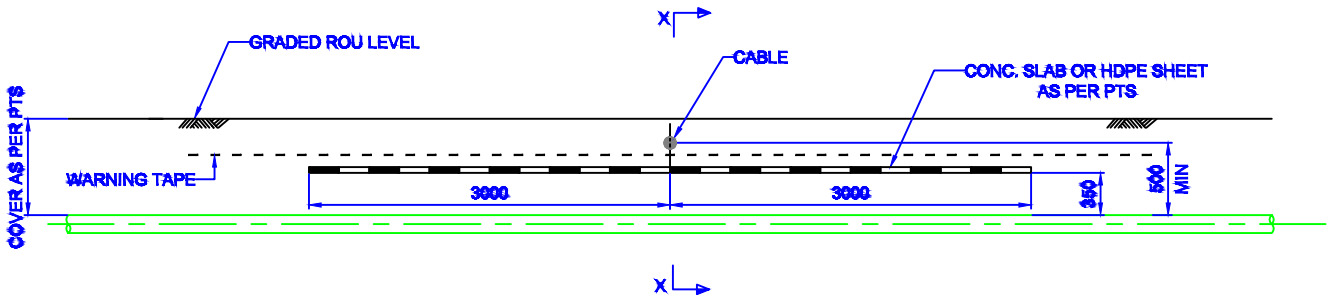


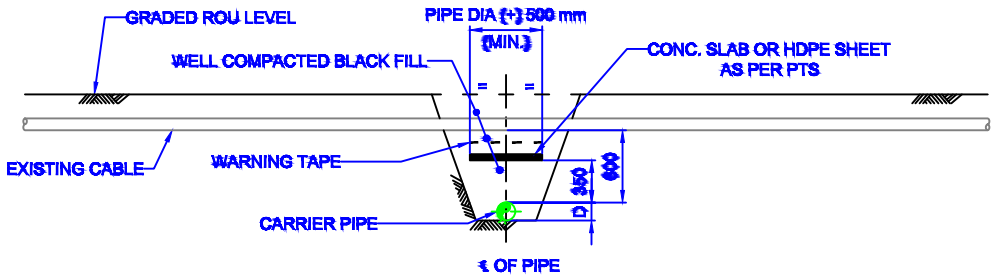

Note:

1. Concelaing of Gi Pipe Should not be Done
2. MDPE pipe in Niche should be should be covered by atleast 50mm PCC
3. All Hollow spaces should be filled by fine sand (compact)
4. Clamping of GI sleeve should be firm. Suitable no. of clamps to be provided.

Indian Oil Corporation Limited

# Veranda Crossing for PNG (D) Connection




## SECTION X-X

**NOTES:-**

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWINGS.
3. A MODIFIED PIPELINE WARNING SIGN SHALL BE INSTALLED CLOSE TO THE CROSSING.
4. IN CASE OF ARMOURED CABLE, C.P. BONDING IS TO BE PROVIDED BETWEEN PIPELINE AND CABLE ARMOUR. IN CASE OF UNARMOURED CABLE, ARRANGEMENT FOR SHIELDING BY PROVIDING CASING ON EITHER SIDE OF THE PIPELINE OR CABLE SHALL BE CONSIDERED.
5. APPROVAL OF THE CROSSING SHALL BE OBTAINED FROM CONCERNED AUTHORITIES.

REFERENCE DRAWING

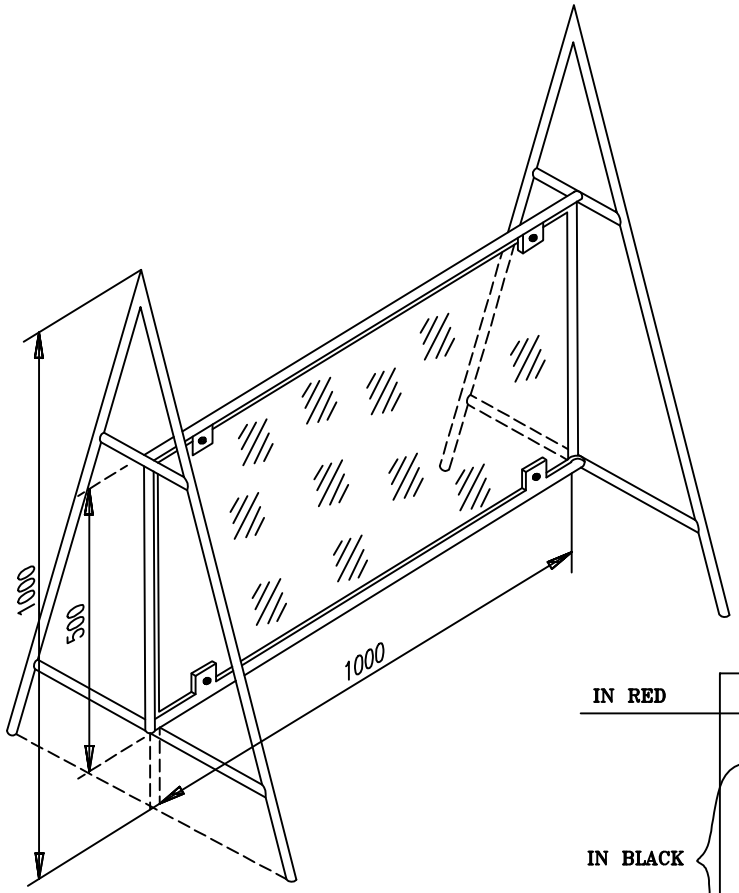
TITLE: TIYPCAL UNDERGROUND CABLE CROSSING DETAILS

| SCALE: | NTS | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-003 | 0 |

FORMAT NO C211050-FMT-005_00

NOTES:-

1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.




IN RED → C A U T I O N ← CLIENT'S LOGO

WORK IN PROGRESS

IN BLACK {

LAYING OF NATURAL GAS PIPELINE

CLIENT : OWNER'S NAME

CONTRACTOR NAME :

DATE OF COMMENCEMENT :

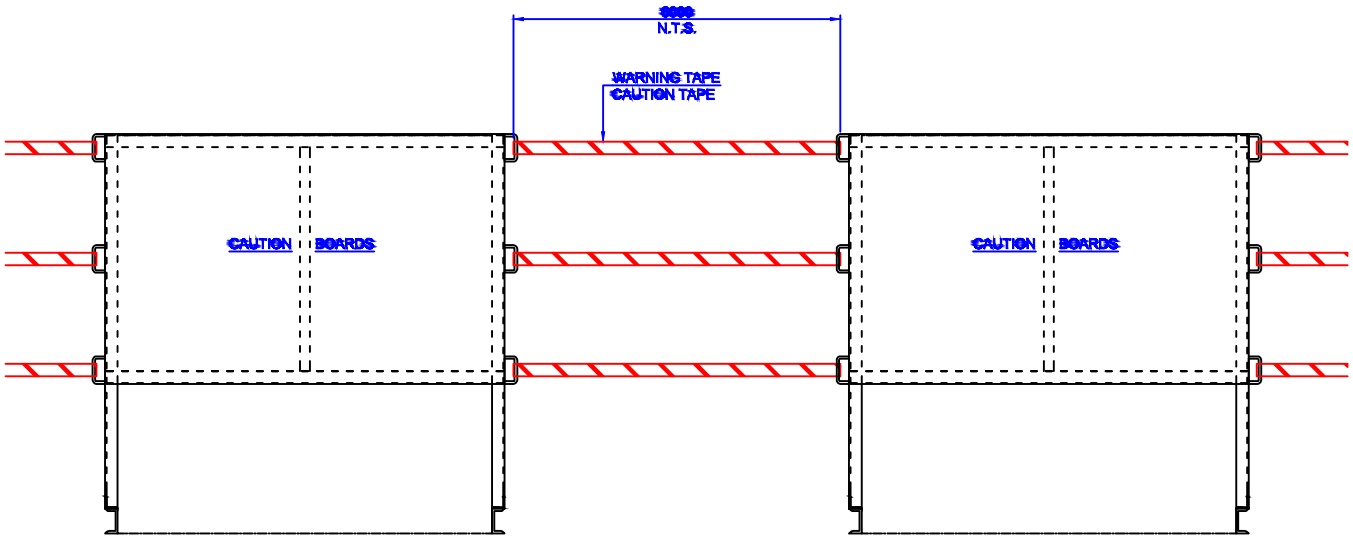
DATE OF COMPLETION :

EMERGENCY PHONE NOS:

REFERENCE DRAWING

CAUTION BOARD FOR BARRICADING

| NTS | TOTAL NO. OF SHTS: 1 OF 1 | |
|---|---|---|
| JOB NO. | DRAWING NUMBER | REV. |
| | IOC-STD-CGD-004 | 0 |



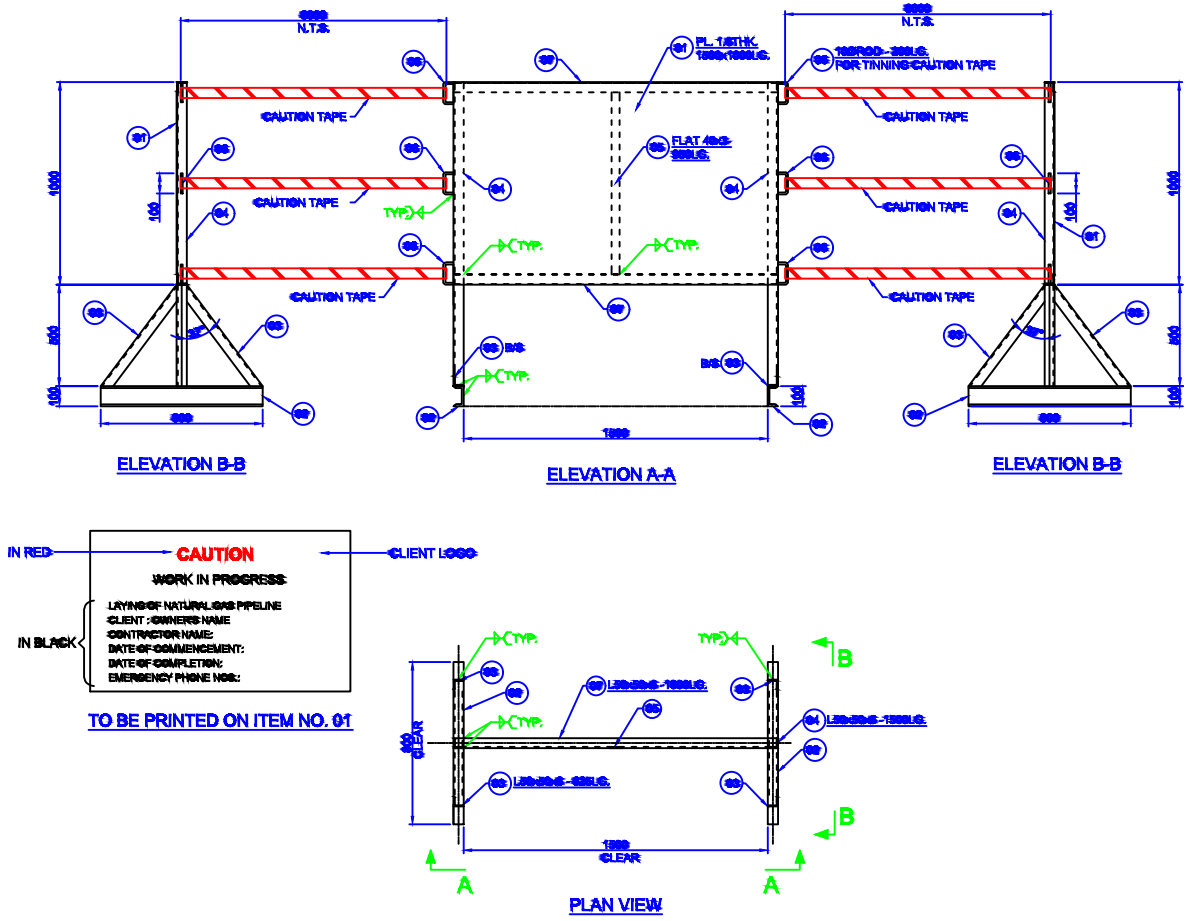

SCHEMATIC LAYOUT OF CAUTION BOARDS AND BARRICADING

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOTE SCALE THE DRAWING.

**REFERENCE DRAWING**

| | | | |
|---|---|---|---|
| TITLE: BARRICADING | | | |
| SCALE: NTS | | TOTAL NO. OF SHTS: 1 OF 1 | |
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-005 | 0 |




NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOTE SCALE THE DRAWING.

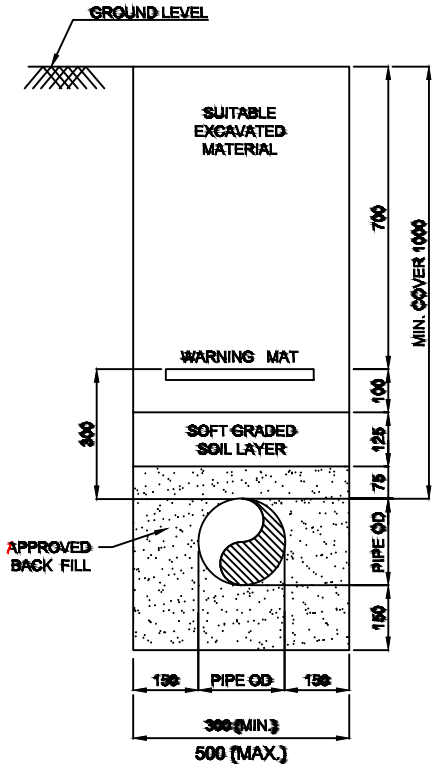
## BILL OF MATERIAL

| Item Mkt. | Section | Width | Length | Item Qty. | Weight | Total Weight |
|---|---|---|---|---|---|---|
| | | | | (Nos) | Kgs./M.Mt. | in Kgs. |
| 1. | PL. 1.6 THK. | 1000 | 1000 | 1 | 12.56 | 30.10 |
| 2. | ISMC 100 | – | 600 | 2 | 9.20 | 14.72 |
| 3. | L50x50x6 | – | 625 | 4 | 4.50 | 11.25 |
| 4. | L50x50x6 | – | 1500 | 2 | 4.50 | 13.50 |
| 5. | Flat 3Thk. | 900 | 40 | 1 | 0.94 | 0.03 |
| 6. | 10Ø Rod | – | 300 | 6 | 0.62 | 0.74 |
| 7. | L50x50x6 | – | 1000 | 2 | 4.50 | 14.40 |
| | | | | Grand Total (Kg) | | 84.84 |

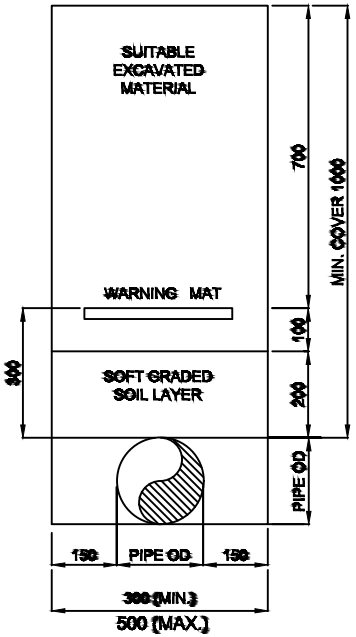
REFERENCE DRAWING

TITLE: CAUTION BOARD & TAPE ARRANGEMENT IN G.I / RISER INSTALLATION

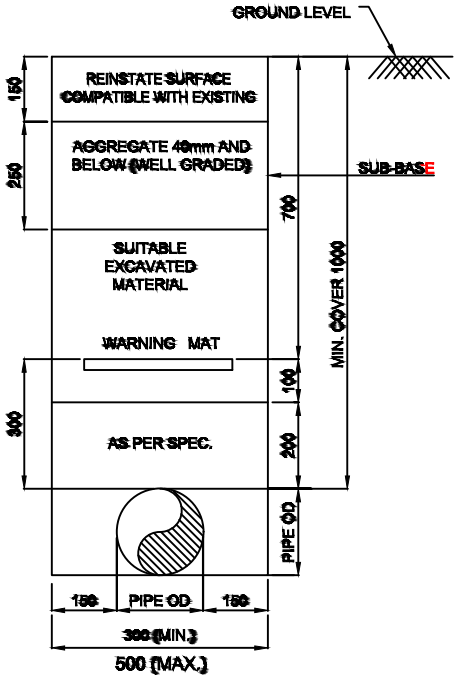
| SCALE: | NTS | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-006 | 0 |




TRENCH IN ROCKY STRATA
TYPICAL SECTION




TRENCH IN NORMAL SOIL
TYPICAL SECTION




TRENCH RESTORATION DETAIL
TYPICAL SECTION

NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.
3. FOR ALL PIPELINE TO BE CONSTRUCTED IN THE LAND UNDER JURISDICTION OF GOVT. OF INDIA, THE MIN COVER TO BE ADOPTED SHALL BE 1000MM IN ACCORDANCE WITH GOVT. OF INDIA PETROLEUM PIPELINE (ACQUISITION OF RIGHT OF USER IN LAND) ACT NO. 50, 1962 AND AMENDMENT ACT NO. 13 OF 1963. ANY EXTRA COVER REQUIREMENT SHALL BE IN ACCORDANCE WITH SPECIFICATIONS.
4. MIN. COVER REQUIREMENT SHALL BE SUBJECT TO APPROVAL OF CONCERNED AUTHORITIES WHEREVER REQUIRED.
5. EXTRA COVER REQUIREMENT SHALL BE ESTABLISHED AT ALL OVER BE NDB AND HORIZONTAL BE NDB WHEREVER NECESSARY.
6. FOR MINIMUM COVER REQUIREMENT AT PIPELINE CROSSING ROADS, RAILWAY TRACKS, RIVER MARSHY AREAS, ETC., REFER RELEVANT STANDARDS.

REFERENCE DRAWING

TITLE:
TYPICAL TRENCH DIMENSIONS FOR PIPELINE

| SCALE: | NTS | TOTAL NO. OF SHTS: | 1 OF 1 |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-007 | 0 |

**NOTES:-**

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE THE DRAWING.

REFERENCE DRAWING

TITLE:

PLATE MARKER

| SCALE: NTS | TOTAL NO. OF SHEETS: | 1 OF 1 | |
|---|---|---|---|
| SIZE | JOB NO. | DRAWING NUMBER | REV. |
| A3 | ----- | IOC-STD-CGD-008 | 1 |

FORMAT NO: C211050-FMT-005_00

**Schedule of Rates for MDPE Pipeline laying, DMA, Last Mile Connectivity Works & Associated Works**

| Sl. No. | Item Description | Quantity | Units | Proposed SOR Rates (Excl. GST) |
|---|---|---|---|---|
| | | | | |
| **10** | **PE PIPELINE WORK** | | | |
| 10 | Laying of MDPE Pipeline of PE100 grade with SDR 11 by any methodology **(open cut trenching/trenchless/manual or mechanical boring/moling/HDD)** in all kind of soil (soft/hard/rock) including hard rock with all kind of surface (normal/built-up/CC) as mentioned in SOR item. Raking up of built-up surface for the entry and exit pit in case of laying by moling/HDD or open trenching in case line is laid by open cut method is covered under the scope of this item. **Procurement and Installation of PE Fittings, Transition Fittings, Warning Mats and any other items required for execution of work shall also be in Contractor's scope.** Preparation of detailed route plan, **making trial pits to determine the underground utilities/ services etc. Liasioning** shall be carried out by the contractor to complete the project in totality.<br><br>Restoration of the all excavation / trial pits as per satisfaction to Engineer- Incharge (EIC) to original condition, barricading the work area as per the procedures & drawings provided in the tender and as per the directions of EIC. Dewatering of trenches / pits if required as per site condition. Repairing of all damaged utilities if any, and payment of any compensation (if claimed by owner / other utility agencies). Trenching to the required depth in all type of surface/soil, providing additional protection like CC slab etc. as per PNGRB guideline where sufficient depth can not be attained, uncoiling / stringing of PE pipes, jointing of the PE pipe ends / fittings / valves by qualified personnel, using approved electro fusion techniques as per the specification. No Separate rate is payable for excavation in any kind of strata including rock.<br><br>All fittings whatsoever required to complete the work is in contractor's scope." Receiving, handling, loading, transportation and unloading of owner supplied PE pipes or any other free issue material from Owner's designated stock yards to Contractor's own stock-yards / work-sites. Proper storing, stacking, identification, providing security and insurance cover for the materials.<br><br>Survey of designated area & submission of plan for laying of Medium pressure/Low pressure network/service lines for societies / colonies/ localities shall be done by the contractor. However the MDPE pipe is to be laid on best probable route after discussion with EIC. **All the Proposed route/kmz file of medium pressure main pipeline (180/125/90/63) and Low pressure network/service lines 32/20mm dia pipeline**, as per site condition shall be discussed and finalised with IOCL/consultant for execution. Further, the scope of contractor also includes preparation of plan/kmz, for any change in route due to site condition for mainline (180/125/90/63) etc. Intimation to all other utility agencies through owner/ CBuD app as per the directives of EIC. | | | |
| | Preparation and getting approval of schedules, execution procedures, drawings / sketches. Finalizing optimum route with consent of EIC. Uncoiling / stringing, laying and aligning of MDPE pipes in trench, clamping, jointing of the pipe ends / fittings / valves by qualified personnel using approved electro-fusion techniques as per specification. Achieving the desired top cover of MDPE pipeline Laying using any method with or without casing, survey of the under ground utilities, submission of site plans/layout drawings and HDD profiles for approval by EIC, execution of the work as per the specification, including excavation of the pits, moling with hole size not exceeding 20% of the pipe dia.<br>Jointing and insertion of the carrier pipe in casing pipe (on case to case basis) and subsequent backfilling, compaction & restoration. Item also includes dewatering from the trench before laying of the pipes if required. The laying shall be carried out by any methodology as per specification and site requirement as decided by Engineer-in-Charge (EIC). Lowering the PE pipe line in trench to required depth, padding around pipeline with suitable soil including supply of foreign soil/sand required in rocky area or any hard strata, supply & laying of PE warning mat over the pipeline along the complete route and backfilling with available excavated material, if suitable, after screening or procurement of suitable sand / soil as per directions of EIC.<br>Compaction with manual technique / jumping jack compactor and water at subsequent layers of 150mm, placement of all tiles / slabs / kerb stones etc. removed during excavation. Roads, pavements, footpaths etc. shall be made motorable wherever pipeline is laid and shall be restored to original condition to the satisfaction of respective authority & EIC. Restoration Charges for all tiles / slabs / Kerb stones / Cement Concrete Road / Paver/ Brick soiling/ Asphalt road/ any type of tar road/ Red Sand Stone/ Channels etc. will be paid over and above with the separate SOR item rate Procurement & installation of Transition fitting, GI end plug at TF for domestic connections/ commercial and industrial installations as per Instruction of Owner/Owner's representative for satisfactory completion of job and Covering with lean concrete (1:3:6) with 20 mm down aggregate, wherever LMC is not to be provided immediately.<br>Supply & Installation of Transition fitting of any required size for PNG Connection/SR/Domestic/Commercial/Industrial connection is included in the PE laying rate. No separate payment shall be made for supply & installation of TF. Excavation, breaking through any obstructions, insertion of pipe, sealing the annulus, firm fixing of the sleeves with concrete mix, preparation of concrete pedestal & restoration of excavated pits within the size of pedestal & the same pit with the laying of pipe as defined in technical specification / instruction of EIC. Concrete Pedestal construction with supply of GI sleeve is included in the contractor's scope and no separate payment shall be made.<br>GIS data collection: The scope includes Capturing GIS data of PE network along with all PE valves and fittings and sharing data in format prescribed by EIC/IOCL. The specification of the device to be used for GIS data capturing is part the technical volume. GIS data to be collected prior to backfilling of trenches to locate & depict the as laid underground pipelines on GIS portal. Payment for GIS data collection shall be paid separately under relevant SOR. Cleaning the area of all unserviceable materials, debris, excess earth near trenches to the designated disposal area as per specifications, instructions of land owners / EIC to the complete satisfaction of local authorities. Supply & Installation of Pipeline Markers as per relevant SOR. | | | |
| 20 | **Flushing, cleaning, pneumatic testing, purging with nitrogen and commissioning as per scope of work**, specification and approved procedures providing all tools and tackles, nitrogen, instruments, manpower and other related accessories and as per instructions of the EIC/ SIC. Maintaining the completed pipelines/ installation for any defect, failures during defect liability period. Preparation and submission of as-built drawings, crossings details, termination, utility graphs and deviation statements. Submission of all documents required for contract closure in numbers as mentioned in contract. Handing over the completed works to owner for their operation/ use, returning of all surplus material to owner stores, reconciliation of free issue material area wise and obtaining no objection certificate. Submission of as-graphs and as-built drawings as per the attached specification and the instruction of EIC/ Owner. Final clean-up of right-of-use or area disturbed by contractor during their construction activities for laying of pipeline works and disposal of debris and surplus material to designated disposal areas and backfilling of trench and compaction of the same as per satisfaction of Owner and / or as directed by EIC.<br>Preparation, Certification and submission of (DPR) daily progress reports, graphs, As-built drawings, crossings details, utility graphs and deviation statements. Any other activities not mentioned / covered explicitly above, but otherwise required for satisfactory completion / operation / safety / statutory / maintenance of the works shall also be covered under the scope of work and has to be completed by the Contractor within specified schedule. The list of areas where the pipeline to be laid/ allocation of work will be done after awarding of the tender.<br>**The quantities are tentative and it may be changed during the tenure of contract as per the requirement of the Owner.** In case more than 1 MDPE pipelines are laid in a common trench/bundle pulling, SOR rate of higher dia shall be paid as per relevant SOR. Payment for lower dia pipeline which is laid in common shall be made under item of common laying. No Separate payment shall be made for any additional excavation including rocky strata if required for maintaining sufficient gap between two PE pipelines. PE line should preferably be laid by open cut/moling methodology so that connection can be done easily as and when required. HDD method is allowed only after consent from Engineer In-charge (EIC) for any specific location/stretch for laying of PE line. **Shallow depth to be preferred for HDD. Project area means areas where Low Pressure PE network (63/32mm) is not laid previously as decided by EIC.O&M area means areas where Low Pressure PE network (63/32mm) PE network is already laid & backfilled or commissioned previously provided line is not laid under same work order as decided by EIC .** | | | |
| **30** | **PE Pipe line laying without casing in all kinds of surfaces & All kinds of Soil/Strata including hard rock using any laying methodology "Payment for cutting of Built-up (PCC/RCC/Asphalt) surfaces shall be made separately under relevant SOR wherever applicable. Paver block shall not be considered as built-up road and dismantling of paver blocks is included in this item.This item includes laying in hard rock. No separate payment shall be made for rock excavation under any SOR item. If required, Supply of Foreign sand/soil for 150mm thick padding all around pipeline is included under scope.** | | | |

| Sl. No. | Item Description | Quantity | Units | Proposed SOR Rates (Excl. GST) |
|---|---|---|---|---|
| 40 | **Laying In Project Area : Laying of 20 mm dia (Service Line) PE Pipeline up to TF** | **1.00** | **M** | **300.23** |
| 50 | **Laying in O&M Area : Laying of 20 mm dia (Service Line) PE Pipeline up to TF** | **1.00** | **M** | **330.26** |
| 60 | **Laying of MDPE Service Line (Tap-off point to TF) in O&M areas- For pipe length up to 8 M:**<br><br>**MDPE Service Line laying O&M areas including testing and commissioning for pipe length up to 8 meters: Includes laying of pipeline (for 20mm)** in all type of surface i.e. Kutcha, metal, concrete (PCC/RCC), bituminous, tiled, brick lined etc. after racking up of hard surface of any type by any methodology. Roads, pavements, footpaths and access ways shall be restored to a safe and motorable condition immediately after completion of laying activities. **The rate includes cutting in all strata including hard rock, CC surface & rock excavation. No separate payment shall be made under any other SOR.**<br><br>**Supply & installation of GI Sleeve / Half Round Concrete Sleeve/ HDPE Crash Guards shall be included in the laying rates. All other activities mentioned in the tender shall be applicable. Supply & installation of GI Sleeves (2.5" NB × 300 mm length) and Half Round Concrete Sleeves** for domestic connections, breaking through any obstructions, insertion of pipe, sealing of the annulus, fixing of the sleeves with concrete mix, preparation of pedestal, and restoration of excavated pits within the size of the pedestal and the same pit associated with the laying of 20 mm PE pipeline, as defined in the technical specification and as per the instructions of the EIC, shall be included in this SOR rate. GI end plug at TF for domestic connections to be installed and covered with lean concrete (1:3:6) with 20 mm down aggregate, wherever LMC is not to be provided immediately.<br><br>The rates shall include all costs associated with coordination and liaisoning activities with statutory bodies. **For service lines exceeding 8 m in length, payment for the length beyond the initial 8 m shall be made under the relevant per-meter SOR item.**<br><br>**The scope includes providing and laying reinforced cement concrete of 1:1.5:3 mixing ratio (Concrete shall be design mix/nominal mix) with 20mm & down size graded crushed stone aggregates in non-suspended slabs/pavement slabs including pedestal/ramp etc.**, laying in alternate panels to required slopes, all necessary form work and finishing the top surface rough/smooth as required in any position, shape, level and thickness etc. as specified and directed by EIC. The rate includes grouting of pockets, supply of material, tools, shuttering, Reinforcement etc.. Additional rate for construction of RCC structure for protection of service line shall be payable under different SOR. **PCC/RCC breaking up to 250 mm depth shall be included in this item rate. Breaking above 250 mm shall be payable under respective relevant SOR item.** | **1.00** | **EA** | **3858.67** |
| 80 | **PE Pipe line laying without casing in all kinds of surfaces & All kinds of Soil/Strata except hard rock strata using any laying methodology. Payment for cutting of Built-up (PCC/RCC/Asphalt) surfaces shall be made separately under relevant SOR wherever applicable . If required, Supply of Foreign sand/soil for 150mm thick padding all around pipeline is included under scope. Paver block shall not be considered as built-up road and dismantling of paver blocks is included in this item.** | | | |
| 90 | Laying of 32 mm dia pipe (Laying of 32mm shall accompany offline service line/GC with 20mm to the customers en route).<br>Note: Flushing, Testing, commissioning of 32mm and 20mm shall be done together. | 1.00 | M | **471.48** |
| | **PE Pipeline laying with HDPE casing in all type of soil/surface (normal/hard/CC/Built-up etc.) & Strata including hard rock using any laying methodology except HDD. This item is applicable where rock breaker/blasting is used for excavation and diamond cutter and other rock drilling tools are used for HDD with approval of EIC. MDPE pipeline laying by any method with supply & installation of HDPE casing pipe of PE 100 PN 6/ GI casing pipe of heavy class as per specification in all kind of laying like Nala crossing, as per the sco pe of work, standard procedure, specifications & PNGRB T4S, including excavation of the pits, jointing and insertion of carrier pipe , subsequent backfilling, compaction, end sealing etc. The payment shall be made for length of casing pipe laid, remaining carrier p ipe length without casing shall be paid under SOR relevant to laying without casing pipe. No separate payment shall be made for exca vation including rocky strata under any SOR item. If required, Supply of Foreign sand/soil for 150mm thick padding all around pipeli ne is included under scope. No separate payment shall be made for rock excavation & cutting of built-up (PCC/RCC/Asphalt) surfaces under any relevant SOR.** | | | |
| 100 | Laying of 63 mm Dia pipeline (in 125mm dia HDPE casing pipe) in all areas | 1.00 | M | **794.52** |
| 110 | **PE Pipe line laying without casing in all kinds of surfaces including built-up & Hard Rock Strata using any laying methodology. This item is applicable where rock breaker/blasting is used for excavation and diamond cutter and other rock drilling tools are used for HDD with approval of EIC. Supply of Foreign sand/soil for 150mm thick padding all around pipeline is included under scope. No separate payment shall be made for rock excavation & cutting of Built-up (PCC/RCC/Asphalt) surfaces under any relevant SOR.** | | | |
| 120 | Laying of 32 mm dia PE Pipeline in all areas | 1.00 | M | **343.44** |
| 130 | **PE Pipeline laying with HDPE casing in all type of soil/surface (normal/hard/CC/Built-up etc.) & Strata including hard rock using any laying methodology. This item is applicable where rock breaker/blasting is used for excavation and diamond cutter and other rock drilling tools are used for HDD with approval of EIC. MDPE pipeline laying by any method with supply & installation of HDPE casing pipe of PE 100 PN 6/ GI casing pipe of heavy class as per specification in all kind of laying like Nala crossing, as per the sco pe of work, standard procedure, specifications & PNGRB T4S, including excavation of the pits, jointing and insertion of carrier pipe , subsequent backfilling, compaction, end sealing etc. The payment shall be made for length of casing pipe laid, remaining carrier p ipe length without casing shall be paid under SOR relevant to laying without casing pipe. No separate payment shall be made for exca vation including rocky strata under any SOR item. If required, Supply of Foreign sand/soil for 150mm thick padding all around pipeli ne is included under scope. No separate payment shall be made for rock excavation & cutting of built-up (PCC/RCC/Asphalt) surfaces under any relevant SOR.** | | | |
| 140 | Laying of 20mm/32 mm Dia pipeline (in 63 mm dia HDPE casing pipe /3" GI casing pipe of heavy class) in project areas | 1.00 | M | **383.18** |
| 150 | Laying of 20mm/32 mm Dia pipeline (in 63 mm dia HDPE casing pipe /3" GI casing pipe of heavy class) in O&M areas | 1.00 | M | **421.49** |
| 160 | **PE Pipe line laying in all kinds of surfaces & All kinds of Soil/Strata except hard rock strata. Payment for cutting of Built-up (PCC/RCC/Asphalt) surfaces shall be made separately under relevant SOR wherever applicable. If required, Supply of Foreign sand/soil for 150mm thick padding all around pipeline is included under scope. Paver block shall not be considered as built-up road and dismantling of paver blocks is included in this item.** | | | |
| 170 | Laying of 63 mm dia pipeline by open trench method in all areas | 1.00 | M | **154.73** |
| 180 | Laying of 63 mm dia pipeline by moling/boring method in all areas | 1.00 | M | **163.73** |
| 190 | Laying of 90 mm dia pipeline by open trench method in all areas | 1.00 | M | **232.57** |
| 200 | Laying of 90 mm dia pipeline by moling/boring method in all areas | 1.00 | M | **273.65** |

| Sl. No. | Item Description | Quantity | Units | Proposed SOR Rates (Excl. GST) |
|---|---|---|---|---|
| 210 | Laying of 125 mm dia pipeline by open trench method in all areas | 1.00 | M | 250.75 |
| 220 | Laying of 125 mm dia pipeline by moling/boring method in all areas | 1.00 | M | 297.00 |
| 230 | Laying of 180 mm dia pipeline by open trench method in all areas | 1.00 | M | 361.08 |
| 240 | Laying of 180 mm dia pipeline by moling/boring method in all areas | 1.00 | M | 427.67 |
| 250 | **PE Pipe line laying in all type of Surface (normal/hard/CC/Built-up etc.) & Hard Rock Strata. This item is applicable for stretches where rock breaker/blasting is used for excavation with approval of EIC. Supply of Foreign sand/soil for 150mm thick padding all around pipeline is included under scope. No separate payment shall be made for rock excavation & cutting of built-up (PCC/RCC/Asphalt ) surfaces under any relevant SOR.<br>Payment shall be applicable only for the length where Rock excavation using breaker/ blasting is executed and rest shall be paid under laying in normal strata.** | | | |
| 260 | Laying of 63 mm dia by open trench method in all areas | 1.00 | M | 351.54 |
| 270 | Laying of 90 mm dia by open trench method in all areas | 1.00 | M | 478.35 |
| 280 | Laying of 125 mm dia by open trench method in all areas | 1.00 | M | 522.35 |
| 290 | Laying of 180 mm dia by open trench method in all areas | 1.00 | M | 752.16 |
| 300 | **PE Pipeline laying by HDD Method, without casing in all kinds of soil/surface (normal/hard/CC/Built-up etc.) & Strata excluding Hard rocky strata.<br>MDPE pipeline laying by HDD method without casing pipe in all kinds of surfaces, terrain & soil condition including survey of the underground utilities, intimation to all other utility agencies through owner/ CBuD app, submission of HDD profile for approval, execution of the work as per the scope of work, standard procedure, specifications & PNGRB T4S, including excavation of the pits, jointing and insertion of carrier pipe, subsequent backfilling, compaction, submission of as-built drawings/ graphs as per specification and the instructions of EIC/ SIC of owner. The all other activities required to complete the work in all respect shal l be scope of the Contractor within the quoted rates. No separate payment shall be made for cutting of built-up surface. If required , Supply of Foreign sand/soil for 150mm thick padding all around pipeline is included under scope.** | | | |
| 310 | Laying of 63 mm dia by HDD in all areas except hard rock | 1.00 | M | 145.73 |
| 320 | Laying of 90 mm dia by HDD in all areas except hard rock | 1.00 | M | 352.41 |
| 330 | Laying of 125 mm dia by HDD in all areas except hard rock | 1.00 | M | 513.19 |
| 340 | Laying of 180 mm dia by HDD in all areas except hard rock | 1.00 | M | 738.99 |
| 350 | **PE Pipeline laying by HDD Method, without casing in all kinds of soil/surface (normal/hard/CC/Built-up etc.) & Hard rocky strata. This item is applicable where rock breaker/ blasting is used for excavation and diamond cutter and other rock drilling tools are us ed for HDD with approval of EIC. Record for use of rock cutting tools to be created and maintained for each section/HDD. MDPE pipeli ne laying by HDD method without casing pipe in all kinds of surfaces, terrain & soil condition including survey of the underground utilities, intimation to all other utility agencies through owner/ CBuD app, submission of HDD profile for approval, execution of th e work as per the scope of work, standard procedure, specifications & PNGRB T4S, including excavation of the pits, jointing and inse rtion of carrier pipe, subsequent backfilling, compaction, submission of as-built drawings/ graphs as per specification and the inst ructions of EIC/ SIC of owner. The all other activities required to complete the work in all respect shall be scope of the Contracto r within the quoted rates. No separate payment shall be made for cutting of built-up surface. If required, Supply of Foreign sand/ s oil for 150mm thick padding all around pipeline is included under scope.** | | | |
| 360 | Laying of 63 mm dia by HDD in all areas in hard rock | 1.00 | M | 546.50 |
| 370 | Laying of 90 mm dia by HDD in all areas in hard rock | 1.00 | M | 1333.58 |
| 380 | Laying of 125 mm dia by HDD in all areas in hard rock | 1.00 | M | 1915.80 |
| 390 | Laying of 180 mm dia by HDD in all areas in hard rock | 1.00 | M | 2758.79 |
| 450 | **PE Pipeline laying by HDD Method, with casing (Including supply & installation of HDPE casing pipe) in Hard rock strata. "MDPE pipeline laying by HDD method with supply & installation of HDPE casing pipe of PE 100 PN 6 as per specification in all kind of terrain & soil condition including survey of the underground utilities, intimation to all other utility agencies through owner/ CBuD app, submission of HDD profile for approval, execution of the work as per the scope of work, standard procedure, specifications & PNGRB T4S, including excavation of the pits, jointing and insertion of carrier pipe, subsequent backfilling, compaction, restoration, submission of as-built drawings/ graphs as per specification and the instructions of EIC/ SIC of owner. The all other activities required to complete the work in all respect shall be scope of the Contractor within the quoted rates. The payment shall be made for length of casing pipe laid in HDD, remaining carrier pipe length without casing shall be paid under SOR relevant to laying without casing pipe. No separate payment shall be made for rock excavation & cutting of built-up surface. If required, Supply of Foreign sand/ soil for 150mm thick padding all around pipeline is included under scope."** | | | |

| Sl. No. | Item Description | Quantity | Units | Proposed SOR Rates (Excl. GST) |
|---|---|---|---|---|
| 460 | Laying of 63 mm dia (in 125 mm HDPE casing pipe) in all areas | 1.00 | M | 1849.79 |
| 470 | Laying of 90 mm dia (in 180 mm HDPE casing pipe) in all areas | 1.00 | M | 2069.14 |
| 480 | Laying of 125 mm dia (in 200-250 mm HDPE casing pipe) in all areas | 1.00 | M | 2848.91 |
| 490 | Laying of 180 mm dia (in 300-350 mm HDPE casing pipe) in all areas | 1.00 | M | 4102.77 |
| 500 | **PE Pipeline laying in common with another PE pipeline in all type of soil/surface (normal/hard/CC/Built-up etc.) & Strata including Hard rock strata by any methodology. Laying of PE pipeline in common with another PE pipeline in same trench or same bore using any methodology in all kind of soil and surface. Payment of higher dia pipeline will be paid as per relevant SOR. For lower dia pipeline which is laid in common, payment shall be made under this SOR. No Separate payment shall be made for any additional excavation including rocky strata if required for maintaining sufficient gap between two PE pipelines. In case two same dia pipeline is laid one will be considered for common laying for which payment shall be made under this item. Testing, pre-commissioning, commissioning shall be paid under relevant SOR. No separate payment shall be made for rock excavation & cutting of built-up (PCC/RCC/Asphalt) surfaces under any relevant SOR.** | | | |
| 510 | Laying of PE pipeline in common trench/bore in all areas | 1.00 | M | 46.13 |
| 520 | **GIS data collection for PE pipeline. The scope includes Capturing GIS data of PE network along with all PE valves and fittings and sharing data in format prescribed by EIC/IOCL. The specification of the device to be used for GIS data capturing is part the technical volume. GIS data to be collected prior to backfilling of trenches to locate & depict the as laid underground pipelines on GIS portal. Any rectification/re-collection of data if required during validation is to be done by contractor at no extra cost.** | | | |
| 530 | GIS data collection for PE pipeline of any diameter | 1.00 | M | 10.71 |
| 540 | **Testing of PE Pipeline. Flushing, cleaning, pneumatic testing and pressure preservation of PE pipeline laid by any method in all areas including PE pipe Line Repairing, excavation, leakage arrest, Electrofusion jointing, supply and installation of all fittings re quired & all work to make network ready for pre-commissioning. Identification of damages by sectionalising the pipeline network, rep airing, jointing, Any excavation jointing/tie-in/looping/hook-up required is included in the scope of contractor. Submission/updation of as laid graphs/reports, as built drawings (if any) etc.** | | | |
| 550 | 20mm dia PE line | 1.00 | M | 53.57 |
| 560 | 32mm dia PE line | 1.00 | M | 66.95 |
| 570 | 63mm dia PE line | 1.00 | M | 66.95 |
| 580 | 90mm dia PE line | 1.00 | M | 80.34 |
| 590 | 125mm dia PE line | 1.00 | M | 107.13 |
| 600 | 180mm dia PE line | 1.00 | M | 116.06 |
| 610 | **Pre-Commissioning of PE Pipeline. Pre commissioning as per specification and approved procedures, providing all tools and tackles, test ends, Nitrogen, instruments, manpower and other related accessories as per the instructions of the EIC. Purging with nitrogen at positive pressure as decided by EIC and Maintaining the completed pipelines/ installation for any defect, failures till hand over. Any excavation jointing/tie-in/looping/hook-up required is included in the scope of contractor. Submission/updation of as laid gra phs/reports submission of as built drawings etc.** | | | |
| 620 | 20mm dia PE line | 1.00 | M | 4.46 |
| 630 | 32mm dia PE line | 1.00 | M | 6.70 |
| 640 | 63mm dia PE line | 1.00 | M | 8.93 |
| 650 | 90mm dia PE line | 1.00 | M | 11.16 |
| 660 | 125mm dia PE line | 1.00 | M | 13.39 |
| 670 | 180mm dia PE line | 1.00 | M | 15.62 |
| 680 | **Commissioning of PE Pipeline. Commissioning of PE pipeline laid by any method in all areas as per scope of work, specification and approved procedures providing all tools and tackles, supply of nitrogen, instruments, manpower and other related accessories and as per instructions of the EIC/ SIC. Maintaining the completed pipelines/ installation for any defect, failures till hand over. Any ex cavation jointing/tie-in/looping/hook-up required is included in the scope of contractor. Submission/updation of as laid gr aphs/re ports submission of as built drawings etc.** | | | |
| 690 | 20mm dia PE line | 1.00 | M | 6.70 |
| 700 | 32mm dia PE line | 1.00 | M | 11.16 |
| 710 | 63mm dia PE line | 1.00 | M | 22.32 |
| 720 | 90mm dia PE line | 1.00 | M | 26.78 |
| 730 | 125mm dia PE line | 1.00 | M | 31.25 |
| 740 | 180mm dia PE line | 1.00 | M | 40.18 |

| Sl. No. | Item Description | Quantity | Units | Proposed SOR Rates (Excl. GST) |
|---|---|---|---|---|
| 750 | **Testing of already laid PE Pipeline. "This is for the line which is laid previously by other contractor. Flushing, cleaning, pneuma tic testing and pressure preservation of PE pipeline laid by any method in all areas including identification of pending tie-ins/joi nts, excavation, Electrofusion jointing, supply and installation of all fittings required & all work to make network ready for pre-c ommissioning. Any excavation jointing/tie-in/looping/hook-up required is included in the scope of contractor. Laying of any pup-pie ce for jointing of up to 2m length for is included in the scope of this item for which no extra payment shall be made. If more than 2m PE pipeline laying is required for jointing the laid network, it will be considered as fresh laying and accordingly payment for l aying shall be made under relevant SOR item for length over and above 2m. PE Pipe required shall be issued by Owner as free issue ma terial. Identification of damages by sectionalising the pipeline network and air filling or by any method as required. Repair work r equired at each identified damaged location shall be paid separately under relevant SOR item. Scope includes Submission/updation of as laid graphs/reports, as built drawings (if any) etc. "** | | | |
| 760 | 20mm dia PE line | 1.00 | M | **58.92** |
| 770 | 32mm dia PE line | 1.00 | M | **73.65** |
| 780 | 63mm dia PE line | 1.00 | M | **73.65** |
| 790 | 90mm dia PE line | 1.00 | M | **88.38** |
| 800 | 125mm dia PE line | 1.00 | M | **117.84** |
| 810 | 180mm dia PE line | 1.00 | M | **127.65** |
| 820 | **Pre-Commissioning & Commissioning of already laid PE Pipeline. This is for the line which is laid previously by other contractor. Making the tested network ready for commissioning, Purging with nitrogen at positive pressure as decided by EIC and commissioning of PE pipeline laid by any method in all areas as per scope of work, specification and approved procedures providing all tools and tac kles, supply of nitrogen, instruments, manpower and other related accessories and as per instructions of the EIC/ SIC. Maintaining the completed pipelines/ installation for any defect, failures till hand over. Any excavation jointing/tie-in/looping/hook-up requir ed is included in the scope of contractor. Submission/updation of as laid graphs/reports submission of as built drawings etc.** | | | |
| 830 | 20mm dia PE line | 1.00 | M | **11.16** |
| 840 | 32mm dia PE line | 1.00 | M | **17.86** |
| 850 | 63mm dia PE line | 1.00 | M | **31.25** |
| 860 | 90mm dia PE line | 1.00 | M | **37.94** |
| 870 | 125mm dia PE line | 1.00 | M | **44.64** |
| 880 | 180mm dia PE line | 1.00 | M | **55.79** |
| 890 | **HSE Compliance - PE Work Charges for compliance to Health, Safety & Environment (HSE) as detailed in Scope of Work. MDPE Section -PPE, Continuous Barricades along the trenches as per approved drawing in tender, Use of Safety Boots, Hand gloves, Reflective jacke ts, Hard hats(helmets), Safety shoes, eye and ear safety equipments, Fire extinguishers, warning display board and as per the detail ed scope of work in tender specifications and as per the direction of EIC.** | | | |
| 900 | Providing hard barricading with all HSE compliance for PE Pipeline | 1.00 | M | **10.71** |
| 910 | Providing Safety Cone & Chain barricading with all HSE compliance for PE Pipeline | 1.00 | M | **7.15** |
| 920 | **Supply & Installation of GI/ MS/ Concrete Sleeves/HDPE Crash Guard (wherever required as a Special Case as per instructions of the E ngineer-in-charge) "Supply, installation of sleeve, insertion of pipe, sealing the annuals, firm fixing of Sleeves with concrete m ix. Breaking through any obstructions and their subsequent restoration, as per specifications and instructions of the Engineer-in-ch arge. GI/MS Pipes shall be Heavy (C-Class) as per IS-1239. The decision regarding use of type of sleeves to be used at various locat ions shall be made by Engineer In Charge/ Owner."** | | | |
| 930 | GI Sleeves /Concrete Sleeves | | | |
| 940 | 2 1/2" NB, 1' Length | 1.00 | EA | **20.57** |
| 950 | 4" NB, 1' Length | 1.00 | EA | **35.80** |
| 960 | MS Enamel Coated | | | |
| 970 | 4" NB, 3' Length | 1.00 | EA | **82.47** |
| 980 | Concrete Sleeve (NP-2 Class) | | | |
| 990 | 4" NB, 3' Length | 1.00 | EA | **20.74** |
| 1000 | 6" NB, 3' Length | 1.00 | EA | **32.92** |

| Sl. No. | Item Description | Quantity | Units | Proposed SOR Rates (Excl. GST) |
|---|---|---|---|---|
| 1010 | **Restoration Work Restoration of excavated pits, trench, surface with required thickness as per original condition. Restoration of t he roads, pavements, channels, footpaths, tiles, stones etc. to original condition including supply of the approved quality material required to complete the activities mentioned above as per local authorities norms, obtaining NOC from concerned local authorities / land owners / third party inspection agencies (if any) designated by owner and to? the satisfaction of Engineer-in-charge. Aspha lt road: Restoration of bitumen Asphalt road after laying of MDPE pipe line as per the drawing and to the original conditions, speci fications and instruction of Engineer-In-Charge. Restoration of roads shall be done to the satisfaction of local authorities and to get NOC from the concerned authorities. Restoration of the all kind of pathway by using excavated material such as tiles/pavers/gra nite/red stone etc by providing PCC pf required thickness and making it as original as per the drawings and to the original conditio ns Item includes providing of extra material such as Tiles/Paver/Granite etc matching to original pathways. Concrete road/ Concrete pavement: Restoration of concrete road and pavements shall be done by providing PCC 1:4:8 of specified thickness as per the drawing and to the original condition. The cost of all materials, labours, Shuttering, compacting the base surface etc. are in the scope of this item.** | | | |
| 1020 | Asphalt Road/ any type of tar road | 1.00 | M | **715.60** |
| 1030 | Cement Concrete Road | 1.00 | M | **832.37** |
| 1040 | Tiles / Paver / Blocks / Kerb Stones, Red Sand Stone | 1.00 | M | **297.49** |
| 1050 | Brick Soling / Channels, etc. | 1.00 | M | **213.70** |
| 1060 | **Installation of valve in pit including supply of PE valves. Supply of isolation valves (as per data sheet) and installation of valv es in the valve pits as per typical drawing and specification enclosed and instructions of Engineer-in-charge. Payment of civil cons truction of valve Pits shall be paid separately as per relevant SOR.** | | | |
| 1070 | PE Valve 63 mm dia - Standard type (non extended) | 1.00 | EA | **9749.75** |
| 1080 | PE Valve 90 mm dia - Standard type (non extended) | 1.00 | EA | **14693.99** |
| 1090 | PE Valve 125mm dia - Standard type (non extended) | 1.00 | EA | **19791.64** |
| 1100 | PE Valve 180mm dia - Standard type (non extended) | 1.00 | EA | **28499.96** |
| 1110 | PE Valve 63 mm dia - Extended Stem with Purging Point (2PS) | 1.00 | EA | **15435.00** |
| 1120 | PE Valve 90 mm dia - Extended Stem with Purging Point (2PS) | 1.00 | EA | **18495.00** |
| 1130 | PE Valve 125mm dia - Extended Stem with Purging Point (2PS) | 1.00 | EA | **22770.00** |
| 1140 | PE Valve 180mm dia - Extended Stem with Purging Point (2PS) | 1.00 | EA | **90000.00** |
| 1150 | PE Valve 63 mm dia - Extended Stem without Purging Point | 1.00 | EA | **12690.00** |
| 1160 | PE Valve 90 mm dia - Extended Stem without Purging Point | 1.00 | EA | **14490.00** |
| 1170 | PE Valve 125mm dia - Extended Stem without Purging Point | 1.00 | EA | **17091.00** |
| 1180 | PE Valve 180mm dia - Extended Stem without Purging Point | 1.00 | EA | **78750.00** |
| 1190 | **Construction of RCC Valve Pits. Construction of Valve Pits as per the enclosed tender drawing and specification. The item includes supply of all the material including Pre-cast RCC cover, shuttering, reinforcement, labour, curing etc as per the drgs, specificatio n and instruction of EIC. Note: The tender drawing enclosed is only for reference purpose and contractor shall be required to prepa re drawings (in line with reference tender drawing) for specific sizes of Valve pits and the same shall be approved by EIC.** | | | |
| 1200 | Type-I having Internal size of approximately Rs. 1000 x 1000mm | 1.00 | EA | **17988.75** |
| 1210 | Type-II having Internal size of approximately 600 x 600mm | 1.00 | EA | **16791.61** |
| 1220 | Type-III having Internal size of approximately 1500mm x 1500mm | 1.00 | EA | **24340.67** |
| 1230 | **Fabrication & Installation of Pipeline Markers: Procurement and Installation of Route Markers / Pole Markers / Plate Markers as per the attached drawings, along the route / along boundary wall, lamp posts including all associated civil works such as excavation an d construction in all types of soils, construction of pedestals and grouting with concrete, cleaning, procurement and application of approved colour and quality of primer and paint, stencil letter cutting of numbers, direction, chainage etc., restoration of area t o original condition and performing all works as per drawings, specification and instruction of Engineer-in-Charge.** | | | |
| 1240 | RCC Route Markers | 1.00 | EA | **697.90** |
| 1250 | Pole markers with foundation | 1.00 | EA | **2883.53** |
| 1260 | Plate markers | 1.00 | EA | **370.60** |
| 1270 | **MDPE Repair Activity** | | | |
| 1280 | Rectification of MDPE pipeline of any diameter up to 63 mm dia, including excavation of pits, leakage arrest, cutting/jointing, supply and installation of all required MDPE fittings, and complete restoration. MDPE pipe material shall be issued as free issue material by the Owner.<br><br>Note: The payment shall be made per pit (in numbers) where the fitting is installed. For excavation, backfilling, and restoration of trial pits (where fittings are not installed), payments shall be made separately under the relevant items of Civil SOR. For hiring of Compressor for testing/flushing/retesting/etc., the payment shall be made as per the relevent item of SOR. | 1.00 | EA | **5134.00** |
| 1290 | Rectification of MDPE pipeline of any diameter above 63 mm dia, including excavation of pits, leakage arrest, cutting/jointing, supply and installation of all required MDPE fittings, and complete restoration. MDPE pipe material shall be issued as free issue material by the Owner.<br><br>Note: The payment shall be made per pit (in numbers) where the fitting is installed. For excavation, backfilling, and restoration of trial pits (where fittings are not installed), payments shall be made separately under the relevant items of Civil SOR. For hiring of Compressor for testing/ flushing/ retesting, etc., the payment shall be made as per the relevent item of SOR. | 1.00 | EA | **5827.00** |
| 1300 | Hiring of Compressor<br><br>Hiring of compressor, including all operational costs, compressor technician/operator, manpower, fuel, lubricants, maintenance, tools and tackles, and all associated charges. The compressor shall be used for flushing, testing, and retesting of the MDPE network, as directed by the Engineer-in-Charge (EIC). | 1.00 | Hours | **721.00** |

| Sl. No. | Item Description | Quantity | Units | Proposed SOR Rates (Excl. GST) |
|---|---|---|---|---|
| | Note : 1. Applicability of "MDPE Repair Activity" item including sub-items shall be strictly payable only for existing/damaged pipelines which is handed over (commissioned/not-commissioned) to IOCL and as per the instructions of EIC. It shall not be applicable for new laying under the same or any other contract.<br>2. Any damages caused during repair shall be rectified by the Contractor at his own cost. | | | |
| 1310 | **Civil Works** | | | |
| 1320 | **Cutting of built-up surfaces - PCC / RCC Road/asphalt multi-layer Road** | | | |
| 1330 | Cutting of built-up surfaces - PCC / RCC Road/asphalt multi-layer Road (along length of pipeline) of any width and excavation for laying of PE line in built-up surface as per direction of EIC. These rates are not applicable on HDD method and laying in hard rock strata. Paver block shall not be considered as built-up surface and no payment shall be made under this SOR for dismantling paver blocks. (For PCC/ RCC thickness upto 10 inch no separate payment shall be made). | 1.00 | M | **161.41** |
| 1340 | Demolishing PCC/ RCC for thickness exceeding 10 inches by manual or mechanical means,including stacking of steel reinforcement bars and disposal of unserviceable material within a lead of 50 metres, as per the directions of the Engineer-in-Charge (EIC).<br><br>Notes:<br>1) Dismantling shall be carried out during day shift only, and prior permission for the same shall be obtained.<br>2) Necessary covers, barricades, and safety arrangements around the work area shall be provided prior to commencement of dismantling operations. | 1.00 | CUM | **2780.62** |
| 1350 | Earth work in excavation in all kinds of soil by mechanical means (Hydraulic excavator)/ manual means including dressing of sides and ramming of bottoms including getting out the excavated soil and disposal of surplus excavated soil, all works up to any lead and lift, as directed by the Engineer-in-Charge: | 1.00 | CUM | **188.00** |
| 1360 | Construction of RCC structure for protection of service line (20/32 mm dia. ) for drain/nallah (adjecent to house / Boundry walls / Multistory Buildings) crossing<br><br>The scope includes providing and laying reinforced cement concrete in the ratio of 1:1.5:3, using 20 mm and down-size graded crushed stone aggregates, in non-suspended slabs/pavement slabs, including pedestals/ramps, etc., laid in alternate panels to the required slopes, with all necessary formwork and finishing of the top surface as rough/smooth, as required, in any position, shape, level, and thickness. The rate includes grouting of pockets, supply of materials, tools, shuttering, reinforcement, etc. | 1.00 | EA | **2159.63** |
| 1370 | **Providing extra protection for service lines where proper depth cannot be obtained. "The buried service lines shall be provided with a minimum cover of 1.0 m. Where it is impractical to provide 1.0 m cover due to physical constraints, additional protective measures such as concrete slabs shall be installed at least 300 mm above the service line. In no case the depth of cover shall be less th an 600mm. The depth of cover can be further reduced up to 375 mm provided it meets the following requirements: i. The line pressure shall not exceed 110 mbar. ii. The diameter of pipe shall not exceed 63mm. All records of such cases of lesser cover shall be prepar ed & maintained separately."** | | | |
| 1380 | Supply & Installation of RCC slab of minimum 150mm thick and 300mm width for protection of pipeline. There shall be sand filling ac ross three sides of the line pipe of 100mm each shall be required to be taken by contractor in consultation with EIC as per latest P NGRB Guidelines. No additional payment shall be admissible against the same. In case RCC slab protection is also required at the b ot tom of pipeline, length of same shall also be measured for payment purpose. | 1.00 | M | **502.07** |
| 1390 | Earth Filling - Supplying and filling selected earth/ moorum (excluding black cotton soil) from Contractor's own borrow areas including royalty, with all leads and lifts in low laying areas and filling to required grade and level including watering, compacting in layers not exceeding 20 cm thickness, complete in all respects inclusive of cost of all labour, materials, tools, tackles etc. a s per drawings, specifications and direction of Site Engineer. | 1.00 | CUM | **373.18** |
| 1400 | Sand Filling - Supplying and filling in plinth with sand in low lying areas,foundation, including watering, ramming, consolidating and dressing complete. | 1.00 | CUM | **1764.51** |
| 1410 | "Paver Blocks- Providing and laying 60 mm thick factory made cement concrete interlocking paver block of M-35 grade made by block m aking machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and patter n over and inc luding 50mm thick compacted bed of coarse sand, filling the joints with line sand etc. all complete as per the direction of the Engi neer-in-Charge." | 1.00 | SQM | **800.03** |
| 1420 | Reinforced Cement Concrete (1:1.5:3 with 20 mm down aggregate): Excavation in any plane & dimension including disposal of excavated earth up to any lead in all conditions, backfilling using serviceable earth and disposal of surplus and unserviceable earth. Soil to be levelled and properly compacted complete in all respect as per scope of work including brick soiling and PCC, technical specification and directions of EIC. Providing and laying REINFORCED CEMENT CONCRETE (RCC) (Concrete shall be 1:1.5:3 nominal mix) with 20mm & down size graded crushed stone aggregates in NON SUSPENDED slabs/pavement slabs including pedestals, ramps etc. leaving pockets, laying in alternate panels to required slopes, all necessary form work and finishing the top surface rough or smooth as required and directed , providing pockets/openings etc. including vibrating, tampering, curing, rendering and making smooth if required in any position, s hape, level and thickness etc. as specified and directed by EIC. The rates include grouting of pockets, procurement of material, shuttering, tools & tackles, reinforcement etc. | 1.00 | CUM | **12338.94** |
| 1430 | Plain Cement Concrete (1:2:4 with 20 mm down aggregate): Excavation in any plane & dimension including disposal of excavated earth up to any lead in all conditions, backfilling using servic eable earth and disposal of surplus and unserviceable earth. Soil to be levelled and properly compacted complete in all respect as p er scope of work, technical specification and directions of EIC. Providing and laying PLAIN CEMENT CONCRETE (PCC) (1:2:4 nominal mix) with 20mm & down size graded crushed stone aggregates in NON SUSPENDED slabs/pavement slabs inc lu ding pedestals, ramps etc. leaving pockets, laying in alternate panels to required slopes, all necessary form work and finishing the top surface rough or smooth as required and directed, providing pockets/openings etc. including vibrating, tampering, curing, r ende ring and making smooth if required in any position, shape, level and thickness etc. as specified and directed by EIC. | 1.00 | CUM | **4752.75** |
| 1440 | **Gate and Fencing** | | | |
| 1450 | Supply of erection of single leaf mild steel gate 2.5m high with mesh with anti climbing measures/spikes complete in all respect inc luding painting as per TS on all MS items, all works as per specification and drawings. | 1.00 | EA | **24802.46** |
| 1460 | Supply of all materials, fabrication and erection of chain link fencing 2.5m high with mesh up to 2m height and Concertina coil/RBT wire (@100mm c/c gap) fencing complete in all respects including painting as per TS on all MS items, all works as per specification and drawings. | 1.00 | M | **3082.86** |
| 1470 | **Installations of DRS/DCU. "Receiving, handling, loading, transportation and unloading of own er supplied DRS/DCU/Service regulator including wall mounted SR from Owner's designated stock yards to Contractor's own stock-yards/ work-sites. Proper storing, stacking, identification, providing security and insurance cover for the materials . Supply of cover box for service regulator is in the scope of contractor. Installations of DRS/DCU/Service regulator with all associated work at foundation/wall and hooking up with PE pipe line/internal piping. The scope includes installation of transition fittings and other PE and CS/GI fittings, CS/GI pipes as per requirements and various associated works (including steel welding with NDT and pressure testing, if required) to commission DRS/Service Regulator. Payment towards civil foundation works and structural works (including gate and fencing) shall be made separately under the relevant SOR item(s).<br>Supply of Transition Fittings shall be paid separately as per relevant items.** | | | |
| 1480 | DRS / DCU | 1.00 | EA | **32523.37** |
| 1490 | Wall mounted/ on ground type Service Regulator | 1.00 | EA | **10804.25** |
| 1500 | **Installations of Industrial/Commercial MRS: "Receiving, handling, loading, transportation and unloading of owner supplied Commercial/Industrial MRS including wall mounted MRS from Owner's designated stock yards to Contract or's own stock-yards/ work-sites. Scope includs Installations of IOCL supplied meter, Installation of Commercial/Industrial MRS inclusing all associated work at foundation/wall mounting and hooking up with PE pipe line/internal piping to commission the MRS. Payment towards civil foundation work & structural work for gate and fencing shall be payable as per relevant SOR items. . The payment towards any additional CS/GI piping work shall be paid separately under relevant SOR.** | | | |
| 1510 | Installation of Low Pressure MRS - G4 to G25 (Diaphragm) and providing assisstance for Commissioning | 1.00 | EA | **3285.00** |
| 1520 | Installation of Medium Pressure MRS - G10 to G65 (RPD) and providing assisstance for Commissioning | 1.00 | EA | **7408.80** |
| 1530 | Installation of Medium Pressure MRS - G100 to G650 (RPD) and providing assisstance for Commissioning | 1.00 | EA | **10750.50** |
| 1540 | **Additional piping work for MRS inlet - Supply, Erection, welding, painting, testing, purging & commissioning of CS pipes & all type of fittings/equipment and submission of As-built drawings.** | | | |

| Sl. No. | Item Description | Quantity | Units | Proposed SOR Rates (Excl. GST) |
|---|---|---|---|---|
| **1550** | **Order placement for purchasing of CS Pipes & fittings as per approved drawings, providing material TC/Calibration certificates, Scheduling, Planning of material & Forwarding inspection call, Dispatch clearance, handling, loading, transportation to site location and unloading of these at respective contractor's store. Receiving, taking over, handling, loading, transportation to site location and unloading of contractor supplied material as defined in specification from Contractor's designated stock yards to IOCL's work sites, proper storing, stacking, identification, providing security and insurance cover. Preparation and approval of sketches, schedules & execution procedures and all others necessary documentation. Finalising Piping location with optimum route in consent of customer from Meter Outlet till Customer's Appliance. Making temporary but stable platforms/ scaffolding/ rope ladders and supply of all other safety devices.**<br><br>**Drillings of holes through the walls Brick, RCC, Granite, Marble, Wood Cutting, Glass Cutting with proper heavy duty hammer drill machine, tools & tackles, using proper sealant/grout material and colours to match the original replacement of the damages during drilling, restoring the area to the original condition, Painting of entire length of pipe along with fittings after proper surface finish by one coat of approved primer paint and two coats of approved synthetic enamel paint. Restoring the wall surface to original conditions, Supply & fixing of approved MS angle clamps, Ceiling clamps & dowel plugs with screws, supply and insertion of insulation material i.e. PVC, PTFE sheet between pipe/ meter support and pipe/ meter, grout material, suitable thread sealant i.e. Teflon Tape / lock tight, Supply of different sizes 1" to 4", 150# spiral wound gasket, studs & bolts (various sizes with wire sealing arrangement wherever required), testing, purging (including supply of nitrogen) and commission of the complete installation. Including installation of all associated equipment, valves, pressure gauges, flanges, filters, strainers etc.**<br>**Supply, Erection, Welding of joints, NDT works (except radiography for which separate payment shall be made per joint under relevant SOR item if required), pressure testing, purging (including supply of nitrogen) & commissioning of CS Seamless A 106 Gr-B Pipeline. It includes supply & installation pipes, all type of fittings, nipple, bends etc. (except ball valves/Globe valves/isolation valves/pressure gauges/strainer/filter/sockolet, reducer & flanges for which separate payment shall be made as per relevant item no.), Supply Of Consumables Like Spiral Wound Gaskets (Winding ANSI 304 Graphite Centring Ring Cs), Stud Bolts (ASTM A 193 B 7, Hexagonal Nuts, ASTM A194 Gr 2H), Clamps and any other consumables is included in this item rate. Painting of entire length of piping along with fittings after proper surface finish by one coat of approved primer paint and two coats of approved synthetic enamel paint. Marking of gas flow direction on piping with paint & writing "Gas Pipeline" at Suitable intervals.** | | | |
| **1560** | 4" NB 6.4 mm wall thickness Pipeline | 1.00 | M | **2318.40** |
| **1570** | 3" NB Sch-40 Pipeline | 1.00 | M | **2249.50** |
| **1580** | 2" NB Sch-80 Pipeline | 1.00 | M | **2240.50** |
| **1590** | 1-1/2" NB Sch-80 Pipeline | 1.00 | M | **1879.47** |
| **1600** | 1" NB Sch-80 Pipeline | 1.00 | M | **1334.87** |
| **1610** | 3/4" NB Sch-80 Pipeline | 1.00 | M | **1001.17** |
| **1620** | RADIOGRAPHY OF JOINTS | | | |
| **1630** | RT of 4"NB Joints | 1.00 | EA | **628.23** |
| **1640** | RT of 3"NB Joints | 1.00 | EA | **478.71** |
| **1650** | RT of 2"NB Joints | 1.00 | EA | **530.26** |
| **1660** | RT of 1-1/2"NB Joints | 1.00 | EA | **469.42** |
| **1670** | RT of 1"NB Joints | 1.00 | EA | **396.26** |
| **1680** | RT of 3/4"NB Joints | 1.00 | EA | **297.22** |
| **1690** | "Providing assistance to IOCL to obtain permission from land/RoU owing agencies like NHAI, Indian Railways and any other government agencies who maintains the public lands. This rates are not applicable for Private lands i.e. Apartments etc. Permissions required from various authorities like NHAI / SH/PWD/Railways / Irrigation (Canal) etc. falling enroute shall be inclusive in the item rate." | 1.00 | M | **22.66** |

| Sl. No. | Item Description | Quantity | Units | Proposed SOR Rates (Excl. GST) |
|---|---|---|---|---|
| 1700 | **Ground Penetrating RADAR "Carrying out subsurface utility survey along the proposed pipeline route and/ or as specified by Engineer -In-Charge for 5 m corridor using Ground Penetrating Radar (GPR) for depth up to 5m below the existing ground level to locate and id entify all existing underground utilities/buried objects including but not limited to pipelines, sewers, conduits, cables, drains, m anholes, appurtenances etc in the proposed corridor along with location, DGPS coordinates, depth, shape and dimensional details of utilities. Four (4) Copies of Report and Drawings incorporating all collected data shall be submitted as per scope of work and direct ion of the Engineer-in-charge. Scale of Drawing shall be Planimetry (X Axis 1:1000, Y Axis 1:100), Longitudinal Section (Z Axis 1:10 0) and Transverse Section at critical location. Note: 1.Survey Agency for execution of GPR Survey Work to be engaged by the Contract or shall be submitted for approval of Owner/ Consultant prior to start of work. 2. GPR Work shall be carried in presence of Contract or Representative, EPMC & TPI."** | | | |
| 1710 | GPR Survey Length up to 1 Km including mobilisation | 1.00 | EA | **17760.96** |
| 1720 | "GPR Survey more than 1 Km Note : In case of GPR Survey Length exceeds 1 Km, payment for quantity beyond 1 Km shall be payable on pe r meter basis as per this S OR Item)" | 1.00 | M | **17.79** |
| 1730 | **Electrical Work** | **0.00** | **EA** | |
| 1740 | "Supply, Installation, testing & commissioning of Maintenance free Earthing with GI earth pipe, 3.0 mtr long, 100 mm dia including accessories and providing masonry enclosure with cover plate having locking arrangement etc, (with charcoal and salt ) as require d as per IS 3043. Supply and installation of GI earthling conductor of the following sizes:- Above ground/buried under ground" | 1.00 | EA | **9708.23** |
| 1760 | Supply & Installation of 25X 6mm GI Strip | 1.00 | M | **125.15** |
| 1770 | Supply & Installation of 2.5 sq.mm CuPVC wire | 1.00 | M | **45.48** |
| 1780 | Supply & Installation 10sq. mm Cu PVC insulated cable | 1.00 | M | **102.39** |
| 1790 | **LAST MILE CONNECTIVITY WORKS** | | | |
| 1800 | **LAST MILE CONNECTIVITY WORK** | | | |
| 1810 | **Installation of Powder Coated GI Pipes (Heavy Class)/Cu tube/Multi Layered Composite (MLC) pipes for all floor levels including high-rise along with supply & installation of GI, Cu, MLC Fittings, welded fittings, Brass fittings, Flexible Hose (Anaconda) if required ,Appliance Valve & Isolation valve, Meter, Regulator to complete the work as per the satisfaction of EIC. Note:-Powder Coated GI Pipe, Cu Pipe, Isolation Valve, Appliance Valve of 1/4"" dia, Meter & Regulators shall be free issue material. (In cases where the IV/AV is to be supplied by the vendor as per the EIC's instructions, the payment shall be made under the relevant SOR item)"** Assessment of material requirement for installation at site, Order placement for Purchasing of GI fittings, Copper fittings, Brass Fittings & Flexible Hose (Anaconda; adaptors to be used preferably, anaconda to be used only if unavoidable), 1/2" femaleX3/4" (or any size as required) male GI bush for GI to regulator & regulator to meter connection, 1/2" male X 3/4" (or any size as required) female SS adaptor for regulator to meter connection as per specification from approved/recommended vendors by Owner for completing the work, Scheduling, Planning of material & Forwarding inspection call, getting dispatch clearance, handling, loading, transportation and unloading of these items at respective contractor's store. Receiving, taking over, handling, loading, transportation and unloading of owner supplied items i.e. GI & Cu Pipe, Isolation Valve, Appliance Valve, Domestic, Commercial, & Industrial Meter & Regulator etc. as defined in specification from owners designated stock yard to contractors own store/ work site, proper storing stacking, identification, providing security and insurance cover. Preparation and approval of sketches, schedules & execution procedures. Finalizing optimum route with consent of customer from transition fitting to cooking oven / appliance and ensuring installations in well ventilated areas. Making temporary but stable platforms/ scaffolding/ rope ladders and supply of all other safety devices. SAP/ Portal entry / Data Entry for new connections - New registration tracking and feasibility survey and its updation as per Owner defined TAT, printing of stationary as per approved Owner formats required during connections. All fittings whatsoever required to complete the work is in contractor's scope. Connection using meter adaptor(s)/bush is preferrable instead of anaconda. Anaconda is optional and only to be used for specific cases where connection using adaptor/bush is not possible as directed by EIC. Installation of GI service pipes & fittings, regulators, Valves etc. including NPT threading, as specified, Drillings of holes through the walls (Brick, RCC), Granite, Marble, Wood Cutting, Glass Cutting with proper heavy duty hammer drill machine, tools & tackles, using proper sealant/grout material and colours to match the original replacement of the damages during drilling, restoring the area to the original condition, Painting of scratched length of powder coated pipe and fittings after proper surface finish by one coat of approved primer paint and two coats of approved synthetic enamel paint. | | | |
| | Restoring the wall surface to original conditions. Copper tube shall be installed inside the kitchen only up to the Appliance valve as per requirement and the satisfaction of EIC, the contractor to provide all equipment, tools and materials necessary to execute the work in efficient manner by cutting, cleaning, flux application, soldering and lacquering. The work includes supply of tools, tackles and consumables including clamp for fixing the tubes. Supply & fixing of approved clamps & nylon plugs with SS 304 2" screws, grout material, suitable thread sealant i.e. Teflon Tape,<br>Joining of transition fitting to above ground service GI pipes, testing, purging and commission of the complete installation. The rates in connections also includes meter and regulator installation, tap off rates etc. Installation in already gas charged area, planning & coordinating with existing consumer's for New tap offs from existing riser with or without tee, testing of these existing risers and commissioning of these connections with newly tap offs etc. is inclusive. Project area means - area where riser after TF/RIV is not installed/commissioned previously. O&M area means - areas where GI work is required for additional connection from already installed/commissioned riser provided riser work is not installed/commissioned under same work order. Area to be declared and decided by EIC. | | | |
| 1820 | **i) GI Pipe Installation - Threaded** | | | |
| 1830 | Installation of 1/2" GI Pipe in Project areas including supply & installation of contractor's Supplied Materials | 1 | M | **146.22** |
| 1840 | Installation of 1/2" GI Pipe in O&M areas including supply & installation of contractor's Supplied Materials | 1 | M | **153.53** |
| 1850 | Installation of 3/4" GI Pipe in Project areas including supply & installation of contractor's Supplied Materials. | 1 | M | **164.93** |
| 1860 | Installation of 3/4" GI Pipe in O&M areas including supply & installation of contractor's Supplied Materials | 1 | M | **173.17** |
| 1870 | Installation of 1" GI Pipe in all areas including supply & installation of contractor's Supplied Materials. | 1 | M | **177.81** |
| 1880 | Installation of 1.5" GI Pipe in all areas including supply & installation of contractor's Supplied Materials. | 1 | M | **190.25** |
| 1890 | **ii) GI Pipe Installation - Welded** | | | |
| 1900 | Installation of 3/4" GI Pipe in all areas including supply & installation of contractor's Supplied Materials | 1 | M | **181.42** |
| 1910 | Installation of 1" GI Pipe in all areas including supply & installation of contractor's Supplied Materials. | 1 | M | **195.59** |
| 1920 | Installation of 1.5" GI Pipe in all areas including supply & installation of contractor's Supplied Materials. | 1 | M | **209.27** |

| Sl. No. | Item Description | Quantity | Units | Proposed SOR Rates (Excl. GST) |
|---|---|---|---|---|
| 1930 | **iii) 1/2" GI + Cu Pipe Installation - Lumpsum** | | | |
| 1940 | Installation of 1/2" GI + Cu (from Existing riser) upto a length of 4m and upto appliance along with meter & regulator installation. In case cummulative length of GI + Cu exceeds 4 m, additional quantity beyond 4 Meters (GI + Cu) shall be payable under the relevant SOR item for installation of 1/2" GI pipe only.<br>Testing and commissioning shall be paid separately as per actual length as per relevant SOR item. | | | |
| 1950 | For floors above G+3 and upto G+14 | 1 | EA | **1642.45** |
| 1960 | For floors abopve G+14 | 1 | EA | **2313.19** |
| 1970 | **HSE Compliance - per Meter** | | | |
| 1980 | **HSE Compliance - GI Work Charges for compliance to Health, Safety & Environment (HSE) as detailed in Scope of Work. Use of Safety Boots, harness belts, Hand gloves, Reflective jackets, Hard hats (helmets), Safety shoes, eye and ear safety equipments, Fire extinguishers, warning display board and as per the detailed scope of work in tender specifications and as per the direction of EIC.** | | | |
| 1990 | All HSE compliance for GI Work of any dia. | 1.00 | M | **13.39** |
| 2000 | **HSE Safety Compliance for Working at Height** | | | |
| 2010 | **For floors above G+3 and upto G+14:**<br>GI Section: Safety requirement per Rise -<br>Use of Fall arrestor/ PETZL or equivalent make, Ascendors/ descendors, PPE, Barricades, Warning Boards (03 Nos. ) connected with warning/Caution tapes in areas where piping work is in progress , Use of Safety shoes, Walky talky, Hand gloves, Reflective jackets, Hard hats(helmets), eye and ear safety equipments, Fire extinguishers and as per the detailed scope of work in tender specifications; In case of non compliance- Refere SCC clause - for applicable penalty .<br>For floors above G+3 and upto G+14, full body safety harness and accessories of PETZL shall be compulsory.<br>This item shall be payable in addition to the per-meter HSE Compliance rate for GI Work. | 1.00 | EA | **376.66** |
| 2020 | **For floors above G+14:**<br>GI Section- Safety requirement per Rise -<br>Use of Fall arrestor/ PETZL or equivalent make, Ascendors/ descendors, PPE, Barricades, Warning Boards (03 Nos. ) connected with warning/Caution tapes in areas where piping work is in progress , Use of Safety shoes, Walky talky, Hand gloves, Reflective jackets, Hard hats(helmets), eye and ear safety equipments, Fire extinguishers and as per the detailed scope of work in tender specifications; In case of non compliance- Refere SCC clause - for applicable penalty .<br>For floors above G+14, full body safety harness and accessories of PETZL shall be compulsory.<br>This item shall be payable in addition to the per-meter HSE Compliance rate for GI Work. | 1.00 | EA | **1100.57** |
| 2030 | **Testing & Rectification of GI Pipe Installation in any area - all type. Testing of GI network installed (new or previously) includi ng all tools & tackles, materials, any rectification & making connection ready for conversion. Submission/updation of as laid graphs /reports, isometric drawings etc. as required. Updation of all data in SAP/IOCL apps as directed by EIC.** | **0.00** | **M** | |
| 2040 | 1/2" GI Pipe | 1.00 | M | **48.74** |
| 2050 | 3/4" GI Pipe | 1.00 | M | **54.97** |
| 2060 | 1" GI Pipe | 1.00 | M | **65.20** |
| 2070 | 1.5" GI Pipe | 1.00 | M | **69.74** |
| 2080 | **Meter-Regulator Installation** | | | |
| 2090 | Installation of regulator, meter with associated inlet & outlet connections with supply & installation of fittings/adaptors/anaconda , supply and fixing of approved meter brackets (as required) and other supports up to appliance valve & surakhsa hose including supply of all material in contractor's scope - for any area. Scope includes GIS tagging of connection, Updation of all data in SAP/IOCL apps as directed by EIC. | 1.00 | EA | **195.71** |
| 2100 | Testing & commissioning of Meter-regulator system including online testing of gas meter and regulator assembly, Updation of all data in SAP/IOCL apps as directed by EIC. | 1.00 | EA | **83.88** |
| 2110 | **Pre-Commissioning & Commissioning of GI Network. Pre-commissioning & Commissioning of GI network including all tools & tackles, mat erials, rectification/re-testing of any segment if required & making connection ready for gas supply. Submission/updation of as laid graphs/reports, isometric drawings etc. as required. Updation of all data in SAP/IOCL apps as directed by EIC.** | | | |
| 2120 | 1/2" GI Pipe | 1.00 | M | **35.35** |
| 2130 | 3/4" GI Pipe | 1.00 | M | **41.58** |

| Sl. No. | Item Description | Quantity | Units | Proposed SOR Rates (Excl. GST) |
|---|---|---|---|---|
| 2140 | 1" GI Pipe | 1.00 | M | **42.71** |
| 2150 | 1.5" GI Pipe | 1.00 | M | **43.74** |
| 2160 | **Cu Tubing Work** | | | |
| 2170 | Installation, testing, pre-commissioning & commissioning 12 mm Copper Tube - Inside kitchen location only - including supply & inst allation of contractor's Supplied Materials. Submission/updation of as laid graphs/reports, isometric drawings etc. as required. Up d ation of all data in SAP/IOCL apps as directed by EIC. | 1.00 | M | **234.68** |
| 2180 | **Testing and Conversion of Domestic Appliances** | | | |
| 2190 | Conversions of all the burners of LPG Stove (one appliance per household) to Natural Gas (NG) based appliances, Supply & changing of the nozzles / jets and associated controls for domestic & imported appliances with proper tools and tackles. The rates include tes t ing of Kitchen piping from meter to Appliance valve and supply and fixing of one Steel reinforced Flexible Hose as per IS 9573 (w it h Type as per latest PNGRB guidelines) per appliance/stove with clamps. Cleaning and performing minor maintenance including gas inl et side change in stove, greasing etc. of the appliance. Testing and showing the performance to the customer, signing of joint mete r records (JMR) and instructing the customer on use & safety norms, complete as per specifications & to satisfaction of owner / Engi neer in Charge. (Supply of Steel Reinforced Rubber hose, Nozzle jets for conversion of burners is inclusive.) | 1.00 | EA | **173.79** |
| 2200 | Perfoming Slab hole by using specific tools (wherever required) | 1.00 | EA | **186.30** |
| 2210 | Perfoming Core cutting by using specific tools (wherever required) | 1.00 | EA | **167.67** |
| 2220 | Perfoming glass cutting by using specific tools (wherever required) | 1.00 | EA | **62.37** |
| 2230 | Replacement of defective Meter/Domestic Regulator/Meter Regulator with new ones (which are freely issued by IOCL) | 1.00 | EA | **246.24** |
| 2240 | **Supply of LMC Materials- Isolation Ball Valve and Appliance Valve**<br>**These items are be supplied only after clearance from owner's representative/ EIC** | | | |
| 2250 | Isolation Ball valve (1/2") | 1.00 | EA | **244.20** |
| 2260 | Isolation Ball valve (3/4") | 1.00 | EA | **386.10** |
| 2270 | Isolation Ball valve (1") | 1.00 | EA | **372.36** |
| 2280 | Isolation Ball valve (1.5") | 1.00 | EA | **785.20** |
| 2290 | Appliance valve (1/4") | 1.00 | EA | **205.70** |
| 2300 | **DIRECT MARKETING AGENCY WORKS** | | | |
| 2310 | "Organising events (Nukkad Natak/awareness camp/audio announcement in local lanuguage) for promotion of use of Natural Gas among hou sehold consumers in societies/ coloniew etc. -The agent shall make arrangement for conopies, Banners (as per design approved by IOC L), audio system mounted on vehicle (audio cli p to be approved by IOCL) etc. -Supply and distribution of Pamphlets of about 8.5" X 5.5" size (quality of paper to be used and printing material shall be appro ved by OWNER (1000 numbers of Pamphelets per events s hall be arranged by agency) -Agency shall provide minimum 4 persons per event to promote the usage of Natural Gas among household co nsumers." | 1.00 | EA | **5830.03** |
| 2320 | "Installation of Hoardings at prominent Loaction (to be decided by OWNER) within city of size of about 5 m X 3 m for a period of two years.However, Payment shall be as per the actual months of installation of particular hoarding. Agency shall be responsible for p aying all amount to various authorities as per their rules and regulations including rental. The material to be printed on hoardings shall be finalised by OWNER. Hoardings can also be installed on existing advertising boards/frames available at prominent location and at the descition of OWNER. Rate is inclusive of obtaining permission for hoarding from Corporation, taxes levied therein" | 1.00 | MON | **19526.32** |
| 2330 | Advertisesing through running of video clip of about 30 second duration (4 times per day) in a movie theatre (to be decided by OWNER ). Video Clip to be prepared by agency in consultation with OWNER. Selection of Movie theatre shall be at the sole descretion of th e OWNER only. | 1.00 | MON | **101384.62** |
| 2340 | Advertisesing through running of audio clip of about 10 second duration (4 times per day) in one of the FM Channels (to be decided b y OWNER). Audio Clip to be prepared by agency in consultation with OWNER. Selection of FM channel will be at the sole descretion of the OWNER only. | 1.00 | MON | **27017.60** |
| 2350 | Advertisesing through running of Video clip of about 30 second duration (6 times per day) in one of the TV Channels (to be decided by OWNER).Video Clip to be prepared by agency in consultation with OWNER. Selection of TV Channel for broadcasting the Video clip will be at the sole descretion of the OWNER only. | 1.00 | MON | **9501.33** |
| 2360 | **D-PNG Registration** | | | |
| 2370 | Interaction with individual household consumers, Registration for PNG(Domestic) supply by gettings prescribed For duly filled (Form s to be provided by IOCL), data entry in IOCL's mobile/desktop applications for PNG(D), submission of consolidated data in requisi t e format on daily basis. Providing uniform and ID cards to marketing executives, collection of GPS cooridnates of consumers' household and submitting it in the requisite format. Scrutiny of forms duly certified by Engineer-in-Charge (EIC) as per PNG Scheme. | 1 | EA | **174.92** |
| 2380 | Collection of Security Deposit amount (if Applicable) from Registered Customer as per IOCL PNG Scheme & Providing assisstance for clerance of cheque in bank/reconcile online payment, Reconciliation of data & updation of data in Mobile App/Excel/SAP as desired by EIC. | 1 | EA | **74.97** |
| 2390 | **(Marketing) DMA WORK Carrying out the work of obtaining PNG registration in all respect as detailed in Scope of work and Special Conditions of contract and as per directions/instructions of Engineer In charge /Authorized representative including but not limited to following :**<br>**1) Enrolment & Registration of PNG Customers as per the given target.**<br>**2) Collection of filled up form along with Security Deposit amount (only in the form of cheque/Demand Draft/ Online mode) and relevant documents.**<br>**3) Carrying out the work of demand registration, evaluation, facilitation of signing of GSA and collection of security deposit and payment against payment security as detailed in scope of work and special condition of contract of tender document as per requirement and the satisfaction of the EIC for industrial and commercial customers. 4) Carrying out the marketing activities for PNG connection as per directions/instructions of the EIC including but not limited to the following: Printing & Distribution of leaflets & FAQ, Printing & Installation of banners at prime locations, Awareness cum Registration Camp, Audio/Visual Presentations, Organizing Road Shows, etc.** | | | |
| 2400 | Commercial PNG Connections | 1.00 | EA | **1665.12** |
| 2410 | Industrial PNG Connections | 1.00 | EA | **2528.94** |
| 2420 | **Ground Connectivity to Industrial/Commercial Customer** | | | |

| Sl. No. | Item Description | Quantity | Units | Proposed SOR Rates (Excl. GST) |
|---|---|---|---|---|
| 2430 | Service Line Laying for Industrial/Commercial connection : Laying, testing and commissioning in all type of surface i.e. Kutcha, metal, concrete (PCC/RCC), bituminous, tiled, brick lined etc. after racking up of hard surface of any type by any methodology. Roads, Pavement, Footpaths etc. shall be made motorable once the pipeline is laid. The rate includes cutting of hard/CC surface & rock excavation. No separate payment shall be made under any SOR. Including supply of all required PE fittings, saddles, and transition fittings of suitable sizes for tapping from existing PE pipelines of 32, 63, 90, 125, and 180 mm diameter.<br><br>Supply & installation of GI Sleeve /Half round Concrete sleeve shall be included in laying rates. All other activities mentioned in tender are applicable. Supply & installation of GI Sleeves, 2.5" NB x 300 mm length, 4" NB x 300mm length, 6" x 300mm Length, Half Round Concrete Sleeves for Industrial & Commercial connections, breaking through any obstructions, insertion of pipe, sealing the annulus, fixing of the sleeves with concrete mix, preparation of pedestal & restoration of excavated pits within the size of pedestal & the same pit with the laying of 20 mm as defined in technical specification and instruction of EIC.<br><br>The rates shall include liaison rates with statutory bodies and no separate rates are payable under this SOR. Wherever service lines are to be more than 8m, additional rate shall be payable under respective SOR for additional length.The scope includes construction providing and laying reinforced cement concrete of of 1:1.5:3 mixing ratio (Concrete shall be design mix/nominal mix) with 20mm & down size graded crushed stone aggregates in Non suspended slabs/pavement slabs including pedestal/ramp etc., laying in alternate panels to required slopes, all necessary form work and finishing the top surface rough/smooth as required in any position, shape, level and thickness etc. as specified and directed by EIC. The rates includes grouting of pockets, supply of material, tools, shuttering, Reinforcement etc. Any Length more than 8m, payment shall be made under respective SOR of PE Laying Items. | | | |
| 2440 | **MDPE Pipeline laying in all type of surface by any method** | | | |
| 2450 | Laying of 32 mm Dia MDPE pipeline - pipe length upto 8 mtrs for industrial and commercial connections upto TF | 1.00 | EA | **6837.89** |
| 2460 | Laying of 63 mm Dia MDPE pipeline - pipe length upto 8 mtrs for industrial and commercial connections upto TF | 1.00 | EA | **11459.83** |
| 2470 | Laying of 90 mm Dia MDPE pipeline - pipe length upto 8 mtrs for industrial and commercial connections upto TF | 1.00 | EA | **14533.70** |
| 2480 | **Reimbursement to Plumbers Incentives** | | | |
| 2490 | Reimbursement for Plumber Incentives - PNG Connections<br>Reimbursement of incentive paid by the Contractor to eligible Plumbers for execution of each Ready for Connection (RFC)/ NG charging of PNG connections. Incentives shall be payable only for Plumbers achieving a minimum of 20 RFC installations in a calendar month under the contract.<br>Contractor shall disburse the incentive to the eligible Plumbers and submit UTR/e-payment proof including supporting documents viz. plumber-wise connection details, acknowledgment and certification by TPI/Owner representative.<br>Payment under this item shall be as per actual eligible connections certified by EIC. | 1.00 | EA | **200.00** |
| 2500 | Reimbursement for Plumber Incentives - Working at Height for PNG Connections<br>Reimbursement of additional incentive paid by the Contractor to eligible Plumbers for execution of PNG connections from Second Floor and above. Contractor shall disburse the incentive to the eligible Plumbers and submit UTR/e-payment proof including supporting documents viz. plumber-wise connection details, acknowledgment and certification by TPI/Owner representative. Payment under this item shall be limited to actual eligible connections executed at **Second Floor and above** and certified by EIC. This item shall be payable in addition to the reimbursement against Plumber Incentives for PNG connections | 1.00 | EA | **200.00** |
| 2510 | **"Notes:**<br>1) The SOR items would be executed as per the job requirement.<br>2) The scope as mentioned in the above SOR is of indicative nature only and shall include all activities as detailed in the relevant clauses of the specifications.<br>3) Any other material & ac tivities not mentioned/covered above, but otherwise required for satisfactory completion/safety of work a s defined in tender has to be supplied / done by contractor at no extra cost to owner.<br>4) Prices quoted in column shall be all inclusive of all taxes / duties (excluding GST) and nothing extra shall be payable by the O wner except for statutory variation in GST.<br>5) The quantities menti oned in SOR are tentative only and for the purpose of evaluation and may vary as per the actual site conditi on.<br>6) The SOR shall be read along with the relevant clauses of tender document" | | | |

Notes:

a) The SOR items would be operatable as per job requirement.

b) The quantities stated in SOR are tentative and may vary considerably on ± side depending upon site condition, methodology adopted as per site requirement. The payment will be made as per actual certified Measurement at site and as instructed by EIC.

c) The scope as mentioned in the SOR is of indicative nature only and shall include all activities as detailed in the relevant clauses of the specifications attached and other relevant documents enclosed with bid.

d) Any other materials & activities not mentioned/covered in SOR, but otherwise required for satisfactory completion/safety of work as defined in tender/bid has to be supplied /done by contractor with in the specified schedule at no extra cost to owner.

e) Contractor shall be required to deploy adequate no. of plumbing teams to ensure domestic conversions expeditiously. In this regard, no. of independent teams shall be decided by Engineer-in-charge.

f) Efforts shall be made to offer complete work front in nearby areas based on availability. However, it is to be noted that offered the work front may be at different locations (which may not be near to each other) in staggered basis across the GA. Bidder to understand to execute the required work at various locations and be prepared as per the allotted fronts at scattered locations across the GA.

# INDIAN OIL CORPORATION LIMITED

# GENERAL CONDITIONS OF CONTRACT

(AS AMENDED IN 2025)

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## SECTION 1

### DEFINITIONS

1.0.0.0 The following expressions hereunder and elsewhere in the Contract Documents used, unless repugnant to the subject or context thereof shall have the following meanings hereunder respectively assigned to them, namely:

1.1.0.0 "Acceptance of Tender" shall mean the acceptance of bid by the OWNER through a letter, or fax of acceptance or any other written mode of notification of award of work;.

1.2.0.0 "Approval" shall mean the written and signed approval of the OWNER or of Engineer-in-Charge or Consultant, if so authorized in this behalf by the OWNER, and with respect to a plan or drawing shall include an approval in Code 2, subject to the limitation(s) specified in such approval;

1.3.0.0 "Approval in Code 2" shall mean an approval to proceed with the work covered by plans or drawings subject to certain limitation(s) as specified in such approval;

1.4.0.0 "Completion" or "Final Completion" shall mean the successful provision of all materials and inputs and the successful completion and conclusion of all activities required in all respects to complete the contractual works in accordance with the Contract, but shall not include the obligation to rectify defects during the Defect Liability Period;

1.5.0.0 "Completion Certificate" shall mean the Completion Certificate issued by the Engineer-in-Charge in accordance with the provisions of Clause 5.5.0.0 hereof;

1.6.0.0 "Commissioning" of a Plant or Unit shall mean pressing into service the unit(s), equipment(s), vessel(s), pipeline(s), machinery and system(s) and sub-system(s) comprising the Plant, in accordance with the approved Operation Manual and as per procedures recommended by the Designer/Process Licensor or Supplier thereof, and approved by the OWNER, after successful trial runs of the Plant/Unit;

1.7.0.0 "Consultant" shall mean the Consultant appointed by the OWNER for the Project or the Works;

1.8.0.0 "Consumables" shall mean all items which are consumed in the execution of the Work, without being directly incorporated in the Work, such as fuel, electricity, water, POL, welding rods, electrodes and utilities;

1.9.0.0 "Contract" shall mean the agreement between the parties as derived from the Contract Documents;

1.10.0.0 "CONTRACTOR" shall mean individual, agency, firm or company (whether incorporated or not) selected by the OWNER for the performance of the Contract and shall include its legal representatives, successors and permitted assigns;

1.11.0.0 "Contract Documents" shall mean the contract documents as defined in Article 1 in the Form of Contract as annexed (Annexure 1) to the General Conditions of Contract;

1.12.0.0 "Defect Liability Period" shall mean the defect liability period as specified in Clause 5.6.0.0 hereof.;

1.13.0.0 The "Engineer-in-Charge" shall mean the Engineer or other officer of the OWNER, Consultant or other organization for the time being nominated by the OWNER in writing to act as Engineer-in-Charge for the purpose of the Contract or any specific works;

1.14.0.0 "Final Certificate" shall mean the final certificate, issued by the Engineer-in-Charge, in accordance with the provisions of Clause 6.8.0.0 hereof;

1.15.0.0 "General Manager" shall mean the Executive Director, Chief General Manager, General Manager or other Executive (howsoever designated) of the Project to which the Contract relates, and if there is no such separate Executive designated, shall mean the Executive Director (if any) or the Chief General Manager or General Manager, as the case may be, of the Refinery, Pipeline(s), Marketing, or other Unit or Department of the OWNER to which the Project relates and will include the concerned Head of the installation of the Engineering

Department of the State in Marketing Division;

1.16.0.0 "Guarantee tests" shall mean all tests, undertaken after the Plant goes into operation and has stabilized, for ensuring that the functioning of the Plant meets all guarantees, as regards throughput, quality and magnitude/quantity of output, at the final stage as well as at the stipulated interim stages of operation/process, as well as in respect of consumption of utilities, chemicals and catalysts, etc.;

1.17.0.0 "Job Site" shall mean site at which the work is to be performed by the CONTRACTOR provided by the OWNER under clause 4.1.4.0 hereof, and shall include a part or portion of the job site but shall not include any land provided by the OWNER under clause 3.6.0.0 hereof;

1.18.0.0 "Manuals" shall mean the Erection and Installation Manual of the various equipment and machinery forming part of the Work(s) or Plant(s)/Unit(s) as well as the Operation and Maintenance Manuals thereof;

1.19.0.0 "Materials" shall mean all materials, plant, machinery, instruments, components, equipment, sub-assemblies and assemblies, parts, spares and other items or things required for permanent incorporation in the works;

1.20.0.0 "Mechanical Completion", as applied to a Plant or Unit, shall mean the completion of civil works, erection, aligning and grouting of all mechanical and electrical equipment and piping, hydrostatic and other testing of all storage tanks, vessels, piping etc., all electrical and all utility connections to the equipment, mounting and fixing of all instruments, control systems and connecting them as required, testing and trial runs of all equipment on "no-load" and bringing the Plant to a state of readiness for pre-commissioning;

1.21.0.0 "Notified Claim" shall mean a claim of the CONTRACTOR notified in accordance with the provisions of Clause 6.6.1.0 hereof;

1.22.0.0 "Order" and "Instruction" shall respectively mean any written order or onstruction given by the Engineer-in-Charge or OWNER or Site Engineer(s) within the scope of their respective powers in terms of the Contract;

1.23.0.0 "OWNER", unless otherwise specified, shall mean Indian Oil Corporation Limited, a company incorporated in India and having its registered office at G-9, Ali Yavar Jung Marg, Bandra (East), Mumbai-400 051 and shall include its successors and assigns;

1.24.0.0 "Plans" and "Drawings" shall mean and include all technical documentation such as maps, sketches, designs, drawings, plans, details, charts, schedules, tracings, prints, computer outputs, printouts, and manuals, relating to the work forming the subject matter of the contract, including but not limited to those forming part of the Tender Documents, Offer Documents, and working drawings and details, together with amendments/alterations/revisions/modifications thereto, as may have been approved by and/or furnished by the OWNER, the Engineer-in-Charge and/or the Consultant, as well as "As-Built" drawings to be submitted by the CONTRACTOR, as required under the contract;

1.25.0.0 "Pre-commissioning" shall mean the activities to be taken up before the taking up of Start-up, Commissioning and trial runs of the Plant/Unit, and shall include, without being limited to, all operations such as checking of all systems, subsystems, piping and vessels, flushing with air, water and steam, air-blowing and steam-blowing, system pressure and leak tests, purging with inert gas as required, checking all electrical equipment for earthing/ resistances, operability tests and cold run on all operating equipment, vessels and systems individually and in combination, integration of all control systems with one another and with the main control system, and completion of all operations detailed under the head, "COMPLETION OF CONSTRUCTION" in API-700;

1.26.0.0 "Progress Schedule" shall mean the Progress Schedule established by the CONTRACTOR and approved by the Engineer-in-Charge for completion of the work(s) within the time schedule in accordance with the provisions hereof and failing such Progress Schedule, shall mean the Progress Schedule established by the Engineer-in-Charge in accordance with the provisions hereof;

1.27.0.0 "Performance Test(s)" shall mean all tests meant to ensure that the Plant(s)/Unit(s) is/are in all respects in accordance with the requirements of the Contract and that the Plant functions properly and smoothly, in all respects as per the approved design parameters, within the permissible tolerances, and satisfies all the stipulated operating parameters, and will include

the Guarantee Tests;

1.28.0.0 "Project" shall mean the project embracing the work(s) forming the subject matter of the Contract;

1.29.0.0 "Site Engineer" shall mean the engineer(s)/officer(s) for the time being designated by the Engineer-in-Charge as his representative(s) in writing, and authorized by him to assist him in performing his duties and functions for the purpose of the Contract;

1.30.0.0 "Plant" or "Unit" shall mean the grouping of and assembly of systems, subsystems, machinery, equipment, piping and associated facilities, designed to function as a cognizable part of the Project Facility whether alone or in conjunction with other Plants/Units and Facilities. (Examples: Distillation Unit, Reformer Unit or Desulphurization Unit.);

1.31.0.0 "Schedule of Rates" or "Price Schedule" shall mean the Schedule of Rates or Price Schedule annexed to the Acceptance of Tender, and shall also include a lump sum price;

1.32.0.0 The "Specification(s)" shall mean the various specifications as set out in the Specifications forming part of the Tender Documents and as referred to and derived from the Contract and any order(s) or instruction(s) there under, and in the absence of any specifications as aforesaid covering any particular work or part or portion thereof, shall mean the Specifications and Codes of the Bureau of Indian Standards and other Organizations, including but not limited to British Standards Institution, ASTM, ASME, ANSI, API, AWS, AWWA, NACE, HEI, IEC, IBR, IEEE, EIL, CPWD, etc, with such modifications as may be applicable for the particular part(s) of the Contract, as decided by the Engineer-in-Charge and as per Standard Engineering and Industry Practice and/or as directed by the Engineer-in-Charge;

1.33.0.0 "Security Deposit" shall mean the Security Deposit as specified in Clause 2.1.0.0 hereof and associated clauses there under;

1.34.0.0 "Subsystems" shall mean the further breakdown of a System into its subsections and sub-components, each designed to fulfill a precisely demarcated function or role in the working of the system. (Example: Demineralization of boiler feed water and fuel injection for boilers for the Steam Generation system);

1.35.0.0 "Start-up" shall mean all activities required to be performed after Pre-commissioning and prior to trial operation and shall include final Pre-commissioning inspection and check out of equipment, vessels and system(s) and supporting sub-system(s), initial operation of complete equipment and systems within the Plant/Unit to obtain necessary pre-trial operation data, confirmation and correction of calibration, shutdown inspection and adjustment and other steps required to be taken prior to and enable Commissioning/trial operation;

1.36.0.0 "System" shall mean the breakdown of the Plant or Unit into specific sections and components, each designed to fulfill a precisely demarcated function or role in the working of the Plant/Unit (Examples: Fresh water system, circulating water system, steam and power generation and distribution systems, fuel system, effluent system in a Power Plant);

1.37.0.0 "Time Schedule" shall mean the time schedule for final completion of the Works or Mechanical Completion of the Plant(s)/Unit(s), as the case may be, incorporated in the Contract or as may be extended by the OWNER or Engineer-in-Charge pursuant to the provisions hereof and shall include interim time schedules set up for achieving interim/phase-wise/stage-wise progress/completion/testing/Commissioning/handing over, as may be prescribed by the OWNER/Engineer-in-Charge, within the overall Time Schedule as originally envisaged or as extended.

1.38.0.0 "Total Contract Value" shall, up to calculation of the entire remuneration (excluding any Goods and Services Tax) due to the CONTRACTOR in terms of the Contract on successful completion of the Work, mean the Total Contract Value as specified in the Acceptance of Tender, and after calculation of the entire remuneration due to CONTRACTOR under the Contract on successful completion of the Contract, shall mean the totality of such remuneration (excluding any Goods and Services Tax);

1.39.0.0 "Utilities" shall mean power, electricity, gas and other sources of energy, water, earth and other things whatsoever (other than materials and consumable(s)) required for or in the

performance of the work(s);

1.40.0.0 "Work", "Scope of Work", "Service", and "Scope of Services" shall mean the totality of the work, services and activities to be performed or undertaken and the totality of the responsibilities to be discharged, as envisaged by expression or implication in the Contract and shall include all inputs required for such performance and discharge including (but not limited to) know-how, design/engineering inputs, preparation and supply of drawings and details, project management (including pre-construction activities, tendering, procurement, inspection and expediting), construction supervision, Pre-commissioning, Start-up and Commissioning and supply of consumables, materials, labour, construction and other requisite machinery and equipment, utilities and inputs required for, relative or incidental to and/or in connection with the performance of the Contract up to completion (including testing, Commissioning, handing over, troubleshooting, rectification, maintenance and defect liabilities).

# SECTION - 2
# GENERAL

2.0.0.0 **INTERPRETATION OF CONTRACT DOCUMENTS**:

2.0.1.0 Singular and Plural: Where the context so requires, words imparting the singular also include the plural and vice versa.

2.0.2.0 Masculine and Feminine: Where the context so requires, words imparting the masculine gender shall also include the feminine gender and the neuter gender and vice versa.

2.0.3.0 Meanings: Unless expressly stipulated to the contrary in this Contract: (i) the words "direction(s)/directed", "instruction(s),/instructed," "order(s)/ordered," "requirement(s)/ required", "permission(s) /permitted", "approval(s) /approved", shall mean the written directions, instructions, orders, requirements, permissions or approvals, as the case may be, of the OWNER or of the Engineer-in-charge or Site Engineer; (ii) the words "as felt", "considered necessary", "acceptable", "desirable" or "satisfactory", shall mean that the OWNER or Engineer-in-charge or Site Engineer feels or considers that the particular thing is necessary, acceptable, desirable, or satisfactory, as the case may be.

2.0.4.0 Language: All documents pertaining to the Contract, including drawings, manuals and any other writings shall be in English language. The translations, if any, in Hindi or any other language, as may be furnished by the OWNER of any of the documents forming the Contract, shall not anywise operate as the Contract between the parties or regulate upon the terms and conditions of the Contract Documents with the intention that all rights and obligations of the parties in terms of Contract Documents and any reference to the Contract or Contract Documents or any of them shall be deemed the rights and obligations arising out of the Contract Documents as written in English and / or Contract or Contract Documents or any of them as written in English; and no claim, dispute, difference or other objection will lie or will be entertained by the OWNER on account of any difference in the import or interpretation between any provision in the Hindi or any other language translation of the Contract Documents or any of them and the Contract Documents in English.

2.0.5.0 Measurement Units: The metric system of measurement units shall be used in the Contract, unless otherwise expressly stipulated.

2.0.6.0 The several Contract Documents forming the Contract are to be read together as a whole and are to be taken as mutually explanatory.

2.0.7.0 Should there be any doubt or ambiguity in the interpretation of the Contract Documents or error, omission or contradiction therein or in any of them, the CONTRACTOR shall, prior to commencing the relative work, apply in writing to the Engineer-in-Charge for his decision in resolution of the doubt, ambiguity or contradiction or correction of the error or omission, as the case may be. Should the CONTRACTOR fail to apply to the Engineer-in-Charge for his decision, as aforesaid, prior to commencing the relative work, the CONTRACTOR shall perform the said work at his own risks, and the provisions of Clause 2.0.10.0 hereof shall apply to any such work performed by the CONTRACTOR.

2.0.8.0 Notwithstanding anything provided in Clause 2.0.7.0 hereof, either the CONTRACTOR or the Site Engineer under intimation to CONTRACTOR, may at any time prior to, during or after the execution of the work or any part thereof (if the CONTRACTOR has failed to make an application as provided for in Clause 2.0.7.0) apply to the Engineer-in-Charge in writing for his decision in resolution of any doubt, ambiguity or contradiction, in the Contract Documents or any of them of the correction of any error or omission therein, as the case may be.

2.0.9.0 The decision of the Engineer-in-charge on any application under Clause 2.0.7.0 or Clause 2.0.8.0 hereof shall be in writing and final and binding upon the CONTRACTOR and shall form part of the Contract Documents, with the intent that the Contract Documents shall be read as though the said decision is and was at all times incorporated therein.

2.0.10.0 If thereafter the CONTRACTOR performs or executes any work at variance with the decision

of the Engineer-in-Charge, then, notwithstanding payment in respect of such work having been made to the CONTRACTOR, such work shall be deemed to be a defective work and the provisions of Clause 5.1.4.0 hereof and associated clauses there under shall apply thereto.

2.0.11.0 Any work shown, indicated or included in the job description, Plan(s), Drawing(s), Specifications and / or Schedule of Rates shall be deemed to form part of the work, notwithstanding failure to show, indicate or include such work in any other or others among the Documents aforesaid with the intent that the indication or inclusion of the work within any one of the said documents shall be deemed to be a sufficient indication or inclusion of the work within the work covered by the Contract.

2.0.12.0 No verbal agreement, assurances, representations or understanding given by any employee or officer of the OWNER or so understood by the CONTRACTOR, whether given or understood before or after the execution of the Contract, shall anywise bind the OWNER or alter the Contract Documents unless specifically given in writing and signed by a person specifically authorized by the OWNER and given as an Agreed Variation to the relative term(s) in the Contract Documents.

2.0.13.0 Clause headings given in this or any other Contract Document are intended only as, a general guide for convenience in reading and segregating the general subject of the various clauses, with the intent that the clause headings shall not govern the meaning or importance of the clauses there under appearing or confine or otherwise affect the interpretation thereof.

2.0.14.0 In case of irreconcilable conflict in non technical matters between the provisions in the separate Contract Documents concerning or governing the same aspect precedence shall be given to the provisions contained in the documents mentioned below in the order in which they are set out below:

1. Formal Contract
2. Acceptance of Tender
3. Price Schedule annexed to Letter of Acceptance
4. Agreed Variations annexed to the Letter of Acceptance
5. Addenda to the Tender documents
6. Additional Conditions of Contract
7. Special Conditions of Contract
8. General Conditions of Contract
9. Instructions to Tenderers / Special Instructions to Tenderers
10. GeM General Terms and Conditions

A variation or amendment issued after the execution of the formal contract shall take precedence over the formal contract and all other Contract Documents.

2.0.15.0 In case of irreconcilable conflict in technical matters between the provisions concerning or governing the same aspect, clauses 2.0.7.0 and 2.0.8.0 shall be applied.

2.0.16.0 Should any provision of the Contract be found to be invalid, illegal or otherwise not enforceable by any court of law, such finding shall not affect the remaining provisions hereto and they shall remain binding on the parties hereto.

2.1.0.0 **SECURITY DEPOSIT**

2.1.1.0 The CONTRACTOR shall furnish Security Deposit in the amount equivalent to 10% (ten percent) of the Total Contract Value. Such Security Deposit is to be held by the OWNER as security for the due performance of the CONTRACTOR's obligations under the Contract and/or for the due payment of any amounts claimed by the OWNER from the CONTRACTOR.

2.1.1.1 The Security Deposit shall be made up of the Initial Security Deposit, and the retention monies, of a sum equal to 10% (ten percent) of the total (gross) value of each bill, up to and until the recovery of full Security Deposit to the extent specified in Clause 2.1.1.0 hereof is achieved. The deductions for the retention money(ies) will be stopped after the Security Deposit limit of 10% (ten percent) of the Total Contract Value is reached, unless otherwise required in terms of Clause 2.1.1.6 hereof.

2.1.1.2 The CONTRACTOR shall, within 10 (ten) days of the receipt of Acceptance of Tender issued

by the OWNER, deposit Initial Security Deposit in an amount equal to 2.5% (Two and a half percent) of the Total Contract Value as aforesaid, in one or more of the following modes, subject to the stipulation(s) contained in the said Acceptance of Tender by the OWNER:

a) through electronic transfer to the bank account designated by the OWNER (demand draft or pay order or cash or cheque shall not be accepted).

b) If the Earnest Money Deposit has already been deposited, the CONTRACTOR may be permitted to adjust the same towards part of the Initial Security Deposit and pay the balance in the manner stipulated at (a) above.

c) By Bank Guarantee(s) in the prescribed form as included in the Tender Documents, from a Scheduled Bank in India acceptable to the OWNER, provided the amount covered by such Bank Guarantee is not less than Rs.1,00,000/- (Rupees One Lakh only). This Bank Guarantee shall be valid up to a period of 3 (three) month beyond the end of the Defect Liability Period and the same shall have a claim period for at least 3 (three) month thereafter.

d) By Insurance Surety Bond (only if the CONTRACTOR is an Indian entity) from an insurer registered with Insurance Regulatory and Development Authority, acceptable to the OWNER, in the prescribed format, provided, the amount covered by such Insurance Surety Bond is not less than Rs.1,00,000/- (Rupees One Lakh only). This Insurance Surety Bond shall be valid up to a period of 3 (three) months beyond the end of the Defect Liability Period shall have a claim period for at least 3 (three) month thereafter.

2.1.1.3 The CONTRACTOR will be permitted to furnish a Bank Guarantee/Insurance Surety Bond for the full Security Deposit of 10% (ten percent) of the Total Contract Value, in advance, in which case, no Initial Security Deposit will be required to be furnished and no deductions shall be made from his running bills towards retention money, except as may be required in terms of clauses 2.1.1.1 and 2.1.1.6 hereof.

2.1.1.4 The CONTRACTOR may, at any time and from time to time, during the course of or after completion of the work, with the permission of the OWNER, substitute his cash security deposit by way of retention money(ies) deducted from his bills and lying with the OWNER,

a) by Bank Guarantee(s) in the prescribed proforma from a Scheduled Bank in India acceptable to the OWNER and withdraw the equivalent cash amount(s), provided the amount covered by any such Bank Guarantee is not less than Rs.1 lakh (Rupees One lakh only).

b) by Insurance Surety Bond (only if the CONTRACTOR is an Indian entity) from an insurer registered with Insurance Regulatory and Development Authority acceptable to the OWNER in the prescribed proforma acceptable to the OWNER and withdraw the equivalent cash amount(s), provided the amount covered by any such Insurance Surety Bond is not less than Rs.1 lakh (Rupees One lakh only).

2.1.1.5 The Earnest Money deposited by the CONTRACTOR along with his Tender shall, unless it has been adjusted in accordance with clause 2.1.1.2(b) above, be refunded by the OWNER, after the Initial Security Deposit or the full Security Deposit, as the case may be, has been deposited by the CONTRACTOR and form of contract has been executed by the CONTRACTOR, if applicable.

2.1.1.6 If at any time during the course of the work, the gross value of the work, as reflected by the Running Bills submitted by the CONTRACTOR has in the opinion of the OWNER (which shall be final and binding on the CONTRACTOR), exceeded or is likely to exceed the Total Contract Value indicated in the Acceptance of Tender, the CONTRACTOR shall be bound to pay further Security Deposit as will make up the total Security Deposit to 10%(ten percent) of the then anticipated Contract Value, failing which the OWNER shall be at liberty to make such deductions towards retention money(ies) from the CONTRACTOR's Running Bills, and will, at all times, ensure that the Security Deposit does not fall below 10% (ten percent) of the gross value of the work, as reflected by the gross payments made to the CONTRACTOR, without taking into account any deductions. If the shortfall in Security Deposit is discovered after completion of the work, the shortfall shall be made good by the CONTRACTOR on demand from the OWNER, failing which, it will be recovered from any money (ies) due to the

CONTRACTOR from the OWNER under this Contract and/or any other contract with the OWNER.

2.1.1.7 If after completion of the work, the Total Contract Value falls below the total contract value as indicated in the Acceptance of Tender, such that the total Security Deposit (made up of initial Security Deposit and retention money(ies) or otherwise) in the hands of the OWNER is in excess of the total Security Deposit calculated at 10% (ten percent) of the reduced contract value, such excess amount, as is in the form of cash in the hands of the OWNER, shall be refunded to the CONTRACTOR along with the Final Bill. If the Security Deposit furnished by the CONTRACTOR to the OWNER in the form of Bank Guarantees/Insurance Surety Bond(s) is in excess of the full Security Deposit calculated on the Total Contract Value, by over Rs.1 lakh, the CONTRACTOR shall be permitted to replace the Bank Guarantee(s)/ Insurance Surety Bond(s) already submitted, by Bank Guarantee(s)/Insurance Surety Bond(s) to cover the reduced value of Security Deposit.

2.1.1.8 The Security Deposit shall be held by the OWNER as security for the due performance of the CONTRACTOR's obligations under the Contract and for the payment of any amounts claimed by the OWNER from the CONTRACTOR, provided that nothing herein stated shall make it incumbent upon the OWNER to utilize the Security Deposit in preference to any other remedy which the OWNER may have, nor shall be construed as confining the claims of the OWNER against the CONTRACTOR to the quantum of the Security Deposit.

2.1.1.9 The Security deposit including the Earnest Money / retention money(ies), and other withheld amounts from the Running Account Bill(s), if any, at any time remaining in the hands of the OWNER, shall be free of any liability for payment of any interest to the CONTRACTOR.

2.1.1.10 Upon determination of the Contract prior to completion of work(s) for any cause, the OWNER shall in so far as the Security Deposit constitutes cash refund and in so far as the Security Deposit is in any other form, release/discharge/return, as the case may be, to CONTRACTOR, the unutilized balance of the Security Deposits, if any, for the time being remaining in the hands of the OWNER after settlement of accounts and discharge of all amounts due from the CONTRACTOR to the OWNER and fulfillment of all obligations of the CONTRACTOR.

2.1.2.0 In case Mobilization Advance is paid to the CONTRACTOR under the provisions of Clause 6.4.5.0 hereof, it shall be permissible for the CONTRACTOR to furnish a Composite Bank Guarantee to cover both Mobilization Advance as well as retention monies forming part of the Security Deposit, which shall be subject to the following conditions:

a) The Composite Bank Guarantee will be for a value equivalent to 110% of the advance plus applicable GST or 10% (ten percent) of the Total Contract Value, whichever is greater, and shall be kept valid up to 3 (three) months beyond the expiry of the Defect Liability Period with a claim period of atleast 3 (three) month thereafter;

b) In addition, Initial Security Deposit shall be payable as laid down in Clause 2.1.1.2 hereof;

c) Recoveries will be effected from each Running Account Bill at the rate of 10% (ten percent) of the gross bill value, till the entire Mobilization Advance (together with interest accrued thereon) is fully recovered;

d) Initially, the composite Bank Guarantee will be entirely reckoned towards Mobilization Advance and progressively, the portions of Composite Bank Guarantee, vacated by the recoveries effected towards Mobilization Advance, shall be reckoned towards Security Deposit, such that after the Mobilization Advance stands fully recovered with interest accrued thereon, the entire composite Bank Guarantee shall be reckoned to cover the Security Deposit for the Work. The Initial Security Deposit furnished by the CONTRACTOR under (b) above shall be refunded / returned after recovery of Mobilization Advance is effected from the Running Account Bills up to an aggregate amount equivalent to the Initial Security Deposit.

e) All the other stipulations hereof in respect of Security Deposit shall apply.

2.1.3.0 The CONTRACTOR shall from time to time at the request of the OWNER suitably extend the validity of any Bank Guarantee (whether furnished by way of Initial Security Deposit, Security Deposit or Composite Bank Guarantee) or to secure any advance for such period(s) as may

from time to time be required by the OWNER failing which, without prejudice to any other right or remedy available to the OWNER, the OWNER shall be entitled to encash the Bank Guarantee. The above provisions shall apply mutatis mutandis to Insurance Surety Bond(s) if furnished .

2.2.0.0 **PLANS, DRAWINGS, SPECIFICATIONS AND APPROVALS TO BE FURNISHED BY THE OWNER**

2.2.1.0 Plan(s) and drawing(s) and other information forming part of the Tender Documents shall constitute only a general guidance to enable the CONTRACTOR to visualize the work and/or supplies contemplated under the Contract. These have been prepared and released in good faith on the basis of information available to the OWNER. The OWNER assumes no responsibility as to the correctness thereof, and the CONTRACTOR is expected prior to tendering to have undertaken a complete and independent survey and to have made his own study of all factors relevant to the performance of the work or making the supplies.

2.2.2.0 Detailed working plan(s), drawing(s), any specification(s) and approval(s) required to be furnished by the OWNER for the actual execution of the work shall be furnished from time to time as and when required during the execution of the work.

2.2.3.0 It shall be the exclusive responsibility of the CONTRACTOR to call upon the Engineer-in-charge (in respect of approvals to be furnished by the OWNER) for and to pursue and obtain from the Engineer-in-Charge any plan(s), drawings(s), specification(s) or approval(s) required to be furnished to the CONTRACTOR under the Contract for the proper execution of the work or any particular item or job therein or the making of any supply, as the case may be, as and when required, sufficiently in advance of the stage of delivery of the materials or of the commencement or progress of the work for the performance or continuance of which the same shall be required. Any failure by the CONTRACTOR to do so shall be entirely at the risks and costs of the CONTRACTOR and shall not constitute a ground for the extension of time, unless the Engineer-in-Charge shall fail to provide the CONTRACTOR plan(s), drawing(s), specification(s) or approval(s) or disapproval(s)as the case may be within 15 (fifteen) days of notice by the CONTRACTOR to the Engineer-in-charge specifically stating the drawing(s), specification(s) or approval(s) which is/are pending, the period for which it/they are pending, the reason(s) for which they are pending, and that the notice is being given pursuant to the provisions of this clause on the clear understanding that if the plan(s), drawing(s), specification(s), or approval(s) or disapproval(s), is/are not granted within 15 (fifteen) days, the CONTRACTOR will be making claim for deemed approval pursuant hereto. If thereafter, said notice notwithstanding, the approval or disapproval, as the case may be, is not granted within 15 (fifteen) days, the relative approval(s) in Code 1 shall be deemed to have been granted, and the relative approval shall at the request of the CONTRACTOR be certified thereon by the General Manager, and the CONTRACTOR shall proceed with the work accordingly, without entitlement to any extension of time on this account.

2.2.4.0 The CONTRACTOR shall carefully study the plans/drawings furnished to him, in conjunction with all other connected plans/drawings and other Contract documents and shall bring to the notice of the Engineer-in-Charge for clarification/correction any ambiguity, error, discrepancy, contradiction or omission therein prior to the execution of the related work (s) or undertaking the related supply (ies) as the case may be, and the provisions of Clause 2.0.9.0 hereof shall mutatis mutandis apply to such clarification or correction.

2.2.4.1 Any work performed by the CONTRACTOR in absence of or contrary to such clarification/correction, shall be at the CONTRACTOR's risks and responsibilities and the provisions of Clauses 2.0.10.0 and 5.1.4.0 hereof and associated clauses there under with respect to defective works shall apply thereto.

2.2.4.2 Any approval to be accorded by the Engineer-in-Charge/ OWNER shall be furnished either in Code 3, Code 2 or Code 1 and the Contractor shall take the necessary action as may be required. For the purposes of the Contract:

"Code-1 or Level-1 Approval or Approved for Construction (AFC)" means final approval of drawings/documents incorporating all comments of the OWNER (including OWNER's Consultant);

"Code-2 or Level-2 Approval" means tentative approval of the drawings/ documents by the

OWNER (including OWNER's Consultant) with comments to be incorporated by Contractor, with the intent that subject to incorporation of and/or rectification in accordance with such comments, construction/ manufacture can proceed based on commented drawings/ documents pending their re-submission and grant of Code-1 or Level-1 Approval;

"Code-3 or Level-3 Approval" means that on review of the drawings/ documents by the OWNER (including OWNER's Consultant) the same have not been found in accordance with the applicable codes, standards, design basis and contractual stipulations and must therefore be re-submitted for review and approval after appropriate correction and/or re-preparation.

2.2.5.0 Notwithstanding anything to the contrary in the Contract Documents expressed or implied, and notwithstanding the absence of any ambiguity, error, discrepancy, contradiction or omission in the plans/drawings as aforesaid, the OWNER shall be entitled at any time before or during execution of the related work(s) to amend / modify or alter any plan(s), drawing(s) or specifications furnished to the CONTRACTOR by the OWNER and the CONTRACTOR shall thereafter perform and / or continue to perform the related work(s) according to the amended / modified / altered plans/ drawings/ specifications without entitlement to any extra remuneration and should the CONTRACTOR execute any relative work(s) at variance therewith (notwithstanding that the CONTRACTOR shall have already been made any payment in respect thereof), the provisions of Clause 5.1.4.0 hereof and associated clauses there under relating to defective works shall apply thereto, provided that:

(i) If any such amendment / modification / alteration shall in the opinion of the CONTRACTOR, necessitate an extension of time for completion, the provisions of Clause 4.3.6.0 hereof and clauses related thereto shall apply.

(ii) If such amendment or modification shall in the opinion of the Engineer-in-Charge (whose opinion in this behalf shall be final and binding upon the CONTRACTOR) necessitate the performance of any work not covered by the Schedule of Rates or the lump sum price, as the case may be, the remuneration for such work or portion or item thereof, as the case may be, not covered by the Schedule of Rates or lump sum price, as the case may be, shall be determined in accordance with the provisions of Clause 2.4.1.2 hereof.

2.2.6.0 Copies of all plans and drawings relating to work(s) shall be kept and maintained at the CONTRACTOR's office at the site and shall be made available to the Engineer-in-Charge and Site Engineer for inspection and reference at any time during the execution of work.

2.2.7.0 All plans and drawings furnished by the OWNER to the CONTRACTOR shall be and remain the property of the OWNER and shall be returned by the CONTRACTOR to the OWNER on completion of the works or prior determination of the Contract.

**2.3.0.0 PLANS, DESIGNS, DRAWINGS & SPECIFICATIONS TO BE FURNISHED BY THE CONTRACTOR**

2.3.1.0 Where the CONTRACTOR shall, within the scope of work, be required to prepare or furnish any plan(s), drawing(s), design(s) or specifications in respect of the work or any particular work, the CONTRACTOR shall within 15 (fifteen) days (or such other period as the OWNER may prescribe in this behalf) of receipt of notification of Acceptance of Tender or within 15 (fifteen) days before the proposed date of commencement of the relative work, whichever shall be earlier, submit to the OWNER for approval the relative plan(s), drawing(s), design(s) or specification(s). The OWNER shall be entitled at any time to suggest any amendment(s) / modification(s) in the plans, designs, drawings or specifications and the CONTRACTOR shall thereupon either convince the OWNER of the unnecessity in whole or portion of such amendment / modification or shall implement the same and shall cause the plans, drawings, designs or specifications to be accordingly amended provided that no such approval of or amendments or modifications in the plans, drawings, designs or specifications by or suggested by the OWNER shall anywise absolve the CONTRACTOR of any of his obligations, responsibilities or liabilities under the Contract.

2.3.2.0 The CONTRACTOR shall not permit any work to be done or any installation, material or equipment to be supplied or fabricated or erected at variance with plans, drawings, designs or specifications approved by the OWNER and / or amended or modified as aforesaid.

2.3.3.0 Unless otherwise required, at least 3 (three) sets along with soft copies / scanned copies in

pdf / acceptable format of all approved plans, drawings, designs and specifications prepared by the CONTRACTOR, together with similar set of all revisions, amendments, and modifications therein shall be lodged with the OWNER for the record of the OWNER. Such sets of plans, drawings, designs and specifications shall be signed by the CONTRACTOR and shall indicate thereon the number and date of each revision, amendment and/or modification of communication by the OWNER or any consultant appointed by the OWNER for or relative to the approval thereof.

2.4.0.0 **ALTERATIONS IN DESIGNS, PLANS, DRAWINGS, SPECIFICATIONS, ORDERS AND INSTRUCTIONS**

2.4.1.0 In addition to the provisions of Clause 2.2.0.0 and associated clauses there under, the Engineer-in-Charge and / or Site Engineer shall have the power by written notice to the CONTRACTOR at any time prior to or in the course of the execution of works or any part thereof to alter or amend the specifications, orders and / or instructions or any of them by addition, omission, substitution or otherwise howsoever with or without altering or amending the plans, drawings and / or designs and the CONTRACTOR shall carry out the related work in accordance with such altered specifications, orders, instructions, plans, drawings and / or designs as the case may be, on the same terms and conditions in all respects, subject to the provisions of Clause 2.4.1.2 hereof.

2.4.1.1 If such alteration or amendment shall, in the opinion of the CONTRACTOR, necessitate an extension in the time for completion, the provision of Clause 4.3.6.0 hereof and related clauses with regard to the extension of time, shall apply.

2.4.1.2(a) If such alteration or amendment shall, in the opinion of the Engineer-in-Charge (whose opinion in this behalf shall be final and binding upon the CONTRACTOR), necessitate the performance of any work not covered by the Schedule of Rates, the remuneration for such work or portion or item thereof not covered by the Schedule of Rates shall be determined in the following manner:

(i) If it is possible to derive the rate(s) for such work or items of work from any of the items of material and / or work covered in the Schedule of Rate(s), the rate(s) for the relative works / items shall be the rate(s) arrived at on the basis of such derivation. The opinion of the Engineer-in-Charge as to whether or not the relative rates can be derived from the rates for the items of material and / or work included in the Schedule of Rates and the consequent derivation of rate(s) on basis thereof shall be final and binding upon the CONTRACTOR.

(ii) If, in the opinion of the Engineer-in-Charge, the relative rate(s) shall not be derivable within the provisions of paragraph (i) hereof above, the relative rate(s) shall be the rate(s) for the work or items of work settled as follows:

An analysis of the rate for the completed work or items shall be prepared by taking (if andso far as applicable):

A) Issue rate(s) for materials supplied by the OWNER, if applicable;

B) Materials supplied by the CONTRACTOR and incorporated in the permanent works at the rate(s) (if any) for material specified in the relevant Schedule forming part of the Contract; and

C) Labour cost at rate(s) for labour, if any, specified in the relevant Schedule forming part of the Contract.

(iii) The opinion of the Engineer-in-Charge as to the quantity of material and / or labour involved shall be final and binding on the CONTRACTOR.

(iv) In the event of any item of material or labour involved not being covered by the relevant schedule forming part of the Contract for the purpose of determining the rates in terms of items (B) and / or (C) of paragraph (ii) above, market rates shall be taken into account for such items of materials and labour as are not covered by the relevant schedules forming part of the contract and there shall be added thereto 15% (Fifteen percent) to cover CONTRACTOR's supervision, overheads and profits. For the purpose of clarification, it is stated that 15% (Fifteen percent) addition shall apply only for any item not covered by

the relevant schedule of the Contract.

(v) The opinion of the Engineer-in-Charge as to whether or not any particular item(s) of material(s) or labour involved is covered by the relevant Schedule(s) and if not as to the market rate(s) thereof shall be final and binding upon the CONTRACTOR.

2.4.1.2 (b) If any alteration, amendment or modification shall, in the opinion of the Engineer-in- charge (whose opinion in this behalf shall be final and binding upon the CONTRACTOR) result in a reduction or increase or change in the work or supply covered by the lump sum Price so as to render unreasonable the lump sum Price, the OWNER and the CONTRACTOR shall negotiate a suitable increase or reduction, as the case may be, in the lump sum Price, and failing agreement on a negotiated rate for the item by appropriate reduction/increase, as the case may be, the Engineer-in-Charge shall fix the reduction or increase as he considers reasonable in the circumstances to the lump sum Price, and the lump sum Price shall be deemed to be accordingly amended to the extent applicable to the work covered by the alteration or amendment.

2.4.1.3 Pending finalization in respect of the revised rate of any item in the Price Schedule or increase/reduction in the lump sum Price pursuant to the provisions of clause 2.4.1.2 hereof, the CONTRACTOR shall continue and be bound to continue and perform the works and/or make the supply to completion in all respects according to the contract (unless the contract or works be determined by the OWNER) and the CONTRACTOR shall be liable and bound in all respects under the contract.

2.4.2.0 The rate(s) for any work determined in accordance with the provisions of Clause 2.4.1.2 above shall for the purpose of the Contract with respect of the work or items of work or supply affected by such amendment, alteration or modification be deemed to be rate(s) for such work or item(s) of work within the Schedule of Rates, or the lump sum Price, as the case may be.

2.4.3.0 The CONTRACTOR shall not be entitled to any compensation in addition to the payment for the work actually performed by the CONTRACTOR calculated on the basis of the Schedule of Rate(s) or lump sum Price or as provided for in Clause 2.4.1.2 hereof, as the case may be, as a result of any amendment or variation in the specification, orders, instructions, plans, designs or drawings notwithstanding that such alteration(s) / variation(s) may have resulted in a reduction of the total quantum or value of the work involved under the Contract, except as provided for in clause 2.6.2.0 hereunder.

2.5.0.0 **ALTERATION IN THE SCOPE OF WORK**

2.5.1.0 The OWNER may, at any time(s) before or after the commencement of the work, by notice in writing issued to the CONTRACTOR, alter the scope of work by increasing or reducing the works or the jobs required to be done by the CONTRACTOR or by adding thereto or omitting there from any specific works or jobs or operations or by substituting any existing works or jobs or operations with other works or jobs and / or operations, or by requiring the CONTRACTOR to perform any additional works in or about the job site, and upon receipt of such notice, the CONTRACTOR shall execute the job(s) as required within the altered scope of work.

2.5.2.0 If any alteration in the scope of work shall, in the opinion of the CONTRACTOR, necessitate any extension in the time for completion, the provisions of Clause 4.3.6.0 hereof and associated clauses with regard to the extension of time shall apply.

2.5.3.0 (a) If such alteration shall, in the opinion of the Engineer-in-Charge (whose opinion in this behalf shall be final and binding upon the CONTRACTOR), necessitate the performance of any work not covered by the Schedule of Rates, the remuneration for such work or portion or item thereof not covered by Schedule of Rates shall be determined in accordance with the provisions of Clause 2.4.1.2 hereof.

(b) If in the opinion of the Engineer-in-Charge (whose opinion in this behalf shall be final and binding upon the CONTRACTOR) any alteration in the scope of the work shall result in any reduction or increase or change in the work or supply covered by the lump sum price so as to render unreasonable the lump price, the lump sum Price shall be increased or reduced, as the case may be, in accordance with Clause 2.4.1.2 hereof.

2.5.3.1 Providing determination of the rates aforesaid, the provisions of clause 2.4.2.0 shall mutatis

mutandis apply.

2.5.4.0 The CONTRACTOR shall not be entitled to any compensation in addition to the payment for the work actually performed by the CONTRACTOR calculated on the basis of the Schedule of Rates or lump sum Price or as provided in Clause 2.4.1.2 hereof, as the case may be, as a result of any alteration in the scope of work notwithstanding that such alteration may have resulted in a reduction in the total quantities or value of work involved, except as provided for in clause 2.6.2.0 hereunder.

2.6.0.0 **QUANTITIES OF WORK**

2.6.1.0 Subject to the provisions of Clause 2.6.2.0 hereof, the quantities of work stated in the Form ofSchedule of Rates do not form part of the Contract and the OWNER shall not be liable for any increase or decrease in the actual quantities of work performed (notwithstanding the percentage of such increase or decrease), nor shall such increase or decrease in the actual quantities form the basis of any alteration of rates quoted and accepted or in the lump sum price or for any claim for additional compensation, damages or loss or profits or otherwise, with the intent that the CONTRACTOR shall notwithstanding the quantities mentioned in the Form of Schedule of Rates only be entitled to payment in respect of actual quantities of work performed in terms of the contract and measured in the Final Measurements, notwithstanding the percentage of increase or shortfall in such quantities and notwithstanding that the Total Contract Value for the completed works on finalization of all dues to the CONTRACTOR under the Contract shall be less than the total contract value as specified for the purpose of Security Deposit in the Acceptance of Tender.

2.6.1.1 Notwithstanding the provision of Clause 2.6.1.0, if at any time prior to completion of the work(s), the CONTRACTOR finds that the accumulated quantities of work and the amounts payable in respect thereof under the Schedule of Rates exceeds by more than 20% (twenty per cent) of the estimated Total Contract Value of the work as set out in the detailed Letter of Acceptance, the CONTRACTOR may give a written notice thereof to the Site Engineer and Engineer-in-Charge. The CONTRACTOR may within 7 (seven) days of the notice aforesaid, if given, make a written request to Engineer-in-Charge for extension of any relative time of performance in accordance with the provisions of Clause 4.3.6.0 and all provisions relevant thereto shall be applicable to such request.

2.6.2.0 If, as a consequence of such amendments/variations/alterations/modifications/reductions, as envisaged in clauses 2.4.0.0 and/or 2.5.0.0 hereof and associated sub clauses there under, or pursuant to Clause 2.6.1.0 hereof, the quantities of work and the gross value of work actually performed by the CONTRACTOR, as valued on finalization of all dues to the CONTRACTOR under the Contract, shall be less than 80% (eighty percent) of the Total contract value, then the CONTRACTOR shall be entitled to 10% (ten percent) of the amount by which the reduced contract value as aforesaid falls short of 80% (eighty percent) of the Total Contract Value by way of allowance for the advantage (including profit) which the CONTRACTOR may have anticipated on the execution of the work up to the Total Contract Value. And the CONTRACTOR shall not be entitled to any compensation in addition to the payments specifically provided for above, and the CONTRACTOR hereby specifically waives any and all contrary rights and claims whatsoever.

2.7.0.0 **CANCELLATION OF CONTRACT**

2.7.1.0 The OWNER shall be entitled at any time at his discretion to cancel the Contract, if, in the opinion of the OWNER, the cessation of the work becomes necessary owing to any cause whatsoever, and a notice in writing from the OWNER to the CONTRACTOR of such cancellation and the reason(s) therefor shall be conclusive proof of such cancellation and the reasons therefor.

2.7.2.0 Upon cancellation of the Contract, the Engineer-in-Charge may require the CONTRACTOR:

i) To perform to completion or to any other intermediary stage of completion to the satisfaction of the Engineer-in-Charge any work(s) already commenced by the CONTRACTOR and

ii) To take such steps as are considered necessary by the Engineer-in-Charge for properly protecting and securing the works performed by the CONTRACTOR, to the satisfaction

of the Engineer-in-Charge:

And the CONTRACTOR shall act accordingly and the same shall be deemed to be included within the CONTRACTOR's scope of work.

2.7.3.0 Upon receipt of a notice as specified in Clause 2.7.1.0 hereof the CONTRACTOR shall, unless the notice otherwise requires:

i) Immediately discontinue work and/or supply from the date and to the extent specified in the notice;

ii) Not place any further orders or sub-contracts for materials, services or facilities other than as may be necessary or required for completing or performing such portion of the work(s) or supplies which the CONTRACTOR is required to complete or perform;

iii) Promptly make every reasonable effort to obtain cancellation or fulfillment, as the case may be, at the option of the Engineer-in-Charge/OWNER of all orders and sub-contracts to the extent they relate to the performance of the work(s) or supplies cancelled.

iv) Assist the Engineer-in-Charge/OWNER as specifically requested in writing by the Engineer-in-Charge/OWNER in the maintenance, protection and disposition of property/works acquired by the OWNER pursuant to the Contract.

2.7.4.0 Upon cancellation of the Contract, the OWNER shall take over from the CONTRACTOR the approved surplus materials supplied by the CONTRACTOR for permanent incorporation in the work and lying at the job site on the date of receipt of notice of cancellation by the CONTRACTOR and the decision of the Site Engineer as to the approved materials lying at Site on the date of cancellation and the quantities thereof shall be final and binding upon the CONTRACTOR.

2.7.5.0 Upon cancellation of the Contract, the CONTRACTOR agrees to waive any claim for damages, including loss of anticipated profits on account thereof, and as the sole right and remedy of the CONTRACTOR against the OWNER resultant upon such cancellation, the CONTRACTOR agrees to accept from the OWNER the following, namely:

i) The cost of settling and paying claims for cancellation or completion of pending orders and/or sub-contracts as provided for in sub-clause (iii) of Clause 2.7.3.0 hereof;

ii) The cost of protecting, securing and/or maintaining the works pursuant to the provisions of sub-clause (ii) of Clause 2.7.2.0 hereof and/or sub-clause (iv) of Clause 2.7.3.0 hereof;

iii) Payment for the supplies actually made determined in accordance with the provisions of Clause 2.4.1.2 hereof.

iv) Payment for the work actually performed by the CONTRACTOR calculated on the basis of Unit Rates or lump sum rates wherever applicable and the provisions of Clause 6.1.0.0 shall apply mutatis mutandis. Where Unit Rates or lump sum rates are not applicable and/or the relative works are incomplete, the provisions of Clause 2.4.1.2 shall apply for calculating remuneration.

v) The cost of materials taken over by the OWNER including materials dispatched and/or in transit for permanent incorporation in the Works prior to the receipt of the notice referred to in Clause 2.7.4.0 hereof, subject to such material having been delivered to the OWNER in good condition.

vi) An allowance, if any due, as determined by the Engineer-in-Charge (whose decision shall be final) to cover the cost of CONTRACTOR's actual mobilization and demobilization at job site for the work to the extent uncovered by payments under items (i) to (iv) above.

The CONTRACTOR shall not be entitled to any compensation in addition to the payments specifically provided for above, and the CONTRACTOR hereby specifically waives any and all contrary rights and claims whatsoever.

Provided that upon cancellation of the Contract on account of Force Majeure, the CONTRACTOR shall be entitled only to the following from the OWNER, namely:

(a) The cost of protecting, securing and/or maintaining the works pursuant to the provisions of sub-clause (ii) of Clause 2.7.2.0 hereof and/or sub-clause (iv) of Clause

2.7.3.0 hereof;

(b) Payment for the supplies actually made determined in accordance with the provisions of Clause 2.4.1.2 hereof.

(c) Payment for the work actually performed by the CONTRACTOR calculated on the basis of Unit Rates or lump sum rates wherever applicable and the provisions of Clause 6.1.0.0 shall apply mutatis mutandis. Where Unit Rates or lump sum rates are not applicable and/or the relative works are incomplete, the provisions of Clause 2.4.1.2 shall apply for calculating remuneration.

(d) The cost of materials taken over by the OWNER including materials dispatched and/or in transit for permanent incorporation in the Works prior to the receipt of the notice referred to in Clause 2.7.4.0 hereof, subject to such material having been delivered to the OWNER in good condition.

It is further agreed that the CONTRACTOR shall not be entitled to any compensation in addition to the payments specifically provided for above, and the CONTRACTOR hereby specifically waives any and all contrary rights and claims whatsoever.

2.7.6.0 For purposes of measurement, the provisions of Clause 6.1.0.0 shall apply. For purposes of payments, provisions of Clause 6.4.9.3 shall apply, as applicable.

2.7.7.0 Upon cancellation of the Contract, the CONTRACTOR shall as soon as is reasonably feasible prepare an account of all amounts due to it from the OWNER pursuant to Clause 2.7.5.0 hereof and upon submission of such account to the OWNER, the CONTRACTOR shall forthwith provide Bank Guarantee(s)/Insurance Surety Bond(s) (only if the CONTRACTOR is an Indian entity) furnished by way of Security Deposit with reduced value to cover defects in the works performed and supplies made by the CONTRACTOR for the Defect Liability Period specified in Clause 5.6.1.2 hereof, and such Bank Guarantee(s) shall be valid throughout Defect liability period shall have a claim period of 3 (three) month thereafter. Alternatively, the CONTRACTOR may also cause fresh Bank Guarantee(s)/ Insurance Surety Bond(s) (only if the CONTRACTOR is an Indian entity) to be furnished to the OWNER for the amount and period aforesaid in lieu of the existing Bank Guarantee(s)/ Insurance Surety Bond(s) furnished to the OWNER by way of Security Deposit and the provisions of Clause 2.1.1.0 to 2.1.3.0 hereof shall mutatis mutandis apply to such substituted Bank Guarantee(s)/Insurance Surety Bond(s).

2.8.0.0 **SUSPENSION OF WORK**

2.8.1.0 The Engineer-in-Charge may at any time(s) at his discretion, should he consider that the circumstances so warrant (the decision of the Engineer-in-Charge as to existence of circumstances warranting such suspension shall be final and binding upon the CONTRACTOR), by notice in writing to the CONTRACTOR temporarily suspend the work or supply or any part thereof for such period(s) as Engineer-in-Charge shall deem necessary and the CONTRACTOR shall upon receipt of the order of suspension forthwith suspend the work(s) or supply (ies) or such part thereof as shall have been suspended until he has received a written order from the Engineer-in-Charge to proceed with the work suspended or any part thereof.

2.8.1.1 During the period of any suspension under Clause 2.8.1.0 the CONTRACTOR shall at his own cost within the scope of the relative work properly protect and secure the work and materials so far as is necessary in the opinion of the Engineer-in-Charge.

2.8.2.0 If the suspension under Clause 2.8.1.0 is for reasons of force majeure as defined in Clause 4.3.9.0 or by reason(s) of default or failure on the part of the CONTRACTOR or is for the purpose of ensuring safety of the work(s) or any part thereof or is necessary for the proper execution of the work(s) or is for reason(s) of weather affecting the safety or quality of the work(s) or materials (the reasons for the suspension stated by the Engineer-in-Charge in any notice of suspension as aforesaid, inclusive as to existence of default or failure on the part of the CONTRACTOR, if so stated in the notice, shall be final and binding upon the CONTRACTOR), the CONTRACTOR shall not be entitled to claim compensation for any loss or damage sustained by the CONTRACTOR by virtue of any suspension as aforesaid

notwithstanding that consequent upon such suspension the machinery, equipment and/or labour of the CONTRACTOR or any part thereof shall be or become or be rendered idle and notwithstanding that the CONTRACTOR shall be liable to pay salary, wages or hire charges or bear other charges and expenses thereof.

2.8.3.0 Unless the suspension is by reason of default or failure on the part of the CONTRACTOR (and the reasons for the suspension stated by the Engineer-in-Charge in any notice of suspension as aforesaid inclusive as to the existence of default or failure on the part of the CONTRACTOR if so stated in the notice, shall be final and binding upon the CONTRACTOR), if in the opinion of the CONTRACTOR such suspension shall necessitate any extension in the time of completion, the provisions of Clause 4.3.6.0 hereof and related clauses in respect of extension of time shall apply.

2.8.4.0(a) In the event of a suspension affecting the entire works remaining in operation in respect of the entire works for a period in excess of 4 (four) months from the date of commencement of the suspension, the CONTRACTOR shall have the option at any time before the issue of an order by the OWNER or the Engineer-in-Charge removing the suspension, to terminate the Contract by giving written notice thereof to the OWNER. Unless the suspension be by reason of default or failure on the part of the CONTRACTOR, as specified in clause 2.8.3.0 hereof, and subject to provisions of 2.8.2.0 such termination shall be deemed to operate as a cancellation of Contract, within the provisions of clause 2.7.1.0 hereof, and the provisions of clause 2.7.2.0 to 2.7.7.0 shall apply mutatis mutandis thereto.

2.8.4.0(b) In the event of a suspension affecting part of the works for a period in excess of 4 (four) months from the date of commencement of the suspension, and unless the suspension be by reason of default or failure on the part of the CONTRACTOR, as specified in clause 2.8.3.0 hereof, and subject to provisions of 2.8.2.0 the CONTRACTOR shall have the option at anytime before the issue of an order by the OWNER or the Engineer-in-Charge removing such suspension, to seek alteration in the Scope of Work in respect of suspended works by giving a written notice thereof to the OWNER. If the Engineer-In-Charge/Owner does not lift the suspension within 28 (Twenty Eight) days of receipt of the Contractor's notice as aforesaid, the scope of work shall be deemed to be altered to the extent that the suspended works shall not be within the scope of the Contract. Such alteration shall be considered as an alteration under Clause 2.5.0.0.

2.8.5.0 In the event of such termination being upon a suspension consequent to a default or failure by the CONTRACTOR, the CONTRACTOR shall not be entitled to any damage, compensation, loss of profit or other compensation whatsoever in addition to payment for the completed supplies made and completed works done in terms of the Contract in accordance with the provisions of sub-clauses (iii), (iv) & (v) of clause 2.7.5.0 hereof.

2.8.6.0 Except for a suspension by a written order of the Engineer-in-Charge under clause 2.8.1.0 hereof, the CONTRACTOR shall not suspend the work for any cause and any such suspension if occurs, shall be attended by consequences as for suspension under clause 7.0.1.0 (i)(i) and (k) hereof.

2.8.7.0 Notwithstanding anything provided in Clause 2.7.0.0 and/or Clause 2.8.0.0 and related Clauses there under, upon a cancellation of the contract under the provisions of Clause 2.7.1.0 hereof or termination of the contract under provisions of Clause 2.8.4.0 (a) hereof, the provisions of Clauses 7.0.3.0 to 7.0.7.0 hereof consequent upon termination of Contract, shall apply. Should the termination be one to which the provisions of Clause 2.8.5.0 hereof apply, then the provision of Clauses 7.0.2.0 to 7.3.0.0 consequent upon termination of Contract shall also mutatis mutandis apply.

2.9.0.0 DECISION OF OWNER OR ENGINEER-IN-CHARGE

2.9.1.0 Any decision, opinion, or determination by the OWNER or the Engineer-in-Charge, which is expressed in terms of these General Conditions of Contract to be final and/or binding upon the CONTRACTOR shall be arrived at after giving the CONTRACTOR an opportunity to be heard either by making a written representation or by way of a personal hearing, and the

decision, opinion or determination, as the case may be, shall be arrived at after taking into account the views, if any, of the CONTRACTOR and shall record the reason(s) on which the decision, opinion or determination is based.

## SECTION - 3

### MATERIALS, LABOUR AND EQUIPMENT

3.0.0.0 CONTRACTOR'S RESPONSIBILITY

3.0.1.0 Notwithstanding anything to the contrary in the Contract Documents express or implied, the CONTRACTOR shall be and remain at all times exclusively responsible to provide all material, labour, equipment, machinery, facilities, utilities and consumables and temporary works and other items and things whatsoever required for or in connection with the work, including, but not limited to those indicated by expression or implication in the Job Description, Schedule of Rates, the Specification, Plans, Drawings, and/or other Contract Documents or howsoever otherwise as shall or may from time to time and at any time be necessary for or in connection with the work, either for incorporation in or within the permanent works or in or relative to the execution and performance of the work.

3.1.0.0 MATERIALS SUPPLIED BY THE CONTRACTOR

3.1.1.0 Materials supplied by the CONTRACTOR shall conform to the specifications and shall be suitable for the purpose for which they are required.

3.1.2.0 Unless otherwise specified by the OWNER, all materials supplied by the CONTRACTOR shall be supplied by reputed manufacturers or suppliers approved by the OWNER or listed for the relative materials with the DGS&D and/or borne on the approved list of suppliers maintained for relative items by such organizations as are approved by the Engineer-in- Charge. If in respect of any materials, including but not limited to sand, stone, aggregate, bricks, earth, lime, steel and cement in respect whereof neither IS marking/approval nor any approved list of suppliers is available, such materials shall be obtained from sources/suppliers/manufacturers approved by the Engineer-in-Charge provided that no approval by the Engineer-in-Charge or any other representative of the OWNER for the supply of IS stamped materials or of materials supplied by DGS&D listed suppliers or other approved suppliers shall relieve the CONTRACTOR of his full responsibility in respect of the suitability and quality of the material or any defects therein or in any works or construction in or relative to which the same has been utilized.

3.1.3.0 Notwithstanding that any area(s) or source(s) has/have been allotted or suggested by the OWNER to the CONTRACTOR from which any materials for incorporation in the works can be obtained, the CONTRACTOR shall independently satisfy himself of the suitability, accessibility and sufficiency of the source(s) of supply suggested or allocated by the OWNER and suitability of materials available from such source(s), with the intent that any allotment or suggestion as aforesaid shall not anywise relieve the CONTRACTOR of his full liability in respect of the suitability and quality of material(s) there from and incorporate the same within the permanent works entirely at his own risks and costs in all respects, with the intent that any such allocation or suggestion by the OWNER shall only be by way of assistance to the CONTRACTOR and shall not entail any legal or financial responsibility or liability upon the OWNER.

3.1.4.0 Notwithstanding any other provisions in the Contract Documents for analysis or tests of materials and in addition thereto, the CONTRACTOR, shall, if so required for reasonable cause by the Engineer-in-Charge or Site Engineer in writing, at his own risks and costs, analyze, test, prove and weigh all materials (including materials incorporated in the work(s)) required to be analyzed, tested, proved and/or weighed by the Engineer-in-Charge or Site Engineer and shall have such analysis test conducted by the agency(ies), if any, specified by the Engineer-in-Charge or Site Engineer. The CONTRACTOR shall provide all equipment, labour, materials and other things whatsoever required for testing, preparation of the samples, measurement of work and/or proof or weighment of the materials as directed by the Engineer-in-Charge or Site Engineer.

3.1.5.0 The OWNER does not warrant or undertake the provision of any material(s) and the CONTRACTOR shall not imply by conduct, expression or assurance or by any other means any promise or obligation on the part of the OWNER in this respect understood by the CONTRACTOR, unless made by specific written instrument forming part of the CONTRACT or appropriately entitled as an amendment to the Contract.

3.2.0.0 MATERIAL AND EQUIPMENT SUPPLIED BY THE OWNER

3.2.1.0 In the case of contracts (including for equipment erection and/or piping), for which the OWNER undertakes the procurement and supply of equipment and materials, the supply of equipment

and materials to the CONTRACTOR shall be on the following terms and conditions:

(a) Deliveries shall be either from the storage of the OWNER or from the factory/storage of supplier or from nearest suitable railhead or other point(s) of collection as may be determined by the OWNER taking into account the source(s) of supply of the material.

(b) It shall be the responsibility of the CONTRACTOR at his own risks and costs to take delivery of the materials from the stores, factory, railhead or other collection point, as the case may be, and to arrange for its loading, transportation to job site and unloading at the job site or other place of storage. The CONTRACTOR shall in taking delivery ensure compliance of any conditions for delivery applicable to deliveries from OWNER's or supplier's factory/stores or railways or other transporters concerned, and shall be exclusively responsible to pay and bear any demurrage or penalty or other charges payable by virtue of any failure or delay by the CONTRACTOR in lifting the supplies and/or any failure by the CONTRACTOR to observe the conditions of supply as aforesaid, and shall keep the OWNER indemnified from and against all consequences thereof.

(c) The CONTRACTOR shall inspect the equipment and materials supplied to him at the time of taking delivery thereof and satisfy himself of the quantity and condition thereof prior to taking delivery and the OWNER shall not be liable for any claims or complaintsfor any defect or deficiency in the equipment or materials once the CONTRACTOR has taken delivery thereof, if the defect or deficiency could have been reasonably detected at the time of delivery.

(d) The CONTRACTOR shall on receiving and opening the packing cases or other packaging of equipment and material on behalf of the OWNER, verify and tally the actual contents with the packing list and bring any discrepancies to the notice of the Engineer- in-charge and the Site Engineer. The CONTRACTOR shall also sort out and segregate and hand over to the OWNER's stores, the Instruction Manuals, Operation and Maintenance Manuals, Special Maintenance Tools, Erection Spares, Commissioning Spares, and Maintenance Spares and other extras, if received with the main equipment. The Erection Spares may be got issued from the OWNER's stores if required, after getting authorization from the Engineer-in-charge. The Commissioning Spares may be got issued from the OWNER's Stores, if Commissioning is included in the CONTRACTOR's scope.

(e) The equipment and/or material(s) supplied or procured by the OWNER shall be utilized by the CONTRACTOR only for incorporation in the permanent works and even so shall not (unless specifically authorized by the OWNER in this behalf) be utilized for manufacturing any item(s) which can be obtained in finished form from standard manufactures.

(f) The CONTRACTOR shall furnish to the Engineer-in-Charge sufficiently in advance a detailed statement showing his requirement of the types and quantities of equipment and materials agreed to be supplied by the OWNER, indication of the time when relative types and quantities thereof shall be required by him for the works so as to enable the OWNER to verify the quantities of materials specified by the CONTRACTOR and to enable the OWNER to make arrangements for the supply thereof.

g) The OWNER shall not be responsible for any delay in the supply of any equipment and/or materials supplied or procured or agreed to be supplied or procured by the OWNER, and no such delay or failure shall anyway render the OWNER liable for any claim for damages or compensation by the CONTRACTOR notwithstanding that an increase in the time of performance of the contract be involved by virtue of such delay and notwithstanding any labour, machinery or equipment brought upon to the job site by the CONTRACTOR for the performance of the work being rendered idle by such delay or failure, PROVIDED that if such delay shall in the opinion of the CONTRACTOR, necessitate an extension of time for completion, the provisions of Clause 4.3.6.0 hereof relating to extension of time and associated provisions thereof shall apply.

h) The CONTRACTOR shall maintain a day to day account of all equipment and materials supplied to him by the OWNER indicating the daily receipt(s), consumption and balance(s) in hand of each material and category thereof. Such account shall be maintained in such form (if any) as shall be prescribed by the Engineer-in-Charge and shall be supported by all documents necessary to verify the correctness of the entries in the account. Such account shall be maintained at the CONTRACTOR's office at the site, and shall be open for inspection and verification (by verification of documents in support of the entry as also by physical verification of the stocks) at all times by the Engineer-in- charge and Site Engineer without notice, and for the purpose the Engineer-in-Charge and Site Engineer shall be permitted and

enabled without obstruction to enter into any godown or other place or premises where the equipment or materials or any part thereof shall be stored and to inspect the same and to take by himself and/or through his representative(s) an inventory thereof.

i) All equipment and materials supplied by the OWNER shall be taken delivery of, held, stored and utilized by the CONTRACTOR as trustee of the OWNER, and delivery of material to the CONTRACTOR shall constitute an entrustment thereof by the OWNER to the CONTRACTOR, with the intent that any utilization, application or disposal thereof by the CONTRACTOR otherwise than for permanent incorporation in contractual works in terms hereof shall constitute a breach of trust by the CONTRACTOR.

j) The CONTRACTOR shall hold and store any equipment or material(s) supplied by the OWNER only at such place and/or premises as may be approved by the Engineer-in-Charge, provided that no such approval shall absolve the CONTRACTOR in whole or part of his full liabilities in respect of such material, and the CONTRACTOR shall be and remain responsible at all times at his own risk and cost to ensure that the material(s) supplied by the OWNER is/are retained at all times in premises that are air and water tight and otherwise suitable for the storage of the concerned equipment or materials so as to prevent damage or deterioration for any cause whatsoever or theft or other loss, and shall arrange such watch and ward therefor as shall be necessary to ensure the safety thereof.

k) The Engineer-in-Charge may at his discretion require that all premises in which any equipment or materials supplied by the OWNER are stored, shall be double-locked with the keys to one lock retained by the Site Engineer or his representative and the other with the CONTRACTOR with the intent that all issues of OWNER supplied equipment and materials shall be with concurrence of the Site Engineer or his representative, as the case may be, provided that any such double-locking and/or concurrence as aforesaid shall be an additional precaution and shall not anywise absolve the CONTRACTOR of his full liabilities or responsibilities in respect of such equipment or materials.

l) The equipment supplied by the OWNER shall be insured by the OWNER against normal risks during transit, storage and erection. The CONTRACTOR shall, however, be responsible forthwith to make and pursue on behalf of the OWNER any and all claims under the policy (ies) and to fulfill all formalities required to obtain payment there under and/or to assist the OWNER in making or pursuing any such claim(s) and/or in obtaining payment there under.

m) The CONTRACTOR shall be required to take out at his own cost and initiative and keep in force at all times during the pendency of the contractual work, policy (ies) of insurance against the risks of fire, lightning, flood, inundation and theft and against any other damage or loss, for the full value of the OWNER supplied materials lying in the CONTRACTOR's custody and/or storage pending utilization/ incorporation in the work and during erection/incorporation in the work. The insurance shall be kept valid till the completions of the work and till the materials are duly accounted for to the satisfaction of the OWNER.

n) Such insurance policy (ies) shall be in the joint names of OWNER and the CONTRACTOR with exclusive right in the OWNER to receive all money (ies) due in respect of such policy (ies), and with right in the OWNER (but without obligation to do so) to take out and/or pay the premia for any such policy (ies) and deduct the premia and any other costs and expenses in this behalf from the money (ies) for the time being due to the CONTRACTOR.

o) Notwithstanding anything stated above, it shall be the responsibility of the CONTRACTOR to lodge with insurers and follow up claim(s), if any, under any policy(ies) of insurance aforesaid, and nothing herein provided shall absolve the CONTRACTOR from his full liabilities under the provisions of this clause and associated provisions hereof.

p) Where the OWNER issued materials are being stored within the battery area under the security and gate-pass control of the OWNER and are covered by the Overall Storage- cum erection insurance Policy taken by the OWNER for the works, the OWNER may, at his sole discretion, permit the CONTRACTOR to furnish in lieu of insurance provided in (m) above, an Indemnity Bond in the proforma prescribed by the OWNER, for the entire value of the OWNER supplied materials and for the entire duration during which the materials shall be lying in the storage and custody of the CONTRACTOR.

q) No such Insurance(s), as aforesaid, shall anywise absolve the CONTRACTOR from his full liabilities hereunder, with the intent that the CONTRACTOR shall at all times be exclusively responsible for any and all loss(es), damage(s), deterioration, misuse, theft or other application or disposal of the equipment or material(s), supplied by the OWNER or any of

them contrary to the provisions hereof and shall keep the OWNER indemnified from and against the same and shall forthwith at his own cost and expense replace any such equipment and material(s) lost, damaged, deteriorated, misused, stolen, applied and/or disposed as aforesaid, with other equipment or material of equivalent quality and quantity to the extent that the same is not covered by any insurance as above, and if covered, payment under the relative policy(ies) is for any reason not available to the OWNER.

r) The CONTRACTOR shall use the equipment and materials supplied by the OWNER for incorporation in the permanent works, carefully and judiciously with no wastage or the minimum possible wastage, wherever some wastage is inevitable or unavoidable, in any case within the wastage limit, if any, specified by the OWNER in respect of any such materials. For any excess wastage or scrap, due to misuse or injudicious, careless or wrong use of OWNER supplied materials, or in case of loss, damage or deterioration of the materials during storage with the CONTRACTOR, as to all of which the decision of the Engineer-in-charge shall be final and binding on the CONTRACTOR, theCONTRACTOR shall be bound to replace the material of equivalent quantity and grade, acceptable to the OWNER within the time limit specified by the OWNER, and where this is not possible, practicable or advisable, in the opinion of the OWNER, which shall be final and binding on the CONTRACTOR, the OWNER shall be compensated by the CONTRACTOR for the loss caused, for the replacement costs, which shall be worked out by the OWNER based on the assessed landed cost plus the costs of procurement at 1% (one percent) of the assessed landed costs for the OWNER. This amount shall forthwith be remitted by the CONTRACTOR within a week of demand made by the OWNER, failing which the OWNER shall be entitled to recover / adjust the amount demanded from any money (ies) due from the OWNER to the CONTRACTOR and/or from any Security or any other deposits of the CONTRACTOR lying with the OWNER, under this and/or any other contract, without any further notice to the CONTRACTOR. The decisions of the OWNER in respect of the actions contemplated in this clause shall be final and binding on the CONTRACTOR.

s) Notwithstanding anything herein provided and notwithstanding the transfer of all risks in respect of such equipment and materials to the CONTRACTOR, the Ownership in respect of all OWNER supplied equipment and materials shall at all times be and remainin the OWNER.

t) The excess equipment and material and the scrap material generated from the work, in so far as the OWNER supplied materials are concerned, shall be returned to the OWNER's Stores. On completion of the work, the CONTRACTOR shall duly render accounts for the materials and equipment issued by the OWNER, to the satisfaction of the OWNER. Any shortages, losses and/or damages shall be to the CONTRACTOR's account and all the conditions stipulated under sub-clause (r) above shall apply in this case also.

3.3.0.0 **POWER, WATER & OTHER FACILITIES**

3.3.1.0 The CONTRACTOR shall be responsible to provide within the scope of work all facilities, consumables and utilities necessary for performance of the work including (but not limited to) water, power, transportation, labour, tools, construction and testing equipment, machinery and land at or about the job site(s) for the CONTRACTOR's field offices, godowns, workshop; residential accommodation for CONTRACTOR's staff; quarry rights and borrow areas, access roads and right(s) of way to or about the job site(s) and CONTRACTOR's offices, godowns, workshop accommodation, quarries and / or borrow areas.

3.3.2.0 The OWNER does not warranty or undertake the provision of any facility, consumable or utility whatsoever to the CONTRACTOR, or assistance in obtaining / procuring the same or other assistance whatever for or in the performance or testing of the work and the CONTRACTOR shall not imply by conduct, expression or assurance or by any other means, any promise or obligation on the part of the OWNER contrary to the provisions hereof and any such promise or obligation understood by the CONTRACTOR shall not be binding upon the OWNER.

3.3.3.0 Any assistance which the OWNER renders to the CONTRACTOR in terms hereof or otherwise relative to the work by provision of any facility, utility, consumables, water, power, transportation, labour, tools, construction and / or testing equipment, and machinery, provision of land for quarries or borrow areas or for CONTRACTOR's office, godowns, workshops or accommodations or provisions of right of way, access road(s) and / or railway siding facilities, or other facility, utility, or consumables for or in the performance of the work shall not for any cause afford a basis or defence to the CONTRACTOR for the performanceof any of his obligations under the Contract, nor a ground for extension of time for completion or other claim whatsoever.

3.4.0.0 **POWER SUPPLY**

3.4.1.0 Without prejudice to the provisions of Clause 3.3.0.0 hereof and following clauses there under, as and when adequate power supply becomes available for the site, the OWNER may at its discretion provide supply of power to the CONTRACTOR for the work from the nearest sub-station, from which source the CONTRACTOR shall at his own cost and initiative make arrangement for temporary distribution of power to CONTRACTOR's work(s) at the site.

3.4.1.1 All arrangements for the distribution of power from sources aforesaid and the work relative thereto shall be made/performed/ installed in conformity with Indian Electricity Regulations, and shall be subject to prior approval of the Site Engineer.

3.4.1.2 The CONTRACTOR shall, at his own costs and initiative on completion or prior determination of the work or otherwise during execution of the work, if required by the Site Engineer because of hindrance caused thereby or for any other cause, forthwith remove or re-route the distribution lines/installations or other work(s) in respect thereof as the case may be, required to be removed/ re-routed.

3.4.2.0 The OWNER shall recover from the CONTRACTOR for power consumed by the CONTRACTOR from OWNER's source(s) of supply at the rate prescribed by the OWNER in this behalf from time to time. The amount due to the OWNER in respect of such power supplied shall without prejudice to any other mode of recovery to the OWNER, be deductible from the Running Account/ Final Bill(s) of the CONTRACTOR and / or any monies due to the CONTRACTOR under this or any other Contract from time to time.

3.4.2.1 The CONTRACTOR shall provide at his own cost suitable electric meters approved by the Site Engineer for measurement of Power units consumed by the CONTRACTOR for determination of the payment due thereon to the OWNER. Such meters shall be under the control and custody of the OWNER.

3.4.2.2 In the event of failure or defect of meter(s), power charges shall be calculated on the consumption determined by the Engineer-in-Charge (whose decision shall be final both as regards the existence of a defect or failure, and as regard the power consumed).

3.4.3.0 The OWNER may at any time suspend or discontinue power supply to the CONTRACTOR, and such suspension or discontinuance shall not entitle the CONTRACTOR to any compensation or damages nor shall constitute a basis for extension of time for completion.

3.4.4.0 Power supplied by the OWNER to the CONTRACTOR shall be entirely at the risk of CONTRACTOR as to the continuity and regularity of supply, maintenance of voltage and adequacy of load without any warranty by or liability to the OWNER in respect thereof and without entitlement to the CONTRACTOR on grounds of discontinuance, fluctuation of voltage or inadequacy of load or any other cause whatsoever to claim from OWNER in respect thereof or consequences thereof.

3.5.0.0 WATER SUPPLY

3.5.1.0 Without prejudice to the provisions of Clause 3.3.0.0 hereof and the following clauses there under, in the event of the OWNER having adequate source of water supply at the site available for distribution, the OWNER may at its discretion provide water to the CONTRACTOR for the work from the OWNER's source of supply upon the CONTRACTOR at his own cost and initiative providing suitable pumping installations and pipe network for the conduct of water to and distribution to the CONTRACTOR's place of work.

3.5.1.1 Such installation, pipes and other equipment shall be laid out / installed by the CONTRACTOR only with the prior approval of the Site Engineer so as not to interfere with the layout and progress of the other construction work at the site and access to or about the job site.

3.5.1.2 The CONTRACTOR shall forthwith on completion of the work or earlier determination of the contract or during the execution of the work(s), if so required by the Site Engineer, on ground of hindrance or obstruction caused thereby or other causes whatsoever at his own cost and initiative remove or re-route, as the case may be, any installations, pipes and / or other equipment or any part or portion thereof installed or erected by the CONTRACTOR for the conduction and/ or distribution of water, and fill any trenches, ditches or other excavations made by the CONTRACTOR for the purpose thereof and restore the site to the same condition in which it was prior to the installation.

3.5.2.0 The OWNER shall recover from the CONTRACTOR for water consumed by the CONTRACTOR from OWNER's source of supply at the rate prescribed by the OWNER in this behalf from time

to time. The amount due to the OWNER in respect thereof shall (without prejudice to any other mode of recovery available to other OWNER) be deductible from the Running Account / Final Bill of the CONTRACTOR and / or payments due to the CONTRACTOR from time to time under this or any other contract.

3.5.2.1 The CONTRACTOR shall provide at his own cost and initiative suitable water meters approved by the Site Engineer for measurement of water units consumed by the CONTRACTOR for determination of the payment due in this behalf to the OWNER. Such meters shall be under the custody and control of the OWNER.

3.5.2.2 In the event of failure or defect of meters, water charges shall be calculated on the consumption determined by the Engineer-in-Charge (whose decision shall be final both as regards the existence of a defect or failure and as regards the water consumed).

3.5.3.0 The OWNER may suspend or discontinue water supply to the CONTRACTOR and such suspension or discontinuation shall not entitle the CONTRACTOR any compensation or damages or constitute a basis for extension of time for completion or other claim whatsoever.

3.5.4.0 Water supplied by the OWNER to the CONTRACTOR shall be entirely at the risk of the CONTRACTOR as to the continuity and regularity of supply and maintenance and adequacy of pressure without any warrant by or liability to the OWNER in respect thereof and without entitlement to the CONTRACTOR on grounds of discontinuance, irregularity, drop or rise in pressure or other cause whatsoever to claim from OWNER in respect thereof or the consequences thereof.

3.6.0.0 **LAND**

3.6.1.0 Without prejudice to the provision of Clause 3.3.0.0 hereof and following clauses there under, the OWNER may at his discretion and convenience, if it has sufficient available land at its disposal, provide land to the CONTRACTOR near or about the job site, for the construction of the CONTRACTOR's field office(s), godowns, workshops, assembly yard and residential accommodation required for or in connection with the execution of the work(s). Such land shall be utilized by the CONTRACTOR only for the purpose of the contract and for the duration of the contract.

3.6.2.0 The CONTRACTOR shall at his own cost and initiative construct temporary buildings or other accommodation necessary for the purpose and make suitable arrangements for water and power supply thereto and for provision of sanitary, drainage and dewatering arrangements thereof in accordance with plans / designs / layouts previously approved by the Site Engineer in this behalf.

3.6.3.0 Any land provided by the OWNER to the CONTRACTOR within the provisions hereof shall be strictly on a licence basis, and shall not create any right, title or interest whatsoever in the CONTRACTOR herein or in respect thereof.

3.6.4.0 The CONTRACTOR shall pay the licence fee @ Rs.1000/- (Rupees One Thousand only) per month for land of an area up to 500 (Five Hundred) square meters and Rs. 200/- (Rupees Two Hundred only) for each additional 100 (One hundred) square meters or part thereof, per month or part thereof, for any land made available to the CONTRACTOR within the provisions hereof, and the OWNER shall be entitled (without prejudice to any other mode of recovery), to recover licence fee from the Running / Final Bill(s) of the CONTRACTOR and / or any other payments due to the CONTRACTOR from time to time under this or any other contract.

3.6.5.0 Notwithstanding anything herein provided, the OWNER reserves the right at any time during the pendency of the work to ask the CONTRACTOR to vacate the land or any part thereof on giving 7 (seven) days written notice to the CONTRACTOR in this behalf.

3.6.5.1 Forthwith on or before the expiry of such notice or within two weeks of the completion of the works or the earlier determination of the Contract, the CONTRACTOR shall remove all constructions, works, piping and other installations, whatsoever, not forming part of the contractual works put up or erected by the CONTRACTOR upon the land, and shall have the land cleared, levelled and dressed to the satisfaction of the Engineer-in-Charge.

3.6.5.2 The CONTRACTOR shall not be entitled upon any vacation or notice within the provisions of Clause 3.6.5.0 hereof to claim any resultant compensation or damage from the OWNER, nor shall such notice or vacation constitute a ground or basis for any extension of time for completion.

3.6.6.0 Likewise, the OWNER may at its discretion and convenience upon such terms and conditions as the OWNER may prescribe in this behalf, arrange or allocate or provide to the CONTRACTOR, borrow area(s) or quarry or mining rights and / or any right(s) of way or other access to or about

the job site and unless specifically excluded, the provisions of Clause 3.1.3.0 hereof above, shall apply in respect of any borrow area, quarry, mining right and / or right of way or other access allocated, arranged, provided or permitted by the OWNER to the CONTRACTOR.

3.6.6.1 The OWNER shall be entitled, at any time without notice to the CONTRACTOR, to suspend or withdraw use by the CONTRACTOR of any such area, right or access as aforesaid and no suspension or withdrawal of such facility, or disruption or inadequacy thereof by virtue of flood, disrepair or other cause whatsoever, shall form the basis of any claim by the CONTRACTOR, for compensation or damages or ground for extension of time for completion. Upon such notice or within two weeks of the completion of the works or the earlier determination of the Contract the provisions of Clause 3.6.5.1 hereof shall mutatis mutandis apply.

3.7.0.0 Notwithstanding anything herein provided, the provisions of Clause 7.0.5.0 to 7.0.7.0 hereof and related clauses applicable consequent upon termination of Contract shall apply to any breach by the CONTRACTOR of his obligations within the provisions of Clause 3.4.1.2, 3.5.1.2, 3.6.5.1 and 3.6.6.1 hereof as if it is a breach of Clause 7.0.5.0 hereof.

3.8.0.0 **ACCESS TO SITE**

3.8.1.0 The CONTRACTOR shall construct, if necessary at his own cost and initiative, temporary access road to the site from the main public feeder road(s) and from borrow areas and mines and quarries, and shall so align such roads or ways so as not to interfere with the construction of the site or hamper construction of pavement roads by or on behalf of the OWNER or other CONTRACTORS operating at or about the job site.

3.8.2.0 The CONTRACTOR shall, if so required or relative to the performance of any other work at the site or construction of permanent roads, suspend, discontinue use of and / or re-route any access road constructed by him. No suspension, discontinuance or re-routing as aforesaid shall form the basis of any claims by the CONTRACTOR against the OWNER for compensation of damages or ground for extension of time for completion or other claim whatsoever.

3.9.0.0 **LABOUR, MACHINERY & EQUIPMENT**

3.9.1.0 If, during the execution of the works, the OWNER shall for any cause find it necessary to do so, the OWNER may, at its discretion and convenience provide labour, machinery and / or equipment to the CONTRACTOR for the performance of the work and / or testing of the works. The terms and conditions for provisions and / or hiring of such labour, equipment, machinery shall, in addition to any other condition relative thereto as may be specified by the OWNER, unless expressly excluded, be deemed to include the following:

(i) Charges: The labour, equipment and / or machinery shall be supplied at the rate(s) in this behalf prescribed by the OWNER from time to time.

(ii) Recoveries: The amount(s) recoverable by the OWNER from the CONTRACTOR in respect of labour, equipment and / or machinery procured or supplied by the OWNER shall (without prejudice to any other mode of recovery) be debited to the CONTRACTOR's account and deducted from the Running Account / Final Bill(s) of the CONTRACTOR and / or any monies from time to time becoming due to the CONTRACTOR.

(iii) Any labour, equipment and / or machinery supplied or procured by the OWNER shall be utilized by the CONTRACTOR only for use in the contractual work.

(iv) The CONTRACTOR shall be responsible to ensure utilization of the equipment and / or machinery only within the capacity of such equipment and / or machinery, to ensure the proper utilization thereof in all respects without any manner of abuse or excess, and shall follow and obey all instructions or directions as shall or may be given by the Site Engineer in respect thereof, and if so required by the Site Engineer, shall provide at cost (to be determined by the Engineer-in-Charge in the event of dispute) labour for the operation, maintenance and repair of the equipment / machinery and / or shall operate, maintain and/or repair the same at his own costs and expenses, and provide all the inputs necessary for the operation, repair and maintenance thereof, including spare parts, fuel and lubricants. The CONTRACTOR shall keep the OWNER indemnified from and against all losses, damages and / or costs, charges and expenses resultant from any breach or failure to observe the provisions hereof.

(v) The CONTRACTOR shall ensure the safe-keeping and custody of the equipment and machinery at the site and shall be exclusively responsible and accountable for any loss,

damage, theft or misuse thereof (and shall make proper arrangement for the storage and watch and ward thereof) and shall keep the OWNER indemnified from and against the same.

(vi) The CONTRACTOR shall ensure return of the equipment / machinery to the OWNER upon the Completion of the works or earlier determination of the Contract or as and when called upon by the OWNER to return the same during the execution of the work in the same condition in which the equipment / machinery was at the time of bringing the same to job site or delivery to the CONTRACTOR, as the case may be.

(vii) The provisions of Clause 3.2.1.0 hereof shall mutatis mutandis apply to equipment and machinery supplied by the OWNER to the CONTRACTOR.

3.10.0.0 **GOVERNMENT CONTROLLED MATERIALS**

3.10.1.0 In respect of all Government controlled or other scarce/imported materials in respect of which licenses, release orders, permits or authorizations have been granted in the name of the OWNER, the CONTRACTOR shall be deemed to be acting on behalf of the OWNER and as agent of OWNER in respect of deliveries taken by the CONTRACTOR against any licences, release orders, permits, or authorizations issued in the name of OWNER for Government controlled materials. The ownership in such materials shall (without prejudice to the responsibility/liability of the CONTRACTOR in respect thereof as set out in the various conditions hereof) vest in the OWNER from the point of time when it would have ordinarily vested in the OWNER on a direct delivery to the OWNER.

## SECTION - 4

### PERFORMANCE OF WORK

4.0.0.0 GENERAL

4.0.1.0 All works shall be performed and executed by the CONTRACTOR in strict conformity with the Job Description, Specifications, Plans, Drawings, Designs and other Contract Documents applicable to the specific work(s) and any relative orders or instructions as may be issued to the CONTRACTOR by the Engineer-in-Charge or Site Engineer from time to time.

4.0.2.0 The Engineer-in-Charge and Site Engineer shall be entitled from time to time or at any time at their discretion in order to procure the proper performance of the work and/or the proper compliance with the specifications or other contractual requirements to issue written orders or instructions to the CONTRACTOR relative to the performance and / or execution of the work(s) by the CONTRACTOR or otherwise relative to any matter touching or affecting the Contract or arising there from, and to revise or revoke any orders or instructions previously issued, and the CONTRACTOR shall, subject to the provisions of the following clause, obey and/or abide thereby.

4.0.2.1 Without prejudice to the provisions of Clause 4.0.2.0 hereof and associated clauses thereto, should the CONTRACTOR require any clarification in respect of any orders or instructions issued by the Engineer-in-Charge or Site Engineer, or should there appear to the CONTRACTOR to be any contradiction between any orders or instructions issued by the Engineer-in-Charge or Site Engineer and / or between any order(s), instruction(s) and the Contract Document or any of them, the CONTRACTOR shall refer the matter immediately in writing to the Engineer-in-Charge for his decision before proceeding further with the work, and the decision of the Engineer-in-Charge on any such matter shall be final and binding upon the CONTRACTOR, who shall perform the work accordingly without entitlement to any claim against or compensation from the OWNER resultant upon such order, instruction or decision.

4.0.3.0 The CONTRACTOR shall, within 10 (ten) days of receipt of notification of Acceptance of Tender, name at each job site at which the CONTRACTOR shall be awarded any work under the Contract, an engineer responsible for the work at the job site on behalf of the CONTRACTOR. The said Engineer of CONTRACTOR shall be the representative of the CONTRACTOR at the job site for and relative to all actions and transactions and dealings on behalf of the CONTRACTOR and to whom labour, materials, equipment and / or machinery procured or supplied by the OWNER may be given and to whom all Plans, Designs, Drawings, Orders and Instructions or other documents or communications for or relative to the job site may be given, with the intent that all transactions and dealings had with the said engineer shall be deemed to have been had with the CONTRACTOR, and any and all Plans, Drawings, Designs, Orders, Instructions, Documents or Communications and / or labour, material, equipment or machinery delivered to said engineer shall be deemed to have been delivered to the CONTRACTOR.

4.0.3.1 The Engineer(s) / supervisors appointed by the CONTRACTOR or his Sub-Contractors / other agencies, for the work shall be duly and adequately qualified with relevant experience to handle the work of the Contract to the satisfaction of the Engineer-in-charge. For this purpose, the CONTRACTOR shall furnish the bio-data of the Engineer(s) / supervisors proposed to be appointed by him for the work to the Engineer-in-charge for his approval. The CONTRACTOR shall be bound to appoint only such technical personnel as are approved by the Engineer-in-Charge for handling the work from time to time.

4.0.4.0 The CONTRACTOR shall provide and maintain, at or about each job site, an office for the working accommodation of the CONTRACTOR's engineer(s) and staff. Such office shall remain open and attended at all hours during which work is being performed at the job site, for the receipt of orders, instructions, notices, and other communications.

4.0.5.0 The CONTRACTOR shall co-operate with and afford the OWNER / Engineer-in-Charge and other CONTRACTORS engaged at the site, access to the work and supply at cost determined by the Engineer-in-Charge (whose decision shall be final) of power and water for the performance of the work entrusted to them and / or for the carriage and storage of materials by them and whenever any work is contingent or dependent upon the performance of any work by the CONTRACTOR or is being done in association, collaboration or in proximity with any other CONTRACTORs, the CONTRACTOR shall co-operate with the OWNER or other CONTRACTOR(s)/ agency(ies) involved in such work to ensure the harmonious working between the CONTRACTOR and the OWNER / CONTRACTOR(s), agency(ies) involved, and shall comply with any instructions issued by the Engineer-in- Charge for the purpose.

4.0.6.0 The OWNER/Engineer-in-Charge shall be entitled at its/his discretion, to appoint one or more Site Engineers and / or other personnel at or about each job site on behalf of the OWNER to do such acts, deeds, matters and things as may be necessary to safeguard the OWNER's interest including (but not limited to, at the discretion of the OWNER), supervision and testing of the work(s) being conducted by the CONTRACTOR at the job site and rendering such assistance to the CONTRACTOR relative thereto as the OWNER or such engineer(s) or personnel shall or may deem fit, it being understood, however, that the presence of any engineer(s) or personnel of the OWNER at or about each job site or any supervision, inspection or test performed or conducted by any such engineer(s) and / or personnel of the OWNER in respect of any work(s) or any other assistance rendered by such engineer(s) and / or personnel to the CONTRACTOR relative thereto, shall be without any attendant obligation or liability of the OWNER vis-à-vis the CONTRACTOR, nor shall relieve the CONTRACTOR of his full responsibility in respect of the work(s) under the Contract or bind the OWNER or accept as satisfactory or complete and/ or in accordance with the Contract any work(s) performed by the CONTRACTOR which has / have been supervised, inspected, tested or assisted by the said engineer(s) and / or personnel of OWNER.

4.0.7.0 If the CONTRACTOR's work or any part thereof shall be consequent or resultant upon any works performed by any other person or shall be in continuance thereof or otherwise based or founded thereon, the CONTRACTOR shall before commencing with its/his work, bring to the notice of the Engineer-in-charge and the Site Engineer, in writing, any defects existing in said prior works, failing which the CONTRACTOR shall be deemed to have accepted as complete and proper the said prior works and to have waived any and all rights to complaintof or in respect of any defect(s) as may exist therein.

**4.1.0.0 WORK FRONT/ JOB SITE**

4.1.1.0 Keeping in view the Progress Schedule as specified in Clause 4.3.5.0 or Activity Schedule prepared in accordance with 6.4.9.2, if applicable, the work front/job site required by the CONTRACTOR for the performance of the works shall be handed over by the OWNER to the CONTRACTOR sequentially in the stages meeting the CONTRATOR'S requirements for the works with a view that the CONTRACTOR shall so plan his works as to perform and achieve completion in a sequential manner without starting all the works at the same time.

4.1.2.0 To this end, if so required by the Engineer-in-Charge, within 28 (twenty eight) days of finalization of the Progress Schedule or Activity Schedule, the CONTRACTOR shall finalize in consultation with the Engineer-in-Charge, sequential requirements of the work front/Job Site taking into account other works concurrently being undertaken by the OWNER at and about the same job site and/or on the performance or completion of which the CONTRACTOR's performance depends (the "Front Release Programme").

4.1.3.0 In the event that the OWNER , for any reason(s) not attributable to the CONTRACTOR is unable to hand over to the CONTRACTOR, the relative work front/job site on the planned date of release thereof as specified in the Front Release Programme/Progress Schedule/Activity Schedule, as the case may be,as a result of which the CONTRACTOR is prevented from continuing with the work, the CONTRACTOR shall give written notice thereof to the Engineer-in-Charge and the OWNER, specifying the particular work front/job site with reference to which the default has occurred and specifying that the notice is being given under this Clause 4.1.3.0 of the General Conditions of Contract, and if the work front/job site is not thereafter sufficiently made available to the CONTRACTOR within 10 (ten) days from the receipt of such notice and the CONTRACTOR cannot commence or progress with the work, the provisions of clause 4.3.6.0 hereof with regard to extension of time shall mutatis mutandis apply as the sole right and remedy of the CONTRACTOR and the CONTRACTOR waives all rights to claim compensation or damages for any equipment, personnel and labour consequently rendered idle.

4.1.4.0 The Engineer-in-Charge shall furnish the CONTRACTOR with only four corners of the job site and a level bench mark, and the CONTRACTOR shall at his own cost and initiative set out the work to the satisfaction of the Site Engineer, but shall be solely responsible for the accuracy of such setting up notwithstanding the satisfaction as aforesaid of the Site Engineer or any other assistance rendered by the Site Engineer for the purpose.

4.1.5.0 The CONTRACTOR shall provide, fix and be responsible for the maintenance of all stakes, templates, contour and level marks, profiles and the like and shall take all precautions necessary to prevent their removal or disturbance, and shall be responsible for the consequence of such removal or disturbance and for their efficient and timely reinstatement. The CONTRACTOR shall also be responsible for the maintenance of all survey marks, boundary marks, distance marks, and centre line marks, whether existing or supplied / fixed by the CONTRACTOR.

4.1.6.0 Before commencing the work, the CONTRACTOR shall at his own cost and initiative, provide all necessary reference and level posts, pegs, bamboos, flags, ranging rods, strings and other materials for proper layout of the work in accordance with scheme for benchmarks acceptable to the Site Engineer. The centre, longitudinal or face line and cross line shall be marked by means of small masonary pillars. Each pillar shall have a distinct mark at the centre to enable suitable survey equipment to be set over it. No work shall be started until all these points are approved by the Site Engineer but, such approval shall not relieve the CONTRACTOR of any of his responsibilities in respect of adequacy or accuracy thereof. The CONTRACTOR shall also provide all labour, material and other facilities necessary for the proper checking of layout and inspection of the points during construction.

4.1.7.0 Pillars bearing geodetic marks located at the sites of works under construction should be protected and fenced by the CONTRACTOR.

4.1.7.1 On completion of works, the CONTRACTOR must submit to the Engineer-in-Charge the geodetic documents according to which the work was carried out.

4.1.8.0 The CONTRACTOR shall be exclusively responsible for provision and maintenance of horizontal and vertical alignments and levels and for the correctness of every part of the work in accordance therewith and shall at his own cost rectify any errors or imperfectness therein.

4.2.0.0 CONDITIONS OF WORK

4.2.1.0 Work shall be carried on for a minimum of 48 (forty-eight) hours a week and 8 (eight) hours on any working day. If necessary, the CONTRACTOR shall work overtime or in two or more shifts in a day. Except as herein specifically provided to the contrary, the CONTRACTOR shall not be entitled to any extra compensation or remuneration for overtime or double or triple shift working, nor shall the OWNER anywise be responsible for any idle time payments to CONTRACTOR's staff or for labour, equipment or machinery, howsoever occasioned, and the CONTRACTOR waives any and all contrary rights and claims.

4.2.1.1 Should it be necessary to work on Sunday and / or holiday, the CONTRACTOR shall so work without extra compensation, after obtaining prior approval from the Site Engineer or the Engineer-in-charge.

4.2.2.0 The execution of the work(s) shall entail working in all seasons including the monsoons. In so far as necessary, the CONTRACTOR shall maintain at each job site at all times such material, labour, pumps, equipment and machinery as may be required for the performance of the work during the monsoon or other rains and shall plan well in advance for the collection of material and equipment and the erection of such tarpaulins, sheds, wind breakers and / or other protection as shall or may be necessary for the work during the monsoon or other rains so that the rains or monsoon shall not hamper working.

4.2.2.1 The CONTRACTOR shall also arrange and bring to each job site such special equipment and machinery as may be necessary to enable work during the monsoon, and shall, at his own cost and initiative, arrange at all times for dewatering the job sites so as to keep the construction site and areas to be worked upon, free of water.

4.2.2.2 The CONTRACTOR shall not be entitled to any extra compensation or remuneration for or relative to any work to be done in any season including during the monsoon, or for or relative to any special arrangements to be made and / or equipment or machinery to be brought to the job site(s) to enable such working.

4.3.0.0 TIME FOR COMPLETION

4.3.1.0 The CONTRACTOR shall complete in all respects in accordance with the Contract, the entire work at each job site within the time specified in this behalf in the Time Schedule.

4.3.2.0 Within 30 (thirty) days from the date of issuance of Acceptance of Tender/issuance of specific notice, if applicable, the CONTRACTOR shall submit to the Engineer-in-Charge for approval in respect of each job site, a detailed Progress Schedule in graphical or other suitable form giving dates of various operations and works within the Time Schedule providing sufficient margin to cover for contingencies and for final testing and consequential reparation. The Engineer-in-Charge and the CONTRACTOR shall thereafter within 10 (ten) days settle the Progress Schedule and the Progress Schedule so settled shall be the approved Progress Schedule and shall form part of the Contract with attendant obligation upon the CONTRACTOR to commence the various works/operations involved on or before the date(s) mentioned in the Progress Schedule and to conclude the said work(s)/operation(s) on or before date mentioned in this behalf in the approved Progress Schedule. Failure by Contractor to commence or complete within prescribed date(s) any work or operation shall be deemed to be a breach to which the provisions of Clause 7.0.1.0 hereof relating to termination of contract shall apply, but without prejudice to any other consequences or rights or remedies which the OWNER may have in this behalf.

4.3.3.0 The Progress Schedule shall also indicate the latest dates of finishing of various operations and activities comprising the work in the critical path and the interlinking of the various activities and bring to light the specific/critical items on which the inputs from the Engineer-in-Charge /Consultant or other agencies, if any, would be required, to ensure adherence to the schedule.

4.3.4.0 If the CONTRACTOR shall fail to submit to the Engineer-in-Charge a Progress Schedule as envisaged above or if the Engineer-in-charge and CONTRACTOR fail to agree upon the Progress Schedule as envisaged above, then the Engineer-in-Charge shall prepare the Progress Schedule (the dates of progress as fixed by the Engineer-in-Charge being final and binding upon the CONTRACTOR except as herein otherwise expressly provided), and shall issue the Progress Schedule so prepared to the CONTRACTOR, which shall then be the Approved Progress Schedule and all the provisions of Clause 4.3.2.0 shall apply relative thereto.

4.3.5.0 Any reference in the Contract Documents to the "Approved Progress Schedule" or to the "Progress Schedule" shall mean the "Approved Progress Schedule" specified in Clause 4.3.2.0 above or the "Progress Schedule" prepared and issued by the Engineer-in-Charge as specified in Clause 4.3.4.0 above, whichever shall be in existence. In the absence of such approved Progress Schedule or such Progress Schedule prepared by the Engineer-in- charge, the Progress Schedule first prepared by the CONTRACTOR (with the incorporation of the OWNER's/Engineer-in-charge's comments thereon, if any), shall until such approved Progress Schedule or such Progress Schedule prepared by the Engineer-in-charge comes into existence, be deemed to be the Progress Schedule for the purpose of the Contract.

4.3.6.0 Within 7 (seven) days of the occurrence of any act (including any instruction by the OWNER or Engineer-in-Charge or Site Engineer) event or omission which, in the opinion of the CONTRACTOR, is likely to lead to delay in the commencement or completion of any particular work(s) or operation(s) or the entire work at any Job Site(s) and is such as would entitle the CONTRACTOR to an extension of the time specified in this behalf in the Progress Schedule(s), the CONTRACTOR shall inform the Site Engineer and the Engineer-in-Charge in writing of the occurrence of the act, event or omission and the date of commencement of such occurrence. Thereafter, if even upon the cessation of such act or event or the fulfillment of the omission, the CONTRACTOR is of opinion that an extension of the time specified in the Progress Schedule relative to particular operation(s) or item(s) or work or the entire work at the Job Site(s) is necessary, the CONTRACTOR shall within 7 (seven) days after the cessation or fulfillment as aforesaid, make a written request to the Engineer-in-Charge for extension of the relative time specified in the Progress Schedule and the Engineer-in-Charge may at any time prior to completion of the work extend the relative time of completion in the Progress Schedule for such period(s) as he considers necessary, if he is of opinion that such act, event or omission constitutes a ground for extension of time in terms of the Contract and that such act, event or omission has in fact resulted in insurmountable delay to the CONTRACTOR.

4.3.6.1 The application for extension of time made by the CONTRACTOR to the Engineer-in-Charge should contain full details of -

(a) The notice under Clause 4.3.6.0 with a copy each of the notice sent to the Engineer-in-Charge and Site Engineer,

(b) The activity of the Progress schedule affected,

(c) The bottleneck(s) or obstruction(s) perceived/experienced, and the reason(s) therefor,

(d) Extension required/ necessitated on account of (c) above,

(e) Extension required /necessitated on account of reasons attributable to the OWNER,

(f) Extension required/ necessitated on account of force majeure reasons, and

(g) The total extension of time (if any) required/ necessitated for completion, taking the above into account and after eliminating all overlaps.

4.3.6.2 The opinion/ decision of the Engineer-in-Charge on the CONTRACTOR's application and as to the extension of time necessary shall, subject to the provisions of clause 4.3.7.0 hereof, be final and binding upon the CONTRACTOR.

4.3.7.0 Notwithstanding the provisions of clause 4.3.6.0 hereof, the OWNER may at any time at the request of the CONTRACTOR made by way of appeal either against the decision of the Engineer-in-Charge taken under clause 4.3.6.0 or against the Engineer-in-Charge's refusal to take a decision under the said clause, if satisfied of the work or any item or operation thereof if it is satisfied that the act, event or omission complained of constitutes a ground for extension of time in terms of the Contract and such act, event or omission has in fact resulted in insurmountable delay to the CONTRACTOR, extend the relative time for completion in the Progress Schedule for such period(s) as the OWNER may consider necessary, and the decision of the OWNER as to the existence or otherwise of any grounds justifying the extension and as to the period(s) of extension necessary shall be final and binding upon theCONTRACTOR.

4.3.8.0 Subject as elsewhere herein or in the contract documents expressly provided, only the existence of force majeure circumstances as defined in clause 4.3.9.0 hereof or OWNER's hold up as defined in clause 4.3.9.1. hereof shall afford the CONTRACTOR a ground for extension of time for completion of the work or any part of the work or any operation(s) involved therein, and specifically without prejudice to the generality of the foregoing, inclement weather, strike, shutdown, third party breach, delay in supply of material(s) or commercial hardship shall not afford the CONTRACTOR a ground for extension of time or relieve the CONTRACTOR of his/its full obligations under the Contract, nor will any forced shutdown or idleness or other impediment in progress or completion of the work due to any reason whatsoever afford the CONTRACTOR a ground for extension of time or relieve the CONTRACTOR of his/its full obligations under the Contract except and to the extent otherwise elsewhere herein specifically provided, nor shall any shut down or idle time charges be payable by the OWNER to the CONTRACTOR for delay in the commencement, progress or completion of the work due to any reason whatsoever, including due to the existence of force majeure circumstances.

4.3.9.0 The term "FORCE MAJEURE" as employed in this contract shall mean any event or circumstance or combination of events or circumstances that: (1) prevent or delay the affected Party (the "Affected Party") from performing in whole or in part its obligations pursuant to the terms of this Contract ; (2) are unforeseen and not within the Affected Party's reasonable control; and (3) are unavoidable by the exercise of due diligence by the Affected Party acting as a reasonable and prudent Party under the relevant circumstances. Subject to satisfaction of the conditions specified in items (1), (2), and (3) above, Force Majeure shall include wars (declared or undeclared) or revolutions, civil wars, acts of terrorism, typhoons, cyclones, hurricanes, tidal waves, fires, major floods, earthquakes, epidemics, quarantine restrictions and freight embargoes and nation- wide transporters' strikes, national strikes and state-wide strikes.

4.3.9.1 The term "OWNER's hold up" as employed in this Contract applies to a delay by the OWNER in providing a drawing, specification, approval, change, alteration, instruction, front, input, material or facility which the OWNER is required to provide under the CONTRACT and on which the progress or further progress of the work or any part of the work or any activity involved therein is dependent and will include any act of the OWNER or any other contractor appointed by the OWNER which prevents or interrupts the further progress of the whole work or a substantial portion thereof.

4.3.9.2 An extension of time shall only be granted on and with reference to an application made by the CONTRACTOR to the Engineer-in-Charge in compliance with the provisions of Clauses 4.3.6.0 and 4.3.6.1 hereof.

4.3.10.0 Upon an extension of the time for Mechanical Completion or Final Completion of the works in all respects or any part of the work or any operation(s) involved therein pursuant to Clause 4.3.6.0 or Clause 4.3.7.0 hereof, the extended date/time of completion shall be deemed to be the relative date of completion in the Progress Schedule, and such extension shall constitute the sole remedy of the CONTRACTOR for and/or arising out of such delays, and the CONTRACTOR shall not be entitled in addition to or in lieu of such extension, to claim any damages or compensation for extended stay or otherwise whether under the law governing contracts or quasi-contracts or any other relationship, and the CONTRACTOR hereby waives any and all contrary rights.

4.3.11.0 The mere fact that the OWNER shall not have terminated the contract or that the OWNER or Engineer-in-charge has permitted the CONTRACTOR, for the time being, to continue with the work for its completion shall not prejudice the full rights and remedies available to the OWNER under the contract arising out of the delayed completion, including the right of Price discount, damages and/or termination. Such permission(s) shall unless specifically stated to be an extension of time under Clause 4.3.6.0 or Clause 4.3.7.0, as the case may be, not be construed as extension(s) of time under Clause 4.3.6.0 or 4.3.7.0 hereof, and shall merely constitute an indication or intimation, as the case may be, of the OWNER's willingness, for the time being, to accept the delayed completion, subject to its rights under the Contract.

4.3.12.0 No assurance, representation, promise or other statement by any personnel, engineer or representative of the OWNER in relation to extension of time for commencement or completion of any work(s) or operation thereof or of the entire Works under the Contract shall be binding upon the OWNER or shall constitute an extension of time for commencement or completion of the entire Work(s) or any part or operation thereof within the provisions of Clause 4.3.6.0 or Clause 4.3.7.0 hereof, unless the same has been communicated to the CONTRACTOR in writing by the Engineer-in-charge under Clause 4.3.6.0 or by the OWNER under Clause 4.3.7.0 and the writing specifically states that it embodies an extension of time within the provisions of Clause 4.3.6.0 or Clause 4.3.7.0 as the case may be, and without prejudice to the foregoing, the mere agreement or prescription or signing of a Progress Schedule by the Site Engineer or any site representative of the OWNER at variance with the Progress Schedule, as the case may be, referred to in Clauses 4.3.2.0, 4.3.3.0, 4.3.4.0 and/or 4.3.5.0 hereof or containing an extended time of commencement or completion in respect of the entire work(s) or any part or operation thereof shall not anywise constitute an extension of time in the terms of the Contract so as to bind the OWNER or relieve the CONTRACTOR of all or any of his liabilities under the Contract, nor shall constitute a promise on behalf of the OWNER or a waiver by the OWNER of any of its rights in terms of the Contract relative to the performance of the Contract within the time specified or otherwise, but shall be deemed only (at the most) as a guidance to the CONTRACTOR for better organizing his work on a recognition that the CONTRACTOR has failed to organize his work and/or perform the same within the time specified in the Progress Schedule established within the provisions of Clause 4.3.2.0 or Clause 4.3.3.0 or Clause 4.3.4.0 or Clause 4.3.5.0 hereof, as the case may be.

4.4.0.0 PRICE ADJUSTMENT

4.4.1.0 The contractual price payable shall be subject to adjustment by way of discount or payment of bonus as hereinafter specified, depending upon if the Unit(s) is/are mechanically completed or the contractual works are finally completed, under the Contract, subsequent or prior to the date of Mechanical Completion/Final Completion specified in the Progress Schedule.

4.4.2.0 If Mechanical Completion of the Unit(s)/final completion of the works is not achieved by the last date of Mechanical Completion of the Unit(s)/final completion of the works specified in the Progress Schedule (hereinafter referred to as the “starting date for discount calculation”), the OWNER shall be entitled to adjustment by way of discount in the price of the works and services in a sum equivalent to the percent of the Total Contract Value as specified below namely:

(i) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 1 (one) week of the starting date for discount calculation - ½ % (half percent) of the Total Contract Value.

(ii) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 2 (two) weeks of the starting date for discount calculation - 1% (one percent) of the Total Contract Value.

(iii) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 3 (three) weeks of the starting date for discount calculation -1½ % (one and a half percent) of the Total Contract Value.

(iv) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 4 (four) weeks of the starting date for discount calculation – 2 % (two percent) of the Total Contract Value.

(v) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 5 (five) weeks of the starting date for discount calculation - 2½ % (two and a half percent) of the Total Contract Value.

(vi) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 6 (six) weeks of the starting date for discount calculation – 3 % (three percent) of the Total Contract Value.

(vii) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 7 (seven) weeks of the starting date for discount calculation –3½ % (three and a half percent) of the Total Contract Value.

(viii) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 8 (eight) weeks of the starting date for discount calculation – 4% (four percent) of the Total Contract Value.

(ix) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 9 (nine) weeks of the starting date for discount calculation –4½ % (four and a half percent) of the Total Contract Value.

(x) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 10 (ten) weeks of the starting date for discount calculation – 5 % (five percent) of the Total Contract Value.

(xi) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 11 (eleven) weeks of the starting date for discount calculation – 5 ½ % (five and a half percent) of the Total Contract Value.

(xii) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 12 (twelve) weeks of the starting date for discount calculation – 6 % (six percent) of the Total Contract Value.

(xiii) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 13 (thirteen) weeks of the starting date for discount calculation– 6 ½ % (six and a half percent) of the Total Contract Value.

(xiv) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 14 (fourteen) weeks of the starting date for discount calculation - 7 % (seven percent) of the Total Contract Value.

(xv) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 15 (fifteen) weeks of the starting date for discount calculation - 7 ½ % (seven and a half percent) of the Total Contract Value.

(xvi) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 16 (sixteen) weeks of the starting date for discount calculation– 8 % (eight percent) of the Total Contract Value.

(xvii) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 17 (seventeen) weeks of the starting date for discount calculation – 8 ½% (eight and a half percent) of the Total Contract Value.

(xviii) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 18 (eighteen) weeks of the starting date for discount calculation - 9 % (nine percent) of the Total Contract Value.

(xix) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 19 (nineteen) weeks of the starting date for discount calculation – 9 ½% (nine and a half percent) of the Total Contract Value.

(xx) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 20 (twenty) weeks of the starting date for discount calculation – 10 % (ten percent) of the Total Contract Value.

The reduction in the contract price hereunder by way of price discount shall in no event exceed 10% (ten percent) of the Total Contract Value.

4.4.2.1 The starting date for discount calculation shall be subject to variation upon extension of the date for Mechanical Completion of the Unit(s)/final completion of the works with a view that upon any such extension there shall be an equivalent extension in the starting date for discount calculation under Clause 4.4.2.0 hereof.

4.4.2.2 It is specifically acknowledged that the provisions of Clause 4.4.2.0 constitute purely a provision for price adjustment and/or fixation and are not to be understood or construed as a provision for liquidated damages or penalty under Section 74 of the Indian Contract Act or otherwise.

4.4.2.3 Price Adjustment shall be without prejudice to right of the OWNER to recover from the CONTRACTOR, actual direct damage if suffered by the OWNER on account of such delayed performance.

4.4.2.4 If Mechanical Completion of the Unit(s)/final completion of the works is achieved prior to the last date of Mechanical Completion of the Unit(s)/final completion of the works specified in the Progress Schedule, the CONTRACTOR shall be entitled to adjustment by way of bonus in the price of the works and services in a sum equivalent to the percent of the Total Contract Value as specified below namely:

i) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 1 (one) week prior to the Scheduled Mechanical Completion of the Unit(s)/final completion of the works specified in the Progress Schedule – 0.25% (one quarter percent) of the Total Contract Value.

ii) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 2 (week) week prior to the Scheduled Mechanical Completion of the Unit(s)/final completion of the works specified in the Progress Schedule – 0.50% (one half percent) of the Total Contract Value.

iii) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 3 (three) week prior to the Scheduled Mechanical Completion of the Unit(s)/final completion of the works specified in the Progress Schedule – 0.75 %(three fourth percent) of the Total Contract Value.

iv) For Mechanical Completion of the Unit(s)/final completion of the works achieved within 4 (four) week prior to the Scheduled Mechanical Completion of the Unit(s)/final completion of the works specified in the Progress Schedule – 1 % (one percent) of the Total Contract Value.

The adjustment in the contract price hereunder by way of payment of bonus shall in no event exceed 1% (one percent) of the Total Contract Value and the same shall be considered an incentive for early completion in terms of the Contract.

4.4.2.5 Alternatively, OWNER shall be entitled to terminate the Contract under Clause 7.0.1.0 and associated clauses there under, if delayed performance is not acceptable to the OWNER. In the event of OWNER exercising its said right of termination after the last date for Scheduled Mechanical Completion of the Unit(s) and/or Final Completion of the works as stipulated in the relative Progress Schedule without prejudice to any other right or remedy available to the OWNER, the OWNER shall be entitled to discount as aforesaid upto the date of termination in the contractual price of works performed and accepted by the OWNER upto the date of termination. This discount shall be in addition to any amount as may be due consequent to a termination under Clause 7.0.1.0 hereof and associated clauses there under.

4.5.0.0 DEVIATIONS AND VARIATIONS IN SPECIFICATIONS

4.5.1.0 The Engineer-in-Charge may at his discretion, and without prejudice to any other right or remedy available to the OWNER in this behalf permit a deviation or variation from the Specifications or accept any work or items of work performed by the CONTRACTOR at variance with the Specifications and any such permission, deviation or variation shall ipso facto be subject to the

condition that the monetary benefit of the deviation or variation, as determined by the Engineer-in-Charge (whose decision shall be final and binding upon the CONTRACTOR) shall be passed on to the OWNER. In such event the CONTRACTOR shall be entitled only to such remuneration in respect of such works or item(s) of work as may be determined by the Engineer-in-charge after reduction of the monetary benefit arising from the deviation or variation as determined by the Engineer-in-charge after reduction of the monetary benefit arising from the deviation or variation as determined by the Engineer-in- charge.

4.5.2.0 Any permission or acceptance for any deviation or variation in specification as envisaged in Clause 4.5.1.0 hereof shall not be understood by the CONTRACTOR unless specifically given in writing by the Engineer-in-charge to the CONTRACTOR in the absence of which any deviation taken or variation done in any work performed by the CONTRACTOR at variance with contractual specifications, shall be deemed to be defective works attracting consequences elsewhere herein specified with respect to defective work(s).

4.6.0.0 REPORTS AND RECORDS

4.6.1.0 The CONTRACTOR shall, from time to time, maintain at each job site (in addition to any records or registers required to be maintained by the CONTRACTOR under any law, rule or regulation having the force of law) such records and registers as the Engineer-in-Charge or Site Engineer shall or may require the CONTRACTOR to keep and / or maintain from time to time.

4.6.2.0 In addition to any other records or registers required to be maintained by the CONTRACTOR from time to time and / or to the reports required to be furnished by the CONTRACTOR, the CONTRACTOR shall daily or otherwise as may be prescribed by Engineer-in-Charge or Site Engineer, submit to the Site Engineer a Progress Report of all work done and / or progress achieved by the CONTRACTOR at each job site within the preceding day or the period of last report, as the case may be.

4.6.2.1 The receipt and / or acceptance of any such report by the Site Engineer shall be without prejudice to the full rights and remedies of OWNER and obligations / liabilities of the CONTRACTOR under the Contract, and shall not anywise operate as an estoppel against the OWNER by reason of the fact that no notice or objection was taken of or to any information contained in any such report; nor shall any statement in any such report be deemed to be correct merely by virtue of the existence of such statement, and its being uncontroverted by any officer of the OWNER.

4.6.3.0 The CONTRACTOR shall also maintain at each job site a Site Order / Site Instructions Book, in which the day to day instructions of the Site engineer / Engineer-in-charge / other Inspecting Officers of the OWNER shall be recorded. Each such Order / Instruction shall be duly acknowledged and compliance with the same shall also be recorded in the appropriate columns of the Site Order / Site Instructions Book. This book shall be kept available for inspection by the officers of the OWNER. The Site Order / Site Instruction Book shall be lodged with the Engineer-in-charge on completion of the Work or sooner determination of the contract for any cause.

4.7.0.0 EXECUTION OF THE WORK

4.7.1.0 The CONTRACTOR shall provide sufficient labour, staff (qualified and unqualified), machinery, tools and equipment, material, consumables, utilities and things whatsoever necessary for the proper performance of the work and to ensure the rate of progress as envisaged in the Progress Schedule.

4.7.1.1 All the skilled persons employed by the CONTRACTOR (directly or through his sub- contractors and/or other agencies) on the work shall be duly and adequately skilled in their respective trades, to the satisfaction of the Engineer-in-charge. Any person employed on the work found to be inadequately skilled or otherwise incompetent, may be directed by the Engineer-in-charge to be removed from the site and replaced by adequately skilled and competent persons and the CONTRACTOR shall forthwith comply with such directions of the Engineer-in-charge.

4.7.2.0 If, in the opinion of the Engineer-in-charge or Site Engineer (the opinion of either of whom in this behalf shall be final), the work(s), operation(s) at any job site as a whole is/are not meeting the progress necessary to achieve the relative date of commencement or completion in the Progress Schedule, the Engineer-in-charge or Site Engineer may instruct the CONTRACTOR to employ/provide additional labour, staff, machinery, tools, equipment or material or things necessary to achieve the required progress and CONTRACTOR shall forthwith comply with instruction(s).

4.7.3.0 Should the CONTRACTOR fail to comply with such instruction(s) or fail to comply therewith to the satisfaction of the Engineer-in-charge (whose opinion in this behalf shall be final and binding upon the CONTRACTOR) the Engineer-in-charge may, at his discretion, at the risk and cost of the CONTRACTOR, appoint, procure or provide the additional labour, staff, machinery, equipment, tools and materials as the Engineer-in-charge (whose decision in this behalf shall be final and binding upon the CONTRACTOR), considers necessary to achieve the necessary progress in relation to any particular work or operation or the work as a whole. In so doing, Engineer-in-charge/Site Engineer shall be deemed to be acting for and on behalf of and as agent of the CONTRACTOR and all such appointments, procurement and/or provision shall be deemed to have been made by the CONTRACTOR and paid for by the CONTRACTOR. In addition to the other amounts payable to OWNER in respect of any labour, staff, machinery, equipment and/or material, as aforesaid procured or provided by the OWNER, the OWNER shall be entitled in this event to recover from the CONTRACTOR 1% (one per cent) as administrative charges on the total expenditure incurred by the OWNER under this clause, on behalf of the CONTRACTOR.

4.7.4.0 Without prejudice to the OWNER's rights under Clause 4.7.3.0 and in addition or as an alternative thereto, should the Engineer-in-charge at any stage (notwithstanding that the time for completion of the relative work or item of work as specified in the Progress Schedule has not expired) be of opinion (the opinion of the Engineer-in-charge in this behalf being final) that the performance of any work or item or work by the CONTRACTOR is unsatisfactory (whether in the rate of progress, the manner, quality or workmanship of the performance, or in the adherence to specifications, or in the omission, neglect or failure to do, perform, complete or finish any work or item, or for any other cause whatsoever), the Engineer-in- charge shall be entitled (without prejudice to any other rights of the OWNER and/or obligations of the CONTRACTOR under the Contract) at his discretion and the risk and cost of the CONTRACTOR under due intimation to contractor in writing, appoint one or more sub-contractors for the satisfactory performance thereof or any part thereof, or may undertake the performance thereof or any part thereof departmentally, and the provisions of Clause 4.7.3.0 hereof shall mutatis mutandis apply to any action taken by the Engineer-in-charge pursuant to this clause in the same manner as applicable to an action taken under the said clause.

4.7.5.0 If the amount incurred by the OWNER /Engineer-in-charge, on account of carrying out works under Clause 4.7.3.0 and/or 4.7.4.0 above, is in excess of the amount due to the CONTRACTOR the OWNER shall be entitled to recover the same, at the OWNER's discretion from any amount due to the CONTRACTOR from the OWNER under this or underany other contract, and any Security Deposit(s) or Bank Guarantee(s) or Insurance Surety Bond(s) of the CONTRACTOR under this Contract.

4.7.6.0 Any action taken by the Engineer-in-Charge or Site Engineer under Clauses 4.7.3.0 and / or 4.7.4.0 shall be without prejudice to the full rights of the OWNER and full liability of the CONTRACTOR under the Contract, including but not limited to the OWNER's full rights under Clause 4.4.0.0 and associated clauses there under, and under Clauses 7.0.7.0 and 7.0.8.0 hereof.

**4.8.0.0 SUB CONTRACTS**

4.8.1.0. The CONTRACTOR shall not assign, sub-contract or sublet the whole or any part of the work in any manner provided that the CONTRACTOR may, with the prior written approval of the Engineer-In-Charge, subcontract any particular work or part of the work to a sub-contractor approved by the Engineer-In-Charge.

For such approval, the CONTRACTOR will submit for approval to the OWNER and the Engineer-in-Charge the details of the proposed sub-contractors in the Format prescribed by the OWNER for the purpose. The CONTRACTOR shall ensure that only competent and resourceful agencies with proven track record and performance should be proposed for the work to be sub-contracted and submit such documents to the Engineer-in Charge as may be required by the Engineer-in-Charge in this regard.

For avoidance of doubt, it is clarified that

a) Procurement of material, hire of equipment or engagement of labour will not mean sub-contracting.
b) Execution of the Works (or any part thereof) by petty contractors or on piece work basis under the supervision of the Contractor (or its representative) shall not be deemed to be sub-contracting under the Contract.

c) The contractor shall be required to obtain consent from Engineer-In-Charge for purchases of Materials and Services which are in accordance with the Approved vendor list/Approved makes specified in the Contract or for provisions of labour or for the subcontracts for which the sub-contractors are named in the Contract.

4.8.2.0 Notwithstanding, approval of the sub-contract as aforesaid, and notwithstanding that the OWNER/Engineer-in-Charge shall have received a copy of the Contract between the CONTRACTOR and sub-Contractor, the CONTRACTOR shall be and shall remain exclusively responsible to the OWNER for the due and proper performance of the Contract, and the sub-Contractor shall for all purposes vis-à-vis the OWNER be deemed to be the servant/agent of the CONTRACTOR employed for the performance of the particular work with full responsibility on CONTRACTOR for all acts, omissions and defaults of the sub-Contractor.

4.8.3.0 Subject as herein above in this behalf specifically permitted and provided, the CONTRACTOR shall not sub-contract any work under the Contract, and any sub- contract in breach hereof shall be deemed to be an unauthorized sub-contracting of the Contract or part or portion thereof sub-contracted, as the case may be.

4.8.4.0 If any Sub-Contractor engaged upon the work at the site executes any work which in the opinion of the Engineer-in-Charge is not of the requisite standard (the opinion of the Engineer-in-Charge being final in this behalf), then without prejudice any other right or remedy available to the OWNER, the Engineer-in-Charge may by written notice to the CONTRACTOR require the CONTRACTOR to terminate such sub-contract, and the CONTRACTOR shall upon the receipt of such notice, forthwith terminate such sub-contract at the risks and costs of the CONTRACTOR, and shall keep the OWNER indemnified from and against the consequences.

4.8.5.0 Notwithstanding any Sub-Contract being approved by the Engineer-in-Charge as hereinabove envisaged, the CONTRACTOR shall, at the commencement of every month, furnish to the Engineer-in- Charge a list of all sub-contractors engaged and working at the site during the previous month, with particulars of the general nature of the works performed by them.

4.9.0.0 MISCONDUCT

4.9.1.0 If and whenever any of CONTRACTOR's or sub-contractor's agent(s) / sub-agent(s), consultant(s) or employee(s) shall in the opinion of the Engineer-in-Charge or Site Engineer (whose opinion in this behalf shall be final) be guilty of misconduct or be incompetent or insufficiently qualified or negligent in the performance of his / their duties, or if in the opinion of the Engineer-in-Charge (which shall be final) it is undesirable for any reason (which need not be disclosed to the CONTRACTOR) for such person(s) to be employed in the work, the CONTRACTOR, if so directed by the Site Engineer, shall forthwith remove or cause to be removed such person(s) from employment thereon, and any person(s) so removed shall not be re-employed in the work except with the prior permission in writing of the Engineer-in- charge. Any person(s) so removed from the works shall be immediately replaced at the expense of the CONTRACTOR by a qualified and competent substitute.

4.9.2.0 If, at any time, in the course of execution of the Contract, the OWNER / Engineer-in-charge finds that any person employed by the CONTRACTOR or his sub-contractor(s) or other agency(ies) employed by the CONTRACTOR is not observing and/or is willfully flouting the operating security and safety precautions of the area in which he is working and / or are found to be indulging in activities prejudicial to the interest of the OWNER, the CONTRACTOR shall forthwith, on being directed by the OWNER/ Engineer-in-charge in this behalf remove or cause to be removed such person(s), as may be named by the OWNER / Engineer-in-charge in this behalf, from the site, within 24 hours of such intimation and such person(s) shall not be re-employed in this work or any other work under the OWNER, without the prior written permission of the OWNER. All repatriations of any person(s) removed from the site shall be done by the CONTRACTOR at his own cost and the vacancy (ies) so caused shall be filled by the CONTRACTOR at his own expenses by competent substitutes.

4.9.3.0 If any activities of any such person are considered by the OWNER or Engineer-in-charge to be criminal in character and/or prejudicial to the public or national interest, the CONTRACTOR shall, in addition to removing such person(s) as stipulated in 4.9.2.0 above, also co-operate with the OWNER/ Engineer-in-charge in lodging such complaints with the police or other authorities as the OWNER or Engineer-in-Charge considers necessary, and shall co-operate with the OWNER, in handing over such person(s) to the concerned authorities as decided by the OWNER.

4.9.4.0 The CONTRACTOR shall keep the OWNER indemnified from and against all personnel and third party claims whatsoever (inclusive of all costs incurred between attorney and client) arising out of any act or omission or intermission on part of any sub-contractor or agent, sub- agent, consultant, or employee of the CONTRACTOR or any sub-contractor, whether committed, omitted or arising with or without the scope of the contract, sub-contract, agency or employment, or otherwise.

4.10.0.0 CHANGE IN CONSTITUTION OF THE CONTRACTOR

4.10.1.0 The CONTRACTOR, whether an individual, Proprietary concern, Partnership firm, Private limited Company or Public Limited Company, shall not make any change(s) in its constitution, by transfer of substantial shareholding or of management (in the case of a company) or by addition or deletion of Partners, change in the terms of Partnership, or make any other material change(s) without prior intimation to and approval of the OWNER.

## SECTION - 5

### INSPECTION, TESTING AND QUALITY ASSURANCE

5.0.0.0 QUALITY ASSURANCE

5.0.1.0 Within 14 (fourteen) days of the receipt of the Letter of Acceptance from the OWNER, the CONTRACTOR shall submit to the Engineer-in-charge, a detailed Quality Assurance Plan (QAP) envisaged by him for ensuring due and proper adherence to Quality as required by the Specifications for the work. This Quality Assurance Plan shall give in detail the organization and methodology, checks and controls, as well as the correction mechanisms built into the QAP system as envisaged by the CONTRACTOR at the Site and elsewhere, for ensuring quality inputs into the work and for ensuring quality output on the Job.

5.0.2.0 The Engineer-in-charge shall be entitled, from time to time and at any time to make or cause to be made such addition(s), modification(s) or alterations(s) in the QAP as he considers necessary to improve the QAP (the decision of the Engineer-in-Charge in this behalf shall be final and binding on the CONTRACTOR), and the CONTRACTOR shall thereafter follow the QAP as added, modified or altered by the Engineer-in-charge.

5.0.3.0 Where under the QAP or otherwise in terms of the Contract, inspection and/or approval of the OWNER/Engineer-in-Charge for any works or materials is necessary for the CONTRACTOR to proceed further, the CONTRACTOR shall give the OWNER at least 7 (seven) days' written notice in respect of materials and at least 3 (three) days' written notice in respect of works of the readiness of the material(s) or works for inspection and if the OWNER/Engineer-in- Charge, notwithstanding receipt of notice fails to conduct relative inspection within the said period, the OWNER/Engineer-in-Charge will be deemed to have waived the right of inspection and the CONTRACTOR will be at liberty to proceed on the basis that materials or the works as the case may be, have been approved.

5.1.0.0 INSPECTION AND TESTING OF MATERIALS

5.1.1.0 The Engineer-in-Charge shall be entitled at all times, at the risk of the CONTRACTOR, to inspect and/or test by itself or through an independent person(s) or agency(ies) appointed by the OWNER or Engineer-in-Charge and / or to direct the CONTRACTOR to inspect and/or test or to get inspected and/or tested, all materials, items and components, whatsoever supplied or proposed for supply for incorporation in the works, inclusive during the course of manufacture or fabrication by the CONTRACTOR and / or at the CONTRACTOR 's or his sub-vendors' works or otherwise, of such material, item or component. The inspection and / or tests shall be conducted at the expense of the CONTRACTOR, and may be directed by the OWNER or Engineer-in-charge to be conducted by authorized representatives of the OWNER/Engineer-in-charge or third party inspection agency(ies) appointed by the OWNER. The OWNER may also require that all the inspections and tests conducted by the CONTRACTOR at his works or his sub-vendors' works be carried out in the presence of authorized representatives of the OWNER/Engineer-in-Charge/ third party inspection agency (ies) appointed by the OWNER. The CONTRACTOR shall provide the OWNER/ Engineer-in- charge and/or their representatives/Agents every facility or assistance necessary for carrying out or witnessing, as the case may be, the test(s)/inspection(s).

5.1.2.0 The CONTRACTOR shall also on receipt of intimation of any communication of any inspection or tests by the OWNER/Engineer-in-Charge or any of their representative(s)/agency (ies) nominated by the OWNER or Engineer-in-Charge in this behalf, present himself or his authorized representative at the place of inspection and/or testing to receive any orders or instructions consequent thereto, as shall be necessary.

5.1.3.0 The CONTRACTOR shall furnish to the Site Engineer for approval when requested, or as required by the specifications or other Contract Documents, adequate samples of all materials and finishes intended for incorporation in the works, such samples are to be submitted before the work is commenced permitting sufficient time for test(s)/examination(s) thereof of the OWNER. All materials furnished and finishes incorporated in the work shall conform to the approved sample(s) in all respects.

5.1.4.0 The Engineer-in-Charge and/or Site Engineer shall be entitled to reject at any time any defective material, item or component (including specially manufactured or fabricated items and components) supplied by the CONTRACTOR for incorporation in the works, notwithstanding previous inspection and/or testing thereof by or on behalf of the OWNER without rejection and

notwithstanding previous approval thereto by or on behalf of the OWNER (the decision of the Engineer-in-Charge as to any defect as aforesaid being final and binding upon the CONTRACTOR), and upon such rejection, the CONTRACTOR shall either perform such work or improvement thereon or in respect thereof, as shall be necessary to bring the material item/component to the requisite standard, or shall, if so required by the Engineer-in-Charge (whose decision in this behalf shall be final), remove the rejected material/item/component from the job site within the time specified by the Engineer-in-Charge or the Site Engineer and replace it at his own cost and expense (without additional remuneration or compensation in respect thereof) with material(s)/item(s)/component(s) approved by the Site Engineer. The provisions of clause 5.2.7.0 hereof shall mutatis mutandis apply to any failure of default by the CONTRACTOR to do so.

5.2.0.0 INSPECTION AND TESTING OF WORKS

5.2.1.0 The CONTRACTOR shall at all times ensure the highest standards of workmanship relative to the work, to the satisfaction of the Site Engineer or any inspector(s) or inspecting agency(ies) nominated by the OWNER/Engineer-in-Charge in this behalf. The Site Engineer/inspector(s)/inspecting agency (ies) shall have the power to inspect the work in all respects, at any and all times up to completion of the work as also to test or instruct the CONTRACTOR to test the works or any structure, material or component thereof at the risk and cost of the CONTRACTOR, either by the CONTRACTOR or by any agency (ies) nominated by the OWNER/Engineer-in-Charge or Site Engineer in this behalf.

5.2.1.1 The CONTRACTOR shall provide all facilities, instruments, material, labour and accommodation required for inspecting and testing the works (including checking the setting out of the works) and shall afford the Site Engineer/inspector(s)/inspecting agency(ies) all assistance necessary to conduct the tests.

5.2.1.2 The CONTRACTOR shall also provide and keep at all times during the progress of the work and maintenance period, proper means of access to the works and every part thereof by means of ladders, gangways, etc., and necessary attendance to move and set up the same as directed by the Site Engineer/inspector(s)/inspecting agency (ies) for inspection or measurement of the works.

5.2.1.3 The OWNER and the CONTRACTOR shall each bear the cost of their respective personnel involved in any inspection. The CONTRACTOR shall exclusively bear the costs of any marine vessel, third party personnel and/or experts and/or equipment (including specialized equipments) required or employed in or for any inspection to be conducted.

5.2.2.0 On no account shall the CONTRACTOR proceed with concreting or other work such as (but not limited to) foundations, superstructure or edge preparation of pipes for welding) by covering up or otherwise placing beyond the reach of inspection or measurement any works before necessary inspection entries are filled in the Site Inspection Register by the Site Engineer or the inspector(s) or inspecting agency(ies).

5.2.3.0 Should the CONTRACTOR fail to comply with any of the provisions aforegoing relative to inspection and / or testing of the works, the Engineer-in-Charge or Site Engineer shall in his absolute discretion be entitled to remove / dismantle and / or uncover, as the case may be, at the risk and cost of the CONTRACTOR for test and examination any works, structure or component thereof installed, erected or put up by the CONTRACTOR and to conduct or have conducted the test(s) and / or examination at the risk and cost of the CONTRACTOR.In such event, the CONTRACTOR shall also bear the risk and costs of replacement, reinstallation or re-erection of the concerned works, structure, or component, as the case may be.

5.2.4.0 Notwithstanding anything provided in the aforegoing clauses hereof, the CONTRACTOR shall be and remain liable at his own cost and initiative to conduct all tests at all relevant times during supply, erection and installation of any works, structure, material or component as shall be required in terms of the Contract Documents or by any codes or specifications referred to therein or approved by the OWNER or the Engineer-in-Charge. Where the Contract Documents or codes or specifications do not state or nominate the agency or laboratory where such test shall be conducted, the same shall be conducted at the cost of the CONTRACTOR through an agency(ies) or laboratory(ies) nominated by the OWNER or the Engineer-in-Charge for the purpose.

5.2.5.0 Should the Engineer-in-Charge or Site Engineer on inspection or testing be not satisfied with the quality or workmanship of any works, structure, item or component (the decision of the Engineer-in-Charge being final in this behalf), the CONTRACTOR shall forthwith re-perform, replace, reinstall or re-erect, as the case may be, such works, structure, item or component, and no such

rejected works structure, item or component shall be reused with reference to the work except with the prior permission of the Engineer-in-Charge or Site Engineer, and the provisions of Clause 5.2.7.0 hereof shall apply to default by the CONTRACTOR of the provisions of this Clause.

5.2.6.0 Notwithstanding anything provided in foregoing clauses hereof and notwithstanding that the Site Engineer and/or Inspector(s) or Inspecting Agency(ies) has/have inspected, tested and/or approved any particular work, structure, item or component, such inspection, test or approval shall not absolve the CONTRACTOR of his full responsibility under the Contract (inclusive of and relative to specification fulfillment and performance guarantees) the said inspection and test procedure being intended basically for the satisfaction of the OWNER that prima facie the erection done and/or materials and components supplied for incorporation in the works is in order.

5.2.7.0 Should the CONTRACTOR fail to remove and/or re-perform replace, reinstall, re erect, as the case may be, any work, structure, material, item or component rejected or found defective in terms of Clause 5.1.4.0 or Clause 5.2.5.0 hereof within such period as the Engineer-in- Charge may specify by written notice to the CONTRACTOR in this behalf, the CONTRACTOR shall be deemed to be in breach of contract within the provisions of Clause 7.0.1.0 hereof with regard to termination of Contract and associated provisions there under and the OWNER and Engineer-in-Charge shall be entitled (without prejudice to any other right or remedy of the OWNER) to remove the rejected / defective works, structure, material, item or component and to re-perform, replace reinstall and / or re-erect, as the case may be, the same by itself or through other agency(ies) or contractor(s) at the risks and costs of the CONTRACTOR in all respects, and recover the costs incurred by the OWNER in this behalf together with administrative charges of 1% (one percent) thereon admissible to the OWNER, and the OWNER shall be entitled (without prejudice to any other mode of recovery) to deduct the same from the Running Account / Final Bill(s) of the CONTRACTOR or any monies becoming due to the CONTRACTOR from time to time under this or any other Contract.

5.2.7.1 For the purposes of Clause 5.2.7.0 hereof, the decision of the Engineer-in-Charge on whether the works, structure, material, item or component is/are defective and/or is/are required to be removed and/or re-performed replaced, re-installed and/or re-erected, as the case may be, and as the costs incurred by the OWNER in this behalf, shall be final and binding upon the CONTRACTOR.

5.2.8.0 Without prejudice to and in addition to any other right of inspection, test or examination by the OWNER, before or after the passing and payment of the Final Bill, but before the expiry of the defect liability period, external agencies such as the Chief Technical Examiner of the Central Vigilance Commission shall have the right to technically audit the works. Any defects in the works pointed out by this technical audit group/agency shall be final and binding on the CONTRACTOR, notwithstanding that the Final Bill had been passed and/or paid to the CONTRACTOR and notwithstanding that the findings and report of this agency is released after the expiry of the defect liability period. The CONTRACTOR shall be bound to remove the defects pointed out by the technical audit group/agency and to repair / replace the defective works to the satisfaction of the OWNER, and the OWNER shall be entitled to retain in whole or part the CONTRACTOR's dues (if the Final Bill has not been paid), or the Security Deposit (if any) remaining in the hands of the OWNER, or to encash in whole or part the Bank Guarantee(s) (if any), Insurance Surety Bond(s) remaining in the hands of the OWNER to ensure the fulfillment of the CONTRACTOR's obligations in this regard.

5.2.8.1 Should the CONTRACTOR fail to comply with the provisions of Clause 5.2.8.0 hereof, the provisions of Clauses 5.2.7.0 and 5.2.7.1 hereof shall mutatis mutandis apply.

5.2.8.2 In case the defects or any of them are such as not to require replacement, the OWNER shall have the right to accept the defective work with suitable reduction in rates/price, as may be determined by the General Manager, for the determination of which the provisions of Clause 2.4.1.2 hereof shall mutatis mutandis apply, for which purpose any reference in Clause 2.4.1.2 to the Engineer-in-Charge shall be deemed to be a reference to the General Manager, and the defective works shall be deemed to be works not covered by the Schedule of Rates/lump sum price as the case may be. The reduction as determined by the General Manager shall be final and binding on the CONTRACTOR.

5.2.8.3 Should the money retained by the OWNER pursuant to the provisions of Clause 5.2.8.0 hereof be insufficient to meet the CONTRACTOR's liabilities, the CONTRACTOR shall forthwith on demand by the OWNER pay the shortfall, failing which the CONTRACTOR shall be liable to pay the OWNER interest on the outstanding at the rate of interest applied by the State Bank of India

on overdrafts, and the OWNER shall, without prejudice to any other right or remedy available to the OWNER, be entitled to recover the shortfall from any amount(s) payable or becoming due and payable under any other contract(s).

5.3.0.0 **FINAL TESTS & POSSESSION OF WORKS**

5.3.1.0 As soon as the works have been completed in all respects to the satisfaction of the Engineer- in-charge or Site Engineer, Final Tests of the works shall be undertaken by the CONTRACTOR at the risks and costs of the CONTRACTOR in the presence of the Site Engineer or his authorized representative(s). The OWNER may at its discretion permit final test(s) piecemeal in respect of particular part(s) or group(s) of the works or in respect of particular job site(s) involved.

5.3.1.1. The CONTRACTOR and the Site Engineer shall maintain a joint record of all Final Tests conducted, together with the results thereof, indicating the dates on which each of the said Final Tests was completed part-wise, component-wise, section-wise, group-wise, plant-wise, system-wise and sub-system wise, as well as on the entire works or Unit as a whole.

5.3.2.0 The OWNER shall be entitled to take over for operation, any of the various parts, components, sections, groups, plants, systems or sub-systems of the work, on which the respective Final Tests are completed. The date, on which the Final Tests on the entire work have been completed, shall be reckoned as the date of completion of the entire work covered by the Contract.

5.3.2.1 Unless commissioning is included within the scope of work of the CONTRACTOR, in a Contract in which the scope of work of the CONTRACTOR includes erection and/or installation of a Plant or Unit or of any equipment, the date of Mechanical Completion thereof recorded by the Engineer-in-charge pursuant to successful Final Tests under Clause 5.3.1.1 hereof shall be reckoned as date of completion of the work.

5.3.3.0 If during Final Tests or prior thereto any defects(s) in the design (insofar far as the work may involve any designing on the part of the CONTRACTOR ) or in any work performed or structure or component installed or erected or re-installed or re-erected or in any installation or erection or material or other items incorporated in the works, is/are noticed, the CONTRACTOR shall forthwith repair (if it can be repaired) and/or remove and/or demolish the same (if it cannot be repaired) and replace, re-install and re-erect the same and otherwise do and provide whatever is necessary to be done or provided to correct, repair, and/ or rectify the defect(s) to the satisfaction of the Engineer-in-charge, and if the defect (s) be discovered during the Final Tests, the CONTRACTOR shall thereafter repeat the Final Tests or such of them as may be required to be repeated and so on, until the successful conclusion of Final Tests as aforesaid, without any defects in respect of the entire works or Plant or Unit, as the case may be.

5.3.3.1 Should the CONTRACTOR fail to correct, repair or rectify any defects as aforesaid, the provisions of Clauses 5.2.7.0 and 5.2.7.1 hereof shall mutatis mutandis apply.

5.3.4.0 If, by reason of any default on the part of the CONTRACTOR, Final Tests cannot be conducted in respect of the entire works or for the Plant or Unit (in the case of a Contract which includes within its scope the erection or installation thereof) or for any of the separate part(s), component(s), section(s), group(s), system(s) or sub-system(s) comprised therein, within 30 (thirty) days after the dates fixed for the completion of the entire works covered by the Contract under the Progress Schedule or Mechanical Completion of the Plant/Unit, as the case may be, the OWNER shall be entitled, notwithstanding anything provided in Clause 5.3.2.0 hereof and without prejudice to any other rights or remedies of the OWNER and/or the liabilities of the CONTRACTOR under the Contract including (but not limited to) the rights of the OWNER under clauses 4.4.0.0, 7.0.1.0 and associated clauses there under, to take over and use the incomplete works or Plant or Unit, as the case may be, with or without affording the CONTRACTOR any further opportunity for completing the works and/or satisfying the requirements of final tests. The taking over and possession or use of the works or Plant or Unit or any part or portion or component, section or group or system or sub- system thereof by the OWNER, under the above provisions shall not be deemed to be an acceptance of the works or Plant or Unit or the relative part, portion, component, section, group, plant, system or sub-system, as the case may be, nor shall relieve the CONTRACTOR of his full obligations in respect thereof under the Contract.

5.3.5.0 If the CONTRACTOR is permitted to complete and/or conduct Final Tests for the works or Plant or Unit, or any part of the works or Plant or Unit, as the case may be, after it is taken over under the provisions hereof, this shall be without prejudice to the rights of the OWNER under the Contract, including (but not limited to) clauses 4.4.0.0 and 7.0.1.0 and associated clauses there under.

5.3.5.1 If the CONTRACTOR is permitted to complete and/or conduct Final Tests for the works or Plant

or Unit or any part of the works or Plant or Unit, as the case may be, and the CONTRACTOR is of opinion that such taking over and/or use shall require an extension of time for completion and/or for conducting Final Tests, the provisions of Clause 4.3.6.0 and associated Clauses there under relating to extension of time shall apply.

5.3.5.2 If pursuant to action under Clause 5.3.4.0 the CONTRACTOR is not permitted by the OWNER to complete and/or to conduct Final Tests for the works or Plant or Unit or any part thereof, the incomplete works/Plant/Unit shall be deemed to be a defective work. If the OWNER decides not to exercise its rights under Clause 4.7.4.0 or Clause 7.0.1.0 in respect thereof, then the OWNER shall (without prejudice to any other right which it may have) be deemed to have agreed to accept the defective works subject to a reduction in the applicable rate(s)/lump sum price(s) as determined by the General Manager, and the provisions of Clause 5.2.8.2 hereof shall mutatis mutandis apply.

5.3.6.0 If the works in their entirety are complete or as the case may be, the Unit is mechanically complete but the Final Tests cannot be completed in respect of the entire work or the Plant/ Unit or any part/ component/ section/ group/system/ subsystem thereof, for reasons solely attributable to the OWNER, then;

(i) After the date fixed for completion of the entire Works or Mechanical Completion of the Plant/ Unit, as the case may be, under the Progress Schedule, the OWNER shall be entitled to take over and use the Works/Plant/Unit pending the completion of the Final Tests by the CONTRACTOR at a later date.

(ii) If the Final Tests cannot be completed within 3 (three) months of the date fixed for the completion of the entire works or the Mechanical Completion of the Plant/Unit, as the case may be, for reasons solely attributable to the OWNER, the CONTRACTOR 's progressive/ stage wise payment, if any, held back specifically for non-completion of the said Final Tests, shall be released to the CONTRACTOR by the OWNER, against a Bank Guarantee for an equivalent amount issued in a form and by a Scheduled Bank in India acceptable to the OWNER. This Bank Guarantee shall be kept valid for a period of 3 (three) months from the date of release of payment as aforesaid; and

(iii) If, however, it is still not possible to conduct the Final Tests, within 6 (six) months of the date fixed for the completion of the entire works or Mechanical Completion of the Plant/Unit for reasons solely attributable to the OWNER, the Final Tests for the concerned works or Plant/Unit or part/ component/section/ group/ plant system/ subsystem thereof, shall be deemed to have been completed and the said Bank Guarantee will be released to the CONTRACTOR, duly discharged, by the OWNER.

5.3.7.0 The OWNER may, in addition to any other right(s) or power(s) to take over and/or use incomplete or defective works, at any time during the progress of the works, notwithstanding that time for the completion of the entire works or concerned part, system(s), portion or section thereof according to the Progress Schedule(s) shall not have expired, take over and/or use for any purpose the incomplete or partially completed works or any part, system(s), portion or section thereof, as the case may be, and give the CONTRACTOR an opportunity for completing the work or relative part, system(s) or portion or section thereof, as the case may be, within the time for completion permitted therefor under the Progress Schedule. If in the opinion of the CONTRACTOR, such taking over and/or use require an extension of time for completion, the provision of Clause 4.3.6.0 hereof and associated clauses there under relating to extension of time shall apply. Provided Always that such taking over, possession or use of the works or any part, system(s), portion or section thereof by the OWNER within the provisions hereof shall not be deemed to be an acceptance of work or relative part, system(s), portion or section thereof by the OWNER or relieve the CONTRACTOR of his full obligations in respect thereof under the CONTRACT.

5.4.0.0 **COMMISSIONING AND PERFORMANCE TESTS**

5.4.1.0 Notwithstanding the deeming provisions under clause 5.3.6.0, the CONTRACTOR shall remain liable to commission the Plant/Unit.

5.4.2.0 Prior to Commissioning the Plant or Unit, the CONTRACTOR shall undertake all operations necessary for start-up of the Plant/Unit to the satisfaction of the Engineer-in-Charge.

5.4.3.0 The OWNER shall provide in accordance with the provisions of Clause 3.3.0.0 hereof, the utilities required for Start-up and Commissioning the Plant/Unit and the raw material or feed stock to be processed in the Plant or Unit, the CONTRACTOR shall provide all other inputs and

consumables required for Start-up and Commissioning the Plant/Unit including grease and lubricants and first fill of fuels and oils for the equipment and machinery.

5.4.4.0 The CONTRACTOR shall provide all personnel required for Start-up and supervisory and technical personnel required for Commissioning, while the OWNER shall provide operating personnel for Commissioning, and shall make and undertake modifications in the Plant/Unit required for successfully Commissioning the Plant/Unit. The CONTRACTOR shall not, however, within the scope of the work of erecting and/or installing or Commissioning the Plant/Unit be required to supply any material (other than utilities and consumables) required to be incorporated in such modification.

5.4.5.0 The Plant/Unit shall be understood to have been successfully commissioned by continuous and stabilized operation up to full capacity for a continuous period of not less than 7 (seven) days. On successful Commissioning of Plant/Unit, the Engineer-in-Charge shall issue a Commissioning Certificate which shall state the date of completion of Commissioning.

5.4.6.0 If conduct of Performance Tests falls within the scope of work of a CONTRACTOR engaged inter alia for erection and/or installation of a Plant or Unit, the work shall be deemed not to be complete until successful completion of the Performance Tests.

5.4.6.1 Performance tests shall be started when the Unit is stabilized under design conditions. The Plant shall be operated and controlled in accordance with procedures set up before hand. The performance shall be measured on the basis of the average of data obtained during 72 (Seventy two) hours of performance tested under continuous operation of the Unit/Plant in Performance Test conditions after the Unit/Plant has been stabilized.

5.4.7.0 The CONTRACTOR shall provide technical and supervisory personnel required to conduct the Performance Tests, while the OWNER shall provide all other inputs required for the purpose. The CONTRACTOR shall make and undertake all modifications required to be made in the Plant/Unit to meet the Performance parameters and/or to successfully complete the Performance Tests for the Plant/Unit. The CONTRACTOR shall not, however, within the scope of work of erecting and/or installing or conducting Performance Tests for the Plant/Unit be required to supply any materials (other than utilities and consumables) required to undertake the modifications. The Performance Tests shall be repeated, if necessary, until successful completion of the Performance Tests. On successful completion of the Performance Tests, the Engineer-in-Charge shall issue the CONTRACTOR a Performance Test Certificate which shall indicate the dates on which the Performance Tests were conducted and the date(s) of successful completion of the Performance Tests. The provisions of Clause 5.2.6.0 hereof shall mutatis mutandis apply to Performance Tests in the same manner as they apply to Final Tests.

5.4.8.0 If during Commissioning and/or Performance Tests, any defects are discovered in any work performed by the CONTRACTOR or in any erection or installation undertaken by the CONTRACTOR, the CONTRACTOR shall forthwith within the scope of work do and provide all that is necessary to be done or provided to correct, repair and/or rectify the defect(s) to the satisfaction of the Engineer-in-Charge and shall remove or demolish and re-erect or re-install the defective works, if necessary, and shall thereafter continue with the Commissioning or repeat the Performance Tests, as the case may be, or such of them as are required to be performed, and so on until successful completion of the Commissioning and/or Performance Tests. Should the CONTRACTOR fail to correct, repair or rectify any defects as aforesaid, the provisions of Clauses 5.2.7.0 and 5.2.7.1 hereof shall mutatis mutandis apply.

5.4.8.1 (a) If on any testing any material or equipment or the Unit does not meet the design, rated or guaranteed performance relative thereto, the CONTRACTOR shall forthwith within the CONTRACTOR's scope of work and at no additional cost to the OWNER undertake such additional tests and/or operations as are necessary to identify the cause of such failure. Such tests and/or operations shall be conducted in conjunction with the Process Licensor, if the Unit as a whole fails to meet the Process Licensor's Guarantees.

(b) If as a result of such tests and/or operations it is determined that the design, rated and/or guaranteed outputs or capacities have not been met because of a defect or deficiency or unsuitability or inadequacy in or of any material(s) (including machines and equipment) supplied by the CONTRACTOR, the CONTRACTOR shall forthwith in consultation with the Engineer-in-Charge take steps necessary to cause the defect/ deficiency/ unsuitability/ inadequacy to be identified and rectified, either by re-placement of the defective material or part thereof or by repair thereof.

(c) If under any of the provisions hereof, the CONTRACTOR is required to undertake any modification, rectification or replacement, the CONTRACTOR shall for this purpose forthwith

establish a Time Schedule acceptable to the Engineer-in-Charge for such modification/replacement/rectification bearing in mind the time exigencies and the Project requirements. Should the CONTRACTOR fail to establish the Time Schedule, the Engineer-in-Charge shall establish the Time Schedule, and the Time Schedule so established shall be binding on the CONTRACTOR.

(d) Should the CONTRACTOR thereafter fail to adhere to a Time Schedule so established for the replacement/rectification, the OWNER may (but without obligation to do so) take over in whole or part such replacement/rectification at the risk and cost of and as agent of the CONTRACTOR. In so doing, the OWNER shall be entitled to identify and employ through private negotiations the quickest available resources of supply and/or work without resorting to the tender process or any other form of competitive bidding and shall be entitled to recover from the CONTRACTOR, the costs incurred by the OWNER in respect thereof, plus 1% (one percent) administrative charges thereon.

5.4.9.0 The procedure for Commissioning the Plant/Unit and/or for conducting Performance Tests shall be as prescribed by the Engineer-in-Charge taking into account the requirements of the manufacturers/Vendors of plant and equipment and the Licensors of the process (es) involved. The CONTRACTOR shall strictly comply with the procedure to ensure strict adherence with the said requirements.

5.4.9.1 Contractor shall carry out all activities for collecting the required data during Performance Test runs to identify problems of non-performance for further analysis and modifications required to meet process performance parameters.

5.4.10.0 If for reasons solely attributable to the OWNER and/or not attributable to the CONTRACTOR, the Commissioning of the Unit cannot be undertaken or completed by the CONTRACTOR within 6 (six) months of the Mechanical Completion of the Unit and/or the Performance Test(s) for the Unit cannot be undertaken or completed by the CONTRACTOR within 6 (six) months of successful Commissioning of the Unit, the OWNER and the CONTRACTOR shall negotiate in good faith an equitable resolution which either removes from the CONTARCTOR's scope, the Commissioning and/or Performance Test(s)of the Unit or discharges the CONTARCTOR from further obligation for Commissioning and/or Performance Test(s) of the Unit, or extends the period required for Commissioning of the Unit and/or undertaking Performance Test(s), with suitable compensation to the CONTRACTOR for the costs and charges incurred or to be incurred for the option selected by the OWNER.

5.4.11.0 If Commissioning of the UNIT commences later than 3 (three) months of Mechanical Completion of the UNIT for any reason not attributable to the CONTRACTOR, the OWNER and the CONTRACTOR shall agree upon the reasonable cost incurred for maintaining watch and ward and preservation and insurance of the UNIT beyond the said 3 (three) months period and up to commencement of Commissioning, which shall be payable to the CONTRACTOR in addition to the price of services and this additional amount shall be included within and form part of the Final Bill of the CONTRACTOR. If the Commissioning of the UNIT is delayed beyond 6 (six) months of Mechanical Completion of the UNIT, the OWNER and the CONTRACTOR shall work out the modalities for the takeover of the UNIT by the OWNER without prejudice to the CONTRACTOR's obligation for and related to and consequent to Commissioning.

5.4.12.0 If Commissioning of the UNIT and/or the conduct of the Performance Test is delayed beyond 6 (six) months from the date of Mechanical Completion of the UNIT for reasons not attributable to the CONTRACTOR, the OWNER shall (subject to such adjustments as permissible) release to the CONTRACTOR, the undisputable balance payable for any other work on commissioning and/or Performance Tests other than any amount payable for Commissioning and/or Performance Tests against the CONTRACTOR furnishing a Bank Guarantee from a scheduled bank in India (including the Indian branch of a foreign bank) acceptable to the OWNER in a format prescribed by the OWNER for an amount equivalent to the amount of the payment(s) to be released. The validity of such Bank Guarantee(s) shall be initially for a period of 6 (six) months and shall be extended for one further period of 6 (six) months. If the Commissioning and/or Performance Test cannot be conducted within such extended period for reasons solely attributable to the OWNER, the Bank Guarantee will be substituted by Corporate Guarantee of the CONTRACTOR in a format acceptable to the OWNER. If however, the UNIT cannot be commissioned within the said period for reason(s) attributable to the CONTRACTOR or if commissioning and/or the Performance Test conducted indicates that the UNIT does not perform to the contractual specifications and requirements, then the Bank Guarantee(s) shall even after the extension aforesaid continue to be extended up to and until successful Commissioning and Performance Tests of the UNIT. In either event, the OWNER will be entitled

to encash the Bank Guarantee(s) if the Bank Guarantee is not extended or substituted by an acceptable Corporate Guarantee, as the case may be, at least 14 (Fourteen) days prior to the date of expiry of Bank Guarantee(s).

5.5.0.0 **COMPLETION CERTIFICATE**

5.5.1.0 After the Final Tests have been successfully completed in respect of all the works envisaged in the contract, or after the Plant/Unit has been Mechanically completed, as the case may be, the CONTRACTOR shall clear the job site of all scaffolding, wiring, pipes, surplus materials, CONTRACTOR 's labour, equipment and machinery and shall demolish, dismantle and remove all CONTRACTOR 's site offices and quarters and other temporary works, structures and constructions and other items and things whatsoever brought upon or erected at the job site or any land allotted to the CONTRACTOR by the OWNER and not incorporated in the permanent works and shall remove all rubbish from the job site and the land allotted to the CONTRACTOR and shall clear, level and dress the job site and said land to the satisfaction of the Site Engineer and shall put the OWNER in undisputed custody and possession of the job site and all land allotted by the OWNER to the CONTRACTOR , and unless the CONTRACTOR shall have fulfilled the provisions of the clause, the works shall not be deemed to have been completed, and failing compliance by the CONTRACTOR of the provisions of this clause, the provisions of Clauses 7.0.6.0 and 7.0.7.0 hereof and associated provision there under shall mutatis mutandis apply.

5.5.2.0 Upon the satisfactory fulfillment by the CONTRACTOR of the provisions of Clause 5.5.1.0 hereof, the CONTRACTOR shall be entitled to apply to the Engineer-in-Charge, for a Completion Certificate in respect of the entire work or work at any job site, as the case may be, upon submission of the following documents:

(i) The Technical Documents according to which the work was carried out;

(ii) Complete set of working drawings showing therein corrections and modifications (if any) made during the course of execution of the works, signed by the Engineer-in- Charge;

(iii) Certificates of final levels as set for various works, signed by the Site Engineer;

(iv) Records of the final test as maintained jointly and signed by the representative of the CONTRACTOR and the Site Engineer or Mechanical Completion Certificate (if Commissioning is not within the CONTRACTOR's scope of work) and Commissioning Certificate (if Performance Tests are not within the CONTRACTOR's scope of work) and Performance Test Certificate (if Performance Tests are within the CONTRACTOR'S scope of work).

(v) Certificate of Site Engineer of satisfactory fulfillment of the provisions of Clause 5.5.1.0 hereof;

(vi) List of surplus/scrap materials, ( out of the materials issued by the OWNER) returned to the OWNER's Store or otherwise disposed of, duly signed by the Site Engineer;

(vii) Materials-at-site accounting for OWNER-supplied materials, signed by the Site Engineer;

(viii) Discharge Certificate in respect of OWNER-supplied equipment and machinery, signed by the Site Engineer and

(ix) Declaration by the CONTRACTOR that he has duly cleared any and all of the dues payable by him to his Labour/ Piece rate workers (PRWs), Sub-Contractors, Suppliers, Vendors, , Octroi / entry tax, Goods and Service Tax, Excise and Customs, Provident fund, ESI and royalties, if any.

(x) Proof in payment in full of the cess payable under the Building & other Construction Workers' Welfare Cess Act, 1996, wherever applicable.

5.5.3.0 If Engineer-in-Charge is satisfied of the completion of the work relative to which the Completion Certificate has been sought and of the completeness in all respects of the documents specified in Clause 5.5.2.0 hereof, the Engineer-in-Charge shall, within 14 (fourteen) days of receipt of the application for Completion Certificate, issue a Completion Certificate in respect of the said work in the format prescribed by the OWNER.

5.5.3.1 The issue of a Completion Certificate shall be without prejudice to the OWNER's rights and to the CONTRACTOR's liabilities under the Contract, including the CONTRACTOR's liability for the

Defect Liability Period under Clause 5.6.1.0 hereof, nor shall the issue of a Completion Certificate in respect of the works or work at any job site be construed as a waiver of any right or claim of the OWNER against the CONTRACTOR in respect of work or the works at the job site in respect of which the Completion Certificate has been issued.

5.5.4.0 Up to and until issue of the Completion Certificate as provided for hereinabove in respect of the work or works at any job site, the relative work(s) shall be and remain at the risks of the CONTRACTOR in all respects, including (but not limited to) accident, fire, lightning, earthquakes, flood, storm, tempest, riot, civil commotion and/ or war, except for such works/Plant/Unit or parts, portions, components, sections, groups, systems or sub-systems, which have been taken over by and put to beneficial use by the OWNER, in respect whereof such risks shall pass to the OWNER when the OWNER takes over the same in terms of the Contract.

5.6.0.0 **DEFECT LIABILITY PERIOD**

5.6.1.0 The Defect Liability Period for the works (including the materials incorporated therein within the CONTRACTOR's scope of supply) shall unless otherwise specified be 12 (twelve) months from the date of Completion/Mechanical Completion stated in the Completion Certificate.

5.6.1.1 The CONTRACTOR shall, at his own cost and initiative, correct, repair and/or rectify any and all defect(s) and/or imperfections in the design of the work (insofar as the CONTRACTOR shall be concerned with the design of the work or any part thereof) and/or in the work performed and/or materials, components or other items incorporated therein within the CONTRACTOR's scope of supply as shall be discovered during the Defect Liability Period and in the event of the CONTRACTOR failing to do so, the provisions of Clauses 5.2.7.0 and 5.2.7.1 hereof shall apply.

5.6.1.2 Defect liability Period for the works completed till the date of cancellation of contract shall be 12 (twelve) months from the date of Cancellation of Contract.

SECTION 6

## MEASUREMENTS AND PAYMENTS

### 6.0.0.0 FINAL MEASUREMENTS

6.0.1.0 Within 15 (fifteen) days from the date of completion of Final Test(s) in respect of the works or any portion, section, group or job site, as the case may be, the CONTRACTOR shall cause to be jointly taken with the Site Engineer, final measurements as herein provided for the works covered by the said Final Test(s).

6.0.2.0 If the CONTRACTOR fails to apply to the Engineer-in-Charge for final measurements within 15 (fifteen) days from the date of relative final tests as specified in Clause 6.0.1.0 hereof, the Site Engineer may, of his own initiative, notify the CONTRACTOR in writing of the date(s) for final measurements. The CONTRACTOR shall be bound to present himself for the measurements on date(s) so notified, failing which the provision of Clause 6.1.4.0 hereof shall apply.

### 6.1.0.0 MODE OF MEASUREMENT

6.1.1.0 All measurements shall be in the metric system, and except where expressly indicated to the contrary in the Schedule of Rates or other Contract Documents, all measurements shall be taken in accordance with the procedures set forth in the Schedule of Rates, Specifications and other Contract Documents, notwithstanding any provision(s) in the relative standard method of measurement or any other general or local custom to the contrary.

6.1.2.0 In the event of the mode of measurement being not provided for by the Contract Documents in respect of any item of the work, such item of work shall be measured in accordance with the Indian Standard Specification No.1200 (latest edition) and such other Indian Standard Specifications as may be applicable, and in the event of such item not being covered by the said Indian Standard Specifications, shall be measured in accordance with the method of measurement in this behalf determined by the Engineer-in-Charge, whose decision shall be final and binding upon the CONTRACTOR.

6.1.3.0 All measurements shall be taken jointly by the Site Engineer or his representative on the one hand and the CONTRACTOR or his representative on the other hand and the CONTRACTOR shall be bound to present himself or his authorized representative whenever so required by the Site Engineer, and shall remain present throughout the time required for joint measurements.

6.1.4.0 If the CONTRACTOR absents himself for any reason whatsoever on any date appointed for joint measurements, the joint measurements shall be taken by the Site Engineer in the absence of the CONTRACTOR and the measurements signed by the Site Engineer shall be final and binding upon the CONTRACTOR.

6.1.5.0 Measurements shall be signed and dated on each page by the CONTRACTOR/CONTRACTOR's representative and Site Engineer/Site Engineer representative. If the CONTRACTOR objects to any of the measurements recorded, including the mode of measurement, such objection shall be noted in the Measurement Book against the item objected to and such note shall be signed by the CONTRACTOR/CONTRACTOR's representative and Site Engineer/Site Engineer's representative. In the absence of any noted objection as aforesaid, the CONTRACTOR shall be deemed to have accepted the relative measurements as entered in the Measurement Book/Sheets and shall be barred from raising any objection in respect of any measurements recorded in the Measurement Book.

6.1.6.0 All measurements relative to which any objections have been noted in the Measurement Book shall be submitted by the Site Engineer/ his representative to the Engineer-in-Charge for his decision, and the decision of the Engineer-in-charge relative thereto (whether on the correct measurement to be adopted or on the mode of measurement to be adopted) shall be final and binding upon the CONTRACTOR.

6.1.7.0 The OWNER and the CONTRACTOR shall each bear the costs of their respective personnel involved in any measurement. The CONTRACTOR shall exclusively bear costs of any marine vessel, third party personnel and / or experts and/or equipment (including specialized equipments) required or employed in or for any measurements to be conducted.

6.2.0.0 **FINAL BILL**

6.2.1.0 On the basis of the Final Measurements entered in the Measurement Books/Sheets (the measurements decided by the Engineer-in-Charge upon any objection and/or mode of measurement decided by the Engineer-in-Charge upon any objection being the measurement to be adopted in such event), the CONTRACTOR shall prepare and submit to the Engineer- in-charge a Final Bill in the prescribed form with reference to the total work covered by the Contract. Such Bill is to be drawn up by applying the applicable rate(s) specified in the Schedule of Rates to the relative measured quantity (ies). Final Bill shall also include the reconciliation or accounting of all materials supplied by or on behalf of the OWNER as free issue material or otherwise.

6.2.1.1 If there is any difference or disputes between the CONTRACTOR and the OWNER as to the item(s) of the Schedule of Rates applicable to any particular supply, work or operation, the decision of the Engineer-in-charge on the applicable item(s) of the Schedule of Rates shall be final and binding upon the CONTRACTOR. If the Engineer-in-Charge shall be of the opinion (which opinion shall be final and binding upon the CONTRACTOR) that the disputed supply, work or operation is not covered by any item in the Schedule of Rates or by any other rate fixed pursuant to the provisions hereof, the Engineer-in-charge shall determine the applicable rate(s) in respect thereof according to the provisions of Clause 2.4.1.2 hereof, and the rate(s) so determined by the Engineer-in-charge shall be final and binding on the CONTRACTOR.

6.2.1.2 If the CONTRACTOR has already prepared the Final Bill, the CONTRACTOR shall amend the Final Bill to apply the applicable item(s) of the Schedule of Rates and/or rate(s) as determined by the Engineer-in-charge and if the CONTRACTOR has not prepared the Final Bill, shall prepare the Final Bill accordingly.

6.2.2.0 The Final Bill shall, in addition to the payment entitlements arrived at according to the provisions of Clause 6.2.1.0 hereof and associated clauses above, include in a separate statement annexed thereto the notified claims of the CONTRACTOR as provided for in Clause 6.6.3.0 hereof.

6.2.3.0 The Final Bill drawn in accordance with the provisions hereof shall be submitted to the Engineer-in-charge for certification in quintuplicate (or in such other number of copies as may be prescribed), accompanied by the Completion Certificate relating to the works.

6.2.3.1 The Engineer-in-Charge shall within 30 days of the receipt of the Final Bill drawn in accordance with the provisions hereof proceed to check, correct and certify the Final Bill and shall forward the corrected and certified Final Bill to the OWNER for scrutiny and payment together with the Completion Certificate, and shall send to the CONTRACTOR for his information a copy of the Final Bill as corrected and certified.

6.2.4.0 All monies payable under the Contract shall become due to the CONTRACTOR only after submission to the OWNER of the certified Final Bill accompanied by the Completion Certificate in respect of the works.

6.2.5.0 Payment of the amount(s) due on the certified Final Bill to the extent admitted by the OWNER shall be made within 90 (ninety) days from the date of its certification by the Engineer-in- charge.

6.2.5.1 The payment to the CONTRACTOR on the Final Bill shall be subject to deduction of retention money(ies), balance security deposits and other claims, if any, as well as income tax as provided under section 194-C of the Income Tax Act and such other taxes and deductions as provided for under any law, rule or regulation having the force of law for the time being applicable (including any hold ups directed or necessitated by Court Orders or Orders of any Tribunal or other statutory authority and/or of the Vigilance Commission).

6.2.6.0 The OWNER may authorize the Engineer-in-charge and/or any other person(s) to commence a dialogue with the CONTRACTOR for arriving at a settlement of the notified claims of the CONTRACTOR annexed to the Final Bill as provided in Clause 6.6.3.0 hereof.

6.2.6.1 If a settlement is negotiated with the CONTRACTOR in respect of such claims and such settlement is approved by the OWNER, the CONTRACTOR shall submit a supplementary Final Bill (“Supplementary Final Bill “) to the OWNER drawn in terms of the said settlement, and the provisions of Clause 6.2.3.1 and associated clauses there under shall mutatis mutandis apply to such Supplementary Final Bill.

6.2.6.2 Payment of the amount due on the Supplementary Final Bill drawn in terms of the settlement envisaged in clause 6.2.6.1 shall be made within 90 (ninety) days from the date of its certification by the Engineer-in-Charge.

6.3.0.0 **SCHEDULE OF RATES:**

6.3.1.0 The remuneration determined due to the CONTRACTOR under the provision of Clause 6.2.0.0 hereof shall constitute the entirety of the remuneration and entitlement of the CONTRACTOR in respect of the work(s) under the Contract, and no further or other payment whatsoever shall be or become due or payable to the CONTRACTOR under the Contract.

6.3.2.0 Without prejudice to the generality of the provisions of Clause 6.3.1.0 hereof, the Schedule of Rates shall be deemed to include and cover:

(i) All costs, expenses, outgoings and liabilities of every nature and description whatsoever and all risks and delays whatsoever (foreseen or unforeseen) to be taken or which may occur in or relative to the execution, completion, testing and/or handing over the work to the OWNER and/or in or relative to acquisition, loading, unloading, transportation, storing, working upon, using, converting, fabricating, erecting any item, equipment, material or component in or relative to the works whether or not such risks and delays are attributable to any act or omission of the OWNER or of the CONTRACTOR or of any third party and the CONTRACTOR shall be deemed to have known the nature, scope, magnitude and the extent of the works and items, materials, utilities, consumables, equipment, and components and work, labour and services required for the proper and complete execution of the works though the Contract Documents may not fully and precisely set out, describe or specify them; and the generality hereof shall not be deemed to be anywise limited, restricted or abridged because in certain cases, the Contract Documents or any of them shall or may and/or in other cases, they shall or may not expressly state that the CONTRACTOR shall do or perform any particular work, labour or service or because in certain cases, the Contract Documents state a particular work, operation, supply, labour or service shall be performed/made by the CONTRACTOR at his own cost or without additional payment, compensation or charge or without entitlement of claim against the OWNER or words to similar effect, and in other cases, they do not do so or because in cases it is stated that the same are included in or covered by the Schedule of Rates and in other cases, it is not so stated and the CONTRACTOR hereby waives any and all contrary rights;

(ii) The cost of all constructional plant, equipment, supply of water and power, construction of temporary roads and access, temporary works and facilities, pumps, wiring, pipes, scaffolding, shuttering, and other materials, supervision, labour, insurances, fuel, stores, spares, supplies, appliances and other materials, items, articles and things whatsoever (foreseen or unforeseen) to be supplied, provided or arranged by the CONTRACTOR in or relative to or in connection with the performance and/or execution of each item specified in the Schedule of Rates and any related or incidental works or operations by expression or implication involved therein or incidental thereto, complete in every aspect in accordance with Contract Documents, and the plan(s), drawing(s), design(s), order(s) and/or instruction(s).

(iii) The cost of royalties, licence fees, charges, duties, penalties, levies and damages whatsoever payable for or in respect of any protected or patented goods, materials, equipment or processes employed in or relative to the works and all rents, royalties, licence fees and any other fee, duty, penalty, levy, loss or damage payable on the excavation, removal or transportation of any material or acquisition or use of any right of way or other rights, licences, permits, privileges or usages required for or relative to the performance of the works;

(iv) Customs duties, excise duties and other duties, sales tax on sale or purchase or turnover or on Works Contract or otherwise and other direct and indirect taxes, quay and port dues or charges and all other duties, taxes, fees, charges, levies octroi and/or cesses whatsoever imposed by the Central Government or State Government or Municipal or Local Bodies and other Authorities whatsoever payable on any materials and/or works imported, exported, transported, supplied or performed (including materials incorporated in the works or brought to site for the performance of the work) without any entitlement to the CONTRACTOR for any exemption, remission, refund or reduction thereof.

(v) The cost of all indemnities to the OWNER and insurance premia on insurance required in terms of the Contract Documents under any law, rule or regulation, or otherwise taken out by the CONTRACTOR and the cost of all risks whatsoever (foreseen or unforeseen) including but not limited to risks and costs of delay, OWNER's hold up, extended stay, idle personnel or equipment or extension of time or reduction or increase in the work or scope of work and/or cancellation of Contract and/or accidents, strike, civil commotion, war, labour

trouble, third party breach, fire, lightning, inclement weather, storm, tempest, flood, earthquake and other acts of God, Government regulation or imposition or restriction, dislocation of road, rail and other transport, access or facilities, flooding of site and/or access roads or approaches thereto, suspension of work, sabotage and other cause whatsoever.

(vi) The cost of all material supplied to the OWNER for incorporation in the works delivered to the job site and stacked as instructed by the Engineer-in-Charge including (but not limited to) loading, transportation and unloading thereof, waste or materials and returns and disposal of waste and/ or empties; and

(vii) All supervision charges, establishment overheads, finance charges and other costs and expenses of and charges to the CONTRACTOR, and CONTRACTOR's profit of and relative to the work.

6.3.3.0 Subject to the provisions of Clause 8.1.0.0, the rates stated in the Schedule of Rates shall not be subject to escalation or increase on any account whatsoever.

6.4.0.0 **ON ACCOUNT PAYMENTS AND ADVANCES**:

6.4.1.0 Without prejudice to the provision of Clause 6.2.4.0 hereof, the OWNER may at its discretion by way of assistance to the CONTRACTOR, make 'on account' payments to the CONTRACTOR, during the progress of the work on the basis of Running Account Bills as hereinafter more specifically mentioned.

6.4.1.1 Monthly or otherwise as the Engineer-in-Charge may specify in this behalf, the CONTRACTOR shall make a quantitative assessment of the work performed by CONTRACTOR at each job site during the preceding month or other specified period and submit a Running Account Bill (in the form prescribed by the OWNER) in quintuplicate to the Site Engineer of the work during the said month/period with detailed measurements thereof, the said Running Account Bill(s), to be drawn by applying unit quantities measured to the applicable item(s) in the Schedule of Rates. The Engineer-in-Charge shall thereafter have summary verification undertaken of the work and quantities entered in the Running Account Bill(s), and may certify the Running Account Bill(s) for payment on basis of such verification.

6.4.1.2 Running Account Bills as specified in Clause 6.4.1.1 hereof may be drawn by the CONTRACTOR every alternate month, and an ad hoc payment made by the OWNER in respect of the intervening month for the amount certified by the Engineer-in-Charge on the basis of a summary assessment made by the Engineer-in-Charge of the value performed by the CONTRACTOR during the intervening month, such ad hoc payment(s) to be deducted from the amount(s) certified by the Engineer-in-Charge as payable on the Running Account Bill(s) thereafter following.

6.4.1.3 Where the Contract stipulates a lump sum as payable for the work or where a lump sum rateis stipulated in the Schedule of Rate(s) or otherwise in respect of any particular work or part thereof and the works are not, at any intervening stage, capable of measurement, the Running Account Bill to be prepared by the CONTRACTOR according to the provisions of Clause 6.4.1.1 hereof shall be prepared on the basis of a value assessment of such work as certified by the Engineer-in-charge, as percentage of the entire work or item of work for which the lump sum rate is stipulated.

6.4.1.4 No Running Account Bill(s) shall be made and/or certified for a total value of less than Rs.50,000/- (Rupees fifty thousand only) unless otherwise expressly agreed.

6.4.2.0 All on account payments shall be subject to deductions there from of all dues to the OWNER, retention monies and other deductions provided for in the Contract, and taxes and other monies deductible within the provisions of Section 194-C of the Income Tax Act or any other law, rule or regulation for the time being in force.

6.4.3.0 All on account payments shall be regarded merely as advance payments against the amount which will become due to the CONTRACTOR in terms of the Contract, and any such payments shall be without prejudice to the full rights of the OWNER under the Contract andto the liabilities of the CONTRACTOR there under, and specifically shall not be regarded as an acceptance or completion of any work(s) paid for in terms of any Running Account Bill or otherwise, notwithstanding any verification or certification by the Engineer-in-Charge in respect thereof.

6.4.3.1 The Schedule of Rate item(s) applied by the CONTRACTOR in respect of any work in his Running Account Bill(s) and the acceptance thereof by the Engineer-in-Charge while verifying and certifying the Bill for payment in respect of such work or otherwise in certifying any payment

within the provisions aforesaid shall not be deemed to be binding upon the OWNER as determining the applicable Schedule of Rate item(s) and shall be without prejudice to the rights of the OWNER within the provisions of Clause 6.2.1.1 hereof.

6.4.4.0 Unless or until an extension of time has been granted by the Engineer-in-charge under Clause 4.3.6.0 hereof or by the OWNER under Clause 4.3.7.0 hereof on account payments made under Running Account Bills raised by the CONTRACTOR for the works executed after the expiry of the date of final completion of the works under the approved Progress schedule, shall be subject to provisional withholding of an amount towards adjustment by way of discount in the price calculated as per provisions of Clause 4.4.2.0 hereof. The amount so withheld shall be adjusted towards the Price Adjustment (if any) finally determined after completion of the works, without prejudice to the OWNER's right to recover from the CONTRACTOR any shortfall between the Price Adjustment finally determined and the amount provisionally withheld. Any excess amount provisionally withheld in excess of Price Adjustment finally determined shall upon such determination be paid to the CONTRACTOR. As an alternative, the CONTRACTOR shall have an option to provide:

a) Bank guarantee from a scheduled bank and in a format acceptable to the OWNER for a sum equal to 10% (ten percent) of the Total Contract Value which shall be available for recovery of the Price Adjustment for Slippages in completion (if any) finally determined after completion of the works. This Bank guarantee shall be in addition to any other guarantee to be provided by the CONTRACTOR and shall be valid for a period of not less than 6 (six) months from the date of final completion of the works with a claim period of atleast 3 (three) month thereafter or;

b) Insurance Surety Bond (only if the CONTRACTOR is an Indian entity) from an insurer registered with Insurance Regulatory and Development Authority, acceptable to the OWNER, in the format included acceptable to the OWNER for a sum equal to 10% (ten percent) of the Total Contract Value which shall be available for recovery of the Price Adjustment for slippages in completion (if any) finally determined after completion of the works. This Insurance Surety Bond shall be in addition to any other guarantee to be provided by the CONTRACTOR and shall be valid for a period of not less than 6 (six) months from the date of final completion of the works with a claim period of atleast 3 (three) month thereafter.

6.4.5.0 In Contracts of a Total Contract Value of Rs. 10 crore (Rupees ten crore only) and above, the CONTRACTOR may be allowed a Mobilization advance for an amount equivalent to up to 10% (ten per cent) of the Total Contract Value (to be released in not less than two installments as the OWNER may determine), subject to the fulfillment of the following conditions:

a) The CONTRACTOR shall have furnished the Initial Security Deposit as stipulated in Clause 2.1.1.0 and associated clauses hereof.

b) The CONTRACTOR shall have executed the formal contract in terms of the Form of Contract.

c) The CONTRACTOR shall have made a formal application for the release of the Mobilization Advance and shall have furnished a Bank Guarantee to cover the Mobilization Advance and a sum equivalent to 10% (ten per cent) thereof from a Scheduled Bank in India acceptable to the OWNER and in a format approved by the OWNER.

d) The outstanding balance of the Mobilization Advance shall carry interest at 1% (one percent) above the MCLR bank rate prevailing on the date of opening of Price Bids;

e) Without prejudice to any other mode of recovery available to the OWNER, the Mobilization Advance, together with interest thereon calculated on the reducing balance, may be recovered at the rate of 10% (ten per cent) of the gross amount certified against each Running Account Bill, till the advance, together with the interest accrued thereon, is recovered in full. The unrecovered balance if any and interest may be recovered from the Final Bill of the CONTRACTOR and/or from any other amount due to the CONTRACTOR under any other contract or otherwise.

f) All recoveries shall first be apportioned and appropriated to interest and then to principal.

g) (i) If the OWNER is satisfied that 25% (twenty five per cent) of the Mobilization Advance and interest accrued till then on the Mobilization Advance has been repaid to or recovered by the OWNER, the OWNER may on the application of the CONTRACTOR, if the Bank

Guarantee submitted by the CONTRACTOR covers and secures only the Mobilization Advance, permit the CONTRACTOR to substitute the Bank Guarantee by a Bank Guarantee in a format approved by the OWNER from a Scheduled Bank in India acceptable to the OWNER for an amount reduced by 25% (twenty five per cent).

(ii) The provisions of paragraph (i) hereof above, shall mutatis mutandis apply to the OWNER's satisfaction that the CONTRACTOR has repaid 50% (fifty per cent) and/or 75% (seventy five per cent), as the case may be, of the Mobilization Advance, and interest up to then accrued till then on the Mobilization Advance.

i) Any Bank Guarantee furnished to secure the Mobilization Advance shall be valid, in the first instance, for a period of 3 (three) months beyond the Scheduled period of Mechanical Completion of all the works under the Contract. The CONTRACTOR shall prior to the expiry of any period for which a Bank Guarantee is valid, at the request of the OWNER, suitably extend the validity of the Bank Guarantee(s) for such further period or periods as may be required by the OWNER failing which, without prejudice to any other right or remedy available to the OWNER, the OWNER shall be entitled to encash the Bank Guarantee(s) and recover in part or whole the outstanding mobilization advance and interest from the proceeds of the encashment, without prejudice to any other right or remedy.

j) All other conditions stipulated in Clause 2.1.2.0 hereof shall be applicable to the advance(s).

6.4.5.1 (a) Interest shall be applied on the portion of the Mobilization Advance outstanding from any amount certified for payment under a Running Account Bill up to the date of recovery or up to a period of thirty (30) days from the date of submission of the Running Account Bill complete in all respect to the Engineer-in-Charge, whichever is earlier.

(b) Interest shall be applied on the portion of the Mobilization Advance outstanding from any amount certified for payment under the Final Bill up to the date of recovery or up to a period of ninety (90) days from the date of submission of the Final Bill, whichever is earlier. The Final Bill shall be deemed to be submitted on the date when the Engineer-in-Charge has acknowledged receipt of the Final Bill without conveying any reservation.

6.4.6.0 In addition, the OWNER may, at its discretion, allow Secured Advance(s) to the CONTRACTOR, against imperishable materials brought to site for incorporation in the permanent works. Such Secured Advance(s) shall be governed by the following conditions:

(a) The decision of the OWNER as to whether or not to grant a Secured Advance and as to what materials, if any, are imperishable for the grant of Secured Advance and/or as to what has to be done to qualify any particular material for the grant of Secured Advance, shall be final and binding on the CONTRACTOR.

(b) The Secured Advance shall be limited to lower of the following:

(i) 75% (Seventy Five percent) of the value of the imperishable material brought to site for permanent incorporation in the works as assessed by the Engineer-in-Charge, who may call for (but shall not be bound by) the voucher(s)/invoices for any such material from the CONTRACTOR, who shall forthwith comply with the same;

(ii) 90% (Ninety percent) of the concerned item rate for the work in which the material is to be incorporated as set out in the Schedule of Rates.

(c) The Secured Advance shall be recovered from the subsequent Running Account bill(s) of the CONTRACTOR, to the extent as determined by the Engineer-in-charge (whose decision shall be final and binding upon the CONTRACTOR) that the materials covered by the Secured Advance are used up in or for the work(s) covered by the bill(s).

(d) Upon payment/disbursement by the OWNER to the CONTRACTOR or any supplier of the CONTRACTOR of any Secured advance with respect to any materials, the ownership of the said materials shall forthwith vest in the OWNER as security for the repayment of the said advance(s) without necessity of any further act, deed, matter or thing, and the said materials shall be deemed to be OWNER supplied materials entrusted to the CONTRACTOR for permanent incorporation in the works and the provisions of Clause 3.2.1.0 hereof {including sub clauses (a) to (t) thereof} shall mutatis mutandis apply thereto in the same manner as apply to other OWNER supplied materials, and before payment/disbursement of any secured advance by the OWNER pursuant hereto the CONTRACTOR and the Engineer-in-charge shall jointly sign a Statement setting out and detailing the material(s) with reference to which the advance has been reckoned, title to which shall vest in the OWNER pursuant to the

provisions hereof.

(e) Notwithstanding anything provided in sub-clause (c) hereof above, the OWNER shall be entitled (without prejudice to any other right or remedy available to the OWNER) by written notice to the CONTRACTOR to recall the advance or the outstanding balance thereof in the circumstances set out in Clause 6.4.8.0 hereof or if the OWNER is of the opinion that by virtue of delay by the CONTRACTOR in the execution or completion of the work or for any other cause, the value of the remaining material against which the advance has been paid is insufficient to adequately secure the outstanding balance of the advance and interest payable thereon or if allowed to continue will become inadequate to secure the same. Should the CONTRACTOR upon such notice fail to repay the OWNER the outstanding balance of the said advance, it will be open to the OWNER without further reference or notice to the CONTRACTOR to sell in whole or part(s) the materials referred to in sub-clause (d) hereof above by private contract or public tender or a combination thereof or otherwise as the OWNER deems fit, and for the purpose to exercise all powers and to sign and do all acts, deeds, matter and things as are set out in Clause 7.0.6.0 hereof, and the provisions of the said clause shall mutatis mutandis apply to such materials in the same manner as they apply to scaffolding, wiring, pipes, surplus and other materials, equipment and machinery covered by the said Clause.

6.4.7.0 Nothing provided in the foregoing clauses hereof shall anywise be deemed to confer any rights or entitlement on the CONTRACTOR to receive on account payments or Advance payments of any kind whatsoever, nor shall any failure or delay by the OWNER to make any advance or on account payment(s) as herein envisaged or otherwise afford the CONTRACTOR a ground or basis for extension of time for completion or otherwise relieve the CONTRACTOR from any of its/his liabilities under the Contract, it being clearly understood that these on account payments or advance payments are only by way of assistance to the CONTRACTOR.

6.4.8.0 The Mobilization Advance and the materials covered by the Secured Advance shall be utilized by the CONTRACTOR solely for and in the execution of the Contract and for no other purpose, and the CONTRACTOR shall satisfy the OWNER/Engineer-in-charge in this regard whenever required. If it is found that any of the advance(s) or materials aforesaid have been utilized by the CONTRACTOR in whole or part for any other purpose or if the Contract is for any reason cancelled or terminated, the OWNER may at its discretion recall the said advances or the unrecovered portion(s) thereof, as the case may be, and without prejudice to any other right or remedy available to the OWNER, recover the same by recourse to any Bank guarantee to which the OWNER may have recourse for the purpose.

**6.4.9.0 SCHEDULE OF ACTIVITIES FOR ON – ACCOUNT PAYMENT**

6.4.9.1 The provisions of this Clause 6.4.9.0 and associated Clauses there under shall apply only to a contract in which the Schedule of Rates specifies a lump sum price payable for the whole or any part of the work(s) or activities covered by the Contract. If only part(s) of the work(s) or activities under the Contract are the subject of a lump sum price then the provisions of this clause shall apply only to such part.

6.4.9.2 The CONTRACTOR shall within 30 (thirty) days from the date of issue of the Letter of Acceptance, furnish to the OWNER a detailed schedule of Activities specifying in detail the various activities which the CONTRACTOR would be required to perform and the milestones with respect to each which the CONTRACTOR would have to achieve in order to set up and establish the Unit.

6.4.9.3 Each activity entered in the schedule of Activities and each milestone therein shall be priced so as to break-up so far as possible, the lump sum price into various priced milestones of achievements and priced activities required to achieve those milestones. The Schedule of Activities and the said priced break-up of activities therein are intended only to provide a basis for the purpose of calculating on account payments and for the calculating payments due to the CONTRACTOR under Clause 2.7.5.0 hereof upon cancellation of Contract, and for no other purpose.

6.4.9.4 The OWNER shall review or cause to be reviewed the prima facie adequacy, sufficiency, validity and/or suitability of the activities listed in the Schedule of Activities for the works they are intended, and of the percentages indicated in the Schedule of Activities in respect thereof. Such review shall be performed in conjunction with the design, engineering, specification and other technical reviews to be done by the OWNER and all provisions applicable thereto shall be

applicable to the review of the Schedule of Activities.

6.4.9.5 No such review shall in any manner absolve the CONTRACTOR of his full responsibility under the contract to supply and perform within the lump-sum price specified in the Price- Schedule, all materials and services and to perform and undertake the work(s) required to set up and establish the Unit/works in accordance with the Contract and the specifications, complete in all respects, whether or not any particular work, supply or activity required is included within the schedule of activities and whether or not the percentage thereof is included in the price indicated in the Schedule of Activities and whether or not the price thereof is in conformity with the price thereof indicated in the Schedule of Activities. The review and approval of the Schedule of Activities and the prices therein are intended only for the satisfaction of the OWNER that the priced Schedule of Activities prima facie covers the activities required to be performed by the CONTRACTOR within the scope of supply and services.

6.4.9.6 The Schedule of Activities shall be subject to amendment in both items and percentages in so far as necessary consequent upon any amendment in any relevant related technical particulars, and upon any amendment, the amended Schedule of Activities as approved by the OWNER shall thereafter constitute the Schedule of Activities as envisaged in the Contract Documents.

6.5.0.0 **MODE OF PAYMENT**

6.5.1.0 All payment(s) by the OWNER under or in terms of the Contract shall be made through electronic mode. For this purpose, the CONTRCATOR shall submit bank details, cancelled cheque, PAN card and any other information required by the OWNER, such information to be provided by the CONTRACTOR in any format as may be required by the OWNER for the purpose.

6.6.0.0 **CLAIMS BY THE CONTRACTOR**

6.6.1.0 Should the CONTRACTOR consider that he is entitled to any extra payment or compensation in respect of the works over and above the amounts due in terms of the Contract as specified in Clause 6.3.1.0 hereof or should the CONTRACTOR dispute the validity of any deductions made or threatened by the OWNER from any Running Account Bills, the CONTRACTOR shall forthwith give notice in writing of his claim in this behalf to the Engineer-in-Charge and the Site Engineer within 10 (ten) days from the date of the issue of orders or instructions relative to any works for which the CONTRACTOR claims such additional payment or compensation or of the happening of other event upon which the CONTRACTOR bases such claim, and such notice shall give full particulars of the nature of such claim, grounds on which it is based, and the amount claimed.

6.6.2.0 No omission or failure on the part of the Engineer-in- Charge or Site Engineer to reject any claim made or notified by the CONTRACTOR or delay in dealing therewith shall be deemed to be an admission by the OWNER of the validity of such claim or waiver by the OWNER of any of its rights in respect thereof, with the intent that all such claims otherwise valid within the provisions of Clause 6.6.1.0 read with Clauses 6.6.3.0 and 6.6.3.1 shall be dealt with/considered by the OWNER at the time of submission of the Final Bill.

6.6.3.0 Any claims of the CONTRACTOR notified in accordance with the provision of Clause 6.6.1.0 hereof as shall remain at the time of preparation of Final Bill by the CONTRACTOR shall be separately included in the Final Bill prepared by the CONTRACTOR in the form of a Statement of Claims attached thereto, giving particulars of the nature of the claim, grounds on which it is based, and the amount claimed and shall be supported by a copy(ies) of the notice(s) sent in respect thereof by the CONTRACTOR to the Engineer-in-Charge and Site Engineer under Clause 6.6.1.0 hereof.

6.6.3.1 The OWNER shall not anywise be liable in respect of any notified claim not specifically reflected in the Final Bill in accordance with the provisions of Clause 6.6.3.0 hereof and any and all notified claims not specifically reflected and included in the Final Bill in accordance with the provisions of Clause 6.6.3.0 hereof shall be deemed to have been waived by the CONTRACTOR. Further the OWNER shall have no liability in respect thereof and the CONTRACTOR shall not be entitled to raise or include in the Final Bill any claim(s) other than a notified claim conforming in all respects and in accordance with the provisions of Clause 6.6.3.0 hereof.

6.6.4.0 No claim(s) shall on any account be made by the CONTRACTOR after the Final Bill, with the intent the Final Bill prepared by the CONTRACTOR shall reflect any and all notified claims whatsoever of the CONTRACTOR against the OWNER arising out of or in connection with the Contract or work performed by the CONTRACTOR there under or in relation thereto, and the CONTRACTOR shall notwithstanding any enabling provision under any law or Contract and

notwithstanding any right of claim in quantum meruit that the CONTRACTOR could have in respect thereof, be deemed to have waived any and all such claims not included in the Final Bill and to have absolved and discharged the OWNER from and against the same, even if in not including the same as aforesaid, the CONTRACTOR shall have acted under a mistake of law or fact.

6.6.5.0 Notwithstanding the existence of any claim by the CONTRACTOR in terms hereof or otherwise, the CONTRACTOR shall continue and be bound to continue and perform the works to completion in all respects according to the Contract (unless the Contract or works be priorly determined by the OWNER in terms hereof) and shall remain liable and bound in all respects under the Contract.

6.6.6.0 The payment of any sum on account to the CONTRACTOR during the performance of any work or item of work in respect of which a claim has been notified by the CONTRACTOR in terms of Clause 6.6.1.0 hereof or the making or negotiation of any interim arrangements in respect of the performance of such work or item of work by the OWNER, shall not be deemed to be an acceptance of the related claim by the OWNER, or any part or portion thereof with the intent that any such payment shall constitute merely an interim facility or interim assistance to the CONTRACTOR, and not an obligation upon the OWNER.

**6.7.0.0 DISCHARGE OF OWNER'S LIABILITY**

6.7.1.0 The acceptance by the CONTRACTOR of any amount paid by the OWNER to the CONTRACTOR in respect of the final dues of the CONTRACTOR under the Final Bill upon condition that the said payment is being made in full and final settlement of all said dues to the CONTRACTOR, shall without prejudice to the Notified Claims of the Contractor included in the Final Bill in accordance with the provisions under Clause 6.6.3.0 hereof and associated provisions thereunder, be deemed to be in full and final satisfaction of all such dues to the CONTRACTOR, notwithstanding any qualifying remarks, protest or condition imposed or purported to be imposed by the CONTRACTOR relative to the acceptance of such payment, with the intent that upon acceptance by the CONTRACTOR of any payment made as aforesaid, the Contract (including the arbitration clause, if applicable) shall, subject to the provisions of Clause 6.8.2.0 hereof, stand discharged and extinguished.

6.7.2.0 The acceptance by the CONTRACTOR of any amount paid by the OWNER to the CONTRACTOR in respect of the Notified Claims of the CONTRACTOR included in the Final Bill in accordance with the provisions of Clause 6.6.3.0 hereof and associated provisions there under shall, subject to the provisions of Clause 6.7.3.0 hereof, be deemed to be in full and final satisfaction of all claims of the CONTRACTOR notwithstanding any qualifying remarks, protest or condition imposed or purported to be imposed by the CONTRACTOR relative to the acceptance of such payment with the intent that upon acceptance by the CONTRACTOR of any payment made as aforesaid, the Contract (including the arbitration clause, if applicable) shall stand discharged and extinguished insofar as relates to and/or concerns the claims of the CONTRACTOR.

6.7.3.0 Notwithstanding anything provided in Clause 6.7.1.0 and/or Clause 6.7.2.0 hereof the CONTRACTOR shall be and remain liable for defects in terms of Clause 5.6.0.0 hereof and for the indemnity to the OWNER in terms of Clause 6.8.2.0, and shall be and remain entitled to receive the unadjusted balance of the Security Deposit remaining in the hands of the OWNER in terms of Clause 6.8.3.0 hereof.

6.8.0.0 **FINAL CERTIFICATE**

6.8.1.0 After the expiry of the defect liability period as provided for in clause 5.6.0.0 hereof and after all the liabilities of the CONTRACTOR in respect of the Contract have been satisfied, the OWNER or the Engineer-in-Charge, shall within 30 (thirty) days of the receipt by the Engineer-in-Charge of the Application of the CONTRACTOR, issue a Final Certificate to the CONTRACTOR, certifying that the CONTRACTOR has performed all his obligations in respect of the defect liability period in terms of clause 5.6.1.1 hereof.

6.8.2.0 Upon Application for the Final Certificate, the CONTRACTOR shall be deemed to have warranted that it/he has fully paid and satisfied all claims for work, labour, materials, supplies, equipment and all other liabilities whatsoever touching or affecting the Contract, and to have undertaken to indemnify and keep indemnified the OWNER from and against all claims, demands, debts, liens, obligations and liabilities whatsoever arising there from or relating thereto and upon issue of the Final Certificate, the CONTRACTOR shall be deemed to have released,

acquitted and discharged the OWNER from and against all claims (known or unknown), liens, demands or causes of action of any kind whatsoever arising out of or relating to the Contract or otherwise howsoever touching or affecting the same and to have undertaken to indemnify and keep indemnified the OWNER from and against the same.

6.8.3.0 Within 15 (fifteen) days of Application made by the CONTRACTOR in this behalf accompanied by the Final Certificate, or within 15 (fifteen) days of the passing of the CONTRACTOR's Final Bill by the OWNER, whichever shall be later, the OWNER shall pay/refund to the CONTRACTOR the unadjusted balance (if any) of the Security Deposit for the time being remaining in the hands of the OWNER, and upon such payment/refund, the OWNER shall stand discharged of all obligations and liabilities to the CONTRACTOR under the Contract.

**6.9.0.0 CLAIMS OF OWNER:**

6.9.1.0 No release or payments of any unadjusted balance of the Security Deposit by the OWNER to the CONTRACTOR as aforesaid or otherwise shall be deemed or treated as a waiver of any right(s) or claim(s) of the OWNER or shall estop or prevent the OWNER from thereafter making or enforcing any claims or any rights against the CONTRACTOR. The claims of the OWNER, if any, against the CONTRACTOR shall continue to survive and shall not get extinguished notwithstanding the issue of Final Certificate and/or the release of Security Deposit to the CONTRACTOR.

6.9.2.0 If and where the Contract requires the CONTRACTOR to pass or pay to the OWNER any GST/ Comprehensive Economic Partnership Agreement (CEPA) or any other benefit(s), or if the OWNER is required in terms of the Contract to pay, bear or reimburse any excise, customs or like duties or sales or other taxes, the CONTRACTOR shall on receiving any such benefit(s) or on obtaining or being granted any exemption, refund, rebate, set-off or draw-back of any such duty or tax, as the case may be, forthwith pay and pass on the OWNER the full amount or value thereof ; and if the CONTRACTOR fails to pass on or pay to the OWNER the full amounts of the said benefit(s) available to the OWNER, or the full amount or value of such exemption refund, rebate, set- off, or draw-back of any such duty or tax as the case may be, the CONTRACTOR shall be liable to pay interest thereon @ 16% (sixteen percent) per annum from the date the same is received or obtained by or granted to the CONTRACTOR, and OWNER shall, without prejudice to the generality of the foregoing, be entitled to claim and recover the same from the CONTRACTOR as and when the OWNER derives knowledge thereof, together with interest as aforesaid.

SECTION 7

**TERMINATION**

7.0.0.0 TERMINATION

7.0.1.0 Notwithstanding anything elsewhere herein provided and in addition to any other right or remedy of the OWNER under the Contract or otherwise (including the right of the OWNER to claim price discount due under the provisions of Clause 4.4.0.0 hereof or otherwise), the OWNER shall be entitled to terminate the Contract by written notice at any time during the currency on or after the occurrence of any one or more of the following events, omissions or contingencies, namely:

(i) Default or failure by the CONTRACTOR of any of the material obligations of the CONTRACTOR under the Contract, including, but not limited to;

a) Failure to start the work within 10 (ten) days of handing over the job site to the CONTRACTOR, and in the event of more than one job site being involved, failure to start the work at each job site involved within 10 (ten) days of handing over of the concerned job site to the CONTRACTOR or within such extended period(s) as may be permitted by the OWNER in this behalf;

(b) Failure to commence any work at any job site in accordance with the time prescribed in this behalf in the Progress Schedule;

(c) Failure to carry out on the works or any of items to meet the Progress Schedule;

(d) Failure to provide at each job site sufficient labour, material, equipment, machinery, temporary work and/or facilities required for the proper and/or due execution of the work or any part thereof;

(e) Failure to execute the works or any of items in accordance with the Contract;

(f) Disobedience of any order or instruction of the Engineer-in-Charge and/or Site Engineer in terms of the Contract;

(g) Negligence in carrying out the works or carrying out of work found to be unsatisfactory by the Engineer-in-Charge;

(h) Abandonment of the works or any part thereof;

(i) Commission, permission or sufferance of any other breach of any terms, conditions or provisions of the Contract on the part of the CONTRACTOR to be paid, performed and/or observed.

(j) Suspension of the entire works or any part thereof, for a period of 14 (fourteen) days or more without due authority from the OWNER or Engineer-in-Charge.

(k) Failure to deposit the Initial Security Deposit within 30 (thirty) days of receipt by the CONTRACTOR of Acceptance of Tender or within such extended period(s) as may be permitted by the OWNER in this behalf;

(l) Failure to execute the Contract in terms of the Form of Contract forming part of the Tender Documents within 30(thirty) days of notice in this behalf from the OWNER;

(ii) If the CONTRACTOR is incapable of carrying out the work;

(iii) If the CONTRACTOR misconducts himself in any manner;

(iv) If there is any change in the constitution of the CONTRACTOR or in the circumstances or organization of the CONTRACTOR, which may be deemed by the OWNER to be detrimental to the interests of the work or of the OWNER;

(v) Dissolution of the CONTRACTOR (if a firm) or commencement of liquidation or winding up (whether voluntary or compulsory) of the CONTRACTOR (if a company) or appointment of a receiver or manager of any of the CONTRACTOR's assets and/or insolvency of the CONTRACTOR (if a sole proprietorship) or any Partner of the CONTRACTOR (if a firm);

(vi) Distress, execution, or other legal process being levied on or upon any of the CONTRACTOR's goods and/or assets;

(vii) Death of a CONTRACTOR (if an individual);

(viii) If upon any change in the partnership/constitution of a CONTRACTOR's organization (if a partnership or company), the OWNER refuses in its sole discretion to continue the Contract with the re-constituted firm or company;

(ix) If the CONTRACTOR or any person employed by him shall make or offer for any purpose connected with the Contract any gift, gratuity, royalty, commission, gratification or other inducement (whether money or in any other form) to any employee or agent of the OWNER;

(x) If the CONTRACTOR shall sub-contract the whole or any part of the work in contravention of the provisions of Clause 4.8.1.0 hereof or the CONTRACTOR shall assign or attempt to assign his interest or any part thereof in the Contract.

(xi) The occurrence of any other act, event, misfeasance, malfeasance or omission in respect of which the Contract Documents or any declaration furnished in terms thereof or pursuant thereto provides for termination of Contract.

(xii) In case: (a) a petition seeking commencement of insolvency resolution process or liquidation or bankruptcy proceeding against the Contractor is either: (i) filed by such Contractor voluntarily; or (ii) admitted, whether under Insolvency and Bankruptcy Code ("Code") or under any other law (where Code is not applicable) by the National Company Law Tribunal (NCLT), Debt Recovery Tribunal (DRT), or any other court/ tribunal of competent jurisdiction; (b) the Contractor adopts any resolution of its Board of Directors or stakeholders and/or obtains approval for the purpose of effecting any of the foregoing comprised in (a) above; (c) an Interim Resolution Professional/Resolution Professional/ bankruptcy trustee, Liquidator or other similar professional is appointed to take possession, custody, or control of all the assets and property of the Contractor.

7.0.1.1 The decision of the General Manager, as to whether any of the events/ contingencies mentioned in Clause 7.0.1.0 hereof, entitling the OWNER to terminate the Contract, has occurred or not, shall be final and binding upon the CONTRACTOR.

7.0.2.0 The notice of termination shall set forth, in addition to a statement of the reason(s) for terminating the contract, the time(s) and place(s) for conducting a survey and measurementof the work performed under the Contract up to the date of termination for the purpose of determining the final amount(s) due to the CONTRACTOR therefor. The reason(s) for the termination stated in the notice of termination, shall be final and binding upon the CONTRACTOR.

7.0.3.0 For the purpose of measurements, the provisions of Clause 6.1.1.0 to 6.1.7.0 hereof shall apply. Only completed items of the work shall be reckoned for the purpose of measurements and the decision of the Engineer-in-Charge as to whether or not any items of works have been completed for the purpose of measurement shall be final and binding upon the CONTRACTOR. "Completed works" for the purpose of such measurements shall mean works that are capable of use of Final Completion without destruction or alteration. Incomplete items of works shall be measured only on the basis of material supplied and the decision of the Engineer-in-Charge as to the quantity of material involved in or relative to any incomplete works, shall be final and binding upon the CONTRACTOR.

7.0.4.0 For the purpose of determining the amount due to the CONTRACTOR in respect of the work, the provisions of Clauses 6.2.1.0, 6.2.1.1, 6.2.1.2, 6.2.2.0 and 6.3.1.0 shall apply, and the measurements taken shall for the purpose of such accounting be deemed to be final measurements and the bill prepared by the CONTRACTOR on the basis thereof shall be deemed to the Final Bill and no other amount(s) shall be due to the CONTRACTOR in respect thereof, subject to the provisions of Clause 6.6.0.0 and associated clauses there under with regard to claims of the CONTRACTOR.

7.0.5.0 Within 7 (seven) days of completion of the measurements, the CONTRACTOR shall clear the job site of all scaffolding, wiring, pipes, surplus materials, CONTRACTOR's labour, equipment and machinery and shall demolish, dismantle and remove all CONTRACTOR's site offices and quarters, and other temporary works, structures and construction and other items and things whatsoever brought upon or erected at the job site or on any land allotted to the CONTRACTOR by the OW NER and not incorporated in the permanent works and shall remove all rubbish from the job site and the land allotted to the CONTRACTOR and shall clear, level and dress the job site

and said land to the satisfaction of the Engineer-in-Charge and shall put the OWNER in undisputed custody and possession of the job site and all land allotted by the OWNER to the CONTRACTOR.

7.0.6.0 Should the CONTRACTOR fail to comply with provision of Clause 7.0.5.0 hereof in the manner and within the time specified therein, the OWNER shall have the right at the risks and costs of the CONTRACTOR in all respects to clear the job site of all scaffolding, wiring, pipes, surplus materials, CONTRACTOR's labour, equipment and machinery and other materials and things and/or demolish/dismantle and remove all CONTRACTOR's site offices and quarters and other temporary works, constructions and erections whatsoever on or at the job site or on any land allotted to the CONTRACTOR by the OWNER and/or remove all rubbish from the job site, the land allotted to the CONTRACTOR and store, sell, dispose of and/or otherwise deal with any and all material, equipment and machinery etc., and other items and things aforesaid and recoveries of any demolition/dismantling as the OWNER shall in its absolute discretion deem fit, and the CONTRACTOR shall forthwith on demand pay the OWNER, the entirety of the costs and expenses of the OWNER relative to the above, together with 1% (One percent) thereon to cover OWNER's administrative charges, with right in the OWNER (without prejudice to any other mode of recovery), to recover the same from the proceeds of any sale or disposal as aforesaid or any monies of the CONTRACTOR held by the OWNER or dues of the CONTRACTOR and the CONTRACTOR doth thereby irrevocably nominate, constitute and appoint the OW NER (with right to the OWNER to delegate any and all of its rights in terms hereof to such of its officer(s) and/or other person(s) as it shall deem fit) for and on behalf of and as attorney of the CONTRACTOR to do, commit and sign all acts, deeds, matters and things as shall or may be necessary to be done, committed and/or signed by the OWNER to put into effect the provision of this clause with full right to enter into arrangements with third parties for or relative to the storage, sales and/or other disposal of any material, equipment and machinery, etc., and other items and things and to enter into or upon any of the CONTRACTOR's premises and to break locks and other fasteners for entry thereto and generally to do all other acts, deeds, matters and things as shall be necessary to give full effect to the provision of this clause.

**PROVIDED ALWAYS THAT**

(i) The OWNER shall be entitled, without prejudice to the aforegoing and in addition thereto, upon the CONTRACTOR failing to comply with the provisions of Clause 7.0.5.0 hereof after removing/demolishing/dismantling from the job site or land allotted to the CONTRACTOR, any of the CONTRACTOR's scaffolding, wiring, pipes, materials, temporary works and other items and things, by written notice to the CONTRACTOR, to require the CONTRACTOR to take delivery of, lift and/or clear the same within 7 (seven) days (or such other period as may be specified in the said notice) of date of said notice, failing which the OWNER may abandon the same at the risk and costs of the CONTRACTOR, and should the CONTRACTOR fail to take delivery of, lift and/or clear the same within the period in this behalf specified in said notice, the OWNER shall be entitled at any time thereafter to abandon the same at the risks and cost of the CONTRACTOR, whereupon (without prejudice to any other rights of the OWNER), the OWNER shall stand absolutely discharged and absolved in respect of all and any material, equipment, machinery and other items and things whatsoever abandoned as aforesaid;

(ii) Notwithstanding anything to the contrary herein provided, nothing herein stated shall constitute the OWNER as a trustee or bailee for or in respect of any of the CONTRACTOR's material, equipment, machinery or other items or things removed, cleared, demolished, dismantled or abandoned as aforesaid, nor shall the OWNER be bound in law or fact by any duty of care in respect thereof, with the intent that all actions, dealings and disposals within the provisions of this clause shall be exclusively at the risks and liability of the CONTRACTOR (including relative to any loss or damage), and the OWNER shall not be howsoever responsible, accountable or liable in respect thereof.

7.0.7.0 If, due to any cause (including, but not limited to resistance put up by the CONTRACTOR and/or his servants or agent or sub-CONTRACTOR(s) or any court order consequentupon a suit or proceedings filed by the CONTRACTOR and or/the CONTRACTOR's servants, agents or sub-CONTRACTOR(s)), the OWNER is unable to fully take over possession of the entire works at any or all job sites within 7 (seven) days from the date of completion of the measurements as contemplated above, the OWNER shall, in addition to all amounts, compensation and/or damages recoverable from the CONTRACTOR in terms hereof (including but not limited to OWNER's entitlements under Clause 4.4.0.0 and Clause 7.0.9.0 hereof) or otherwise, be entitled to recover from the CONTRACTOR liquidated damages in the amount equivalent to 1% (one per cent) of the total Contract value for each week or part thereof that the said taking over of

possession at any job site is delayed beyond the period of seven days specified above, subject to a maximum of 5% (Five percent) of the Total Contract Value.

7.0.8.0 Notwithstanding anything provided in Clause 7.0.6.0, the OWNER shall have the right at any time prior to the removal of the same from the job site, to take possession of such of the CONTRACTOR's materials at any and all job sites, as the OWNER shall deem fit, and the CONTRACTOR shall forthwith upon being required to do so place the OW NER in undisputed possession and custody of all such materials opted for by the OWNER. The price payable to the CONTRACTOR for such material shall be determined by the Engineer-in-Charge having due regard to the condition of the materials and the cost thereof as determined by the Engineer-in-Charge for which purpose the Engineer-in-Charge shall be entitled to call upon the CONTRACTOR to produce the CONTRACTOR's accounting and other records relevant to such materials. The cost of such materials as determined by the Engineer-in-Charge shall be final and binding on the CONTRACTOR.

7.0.9.0 Upon termination of the Contract, the OWNER shall be entitled at the risk and expense of the CONTRACTOR by itself or through any independent CONTRACTOR(s) or partly by itself and/or partly through independent CONTRACTOR(s) to complete and/or get completed to its entirety the work as contemplated in the scope of work and to recover from the CONTRACTOR in addition to any discounts, compensations or damages that the OWNER may in terms hereof or otherwise be entitled (including price discount within the provisions of Clause 4.4.0.0 and liquidated damages under Clause 7.0.7.0 hereof) to the difference between the amounts as would have been payable to the CONTRACTOR in respect of the work(s) (calculated as provided for in Clause 6.2.1.0 hereof read with the associated provisions there under and Clause 6.3.1.0 hereof) and the amount actually expended by the OWNER for completion of the entire work(s) as aforesaid together with 1% (One per cent) administrative charges of the said amount expended by the OWNER for completion of the entire work(s), and in the event of the latter being in the excess of the former, the OWNER shall be entitled (without prejudice to any other mode of recovery available to the OW NER) to recover the excess from the Security Deposit or any monies due or becoming due to the CONTRACTOR.

7.2.0.0 No amount shall be due and payable to the CONTRACTOR upon or in the event of termination of the Contract unless and until the entirety of the works contemplated in the scope of work shall have been completed in all respects to the satisfaction of the OWNER and following such completion, the Defect Liability Period in respect thereof as herein otherwise provided for has elapsed and all payments finally due on any account to the OWNER and/or other CONTRACTOR(s) in respect of all liabilities in respect thereof has been determined.

7.3.0.0 If, upon the satisfaction of the provisions of Clauses 7.0.9.0 and 7.2.0.0 hereof, there shall remain in the hands of the OWNER any excess/balance after all accounting and adjustment of all dues from the CONTRACTOR to the OWNER, the OWNER shall forthwith pay such excess/balance to the CONTRACTOR and in the event of the Security Deposit and other dues of the CONTRACTOR in the hands of the OWNER being insufficient to meet the dues of the OWNER as aforesaid the CONTRACTOR shall forthwith on demand by the OWNER pay the OWNER the shortfall.

## SECTION 8

## MISCELLANEOUS

8.0.0.0 PERSONAL ACTS AND LIABILITIES

8.0.1.0 No Director, employee, consultant or agent of the OWNER or other person representing the OWNER or acting on behalf of the OWNER in or pursuant to the Contract or in the discharge of any obligation to the OWNER under the Contract or otherwise in relation to the Contract shall have any personal liability to the CONTRACTOR or any Sub-Contractor, agent, representative, director or employee of the CONTRACTOR or to any other person acting for or on behalf of the CONTRACTOR and the CONTRACTOR on its own behalf and on behalf of its Sub-Contractors, directors, employees, agents and representatives hereby waives and disclaims any and all right of action which it or they may have whether under tort or Contract or otherwise against the OWNER or any director, employee, agent, consultant or representative of the OWNER for act of omission or commission done or omitted to be done.

8.0.2.0 The CONTRACTOR shall not be entitled to any increase in the rate(s) mentioned in the Schedule of Rates or any of them or to any other payment, right, benefit or claim whatsoever, by reason of any representation, explanation, statement, assurance or understanding given or alleged to have been given to him by any Director, officer, or other employees of the OWNER, nor shall any Director, officer, or other employee of the OWNER be personally liable for or in respect of any representation, explanation, statement, assurance or understanding given or alleged to have been given by him to the CONTRACTOR or any other person relative to the Contract.

8.0.3.0 The CONTRACTOR shall not under any circumstances pay or advance to any officer(s), servant(s) or agent(s) of the OWNER any sum or money on any account without prior authority of the OWNER in writing and any such payment made or money advanced by the CONTRACTOR without such authority shall be entirely at the risks of the CONTRACTOR without any liability to the OWNER in respect thereof.

8.0.4.0 Any money paid to any partner of the CONTRACTOR (if a firm) and any receipt, settlement, acknowledgement of liability or other document whatsoever signed by any one of the partners of the firm or erstwhile partner of the firm (without notice of the cessation of his interest) or any person held out to be a partner of the firm shall be binding upon the CONTRACTOR vis- à-vis the OWNER and shall constitute a full release and discharge to the OWNER and/or valid settlement, acknowledgement or obligation upon the CONTRACTOR, as the case may be, and the OWNER shall not be concerned, with the application of any monies so paid or the authority of the concerned partner (or erstwhile or purported partner) vis-à-vis the other partners to make the settlement, receipt, acknowledgement or other document(s) concerned provided always that the OWNER shall be entitled at its discretion at any time to call upon all the partners of the CONTRACTOR firm to sign any receipt, settlement, acknowledgement or other document(s) including any receipt, settlement, acknowledgement or other documents signed by a partner (or erstwhile or purported partner) as aforesaid, and all the partners of the firm shall, when called upon to do so by the OWNER, forthwith sign the receipt, order, acknowledgement or other document required to be so signed.

8.1.0.0 **TAXES**

8.1.1.0 The CONTRACTOR shall be exclusively liable for the payment of any and all taxes, levies, duties, cesses and charges now in force or hereafter imposed, increased or modified in respect of any work done and/or materials supplied and for the payment of all contributions and taxes for unemployment compensation, insurance and old age pension and annuity now or hereinafter imposed by the Central or any State Government or any authority with respect to or covered by the wages, salaries or other compensations paid to persons employed or engaged by the CONTRACTOR and doth hereby undertake to indemnify and keep indemnified the OWNER from and against the same and all claims, actions, demands and payments whatsoever against the OW NER howsoever arising there from or in connection therewith.

8.1.2.0 Notwithstanding anything to the contrary elsewhere provided in these General Conditions of Contract;

(i) If and prior to the date of Scheduled Mechanical Completion/completion of the entire work(s) under the contract or any extension thereof by the Engineer-in-Charge under Clause 4.3.6.0 or by the OWNER under Clause 4.3.7.0, there is an increase in the rate of any of the following output taxes (indirect tax which is required to be passed on to OWNER) applicable to invoices raised on the OWNER, namely, Sales Tax, VAT or Service Tax or Goods and Service Tax (GST) relevant to the execution of Contract (in this Clause referred to the "said taxes") between rate(s) of the said taxes as exist on the last date of submission of the Price Bid relevant to the Contract and the date of relative invoice (in the Clause referred to as the "additional tax"), the OWNER shall pay and bear the additional tax. Similarly, if there is any reduction in any of the said taxes between the said dates, the CONTRACTOR shall pass on the benefit of such reduction to the OWNER with a view that the OWNER shall be invoiced for and pay the reduced tax.

(ii) If after the date of the last Price Bid of the CONTRACTOR relevant to the Contract and prior to the date of Scheduled Mechanical Completion/completion of the entire work(s) under the contract or any extension thereof by the Engineer-in-Charge under Clause 4.3.6.0 or by the OWNER under Clause 4.3.7.0, any new output tax (indirect tax which is required to be passed on to OWNER) is introduced in addition to the "said taxes" relevant to the execution of the works, on proof of payment by the CONTRACTOR, the OW NER will reimburse the CONTRACTOR the amount of such new output tax paid by the CONTRACTOR.

(iii) If after the date of the last Price Bid of the CONTRACTOR relevant to the Contract and prior to the date of Scheduled Mechanical Completion/completion of the entire work(s) under the contract or any extension thereof by the Engineer-in-Charge under Clause 4.3.6.0 or by the OWNER under Clause 4.3.7.0, a new output tax (indirect tax which is required to be passed on to OWNER) is introduced in lieu of an existing output tax(es) and the rate and impact of the new tax is in excess in aggregate of the rate and impact of existing tax(es) which it replaces, the OWNER shall on satisfactory proof reimburse the CONTRACTOR the additional tax paid by the CONTRACTOR as a result of the imposition of the new tax. If, on the other hand, the rate and impact of the new tax is less than the aggregate rate and impact of the tax(es) which it replaces, the CONTRACTOR shall pass on to the OWNER the benefit thereof.

8.1.2.1 Provided always that if there is an increase in the rate of output tax (CST, VAT, Service Tax and Goods and Service Tax (GST) ) or any new output tax (indirect tax which is required to be passed on to OWNER) is introduced in addition to the said taxes in lieu of said taxes where the total financial implication on account of new output taxe(s) is more and arises beyond the scheduled Mechanical Completion date, OWNER shall reimburse the same, if the OWNER is entitled for tax credit on such increase in output tax(es) or new output tax(es) is. In other cases, CONTRACTOR shall bear the increase in the rates of existing taxes or any new output tax.

8.1.2.2 The CONTRACTOR shall provide all necessary information as may be requisite for the purpose of calculating the impact of taxes as mentioned above. For purpose of calculating the impact of any benefit to be passed to the OWNER under sub- clauses above, if the CONTRACTOR fails to submit satisfactory documents in relation to such benefit to the OWNER then the benefit shall be determined by the OWNER and such determination by the OWNER shall be final and binding on the CONTRACTOR.

8.1.2.3 The CONTRACTOR shall ensure that it is registered with the respective tax authorities in the Centre and the applicable State(s) in which the work is to be executed, and shall submit to the OWNER self attested copy(ies) of such registration certificate(s). Any taxes/duties/levies claimed by the CONTRACTOR shall be claimed by issuing a proper Invoice raised on the OWNER indicating details/elements of all taxes charged and necessary requirements as prescribed under the respective tax laws. The CONTRACTOR shall mention correct and valid registration numbers applicable to the tax charged on all invoices raised on the OWNER.

8.1.2.4 The CONTRACTOR shall reimburse to or make good to the OWNER any loss to the OWNER resulting from a claim by the OWNER of any tax credit being rejected/disallowed by any tax authority due to non deposit of taxes or non- compliance of tax laws by the CONTRACTOR or of any requirement or formality to be fulfilled by the CONTRACTOR to qualify the OWNER for such tax credit.

8.1.2.5 The CONTRCTOR shall charge the correct rate of tax as prescribed under the respective tax

laws, and shall avail of and shall pass on to the OWNER the benefit(s) of all exemptions, rebates and concessions available to the CONTRACTOR under tax laws as may be applicable after the last date of submission of price bid relevant to the Contract.

8.1.2.6 The OWNER will issue/provide Road Permits to the CONTRCTOR only in respect of material directly purchased by the OWNER and transported by the CONTRACTOR. In such event, the CONTRCTOR will be obliged to ensure the proper utilization of the Road Permit issued /provided by the OWNER for the specific supply, and in case of the seizure of goods or vehicle transporting the goods, the CONTRCTOR will be solely responsible for release of the goods/vehicle and shall reimburse the OWNER any resultant litigation costs incurred by the OWNER.

8.2.0.0 **GOVERNMENT REGULATIONS**

8.2.1.0 The CONTRACTOR shall comply with and ensure strict compliance by his/its sub-contractors and agents of all applicable Central, State, Municipal and local laws and regulations and undertakes to indemnify the OWNER from and against all levies, damages, penalties, any payments whatsoever as may be imposed and against all actions, proceedings claims and demands arising there from and/or relative thereto.

8.3.0.0 **LABOUR LAWS AND REGULATIONS**

8.3.1.0 The CONTRACTOR shall be responsible for strict compliance of and shall ensure strict compliance by its sub-contractors, servants and agents of all laws, rules or regulations having the force of law affecting the relationship of employer and employee between the CONTRACTOR/sub-contractors and their respective employees and/or otherwise concerning labour, social welfare and wages, provident fund, pension, bonus, gratuity and other benefits to employees. Without prejudice to the generality of this provision, the CONTRACTOR shall comply with and ensure that his sub-contractors and other agencies employed by him comply with the provisions of the Payment of Wages Act, 1936, Minimum Wages Act, 1948, Employees' Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Benefit Act, 1961, Mines Act, 1952, The Child and Adolescent Labour (Prohibition & Regulation) Act, 1986, the Inter State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979, The Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996, The Building and Other Construction Workers' Welfare Cess Act, 1996, The Contract Labour (Abolition & Regulation) Act, 1970, Payment of Bonus Act, 1965, Gratuity Act, 1972, Factories Act, 1948 and the Employees Provident Fund and Miscellaneous Provisions Act, 1952 as amended from time to time and all rules, regulations and schemes framed there under from time to time.

8.3.2.0 The CONTRACTOR and sub-contractor(s) of the CONTRACTOR shall obtain from the authority(ies) designated in this behalf under any applicable law, rule or regulation (including but not limited to) the Factories Act, 1948 and Contract Labour (Abolition and Regulation) Act, 1970 (in so far as applicable) any and all such licence(s), consent(s), registration(s) and/or other authorization(s) as shall from time to time be or become necessary for or relative to the execution of the work or any part or portion thereof or the storage or supply of any material(s) or otherwise in connection with the performance of the Contract and shall at all times observe and ensure due observance by the sub-contractors, servants and agents of all terms and conditions of the said licence(s), consent(s), regulation(s) and other authorization(s) and laws, rules and regulations applicable thereto. Without prejudice to the generality of this provision, the CONTRACTOR shall obtain and ensure that his sub-contractors and other agencies employed by him on the work, obtain a valid licence under The Child and Adolescent Labour (Prohibition & Regulation) Act, 1986,, Contract Labour (Regulation & Abolition) Act, 1970 and shall duly and faithfully observe and comply with the provisions of the Contract Labour (Regulation & Abolition) Central Rules 1971 and other Central and State Rules as amended from time to time and applicable to the work, and shall duly, promptly and faithfully maintain and/or cause to be maintained all records and facilities required to be maintained and/or provided in terms thereof or any licence granted there under.

8.3.3.0 The CONTRACTOR shall ensure that wages are paid by himself or by his sub-contractors to their workmen directly without the intervention of any Thekedars or any other intermediary and that no amount by way of commission or otherwise is deducted or recovered by the Thekedars or any other intermediary from the wages of the workmen.

8.3.4.0 The OWNER shall be entitled at all times to carry out any check(s) or inspection(s) of the CONTRACTOR's facilities, records and accounts to ensure that the provisions aforesaid are

being observed by the CONTRACTOR and the sub-contractors and that the workmen are not denied the rights and benefits to which they are entitled under such provisions. Any violation shall, without prejudice to any other rights or remedies available to the OWNER, constitute a ground for termination of the Contract as though specifically set forth under Clause 7.0.1.0 thereof.

8.3.5.0 Nothing in the Contract Documents stated shall anywise constitute any workman/employee of the CONTRACTOR or any sub-contractor as or to be a workman/employee of the OWNER, or place obligation or liability in respect of any such workman/employee upon the OWNER.

8.3.6.0 The CONTRACTOR shall not employ in connection with the work, any person below the age of 18 years. Neither the CONTRACTOR nor any of the sub-contractor directly or indirectly engaged by such CONTRACTOR or such sub-contractor will indulge in any activities in violation of the The Child and Adolescent Labour (Prohibition & Regulation) Act, 1986.

8.3.7.0 The establishment of the CONTRACTOR shall be duly registered under the Employees Provident Fund and Miscellaneous Provisions Act, 1952 and the Employees State Insurance Act, 1948 (if applicable) and the CONTRACTOR shall duly pay his contributions and his employees' contributions to the Authorities prescribed under the said Acts and any Schemes framed there under in respect of all labour employed by him for the execution of the contract. Copies of challans/receipt of such payments alongwith the list showing persons employed together with emoluments paid for the purpose of P.F. deductions shall be submitted to the OWNER before the end of every calendar month. In case the Provident Fund Authority's receipted challan referred to above are not furnished, the OWNER shall deduct 5% (five percent) of the payable amount from the CONTRACTOR's running bill for services and retain the same as a security for the payment of the Provident Fund. Such retained amounts shall be released to the CONTRACTOR only on production of challan/receipts of the Provident Fund Authority for the period covered by the related deduction.

8.3.8.0 Notwithstanding provision of Clause 8.3.7.0, on receiving information of any breach, non-fulfillment and/or non-observance by the CONTRACTOR and/or his sub-contractors and other agencies engaged by him in connection with the Works or any of the provisions or requirements of any of the Labour Laws, rules and regulations and/or as to the inaccuracy of any of the returns or statements furnished by the CONTRACTOR and/or his sub-contractors and/or any records or accounts maintained by any of them with respect to which the OW NER as the principal employer or otherwise can have a liability, the OWNER shall be entitled to deduct from the Bills and any amounts due or becoming due to the CONTRACTOR, under this or other contract(s) with the CONTRACTOR, any sum(s) required or estimated to be required, in its judgment which shall be final and binding on the CONTRACTOR, for making good or compensating for the liability or possible liability of the OWNER by reason of the said breach, non-fulfillment or non- observance and/or inaccuracy aforesaid.

8.3.9.0 The CONTRACTOR shall indemnify and keep indemnified the OWNER from and against all actions, claims, demands and liabilities whatsoever under and in respect of the breach of any of the provisions hereof and/or against any claim, action or demand by any workman/employee of the CONTRACTOR or any sub-contractor and/or from any liability anywise to any sub-contractor under any law, rules or regulation having the force of law including (but not limited to) claims against the OWNER under the Employees' Compensation Act 1923, the Employees Provident Fund and Miscellaneous Provisions Act 1952, the Employee's State Insurance Act 1948 and/or the Contract Labour (Abolition & Regulation) Act 1970 and/or The Child and Adolescent Labour (Prohibition & Regulation) Act, 1986.

8.3.10.0 The CONTRACTOR and his sub-contractors and agents employed by him for and/or in the performance of the Works shall strictly abide by and observe the provision of the "Contractors' Labour Regulations" and the "Model Rules for Labour Welfare" as set out in Appendix I and Appendix II to these General Conditions of Contract, which shall be binding on the CONTRACTOR, his sub-contractors and agents.

8.3.10.1 In the event of an irreconcilable conflict between the provisions herein and the provisions contained in the "Contractors' Labour Regulations" and/or the "Model Rules of Labour Welfare" (as set out in Appendix I and Appendix II hereto), the "Contractors' Labour Regulations" and "Model Rules for Labour Welfare" shall prevail to the extent of the irreconcilable conflict.

8.3.10.2 In the event of irreconcilable conflict between the "Contractors' Labour Regulations" and/or the "Model Rules for Labour Welfare" (set out in Appendix I and Appendix II hereto) and any applicable law, rule or regulation, the law, rule or regulation shall prevail over the "Contractors' Labour Regulation" and/or the "Model Rules for Labour Welfare", as the case may be, and shall be complied with.

8.4.0.0 **SAFETY REGULATIONS, ACCIDENT AND DAMAGE**

8.4.1.0 The CONTRACTOR shall be responsible at his own cost in and relative to performance of the work and contract to observe and to ensure observance by his sub-contractors, agents and servants of the provisions of the Safety Code as hereinafter appearing and all fire, safety and security regulations as may be prescribed by the OWNER from time to time and such other precautions and measures as shall be necessary and shall employ/deploy all equipments necessary to protect all works, material properties, structures, equipment, installations, communications and facilities whatsoever from damage, loss or other hazard whatsoever (including but not limited to fire and explosion) and shall during construction and other operations minimize the disturbance and inconvenience to the OWNER, other contractors, the public and the adjoining land and property owners and occupiers of crops, trees and vegetation and shall indemnify and keep indemnified the OW NER from and against all losses and damages and costs, charges and expenses and penalties, actions, claims, demands and proceeding whatsoever suffered or incurred by or against the OWNER as the case may be, by virtue of any loss, alteration, displacement, disturbance or destruction or accident to any works, materials, properties, structures, equipment, installations, communications and facilities and land and property, owner and occupiers of crops, trees and vegetation as aforesaid, with the intent that the CONTRACTOR shall be exclusively responsible for any accident, loss, damage, alteration, displacement, disturbance or destruction as aforesaid resultant directly or indirectly from any breach by the CONTRACTOR of his obligations aforesaid or upon any operation, act or omission of the CONTRACTOR or his sub- contractor(s) or agent(s) or servant(s).

8.4.2.0 The CONTRACTOR's liabilities under Clause 8.4.1.0 and otherwise under the Contract shall remain unimpaired notwithstanding the existence of any storage-cum-erection or other insurance covering any risk, damage, loss or liability for which the CONTRACTOR is liable to the OWNER in terms of the foregoing sub-clause or otherwise and/or in respect of which the CONTRACTOR has indemnified the OWNER, with the intent that notwithstanding the existence of such insurance, the CONTRACTOR shall be and remain fully liable for all liabilities and obligations under the Contract and indemnities to the OWNER, and the OWNER shall not be obliged to seek recourse under such policy(ies) in preference to recourse against the CONTRACTOR or otherwise to exhaust any other remedy in preference to the remedies available to it under the Contract.

8.5.0.0 **INDEMNITY AND INSURANCE**

8.5.1.0 The CONTRACTOR shall be at all times indemnify and keep indemnified the OWNER and its officers, servants and agents from and against all third party claims whatsoever (including but not limited to property loss and damage, personal accident, injury or death of or to property or person of any sub-contractor and/or the servants or agents of the CONTRACTOR or any other contractor(s) and any sub-contractor and/or of the Owner), and the CONTRACTOR shall at his own cost and initiative at all times up to the successful conclusion of the defect liability period specified in Clause 5.6.0.0 hereof take out and maintain insurance policies in respect of all insurable liabilities under this clause, including but not limited to third party insurance and liabilities under the Motor Vehicles Act, 1988; Employees' Compensation Act, 1923; Fatal Accidents Act, 1855; Personal Injuries (Compensation) Insurance Act, 1963, Emergency Risk Insurance Act, and/or other Industrial Legislation from time to time in force in India with insurance company(ies) approved by the OWNER, and such policy(ies) shall be of not lesser limit than the limits hereunder specified with reference to the matters hereunder specified, namely :

(a) Employees' Compensation Insurance - to the limit to which compensation may be payable under the laws of the Republic of India; but not less than the limits specified below.

(b) Third Party Insurance - body injury and property damage to the limit specified below:

(i) If the Total Contract Value exceeds Rs. 1(one) crore, the policy shall be for not less than Rs.10,00,000/- (Rupees ten lakhs only) for each accident. The sum assured shall not be less than Rs.20,00,000/- (Rupees twenty lacs only) for all accidents; and

(ii) If the Total Contract Value does not exceed Rs.1 (one) crore, the policy shall be for not less than Rs.3,00,000/- (Rupees three lac only) for each accident. The sum assured shall not be less than Rs.10,00,000/- (Rupees ten lakhs only) for all accidents.

Provided that the limits specified above shall operate only as a specification of minimum limits for insurance purpose, but shall not anywise limit the Contractor's liability in terms of this clause to the limit(s) specified.

8.5.2.0 Should the CONTRACTOR fail to take out and/or keep afoot insurance as provided for in the foregoing sub-clauses, the OWNER shall be entitled (but without obligation to do so) to take out and/or keep afoot such insurance at the cost and expense of the CONTRACTOR and without prejudice to any other right or remedy of the OWNER in this behalf to deduct thesum(s) incurred therefor from the dues of the CONTRACTOR.

8.6.0.0 **LIMITATION OF LIABILITY**

8.6.1.0 Except as otherwise specifically provided in the Contract Documents, neither the OWNER nor the CONTRACTOR shall be liable to the other for any indirect or consequential loss including on account of idleness, loss of business, loss of goodwill, loss of opportunity, loss of profit, extended stay, or any like damage which may be suffered by such other party arising out of or in connection with the Contract. The total liability of both the OWNER and the CONTRACTOR arising in connection with or under the Contract, in tort or otherwise will not exceed an amount equivalent to the 100% (hundred percent) of Total Contract Value.

8.6.2.0 Provided, the aggregate cap on liability of the CONTARCTOR as specified above shall not be applicable in case of:

(i) Liabilities under Clause 3.2.0.0 (Materials and Equipment supplied by the OWNER);
(ii) Liabilities under Clause 3.4.0.0. (For power provided by the OWNER);
(iii) Liabilities under Clause 3.5.0.0 (For water provided by the OWNER);
(iv) Liabilities under Clause 3.6.0.0. (For land provided by the OWNER);
(v) Liabilities under Clause 3.9.0.0. (For labour, machinery and equipment provided by the OWNER);
(vi) Liabilities under Clause 3.10.1.0 (For government controlled materials for which the OWNER is liable);
(vii) Liabilities for recoverable advances and interest thereon; and
(viii) Liabilities arising out of fraud, misconduct, negligence, illegal or unlawful acts, or such acts or commissions which are contrary to the most elementary rules of diligence as would have been followed in similar circumstances
(ix) any liability arising out of infringement of intellectual property right(s) by the CONTRACTOR or affiliates or any sub-contractor or any supplier or any of its or their respective officers, directors, employees, servants or agents
(x) any liability arising under Clauses 8.17.0.0 & 8.18.0.0.
(xi) any liability pursuant to Contractor's indemnity obligations under the Contract
(xii) any liability towards third parties including death and/or injury by the Contractor or affiliates or any sub-contractor or any supplier or any of its or their respective officers, directors, employees, servants or agents

Provided always that any limitation of liability aforesaid shall exclude any amounts recovered under any policy(ies) of insurance taken out and/or maintained by the CONTRACTOR pursuant to the provisions of the Contract

8.7.1.0 **TRAINING OF APPRENTICES**

8.7.1.0 The CONTRACTOR shall, if so required by law and/or when called upon the Engineer-in-Charge during the currency of Contract, himself engage and/or procure engagement by his sub-contractor(s) of such number of apprentices and for such period as may be required by the Engineer-in- Charge in this behalf. Such apprentices shall be trained in accordance with the provisions of the Apprentices Act, 1961 and any other Act, rule or regulation having the force of law, regulating upon the employment of apprentices or as may be required by the Engineer -in-Charge in this regard, and the CONTRACTOR shall be responsible at his own cost and initiative and without entitlement to any extra compensation or remuneration from the OWNER in this behalf, to fulfill all obligations of the employer under the said Act, including liability for payment to apprentices as required there under.

8.8.0.0 **RECORDS AND INSPECTION**

8.8.1.0 The CONTRACTOR shall, if and when required by the Engineer-in-Charge produce or cause to be produced before the Engineer-in-Charge or any other officer of the OWNER designated by the Engineer-in-Charge in this behalf, for examination, any cost or other book(s) of account and/or other records and documents in the possession of the CONTRACTOR or any sub-contractor or subsidiary or associated firm or Company of the Contractor or any sub- contractor, and/or copies of extracts thereof and/or other information or returns relative thereto (such

returns to be verified in the manner prescribed by the Engineer-in-Charge or other officer aforesaid designated in this behalf) as may be required relative to the execution of the Contract or for verifying or ascertaining the cost of any material, labour, service or item or thing whatsoever in connection with the Contract, and the decision of the Engineer-in- charge or other officer designated in this behalf, as the case may be, as to whether any book, record, document, information or return is relevant for any of the purpose aforesaid, shall be final and conclusive.

8.8.2.0 Should the Engineer-in-Charge (whose decision in this behalf shall be final) consider it necessary for the purpose of verifying or ascertaining the cost of production for any item orthing to examining the works and/or records of the CONTRACTOR or any sub-contractor(s) or any subsidiary or associated firm or company of the CONTRACTOR engaged in the fabrication, manufacture or assembly of any item or thing, the CONTRACTOR shall permit and/or facilitate such inspection by the Engineer-in-Charge or other officer of the OWNER designated in this behalf by the Engineer-in-Charge and shall afford the Engineer-in-Charge or concerned officer all assistance as shall be necessary for the purpose.

8.9.0.0 **PATENT AND ROYALTIES**

8.9.1.0 If any equipment, machinery or materials to be used or supplied or methods or processes to be practices or employed in the performance of this Contract is/are covered by a patent under which the CONTRACTOR is not licensed, the CONTRACTOR shall before supplyingor using the equipment, machinery, materials, methods or processes as the case may be, obtain such licence(s) and pay such royalty(ies) and licence fee(s) as may be necessary in connection with the performance of this Contract. In the event that the CONTRACTOR fails to pay such royalty or obtain such licence, the CONTRACTOR will defend at his own expense any suit for infringement of patent which is brought against the CONTRACTOR or the OWNER as a result of the failure, and shall pay any damages and costs awarded in such suit and will keep the OWNER indemnified from and against all other consequences thereof.

8.10.0.0 **ARTICLES OF VALUE FOUND**

8.10.1.0 All gold, silver and other metals, minerals or ore of any kind or description and precious and semi-precious stones and bearing earth, rock or strata, coins, treasures, treasure trove, antiques and other items and things whatsoever which shall be found under or upon the job site shall as between the CONTRACTOR and the OWNER be the exclusive property of the OWNER and the CONTRACTOR shall forthwith upon discovery thereof notify the OWNER of such discovery with the details of the item(s) or things discovered and pending directions by the OW NER for the disposal thereof shall hold and preserve the same as trustee of the OWNER to the satisfaction of the Engineer-in-Charge.

8.11.0.0 **MATERIALS OBTAINED FROM DISMANTLING**

8.11.1.0 Any material obtained by the CONTRACTOR consequent upon dismantling of any building, structure or construction whatsoever at the job site other than any building, structure or construction dismantled by the CONTRACTOR pursuant to the CONTRACTOR's liabilities for defects as elsewhere herein provided, shall be the exclusive property of the OWNER.

8.12.0.0 **LIENS AND LIABILITIES**

8.12.1.0 If at any time there is evidence of any lien or claim for which the OWNER might be or become liable and which in terms of the Contract or otherwise is chargeable to or payable by the CONTRACTOR under this Contract or any other contract with IOCL, the OWNER shall have the right to retain out of any payment then due or thereafter becoming due to the CONTRACTOR under this Contract an amount sufficient to completely indemnify the OWNER against such lien or claim, and should the CONTRACTOR not dispute such lien or claim and/or if in the opinion of the OW NER, such lien or claim is otherwise valid (the Owner's opinion in this behalf being final and binding on the CONTRACTOR), the OWNER may pay and discharge the same and deduct the amount so paid together with any legal and other costs, charges and expenses incurred by the OWNER in defending any action and/or in obtaining legal advice or opinion relative to the lien, claim or action, from any monies then due or thereafter becoming due to the CONTRACTOR and/or retained as aforesaid, and if there is no money due or retained as aforesaid or if the same be insufficient to satisfy the payment(s) aforesaid, the CONTRACTOR

shall on demand pay to the OWNER the same and failing such payment within 10 (ten) days of demand by the OWNER in this behalf, shall be liable to pay interest on the amount due from the date of demand up to and until the date of payment in full at the bank rate as applicable to the OWNER plus 1% (one percent) per annum and the provisions hereof (in so far as such notice shall be deemed to be necessary in addition to the contractual provisions herein) shall be deemed to constitute a notice for the payment of interest under the provisions of the Indian Interest Act and in determining such interest, the Certificate issued by an officer of the OWNER in a financial department of the OWNER shall be conclusive evidence of the Bank rate of interest applicable to the OWNER.

8.13.0.0 **LIABILITIES FOR SUB-CONTRACTOR(S)**

8.13.1.0 Without prejudice to any other liabilities or obligations of the CONTRACTOR relative to sub-contractors in terms hereof or otherwise, the CONTRACTOR shall require every sub- contractor to whom any portion of the work to be performed under the Contract has been sub-contracted, to comply with the provisions of the Contract in so far as applicable to each sub-contractor, and the CONTRACTOR shall hold the OW NER harmless and indemnified from any and against all penalties, actions, claims and demands and costs, charges and expenses whatsoever arising out of or in connection with any failure of the CONTRACTOR or any sub-contractor(s) to make full and proper compliance with any of the terms and conditions of the Contract.

8.14.0.0 **WAIVER**

8.14.1.0 It shall always be open to the OW NER to waive in whole or part any right or the enforcement of any right or remedy which the OWNER may have against the CONTRACTOR or of any obligations which the CONTRACTOR may have hereunder, provided always that :

(i) No waiver shall be presumed or inferred unless made in a written communication addressed by the OWNER to the CONTRACTOR and specifically communicated as a Waiver ;

(ii) No waiver of any right or part of any right on one occasion shall be deemed to be a waiver or abandonment of that right for all occasions with the intent that a waiver once given shall be limited to the specific waiver and shall be without prejudice to the right of the Owner to insist upon the strict adherence of the attendant obligations of the Contractor and/or the future enforcement of the right by the Owner in respect of the same and/or any other dependent obligation.

8.15.0.0 **CONTRACTOR'S ESTABLISHMENT**

8.15.1.0 It is understood that the establishment of the CONTRACTOR (and any sub-Contractor engaged by the CONTRACTOR) constitutes an independent establishment involving inter alia in undertaking works and/or services for others of the nature and kind forming the subject matter of the Contract. It is consequently understood that all the employees of the CONTRACTOR (and any Sub-Contractor engaged by the CONTRACTOR) are the employees of the independent establishment of the CONTRACTOR or Sub-Contractor (as the case may be) who have been and will be appointed solely for and/or with reference to the work of that establishment, and have not been and will not be appointed specifically or otherwise for the sole purpose of the work covered by the present Contract. To this end, each CONTRACTOR (and sub-Contractor engaged by the CONTRACTOR) shall issue to each of its employees deputed to the job-site to perform any work in relation to the Contract a regular letter of appointment for employment in the CONTRACTOR'S/ sub-Contractor's independent establishment, with authority in the CONTRACTOR/sub-Contractor to employ or depute him for or in relation to any work or engagement assumed by the CONTRACTOR/sub-Contractor from time to time in the course of its business and the production of a certified copy of each letter of appointment duly acknowledged by the concerned employee shall be a pre-condition for the issue of a Gate Pass to any employee of the CONTRACTOR/sub-Contractor into any area the entry to which is restricted by the OWNER.

8.16.0.0 **COLLECTION OF INDEBTEDNESS**

8.16.1.0 Without prejudice to any other rights or remedies of the OWNER and in addition to any other provisions hereof, the OWNER shall be entitled, out of the Security Deposit (including by recourse to Bank Guarantee/ Insurance Surety Bond) any monies or securities under this or any

other contract(s) for the time being of the CONTRACTOR in its hands and out of any payments then due or becoming due in future to the CONTRACTOR under this or any other Contract,

(a) deduct any and all amounts due to the OWNER from the CONTRACTOR arising out of or in connection with the Contract or any other contract;

(b) retain such amounts which the OWNER has claimed against the Contractor and arising out of or in connection with this Contract or any other contract.

8.17.0.0 **OBSERVANCE OF ENVIRONMENTAL REGULATIONS AND ENVIRONMENTAL PROTECTION**

8.17.1.0 The CONTRACTOR shall ensure that its servants and agents and sub-contractors and their servants and agents shall duly comply with all environmental laws, rules and regulations and the conditions of any permit, permission, consent and/or no-objection granted in this behalfby any authority with respect to or concerning the work, and shall independently so organize and conduct its operations and cause its sub-contractors so organize and conduct their operations as not to cause any hazard or pollution to health, life, property or environment including (but not limited to) discharge of any noxious substance or effluent into the atmosphere or into the earth or into any drain, canal, stream, river, pond, lake or other water body.

8.17.2.0 The CONTRACTOR shall indemnify and keep indemnified the OW NER from and against the breach, non-observance, infraction or dereliction of any of the provisions of Clause 8.17.1.0 hereof, and against any and all claims, actions or proceedings, prosecutions and liabilities and losses and damages and costs (including legal costs), charges and expenses whatsoever suffered or incurred or instituted against the OWNER as the case may be.

8.18.0.0 **CONFIDENTIAL HANDLING OF INFORMATION**

8.18.1.0 The CONTRACTOR and its/his employees, agents and sub-contractors and the employees and agents of the sub-Contractor(s) shall treat as strictly confidential and shall take all steps necessary to ensure confidential handling of all maps, Plans, charts, designs, Drawings, photographs, data, reports, tests, Specifications, methods, and other information developed or acquired by the CONTRACTOR from or by means of the Tender Documents or any facility extended to the CONTRACTOR pursuant thereto or the award or performance of the works or any of them or otherwise disclosed or made available to the CONTRACTOR or any of the aforesaid persons, and shall not disclose or reproduce the same in any book, article, speechor other publication, provided always that the OWNER may upon application by the CONTRACTOR to the OWNER in this behalf permit report, disclosure or re-production of the same in any book, article, speech or other publication if it is satisfied that this would not involve the disclosure of any classified or other information which would not be in the interest of public or security to disclose.

8.18.2.0 Application for such consent shall be submitted to the OWNER in writing outlining the intended use of the relative material and shall be submitted to the OW NER at least one month prior to the expected use accompanied by the text of the relative publication in which it is sought to be used. Photographs should be accompanied by their caption. An application shall not be understood to have been permitted unless expressly permitted in writing by the OWNER.

8.19.0.0 **GOVERNMENT OF INDIA NOT LIABLE**

8.19.1.0 It is expressly understood and agreed by and between the CONTRACTOR and the OWNER that the OWNER is entering into this agreement solely on its own behalf and not on behalf of any other person or entity. In particular, it is expressly understood and agreed that the Government of India is not a party to this agreement and has no liabilities, obligations or rights thereunder. It is expressly understood and agreed that the OWNER is an independent legal entity with power and authority to enter into contracts, solely in its behalf under the applicable laws of India and general principles of Contract Law. The CONTRACTOR expressly agrees, acknowledges and understands that the OWNER is not an agent, representative or delegate of the Government of India. It is further understood and agreed that the Government of India is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs arising out of the Contract. Accordingly, CONTRACTOR hereby expressly waives, releases and foregoes any and all actions or claims, including cross claims, impleader claims or counter claims against the Government of India arising out of this Contract and covenants not to sue the Government of India on any matter, claim, cause of action or thing whatsoever arising out of or under this Contract.

**8.20.0.0 INDEPENDENT CONTRACTOR STATUS**

8.20.1.1 The CONTRACTOR shall act as an independent contractor performing the Contract. The Contract does not create any agency, partnership, joint ventures or joint relationship between the parties. Subject to all compliance with the Contract, the CONTRACTOR shall be solely responsible for the manner in which works are performed. All employees, representatives or sub-CONTRACTORs engaged by the CONTRACTOR in performing the Contract shall be under the complete control of the CONTRACTOR and shall not be deemed to be employees of the CORPORATION and nothing contained in the Contract or in any sub-Contract awarded by the CONTRACTOR shall be construed to create any contractual relationship between any such employees or representative or Sub-Contractor and OWNER. CONTRACTOR shall be responsible for the acts, defaults or negligence of the CONTRACTOR, his agencies, servant or workmen.

8.21.0.0 **EMPLOYMENT BY FIRMS TO OFFICIALS OF THE OWNER**

8.21.1.1 The CONTRACTOR shall not to employ serving OWNER employees unless such recruitment is through open public recruitment process.

8.21.1.2 The CONTRACTOR shall not employ or engage any ex- senior management personnel of OWNER within the initial two years period after their retirement/resignation/severance from the service in connection with the Contract, without specific permission of Owner. Failure to comply with the above shall be deemed to be a breach of contract.

**8.22.0.0 PRADHAN MANTRI SURAKSHA BIMA YOJANA (PMSBY) AND PRADHAN MANTRI JEEVAN JYOTI BIMA YOJANA (PMJJBY).**

8.22.1.1 Contractor shall, ensure that all his/ its personnel deployed under the Contract have obtained additional insurance coverage under the Pradhan Mantri Suraksha Bima Yojana (PMSBY) and Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY) through the participating banks and submit the proof of such insurance coverage to the satisfaction of the OWNER for defraying the cost of the insurance premium amount under the contract. The contractor shall also certify that the claim has not been preferred in the earlier contract of OWNER or otherwise.

8.22.1.2 OWNER after satisfying by verifying the required documents shall release the premium amount to contractor. In case a member is covered through more than one account, insurance cover will be restricted to one only.

**8.23.0.0 INSOLVENCY OF CONTRACTOR**

8.23.1.0 It shall be the responsibility of the Contractor to inform OWNER in writing as per Annexure 6 immediately and in any event within one (1) working day from the earlier of either: (i) filing; or (ii) admission/ rejection by National Company Law Tribunal (NCLT), Debt Recovery Tribunal (DRT) or any other court or tribunal having jurisdiction, of the petition for insolvency resolution or liquidation proceedings under the Insolvency and Bankruptcy Code, 2016 (“Code”) or any other applicable law (in case where Code is not applicable).

8.23.2.0 If the Contractor refuses or fails to share the information regarding their status of insolvency resolution process or liquidation or bankruptcy proceeding, it shall be treated as breach of Contract and OWNER shall be entitled to terminate the contract in terms of Clause 7.0.1.0.

8.24.0.0 **ENVIRONMENTAL, SOCIAL AND GOVERNANCE COMPLIANCES**

8.24.1.0 It shall be responsibility of the Contractor and any of the sub-contractors deployed by the Contractor to ensure compliance with all applicable laws and to ensure safe healthy, inclusive, ethical and equitable work environment, and to have zero tolerance policy towards sexual harassment for all its employees. The Contractor shall be in compliance with all applicable laws in

this regard. The Owner shall have right to carry out any inspection of the Contractors premises in order to verify such compliances and ask for any document or other record as deemed necessary for such compliance. The Contractor shall render all necessary support and assistance for the same. The Contractor shall abide by the undertakings as annexed hereto as Annexures ESG-I to IV.

SECTION 9

## DISPUTE RESOLUTION

9.0.0.0 **NOTICE OF DISPUTE AND AMICABLE SETTLEMENT**

9.0.1.0 Subject to the provisions of Clause 6.2.0.0, in the event of any difference/dispute between the parties to the Contract arising out of or in connection with the Contract, the concerned party shall send a Notice of Dispute specifying all points of disputes / issues, the amounts of any quantified claims, and an estimate of the monetary value of any other claims, along with the supporting document(s) to the other party under the Contract.

Provided such a request can only be made upon submission of Final bill in terms of clause 6.2.0.0, 7.0.4.0 and subject to provisions of clause 6.2.6.0.

9.0.2.0 After receipt of a Notice of Dispute under Clause 9.0.1.0 above, the parties shall in good faith, make all reasonable efforts to arrive at a mutually acceptable resolution to the disputes raised in the Notice of Dispute in a formal meeting(s) between authorized representatives of the parties.

9.0.3.0 Parties agree that any effort by either party for arriving at the mutually acceptable resolution of the disputes is to be kept confidential by both Parties. Parties also agree to not rely upon any views expressed, admissions or suggestions made, or willingness to enter into a settlement by either party as evidence in any forum / arbitration / court proceeding.

9.0.4.0 Parties agree that the Contractor shall not be entitled to any claim or compensation for any consequential, indirect or special losses/damages, including loss of profit, loss of production, loss of use, loss of goodwill, loss of reputation, remote damages, loss of business opportunities, loss of employment opportunities, loss of interest including any pre-reference or *pendente-lite* interest, idling costs of men and machinery, prolongation costs etc., on account of any dispute/ claim raised under the Contract. Parties agree that claim for any such amount by the Contractor shall not be considered and shall be void.

9.0.5.0 In case the parties fail to amicably resolve the disputes between them within 60 days of receipt of Notice of Dispute sent under Clause 9.0.1.0 above, the following provisions of Clause 9 mentioned below, if applicable, shall follow.

9.1.0.0 **MEDIATION/CONCILIATION**

9.1.1.0 If there is no resolution of dispute pursuant to clause 9.0.0.0, then the concerned party would seek resort to the Mediation/Conciliation under the Indian Oil Conciliation Rules 2014 as amended and/or re-enacted from time to time, if the dispute is covered under the said Rules.

9.1.2.0 The said Rules are available on the OWNER's website.

9.2.0.0 A**DMINISTRATIVE MECHANISM FOR RESOLUTION OF CPSEs DISPUTES (AMRCD)**

9.2.1.0 In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts inter se and also between CPSEs and Government Departments/Organizations (excluding disputes concerning Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD as mentioned in DPE OM No. 05/0003/2019-FTS-10937 dated 14-12-2022 as may be modified from time to time .

9.2.2.0 Notwithstanding the existence of any dispute resolution process in terms hereof or otherwise, the CONTRACTOR shall continue and be bound to continue and perform all its/ his outstanding obligations in all respects under the Contract (unless the Contract is determined by the OWNER), and the CONTRACTOR shall remain liable and bound in all respects under the Contract.

**9.3.0.0 DISPUTE RESOLUTION (IN CASE OF DISPUTES IS NOT BETWEEN GOVT. ENTITIES/PUBLIC SECTOR ENTERPRISES)**

9.3.1.0 Subject to the provisions of Clauses 9.0.0.0, 9.1.0.0, 9.2.0.0, 6.7.1.0, and 6.7.2.0 hereof, any dispute arising out of a Notified Claim of the CONTRACTOR included in the Final Bill of the CONTRACTOR in accordance with the provisions of Clause 6.6.3.0 hereof, and any dispute arising out of any claim(s) of the OWNER against the CONTRACTOR shall be referred to the arbitration under the institute as enumerated under Contract documents (whose rules are deemed to be incorporated herein by reference) to an arbitral tribunal appointed under rules as provided for. It is specifically agreed that the OWNER may prefer its claim(s) against the CONTRACTOR as counter-claim(s) if a Notified Claim of the CONTRACTOR has been referred to arbitration. The CONTRACTOR shall not, however, be entitled to raise as a set-off defense or counter- claim any claim which is not a Notified Claim included in the CONTRACTOR's Final Bill in accordance with the provisions of Clause 6.6.3.0 hereof.

Provided that

(a) to be arbitrable, the cumulative value of Notified Claims of Contractor (for domestic procurement contracts) and the claims of OWNER does not exceed Rupees Ten Crore. It is further agreed that in case the cumulative value of Notified Claims of the CONTRACTOR (inclusive of interest amount claimed by CONTRACTOR till the date of filing of statement of claim or the counter-claim as the case may be) filed before Arbitrator and the claims of OWNER (inclusive of interest amount claimed by OWNER till the date of filing of statement of claim or the counter-claim as the case may be) filed before the Arbitrator exceed Rupees Ten Crore, the Arbitrator so appointed shall refrain from proceeding in the arbitration and the arbitration proceedings shall stand terminated forthwith.

(b) in case of the non-domestic procurement contracts to be arbitrable, the cumulative value of Notified Claims of Contractor and the claims of OWNER does not exceed Rupees Hundred Crore. It is further agreed that in case the cumulative value of Notified Claims of the CONTRACTOR (inclusive of interest amount claimed by CONTRACTOR till the date of filing of statement of claim or the counter-claim as the case may be) filed before Arbitrator and the claims of OWNER (inclusive of interest amount claimed by OWNER till the date of filing of statement of claim or the counter-claim as the case may be) filed before the Arbitrator exceed Rupees Hundred Crore, the Arbitrator so appointed shall refrain from proceeding in the arbitration and the arbitration proceedings shall stand terminated forthwith.

9.3.2.0 The Arbitration shall be conducted by an Arbitral Tribunal consisting of:

(i) For claim amount upto Rs. 2 crore, by a Sole Arbitrator, to be appointed by the concerned institute from the panel of arbitrators maintained by such institute. It is agreed between the parties that only a Retired Judge shall be eligible to be appointed as a Sole Arbitrator under this clause, and

(ii) For claim amount above Rs. 2 crore, by a Tribunal of three arbitrators from the panel of arbitrators maintained by such institute. It is agreed between the parties that only Retired Judge(s) shall be eligible to be appointed as arbitrator(s) under this clause. Parties to nominate one arbitrator each and the presiding arbitrator shall be appointed from the panel of arbitrators maintained by such institute, in accordance with the rules of the relevant institute.

In the event institutional arbitration has not been provided for in the Form of Contract, the sole arbitrator provided for in 9.3.2.0 (i) may be appointed by mutual consent of Parties and the arbitrator(s) to be nominated under clause 9.3.2.0 (ii) may be nominated by the Parties without recourse to an arbitration institution and the two arbitrators so nominated may appoint a presiding arbitrator by mutual consent.

9.3.2.1 Seat of the arbitration shall be the place of exclusive jurisdiction as provided in the “Form of Contract”. In the event, “Form of Contract” under the Contract Documents has not been executed between the parties, for any reason whatsoever, the seat of arbitration shall be the place from where the tender has been issued by the OWNER.

9.3.2.2 Notwithstanding any other court or courts having jurisdiction to decide the question(s)

forming the subject matter of the reference if the same had been the subject matter of a suit, all actions and proceedings arising out of or relative to the Contract shall lie only in the court of competent civil jurisdiction in this behalf as specified in the Form of Contract to the exclusion of any other court. In the event, "Form of Contract" under the Contract Documents has not been executed between the Parties, for any reason whatsoever, Court of competent jurisdiction shall be the place from where the tender has been issued by the OWNER, to the exclusion of any other court.

9.3.3.0 If a dispute arises with reference to any of the matters referred to in Paragraphs (i) to (iii) of Clause 9.3.4.0 hereof before the appointment of the Arbitral Tribunal under this clause, such dispute shall be referred for adjudication under Clause 9.3.4.0 hereof and the appointment of the Arbitral Tribunal, if any, shall be subject to and without prejudice to Clause 9.3.4.0 and the Arbitral Tribunal so appointed shall refrain from proceeding in the arbitration so far as concerns any such disputed matter under the decision of the General Manager under Clause 9.3.4.0 in respect thereof. If the dispute arises during the course of the arbitration proceedings commenced under Clause 9.3.0.0 with respect to any of the said matters, the Arbitral Tribunal shall forthwith refrain from proceeding further in the arbitration so far as concerns any such disputed matters until the decision of the General Manager under Clause 9.3.4.0, and if necessary, the Arbitral Tribunal so appointed under this Clause shall direct the parties before him for the purpose to make reference of such dispute(s) to the General Manager under Clause 9.3.4.0

9.3.4.0 Any dispute(s) or difference(s) with respect to or concerning or relating to any of the following matters are hereby specifically excluded from the scope, purview and ambit of the Arbitration Agreement embodied in Clause 9.3.0.0 with the intention that any dispute or difference with respect to any of the said following matters and/or relating to Arbitral Tribunal's jurisdiction with respect thereto shall not and cannot form the subject- matter of any reference or submission to arbitration under Clause 9.3.0.0, and Arbitral Tribunal shall have no jurisdiction to entertain the same or to render any decision with respect thereto, and such matter shall be referred to the General Manager for decision and the same shall be decided by the General Manager (whose decision shall be final and binding on the OWNER and the CONTRACTOR) prior to the appointment of the Arbitral Tribunal, if appointed then Arbitral Tribunal appointed under Clause 9.3.0.0 proceeding with or proceeding further with the reference, as the case may be. The said excluded matters are:

(i) With respect to or concerning the scope or existence or otherwise of the Arbitration Agreement;

(ii) Whether or not a Claim sought to be referred to arbitration by the CONTRACTOR under Clause 9.3.0.0 is a Notified Claim;

(iii) Whether or not a Notified Claim is included in the CONTRACTOR's Final Bill in accordance with the provisions of Clause 6.6.3.0 hereof.

9.3.4.1 The General Manager shall act as a *'persona designate'* or expert and not as an arbitrator and the provisions of the Indian Arbitration and Conciliation Act, 1996 or any law governing arbitration shall not apply to proceedings before the General Manager.

9.3.4.2 The General Manager shall render his decision on the basis of the material placed before him either by the OWNER or by the CONTRACTOR, and if the CONTRACTOR fails to place material before him, the General Manager shall assume that the CONTRACTOR has no material to place and may render his decision accordingly.

9.3.4.3 Venue for the resolution under this Clause shall be at the place where the General Manager is located, provided that the General Manager may with the consent of the Contractor agree upon any other venue.

9.4.0.0 **ADJUDICATION BY COURTS**

Subject to provisions of applicable law, any dispute not resolved or not covered under the provisions of Clauses 9.0.0.0 to 9.3.0.0 above may be referred for final adjudication by a court of competent jurisdiction.

Notwithstanding any other court or courts having jurisdiction to decide any dispute all actions and proceedings arising out of or relative to the Contract shall lie only in the court of competent civil jurisdiction in this behalf as specified in the Form of Contract

to the exclusion of any other court. In the event, “Form of Contract” under the Contract Documents has not been executed between the Parties, for any reason whatsoever, Court of competent jurisdiction shall be the place from where the tender has been issued by the OWNER, to the exclusion of any other court.

9.5.0.0 **CONTINUED PERFORMANCE**

Notwithstanding the fact that settlement of dispute(s) (if any) under any of the mechanisms as enumerated hereinabove, as may be pending, the parties hereto shall continue to be governed by and perform the work in accordance with the provisions under the Contract.

9.6.0.0 **NO INTEREST**

9.6.1.0 Parties agree that the CONTRACTOR shall not be entitled for any pre-reference or *pendente-lite* interest, i.e., date of cause of action till date of Award by Arbitral Tribunal. Parties agree that CONTRACTOR’s claim for any such interest shall not be considered and shall be void. The Arbitrator or Tribunal shall have no authority or power to award pre-reference or pendent-lite interest in the matter to the CONTRACTOR.

9.6.2.0 Where the arbitral award is for the payment of money, no interest shall be payable by Owner on whole or any part of the money for any period till the date on which the award is made.

9.6.3.0 Parties agree that the CONTRACTOR shall not be entitled for any pre-filing interest, i.e., date of cause of action till date of filling of civil suit. Parties agree that CONTRACTOR’s claim for any such interest shall not be considered and shall be void.

9.6.4.0 Where the civil decree is for the payment of money, no interest shall be payable by OWNER on whole or any part of the money for any period till the date on which the suit is filed.

9.6.5.0 The Parties agree that the CONTRACTOR hereby waives any right to claim any pre-reference or pending proceeding interest claim before any conciliator or AMRCD as the case may be.

SECTION 10

**SAFETY CODE**

10.0.0.0 **ADHERENCE TO SAFETY PRACTICES**

10.0.1.0 CONTRACTOR shall adhere to safe construction practice and guard against hazardous and unsafe working conditions and shall comply with OWNER's safety rules as set forth herein.

10.0.2.0 In addition, the Contractor shall adhere to and be bound by the "Safety Practices During Construction" (OISD-GDN-192) formulated by the Oil Industry Safety Directorate from time to time. A copy of the existing "Safety Practices During Construction" as presently formulated by the Oil Industry Safety Directorate is annexed hereto as Appendix III.

10.0.3.0 In the event of any irreconcilable conflict between the 'Safety Practices During Construction" prescribed by the Oil Industry Safety Directorate and the Safety provisions set out herein, the "Safety Practices During Construction" established by the Oil Industry Safety Directorate shall prevail to the extent of the irreconcilable conflict.

10.1.0.0 **FIRST AID AND INDUSTRIAL INJURIES**

10.1.1.0 CONTRACTOR shall maintain first aid facilities for its employees and those of its sub-contractors.

10.1.2.0 CONTRACTOR shall make outside arrangements for ambulance service and for the treatment of industrial injuries. Names of those providing these services shall be furnished to Engineer-in-charge prior to start of construction, and their telephone numbers shall be prominently posted in CONTRACTOR's field office.

10.1.3.0 All critical industrial injuries shall be reported promptly to Engineer-in-charge, and a copy of CONTRACTOR's report covering each personal injury requiring the attention of a physician shall be furnished to OWNER.

10.2.0.0 **GENERAL RULES**

10.2.1.0 Carrying/Striking of matches, lighters inside the refinery area, smoking within the refinery, tank, farm, or dock limits are strictly prohibited. Violators of the "No Smoking" rules shall be discharged immediately. Within the operation area, no hot work shall be permitted without valid gas safety/fire permits. The CONTRACTOR shall be held and responsible for all lapses of his sub-contractors/employees in this regard.

10.3.0.0 **CONTRACTOR'S BARRICADES**

10.3.1.0 CONTRACTOR shall erect and maintain barricades required in connection with his operation to guard or protect :

(i) Excavation

(ii) Hoisting areas

(iii) Areas adjudged hazardous by CONTRACTOR's or OWNER's inspectors.

(iv) OWNER's existing property liable to damage by CONTRACTOR's operations, in the opinion of Engineer-in-Charge/Site Engineer.

(v) Railroad unloading spots.

10.3.2.0 CONTRACTOR's employees and those of its sub-contractors shall become acquainted with OWNER's barricading practice and shall respect the provisions hereof.

10.3.3.0 Barricades and hazardous areas adjacent to but not located in normal routes of travel shall be marked by red flasher lanterns at nights.

10.4.0.0 **SCAFFOLDING**

10.4.1.0 Suitable metal scaffolding shall be provided for workmen for all works that cannot safely be done from the ground or from solid construction except such short period work as can be done safely from ladders. When a ladder is used, an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than 1 in 4 (1 horizontal 4 vertical)

10.4.2.0 Scaffolding or staging more than 12' above the ground floor, swing or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached, bolted, braced and otherwise rewinded at least 3' high above the floor or platform of scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

10.4.3.0 Working platform, gangways and stairways should be so constructed that they should not sag unduly or unequally and if the height of the platform or the gangway or the stairway is more than 12', above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in Clause 10.4.2.0 above.

10.4.4.0 Every opening in the floor of a building or in a working platform be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 3 feet.

10.4.5.0 Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 30' in length while the width between the side rails in rung ladder shall in no case be less than 11.5" for ladder up to and including 10' in length for longer ladders this width would be increased at least ¼" for each additional foot of length. Uniform step spacing shall not exceed 12". Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the site of work shall be so stacked or placed as to cause danger or inconvenience to any person or public. The CONTRACTOR shall also provide all necessary fencing and lights to protect the workers and staff from accidents, and shall be bound to bear the expenses of defence of every suit, action or other proceedings, as law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay damages and costs which may be awarded in any such suit or action or proceedings to any such person, or which may with the consent of the CONTRACTOR be paid to compromise any claim by any such person.

10.5.0.0 **EXCAVATION AND TRENCHING**

10.5.1.0 All trenches 4' or more in depth shall at all times be supplied with at least one ladder for each 100' length or fraction thereof.

10.5.2.0 Ladder shall be extended from bottom of the trench to at least 3' 3" above the surface of the ground. The site of the trenches which is 5' or more in depth shall be stepped back to give suitable slope, or securely held by timber bracing, so as to avoid the danger of sides to collapse. The excavated material shall not be placed within 5' of the edge of the trench or half of trench depth whichever is more. Cutting shall be done from top to bottom. Under nocircumstances shall undermining or undercutting be done.

10.6.0.0 **DEMOLITION**

10.6.1.0 Before any demolition work is commenced and also during the process of the work all roads and open area adjacent to the work site shall either be closed or suitably protected.

10.6.2.0 No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged.

10.6.3.0 All practical steps shall be taken to prevent danger to persons employed, from risk of fire or explosion or flooding. No floor or other part of the building shall be so overloaded with debris or material as to render it unsafe.

10.7.0.0 **SAFETY EQUIPMENT**

10.7.1.0 All necessary personal safety equipment as considered adequate by the Engineer-in-charge should be made available for the use to the persons employed on the site and maintained in a condition suitable for immediate use, and the CONTRACTOR should take adequate steps to ensure proper use of equipment by those concerned.

10.7.2.0 Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective gloves.

10.7.3.0 Those engaged in white washing and mixing or stacking of cement bags or any materials which are injurious to the eyes shall be provided with protective goggles.

10.7.4.0 Those engaged in welding and cutting works shall be provided with protective face and eye shields, and gloves, etc.

10.7.5.0 Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

10.7.6.0 When workers are employed in sewers and manholes, which are in use, the CONTRACTOR shall ensure that the manhole covers are opened and are ventilated at least for an hour before the workers are allowed to get into the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public.

10.7.7.0 The CONTRACTOR shall not employ men below the age of 18 years and women on the work of painting or products containing lead in any form. Wherever men above the age of 18 years are employed on the work of lead painting, the following precautions should be taken:

10.7.7.1 No paint containing lead product shall be used except in the form of paste or readymade paint.

10.7.7.2 Suitable face masks shall be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.

10.7.7.3 Overalls shall be supplied by the CONTRACTOR to workmen and adequate facilities shall be provided to enable the working painters to wash during and on cessation of work.

10.8.0.0 **RISKY PLACES**

10.8.1.0 When the work is done near anyplace where there is a risk of drowning, all necessary safety equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

10.9.0.0 **HOISTING EQUIPMENT**

10.9.1.0 Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following standards or conditions:

10.9.1.1 These shall be of good mechanical construction, sound materials and adequate strength and free from patent defect and shall be kept in good condition and in good working order.

10.9.1.2 Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength and free from patent defects.

10.9.1.3 Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21years should be in charge of any hoisting machine including any scaffolding winch or give signals to the operator.

10.9.1.4 In case of every hoisting machine and of every chain ring hook, shackle, swivel and pulley block used in hoisting or lowering or as means of suspension, the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load and the condition under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.

10.9.1.5 In case of departmental machine, the safe working load shall be notified by the Engineer-in-Charge. As regards CONTRACTOR's machines, the CONTRACTOR shall notify the safe

working load of the machine to the Engineer-in-charge, whenever he brings any machinery to site of work and get it verified by the Engineer-in-charge concerned.

10.10.0.0 **ELECTRICAL EQUIPMENT**

10.10.1.0 Motor, Gearing, Transmission, wiring and other dangerous parts of hoisting appliances shall be provided with efficient safeguards, hoisting appliance should be provided with such means as will reduce to the minimum, the risk of accidental descent of the load, adequate precautions shall be taken to reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized, insulating mats, wearing apparel, such as gloves and boots as may be necessary shall be provided. The workers shall not wear any rings, watches and carry keys or other materials which are goods conductors of electricity.

10.11.0.0 **MAINTENANCE OF SAFEY DEVICES**

10.11.1.0 All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe conditions and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near place of work.

10.12.0.0 **DISPLAY OF SAFETY INSTRUCTIONS**

10.12.1.0 These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at the work spot. The person responsible for compliance of the safety code shall be named therein by the CONTRACTOR.

10.13.0.0 **ENFORCEMENT OF SAFETY REGULATIONS**

10.13.1.0 To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the CONTRACTOR shall be open to inspection by the Welfare Officer, Engineer-in-charge or Safety Engineer of the OWNER or their representatives.

**10.14.0.0 NO EXEMPTION**

10.14.1.0 Notwithstanding the above Clauses 10.0.0.0 to 10.13.0.0 there is nothing in these to exempt the CONTRACTOR from the operations of any other Act or rules in force in the Republic of India.

10.14.2.0 The works throughout including any temporary works shall be carried on in such a manner as not to interfere in any way whatsoever with the traffic on any roads or footpaths, at the site or in the vicinity thereto or any existing works whether the property of the OW NER or of a third party.

10.14.3.0 In addition to the above, the CONTRACTOR shall abide by the safety code provision as per CPWD Safety Code framed from time to time.

10.14.4.0 The CONTRACTOR shall also arrange to obtain valid gate passes for his men and equipment from the concerned authorities of the Refinery/Project

10.14.5.0 No man/material/equipment not covered by valid passes shall be permitted within the Refinery/Project area and no material/equipment shall be permitted to be taken out of the Refinery/Project area, unless authorized by the concerned authorities of the Refinery Project. The CONTRACTOR shall be held fully responsible for any or all delays/losses/damages that may result consequent on any lapses that may occur on the part of his sub-contractors/employees in this regard.

**10.15.0.0 DEDUCTIONS ON ACCOUNT OF SAFETY VIOLATIONS**

10.15.1.0 In addition to price reduction and deductions as provided for, the OWNER shall be entitled to deduct from any payment due to the CONTRACTOR, any amount claimed by the OWNER under the Contract and any costs, damages or expenses for which the CONTRACTOR is liable under the Contract.

10.15.2.1 In addition to price reduction and deductions as provided for in the Contract, the OWNER shall be entitled to deduct from any payment due to the CONTRACTOR, for violations of safety provisions, as per details given below:

(i) Violation of applicable safety, health and environment related norm, an amount of Rs.5000/- per occasion

(ii) Violation as above resulting in :

a) Any physical injury – an amount equal to 0.5% of the Total Contract Value (maximum of Rs.2,00,000) per injury in addition to Rs. 5,000/-

b) Fatal accident – an amount equal 1% of the Total Contract Value (maximum of Rs.10,00,000) per fatality in addition to Rs. 5,000/-

10.16.0.0 **SPECIAL CONTRIBUTIONS**

With a view to ensure the formulation and enforcement of a safety code by the CONTRACTOR, it is stipulated that in the event of any act, omission or accident at the job site which results in the death of a person, the CONTRACTOR shall contribute a sum of Rs.5,00,000/- (Rupees five lakh only), or which results in the permanent disablement of a person, the CONTRACTOR shall contribute a sum of Rs.3,00,000/- (Rupees three lakh only) in addition to any other sum(s) required to be paid by the CONTRACTOR under any law or other contract, to a welfare fund to be established by the OWNER for, inter alia, such contributions, and until such fund is established, to a charity nominated by the OWNER.

# ANNEXURES TO GCC

# Appendix I

## CONTRACTORS' LABOUR REGULATIONS

(Reference : Clause 8.3.0.0 of GCC)

1. These regulations may be called Model Contractors Labour Regulations.

2. Definition : In these regulations, unless otherwise expressed or indicated, the following words and expressions shall have the meaning hereby assigned to them :

   (a) "Labour" means workers employed by a contractor, directly or indirectly through a sub-contractor, or by an agent on his behalf to do any skilled, semi-skilled or unskilled manual, supervisory, technical or clerical work.

   (b) "Fair Wage" means wages, which shall include wages for weekly day of rest and other allowances, whether for time or piece work, after taking into consideration prevailing market rates for similar employments in the neighbourhood but shall not be less than the minimum rates of wages fixed under the payment of Minimum Wages Act.

   (c) "Wages" shall have the same meaning as defined in the Payment of Wages Act.

   (d) "Contractor" for the purpose of these regulations shall include an agent or sub-contractor employing labour on the work taken on the contract.

   (e) "Inspecting Officer" means any Labour Enforcement Officer or Assistant Labour Commissioner of the Chief Labour Commissioner's Organization.

   (f) "Prescribed" means prescribed under the Contract Labour (Regulation and Abolition) Act, 1970 and Rules framed there under.

3. Notice of commencement : The Contractor, shall within SEVEN days of commencement of the work, furnish in writing, to Inspecting Officer of the area concerned the following information:

   (a) Name and Situation of the work.

   (b) Contractor's name and address.

   (c) Particulars of the Department for which the work is undertaken.

   (d) Name and address of sub-contractors as and when they are appointed.

   (e) Commencement and probable duration of the work.

   (f) Number of workers employed and likely to be employed.

   (g) "Fair wages" for different categories of workers.

      (i) Number of hours of work to constitute a normal working day : The number of hours which shall constitute a normal working day for an adult shall be NINE hours. The working day of an adult worker shall be so arranged that it is inclusive of intervals, if any, for rest, it shall not spread over more than twelve hours on any day. When a worker is made to work for more than NINE hours on any day or for more than FORTY EIGHT hours in a week, he shall, in respect of overtime work, be paid wages at double the ordinary rate of wages.

      (ii) Weekly day of rest : Every worker shall be given a weekly day of rest which shall normally be a Sunday unless otherwise fixed and notified at least TEN days in advance. A worker shall not be required or allowed to work on the weekly rest day unless he has or will have a substituted rest day, on one of the five days immediately before or after the rest day, provided that no substitution shall be made which will result in the worker working for more than ten days consecutively without a rest day for a whole day.

4. Where, in accordance with the foregoing provisions, a worker works on the rest day and has been given a substituted rest day, he shall be paid wages for the work done on the weekly rest day at the overtime rate of wages.

(NOTE : The expression "ordinary rate of wages" means the fair wage the worker is entitled to.)

5. Display of notice regarding Wages, Weekly Day of Rest etc. : The contractor shall, before the commencement of his work on the Contract, display and correctly maintain and continue to display and correctly maintain in a clean and legible condition in conspicuous places on the works, notice in English and in the local Indian language, spoken by majority of workers, giving the rate of fair wages, the hours of work for which such wages are payable, the weekly rest days workers are entitled to and name and address of the Inspecting Officer. The Contractor shall send a copy each of such notices to the Inspecting Officers.

6.1 Fixation of Wage Periods : The Contractor shall fix wage periods in respect of which wages shall be payable. No wage period shall normally exceed one month.

6.2 Payment of wages :

(i) Wages due to every worker shall be paid to him direct. All wages shall be paid in current coins or currency or in both. The wages shall be paid without deductions of any kind except those specified by Central Government by General Order or Special Order in this behalf or permissible under the Payment of Wages Act.

(ii) Wages of every worker employed as contract labour in an establishment or by Contractor are less than one thousand, such workers shall be paid within SEVEN days from the end of the Wage period; and before the expiry of the 10th day from the end of the wage period accordingly as the number of workers exceed 1,000.

(iii) When employment of any worker is terminated by or on behalf of the Contractor, the wages earned by him shall be paid before expiry of the second working day from the date on which his employment is terminated.

(iv) All payment of wages shall be made at the work site on a working day except when the work is completed before expiry of the wage period, in which case final payment shall be made at the work site within 48 hours of the last working day and during normal time.

(NOTE : The term "working day" means a day on which labour is employed, and the workis in progress)

7. Register for Workmen : A register of workmen shall be maintained in the prescribed form and kept at the work site or as near to it as possible, and the relevant particulars of every workman shall be entered therein within THREE days of his employment.

8. Employment Card : The Contractor shall issue an employment card in the Form appendedto these regulations to each worker on the day of work or entry into his employment. If a worker already has any such card with him issued by the previous employer, the Contractor shall merely endorse that Employment Card with relevant entries. The Contractor may, alternatively, issue an attendance-cum-wage slip to each worker in the form appended. This card shall be valid for a wage period. The Contractor shall mark attendance on the cards twice each day and again after the rest interval, before he actually starts the work. On termination of employment, the Employment Card shall again be endorsed by the Contractor, service certificate issued and returned to the Worker.

9. Register of Wages etc.:

(i) A register of Wages-cum-Muster Roll in the prescribed Form shall be maintained and kept at the work site or as near to it as possible.

(ii) A wage slip in the prescribed Form shall be issued to every worker employed by the Contractor at least a day prior to disbursement of wages.

10. Fines and deductions which may be made from Wages :

(i) Wages of a worker shall be paid to him without any deduction of any kind except the following:

(a) Fines ;

(b) Deduction for absence from duty, i.e. from the place of his employment he is required to work. The amount of deductions shall be in proportion to the period for which he was absent ;

(c) Deduction for damage to or loss of goods expressly entrusted to the employed person for custody, or for loss of money which he is required to account for, where such damage or loss is directly attributable to his neglect or default ;

(d) Deductions for recovery of advances or for adjustment of overpayment of wages. Advance granted shall be entered in a register ; and

(e) Any other deduction which the Corporation may from time to time allow.

(ii) No fines shall be imposed on any worker say in respect of such acts and omissions on his part as have been approved by the Chief Labour Commissioner or Competent Authority.

(iii) No fine shall be imposed on a worker and no deductions for damage or loss shall be made from his wages until the worker has been given an opportunity of showing cause against such fines or deductions.

(iv) The total amount of fines which may be imposed in any one wage period on a worker shall not exceed an amount equal to three paise in a rupee of the wages payable to himin respect of that wage period.

(v) No fine imposed on a worker shall be recovered from him in installments, or after expiryof sixty days from the date on which it was imposed. Every fine shall be deemed to have been imposed on the day of the act or commission in respect of which it was imposed.

(vi) The Contractor shall maintain both in English and the local Indian language, a list approved by the Chief Labour Commissioner or Competent Authority clearly stating the acts and commissions for which penalty or fine may be imposed on a workman and display it in good condition in a conspicuous place on the work site.

(vii) The Contractor shall maintain a register of fines and the register of deductions for damage or loss in the prescribed Forms which should be kept at the place of work.

(viii) The Contractor shall display in a conspicuous place of work the list of acts and omissions for which the fines can be imposed. They are as under :

1. Willful insubordination or disobedience, whether alone or in combination with other.
2. Theft, fraud or dishonest in connection with the Contractors beside a business or property of Corporation.
3. Taking or giving bribes or any illegal gratification.
4. Habitual late attendance.
5. Drunkenness, fighting, riotous or disorderly or indifferent behaviour.
6. Habitual negligence.
7. Smoking near or around the area where combustible or other materials are locked.
8. Habitual indiscipline

9. Causing damage to work in the progress or to property of the Corporation or of the Contractor.
10. Sleeping on duty.
11. Malingering or slowing down work.
12. Giving of false information regarding name, age, father's name etc.
13. Habitual loss of wage cards supplied by the employers.
14. Unauthorized use of employer's property of manufacture or making of unauthorized articles at the work place.
15. Bad workmanship in construction and maintenance by skilled workers which is not approved by the Corporation and for which the Contractor is compelled to undertake rectification.
16. Making false complaints and/or misleading statements.
17. Engaging trade within the premises of the establishments.
18. Any unauthorized divulgence of business affairs of the employers.
19. Collection or canvassing for the collection of money within the premises of an establishment unless authorized by the employer.
20. Holding meeting inside the premises without previous sanction of the employers.
21. Threatening or intimidating any workmen or employer during the working hours within the premises.
22. Non-observance of Safety norms/practices applicable to the Worksite.

11. Register of Accidents: The Contractor shall maintain a register of accidents in such form as may be convenient at the work place but the same shall include the following particulars :
    a. Full particulars of the labourers who met with accident.
    b. Rate of wages.
    c. Sex
    d. Age
    e. Nature of accident and cause of accident
    f. Time and date of accident
    g. Date and time when admitted in hospital
    h. Date of discharge from the hospital
    i. Period of treatment and result of treatment
    j. Percentage of loss of earning capacity and disability as assessed by Medical Officer.
    k. Claim required to be paid under Employees' Compensation Act.
    l. Date of payment of compensation
    m. Amount paid with details of the person to whom the same was paid.
    n. Authority by whom the compensation was assessed
    o. Remarks

12. Preservation of Registers : The Register of Workmen and the Register of Wages -cum- Muster Roll required to be maintained under these Regulation shall be preserved for 3 years after the date on which the last entry is made therein.

13. Enforcement : The Inspecting Officer shall either, on his own motion or on a complaint received by him, carry out investigations and send a report to the Engineer-in-charge specifying the amounts representing Workers' dues and amount of penalty to be imposed on the Contractor for breach of these Regulations, that have to be recovered from the Contractor, indicating full details of the recoveries proposed and the reasons therefor. It shall be obligatory on the part of the Engineer-in-charge on receipt of such a report to deduct such amounts from payments due to the Contractor.

14. Disposal of amounts recovered from the Contractor : The Engineer-in-charge shall arrange payment to workers concerned within FORTY FIVE days from receipt of a report from the Inspecting Officer. In cases where there is an appeal, payment of workers dues would be arranged by the Engineer-in-charge wherever such payments arise, within THIRTY days from the date of receipt of the decision of the Regional Labour Commissioner (RLC).

15. Appeal against decision of Inspecting Officer : Any person aggrieved by a decision of the Inspecting Officer may appeal against such decision to the RLC concerned within THIRTY days from the date of decision, forwarding simultaneously a copy of his appeal to the Engineer-in-charge. The decision of the RLC shall be final and binding upon the Contractor and the workmen.

16. Representation of parties :

(i) A workman shall be entitled to be represented in any investigation or enquiry under these

Regulations by an officer of a registered trade union of which he is a member or by an officer of a Federation of Trade Unions to which the said trade union is affiliated or where the workman is not a member of any registered trade union, by an officer of a registered trade union, connected with, or by any other workman employed in the industry in which the worker is employed.

(ii) A contractor shall be entitled to be represented in any investigation of enquiry under these Regulations by an officer of an Association of Contractors of which he is a member or by an officer of a Federation of Association of Contractors to which the said association is affiliated or where the Contractor is not a member of any Association of Contractors, by an officer of association of employers, connected with, or by any other employer engaged in the industry in which the Contractor is engaged.

(iii) No party shall be entitled to be represented by a legal practitioner in any investigation or enquiry under these Regulations.

17. Maternity benefits for female employees : The Contractor shall extend the leave, pay and other benefits as admissible to the female employees. No maternity benefits shall be admissible to a female worker unless she has been employed for a total period of not less than 6 months immediately proceeding the date on which she proceeds on leave. The Contractor shall maintain a register of maternity benefits in prescribed form, and shall be kept in all places of work.

18. Inspection of Books and other documents : The Contractor shall allow inspection of the Registers and other documents prescribed under these Regulations by Inspecting Officers and the Engineer-in-Charge or his authorized representative at any time and by the worker or his agent on receipt of due notice at the convenient time.

19. Submission of Returns : The Contractor shall submit periodical returns as may be specified from time to time.

20. Amendments : The Corporation may, from time to time, add to or amend these Regulations, and issue such directions as it may consider necessary for the proper implementation of these Regulations or for the purpose of removing any difficulty which may arise in the administration thereof.

APPENDIX II

MODEL RULES FOR LABOUR WELFARE

(Refer : Clause 8.3.0.0 of GCC)

1. Definitions

(a) "Workplace" means a place at which, on an average, twenty or more workers are employed on any day during which the Contract work is in progress.

(b) "Large Workplace" means a place at which, on an average 500 or more workers are employed.

2. First Aid

(i) At every workplace, there shall be provided and maintained in a readily accessible place First Aid appliances including an adequate supply of sterilized dressings and sterilized cotton wool as prescribed in the Factory Rules of the State in which the work is carried on. The appliances shall be kept in good order and in large work places, they shall be placed under the charge of a responsible person who shall be trained in First Aid treatment and who shall also be readily available during working hours. The First Aid boxes at the rate of not less than one box for 150 contract labour or part thereof shall be ordinarily employed. Adequate arrangement shall be made for immediate recoupment of items/equipment when necessary.

(ii) At large work places, where hospital facilities are not available within easy distance of the Works, First Aid posts shall be established and be run by a trained compounder.

Where large work places are remotely situated far away from regular hospitals, an indoor ward shall be provided with one bed for every 250 employees.

Where large work places are situated in cities, towns or in their suburbs and no beds are considered necessary owing to proximity of city or town hospitals, suitable transport shall be provided to facilitate removal of urgent cases to these hospitals. At other workplaces, some conveyance shall be kept readily available to take injured person or persons suddenly taken seriously ill to the nearest hospital.

At large work places, there shall be provided and maintained an ambulance room of the prescribed sizes, containing the prescribed equipment and in the charge of such medical and nursing staff as may be prescribed. For this purpose, the relevant provisions of the Factory Rules of the State Government area where the work is carried on may be taken as the prescribed standard.

3. Accommodation for labour : The Contractor shall during the progress of the Works, provide, erect and maintain necessary temporary living accommodation and ancillary facilities for labour at his own expense and to standard and scales as approved by the Engineer-in- charge. However, following specifications shall be followed :

(a) (i) The minimum height of each hut at the eaves level shall be 2.10m (7ft) and the floor area to be provided will be at the rate of 2.7 sq.m (30sq.ft.) for each member of the worker's family staying with the labourer.

(ii) The Contractor shall in addition construct suitable cooking places having aminimum area of 1.80m X 1.50m (6' x 5') adjacent to the hut for each family.

(iii) The Contractor shall also construct temporary latrines and urinals for the use of the labourers, each on the scale of not less than four per each one hundred of the total strength. Separate latrines and urinals shall be provided for women.

(iv) The Contractor shall construct sufficient number of bathing and washing places, one unit for every 25 persons residing in the camp. These washing and bathing places shall be suitably screened.

(b) (i) All the huts shall have walls of sun-dried or burnt-bricks laid in mud mortar or other suitable local material as may be approved by the Engineer-in-Charge. In case of sun-dried bricks, the walls should be plastered with mud gobri on both sides. The floor may be katcha, but plastered with mud gobri and shall be at least 15cm. (6") above the surrounding ground. The roofs shall be laid with thatch or any other materials as may be approved by the Engineer-in-Charge and the Contractor shall ensure that throughout the

period of their occupation, the roofs remain water-tight.

(ii) The Contractor shall provide each hut with proper ventilation.

(iii) All doors, windows and ventilators shall be provided with suitable leaves for security purposes.

(iv) There shall be kept an open space at least 7.2m (8 yards) between the rows of huts which may be reduced to 6m (20ft) according to the availability of site with the approval of the Engineer-in-charge. Back to back construction will be allowed.

4. Drinking Water : In every workplace, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of cold water fit for drinking.

Where drinking water is obtained from an intermittent public water supply, each workplace shall be provided with storage where drinking water should be stored.

Every water supply storage shall be at a distance of not less than 15 meters from any latrine, drain or other source of pollution. Where water has to be drawn from an existing well, whichis within such proximity of latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn for drinking. All such wells shall be entirely closed in and be provided with a trap door which shall be dust and water proof.

A reliable pump shall be fitted to each covered well, the trap door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.

5. Washing and Bathing Places : Adequate washing and bathing places shall be provided separately for men and women. Such places shall be kept in clean and drained conditions.

6. Scale of accommodation in latrines and urinals : There shall be provided within the precincts of every workplace, latrines and urinals in an accessible place and the accommodation separately for each of these, shall not be less than at the following scales :

No. of seats

| | | |
|---|---|---|
| (a) Where number of persons does not exceed 50 | - | 2 |
| (b) Where number of persons exceeds 50 but does not exceed 100 | - | 3 |
| (c) For additional persons (per 100 or part thereof) | - | 3 |

In particular cases, the Engineer-in-Charge shall have the power to increase the requirement, where necessary.

7. Latrines and Urinals : Except in workplaces provided with water-flushed latrines connected with a water-borne sewage systems, all latrines shall be provided with receptacies on dry earth system which shall be cleaned at least four times daily and at least twice during working hours and kept in strictly sanitary condition. Receptacies shall be tarred inside and outside at least once a year.

If women are employed, separate latrine and urinals screened from those for men and marked in the vernacular in conspicuous letters "For Women Only" shall be provided on the scale laid down in Rule 6. Those for men shall be similarly marked "For Men Only". A poster showing the figure of a man and a woman shall also be exhibited at the entrance to latrines for each sex. There shall be adequate supply of water close to latrines and urinals.

8. Construction of latrines : Inside walls shall be constructed of masonry or other non- absorbent materials and shall be cement-washed inside and outside at least once a year. The dates of cement washing shall be noted in a register maintained for the purpose and kept available for inspection. Latrines shall have at least thatched roof.

9. Disposal of excreta : Unless otherwise arranged for by the local municipal authority, arrangement for proper disposal of excreta by incineration at the workplace shall be made by means of a suitable incinerator approved by the local medical, health and medical or cantonment authorities. Alternatively, excreta may be disposed of by putting a layer of night soils at the bottom of pucca tank prepared for the purpose and covering it with a 15 c.m. Layer of waste or refuse and then covering it with a layer of earth for a fortnight (when it will turn into manure).

The Contractor shall, at his own expense, carry out all instructions issued to him by the Engineer-in-charge to effect proper disposal of soil and other conservancy work in respect of Contractor's work people or employees at the site. The Contractor shall be responsible for payment of any charges which may be levied by municipal or cantonment authority for execution of such work

on his behalf.

10. Provision of shelters during rest : At every workplace shall be provided, free of cost, four suitable sheds, two for meals and two others for rest, separately for use of men and women labour. Height of each shelter shall not be less than 3 meters from the floor level to lowest part of roof. Sheds shall be kept clean and the space provided shall be on the basis of at least 0.5 sq.m per head.

11. Creches : At a place at which 20 or more women workers are ordinarily employed, there shall be provided at least one hut for use of children under the age of 6 years belonging to such women. Huts shall not be constructed to a standard lower than that of thatched roof, mud floor and wall with wooden planks spread over mud floor and covered with matting.

Huts shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the places clean. There shall be two dais in attendance. Sanitary utensils shall be provided to the satisfaction of local medical, health and municipal or cantonment authorities. Use of huts shall be restricted to children, their attendants and mothers of children.

Where the number of women workers is more than 25 but less than 50, the Contractor shall provide at least one hut and one Dai to look after the children of women workers.

Size of creche(s) shall vary according to the number of women workers employed. Creche(s)

shall be properly maintained and necessary equipment like toys etc. provided.

12. Canteen : A cooked food canteen on a moderate scale shall be provided for the benefit of workers wherever it is considered necessary.

13. Planning, setting and erection of the above mentioned structures shall be approved by the Engineer-in-charge and the whole of such temporary accommodation shall at all times during the progress of the works be kept tidy and in a clean and sanitary condition as per requirements of the local bodies and to the satisfaction of the Engineer-in-charge and at the Contractor's expense. The Contractor shall conform generally to sanitary requirements of local medical, health and municipal or cantonment authorities and at all time adopt such precautions as may be necessary to prevent soil pollution of the site.

On completion of the Work, the whole of such temporary structures shall be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the whole of site left clean and tidy to the entire satisfaction of the Engineer-in-Charge and at the Contractor's expense.

14. Anti-malarial precautions : The Contractor shall, at his own expense, conform to all anti- malarial instructions given to him by the Engineer-in-Charge, including filling up any burrow pits which may have been dug by him.

15. Enforcement : The Inspecting Officer mentioned in the Contractors' Labour Regulations or any other officer nominated in his behalf by the Engineer-in-charge shall report to the Engineer-in-charge all cases of failure on the part of the Contractor and or his sub- contractors to comply with the provisions of these Rules either wholly or in part and the Engineer-in-charge shall impose such fines and other penalties as are prescribed in the conditions.

16. Interpretations etc : On any question as to the application, interpretation of effect of these Rules, the decision of the Chief Labour Commissioner or Deputy Chief Labour Commissioner (Central) shall be final and binding.

17. Amendments : Government/Corporation may, from time to time, add to or amend these rules and issue such directions as it may consider necessary for the proper implementation of these Rules or for the purpose of removing any difficulty which may arise in the administration thereof.

APPENDIX III

SAFETY PRACTICE DURING CONSTRUCTION
(Refer Clause 10.0.2.0 of GCC)

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ANNEXURE I

# SAFETY PRACTICES DURING CONSTRUCTION

## 1.0 INTRODUCTION

Safety in Construction Management deserves utmost attention especially in the hydrocarbon industry, such as Exploration, Refineries, Pipelines and Marketing installations, Gas Processing units etc. Construction is widely recognized as one of the accident prone activities. Most of the accidents are caused by inadequate planning, failure during the construction process and/or because of design deficiencies. Besides property loss, accidents also result in injuries and fatalities to the personnel; same needs to be prevented.

The reasons for accidents during construction activities are related to unique nature of the industry, human behaviour, difficult work-site conditions, extended odd duty hours, lack of training & awareness and inadequate safety management. Unsafe working methods, equipment failure and improper housekeeping also tend to increase the accident rate in construction.

Ensuring good quality of materials, equipment and competent supervision along with compliance of standard engineering practices shall go a long way to in built safety in the system.

The objective of this standard is to provide practical guidance on technical and educational framework for safety and health in construction with a view to:

(a) prevent accidents and harmful effects on the health of workers arising from employment in construction;

(b) ensure appropriate safety during implementation of construction;

(c) provide safety practice guidelines for appropriate measures of planning, control and enforcement.

## 2.0 SCOPE

This document specifies broad guidelines on safe practices to be adhered to during construction activities in oil industry. However, before commencing any job, specific hazards and its effects should be assessed and necessary corrective/preventive actions should be taken by all concerned. The document is intended only to supplement and not to replace or supersede the prevailing statutory requirements, which shall also be followed as applicable. For Personal Protective Equipment (PPE's), OISD-STD-155 (Part I&II) shall be referred to. The scope of this document does not include the design aspects and quality checks during construction.

## 3.0 DEFINITIONS

Definitions of various terminology are given below:

- Adequate, appropriate or suitable are used to describe qualitatively or quantitatively themeans or method used to protect the worker.
- Brace: A structural member that holds one point in a fixed position with respect to another point; bracing is a system of structural members designed to prevent distortion of a structure.
- By hand: The work is done without the help of a mechanized tool.
- Competent Authority: A statutory agency having the power to issue regulations, orders or other instructions having the force of law.
- Competent person: A person possessing adequate qualifications, such as suitable training and sufficient knowledge, experience and skill for the safe performance of the specific work. The competent authorities may define appropriate criteria for the designation of such persons and may determine the duties to be assigned to them.
- Execution agency:

  Any physical or legal person, having contractual obligation with the owner, and who employs one or more workers on a construction site
- Owner:

  Any physical or legal person for whom construction job is carried out.

  It shall also include owner's designated representative/consultant/nominee/agent, authorized

from time to time to act for and on its behalf, for supervising/ coordinating the activities of the execution agency.

- Hazard: Danger or potential danger.
- Guard-rail: An adequately secured rail erected along an exposed edge to prevent persons from falling.
- Hoist: A machine, which lifts materials or persons by means of a platform, which runs on guides.
- Lifting gear: Any gear or tackle by means of which a load can be attached to a lifting appliance but which does not form an integral part of the appliance or load.
- Lifting appliance: Any stationary or mobile appliance used for raising or lowering persons or loads.
- Means of access or egress: Passageways, corridors, stairs, platforms, ladders and any other means for entering or leaving the workplace or for escaping in case of danger.
- Scaffold: Any fixed, suspended or mobile temporary structure supporting workers and material or to gain access to any such structure and which is not a lifting appliance as defined above.
- Toe-board: A barrier placed along the edge of a scaffold platform, runway, etc., and secured there to guard against the slipping of persons or the falling of material.
- Worker: Any person engaged in construction activity.
- Workplace: All places where workers need to be or to go by reason of their work.

4.0 GENERAL DUTIES

4.1 GENERAL DUTIES OF EXECUTION AGENCIES

4.1.1 Execution agency should:

i) provide means and organization to comply with the safety and health measures required at the workplace.

ii) provide and maintain workplaces, plant, equipment, tools and machinery and organize construction work so that, there is no risk of accident or injury to health of workers. In particular, construction work should be planned, prepared and undertaken so that:

(a) dangers, liable to arise at the workplace, are prevented;

(b) excessively or unnecessarily strenuous work positions and movements are avoided;

(c) organization of work takes into account the safety and health of workers;

(d) materials and products used are suitable from a safety and health point of view;

(e) working methods are adopted to safeguard workers against the harmful effects ofchemical, physical and biological agents.

iii) establish committees with representatives of workers and management or make other arrangement for the participation of workers in ensuring safe working conditions.

iv) arrange for periodic safety inspections by competent persons of all buildings, plant, equipment, tools, machinery, workplaces and review of systems of work, regulations, standards or codes of practice. The competent person should examine and ascertain the safety of construction machinery and equipment.

v) provide such supervision to ensure that workers perform their work with due regard to safety and health of theirs as well as that of others.

vi) Employ only those workers who are qualified, trained and suited by their age, physique, state of health and skill.

vii) satisfy themselves that all workers are informed and instructed in the hazards connected with their work and environment and trained in the precautions necessary to avoid accidents and injury to health.

viii) Ensure that buildings, plant, equipment, tools, machinery or workplaces in which a dangerous defect has been found should not be used until the defect has been rectified.

ix) Organize for and remain always prepared to take immediate steps to stop the operation and evacuate workers as appropriate, where there is an imminent danger to the safety of workers.

x) establish a checking system by which it can be ascertained that all the members of a shift, including operators of mobile equipment, have returned to the camp or base at the close of work on dispersed sites and where small groups of workers operate in isolation.

xi) provide appropriate first aid, training and welfare facilities to workers as per various statutes like the Factories Act, 1948 etc. and, whenever collective measures are not feasible or are insufficient, provide and maintain personal protective equipment and clothing in line with the requirement as per OISD-STD-155 (Vol. I& II) on Personnel Protective Equipment. They should also provide access to workers to occupational health services.

xii) Educate workers about their right and the duty at any workplace to participate in ensuring safe working conditions to the extent of their control over the equipment and methods of work and to express views on working procedures adopted as may affect safety and health.

xiii) Ensure that except in an emergency, workers, unless duly authorized, should not interfere with, remove, alter or displace any safety device or other appliance furnished for their protection or the protection of others, or interfere with any method or process adopted with a view to avoiding accidents and injury to health.

xiv) Ensure that workers do not operate or interfere with plant and equipment that they have not been duly authorized to operate, maintain or use.

xv) Ensure that workers do not sleep, rest or cook etc in dangerous places such as scaffolds, railway tracks, garages, confined spaces or in the vicinity of fires, dangerous or toxic substances, running machines or vehicles and heavy equipment etc.

xvii) Obtain the necessary clearance/permits as required and specified by owner

xviii) As per the Govt. circular as amended from time to time all contractors who employ more than 50 workers or where the contract value exceeds Rs. 50 crores, the following facilities are to be provided by contractor at site :

- Arrangement for drinking water
- Toilet facilities
- A creche where 10 or more women workers are having children below the age of 6 years
- Transport arrangement for attending to emergencies

xix) should deploy a safety officer at site

4.2 GENERAL DUTIES OF OWNERS

4.2.1 Owners should:

i) co-ordinate or nominate a competent person to co-ordinate all activities relating to safety and health on their construction projects;

ii) inform all contractors on the project of special risks to health and safety;

iii) Ensure that executing agency is aware of the owner's requirements and the executing agency's responsibilities with respect to safety practices before starting the job.

5.0 SAFETY PRACTICES AT WORK PLACES

5.1. GENERAL PROVISIONS

5.1.1 All openings and other areas likely to pose danger to workers should be clearly indicated.

5.1.2 Workers & Supervisors should use the safety helmet and other requisite Personal Protective Equipment according to job & site requirement. They should be trained to use personal protective equipment.

5.1.3 Never use solvents, alkalis and other oils to clean the skin.

5.1.4 Lift the load with back straight and knees bent as far as possible. Seek the help in case of heavy load.

5.1.5 Ensure the usage of correct and tested tools and tackles. Don't allow the make shift tools and tackles.

5.1.6 No loose clothing should be allowed while working near rotating equipment or working at heights.

5.2 MEANS OF ACCESS AND EGRESS

Adequate and safe means of access (at least two, differently located) to and egress from all workplaces should be provided. Same should be displayed and maintained.

5.3 HOUSEKEEPING

5.3.1 Ensure:

i) proper storage of materials and equipment;

ii) removal of scrap, inflammable material, waste and debris at appropriate intervals.

5.3.2 Removal of loose materials, which are not required for use, to be ensured. Accumulation of these at the site can obstruct means of access to and egress from workplaces and passageways.

5.3.3 Workplaces and passageways, that are slippery owing to oil, grease or other causes, should be cleaned up or strewn with sand, sawdust, ash etc.

5.4 PRECAUTIONS AGAINST THE FALL OF MATERIALS & PERSONS AND COLLAPSE OF STRUCTURES

5.4.1 Precautions should be taken such as the provision of fencing, look-out men or barriers to protect any person against injury by the fall of materials, or tools or equipment being raised or lowered.

5.4.2 Where necessary to prevent danger, guys, stays or supports should be used or other effective precautions should be taken to prevent the collapse of structures or parts of structures that are being erected, maintained, repaired, dismantled or demolished.

5.4.3 All openings through which workers are liable to fall should be kept effectively covered or fenced and displayed prominently.

5.4.4 As far as practicable, guardrails and toe-boards should be provided to protect workers from falling from elevated workplaces.

5.5 PREVENTION OF UNAUTHORISED ENTRY

5.5.1 Construction sites located in built-up areas and alongside vehicular and pedestrian traffic routes should be fenced to prevent the entry of unauthorized persons.

5.5.2 Visitors should not be allowed access to construction sites unless accompanied by or authorized by a competent person and provided with the appropriate protective equipment.

5.6 FIRE PREVENTION AND FIRE FIGHTING

5.6.1 All necessary measures should be taken by the executing agency and owner to:

i) avoid the risk of fire;

ii) control quickly and efficiently any outbreak of fire;

iii) bring out a quick and safe evacuation of persons.

iv) Inform unit/fire station control room, where construction work is carried out within existing operating area.

5.6.2 Combustible materials such as packing materials, sawdust, greasy/oily waste and scrap wood or plastics should not be allowed to accumulate in workplaces but should be kept in closed metal containers in a safe place.

5.6.3 Places where workers are employed should, if necessary to prevent the danger of fire, be provided with:

i) suitable and sufficient fire-extinguishing equipment, which should be easily visible and accessible;

ii) an adequate water supply at sufficient pressure meeting the requirements of various OISD standards.

5.6.4 To guard against danger at places having combustible material, workers should be trained in the action to be taken in the event of fire, including the use of means of escape.

5.6.5 At sites having combustible material, suitable visual signs should be provided to indicate clearly the direction of escape in case of fire.

5.6.6 Means of escape should be kept clear at all times. Escape routes should be frequently inspected particularly in high structures and where access is restricted.

5.7 LIGHTING

5.7.1 Where natural lighting is not adequate, working light fittings or portable hand-lamps should be provided at workplace on the construction site where a worker will do a job.

5.7.2 Emergency lighting should be provided for personnel safety during night time to facilitate standby lighting source, if normal system fails.

5.7.2 Artificial lighting should not produce glare or disturbing shadows.

5.7.3 Lamps should be protected by guards against accidental breakage.

5.7.4 The cables of portable electrical lighting equipment should be of adequate size & characteristics for the power requirements and of adequate mechanical strength to withstand severe conditions in construction operations.

5.8 PLANT, MACHINERY, EQUIPMENT AND HAND TOOLS

5.8.1 General Provisions

i) Plant, machinery and equipment including hand tools, both manual and power driven, should:

a) be of proper design and construction, taking into account health, Safety and ergonomic principles.

b) be maintained in good working order;

c) be used only for work for which they have been designed.

d) be operated only by workers who have been authorized and given appropriate trainingbe provided with protective guards, shields or other devices as required.

ii) Adequate instructions for safe use should be provided.

iii) Safe operating procedures should be established and used for all plant, machinery and equipment.

iv) Operators of plant, machinery and equipment should not be distracted while work is inprogress.

v) Plant, machinery and equipment should be switched off when not in use and isolated before any adjustment, clearing or maintenance is done.

vi) Where trailing cables or hose pipes are used they should be kept as short as practicable and not allowed to create a hazard.

vii) All moving parts of machinery and equipment should be enclosed or adequately guarded.

viii) Every power-driven machine and equipment should be provided with adequate means, immediately accessible and readily identifiable to the operator, of stopping it quickly and preventing it from being started again inadvertently.

ix) Operators of plant, machinery, equipment and tools should be provided with PPEs, including where necessary, suitable ear protection.

5.8.2 Hand tools

i) Hand tools should be repaired by competent persons.

ii) Heads of hammers and other shock tools should be dressed or ground to a suitable radius on the edge as soon as they begin to mushroom or crack.

iii) When not in use and while being carried or transported sharp tools should be kept in sheaths, shields, chests or other suitable containers.

iv) Only insulated or non-conducting tools should be used on or near live electrical installations.

v) Only non-sparking tools should be used near or in the presence of flammable or explosive dusts or vapours.

5.8.3 Pneumatic Tools

i) Operating triggers on portable pneumatic tools should be:

a) so placed as to minimize the risk of accidental starting of the machine.

b) so arranged as to close the air inlet valve automatically when the pressure of the operator's hand is removed.

ii) Hose and hose connections for compressed air supply to portable pneumatic tools should be:

a) designed and tested for the pressure and service for which they are intended;

b) fastened securely on the pipe outlet and equipped with the safety chain, as appropriate.

iii) Pneumatic shock tools should be equipped with safety clips or retainers to prevent dies andtools from being accidentally expelled from the barrel.

iv) Pneumatic tools should be disconnected from power and the pressure in hose lines released before any adjustment or repair is made.

5.8.4 Electrical Tools

i) Low voltage portable electrical tools should generally be used.

ii) All electrical tools should be earthed, unless they are "all insulated" or "double insulated" tools which do not require earthing.

iii) All electrical tools should get inspected and maintained on a regular basis by a competent electrician and complete records kept.

5.8.5 Engines

i) Engines should:

a) be installed so that they can be started safely and the maximum safe speed cannot be exceeded.

b) have controls for limiting speed.

c) have devices to stop them from a safe place in an emergency.

ii) IC engines should not be run in confined spaces unless adequate exhaust ventilation is provided.

iii) When IC engines are being fuelled:

a) the engine should be shut off.

b) care should be taken to avoid spilling fuel;

c) no person should smoke or have an naked light in the vicinity.

d) a fire extinguisher should be kept readily available.

iv) Secondary fuel reservoir should be placed outside the engine room.

6.0 CONSTRUCTION ACTIVITIES

The various common activities in construction are as under:

· Excavation

- Scaffolding, Platforms & Ladders
- Structural Work, Laying of Reinforcement & Concreting
- Road Work (Laying of roads)
- Cutting /Welding
- Working in Confined Space
- Proof/Pressure Testing
- Working at Heights
- Handling & Lifting Equipments
- Vehicle Movement
- Electrical
- Offshore
- Demolition
- Radiography
- Sand/shot blasting/ spray painting
- Work above water

The safe practices to be followed during the implementation of above construction activities are given below:

6.1 EXCAVATION

6.1.1 All excavation work should be planned and the method of excavation and the type of support work required should be decided considering the following:

i) the stability of the ground;

ii) the excavation will not affect adjoining buildings, structures or roadways;

iii) to prevent hazard, the gas, water, electrical and other public utilities should be shut off or disconnected, if necessary;

iv) presence of underground pipes, cable conductors, etc.,

v) the position of culvert/bridges, temporary roads and spoil heaps should be determined;

6.1.2 Before digging begins on site, all excavation work should be planned and the method ofexcavation and the type of support work required decided.

6.1.3 All excavation work should be supervised.

6.1.4 Sites of excavations should be thoroughly inspected:

i) daily, prior to each shift and after interruption in work of more than one day;

ii) after every blasting operation;

iii) after an unexpected fall of ground;

iv) after substantial damage to supports;

v) after a heavy rain, frost or snow;

vi) when boulder formations are encountered.

6.1.5 Safe angle of repose while excavating trenches exceeding 1.5m depth up to 3.0m should be

maintained. Based on site conditions, provide proper slope, usually 45°,and suitable bench of 0.5m width at every 1.5m depth of excavation in all soils except hard rock or provide proper shoring and strutting to prevent cave-in or slides.

6.1.6 As far as possible, excavated earth should not be placed within one meter of the edge of the trench or depth of trench whichever is greater.

6.1.7 Don't allow vehicles to operate too close to excavated area. Maintain at least 2m distance from edge of excavation. No load, plant or equipment should be placed or moved near the edge of any excavation where it is likely to cause its collapse and thereby endanger any person unless precautions such as the provision of shoring or piling are taken to prevent the sides from collapsing.

6.1.8 Adequately anchored stop blocks and barriers should be provided to prevent vehicles being driven into the excavation. Heavy vehicles should not be allowed near the excavation unless the support work has been specially designed to permit it.

6.1.9 If an excavation is likely to affect the security of a structure on which persons are working, precautions should be taken to protect the structure from collapse.

6.1.10 Barricade at 1m height (with red & white band/self glowing caution board) should be provided for excavations beyond 1.5m depth. Provide two entries/exits for such excavation.

6.1.11 Necessary precautions should be taken for underground utility lines like cables, sewers etc. and necessary approvals/clearances from the concerned authorities shall be obtained before commencement of the excavation job.

6.1.12 Water shall be pumped/bailed out, if any accumulates in the trench. Necessary precautions should be taken to prevent entry of surface water in trenches.

6.1.13 During rains, the soil becomes loose. Take additional precaution against collapse of side wall.

6.1.14 In hazardous areas, air should be tested to ascertain its quality. No one should be allowed entry till it is suitable for breathing.

6.1.15 In case of mechanized excavation, precaution shall be taken to not to allow anybody to come within one meter of extreme reach of the mechanical shovel. The mechanized excavator shall be operated by a well-trained experienced operator. When not in operation, the machine shall be kept on firm leveled ground with mechanical shovel resting on ground. Wheel or belt shall be suitably jammed to prevent any accidental movement of the machine. Suitable precautions as per manufacturer guidelines should be taken for dozers, graders and other heavy machines.

6.1.16 In case of blasting, follow strictly IS:4081-1986 & Indian Explosive Act and rules for storage, handling and carrying of explosive materials and execution of blasting operation.

## 6.2 SCAFFOLDING, PLATFORMS & LADDERS

6.2.1 Metal as material of construction

i) A scaffold should be provided and maintained or other equally safe and suitable provision should be made where work cannot safely be done on or from the ground or from part of a building or other permanent structure.

ii) Scaffolds should be provided with safe means of access, such as stairs, ladders or ramps. Ladders should be secured against inadvertent movement.

iii) Every scaffold should be constructed, erected and maintained so as to prevent collapse or accidental displacement when in use.

iv) Every scaffold and part thereof should be constructed :

(a) in such a way so as not to cause hazards for workers during erection and dismantling;

(b) in such a way so as guard rails and other protective devices, platforms, ladders, stairsor ramps can be easily put together;

(c) with sound material and of requisite size and strength for the purpose for which it is tobe used and maintained in a proper condition.

v) Boards and planks used for scaffolds should be protected against splitting.

vi) Materials used in the construction of scaffolds should be stored under good conditions and apart from any material unsuitable for scaffolds.

vii) Couplers should not cause deformation in tubes. Couplers should be made of drop forged steel or equivalent material.
viii) Tubes should be free from cracks, splits and excessive corrosion and be straight to the eye, and tube ends cut cleanly square with the tube axis.
ix) Scaffolds should be designed for their maximum load as per relevant code.

x) Scaffolds should be adequately braced.

xi) Scaffolds which are not designed to be independent should be rigidly connected to the building at designated vertical and horizontal places.
xii) A scaffold should never extend above the highest anchorage to an extent which might endanger its stability and strength.
xiii) Loose bricks, drainpipes, chimney-pots or other unsuitable material should not be used for the construction or support of any part of a scaffold.
xiv) Scaffolds should be inspected and certified:
(a) before being taken into use;
(b) at periodic intervals thereafter as prescribed for different types of scaffolds;
(c) after any alteration, interruption in use, exposure to weather or seismic conditions or any other occurrence likely to have affected their strength or stability.

xv) Inspection should more particularly ascertain that:
(a) the scaffold is of suitable type and adequate for the job;
(b) materials used in its construction are sound and of sufficient strength;
(c) it is of sound construction and stable;
(d) that the required safeguards are in position.

xvi) A scaffold should not be erected, substantially altered or dismantled except by or under the supervision.
xvii) Every scaffold should be maintained in good and proper condition, and every part should be kept fixed or secured so that no part can be displaced in consequence of normal use.
xviii) If out-rigger scaffolding is to be used, it should be specifically designed and inspected before putting in use.

6.2.2 Lifting appliances on scaffolds

i) When a lifting appliance is to be used on a scaffold:
(a) the parts of the scaffold should be carefully inspected to determine the additional strengthening and other safety measures required;
(b) any movement of the scaffold members should be prevented;
(c) if practicable, the uprights should be rigidly connected to a solid part of the building at the place where the lifting appliance is erected.

6.2.3 Prefabricated scaffolds

i) In the case of prefabricated scaffold systems, the instructions provided by the manufacturers or suppliers should be strictly adhered to. Prefabricated scaffolds should have adequate arrangements for fixing bracing.
ii) Frames of different types should not be intermingled in a single scaffold.

iii) Scaffolding shall be erected on firm and level ground.

iv) All members of metal scaffolding shall be checked periodically to screen out defective / rusted members. All joints should be properly lubricated for easy tightening.
v) Entry to scaffolding should be restricted.

vi) Erection, alteration and removal shall be done under supervision of experienced personnel.

vii) Use of barrels, boxes, loose bricks etc., for supporting platform shall not be permitted.

viii) Each supporting member of platform shall be securely fastened and braced

ix) Where planks are butt-joined, two parallel putlogs shall be used, not more than 100mm apart, to give support to each plank.
x) Platform plank shall not project beyond its end support to a distance exceeding 4 times the thickness of plank, unless it is effectively secured to prevent tipping. Cantilever planks should be avoided.

xi) The platform edges shall be provided with 150mm high toe board to eliminate hazards of tools or other objects falling from platform.

xii) Erect ladders in the "four up-one out position"

xiii) Lash ladder securely with the structure.

xiv) Using non-slip devices, such as, rubber shoes or pointed steel ferules at the ladder foot, rubber wheels at ladder top, fixing wooden battens, cleats etc.

xv) When ladder is used for climbing over a platform, the ladder must be of sufficient length, to extend at least one meter above the platform, when erected against the platform in "four up- one out position."

xvi) Portable ladders shall be used for heights not more than 4mt. Above 4mt flights, fixed ladders shall be provided with at least 600 mm landings at every 6mt or less.

xvii) The width of ladder shall not be less than 300mm and rungs shall be spaced not more than 300mm.

xviii) Every platform and means of access shall be kept free from obstruction.

xix) If grease, mud, gravel, mortar etc., fall on platform or scaffolds, these shall be removed immediately to avoid slippage.

xx) Workers shall not be allowed to work on scaffolds during storms or high wind. After heavyrain or storms, scaffolds shall be inspected before reuse.

xxi) Don't overload the scaffolding. Remove excess material and scrap immediately.

xxii) Dismantling of scaffolds shall be done in a pre-planned sequential manner.

6.2.4 Suspended scaffolds/boatwain's chair

i) In addition to the requirements for scaffolds in general as regards soundness, stability and protection against the risk of falls, suspended scaffolds should meet the following specific requirements.

(a) platforms should be designed and built with dimensions that are compatible with the stability of the structure as a whole, especially the length;

(b) the number or anchorage should be compatible with the dimensions of the platform;

(c) the safety of workers should be safeguarded by an extra rope having a point of attachment independent of the anchorage arrangements of the scaffold;

(d) the anchorage and other elements of support of the scaffold should be designed and built in such a way as to ensure sufficient strength;

(e) the ropes, winches, pulleys or pulley blocks should be designed, assembled, used and maintained according to the requirements established for lifting gear adapted to the lifting of persons according to national laws and regulations;

(f) Before use, the whole structure should be checked by a competent person.

6.2.5 Bamboo Scaffolding

i) In general, it should be avoided as far as possible. It should not be used in the unit/off-site areas and where hot work is to be done.

ii) For construction and maintenance of residential and office buildings, situated outside explosive licensed area, bamboo scaffold, if used, should conform to provisions given in IS- 3696 (Part 1)-1987.

6.3 STRUCTURAL WORK, LAYING OF REINFORCEMENT & CONCRETING

6.3.1 General provisions

i) The erection or dismantling of buildings, structures, civil engineering works, formwork, falsework and shoring should be carried out by trained workers only under the supervision of a competent person.

ii) Precautions should be taken to guard against danger to workers arising from any temporary state of weakness or instability of a structure.

iii) Formwork, falsework and shoring should be so designed, constructed and maintained that it will safely support all loads that may be imposed on it.

iv) Formwork should be so designed and erected that working platforms, means of access, bracing and means of handling and stabilizing are easily fixed to the formwork structure.

6.3.2 Erection and dismantling of steel and prefabricated structures

i) The safety of workers employed on the erection and dismantling of steel and prefabricated structures should be ensured by appropriate means, such as provision and use of:

- ladders, gangways or fixed platforms;
- platforms, buckets, boatswain's chairs or other appropriate means suspended from lifting appliances;
- safety harnesses and lifelines, catch nets or catch platforms;
- Power-operated mobile working platforms.

ii) Steel and prefabricated structures should be so designed and made that they can be safely transported and erected.

iii) In addition to the need for the stability of the part when erected, the design should explicitly take following into account:

- the conditions and methods of attachment in the operations of transport, storing and temporary support during erection or dismantling as applicable;
- Methods for the provision of safeguards such as railings and working platforms, and, when necessary, for mounting them easily on the structural steel or prefabricated parts.

iv) The hooks and other devices built in or provided on the structural steel or prefabricated parts that are required for lifting and transporting them should be so shaped, dimensioned and positioned as:

- to withstand with a sufficient margin the stresses to which they are subjected;
- Not to set up stresses in the part that could cause failures, or stresses in the structure itself not provided for in the plans, and be designed to permit easy release from the lifting appliance. Lifting points for floor and staircase units should be located (recessed if necessary) so that they do not protrude above the surface;
- To avoid imbalance or distortion of the lifted load.

v) Store places should be so constructed that:

- there is no risk of structural steel or prefabricated parts falling or overturning;
- storage conditions generally ensure stability and avoid damage having regard to the method of storage and atmospheric conditions;
- racks are set on firm ground and designed so that units cannot move accidentally.

vi) While they are being stored, transported, raised or set down, structural steel or prefabricated parts should not be subjected to stresses prejudicial to their stability.

vii) Every lifting appliance should:

- be suitable for the operations and not be capable of accidental disconnection;
- be approved or tested as per statutory requirement.

viii) Lifting hooks should be of the self-closing type or of a safety type and should have the maximum permissible load marked on them.

ix) Tongs, clamps and other appliances for lifting structural steel and prefabricated parts should:

- be of such shape and dimensions as to ensure a secure grip without damaging the part;
- be marked with the maximum permissible load in the most unfavourable lifting conditions.

x) Structural steel or prefabricated parts should be lifted by methods or appliances that prevent them from spinning accidentally.

xi) When necessary to prevent danger, before they are raised from the ground, structural steel or prefabricated parts should be provided with safety devices such as railings and working platforms to prevent falls of persons.

xii) While structural steel or prefabricated parts are being erected, the workers should be provided with appliances for guiding them as they are being lifted and set down, so as to avoid crushing

of hands and to facilitate the operations. Use of such appliances should be ensured.

xiii) A raised structural steel or prefabricated part should be so secured and wall units so propped that their stability cannot be imperiled, even by external agencies such as wind and passing loads before its release from the lifting appliance.

xiv) At work places, instruction should be given to the workers on the methods, arrangements and means required for the storage, transport, lifting and erection of structural steel or prefabricated parts, and, before erection starts, a meeting of all those responsible should be held to discuss and confirm the requirements for safe erection.

xv) During transportation within the construction area, attachments such as slings and stirrups mounted on structural steel or prefabricated parts should be securely fastened to the parts.

xvi) Structural steel or prefabricated parts should be so transported that the conditions do not affect the stability of the parts or the means of transport result in jolting, vibration or stresses due to blows, or loads of material or persons.

xvii) When the method of erection does not permit the provision of other means of protection against fall of persons, the workplaces should be protected by guardrails, and if appropriate by toe-boards.

xviii) When adverse weather conditions such as snow, ice and wind or reduced visibility entail risks of accidents, the work should be carried on with particular care, or, if necessary, interrupted.

xix) Structures should not be worked on during violent storms or high winds, or when they are covered with ice or snow, or are slippery from other causes.

xx) If necessary, to prevent danger, structural steel parts should be equipped with attachments for suspended scaffolds, lifelines or safety harnesses and other means of protection.

xxi) The risks of falling, to which workers moving on high or sloping girders are exposed, should be limited by all means of adequate collective protection or, where this is impossible, by the use of a safety harness that is well secured to a strong support.

xxii) Structural steel parts that are to be erected at a great height should as far as practicable be assembled on the ground.

xxiii) When structural steel or prefabricated parts are being erected, a sufficiently extended area underneath the workplace should be barricaded or guarded

xxiv) Steel trusses that are being erected should be adequately shored, braced or guyed until they are permanently secured in position.

xxv) Load-bearing structural member should not be dangerously weakened by cutting, holing or other means.

xxvi) Structural members should not be forced into place by the hoisting machine while any worker is in such a position that he could be injured by the operation.

xxvii) Open-web steel joists that are hoisted singly should be directly placed in position and secured against dislodgment.

6.3.3 Reinforcement

i) Ensure that workers use Personnel Protective equipment like safety helmet, safety shoes, gloves etc.

ii) Don't place the hand below the rods for checking clear distance. Use measuring devices.

iii) Don't wear loose clothes while checking the rods.

iv) Don't stand unnecessarily on cantilever rods.

v) To carry out welding/cutting of rods, safety procedures/precautions as mentioned in Item No. 6.5 to be followed.

vi) For supplying of rods at heights, proper staging and/or bundling to be provided.

vii) Ensure barricading and staging for supplying and fixing of rods at height.

viii) For short distance carrying of materials on shoulders, suitable pads to be provided.

ix) While transporting material by trucks/trailers, the rods shall not protrude in front of or by the sides of driver's cabin. In case such protrusion cannot be avoided behind the deck, then it should not extend 1/3rd of deck length or 1.5M whichever is less and tied with red flags/lights.

6.3.4 Concreting

i) Ensure stability of shuttering work before allowing concreting.
ii) Barricade the concreting area while pouring at height/depths.
iii) Keep vibrator hoses, pumping concrete accessories in healthy conditions and mechanically locked.
iv) Pipelines in concrete pumping system shall not be attached to temporary structures such as scaffolds and formwork support as the forces and movements may affect their integrity.
v) Check safety cages & guards around moving motors/parts etc. provided in concreting mixers.
vi) Use Personal Protective Equipment like gloves, safety shoes etc. while dealing with concrete and wear respirators for dealing with cement.
vii) Earthing of electrical mixers, vibrators, etc. should be done and verified.
viii) Cleaning of rotating drums of concrete mixers shall be done from outside. Lockout devices shall be provided where workers need to enter.
ix) Where concrete mixers are driven by internal combustion engine, exhaust points shall be located away from the worker's workstation so as to eliminate their exposure to obnoxious fumes.
x) Don't allow unauthorized person to stand under the concreting area.
xi) Ensure adequate lighting arrangements for carrying out concrete work during night.
xii) Don't allow the same workers to pour concrete round the clock. Insist on shift pattern.
xiii) During pouring, shuttering and its supports should be continuously watched for defects.

6.4 ROAD WORK

6.4.1 Site shall be barricaded and provided with warning signs, including night warning lamps at appropriate locations for traffic diversion.
6.4.2 Filled and empty bitumen drums shall be stacked separately at designated places.
6.4.3 Mixing aggregate with bitumen shall preferably be done with the help of bitumen batch mixing plant, unless operationally non-feasible.
6.4.4 Road rollers, Bitumen sprayers, Pavement finishers shall be driven by experienced drivers with valid driving license.
6.4.5 Workers handling hot bitumen sprayers or spreading bitumen aggregate mix or mixing bitumen with aggregate, shall be provided with PVC hand gloves and rubber shoes with legging up to knee joints.
6.4.6 At the end of day's work, surplus hot bitumen in tar boiler shall be properly covered by a metal sheet, to prevent anything falling in it,
6.4.7 If bitumen accidentally falls on ground, it shall be immediately covered by sprinkling sand, to prevent anybody stepping on it. Then it shall be removed with the help of spade.
6.4.8 For cement concrete roads, besides site barricading and installation of warning signs for traffic diversion, safe practices mentioned in the chapter on "Concreting", shall also be applicable.

6.5 CUTTING/WELDING

6.5.1 Common hazards involved in welding/cutting are sparks, molten metal, flying particles, harmful light rays, electric shocks etc. Following precautions should be taken: -

i) A dry chemical type fire extinguisher shall be made available in the work area.

ii) Adequate ventilation shall be ensured by opening manholes and fixing a shield or forced circulation of air etc, while doing a job in confined space.

iii) Ensure that only approved and well-maintained apparatus, such as torches, manifolds, regulators or pressure reducing valves, and acetylene generators, be used.

iv) All covers and panels shall be kept in place, when operating an electric Arc welding machine.

v) The work piece should be connected directly to Power supply, and not indirectly through pipelines/structures/equipments etc.

vi) The welding receptacles shall be rated for 63 A suitable for 415V, 3-Phase system with a scraping earth. Receptacles shall have necessary mechanical interlocks and earthing facilities.

vii) All cables, including welding and ground cables, shall be checked for any worn out or cracked insulation before starting the job. Ground cable should be separate without any loose joints.

viii) Cable coiling shall be maintained at minimum level, if not avoidable.

ix) An energized electrode shall not be left unattended.

x) The power source shall be turned off at the end of job.

xi) All gas cylinders shall be properly secured in upright position.

xii) Acetylene cylinder shall be turned and kept in such a way that the valve outlet points away from oxygen cylinder.

xiii) Acetylene cylinder key for opening valve shall be kept on valve stem, while cylinder is in use, so that the acetylene cylinder could be quickly turned off in case of emergency. Use flash back arrestors to prevent back-fire in acetylene/oxygen cylinder.

xiv) When not in use, valves of all cylinders shall be kept closed.

xv) All types of cylinders, whether full or empty, shall be stored at cool, dry place under shed.

xvi) Forced opening of any cylinder valve should not be attempted. xvii)Lighted gas torch shall never be left unattended.

xvii) Store acetylene and oxygen cylinders separately.

xviii) Store full and empty cylinders separately.

xix) Avoid cylinders coming into contact with heat.

xx) Cylinders that are heavy or difficult to carry by hand may be rolled on their bottom edge but never dragged.

xxi) If cylinders have to be moved, be sure that the cylinder valves are shut off.

xxii) Before changing torches, shut off the gas at the pressure reducing regulators and not by crimping the hose.

xxiii) Do not use matches to light torches, use a friction lighter.

xxiv) Move out any leaking cylinder immediately.

xxv) Use trolleys for oxygen & acetylene cylinder and chain them.

xxvi) Always use Red hose for acetylene and other fuel gases and Black for oxygen, and ensure that both are in equal length.

xxvii) Ensure that hoses are free from burns, cuts and cracks and properly clamped.

xxviii) Avoid dragging hoses over sharp edges and objects

xxix) Do not wrap hoses around cylinders when in use or stored.

xxx) Protect hoses from flying sparks, hot slag, and other hot objects.

xxxi) Lubricants shall not be used on Ox-fuel gas equipment.

xxxii) During cutting/welding, use proper type goggles/face shields.

## 6.6 WORKING IN CONFINED SPACES

6.6.1 Following safety practices for working in confined space like towers, columns, tanks and other vessels should be followed in addition to the safety guidelines for specific jobs like scaffolding, cutting/welding etc.

i) Shut down, isolate, depressurize and purge the vessel as per laid down procedures.

ii) Entry inside the vessel and to carry out any job should be done after issuance of valid permit only in line with the requirement of OISD-STD-105.

iii) Ensure proper and accessible means of exit before entry inside a confined space.

iv) The number of persons allowed inside the vessel should be limited to avoid overcrowding.

v) When the work is going on in the confined space, there should always be one man standby at the nearby man way.

vi) Before entering inside the vessels underground or located at lower elevation, probability of dense vapours accumulating nearby should also be considered in addition to inside the vessel.

vii) Ensure requisite O2 level before entry in the confined space and monitor level periodically or other wise use respiratory devices.

viii) Check for no Hydrocarbon or toxic substances before entry and monitor level periodically or use requisite Personal Protective Equipment.

ix) Ensure adequate ventilation or use respiratory devices.

x) Depending upon need, necessary respirator system, gas masks and suit shall be worn by everyone entering confined space. In case of sewer, OWS or in the confined area where there is a possibility of toxic or inert gas, gas masks shall be used by everyone while entering.

xi) Barricade the confined spaces during hoisting, radiography, blasting, pressure testing etc.

xii) Use 24V flameproof lamp fittings only for illumination.

xiii) Use tools with air motors or electric tools with maximum voltage of 24V.

xiv) House keeping shall be well maintained.

xv) Safety helmet, safety shoes and safety belt shall be worn by everyone entering the confined space.

xvi) Don't wear loose clothing while working in a confined space.

xvii) In case of the vessels which are likely to contain pyropheric substances (like Iron Sulphide), special care need to be taken before opening the vessel. Attempt should be made to remove the pyropheric substances. Otherwise, these should be always kept wet by suitable means.

xviii) The cutting torches should also be kept outside the vessel immediately after the cutting.

xix) The gas cylinders used for cutting/welding shall be kept outside.

xx) All cables, hoses, welding equipment etc., shall be removed from confined space at end of each work day, even if the work is to be resumed in the same space the next day.

xxi) To the extent possible sludge shall be cleared and removed from outside before entering.

xxii) No naked light or flame or hot work such as welding, cutting and soldering should be permitted inside a confined space or area unless it has been made completely free of the flammable atmosphere, tested and found safe by a competent person. Only non-sparking tools and flameproof hand lamps protected with guard and safety torches should be used inside such confined space or area for initial inspection, cleaning or other work required to be done for making the area safe.

xxiii) Communication should be always maintained between the worker and the attendant.

6.7 PROOF/PRESSURE TESTING

6.7.1 Review test procedure before allowing testing with water or air or any other fluid.

6.7.2 Provide relief valves of adequate size while testing with air or other gases.

6.7.3 Ensure compliance of necessary precautions, step wise loading, tightening of fasteners, grouting etc. before and during testing.

6.7.4 Inform all concerned in advance of the testing.

6.7.5 Keep the vents open before opening any valve for filling/draining of liquid used for hydrotesting. The filling/draining should not exceed the designed rate for pressure testing.

6.7.6 Provide separate gauges of suitable range for pressurizing pump and the equipment to be tested.

6.7.7 Provide gauges at designated locations for monitoring of pressures.

6.7.8 Check the calibration of all pressurizing equipment and accessories and maintain records.

6.7.9 Take readings at pre-defined intervals.

6.8 WORKING AT HEIGHTS

6.8.1 General Provision

i) While working at a height of more than 3 meters, ISI approved safety belt shall be used.

ii) While working at a height of more than 3 meters, permit should be issued by competent person before commencement of the job.

iii) Worker should be well trained on usage of safety belt including its proper usage at the time of ascending/descending.

iv) All tools should be carried in tool kits to avoid their falling.

v) If the job is on fragile/sloping roof, roof walk ladders shall be used.

vi) Provide lifeline wherever required.

vii) Additional safety measures like providing Fall Arrestor type Safety belt, safety net should be provided depending upon site conditions, job requirements.

viii) Keep working area neat and clean. Remove scrap material immediately.

ix) Don't throw or drop material/equipment from height.

x) Avoid jumping from one member to another. Use proper passageway.

xi) Keep both hands free while climbing. Don't try to bypass the steps of the ladder.

xii) Try to maintain calm at height. Avoid over exertion.

xiii) Avoid movements on beam.

xiv) Elevated workplaces including roofs should be provided with safe means of access and egress such as stairs, ramps or ladders.

6.8.2 Roof Work

i) All roof-work operations should be pre-planned and properly supervised.

ii) Roof work should only be undertaken by workers who are physically and psychologically fit and have the necessary knowledge and experience for such work.

iii) Work on roofs shouldn't be carried on in weather conditions that threaten the safety ofworkers.

iv) Crawling boards, walkways and roof ladders should be securely fastened to a firm structure.

v) Roofing brackets should fit the slope of the roof and be securely supported.

vi) Where it is necessary for a person to kneel or crouch near the edge of the roof, necessary precautions should be taken.

vii) On a large roof where work have to be carried out at or near the edge, a simple barrierconsisting of crossed scaffold tubes supporting a tubing guardrail may be provided.

viii) All covers for openings in roofs should be of substantial construction and be secured in position.

ix) Roofs with a pitch of more than 10 should be treated as sloping.

x) When work is being carried out on sloping roofs, sufficient and suitable crawling boards or roof ladders should be provided and firmly secured in position.

xi) During extensive work on the roof, strong barriers or guardrails and toe-boards should be

provided to stop a person from falling off the roof.

xii) Where workers are required to work on or near roofs or other places covered with fragile material, through which they are liable to fall, they should be provided with suitable roof ladders or crawling boards strong enough and when spanning across the supports for the roof covering to support those workers.

xiii) A minimum of two boards should be provided so that it is not necessary for a person to stand on a fragile roof to move a board or a ladder, or for any other reason.

6.8.3 Work on tall chimneys

i) For the erection and repair of tall chimneys, scaffolding should be provided. A safety net should be maintained at a suitable distance below the scaffold.

ii) The scaffold floor should always be at least 65 cm below the top of the chimney.

iii) Under the working floor of the scaffolding the next lower floor should be left in position as a catch platform.

iv) The distance between the inside edge of the scaffold and the wall of the chimney should not exceed 20 cm at any point.

v) Catch platforms should be erected over:
   (a) the entrance to the chimney;
   (b) Passageways and working places where workers could be endangered by fallingobjects.

vi) For climbing tall chimneys, access should be provided by:
   (a) stairs or ladders;
   (b) a column of iron rungs securely embedded in the chimney wall;
   (c) Other appropriate means.

vii) When workers use the outside rungs to climb the chimney, a securely fastened steel core rope looped at the free end and hanging down at least 3 m should be provided at the top to help the workers to climb on to the chimney.

viii) While work is being done on independent chimneys the area surrounding the chimney should be enclosed by fencing at a safe distance.

ix) Workers employed on the construction, alteration, maintenance or repair of tall chimneys should not:
   a) work on the outside without a safety harness attached by a lifeline to a rung, ring or other secure anchorage;
   b) put tools between the safety harness and the body or in pockets not intended for the purpose;
   c) haul heavy materials or equipment up and down by hand to or from the workplace on the chimney;
   d) fasten pulleys or scaffolding to reinforcing rings without first verifying their stability;
   e) work alone;
   f) climb a chimney that is not provided with securely anchored ladders or rungs;
   g) Work on chimneys in use unless the necessary precautions to avoid danger fromsmoke and gases have been taken.

x) Work on independent chimneys should not be carried on in high winds, icy conditions, fog or during electrical storms.

6.9 HANDLING AND LIFTING EQUIPMENT:

6.9.1 General Provisions

Following are the general guidelines to be followed with regard to all types of handling and lifting equipment in addition to the guidelines for specific type of equipments dealt later on.

i) There should be a well-planned safety programmed to ensure that all the lifting appliances and lifting gear are selected, installed, examined, tested, maintained, operated and dismantled with a view to preventing the occurrence of any accident;

ii) All lifting appliances shall be examined by competent persons at frequencies as specified in "The Factories act".

iii) Check thoroughly quality, size and condition of all lifting tools like chain pulley blocks, slings, U-clamps, D-shackles etc. before putting them in use.

iv) Safe lifting capacity of all lifting & handling equipment, tools and shackles should be got verified and certificates obtained from competent authorities before its use. The safe working load shall be marked on them.

v) Check periodically the oil, brakes, gears, horns and tyre pressure of all moving equipments like cranes, forklifts, trailers etc as per manufacturer's recommendations.

vi) Check the weights to be lifted and accordingly decide about the crane capacity, boom length and angle of erection.

vii) Allow lifting slings as short as possible and check packing at the friction points.

viii) While lifting/placing of the load, no unauthorized person shall remain within the radius of the boom and underneath the load.

ix) While loading, unloading and stacking of pipes, proper wedges shall be placed to prevent rolling down of the pipes.

x) Control longer jobs being lifted up from both ends.

xi) Only trained operators and riggers should carry out the job. While the crane is moving or lifting the load, the trained rigger should be there for keeping a vigil against hitting any other object.

xii) During high wind conditions and nights, lifting of heavy equipments should be avoided. If unavoidable to do erection in night, operator and rigger should be fully trained for night signaling. Also proper illumination should be there.

xiii) Allow crane to move on hard, firm and leveled ground.

xiv) When crane is in idle condition for long periods or unattended, crane boom should either be lowered or locked as per manufacturer's guidelines.

xv) Hook and load being lifted shall remain in full visibility of crane operators, while lifting, to the extent possible.

xvi) Don't allow booms or other parts of crane to come within 3 meters reach of overhead electrical cables.

xvii) No structural alterations or repairs should be made to any part of a lifting appliance, which may affect the safety of the appliance without the permission and supervision of the competent person.

6.9.2 Hoists

i) Hoist shafts should be enclosed with rigid panels or other adequate fencing at:

(a) ground level on all sides;

(b) all other levels at all points at which access is provided;

(c) all points at which persons are liable to be struck by any moving part.

ii) The enclosure of hoist shafts, except at approaches should extend where practicable at least 2mt above the floor, platform or other place to which access is provided except where a lesser height is sufficient to prevent any person falling down the hoistway and there is no risk of any person coming into contact with any moving part of the hoist, but in no case should the enclosure be less than 1mt in height.

iii) The guides of hoist platforms should offer sufficient resistance to bending and, in the case of jamming by a safety catch, to buckling.

iv) Where necessary to prevent danger, adequate covering should be provided above the top of hoist shafts to prevent material falling down them.

v) Outdoor hoist towers should be erected on firm foundations, and securely braced, guyed and anchored.

vi) A ladderway should extend from the bottom to the top of outdoor hoist towers, if no other ladderway exists within easy reach.

vii) Hoisting engines should be of ample capacity to control the heaviest load that they will haveto move.

viii) Hoists should be provided with devices that stop the hoisting engine as soon as the platform reaches its highest stopping place.

ix) Winches should be so constructed that the brake is applied when the control handle is not

held in the operating position.

x) It should not be possible to set in motion from the platform a hoist, which is not designed for the conveyance of persons.

xi) Winches should not be fitted with pawl and ratchet gears on which the pawl must be disengaged before the platform is lowered.

xii) Hoist platforms should be capable of supporting the maximum load that they will have to carry with a safety factor.

xiii) Hoist platforms should be equipped with safety gear that will hold the platform with the maximum load if the hoisting rope breaks.

xiv) If workers have to enter the cage or go on the platform at landings there should be a locking arrangement preventing the cage or platform from moving while any worker is in or on it.

xv) On sides not used for loading and unloading, hoist platforms should be provided with toe- boards and enclosures of wire mesh or other suitable material to prevent the fall of parts of loads.

xvi) Where necessary to prevent danger from falling objects, hoist platforms should be provided with adequate covering.

xvii) Counterweights consisting of an assemblage of several parts should be made of specially constructed parts rigidly connected together.

xviii) Counterweights should run in guides.

xix) Platforms should be provided at all landings used by workers.

xx) Following notices should be posted up conspicuously and in very legible characters:

(a) on all hoists:

- on the platform: the carrying capacity in kilograms or other appropriate standard unit of weight;
- on the hoisting engine: the lifting capacity in kilograms or other appropriate standard unit of weight;

(b) on hoists authorized or certified for the conveyance of persons:

- on the platform or cage: the maximum number of persons to be carried at one time;

(c) on hoists for goods only:

- on every approach to the hoist and on the platform: prohibition of use by persons.

xxi) Hoists intended for the carriage of persons should be provided with a cage so constructed as to prevent any person from falling out or being trapped between the cage and any fixed part of the structure when the cage gate is shut, or from being struck by the counterbalance weight or by articles or materials tailing down the hoistway.

xxii) On each side in which access is provided, the cage should have a gate fitted with devices which ensure that the gate cannot be opened except when the cage is at a landing and that the gate must be closed before the cage can move away from the landing.

xxiii) Every gate in the enclosure of the hoist shaft which gives access from a landing place to the cage should be fitted with devices to ensure that the gate cannot be opened except when the cage is at that landing place, and that the cage cannot be moved away from that landing place until the gate is closed.

6.9.3 Derricks

Stiff-leg derricks

i) Derricks should be erected on a firm base capable of taking the combined weight of the crane structure and maximum rated load.

ii) Devices should be used to prevent masts from lifting out of their seating.

iii) Electrically operated derricks should be effectively earthed from the sole plate or framework.

iv) Counterweights should be so arranged that they do not subject the backstays, sleepers or pivots to excessive strain.

v) When derricks are mounted on wheels:

a) a rigid member should be used to maintain the correct distance between the wheels;

b) they should be equipped with struts to prevent them from dropping if a wheel breaks or the derrick is derailed.

vi) The length of a derrick jib should not be altered without consulting the manufacturer.

vii) The jib of a scotch derrick crane should not be erected within the backstays of the crane.

Guy derricks

i) The restraint of the guy ropes should be ensured by fitting stirrups or anchor plates in concrete

foundations.

ii) The mast of guy derricks should be supported by six top guys spaced approximately equally.

iii) The spread of the guys of a guy derrick crane from the mast should not be more than 450 from the horizontal.

iv) Guy ropes of derricks should be equipped with a stretching screw or turnbuckle or other device to regulate the tension.

v) Gudgeon pins, sheave pins and fool bearings should be lubricated frequently.

vi) When a derrick is not in use, the boom should be anchored to prevent it from swinging.

6.9.4 Gin poles

i) Gin poles should:

(a) be straight;

(b) consist of steel or other suitable metal;

(c) be adequately guyed and anchored;

(d) be vertical or raked slightly towards the load;

(e) be of adequate strength for the loads that they will be required to lift/move.

ii) Gin poles should not be spliced and if a gin pole is composed of different elements, they should be assembled in conformity with their intrinsic material strength.

iii) Gin poles should be fastened at their feet to prevent displacement in operation.

iv) Gin poles, which are moved from place to place and re-erected, should not be taken into use again before the pole, lifting ropes, guys, blocks and other parts have been inspected, and the whole appliance has been tested under load.

v) When platforms or skips are hoisted by gin poles, precautions should be taken to prevent them from spinning and to provide for proper landing.

6.9.5 Tower cranes

i) Where tower cranes have cabs at high level, persons, capable and trained to work at heights, should only be employed as crane operators.

ii) The characteristics of the various machines available should be considered against the operating requirements and the surroundings in which the crane will operate before a particular type of crane is selected.

iii) Care should be taken in the assessment of wind loads both during operations and out of service. Account should also be taken of the effects of high structures on wind forces in the vicinity of the crane.

iv) The ground on which the tower crane stands should have the requisite bearing capacity. Account should be taken of seasonal variations in ground conditions.

v) Bases for tower cranes and tracks for rail-mounted tower cranes should be firm and level. Tower cranes should only operate on gradients within limits specified by the manufacturer. Tower cranes should only be erected at a safe distance from excavations and ditches.

vi) Tower cranes should be sited where there is clear space available for erection, operation and dismantling. As far as possible, cranes should be sited so that loads do not have to be handled over occupied premises, over public thoroughfares, other construction works and railways or near power cables.

vii) Where two or more tower cranes are sited in positions where their jibs could touch any part of the other crane, there should be direct means of communication between them and a distinct warning system operated from the cab so that one driver may alert the other of impending danger.

viii) The manufacturers' instructions on the methods and sequence of erection and dismantling should be followed. The crane should be tested before being taken into use.

ix) The climbing operation of climbing tower cranes should be carried out in accordance with

manufacturers' instructions. The free-standing height of the tower crane should not extend beyond what is safe and permissible in the manufacturers' instructions.

x) When the tower crane is left unattended, loads should be removed from the hook, the hook raised, the power switched off and the boom brought to the horizontal. For longer periods or at times when adverse weather conditions are expected, out of service procedures should be followed. The main jib should be slewed to the side of the tower away from the wind, put into free slew and the crane immobilized.

xi) A wind speed measuring device should be provided at an elevated position on the tower crane with the indicator fitted in the drivers' cab.

xii) Devices should be provided to prevent loads being moved to a point where the corresponding safe working load of the crane would be exceeded. Name boards or other items liable to catch the wind should not be mounted on a tower crane other than in accordance with the manufacturers' instructions.

xiii) Tower cranes should not be used for magnet, or demolition ball service, piling operations or other duties, which could impose excessive loading on the crane structure.

6.9.6 Lifting ropes

i) Only ropes with a known safe working capacity should be used as lifting ropes.

ii) Lifting ropes should be installed, maintained and inspected in accordance with manufacturers' instructions.

iii) Repaired steel ropes should not be used on hoists.

iv) Where multiple independent ropes are used, for the purpose of stability, to lift a work platform, each rope should be capable of carrying the load independently.

6.10 VEHICLE MOVEMENT

6.10.1 Park vehicles only at designated places. Don't block roads to create hindrance for other vehicles.

6.10.2 Don't overload the vehicle.

6.10.3 Obey speed limits and traffic rules.

6.10.4 Always expect the unexpected and be a defensive driver.

6.10.5 Drive carefully during adverse weather and road conditions.

6.10.6 Read the road ahead and ride to the left.

6.10.7 Be extra cautious at nights. Keep wind screens clean and lights in working condition.

6.10.8 All vehicles used for carrying workers and construction materials must undergo predictive/preventive maintenance and daily checks

6.10.9 Driver with proper valid driving license shall only be allowed to drive the vehicle

6.10.10 Routes shall be leveled, marked and planned in such a way so as to avoid potential hazards suchas overhead power lines and sloping ground etc.

6.10.11 While reversing the vehicles, help of another worker should be ensured at all times

6.10.12 An unattended vehicle should have the engine switched off

6.10.13 Wherever possible one-way system shall be followed

6.10.14 Barriers/fixed stops should be provided for excavation/openings to prevent fall of vehicle

6.10.15 Load should be properly secured

6.10.16 The body of the tipper lorry should always be lowered before driving the vehicle off.

6.10.17 Signs/signals/caution boards etc. should be provided on routes .

6.11 ELECTRICAL

6.11.1 General Provisions

i) Only persons having valid licenses should be allowed to work on electrical facilities.

ii) No person should be allowed to work on live circuit. The same, if unavoidable, special care and authorization need to be taken.

iii) Treat all circuits as "LIVE" unless ensured otherwise.

iv) Electrical "Tag Out" procedure "MUST" be followed for carrying out maintenance jobs.

v) Display voltage ratings prominently with "Danger" signs.

vi) Put caution/notice signs before starting the repair works.

vii) All electrical equipment operating above 250V shall have separate and distinct connections to earth grid.

viii) Proper grounding to be ensured for all switch boards and equipment including Portable ones prior to taking into service.

ix) Make sure that electrical switch boards, portable tools, equipment (like grinding machine etc.) don't get wet during their usage. If it happens, stop the main supply, make the tools dry and then only use them. Check proper earthing. .All temporary switch boards/ KIOSKS put up at work site should be suitably protected from rain and the level of same should be high enough to avoid contact with water due to water logging.

x) Don't work wet on electrical system.

xi) Don't overload the electrical system.

xii) Use only proper rated HRC fuses.

xiii) Industrial type extension boards and Plug sockets are only to be used.

xiv) ELCB for all temporary connections must be provided. Use insulated 3-pin plug tops.

xv) All power supply cables should be laid properly and neatly so that they don't cause hindrance to persons working and no physical damage also takes place to the cables during various construction activities.

xvi) All Power cables to be properly terminated using glands and lugs of proper size and adequately crimped.

xvii) Use spark-proof/flame proof type electrical fittings in Fire Hazard zones as per area classification under OISD-STD-113.

xviii) Check installations of steel plates/pipes to protect underground cables at crossings.

xix) Don't lay unarmored cable directly on ground, wall, roof or trees. All temporary cables should be laid at least 750 mm below ground and cable markers should be provided. Proper sleeves should be provided at road crossings. In case temporary cables are to be laid on wooden poles/steel poles, the minimum cable heights should be 4.5 M.

xx) Maintain safe overhead distance of HT cables as per Indian Electricity Rules and relevant acts.

xxi) Don't connect any earthing wire to the pipelines/structures.

xxii) Don't make any unsafe temporary connections, naked joints/wiring etc.

xxiii) Ensure that temporary cables are free from cuts, damaged insulation, kinks or improper insulated joints.

xxiv) Check at periodic intervals that pins of sockets and joints are not loose.

xxv) Protect electrical wires/equipments from water and naked flames.

xxvi) Illuminate suitably all the work areas.

xxvii) All switchboards should be of MS structure only and incoming source should be marked.

xxviii) Hand lamps should not be of more than 24V rating.

xxix) Fire extinguishers (DCP/CO2/Sand buckets) should be kept near temporary switch boards being used for construction purposes. Don't use water for fighting electrical fires.

xxx) Insulating mats shall be provided in the front and back end of switch boards.

xxxi) All parts of electrical installations should be so constructed, installed and maintained as to prevent danger of electric shock, fire and external explosion Periodic checking/certification of electrical safety appliances such as gloves, insulating mats, hoods etc. to be done/witnessed along with maintaining a register at site signed by competent authority.

xxxii) A notice displaying following, should be kept exhibited at suitable places:

a) prohibiting unauthorized persons from entering electrical equipment rooms or from handling or interfering with electrical apparatus;

b) containing directions as to procedures in case of fire, rescue of persons in contact with live conductors and the restoration of persons suffering from electric shock;

c) specifying the person to be notified in case of electrical accident or dangerous occurrence, and indicating how to communicate with him.

xxxiii) No other cables/pipes to be laid in trench used for electrical cables.

xxxiv) Utmost care should be taken while excavating Earth from cable trench to avoid damage or any accident.

xxxv) Sub-station floor cut-outs meant for switch board installations to be covered wherever installation is incomplete.

NOTE: A Residual Current Operated Circuit Breaker (RCCB) or Earth Leakage Circuit Breaker (ELCB), when installed, protects a human being to the widest extent. RCCB or ELCB should be provided as per Indian Electricity Rules.

6.11.2 Inspection and maintenance

i) All electrical equipment should be inspected before taking into use to ensure suitability for its proposed use.

ii) At the beginning of every shift, the person using the electrical equipment should make a careful external examination of the equipment and conductors, especially the flexible cables.

iii) Apart from some exceptional cases, work on or near live parts of electrical equipment shouldbe forbidden.

iv) Before any work is begun on conductors or equipment that do not have to remain live:

a) the current should be switched off by a responsible authorized person;

b) precautions should be taken to prevent the current from being switched on again;

c) the conductors or the equipment should be tested to ascertain that they are dead;

d) the conductors and equipment should be earthed and short-circuited;

e) neighbouring live parts should be adequately protected against accidental contact.

v) After work has been done on conductors and equipment, the current should only be switched on again on the orders of a competent person after the earthing and short-circuiting have been removed and the workplace reported safe.

vi) Electricians should be provided with approved and tested tools, and personal protective equipment such as rubber gloves, mats etc.

vii) All conductors and equipment should be considered to be live unless there is a proof of the contrary.

viii) When work has to be done in dangerous proximity to live parts the current should be cut off.If for operational reasons this is not possible, the live parts should be fenced off or enclosed by

qualified staff from the sub-station concerned.

6.11.3. Testing

i) Electrical installations should be inspected and tested and the results recorded.

ii) Periodic testing of the efficiency of the earth leakage protective devices should be carried out.

iii) Particular attention should be paid to the earthing of apparatus, the continuity of protective conductors, polarity and insulation resistance, protection against mechanical damage and condition of connections at points of entry.

6.12 OFFSHORE

6.12.1 General

The isolated nature of offshore installations are hazardous. They call for greater need for safety and survival at offshore. Safety at offshore is safety of installations and safety of personnel. Safety problems and accidents at offshore have high risks due to limited space, helicopter operation, sea transport etc. Following are the general safety guidelines to be followed in addition to the safety guidelines stipulated for specific jobs dealt later on:

i) Workers should be well trained to do their job independently with high degree of self-control and self-discipline.

ii) On arrival at offshore, everyone should be briefed about the safety rules to be followed at offshore, evacuation system etc. All personnel should wear overall (dangri), helmet and shoes for personnel protection.

iii) In case of emergency, workers should follow instruction of Field Production Superintendent (F.P.S.) In certain cases instructions may be given to abandon the offshore installation and evacuate the persons to safe location.

iv) To overcome above problems, offshore personnel must receive training for using life saving appliances and other personal survival techniques.

v) Any person working at offshore should have one person as standby for any eventuality.

6.12.2 Drilling Rigs

i) Location of jack up rigs should not be less than 5 Kms from shipping route. Orientation of the rig, wind direction etc are required for safe landing of helicopter. Information w.r.t. sea currents, wind speed, Hi-lo tide etc are required for mooring of supply vessels.

ii) Sea bed condition at every location should be ensured for safety of rig.

iii) Radio and other communication facilities should be such to maintain contact with base all times.

iv) During toeing of rig, the rig deck should be clear of load, toeing lines should be in good condition and tensions in various toeing lines should be constantly monitored.

v) Few steps during toeing are:

a) crane booms should be secured to their vesta,

b) all hatches and water tight doors should be closed,

c) number of personnel on board should be restricted,

d) evacuate in case of emergency and operation should be completed preferably in day light.

6.12.3 Drilling

i) In view of CO2 and H2S gas cut from well, effective ventilation should be provided where drilling is in progress.

ii) Safety alarm shall be checked in advance in view of failure of ventilation system.

iii) Suitable sensors for H2S and Methane should be function tested time to time and suitable colour code should be given.

iv) Working areas of the crane should be illuminated during night to avoid accident.

v) Clear space should be available for despatch and receipt of load and, in particular, basket transfer of passengers. Persons engaged in loading/unloading of materials should be protected from falling into the sea.

vi) Signal light should be fitted at the top of the jib.

vii) Crane hook should be fitted with safety latches.

viii) Experienced person should be engaged in operation of specific equipment like winches, cranes etc.

ix) At least three cable turns shall always be there on the winch drum.

x) Adequate communication like walkie talkie, round robin phone should be available between the crane operator, supervisor and helper.

xi) Crane operation should be completely stopped during helicopter landing/taking off.

xii) Except for helicopter landing deck, all decks, platforms, bridges, ladders should have rigid and fixed guard rails at least one meter high and should have one intermediate rail midway between the handrail and 100 mm toe board.

xiii) Wooden ladders shall not be used at offshore.

xiv) Flow sensor in the flow line should be ensured for safe working and to avoid blow out.

xv) Hydrogen sulphide gas In offshore is of great risk and at 10 ppm (0.001%) concentration in air, a person should not be exposed for more than 8 hours, If concentration is more, then breathing apparatus should be used. Corrosion of equipment is also caused by H2S.

xvi) Portable H2S gas detector should be continuously used.

6.12.4 Production Platforms

i) In case hydrocarbon Is released due to overpressure, leak, overflow, gas blow etc., shut down process to stop flow of hydrocarbon. Prevent ignition of released hydrocarbon and in case of fire shut in the process complex and follow emergency contingency plan.

ii) Sub surface safety valve (SSSV)) below the well head should be actuated during uncontrolled well -flow and they should be regularly checked.

iii) Surface safety valve or SDV should be checked for no gas leakage from bleed port / flange etc., in the well head area. It should not be in "mechanical override" or bypassed from panel.

iv) High pressure gas lift lines - blow down system should be O.K.

v) Auto actuation of SDVs in the inlet of pressure vessels should be O.K. and in "normal position" from shutdown panels. A record of status of switches normal/bypassed in auto-con* panels (PSH, PSL, LSL, ILSL) should be maintained.

* Shut Down Panels

vi) Welders rectifier set and electrical connections to it should be checked and approved by electrical-in- charge for proper electrical safely.

vii) "SCADA" telemetry system if available should be operational for remote opening and closingof wells at unmanned platforms (through RPMC).

viii) Local ESD/FSD (near the work site) should be provided for jobs of very critical nature, so that the persons working can access it immediately in emergency for safety. Safety officer should judge the requirement & inform FPS for the same.

ix) Railings and Gratings etc. in and around work area should be O.K. and inspected to avoid slippage of man into sea.

x) Emergency shutdown (ESD) system is initiated when an abnormal condition is detected. ESD should be checked once in six months.

xi) Platform should be manned round the clock.

xii) Welding and cutting work should be regulated by hot work permit.

xiii) All detectors should be calibrated as per recommendation of the manufacturer.

xiv) No system should be by-passed which affects the system of platform.

xv) In H2S field platforms, due care shall be taken as per recommendations.

xvi) Follow the instructions of F.P.S. during stay at platform

6.12.5 Fire Prevention And Control

i) Provision be made for safe handling and storage of dirty rags, trash, and waste oil. Flammable liquids and chemicals applied on platform should be immediately cleaned.

ii) Paint containers and hydrocarbon samples, gas cylinders for welding and cutting should be stored properly. Cylinders should be transported in hand-cart.

iii) Smoking should be restricted and no smoking area should be identified.

iv) Special attention should be given to crude oil pump seals, diesel and gas engines which are potential source of ignition in the event of failure.

v) Fire and smoke detectors i.e. ultraviolet heat, thermal and smoke detector should be function tested once in three months.

vi) Fire is controlled in offshore by water spraying, Halon, CO2 flooding, DCP and sprinkler system.

vii) Foaming agent is applied for controlling fire in liquid hydrocarbon. The system is not effective in gas fire.

viii) Light weight breathing system should be used.

ix) The fire control plan at offshore should reveal control station, fire alarms and fire detectors, deluge valves and sprinkler, fire extinguishing appliances, fireman outfit and ventilation system.

x) Fire fighting equipment should be maintained in ready to use condition.

6.12.6 Life Saving Appliances

i) Life boats with a speed of 6 knots and carrying capacity up to 50 persons are used in offshore.

ii) No. of life boats on one installation should have a capacity to accommodate twice the numberof persons onboard installation.

iii) Launching appliances and life boat equipment should be checked every week.

iv) Boat landing areas should be adequately illuminated.

v) Life raft has no power and they rely on drift.

vi) Life jacket lifts the wearer after entering water.

vii) Life buoys are used to rescue persons if any person accidentally falls in the sea.

viii) All life saving appliances should be inspected by the MMD surveyor /sr. officials once a year.

ix) Every life boat shall be inspected once a week.

x) Every life boat and life raft should be serviced once a year by a competent authority,

6.12.7 Safety Precautions during Helicopter Transportation

i) Passenger briefing regarding safety rules while travelling in helicopter should be carried out before boarding the helicopter.

ii) Emergency procedure should be briefed to all the passenger In case helicopter is to ditch into the sea.

iii) Heli-pad should have a non-skid surface. Nylon rope net should be stretched on the deck.

iv) Proper drainage should be available on helideck.

v) There should be no obstruction on the helideck itself and within 3 meters of its parameter.Closest super structure above the helideck should have red obstruction light.

vi) While landing fire crew of two persons should be standby adjacent to helideck.

vii) Heli-deck should be properly illuminated for night landing.

viii) During switching off helicopter, persons should not be allowed to go out/ towards helicopter

6.13 DEMOLITION

6.13.1. General provisions

i) When the demolition of any building or structure might present danger to workers or to thepublic:

(a) necessary precautions, methods and procedures should be adopted, including those for the disposal of waste or residues;

(b) the work should be planned and undertaken only under the supervision of a competent person.

ii) Before demolition operations begin:

(a) structural details and builders' drawings should be obtained wherever possible;

(b) details of the previous use should be obtained to identify any possible contamination and hazards from chemicals, flammables, etc.;

(c) an initial survey should be carried out to identify any structural problems and risks associated with flammable substances and substances hazardous to health. The survey should note the type of ground on which the structure is erected, the condition of the roof trusses, the type of framing used in framed structures and the load-bearing walls;

(d) a method of demolition should be formulated after the survey and recorded in a method statement having taken all the various considerations into account and identifying the problems and their solutions;

iii) All electric, gas, water and steam service lines should be shut off and, as necessary, capped or otherwise controlled at or outside the construction site before work commences.

iv) If it is necessary to maintain any electric power, water or other services during demolition operations, they should be adequately protected against damage.

v) As far as practicable, the danger zone round the building should be adequately fenced off and sign posted. To protect the public a fence 2m high should be erected enclosing the demolition operations and the access gates should be secured outside working hours.

vi) The fabric of buildings contaminated with substances hazardous to health should be decontaminated. Protective clothing and respiratory devices should be provided and worn.

vii) Where plant has contained flammable materials, special precautions should be taken to avoid fire and explosion.

viii) The plant to be demolished should be isolated from all other plant that may contain flammable materials. Any residual flammable material in the plant should be rendered safe by cleaning, purging or the application of an inert atmosphere as appropriate.

ix) Care should be taken not to demolish any parts, which would destroy the stability of other parts.

x) Demolition activities should not be continued under adverse climatic conditions such as high winds, which could cause the collapse of already weakened structures.

xi) To prevent hazards parts of structures should be adequately shored, braced or otherwise supported.

xii) Structures should not be left in a condition in which they could be brought down by wind pressure or vibration.

xiii) Where a deliberate controlled collapse technique is to be used, expert engineering adviceshould be obtained, and:

(a) it should only be used where the whole structure is to come down because it relies on the removal of key structural members to effect a total collapse;

(b) it should only be used on sites that are fairly level and where there is enoughsurrounding space for all operatives and equipment to be withdrawn to a safe distance.

xiv) When equipment such as power shovels and bulldozers are used for demolition, due consideration should be given to the nature of the building or structure, its dimensions, as well as to the power of the equipment being used.

xv) If a swinging weight is used for demolition, a safety zone having a width of at least one-and- a-half times the height of the building or structure should be maintained around the points of impact.

6.13.2. Demolition of structural steelwork

i) All precautions should be taken to prevent danger from any sudden twist, spring or collapseof steelwork, ironwork or reinforced concrete when it is cut or released.

ii) Steel construction should be demolished tier by tier.

iii) Structural steel parts should be lowered and not dropped from a height.

6.14 RADIOGRAPHY

6.14.1 All radiography jobs shall be carried out as per BARC Safety Regulations

6.14.2 During field radiography, nearby area around the radiation source should be cordoned off.

6.14.3 If the field radiography is to be done at the same location repeatedly, it is advisable to provide either a wire fencing around or a temporary brick enclosure.

6.14.4 Special permission/permit should be taken for radiography from area-in-charge.

6.14.5 As far as possible, field radiography should be done only during night time when there is little orno occupancy there.

6.14.6 Radiation warning signals should be pasted all along the cordoned off area.

6.14.7 Entry into the restricted area by unauthorized persons should be strictly prohibited duringexposure.

6.14.8 The radiation level along with the cordon should be monitored by a suitable and well-calibrated radiation survey meter.

6.14.9 All personnel working with radiography sources should wear appropriate protective equipmentand film badges issued by BARC.

6.14.10 Protection facilities such as manipulator rod, remote handling tongs, lead pots, radiation hazard placards and means of cordon off shall be available at each site.

6.14.11 The radiography source shall never be touched or handled directly with hands.

6.14.12 The package containing radiography cameras and sources should never be carried by public transport like bus, train etc.

6.14.13 Radiography sources and cameras, when not in use, should be stored inside a source pit with lock and key arrangement as approved by BARC. The storage room should preferably be located in an isolated area of minimum occupancy and radiation level outside the storage room should not exceed 0.25 mR/hr as per BARC Regulations.

6.14.14 In case of an accident (due to loss or of damage to radiography source), action should be takenin line with BARC Safety Rules/Guidelines.

6.15 SAND/SHOT BLASTING/ SPRAY PAINTING

6.15.1 Sand blasting should be used only after approval from competent person.

6.15.2 Air Compressor used for sand/shot blasting/painting should have guard and positioned away from

the work place.

6.15.3 Exhaust of the prime mover, if IC engine is used, should be directed away from the work place.

6.15.4 In case of motor driven compressor, the body of the motor as well as the compressor to be properly earthed.

6.15.5 The hoses used for compressed air should be of proper quality, and health of the same to be ensured through regular check/ test.

6.15.6 The operator of sand/shot blasting/painting should wear suitable PPE's including mask.

6.15.7 Adequate measures to be taken to suppress dust/spray particle.

6.15.8 Sand used for sand blasting should be suitably covered & protected from to rain/moisture.

6.15.9 When these activities are done in confined places, adequate measure to be taken for proper ventilation.

6.16 WORK ABOVE WATER

6.16.1 General Provisions

i) Where work is done over or in close proximity to water & where possibility of drowning exists, provision should be made for:
   a) Preventing workers from falling into water;
   b) The rescue of workers in danger of drowning;
   c) Safe and sufficient transport.

ii) Provisions for the safe performance of work over or in close proximity to water should include, where appropriate, the provision and use of suitable and adequate:
   a) fencing, safety nets and safety harnesses;
   b) lifebuoys, life jackets and manned boats;
   c) protection against such hazards as reptiles and other animals.

iii) Gangways, pontoons, bridges, footbridges and other walkways or work places over water should:
   a) possess adequate strength and stability;
   b) be sufficiently wide to allow safe movement of workers;
   c) have level surfaces free from tripping hazards;
   d) be adequately lit when natural light is insufficient;
   e) where practicable and necessary, to prevent danger, be provided with toe-boards, guard rails, hand ropes etc.
   f) be secured to prevent dislodgment by rising water or high winds;
   g) if necessary, be equipped with ladders which should be sound, of sufficient strength and length and be securely lashed to prevent slipping.

iv) All deck openings including those for buckets should be fenced.

6.16.2 Rescue & Emergency procedures

i) Persons who work over water should be provided with some form of buoyancy aid. Life jackets should provided sufficient freedom of movement, have sufficient buoyancy to bring persons to the surface and keep them afloat face upwards, be easily secured to the body, be readily visible by way of self luminous paint/strip.

ii) Nobody should work alone on or above water.

iii) Each worker should be trained in the procedure to be followed in the event of an emergency.

## 7.0 ADDITIONAL SAFETY PRECAUTION FOR UNITS WITH HYDROCARBONS

In addition to general safety precautions as outlined above for the activities in Clause 6.0, following additional safety precautions need to be taken for the sites within the operating area or nearby, where presence of Hydrocarbons cannot be ruled out.

i) No job shall be carried out without a valid permit. Permit should be in line with OISD-STD-105 "Work Permit System".

ii) Smoking should be prohibited in all places containing readily combustible or flammable materials and "No Smoking" notices be prominently displayed.

iii) In confined spaces and other places where flammable gases, vapours or dusts can cause danger, following measures should be taken:

(a) only approved type electrical installations and equipment, including portable lamps, should be used;

(b) there should be no naked flames or source of ignition;

(c) oily rags, waste and clothes or other substances liable to spontaneous ignition shouldbe removed without delay to a safe place;

(d) ventilation should be provided.

iv) Regular inspections should be made of places where there are fire risks. These include the vicinity of heating appliances, electrical installations and conductors, stores of flammable and combustible materials, welding and cutting operations.

v) Welding, flame cutting and other hot work should only be done after issuance of work permit in line with the requirement of OISD-STD-105 after appropriate precautions, as required, are taken to reduce the risk of fire. For carrying out other jobs also, OISD-STD-105 should be followed strictly.

vi) Fire-extinguishing equipment should be well maintained and inspected at suitable intervals by a competent person. Access to fire-extinguishing equipment such as hydrants, portable extinguishers and connections for hoses should be kept clear at all times.

vii) All supervisors and a sufficient number of workers should be trained in the use of fire-extinguishing equipment, so that adequate trained personnel are readily available during all working periods.

viii) Audio means to give warning in case of fire should be provided where this is necessary to prevent danger. Such warning should be clearly audible in all parts of the site where persons are liable to work. There should be an effective evacuation plan so that all persons are evacuated speedily without panic and accounted for and all plant and processes shut down.

ix) Notices should be posted at conspicuous places indicating:

(a) the nearest fire alarm;

(b) the telephone number and address of the nearest emergency services.

x) The work site shall be cleared of all combustible materials, as Sparks and molten metal coming from the welding job can easily ignite combustible materials near or below the welding site. If the combustible materials cannot be removed from the area, the same shall be properly shielded.

xi) A dry chemical type fire extinguisher shall be made available in the work area. Also fire protection facilities like running hoses etc. as per permit should be complied with.

xii) Wherever required, welding screens shall be put up to protect other equipment in adjoining areas against flying sparks. Material used should be metal/asbestos/water curtain.

xiii) Welding or cutting of vessels/ equipments used in Hydrocarbon/ hazardous chemicals shall be done after proper gas freeing and verifying the same with the explosive-meter.

xiv) The confined space/equipment shall be gas freed and cleaned.

xv) Absence of any toxic gas and any flammable gas above explosion limit shall be ensured with the help of gas detection instrument and explosive meter respectively.

xvi) Used and hot electrode stubs shall be discarded in a metal bucket. xvii)Use approved and

certified flame arrestors for vehicles.

xviii) Work permit to be obtained, if construction work is carried out within existing operating area.

8.0 FIRST AID

First aid facilities should be provided in line with various statutory regulations like factory act etc. However following care should be taken:

i) First aid, including the provision of trained personnel should be ensured at work sites. Arrangement should be made for ensuring the medical attention of the injured workers. First aid box should be as per the Factory rules.

ii) Suitable rescue equipment, like stretchers should be kept readily available at the construction site.

iii) First-aid kits or boxes, as appropriate and as per statutory requirements, should be provided at workplaces and be protected against contamination by dust, moisture etc.

iv) First-aid kit or boxes should not keep anything besides material for first aid in emergencies.

v) First-aid kits and boxes should contain simple and clear instructions to be followed, be kept under the charge of a responsible person qualified to render the first aid and be regularly inspected and stocked.

vi) Where the work involves risk of drowning, asphyxiation or electric shock, first-aid personnel should be proficient in the use of resuscitation and other life saving techniques and in rescue procedures.

vii) Emergency telephone numbers of nearby Hospitals, Police, Fire Station and Administration should be prominently displayed.

9.0 DOCUMENTATION

The intention of keeping documentation of all types of accident(s) is to prevent recurrence of similar accident(s). All accidents should be reported as per OISD Guidelines (OISD-GDN-107) and Factories act, 1948.

All accidents (major, minor or near miss) should be investigated, analyzed and recommendations should be documented along with implementation status.

All related data should be well-documented and further analysis highlighting the major cause(s) of accidents be done. This will help in identifying thrust areas and training needs for prevention of accidents.

10.0 SAFETY AWARENESS & TRAINING

Safety awareness to all section of personnel ranging from site-in-charge to workmen helps not only preventing the risk but also build up the confidence. Time and expenditures also get saved as a result.

Safety awareness basically seeks to persuade/inform people on safety besides supplementing skill also. Awareness programmed may include followings:

i) Poster: Posters with safety slogan in humorous, gruesome demonstrating manner may be used to discourage bad habits attributable to accidents by appealing to the workers' pride, self-love, affection curiosity or human aspects. These should be displayed in prominent location(s).

ii) Safety Sign Boards: Different type of message of cautioning, attention, notice etc. should be displayed at the appropriate places for learning/ awareness of the workmen while working at site.

iii) Films & Slides: Film(s) narrating the accident including the causes and possible remedial ways of preventing the recurrence of a similar accident should be displayed at regular intervals. Slides consisting main points of the film show may also be shown to workers.

iv) Talks, lectures & conferences: The success of these events would depend much on audience's understandings of the speaker (s). The speakers are to be knowledgeable and good presenter. Speakers should know to hold the attention and to influence the audiences.

v) Competitions: Organize competition(s) between the different deptts/categories of workers. The sense of reward/recognition also will improve safety awareness and result in enhancing safety levels.

vi) Exhibitions: Exhibitions also make the workers acquainted with hazards and means of preventive measures.

vii) Safety Publication: Safety publications including pocket books dealing with ways of investigation and prevention in the field of safety and so on, may be distributed to workers to promote the safety awareness.

viii) Safety Drives: From time to time, an intensive safety drive by organizing a safety day or a safety week etc. should be launched.

ix) Training: Training for covering the hazards for different trade should be imparted. Training should also include the specific hazards related to a job in addition to the general safety training as has been dealt in various chapters and should include all workers. Reference may be drawn from OISD-STD-154.

## 11.0 REFERRENCES


i) Factory Act, 1948

ii) Indian Electricity Rules

iii) Safety & Health in Construction by ILO

iv) The Building & Other Construction Workers (Regulation, Employment and Conditions of Service) Act 1996

ANNEXURE TO APPENDIX III

LIST OF SAFETY CODES FOR CIVIL WORKS PUBLISHED BY BUREAU OF INDIAN STANDARDS

| Sr.No | Code No. | Title |
|---|---|---|
| 01. | IS : 818 | Code of Practice for Safety and Health Requirements in Electric and Gas Welding and Cutting Operations - First Revision. |
| 02. | IS : 875 | Code of practice for Structural safety of buildings: Masonry walls |
| 03. | IS : 933 | Specification for Portable Chemical Fire Extinguisher, Foam Type - Second Revision. |
| 04. | IS : 1179 | Specification for Equipment for Eye and Face Protection during Welding - First Revision. |
| 05. | IS : 1904 | Code of practice for Structural safety of buildings: Shallow foundations |
| 06. | IS : 1905 | Code of practice for Structural safety of buildings: Masonry walls |
| 07. | IS : 2171 | Specification for Portable Fire Extinguishers, Dry Powder Type -Second Revision. |
| 08. | IS : 2361 | Specification for Building Grips - First Revision. |
| 09. | IS : 2750 | Specification for Steel Scaffoldings. |
| 10. | IS : 2925 | Specification for Industrial Safety Helmets - First Revision. |
| 11. | IS : 3016 | Code of Practice for Fires Precautions in Welding and Cutting Operations - First Revision. |
| 12. | IS : 3521 | Industrial safety belts and harnesses |
| 13. | IS : 3696 - Part I | Safety Code for Scaffolds and Ladders : Part I - Scaffolds. |
| 14. | IS : 3696 - Part II | Safety Code for Scaffolds and Ladders : Part II - Ladders. |
| 15. | IS : 3764 | Safety Code for Excavation Work. |
| 16. | IS : 4014 -Part I & II | Code of practice for Steel tubular scaffolding |
| 17. | IS : 4081 | Safety Code for Blasting and Related Drilling Operations. |
| 18. | IS : 4082 | Recommendations on staking and storage of construction materials at site |
| 19. | IS : 4130 | Safety Code for Demolition of Buildings - First Revision. |
| 20. | IS : 4138 | Safety Code Working in Compressed Air-First Revision |
| 21. | IS : 4756 | Safety code for Tunneling works |
| 22. | IS : 4912 | Safety requirements for Floor and Wall Openings, Railings and toe Boards -First Revision. |
| 23. | IS : 5121 | Safety Code for Piling and other Deep Foundations. |
| 24. | IS : 5916 | Safety Code for Construction involving use of Hot Bituminous Materials. |
| 25. | IS : 5983 | Specification for Eye Protectors - First Revision. |
| 26. | IS : 6922 | Structures subject to underground blasts, criteria for safety and design of |
| 27. | IS : 7155 | Code of recommended practices for conveyor safety |
| 28. | IS : 7205 | Safety Code for Erection on Structural Steel Works. |
| 29. | IS : 7069 | Safety Code for Handling and Storage of Building Materials. |
| 30. | IS : 7293 | Safety Code for Working with Construction Machinery. |
| 31. | IS : 7323 | Guidelines for operation of Reservoirs |
| 32. | IS : 7969 | Safety code for handling and storage of building material |

| | | |
|---|---|---|
| 33. | IS : 8758 | Recommendation for Fire Precautionary Measures in construction of Temporary Structures and Pandals. |
| 34. | IS : 8989 | Safety Code for Erection of Concrete Framed Structures. |
| 35. | IS : 9706 | Code of Practices for construction of Arial ropeways for transportation ofmaterial |
| 36. | IS : 9759 | Guidelines for de-watering during construction |
| 37. | IS : 9944 | Recommendations on safe working load for natural and man-made fibrerope slings |
| 38. | IS : 10291 | Safety code for dress divers in civil engineering works |
| 39. | IS :10386 - Part I | Safety Code for Construction, Operation and Maintenance for River Valley Projects. |
| 40. | IS :10386 - Part II | Safety Code for Construction, Operation and Maintenance of River Valley Projects. |
| 41. | IS : 11057 | Code of practice for Industrial safety nets |
| 42. | IS : 13415 | Code of Practice on safety for Protective barriers in and around building |
| 43. | IS : 13416 | Recommendations for preventive measures against hazards at working places |

ANNEXURE 1

FORM OF CONTRACT

THIS CONTRACT made at ____ this_____day of _;

BETWEEN

INDIAN OIL CORPORATION LTD., a Government of Indian Undertaking registered in India under the Indian Companies Act 1956, having its registered office at G-9, Ali Yavar Jung Marg, Bandra (East), Bombay- 400 051 and the Headquarters of _____ Division at _____(hereinafter referred to as the "OWNER" which expression shall include its successors and assigns) of the One Part;

AND

_____carrying on business in sole proprietorship/carrying on business in partnership under the name and style of_____a Company registered in India under the Indian Companies Act, 1913/1956/2013 having its registered office at

_____ (hereinafter referred to/as collectively referred to as the "Contractor" which expression shall include his/their/its executors, administrators, representatives and permitted assigns/successors and permitted assign) of the other part:

WHEREAS

The OWNER desires to have executed the workof

_____more specifically mentioned and described in the contract documents (hereinafter called the "work" which expression shall include all amendments therein and/or modifications thereof) and has accepted the tender of the CONTRACTOR for the said work.

NOW, THEREFORE. THIS CONTRACT WITNESSETH as follows:

ARTICLE - 1
CONTRACT DOCUMENTS

1.1 The following documents shall constitute the Contract documents, namely :

(a) This Contract;
(b) Tender Documents as defined in the General Instructions to Tenderers;
(c) Letter of Acceptance of Tender along with Fax/Telegram of Intent.

1.2 A copy of each of the Tender Documents is annexed hereto and the said copies have been collectively marked Annexure 'A' while a copy of the Letter of Acceptance of Tender along with annexures thereto have been collectively marked as Annexure - 'B'.

ARTICLE - 2
WORK TO BE PERFORMED

2.1 The CONTRACTOR shall perform the said work upon the terms and conditions and within the time specified in the Contract Documents.

ARTICLE - 3
COMPENSATION

3.1 Subject to and upon the terms and conditions contained in the Contract documents, the OWNER shall pay CONTRACTOR compensation as specified in the Contract documents upon the satisfactory completion of the work and/or otherwise as may be specified in the Contract documents.

ARTICLE - 4
ARBITRATION & JURISDICTION

4.1 The Arbitration institute for administering the arbitration in terms of Clause 9 of General Conditions of Contract shall be _____.

4.2 Notwithstanding any other court or courts having jurisdiction to decide the question(s) forming the subject matter of the reference if the same had been the subject matter of a suit, any and all actions and proceedings arising out of or relative to the Contract (including any arbitration, if applicable in

terms thereof) shall lie only in the court of competent civil jurisdiction in this behalf at _____ and only the said Court(s) shall have sole and exclusive jurisdiction to entertain and try any such action(s) and/or proceeding(s) to the exclusion of all other Courts.

ARTICLE - 5
ENTIRE CONTRACT

5.1 The Contract documents mentioned in Article - I hereof embody the entire Contract between the parties hereto, and the parties declare that in entering into this Contract they do not rely upon any previous representation, whether express or implied and whether written or oral, or any inducement, understanding or agreements of any kind not included within the Contract documents and all prior negotiations, representations, contracts and/or agreements and understandings relative to the work are hereby cancelled.

ARTICLE – 6
NOTICES

6.1 Subject to any provisions in the Contract documents to the contrary, any notice, order or communication sought to be served by the CONTRACTOR on the OWNER with reference to the Contract shall be deemed to have been sufficiently served upon the OWNER (notwithstanding any enabling provisions under any law to the contrary) only if delivered by hand or by Registered Acknowledgment Due Post to the Engineer-in-Charge as defined in the General Conditions of Contract.

6.2 Without prejudice to any other mode of service provided for in the Contract Documents or otherwise available to the OWNER, any notice, order or other communication sought to be served by the OWNER on the CONTRACTOR with reference to the Contract, shall be deemed to have been sufficiently served if delivered by hand or through Registered Post Acknowledgement Due to the principal office of the CONTRACTOR at …… or to the CONTRACTOR's representatives as referred to in the General Conditions of Contract forming part of the Contract Documents.

ARTICLE-7
WAIVER

7.1 No failure or delay by the OWNER in enforcing any right or remedy of the OWNER in terms of the Contract or any obligation or liability of the CONTRACTOR in terms thereof shall be deemed to be a waiver of such right, remedy, obligation or liability, as the case may be, by the OWNER and notwithstanding such failure or delay, the OW NER shall be entitled at any time to enforce such right, remedy, obligation or liability, as the case may be.

7.2 The CONTRACTOR hereby waives all rights contrary to the terms and conditions of the Contract.

ARTICLE-8
NON-ASSIGNABILITY

8.1 The Contract and benefits and obligations thereof shall be strictly personal to the CONTRACTOR and shall not on any account be assignable or transferable by the CONTRACTOR.

ARTICLE- 9
CONTRACT LANGUAGE

9.1 The language of the Contract shall be English and all communications, drawings, design, data, information, codes specifications and other document whatsoever supporting the bid or otherwise exchanged under the Contract shall be in English. In the event that any technical documentation is in any language other than English, the document should be translated and presented to the OWNER/Engineer-in-Charge in English and English document/translated document shall be regarded as the only authentic document.

IN WITNESS WHEREOF the parties hereto have executed this Contract in duplicate the place, day and year first above written.

SIGNED AND DELIVERED

for and on behalf of
INDIAN OIL CORPORATION LTD.
by.....

In the presence of :

1.

2.

SIGNED AND DELIVERED

for and on behalf of..... (CONTRACTOR)

by..... (this day of..... 2000)

**Annexure 2**

**Format for Bank Guarantee in Lieu of EMD**
**(please attach)**

**Annexure 3**

**Format for Bank Guarantee in Lieu of Security Deposit/ Initial Security Deposit (please attach)**

**Annexure 4**

## Format for Bank Guarantee For Mobilisation Advance (please attach)

**Annexure 5**

## Format for Insurance Surety Bond
## (please attach)

## Annexure 6

### Proforma for furnishing details on proceedings under Insolvency and Bankruptcy Code, 2016

Contract /LOA/WO No: xxxxx xxxxx

Job Name: xxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxx Bidder/Contractor Name: xxxxxxxxxxxxxxxxx

I/We hereby declare that:

[Application for initiation of CIRP/ liquidation/ bankruptcy proceedings (*strike off whichever is not applicable*) has been filed against me/us by [*Insert name of the creditor which has filed the application*], the details of which are attached, including copy of the relevant petition

OR

Application for initiation of CIRP/ liquidation/ bankruptcy proceedings (*strike off whichever is not applicable*) filed by [*Insert name of the creditor which has filed the application*] has been admitted against me/us by [*Insert name of NCLT/DRT*] on [*Insert date*] the details of which are attached, including copy of the relevant petition along with the order admitting the said petition

OR

I/We have obtained [*insert details of the approval i.e., board/ shareholders' resolution or approval by any other name*] for initiation of voluntary CIRP/ liquidation/ bankruptcy proceedings (*strike off whichever is not applicable*), the details of which are attached, including copy of the relevant approval/resolution (strike out which ever is not applicable)

It is understood that if this declaration is found to be false, Indian Oil Corporation Limited shall have the right to reject my bid and forfeit the EMD, and if the bid has resulted in a contract, the contract will be liable for termination, without any liability on the part of Indian Oil Corporation Limited, and such termination would be without prejudice to any other right or remedy (including black listing or holiday listing) available to Indian Oil Corporation Limited.

Place: Signature of Bidder/Contractor

Date: Name of Signatory

**Annexure ESG I**

[Company Name]
[Company Address]
[City, State, ZIP Code]
[Date]

**Subject: Undertaking on Prevention of Sexual Harassment**

As part of our unwavering commitment to providing a safe, inclusive, and respectful workplace, We M/s [Company Name] hereby affirm its zero-tolerance policy towards sexual harassment and other forms of discrimination. We take the issue of sexual harassment seriously and have implemented strict measures to ensure that our workplace remains free from any behavior that could undermine the dignity, safety, and well-being of our employees.

We are committed to maintaining an environment in which every individual is treated with respect, fairness, and dignity. Sexual harassment in any form, whether physical, verbal, or non-verbal—will not be tolerated. This policy applies to all employees, contractors, visitors, clients, and anyone who interacts with our company.

We undertake to ensure the above policies are in place and complied with by our vendors, contractors and sub-contractors.

**Signed by:**
[Name]
[Title]
[Company Name]

**Annexure ESG II**

[Company Name]
[Company Address]
[City, State, ZIP Code]
[Date]

**Subject: Undertaking on Prevention of Discrimination in the Workplace**

**To whom it may concern**

At **[Company Name]**, we are firmly committed to fostering an inclusive, respectful, and equitable workplace for all employees, regardless of race, color, religion, gender, sexual orientation, gender identity, age, disability, marital status, national origin, or any other characteristic protected by law. We believe that diversity enriches our work environment and enhances our collective success. Discrimination of any kind, whether overt or subtle, is not only unlawful but also contrary to our core values.

We ensure the above policies are in place and complied with by our vendors, contractors and sub-contractors.

In line with our commitment to a discrimination-free workplace, **[Company Name]** hereby provides the above undertaking.

**Signed by:**
[Name]
[Title]
[Company Name]
**Date:**
[Date]

**Annexure ESG III**

**[Company Name]**
[Company Address]
[City, State, ZIP Code]
[Date]

**Subject: Undertaking on Working Conditions**

**To whom it may concern**

At **[Company Name]**, we are dedicated to ensuring that all employees work in conditions that promote health, safety, dignity, and well-being. We recognize that the quality of working conditions directly impacts productivity, morale, and overall success of our organization. As such, we commit to providing an environment that meets or exceeds the standards set forth by relevant labor laws, industry best practices, and ethical guidelines.

We ensure the above policies are in place and complied with by our vendors, contractors and sub-contractors.

In line with this commitment, we hereby provide the above undertaking.

**Signed by:**

[Name]
[Title]
[Company Name]
**Date:**
[Date]

**Annexure ESG IV**

**[Company Name]**
[Company Address]
[City, State, ZIP Code]
[Date]

**Subject: Undertaking on Health and Safety Practices**

To whom it may concern

At **[Company Name]**, we prioritize the health, safety, and well-being of our employees, contractors, and visitors. We recognize that a safe and healthy work environment is essential to our organization's success and to the overall satisfaction and productivity of our workforce. As such, we are committed to maintaining the highest standards of health and safety in compliance with applicable laws and the industry's best practices.

We ensure the above policies are in place and complied with by our vendors, contractors and sub-contractors.

This undertaking outlines our commitment to ensuring the safety and health of all individuals associated with our company, and to continuously improving our safety management systems.

**Signed by:**
[Name]
[Title]
[Company Name]
**Date:**
[Date]

# PPE MATRIX

| | | Head | | | | | | | Respiratory | | Body | | | | | | | | | | Foot | | | Hands | | Others | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SN | ACTIVITY | Goggles | Helmet (A) | Helmet (B) | Ear muff | Half face mask | Welding Shied | Hearing protection (Ear Muff) | Half- face ( mouth, nose ) | SCBA | Apron ( Three Alternative) | Apron ( Two alternative) | Welding Apron | Full Body Harness with energy absobers ( T | Shock abosrbing lanyard double Y type | Restrain lanyard | Rope grab ( in case of vertical life line) | Hydrojetting Suit and face shield Hood | Low Temp Suit | Chemcial Suit | safety shoes (A) | Safety shoe (B) - Electrical | Gum Boot | Gloves ( two Alternatives) | Electrical Gloves | Safety Troch | IFR Suit*** |
| 1 | Work at Height ( Height > 2m) * | - | Y | - | - | - | - | - | - | - | - | - | - | Y | Y | Y | Y | - | - | - | Y | - | - | - | - | - | - |
| 2 | Excavation | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | - | - | - | - |
| 3 | Fire pump operation | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | - | - | - | - |
| 4 | Testing of Pressure guage | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | - | - | - | - |
| 5 | Excavation involving dewatering works | Y | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | Y | - | - | - |
| 6 | Blast Cleaning | Y | Y | - | Y | Y | - | - | Y | - | Y | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | - |
| 7 | Storage of Chemicals, batch preparation and dosing. | Y | - | Y | Y | Y | - | - | - | - | Y | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | - |
| 8 | Painting (confined space) | - | Y | - | - | Y | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |
| 9 | Spray Painting of Cylinders | - | Y | - | - | Y | - | - | - | - | - | Y | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | - |
| 10 | Working in confined space | - | - | Y | - | - | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |
| 11 | Testing of Gas sensor | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | Y | - | - | - |
| 12 | Tank Guaging | | | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |
| 13 | De gassing of LPG cylidner | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |
| 14 | Shuttering works | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | - |
| 15 | Brick masonary | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | - |
| 16 | Handling of battery | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |
| 17 | Loading and unloading Cylinder at Plant floor | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |

| | | Head | | | | | | | Respiratory | | Body | | | | | | | | | | Foot | | | Hands | | Others | Others |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SN | ACTIVITY | Goggles | Helmet (A) | Helmet (B) | Ear muff | Half face mask | Welding Shied | Hearing protection (Ear Muff) | Half- face ( mouth, nose ) | SCBA | Apron ( Three Alternative) | Apron ( Two alternative) | Welding Apron | Full Body Harness with energy absobers ( Two atlernative) | Shock abosrbing lanyard double Y type | Restrain lanyard | Rope grab ( in case of vertical life line) | Hydrojetting Suit and face shield Hood | Low Temp Suit | Chemcial Suit | safety shoes (A) | Safety shoe (B) - Electrical | Gum Boot | Gloves ( two Alternatives) | Electrical Gloves | Safety Troch | IFR Suit*** |
| 18 | Inspection of Underground/Semi buried/aboveground Horizontal tank at AFS/Depot/Terminal after degassing and cleaning. | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |
| 19 | Road work | Y | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | Y | - | - | - |
| 20 | Reinforcement | Y | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | - |
| 21 | Concreting | Y | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | Y | - | - | - |
| 22 | Inspection of vertical tanks (CR/FR) at Depot/Terminal and Vertical CR tank at AFS after degassing and cleaning. | Y | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | Y | - | - | Y |
| 23 | Grass Cutting | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | - | - |
| 24 | Blinding & deblinding work | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | - | Y |
| 25 | Electrical Work | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | Y |
| 26 | Work on HT panel/ system at AFS/Depot/Terminal | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | Y |
| 27 | Working with possibility of splashes of hot, cryogenic or corrosive liquids | Y | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |
| 28 | Handling of Acetylene Gas and O2 Cylinder | Y | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | - | - | - | Y |
| 29 | Welding and cutting works ** | - | - | Y | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y |
| 30 | Tank cleaning | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | Y | - | - | Y |
| 31 | Product pump house operation | Y | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |
| 32 | DG Operation | - | - | Y | - | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | | Y | - | Y |

| | | Head | | | | | | | Respiratory | | Body | | | | | | | | | | | Foot | | | Hands | | Others | Others |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SN | ACTIVITY | Goggles | Helmet (A) | Helmet (B) | Ear muff | Half face mask | Welding Shied | Hearing protection (Ear Muff) | Half- face ( mouth, nose ) | SCBA | Apron ( Three Alternative) | Apron ( Two alternative) | Welding Apron | Full Body Harness with energy absobers ( Two atlernative) | Shock abosrbing lanyard double Y type | Restrain lanyard | Rope grab ( in case of vertical life line) | Hydrojetting Suit and face shield Hood | Low Temp Suit | Chemcial Suit | safety shoes (A) | Safety shoe (B) - Electrical | Gum Boot | Gloves ( two Alternatives) | Electrical Gloves | Safety Troch | IFR Suit*** |
| 33 | Hydro jetting | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y | - | - | Y |
| 34 | Hydrotesting of LPG Cylinder at Plant | Y | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |
| 35 | Dry ice Blasting | - | - | - | - | - | - | - | - | Y | - | - | - | - | - | - | - | - | Y | - | - | - | - | - | - | - | Y |
| 36 | Catalyst replacement in inert atmosphere | - | - | Y | - | - | - | - | - | Y | - | - | - | - | - | - | - | - | - | Y | Y | - | - | Y | | - | Y |
| | Installation of underground Horizontal tanks at retail out let. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Excavation without dewatering | Please refer PPE at SN 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Excavation involving dewatering works | Please refer PPE at SN 5 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Brick masonary | Please refer PPE at SN 15 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 37 | Casting Strip raft /RCC slab | Y | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | - |
| 38 | Lowering of tanks with Hydra | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | - |
| | Painting ( external) | - | Y | - | - | Y | - | - | Y | - | - | Y | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | - |
| 39 | Backfilling | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | - | - | - | - |
| | Exhuming of underground Horizontal tanks at Retail outlets | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 | Degassing of the Empty tank | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | - | - | - | Y |
| 41 | Dismantling of RCC with removal of debris | Y | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | - |
| 42 | Taking out the tank with Hydra | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | - |
| | Backfilling | Please refer PPE at SN 39 | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | Head | | | | | | | Respiratory | | Body | | | | | | | | | | Foot | | | Hands | | Others | Others |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SN | ACTIVITY | Goggles | Helmet (A) | Helmet (B) | Ear muff | Half face mask | Welding Shied | Hearing protection (Ear Muff) | Half- face ( mouth, nose ) | SCBA | Apron ( Three Alternative) | Apron ( Two alternative) | Welding Apron | Full Body Harness with energy absobers ( Two atlernative) | Shock abosrbing lanyard double Y type | Restrain lanyard | Rope grab ( in case of vertical life line) | Hydrojetting Suit and face shield Hood | Low Temp Suit | Chemcial Suit | safety shoes (A) | Safety shoe (B) - Electrical | Gum Boot | Gloves ( two Alternatives) | Electrical Gloves | Safety Troch | IFR Suit*** |
| 43 | Repair of Retail outlet canopy roofing sheets by replacing the damaged sheets. | - | - | Y | - | - | - | - | - | - | - | - | - | Y | - | - | - | - | - | - | Y | - | - | Y | - | - | - |
| 44 | Removal of product/ sludge for cleaning of horizontal tank and its degassing to facilitate inspection. | - | - | Y | - | - | - | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | Y | Y | - | Y | Y |
| 45 | Removal of product/ sludge for cleaning of Vertical tank and its degassing to facilitate inspection. | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | Y | - | Y | Y |
| 46 | Mainline patrolling | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | Y | Y | - | - | - |
| 47 | ON shore Pipeline survey | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | Y | Y | - | - | - |
| | Pigging | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 48 | Pig launching | Y | - | Y | - | - | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |
| 49 | Pig receiving | Y | - | Y | - | - | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |
| 50 | Inspection of Pig after receipt | Y | - | Y | - | - | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |
| 51 | Cleaning of Pig | Y | - | Y | - | - | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |

| | | Head | | | | | | | Respiratory | | Body | | | | | | | | | | Foot | | | Hands | | Others | Others |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SN | ACTIVITY | Goggles | Helmet (A) | Helmet (B) | Ear muff | Half face mask | Welding Shied | Hearing protection (Ear Muff) | Half- face ( mouth, nose ) | SCBA | Apron ( Three Alternative) | Apron ( Two alternative) | Welding Apron | Full Body Harness with energy absobers ( Two atlernative) | Shock abosrbing lanyard double Y type | Restrain lanyard | Rope grab ( in case of vertical life line) | Hydrojetting Suit and face shield Hood | Low Temp Suit | Chemcial Suit | safety shoes (A) | Safety shoe (B) - Electrical | Gum Boot | Gloves ( two Alternatives) | Electrical Gloves | Safety Troch | IFR Suit*** |
| | Leak repair works | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 52 | Gas monitoring ( hazardous area/ Non-hazardous area) | - | - | Y | - | - | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | Y |
| | Excavation | Please refer PPE at SN 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 53 | Temporary repair by clamps or sleeves | Y | - | Y | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | Y | - | - | - | Y |
| | Hot tapping | Y | - | Y | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | Y | - | - | - | Y |
| | Section replacement | Y | - | Y | - | - | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | - | Y | - | - | - | Y |
| 54 | Coating refurbishment of buried pipelines | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | Excavation without dewatering | Please refere PPE at SN 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 55 | Removal of old and damaged coating | - | - | Y | - | - | - | - | - | - | - | Y | - | - | - | - | - | - | - | - | Y | - | - | Y | - | - | - |
| | Cleaning of pipe surface by blast cleaning | Please refere PPE at SN 6 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 56 | Application of primer and cold applied tape | - | - | Y | - | - | - | - | Y | - | - | Y | - | - | - | - | - | - | - | - | Y | - | - | - | Y | - | - |
| 57 | Testing of coating | - | - | Y | - | - | - | - | Y | - | - | Y | - | - | - | - | - | - | - | - | Y | - | - | - | Y | - | - |
| | Backfilling | Please refer PPE at 39 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | * PPE mentioned in activity may not be required simultaneously while working at height. These use shall depend upon type of activity | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ** Helmet to be used in case helmet attachable welding shield is being used | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ***Over and above, IFR Suit to be worn based on hazard identification and risk assessment of the work being done as per clause no. 4.0 of OISD-STD-155, and other dircetions issued by respective Divisions. In case of any contradiction or confusion, the most stringent guidelines are to be followed. | | | | | | | | | | | | | | | | | | | | | | | | | | |