BHAGYANAGAR GAS LIMITED

(A JOINT VENTURE OF HPCL & GAIL)

ELECTRICAL WORKS FOR DEVELOPMENT AND CONSTRUCTION OF CNG MOTHER STATIONS IN HYDERABAD GA

UNDER OPEN DOMESTIC COMPETITIVE BIDDING

Volume II of II

Bid Document No.:
BGL/694/2025-26

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GENERAL TERMS & CONDITIONS OF WORKS CONTRACT

1 PRELIMINARY

1.1 This is a Contract for execution of job as defined in tender document at the specified location

1.2 The tenderer for the abovementioned item of work is the company/ proprietary concern/ individual (as per details & address mentioned in the unpriced bid) and undersigned (digitally) is authorized to submit the bid on behalf of tenderer.

1.3 The terms and conditions mentioned hereunder are the terms and conditions of the Contract for the execution of the work mentioned under item 1.1 above.

1.4 It is the clear understanding between BHAGYANAGAR GAS LIMITED and the tenderer that in case the bid of tenderer is accepted by BHAGYANAGAR GAS LIMITED and an intimation to that effect is so issued and also a Procurement Order is on the tenderer this document shall form part of the Contract between the parties and terms and conditions hereunder would govern the parties interest.

1.5 Interpretation of Contract Documents: All documents forming part of the Contract are to be taken mutually explanatory. Should there be any discrepancy, inconsistency, error or omission in the contract, the decision of the Owner/Engineer- in-Charge/Site-in-Charge shall be the final and the contractor shall abide by the decision. The decision shall not be arbitrable. Works shown upon the drawings but not mentioned in the specification or described in the specifications without being shown on the drawings shall nevertheless be deemed to be included in the same manner as if they are shown in the drawings and described in the specifications.

1.6 Special conditions of Contract : The special conditions of contract, if any provided and whenever and wherever referred to shall be read in conjunction with General Terms and Conditions of contract, specifications, drawings, and any other documents forming part of this contract wherever the context so requires. Notwithstanding the subdivision of the documents into separate sections, parts volumes, every section, part or volume shall be deemed to be supplementary or complementary to each other and shall be read in whole. In case of any misunderstanding arising the same shall be referred to decision of the Owner/ Engineer- in-Charge/Site-in-Charge and their decision shall be final and binding and the decision shall not be arbitrable.

It is the clear understanding that wherever it is mentioned that the Contractor shall do/perform a work and/or provide facilities for the performance of the work, the doing or the performance or the providing of the facilities is at the cost and expenses of the Contractor not liable to be paid or reimbursed by the Owner.

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1.7 The Order of Precedence of documents shall be as follows with document at level 1 having the highest precedence

1. Contract Agreement
2. Detailed Letter of Acceptance along with its enclosures
3. Letter of Award / Fax of Acceptance
4. Job Specifications (specific to particular job only)
5. Drawings
6. Special Conditions of Contract
7. Technical Specifications
8. Instructions to Bidders
9. General Conditions of Contract
10. Other Documents

Any amendment / change order issued after signing of formal contract shall take precedence over respective clauses of the formal contract and its annexures

2. DEFINITIONS

In this contract unless otherwise specifically provided or defined and unless a contrary intention appears from the contract the following words and expressions are used in the following meanings;

2.1 The term "Agreement" wherever appearing in this document shall be read as "Contract".

2.2 The "competent Authority" for the purpose of this Contract shall be the **Managing Director** or any other person so appointed or authorised.

2.3 The "**Managing Director**" shall mean the Managing Director of BHAGYANAGAR GAS LIMITED or any person so appointed, nominated or designated and holding the office of Chairman & Managing Director.

2.4 The "**Change Order**" means an order given in writing by the Engineer-in-Charge or by Owner to effect additions to or deletion from or alterations into the Work.

2.5 The "**Construction Equipment**" means all appliances and equipment of whatsoever nature for the use in or for the execution, completion, operation or maintenance of the work except those intended to form part of the Permanent Work.

2.6 The "**Contract**" between the Owner and the Contractor shall mean and include all documents like enquiry, tender submitted by the contractor and the procurement order issued by the owner and other documents connected with the issue of the procurement order and orders, instruction, drawings, change orders, directions issued by the Owner/Engineer-in-Charge/Site-in-Charge for the execution, completion and commissioning of the works and the period of contract mentioned in the Contract including such periods of time extensions as may be granted by the owner at the request of the contractor and such period of time for which the work is continued by the contractor for purposes of completion of the work.

2.7 "**The Contractor**" means the person or the persons, firm or Company whose tender has been accepted by the Owner and includes the Contractor's legal heirs, representative, successor(s) and permitted assignees.

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2.8 The "**Drawings**" shall include maps, plans and tracings or prints thereof with any modifications approved in writing by the Engineer-in-Charge and such other drawings as may, from time to time, be furnished or approved in writing by the Engineer-in-Charge.

2.9 The "**Engineer-in-Charge or Site-in-Charge**" shall mean the person appointed or designated as such by the Owner and shall include those who are expressly authorised by the owner to act for and on its behalf.

2.10 "**The Owner**" means the **Bhagyanagar Gas Limited (BGL)** incorporated in India having its Registered office at **Basheerbagh, Hyderabad, Telangana** and Marketing office at the address mentioned for this purpose in the tender header or their successors or assignees.

2.11 The "**Permanent Work**" means and includes works which form a part of the work to be handed over to the Owner by the Contractor on completion of the contract.

2.12 The "**Project Manager**" shall mean the Project Manager of **BGL/ PMC**, or any person so appointed, nominated or designated.

2.13 The "**Site**" means the land on which the work is to be executed or carried out and such other place(s) for purpose of performing the Contract.

2.14 The "**Specifications**" shall mean the various technical and other specifications attached and referred to in the tender documents. It shall also include the latest editions, including all addenda/corrigenda or relevant Indian Standard Specifications and Bureau Of Indian Standards.

2.15 The "Sub-Contractor" means any person or firm or Company (other than the Contractor) to whom any part of the work has been entrusted by the Contractor with the prior written consent of the Owner/Engineer-in-Charge/Site-in- Charge and their legal heirs, representatives, successors and permitted assignees of such person, firm or Company.

2.16 The "Temporary Work" means and includes all such works which are a part of the contract for execution of the permanent work but does not form part of the permanent work confirming to practices, procedures applicable rules and regulations relevant in that behalf.

2.17 The "Tender" means the document submitted by a person or authority for carrying out the work and the Tenderer means a person or authority who submits the tender offering to carry out the work as per the terms and conditions.

2.18 The "Work" shall mean the works to be executed in accordance with the Contract or part thereof as the case may be and shall include extra, additional, altered or substituted works as maybe required for the purposes of completion of the work contemplated under the Contract.

3. SUBMISSION OF TENDER

3.1 Before submitting the Tender, the Tenderer shall at their own cost and expenses visit the site, examine and satisfy as to the nature of the existing roads, means of communications, the character of the soil, state of land and of the excavations, the correct dimensions of the work facilities for procuring various construction and other material and their availability, and shall obtain information on all matters and conditions as they may feel necessary for the execution of the works as intended by the Owners and shall also satisfy of the availability of suitable water for construction of civil works and for drinking purpose and power required for fabrication work etc. Tenderer, whose tender may be accepted and with whom the Contract is entered into shall not be eligible and be able to make any

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claim on any of the said counts in what so ever manner for what so ever reasons at any point of time and such a claim shall not be raised as a dispute and shall not be arbitrable.

A pre-bid meeting may be held as per the schedule mentioned in the tender.

3.2 The Tenderer shall be deemed to have satisfied fully before tendering as to the correctness and sufficiency of his tender for the works and of the rates and prices quoted in the schedule of quantities which rates and prices shall except as otherwise provided cover all his obligations under the contract.

3.3 It must be clearly understood that the whole of the conditions and specifications are intended to be strictly enforced and that no work will be considered as extra work and allowed and paid for unless they are clearly outside the scope, spirit, meaning of the Contract and intent of the Owner and have been so ordered in writing by Owner and/or Engineer-in-Charge/Site-in-Charge, whose decision shall be final and binding.

3.4 Before filling the Tender the Contractor will check and satisfy all drawings and materials to be procured and the schedule of quantities by obtaining clarification from the Owner on all the items as may be desired by the Tenderer. No claim for any alleged loss or compensation will be entertained on this account, after submission of Tender by the Tenderer/Contractor and such a claim shall not be arbitrable.

3.5 Unless specifically provided for in the tender documents or any Special Conditions, no escalation in the Tender rates or prices quoted will be permitted throughout the period of contract or the period of actual completion of the job whichever is later on account of any variation in prices of materials or cost of labour or due to any other reasons. Claims on account of escalation shall not be arbitrable.

3.6 The quantities indicated in the Tender are approximate. The approved schedule of rates of the contract will be applicable for variations upto plus or minus 25% of the contract value. No revision of schedule of rates will be permitted for such variations in the contract value, including variations of individual quantities, addition of new items, alterations, additions/deletions or substitutions of items, as mentioned above. Quantities etc. mentioned and accepted in the joint measurement sheets shall alone be final and binding on the parties.

3.7 Owner reserve their right to award the contract to any tenderer and their decision in this regard shall be final. They also reserve their right to reject any or all tenders received. No disputes could be raised by any tenderer(s) whose tender has been rejected.

3.8 The Rates quoted by the Tenderer shall include Costs and expenses on all counts viz. cost of materials, transportation of machine(s), tools, equipments, labour, power, Administration charges, price escalations, profits, etc. except to the extent of the cost of material(s), if any, agreed to be supplied by Owner and mentioned specifically in that regard in condition of Contract, in which case, the cost of such material if taken for preparation of the Contractor's Bill(s) shall be deducted before making payment of the Bill(s) of the Contractor. The description given in the schedule of quantities shall unless otherwise stated be held to include wastage on materials, carriage and cartage, carrying in and return of empties, hoisting, setting, fitting and fixing in position and all other expenses necessary in and for the full and complete execution and completion of works and in accordance with good practice and recognised principles in that regard.

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3.9 Any person not complying with those rules etc. but submitting the tender in violation of such rules, after being so noticed shall be liable for the forfeiture of the Earnest Money Deposit made with the tender, termination of Contract and sufferance on account of forfeiture of Security Deposit and sufferance of damages arising as a result of termination of Contract.

3.10 Void

3.11 The prices quoted by the Tenderer shall be firm during the validity period of the bid and Tenderer agrees to keep the bid alive and valid during the said period. The Tenderers shall particularly take note of this factor before submitting their tender(s).

3.12 The works shall be carried out strictly as per approved specifications. Deviations, if any, shall have to be authorised by the Engineer-in-Charge/Site-in-Charge in writing prior to implementing deviations. The price benefit, if any, arising out of the accepted deviation shall be passed on to the Owner(i.e. BGL). The decision of Engineer- in-Charge shall be final in this matter.

3.13 The contractor shall make all arrangements at his own cost to transport the required materials outside and inside the working places and leaving the premises in a neat and tidy condition after completion of the job to the satisfaction of Owner. All materials except those agreed to be supplied by the Owner shall be supplied by the contractor at his own cost and the rates quoted by the Contractor should be inclusive of all royalties, rents, taxes, duties, statutory levies, if any, etc.

3.14 The Contractor shall not carry on any work other than the work under this Contract within the Owner's premises without prior permission in writing from the Engineer- in- Charge/Site-in-charge.

3.15 The Contractor shall be bound to follow and ensure compliance to all the safety and security regulations and other statutory rules applicable to the area. In the event of any damage or loss or sufference caused due to non-observance of such rules and regulations, the contractor shall be solely responsible for the same and shall keep the Owner indemnified against all such losses and claims arising from the same.

3.16 At any time after acceptance of tender, the Owner reserves the right to add, amend or delete any work item, the bill of quantities at a later date or reduce the scope of work in the overall interest of the work by prior discussion and intimation to the Contractor. The decision of Owner, with reasons recorded therefor, shall be final and binding on both the Owner and the Contractor. The Contractor shall not have right to claim compensation or damage etc. in that regard. The Owner reserves the right to split the work under this contract between two or more contractors without assigning any reasons.

3.17 Contractor shall not be entitled to sublet, sub contract or assign, the work under this Contract without the prior consent of the Owner obtained in writing.

3.18 All signatures in tender document shall be dated as well as all the pages of all sections of the tender documents shall be initialed at the lower position and signed, wherever required in the tender papers by the Tenderer or by a person holding Power of Attorney authorising

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him to sign on behalf of the tenderer before submission of tender.

3.19 The tender should be quoted in English, both in figures as well as in words. The rates and amounts tendered by the Tenderer in the Schedule of rates for each item and in such a way that insertion is not possible. The total tendered amount should also be indicated both in figures and words with the signature of tenderer.

If some discrepancies are found between the rates given in words and figures of the amount shown in the tender, the following procedure shall be applied :

(a) When there is a difference between the rates in figures and words, the rate which corresponds to the amount worked out by the tenderer shall be taken as correct.

(b) When the rate quoted by the tenderer in figures and words tallies but the amount is incorrect, the rate quoted by the tenderer shall be taken as correct.

(c) When it is not possible to ascertain the correct rate in the manner prescribed above the rate as quoted in words shall be adopted.

3.20 All corrections and alterations in the entries of tender paper will be signed in full by the tenderer with date. No erasures or over writings are permissible.

3.21 Transfer of tender document by one intending tenderer to the another one is not permissible. The tenderer on whose name the tender has been sent only can quote.

3.22 The Tender submitted by a tenderer if found to be incomplete in any or all manner is liable to be rejected. The decision of the Owner in this regard is final and binding.

DEPOSITS

a) **SECURITY DEPOSIT:**

The tenderer, with whom the contract is decided to be entered into and intimation is so given will have to make a security deposit of @10% of the total contract value in the form of account payee crossed demand draft drawn in favour of the Owner, within 30 days from the date of intimation of acceptance of their tender, failing which the Owner reserves the right to cancel the Contract and forfeit the EMD.

Composite Performance Bank Guarantee (CPBG) valid upto a period of 3 months beyond the expiry of defect liability period.

All the works shall be executed in strict conformity with the provisions of the contract documents and with such explanatory details, drawings, specifications and instructions as may be furnished from time to time to the Contractor by the Engineer-in-Charge/ Site- in-Charge, whether mentioned in the Contract or not. The Contractor shall be responsible for ensuring that works throughout are executed in the most proper and workman- like manner with the quality of material and workmanship in strict accordance with the specifications and to the entire satisfaction of the Engineer-in- Charge/Site-in-Charge.

The completion of work may entail working in monsoon also. The contractor must maintain the necessary work force as may be required during monsoon and plan to execute the job in such a way the entire project is completed within the contracted time schedule. No extra charges shall be payable for such work during monsoon. It shall be the responsibility of the contractor to keep the construction work site free from water during and off the monsoon period at his own cost

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and expenses.
For working on Sundays/Holidays, the contractor shall obtain the necessary permission from Engineer Incharge/Site Incharge in advance, no extra amount shall be payable by the owner on this account. The contractor shall be permitted to work beyond the normal hours with prior approval of Engineer-In-Charge/Site-In-Charge and the contractors quoted rate is inclusive of all such extended hours of working and no extra amount shall be payable by the owner on this account.

5.a. SETTING OUT OF WORKS AND SITE INSTRUCTIONS

5.a.1. The Engineer-in-Charge/Site-in-Charge shall furnish the Contractor with only the four corners of the work site and a level bench mark and the Contractor shall set out the works and shall provide an efficient staff for the purpose and shall be solely responsible for the accuracy of such setting out.

5.a.2. The Contractor shall provide, fix and be responsible for the maintenance of all necessary stakes, templates, level marks, profiles and other similar things and shall take all necessary precautions to prevent their removal or disturbance and shall be responsible for consequences of such removal or disturbance should the same take place and for their efficient and timely reinstatement. The Contractor shall also be responsible for the maintenance of all existing survey marks, either existing or supplied and fixed by the Contractor. The work shall be set out to the satisfaction of the Engineer-in-Charge/Site-in-Charge. The approval thereof or joining in setting out the work shall not relieve the Contractor of his responsibility.

5.a.3. Before beginning the works, the Contractor shall, at his own cost, 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 the scheme, for bearing marks acceptable to the Engineer-in-Charge/Site-in- Charge. The Centre longitudinal or face lines and cross lines shall be marked by means of small masonary pillars. Each pillar shall have distinct marks at the centre to enable theodolite to be set over it. No work shall be started until all these points are checked and approved by the Engineer-in-Charge/Site-in- Charge in writing. But such approval shall not relieve the contractor of any of his responsibilities. The Contractor shall also provide all labour, materials and other facilities, as necessary, for the proper checking of layout and inspection of the points during construction.

5.a.4. Pillars bearing geodetic marks located at the sites of units of works under construction should be protected and fenced by the Contractor.

5.a.5. On completion of works, the contractor shall submit the geodetic documents according to which the work was carried out.

5.a.6. The Engineer-in-Charge/Site-in-Charge shall communicate or confirm his instructions to the contractor in respect of the executions of work in a "work site order book" maintained in the office having duplicate sheet and the authorised representative of the contractor shall confirm receipt of such instructions by signing the relevant entries in the book.

5.a.7. All instructions issued by the Engineer-in-Charge/Site-in-Charge shall be in writing. The Contractor shall be liable to carry out the instructions without fail.

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5.a.8. If the Contractor after receipt of written instruction from the Engineer-in-Charge/ Site-in-Charge requiring compliance within seven days fails to comply with such drawings or 'instructions' or both as the Engineer-in-Charge/Site-in-Charge may issue, owner may employ and pay other persons to execute any such work whatsoever that may be necessary to give effect to such drawings or `instructions' and all cost and expenses incurred in connection therewith as certified by the Engineer-in-Charge/ Site-in-Charge shall be borne by the contractor or may be deducted from amounts due or that may become due to the contractor under the contract or may be recovered as a debt.

5.a.9. The Contractor shall be entirely and exclusively responsible for the horizontal and vertical alignment, the levels and correctness of every part of the work and shall rectify effectually any errors or imperfections therein. Such rectifications shall be carried out by the Contractor, at his own cost.

5.a.10. In case any doubts arise in the mind of the Contractor in regard to any expressions, interpretations, statements, calculations of quantities, supply of material rates, etc. the contractor shall refer the same to the Site-in-Charge/ Engineer-in-Charge for his clarification, instructions, guidance or clearing of doubts. The decision of the Engineer-in-Charge/Site-in-Charge shall be final and the contractor shall be bound by such a decision.

5.a.11. "The Contractor shall take adequate precautions, to ensure that his operations do not create nuisance or misuse of the work space that shall cause unnecessary disturbance or inconvenience to others at the work site".

5.a.12. "All fossils, coins articles of value of antiquity and structure or other remains of geological or archaeological discovered on the site of works shall be declared to be the property of the Owner and Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing or damaging any such articles or thing and shall immediately inform the Owner/ Engineer-in-Charge/Site-in-Charge."

5.a.13. "Contractor will be entirely and exclusively responsible to provide and maintain at his expenses all lights, guards, fencing, etc. when and where even necessary or/as required by the Engineer-in-Charge/Site-in-Charge for the protection of works or safety and convenience to all the members employed at the site or general public."

5.b. COMMENCEMENT OF WORK

The contractor shall after paying the requisite security deposit, commence work within 15 days from the date of receipt of the intimation of intent from the EIC/ Owner informing that the contract is being awarded. The date of intimation shall be the date/day for counting the starting day/date and the ending day/date will be accordingly calculated. Penalty, if any, for the delay in execution shall be calculated accordingly.

Contractor should prepare detailed fortnightly construction programme for approval by the Engineer-in-Charge within one month of receipt of Letter Of Intent. The work shall be executed strictly as per such time schedule. The period of Contract includes the time required for

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testing, rectifications, if any, re-testing and completion of work in all respects to the entire satisfaction of the Engineer-in-Charge.

A Letter of Intent is an acceptance of offer by the Owner and it need not be accepted by the contractor. But the contractor should acknowledge a receipt of the purchase order within 07 days of mailing of Purchase Order and any delay in acknowledging the receipt will be a breach of contract and compensation for the loss caused by such breach will be recovered by the Owner by forfeiting earnest money deposit/bid bond**.**

5.c. SUBLETTING OF WORK

5.c.1. No part of the contract nor any share or interest thereof shall in any manner or degree be transferred, assigned or sublet, by the Contractor, directly or indirectly to any firm or corporation whatsoever, without the prior consent in writing of the Owner.

5.c.2. At the commencement of every month the Contractor shall furnish to the Engineer-in-charge/Site-in-Charge list of all sub-contractors or other persons or firms engaged by the Contractor.

5.c.3 The contract agreement will specify major items of supply or services for which the Contractor proposes to engage sub-Contractor/sub-Vendor. The contractor may from time to time propose any addition or deletion from any such list and will submit the proposals in this regard to the Engineer-in-charge/Designated officer-in-charge for approval well in advance so as not to impede the progress of work. Such approval of the Engineer-in-charge/Designated officer-in-charge will not relieve the contractor from any of his obligations, duties and responsibilities under the contract.

5.c.4. Notwithstanding any sub-letting with such approval as resaid and notwithstanding that the Engineer-in-Charge shall have received copies of any sub-contract, the Contractor shall be and shall remain solely to be responsible for the quality and proper and expeditious execution of the works and the performance of all the conditions of the contract in all respects as if such subletting or sub-contracting had not taken place and as if such work had been done directly by the Contractor.

5.c.5 Prior approval in writing of the Owner shall be obtained before any change is made in the constitution of the contractor/Contracting agency otherwise contract shall be deemed to have been allotted in contravention of clause entitled “sub-letting of works” and the same action may be taken and the same consequence shall ensue as provided in the clause of “sub- letting of works”.

5.d EXTENSION OF TIME

1) If the Contractor anticipates that he will not be able to complete the work within the contractual delivery/ completion date (CDD), then the Contractor shall make a request for

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grant of time extension clearly specifying the reasons for which he seeks extension of time and demonstrating as to how these reasons were beyond the control of the contractor or attributable to the Owner. This request should be made well before the expiry of the Contractual Delivery/ Completion Date (CDD).

2) The concerned Competent authority of the Owner shall expeditiously decide upon the request for time extension and decide the levy of price reduction within a maximum period of 6 months from the CDD or date of receipt of the request, whichever is earlier.

3) Grant of any extension of time shall be by means of issuance of a Change Order.

4) void

5.e. SUSPENSION OF WORKS

5.e.1. Subject to the provisions of this contract, the contractor shall if ordered in writing by the Engineer- in-Charge/Site-in-Charge for reasons recorded suspend the works or any part thereof for such period and such time so ordered and shall not, after receiving such, proceed with the work therein ordered to suspended until he shall have received a written order to re-start. The Contractor shall be entitled to claim extension of time for that period of time the work was ordered to be suspended. Neither the Owner nor the Contractor shall be entitled to claim compensation or damages on account of such an extension of time.

5.e.2. In case of suspension of entire work, ordered in writing by Engineer-in- Charge/Site-in-Charge, for a period of 30 days, the Owner shall have the option to terminate the Contract as provided under the clause fortermination. The Contractor shall not be at liberty to remove from the site of the works any plant or materials belonging to him and the Employer shall have lien upon all such plant and materials.

5.e.3. The contractor shall, in case of suspension have the right to raise a dispute and have the same arbitrated but however, shall not have the right to have the work stopped from further progress and completion either by the owner or through other contractor appointed by the owner.

5.f. OWNER MAY DO PART OF WORK

Not withstanding anything contained elsewhere in this contract, the owner upon failure of the Contractor to comply with any instructions given in accordance with the provisions of this contract, may instead of Contract and undertaking charge of entire work, place additional labour force, tools, equipment and materials on such parts of the work, as the Owner may decide or engage another Contractor to carryout the balance of work. In such cases, the Owner shall have the right to deduct from the amounts payable to the Contractor the difference in cost of such work and materials with ten percent overhead added to cover all departmental charges. Should the total amount thereof exceed the amount due to the contractor, the Contractor shall pay the difference to the Owner within 15 days of making demand for payment failing which the Contractor shall be liable to pay interest at 24% p.a. on such amounts till the date of payment.

5.g. INSPECTION OF WORKS

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5.g.1. The Engineer-in-Charge/Site-in-Charge and Officers from Central or State Government will have full power and authority to inspect the works at any time wherever in progress, either on the site or at the Contractor's premises/workshops of any person, firm or corporation where work in connection with the contract may be in hand or where the materials are being or are to be supplied, and the Contractor shall afford or procure for the Engineer-in- Charge/Site-in-Charge every facility and assistance to carryout such inspection. The Contractor shall, at all times during the usual working hours and at all other times at which reasonable notice of the intention of the Engineer-in-Charge/Site-in- Charge or his representative to visit the works shall have been given to the Contractor, either himself be present to receive orders and instructions, or have a responsible agent, duly accredited in writing, present for the purpose. Orders given to the Contractor's agent shall be considered to have the same force as if they had been given to the Contractor himself. The Contractor shall give not less than seven days notice in writing to the Engineer-in-Charge/Site-in-Charge before covering up or otherwise placing beyond reach of inspection and measurement any work in order that the same may be inspected and measured. In the event of breach of above, the same shall be uncovered at Contractor's expense for carrying out such measurement and/or inspection.

5.g.2. No material shall be removed and despatched by the Contractor from the site without the prior approval in writing of the Engineer-in-charge. The contractor is to provide at all times during the progress of the work and the maintenance period proper means of access with ladders, gangways, etc. and the necessary attendance to move and adapt as directed for inspection or measurements of the works by the Engineer-in-Charge/Site-in-Charge.

5.h. SAMPLES

5.h.1. The contractor shall furnish to the Engineer-in-charge/Site-in-Charge for approval when requested or required adequate samples of all materials and finishes to be used in the work.

5.h.2. Samples shall be furnished by the Contractor sufficiently in advance and before commencement of the work so as the Owner can carry out tests and examinations thereof and approve or reject the samples for use in the works. All material samples furnished and finally used/applied in actual work shall fully be of the same quality of the approved samples.

5.i. TESTS FOR QUALITY OF WORK

5.i.1. All workmanship shall be of the respective kinds described in the contract documents and in accordance with the instructions of the Engineer-in-Charge / Site- in- Charge and shall be subjected from time to time to such tests at Contractor's cost as the Engineer-in-Charge/Site-in-Charge may direct at the place of manufacture or fabrication or on the site or at all or any such places. The Contractor shall provide assistance, instruments, labour and materials as are normally required for examining, measuring and testing any workmanship as may be selected and required by the Engineer-in-Charge/Site-in-Charge.

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5.i.2. All the tests that will be necessary in connection with the execution of the work as decided by the Engineer-in- charge/Site-in-Charge shall be carried out at the contractors cost and expenses.

5.i.3. If any tests are required to be carried out in connection with the work or materials or workmanship to be supplied by the owner, such tests shall be carried out by the Contractor as per instructions of Engineer-in-Charge/Site-in-Charge and expenses for such tests, if any, incurred by the contractor shall be reimbursed by the Owner. The contractor should file his claim with the owner within 15 (fifteen) days of inspection/test and any claim made beyond that period shall lapse and be not payable.

5.j. ALTERATIONS AND ADDITIONS TO SPECIFICATIONS, DESIGNS AND WORKS

5.j.1. The Engineer-in-Charge/Site-in-Charge shall have powers to make any alterations, additions and/or substitutions to the schedule of quantities, the original specifications, drawings, designs and instructions that may become necessary or advisable or during the progress of the work and the Contractor shall be bound to carryout such altered/extra/new items of work in accordance with instructions which may be given to him in writing signed by the Engineer-in- Charge/Site- in-Charge. Such alterations, omissions, additions or substitutions shall not invalidate the contract. The altered, additional or substituted work which the Contractor may be directed to carryon in the manner as part of the work shall be carried out by the Contractor on the same conditions in all respects on which he has agreed to do the work. The time for completion of such altered added and/or substituted work may be extended for that part of the particular job. The rates for such additional altered or substituted work under this Clause shall, be worked out in accordance with the following provisions:

5.j.2. If the rates for the additional, altered or substituted work are specified in the contract for similar class of work, the Contractor is bound to carryout the additional, altered or substituted work at the same rates as are specified in the contract.

5.j.3. If the rates for the additional, altered or substituted work are not specifically provided in the contract for the work, the rates will be derived from the rates for similar class of work as are specified in the contract for the work. In the opinion of the Engineer-in- Charge/Site-in-Charge as to whether or not the rates can be reasonably so derived from the items in this contract, will be final and binding on the Contractor.

5.j.4. If the rates for the altered, additional or substituted work cannot be determined in the manner specified above, then the Contractor shall, within seven days of the date of receipt of order to carry out the work, inform the Engineer-in-Charge/ Site-in-Charge of the rate at which he intends to charge for such class of work, supported by analysis of the rate or rates claimed and the Engineer-In-Charge/ Site-in-Charge shall determine the rates on the basis of the prevailing market rates for both material and labour plus 10% to cover overhead and profit of labour rates and pay the Contractor accordingly. The opinion of the Engineer-in- Charge/Site-in-Charge as to current market rates of materials and the quantum of labour involved per unit of measurement will be final and binding on the contractor.

5.j.5. In case of any item of work for which there is no specification supplied by the Owner and is mentioned in the tender documents, such work shall be carried out in accordance

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with Indian Standard Specifications and if the Indian Standard Specifications do not cover the same, the work should be carried out as per standard Engineering Practice subject to the approval of the Engineer-in-Charge/ Site-in-Charge.

5.k. PROVISIONAL ACCEPTANCE

Acceptance of sections of the works for purposes of equipment erection, piping, electrical work and similar usages by the Owner and payment for such work or parts of work shall not constitute a waiver of any portion of this contract and shall not be construed so as to prevent the Engineer from requiring replacement of defective work that may become apparent after the said acceptance and also shall not absolve the Contractor of the obligations under this contract. It is made clear that such an acceptance does not indicate or denote or establish to the fact of execution of that work or the Contract until the work is completed in full in accordance with the provisions of this Contract.

5.l. COMPLETION OF WORK AND COMPLETION CERTIFICATE

As soon as the work is completed in all respects, the contractor shall give notice of such completion to the site in charge or the Owner and within thirty days of receipt of such notice the site in charge shall inspect the work and shall furnish the contractor with a certificate of completion indicating:

a) defects, if any, to be rectified by the contractor

b) items, if any, for which payment shall be made in reduced rates

c) the date of completion.

5.m. USE OF MATERIALS AND RETURN OF SURPLUS MATERIALS

5.m.1. Notwithstanding anything contained to the contrary in any or all of the clauses of this contract, where any materials for the execution of the contract are procured with the assistance of Government either by issue from Government stocks or procurement made under orders or permits or licences issued by Government, the contractor shall use the said materials economically and solely for the purpose of the contract and shall not dispose them of without the permission of the Owner.

5.m.2. All surplus(serviceable) or unserviceable materials that may be left over after the completion of the contract or at its termination for any reason whatsoever, the Contractor shall deliver the said product to the Owner without any demur. The price to be paid to the Contractor, if not already paid either in full or in part, however, shall not exceed the amount mentioned in the Schedule of Rates for such material and in cases where such rates are not so mentioned, shall not exceed the CPWD scheduled rates. In the event of breach of the aforesaid condition the contractor shall become liable for contravention of the terms of the Contract.

5.m.3. The surplus (serviceable) and unserviceable products shall be determined by joint measurement. In case where joint measurement has failed to take place, the Owner may measure the same and determine the quantity.

5.m.4. It is made clear that the Owner shall not be liable to take stock and keep possession and pay for the surplus and unserviceable stocks and the Owner may direct the Contractor to take back such material brought by the Contractor and becoming surplus and which the Owner may decide to keep and not to pay for the same.

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5.n. DEFECT LIABILITY PERIOD

The contractor shall guarantee the work executed for a period of 12 months from the date of completion of the job. Any damage or defect that may arise or lie undiscovered at the time of completion of the job shall be rectified or replaced by the contractor at his own cost. The decision of the Engineer In-charge/Site-Incharge/Owner shall be the final in deciding whether the defect has to be rectified or replaced.

Equipment or spare parts replaced under warranty/guarantees shall have further warranty for a mutually agreed period from the date of acceptance.

The owner shall intimate the defects noticed in writing by a Registered or otherwise and the contractor within 15 days of receipt of the intimation shall start the rectification work and complete within the time specified by the owner failing which the owner will get the defects rectified by themselves or by any other contractor and the expenses incurred in getting the same done shall be paid by the Contractor under the provision of the Contract.

Thus, defect liability is applicable only in case of job/works contract (civil, mechanical, electrical, maintenance etc.) where any damage of defect may arise in future (i.e. within 12 months from the date of completion of job) or lie undiscovered at the time of completion of job.

In other words, in case of service contracts (like car hire etc.) where there is no question of damage or defect arising in future, the defect liability clause is not applicable.

Equipment or spare parts replaced under warranty/guarantees shall have further warranty for 12 months from the date of acceptance. However, in no case will the warranty exceed 24 months from the date of start of the original warranty.

5.o. DAMAGE TO PROPERTY

5.o.1. Contractor shall be responsible for making good to the satisfaction of the Owner any loss of and any damage to all structures and properties belonging to the Owner or being executed or procured by the Owner or of other agencies within the premises of the work of the Owner, if such loss or damage is due to fault and/or the negligence or willful acts or omission of the Contractor, his employees, agents, representatives or sub-contractors.

5.o.2. The Contractors shall indemnify and keep the Owner harmless of all claims for damage to Owner's property arising under or by reason of this contract.

5.p. LIMITATION OF LIABILITY

Notwithstanding anything contrary contained herein, the aggregate total liability of Seller, excluding his liability towards infringement of patent, trade mark or industrial design rights under the contract or otherwise shall be limited to 100% of value of Purchase order. However, neither party shall be liable to the other party for any indirect and consequential damages, loss of profits or loss of production.

5. DUTIES AND RESPONSIBILITIES OF CONTRACTOR

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6. a. *EMPLOYMENT LIABILITY TOWARDS WORKERS EMPLOYED BY THE CONTRACTOR*

6.a.1 The Contractor shall be solely and exclusively responsible for engaging or employing persons for the execution of work. All persons engaged by the contractor shall be on Contractor's payroll and paid by Contractor. All disputes or differences between the Contractor and his/their employees shall be settled by Contractor.

6.a.2. Owner has absolutely no liability whatsoever concerning the employees of the Contractor. The Contractor shall indemnify Owner against any loss or damage or liability arising out of or in the course of his/their employing persons or relation with his/their employees. The Contractor shall make regular and full payment of wages and on any complaint by any employee of the Contractor or his sub contractor regarding non-payment of wages, salaries or other dues, Owner reserves the right to make payments directly to such employees or sub- contractor of the Contractor and recover the amount in full from the bills of the Contractor and the contractor shall not claim any compensation or reimbursement thereof. The Contractor shall comply with the Minimum Wages Act applicable to the area of work site with regard to payment of wages to his employees and also to employees of his sub contractor.

6.a.3. The Contractor shall advise in writing or in such appropriate way to all of his employees and employees of sub-contractors and any other person engaged by him that their appointment/employment is not by the Owner but by the Contractor and that their present appointment is only in connection with the construction contract with Owner and that therefore, such an employment/appointment would not enable or make them eligible for any employment/appointment with the Owner either temporarily or/and permanent basis.

6.b. *NOTICE TO LOCAL BODIES*

The contractor shall comply with and give all notices required under any Government authority, instruction, rule or order made under any act of parliament, state laws or any regulations or by-laws of any local authority relating to the works.

6.c. *FIRST AID AND INDUSTRIAL INJURIES*

6.c.1 Contractor shall maintain first aid facility for his employees and those of his sub-contractors.

6.c.2. Contractor shall make arrangements for ambulance service and for the treatment of all types of injuries. Names and telephone numbers of those providing such services shall be furnished to Owner prior to start of construction and their name board shall be prominently displayed in Contractor's field office.

6.c.3. All industrial injuries shall be reported promptly to owner and a copy of contractor's report covering each personal injury requiring the attention of a physician shall be

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furnished to the Owner.

6.d. SAFETY CODE

6.d.1. The Contractor shall at his own expenses arrange for the Safety provisions as may be necessary for the execution of the work or as required by the Engineer-in-Charge in respect of all labours directly or indirectly employed for performance of the works and shall provide all facilities in connections therewith. In case the contractor fails to make arrangements and provide necessary facilities as aforesaid, the Owner shall be entitled to do so and recover the cost thereof from the Contractor.

6.d.2. From the commencement to the completion of the works, the contractor shall take full responsibility for the care thereof and of all the temporary works (defined as meaning all temporary works of every kind required in or for the execution, completion or maintenance of the works). In case damage, loss or injury shall happen to the works or to any part thereof or to temporary works or to any cause whatsoever repair at his (Contractor's) own cost and make good the same so that at the time of completion, the works shall be in good order and condition and in conformity in every respect with the requirement of the contract and Engineer-in-Charge's instructions.

6.d.3. In respect of all labour, directly or indirectly employed in the work for the performance of the Contractor's part of this agreement, the contractor shall at his own expense arrange for all the safety provisions as per relevant Safety Codes of C.P.W.D Bureau of Indian Standards, the Electricity Act/I.E. Rules. The Mines Act and such other Acts as applicable.

6.d.4. The Contractor shall observe and abide by all fire and safety regulations of the Owner. Before starting construction work, the Contractor shall consult with Owner's Safety Engineer or Engineer-in-Charge/Site-in-Charge and must make good to the satisfaction of the Owner any loss or damage due to fire to

any portion of the work done or to be done under this agreement or to any of the Owner's existing property.

6.d.5. The Contractor will be fully responsible for complying with all relevant provisions of the Contract Labour Act and shall pay rates of Wages and observe hours of work/conditions of employment according to the rules in force from time to time.

6.d.6. The Contractor will be fully responsible for complying with the provision including documentation and submission of reports on the above to the concerned authorities and shall indemnify the Corporation from any such lapse for which the Government will be taking action against them.

6.d.7. Owner shall on a report having been made by an inspecting Office as defined in the Contract Labour Regulations have the power to deduct from the money due to the Contractor any sum required or estimated to be required for making good the loss suffered by a worker(s) by reasons of non-fulfillment of conditions of contract for the benefit of workers no-payment of wages or of deductions made from his or their wages which are not justified by the terms of contract or non observance of the said contractor's labour Regulation.

6.e. INSURANCE AND LABOUR

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Contractor shall at his own expense obtain and maintain an insurance policy with a Nationalised Insurance Company to the satisfaction of the Owner as provided hereunder.

6.e.1. EMPLOYEES STATE INSURANCE ACT

i. The Contractor agrees to and does hereby accept full and exclusive liability for the compliance with all obligations imposed by Employees State Insurance Act, 1948, and the Contractor further agrees to defend indemnify and hold Owner harmless from any liability or penalty which may be imposed by the Central, State or local authority by reason of any asserted violation by Contractor, or sub-contractor of the Employees' State Insurance Act, 1948 and also from all claims, suits or proceedings that may be brought against the Owner arising under, growing out of or by reason of the work provided for by this contract whether brought by employees of the Contractor, by third parties or by Central or State Government authority or any political sub-division thereof.

ii. The Contractor agrees to file with the Employees State Insurance Corporation, the Declaration forms and all forms which may be required in respect of the Contractor's or sub-contractor's employee whose aggregate emuneration is within the specified limit and who are employed in the work provided or those covered by ESI Act under any amendment to the Act from time to time.

The Contractor shall deduct and secure the agreement of the sub- contractor to deduct the employee's contribution as per the first schedule of the Employee's State Insurance Act from wages and affix the employee's contribution cards at wages payment intervals. The Contractor shall remit and secure the agreement of the sub contractor to remit to the State Bank of India, Employee's State Insurance Corporation Account, the Employee's contribution as required by the Act.

ii. The Contractor agrees to maintain all records as required under the Act in respect of employees and payments and the Contractor shall secure the agreement of the sub contractor to maintain such records. Any expenses incurred for the contributions, making contribution or maintaining records shall be to the Contractor's or sub-contractor's account.

iv. The Owner shall retain such sum as may be necessary from the total contract value until the Contractor shall furnish satisfactory proof that all contributions as required by the Employees State Insurance Act, 1948, have been paid.

v. **WORKMAN'S COMPENSATION AND EMPLOYEE'S LIABILITY INSURANCE**

Provide Insurance for all the Contractor's employees engaged in the performance of this contract. If any of the work is sublet, the Contractor shall ensure that the sub contractor provides workmen's compensation and Employer's Liability Insurance for the latter's employees who are not covered under the Contractor's insurance.

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vi. **AUTOMOBILE LIABILITY INSURANCE**

Contractor shall take out an Insurance to cover all risks to Owner for each of his vehicles plying on works of this contract and these insurances shall be valid for the total contract period. No extra payment will be made for this insurance. Owner shall not be liable for any damage or loss not made good

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by the Insurance Company, should such damage or loss result from unauthorised use of the vehicle. The provisions of the Motor Vehicle Act would apply.

vii. **FIRE INSURANCE**

Contractor shall within two weeks after award of contract insure the Works, Plant and Equipment and keep them insured until the final completion of the Contract against loss or damage by accident, fire or any other cause with an insurance company to be approved by the Employer/Consultant in the joint names of the Employer and the Contractor (name of the former being placed first in the Policy). Such Policy shall cover the property of the Employer only.

6.e.2. ANY OTHER INSURANCE REQUIRED UNDER LAW OR REGULATION OR BY

i. Contractor shall also provide and maintain any and all other insurance which may be required under any law or regulations from time to time. He shall also carry and maintain any other insurance which may be required by the Owner.

ii. The aforesaid insurance policy/policies shall provide that they shall not be cancelled till the Engineer-in-Charge has agreed to their cancellation.

iii. The Contractor shall satisfy to the Engineer-in-Charge/Site-in-Charge from time to time that he has taken out all insurance policies referred to above and has paid the necessary premium for keeping the policies alive till the expiry of the defects liability period.

iv. The contractor shall ensure that similar insurance policies are taken out by his sub-contractor (if any) and shall be responsible for any claims or losses to the Owner resulting from their failure to obtain adequate insurance protections in connection thereof. The contractor shall produce or cause to be proceed by his sub-contractor (if any) as the case may be, the relevant policy or policies and premium receipts as and when required by the Engineer-in-Charge/Site-in-Charge.

v. Contractor shall at his own expense cover all the workmen engaged under him under “Pradhan Mantri Surksha Bima Yojana (PMSBY)” and submit proof of the same to BGL.

6.e.3. LABOUR AND LABOUR LAWS

i. The contractor shall at his own cost employ persons during the period of contract and the persons so appointed shall not be construed under any circumstances to be in the employment of the Owner.

ii. All payments shall be made by the contractor to the labour employed by him in accordance with the various rules and regulations stated above. The contractor shall keep the Owner indemnified from any claims whatsoever inclusive of damages/costs or otherwise arising from injuries or alleged injuries to or death of a person employed by the contractor or damages or alleged damages to the

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property.

iii. No labour below the age of eighteen years shall be employed on the work. The Contractor shall not pay less than what is provided under the provisions of the contract labour (Regulations and Abolition) Act, 1970 and the rules made thereunder and as may be amended from time to time. He shall pay the required deposit under the Act appropriate to the number of workman to be employed by him or through sub contractor and get himself registered under the

Act. He shall produce the required Certificates to the Owner before commencement of the work. The Owner recognises only the Contractor and not his sub contractor under the provisions of the Act. The Contractor will have to submit daily a list of his workforce. He will also keep the wage register at the work site or/and produce the same to the Owner, whenever desired. A deposit may be taken by the Owner from the Contractor to be refunded only after the Owner is satisfied that all workmen employed by the Contractor have been fully paid for the period of work in Owner's premises at rates equal to or better than wages provided for under the Minimum Wages Act. The contractor shall be responsible and liable for any complaints that may arise in this regard and the consequences thereto.

iv. The Contractor will comply with the provisions of the Employee's Provident Fund Act and the Family Pension Act as may be applicable and as amended from time to time.

v. The Contractor will comply with the provisions of the payment of Gratuity Act, 1972, as may be applicable and as amended from time to time.

vi. **IMPLEMENTATION OF APPRENTICES ACT, 1961**

The Contractor shall comply with the provisions of the Apprentices Act, 1961 and the Rules and Orders issued thereunder from time to time. If he fails to do so, his failure will be a breach of the contract and the Engineer-in- Charge may, at his discretion, cancel the contract. The Contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provision of the Act.

vii. **MODEL RULES FOR LABOUR WELFARE**

The Contractor shall at his own expenses comply with or cause be complied with Model rules for Labour Welfare as appended to those conditions or rules framed by the Government from time to time for the protection of health and for making sanitary arrangements for worker employed directly or indirectly on the works. In case the contractor fails to make arrangements as aforesaid the Engineer-in-Charge/Site-in-Charge shall be entitled to do so and recover the cost thereof from the contractor.

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6.f. DOCUMENTS CONCERNING WORKS

6.f.1. All documents including drawings, blue prints, tracings, reproducible models, plans, specifications and copies, thereof furnished by the Owner as well as all drawings, tracings, reproducibles, plans, specifications design calculations etc. prepared by the contractor for the purpose of execution of works covered in or connected with this contract shall be the property of the Owner and shall not be used by the contractor for any other work but are to be delivered to the Owner at the completion or otherwise of the contract.

6.f.2. The Contractor shall keep and maintain secrecy of the documents, drawings etc. issued to him for the execution of this contract and restrict access to such documents, drawings etc. and further the Contractor shall execute a SECRECY agreement from each or any person employed by the Contractor having access to such documents, drawings etc. The Contractor shall not issue drawings and documents to any other agency or individual without the written approval by the Engineer-in-Charge/Site- in-Charge.

6.f.3. Contractor will not give any information or document etc. concerning details of the work to the press or a news disseminating agency without prior written approval from Engineer-in-charge/Site-in-Charge. Contractor shall not take any pictures on site without written approval of Engineer-in-Charge/Site-in-Charge.

7.PAYMENT OF CONTRACTOR'S BILLS

7.1. Payments will be made against Running Accounts bills certified by the Owner's Engineer- in-Charge/Site-in-Charge within 30 days from the date of receipt of the bill.

7.2. Running Account Bills and the final bill shall be submitted by the Contractor together with the duly signed measurements sheet(s) to the Engineer-in-Charge/ Site-in-Charge of the Owner in quadruplicate for certification.

The Bills shall also be accompanied by quantity calculations in support of the quantities contained in the bill along with cement consumption statement, actual/theoretical, wherever applicable duly certified by the Engineer-in-Charge/ Site-in- Charge of the Owner.

7.3. All running account payments shall be regarded as on account payment(s) to be finally adjusted against the final bill payment. Payment of Running Account Bill(s) shall not determine or affect in any way the rights of the Owner under this Contract to make the final adjustments of the quantities of material, measurements of work and adjustments of amounts etc. in the final bill.

7.4. The final bill shall be submitted by the Contractor within one month of the date of completion of the work fully and completely in all respects. If the Contractor fails to submit the final bill accordingly Engineer-in-Charge/Site-in-Charge may make the measurement and determine the total amount payable for the work carried out by the Contractor and such a certification shall be final and binding on the Contractor. The Owner/Engineer-in-Charge/Site-in-Charge may take the assistance of an outside party for taking the measurement, the expenses

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of which shall be payable by the Contractor.

7.5. Payment of final bill shall be made within 30 days from the date of receipt of the certified bill by the Disbursement Section of the owner.

7.6 Wherever possible, payment shall be tendered to the contractor in electronic mode (e-payment) through any of the designated banks. The contractor will comply by furnishing full particulars of Bank acount (mandate) to which the payments will be routed. Owner reserves the right to make payment in any alternate mode also.

7.a. MEASUREMENT OF WORKS

7.a.1. All measurements shall be in metric system. All the work will be jointly measured by the representative of the Engineer-in-Charge/Site-in-Charge and the Contractor or their authorised agent progressively. Such measurement will be recorded in the Measurement Book/Measurement Sheet by the Contractor or his authorised representative and signed in token of acceptance by the Owner or their authorised representative.

7.a.2. For the purpose of taking joint measurement, the Contractor/representative shall be bound to be present whenever required by the Engineer-in-Charge/Site- in-Charge.

If, however, they are absent for any reasons whatsoever, the measurement will be taken by the Engineer-in-Charge/Site-in-Charge or his representative and the same would be deemed to be correct and binding on the Contractor.

7.a.3. In case of any dispute as to the mode of measurement for any item of work, the latest Indian Standard Specifications shall be followed. In case of any further dispute on the same the same shall be as per the certification of an outside qualified Engineer/ Consultant. Such a measurement shall be final and binding on the Owner and the Contractor.

7.b. BILLING OF WORKS EXECUTED

The Contractor will submit a bill in approved proforma in quadruplicate to the Engineer- in-Charge/Site-in-Charge of the work giving abstract and detailed measurement for the various items executed during a month, before the expiry of the first week of the succeeding month. The Engineer-in-Charge/Site-in-Charge shall take or cause to be taken the requisite measurements for the purpose of having the bill verified and/or checked before forwarding the same to the disbursement office of the Owner for further action in terms of the Contract and payment thereafter. The Engineer-in-Charge/Site-in- Charge shall verify the bills within 7 days of submission of the Bill by the Contractor.

7.c. RETENTION MONEY

5% of the total value of the Running Account and Final Bill will be deducted and retained by the Owner as retention money on account of any damage/defect liability that may arise for the period covered under the defect liability period clause of the Contract free of interest. Any damage or defect that may arise or lie undiscovered at the time of issue of completion certificate connected in any way with the equipment or materials supplied by contractor or in workmanship shall be rectified or replaced by the contractor at his own expense failing which the Owner shall

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be entitled to rectify the said damage/defect from the retention money. Any excess of expenditure incurred by the Owner on account of damage or defect shall be payable by the Contractor. The decision of the Owner in this behalf shall not be liable to be questioned but shall be final and binding on the Contractor.

Thus, deduction towards retention money is applicable only in case of job/works contracts (civil, mechanical, electrical, maintenance etc.) where any damage or defect may arise in future (i.e. within 12 months from the date of completion of job) or lie undiscovered at the time of issue of completion certificate.

7.d. STATUTORY LEVIES

7.d.1 The Contractor accepts full and exclusive liability for the payment of any and all taxes, duties, cess, levies and statutory payments payable under all or any of the statutes etc.

Variations of taxes and duties arising out of the amendments to the Central / State enactments, in respect of sale of goods / services covered under this bid shall be to BGL's account, so long as :

- They relate to the period after the opening of the price bid, but before the contracted completion period (excluding permitted extensions due to delay on account of the contractors, if any) or the actual completion period, whichever is earlier; and
- The vendor furnishes documentary evidence of incurrence of such variations, in addition to the invoices/documents for claiming Cenvat /Input Tax credit, wherever applicable.

All contributions and taxes for unemployment compensation, insurance and old age pensions or annuities now or hereafter imposed by Central or State Governmental authorities which are imposed with respect to or covered by the wages, salaries or other compensations paid to the persons employed by the Contractor and the Contractor shall be responsible for the compliance with all obligations and restrictions imposed by the Labour Law or any other law affecting employer-employee relationship

and the Contractor further agrees to comply and to secure the compliance of all sub-contractors with all applicable Central, State, Municipal and local laws, and regulations and requirements of any Central, State or Local Government agency or authority.

Contractor further agrees to defend, indemnify and hold harmless from any liability or penalty which may be imposed by the Central, State or Local authorities by reason of any violation by Contractor or sub-contractor of such laws, regulations or requirements and also from all claims, suits or proceedings that may be brought against the Owner arising under, growing out of, or by reasons of the work provided for by this contract by third parties, or by Central or State Government authority or any administrative sub-division thereof. The Contractor further agrees that in case any such demand is raised against the Owner, and Owner has no way but to pay and pays/makes payment of the same, the Owner shall have the right to deduct the same from the amounts due and payable to the Contractor. The Contractor shall not raise any demand or dispute in respect of the same but may have recourse to recover/receive from

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the concerned authorities on the basis of the Certificate of the Owner issued in that behalf.

7.d.2. The rates quoted should be inclusive of all taxes. However, wherever a tax to be deducted at source the same will be deducted from the bills of the Contractor and paid to the concerned authorities. The proof of such payments of tax on works contract will be furnished to the contractor.

The vendor shall comply with all the provisions of the GST Act/Rules/requirements like providing of tax invoices, payment of taxes to the authorities within the due dates, filing of returns within the due dates etc. to enable BGL to take Input Tax Credit. In case of imports, vendor shall provide import documents and invoice fulfilling the requirement of Customs Act and Rules. Vendor will be fully responsible for complying with the Customs provisions to enable BGL to take Input Tax Credit.

In case BGL is not able to take Input Tax Credit due to any noncompliance/default/negligence of the seller of goods/service provider, the same shall be recovered from the pending bills/dues (including security deposit, BG etc.)

Vendor shall be responsible to indemnify the Corporation for any loss, direct or implied accrued to the Corporation on account of supplier/service provider failure to discharge his statutory liabilities like paying taxes on time, filing appropriate returns within the prescribed time etc.

7.d.3. Income tax will be deducted at source as per rules at prevailing rates, unless certificate, if any, for deduction at lesser rate or nil deduction is submitted by the Contractor from appropriate authority.

7.d.4 The contractor shall provide accurate particulars of PAN number as required, under Section 206AA of Income Tax Act 1961.

7.d.5 The contractors having their 'tax residency status' outside India shall provide Tax Residency Certificate (TRC), issued by Government of the Country or the specified territory where the Contractor is a Resident. Rule 21AB of the Income Tax Rules, 1962 has prescribed the contents of a TRC. This would enable the Corporation to deduct tax at source by duly considering the 'treaty relief', if any, under Double Taxation Avoidance Agreement (DTAA) entered into between GOI and the respective country/specified territory in which the Contractors' 'tax residency status' is currently in force.

7.d.6 Anti-Profiteering Clause – GST Act anti-profiteering provisions mandates that any reduction in tax rates or benefits of input tax credits be passed on to the consumer by way of commensurate reduction in prices. Vendors to take note of the same and pass such benefits while quoting their price**.**

7.e. MATERIALS TO BE SUPPLIED BY CONTRACTOR

7.e.1. The Contractor shall procure and provide the whole of the materials required for construction including tools, tackles, construction plant and equipment for the

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completion and maintenance of the works except the materials viz. steel and cement which may be agreed to be supplied as provided elsewhere in the contract. The contractor shall make arrangement for procuring such materials and for the transport thereof at their own cost and expenses.

7.e.2. The Owner may give necessary recommendation to the respective authority if so desired by the Contractor but assumes no responsibility of any nature. The Contractor shall procure materials of ISI stamp/certification and supplied by reputed suppliers borne on DGS&D list.

7.e.3. All materials procured should meet the specifications given in the tender document. The Engineer-in-charge may, at his discretion, ask for samples and test certificates for any batch of any materials procured. Before procuring, the Contractor should get the approval of Engineer-in-Charge/Site-in-Charge for any materials to be used for the works.

7.e.4. Manufacturer's certificate shall be submitted for all materials supplied by the Contractor. If, however, in the opinion of the Engineer-in-Charge/Site-in-Charge any tests are required to be conducted on the material supplied by the Contractor, these will be arranged by the Contractor promptly at his own cost.

7.f. MATERIALS TO BE SUPPLIED BY THE OWNER

7.f.1. Steel and Cement maybe supplied by the Owner to the contractor against payment by Contractor from either godown or from the site or within work premises itself and the contractor shall arrange for all transport to actual work site at no extra cost.

7.f.2. The contractor shall bear all the costs including loading and unloading, carting from issue points to work spot storage, unloading, custody and handling and stacking the same and return the surplus steel and cement to the Owner's storage point after completion of job.

7.f.3. The contractor will be fully accountable for the steel and cement received from the Owner and contractor will give acknowledgement/receipt for quantity of steel and cement received by him each time he uplifts cement from Owner's custody.

7.f.4. For all computation purposes, the theoretical cement consumption shall be considered as per CPWD standards.

7.f.5. Steel and Cement as received from the manufacturer/stockists will be issued to the contractor. Theoretical weight of cement in a bag will be considered as 50 Kg. Bags weighing upto 4% less shall be accepted by the contractor and considered as 50 Kg. per bag. Any shortage in the weight of any cement bag by more than 4% will be to the Owner's account only when pointed out by the Contractor and verified by Engineer-in-Charge/Site in Charge at the time of Contract or taking delivery.

7.f.6. The contractor will be required to maintain a stock register for receipt, issuance and consumption of steel and cement at site. Cement will be stored in a warehouse

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at site. Requirement of cement on any day will be taken out of the warehouse. Cement issued shall be regulated on the basis of FIRST RECEIPT to go as FIRST ISSUE.

7.f.7. Empty cement bag shall be the property of the Contractor. Contractor shall be penalised for any excess/under consumption of cement. The penal rate will be twice the rate of issue of cement for this work.

7.f.8. All the running bills as well as the final bills will be accompanied by cement consumption statements giving the detailed working of the cement used, cement received and stock-on-hand.

7.f.9. The Contractor will be fully responsible for safe custody of cement once it is received by him and during transport. Owner will not entertain any claims of the contractor for theft, loss or damage to cement while in their custody.

7.f.10. The contractor shall not remove from the site any cement bags at any time.

7.f.11. The Contractor shall advise Engineer-in-charge/Site-in-charge in writing atleast 21 days before exhausting the Cement stocks already held by Contractor to ensure that such delays do not lead to interruptions in the progress of work.

7.f.12. Cement shall not be supplied by the Owner for manufacturing of mosaic tiles, precast cement jali and any other bought out items which consume cement and for temporary works.

7.f.13. Cement in bags and in good usable condition left over after the completion of work shall be returned by the contractor to the Owner. The Owner shall make payment to the Contractor at the supply rate for such stocks of cement they accept and receive. Any refused stock of cement shall be removed by the Contractor from the site at his cost and expenses within 15 days of completion of the work.

8.PAYMENT OF CLAIMS AND DAMAGES

8.1. Should the Owner have to pay money in respect of claims or demands as aforesaid the amount so paid and the costs incurred by the Owner shall be charged to and paid by the Contractor and the Contractor shall not be entitled to dispute or question the right of the Owner to make such payments notwithstanding the same may have been without his consent or authority or in law or otherwise to the contrary.

8.2. In every case in which by virtue of the provisions of Workmen's Compensation Act, 1923, or other Acts, the Owner is obliged to pay Compensation to a Workman employed by the Contractor in execution of the works, the Owner will recover from the Contractor the amount of compensation so paid and without prejudice to the rights of Owner under the said Act. Owner shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due to the Contractor whether under this contract or otherwise. The Owner shall not be bound to contest any claim made under Section 12 sub section (1) of the said Act,

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except on the written request of the Contractor and upon his giving to the Owner full security for all costs for which the owner might become liable in consequence of contesting such claim.

8.a. ACTION AND COMPENSATION IN CASE OF BAD WORK

If it shall appear to the Engineer-in-Charge/Site-in-Charge that any work has been executed with bad, imperfect or unskilled workmanship, or with materials, or that any materials or articles provided by the Contractor for execution of the work are not of standards specified/inferior quality to that contracted for, or otherwise not in accordance with the contract, the CONTRACTOR shall on demand in writing from the Engineer-in- Charge/Site-in-Charge or his authorised representative specifying the work, materials or articles complained of, notwithstanding that the same may have been inadvertently passed, certified and paid for, forthwith rectify or remove and reconstruct the work so specified and at his own charge and cost and expenses and in the event of failure to do so within a period of 15 days of such intimation/ information/knowledge, the Contractor shall be liable to pay compensation equivalent to the cost of reconstruction by the Owner. On expiry of 15 days period mentioned above, the Owner may by themselves or otherwise rectify or remove and re-execute the work or remove and replace with others, the materials or articles complained of as the case may be at the risk and expenses in all respects of the Contractor. The decision of the Engineer- in- Charge/ Site-in-Charge as to any question arising under this clause shall be final and conclusive and shall not be raised as a dispute or shall be arbitrable.

8.b. INSPECTION AND AUDIT OF CONTRACT AND WORKS

This project is subject to inspection by various Government agencies of Government of India. The contractor shall extend full cooperation to all the Government and other agencies in the inspection of the works, audit of the Contract and the documents of Contract Bills, measurements sheets etc. and examination of the records of works and make enquiries interrogation as they may deem fit, proper and necessary. Upon inspection etc. by such agencies if it is pointed out that the contract work has not been carried out according to the prescribed terms and conditions as laid down in the tender documents and if any recoveries are recommended, the same shall be recovered from the contractors running bills/final bill/from ordered/suggested Security Deposit/retention money. The Contractor shall not rise any dispute on any such account and the same shall not be arbitrable.

9.CONTRACTOR TO INDEMNIFY THE OWNER

The Contractor shall indemnify the Owner and every member, officer and employee of the Owner, also the Engineer-in-Charge/Site-in-Charge and his staff against all the actions, proceedings, claims, demands, costs, expenses, whatsoever arising out of or in connection with the works and all actions, proceedings, claims, demands, costs, expenses which may be made against the Owner for or in respect of or arising out of any failure by the Contractor in the performance of his obligations under the contract. The Contractor shall be liable for or in respect of or in consequence of any accident or injury to any workmen or other person in the employment of the Contractor or his sub contractor and Contractor shall indemnify and keep indemnified the Owner against all such damages, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

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10.0Price reduction

i) In case of any delay in completion of the work beyond the CDD, the Owner shall be entitled to be paid Price Reduction by the Contractor. The price reduction shall be initially at the rate of 0.5% (half percent) of the total contract value for every week of the delay subject to a maximum of 5% of the total contract value. The price reduction shall be recovered by the Owner out of the amounts payable to the Contractor or from any Bank Guarantees or Deposits furnished by the Contractor or the Retention Money retained from the Bills of the Contractor, either under this contract or any other contract.

ii) The Contractor shall be entitled to give an acceptable unconditional Bank Guarantee in lieu of such a deduction if Contractor desires any decision on a request for time extension.

iii) Once a final decision is taken on the request of the Contractor or otherwise, the price reduction shall be applicable only on the basic cost of the contract and on each full completed week(s) of delay (and for part of the week, a pro-rata price reduction amount shall be applicable).

iv) This final calculation of price reduction shall be only on the value of the unexecuted portion/quantity of work as on the CDD.

v) Contractor agrees with the Owner, that the above represents a genuine pre- estimate of the damages which the Owner will suffer on account of delay in the performance of the work by Contractor. The Contractor further agrees that the price reduction amount is over and above any right which owner has to risk purchase under Clause 12.4 and any right to get the defects in the work rectified at the cost of the contractor.

11 DEFECTS AFTER TAKING OVER OR TERMINATION OF WORK CONTRACT BY OWNER

The Contractor shall remain responsible and liable to make good all losses or damages that may occur/appear to the work carried out under this Contract within a period of 12 months from date of issue of the Completion Certificate and/or the date of Owner taking over the work, whichever is earlier. The Contractor shall issue a Bank Guarantee to the Owner in the sum of 10% of the work entrusted in the Contract, from a bank from the list of banks whose bank guarantees are acceptable to the Owner (list enclosed) and if however, the Contractor fails to furnish such a Bank Guarantee the Owner shall have right to retain the Security Deposit and Retention Money to cover the 10% of the Guarantee amount under this clause and to return/refund the same after the expiry of the period of 12 months without any interest thereon**.** (Please refer to clause 4. Deposits)

7. TERMINATION OF CONTRACT

- The owner may terminate the contract at any stage of the construction for reasons to be recorded in the letter of termination.

- The Owner inter alia may terminate the Contract for any or all of the following reasons that the contractor

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- has abandoned the work/Contract.
- has failed to commence the works, or has without any lawful excuse under these conditions suspended the work for 15 consecutive days.
- has failed to remove materials from the site or to pull down and replace the work within 15 days after receiving from the Engineer written notice that the said materials or work were condemned and/or rejected by the Engineer under specified conditions.
- has neglected or failed to observe and perform all or any of the terms acts, matters or things under this Contract to be observed and performed by the Contractor.
- has to the detriment of good workmanship or in defiance of the Engineer's instructions to the contrary sub-let any part of the Contract.
- has acted in any manner to the detrimental interest, reputation, dignity, name or prestige of the Owner.
- has stopped attending to work without any prior notice and prior permission for a period of 15 days.
- has become untraceable.
- has without authority acted in violation of the terms and conditions of this contract and has committed breach of terms of the contract in best judgement of the owner.
- has been declared insolvent/bankrupt.
- in the event of sudden death of the Contractor.

- The owner on termination of such contract shall have the right to appropriate the Security Deposit, Retention Money and invoke the Bank Guarantee furnished by the contractor and to appropriate the same towards the amounts due and payable by the contractor as per the conditions of Contract and return to the contractor excess money, if any, left over.

- In case of Termination of the contract, Owner shall have the right to carry out the unexecuted portion of the work either by themselves or through any other contractor(s) at the risk and cost of the Contractor. In view of paucity of time, Owner shall have the right to place such unexecuted portion of the work on any nominated contractor(s). However, the overall liability of the Contractor shall be restricted to 100 % of the total contract value.

- The contractor within or at the time fixed by the Owner shall depute his authorised representative for taking joint final measurements of the works executed thus far and submit the final bill for the work as per joint final measurement within 15 days of the date of joint final measurement. If the contractor fails to depute their representative for joint measurement, the owner shall take the measurement with their Engineer-in- Charge/Site-in-Charge or any other outside representatives. Such a measurement shall be final and binding on the Parties and shall not be questioned by the Contractor and no dispute can be raised by the Contractor on the same.

- The Owner may enter upon and take possession of the works and all plant, tools, scaffoldings, sheds, machinery, power operated tools and steel, cement and other materials of the Contract at the site or around the site and use or employ the same for completion of the work or employ any other contractor or other person or persons to complete the works. The Contractor shall not in any way object or interrupt or do any act, matter or thing to prevent or hinder such actions, other Contractor or other persons employed for completing and finishing or using the materials and

  plant for the works. When the works shall be completed or as soon thereafter the Engineer shall

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give a notice in writing to the Contractor to remove surplus materials and plant, if any, and belonging to the Contractor except as provided elsewhere in the Contract and should the Contractor fail to do so within a period of 15 days after receipt thereof the Owner may sell the same by public auction and shall give credit to the contractor for the amount realised. The Owner shall thereafter ascertain and certify in writing under his hand what (if anything) shall be due or payable to or by the Owner for the value of the plant and materials so taken possession and the expense or loss which the Owner shall have been put to in procuring the works, to be so completed, and the amount if any, owing to the Contractor and the amount which shall be so certified shall thereupon be paid by the Owner to the Contractor or by the Contractor to the Owner, as the case may, and the Certificate of the Owner shall be final and conclusive between the parties.

- When the contract is terminated by the Owner for all or any of the reasons mentioned above the Contractor shall not have any right to claim compensation on account of such termination.

8. FORCE MAJEURE

Circumstances leading to force majeure

(a) act of terrorism;

(b) riot, war, invasion, act of foreign enemies, hostilities (whether war be declared or not), civil war, rebellion, revolution, insurrection of military or usurped power;

(c) ionising radiation or contamination, radio activity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel, radioactive toxic explosive or other hazardous properties of any explosive assembly or nuclear component;

(d) epidemics, earthquakes, flood, fire, hurricanes, typhoons or other physical natural disaster, but excluding weather conditions regardless of severity; and

(e) freight embargoes, strikes at national or state-wide level or industrial disputes at a national or state-wide level in any country where Works are performed, and which affect an essential portion of the Works but excluding any industrial dispute which is specific to the performance of the Works or the Contract.

For the avoidance of doubt, inclement weather, third party breach, delay in supply of materials (other than due to a nationwide transporters' strike) or commercial hardship shall not constitute a Force Majeure event.

- Notification of Force Majeure

  Contractor shall notify within [10(ten)] days of becoming aware of or the date it ought to have become aware of the occurrence of an event of Force Majeure giving full particulars of the event of Force Majeure and the reasons for the event of Force Majeure preventing the Affected Party from, or delaying the Affected Party in performing its obligations under the

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Contract.

- Right of either party to terminate

  If an event of Force Majeure occurs and its effect continues for a period of 180 (one hundred eighty days) or more in a continuous period of 365 (three hundred sixty-five) days after notice has been given under this clause, either Party may terminate the Contract by issuing a written notice of 30 (thirty) days to the other Party.

- Payment in case of termination due to Force Majeure

  The Contract Price attributable to the Works performed as at the date of the commencement of the relevant event of Force Majeure.

The Contractor has no entitlement and Owner has no liability for:

a) any costs, losses, expenses, damages or the payment of any part of the Contract Price during an event of Force Majeure; and
b) any delay costs in any way incurred by the Contractor due to an event of Force Majeure.

Time extension for such cases will be worked out appropriately.

9. DISPUTE RESOLUTION

(A) Discussions and Resolution

i) The parties shall attempt to resolve all dispute and difference arising out of or relating to this contract through negotiations in good faith. If any dispute or difference remains unresolved, then all such unresolved disputes or differences shall be referred to the Executive Director/SBU Head of BGL of the concerned department and the Director/ Owner / authorized Senior Official of the contractor/supplier for an amicable solution.

ii) If any dispute or difference remains unsettled within sixty (60) days from the date on which either Party has served a written notice on the other Party making claims and for discussions, then the provisions of Part B (i.e. Conciliation) of this Clause shall apply.

(B) CONCILIATION

(i) All disputes and differences covered under the Conciliation Rules, 2019 arising out of or relating to this contract including its performance or interpretation, shall be fully and finally settled through Conciliation as per the Conciliation Rules, of BGL, as amended from time to time.

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(ii) The Conciliation Rules of BGL and any modification thereof shall be binding upon the Parties

(iii) The language of the conciliation shall be English;

(iv) The governing law of this contract shall be of India.

(v) In case the Conciliation fails, or if there are any disputes or differences which are not covered under Conciliation Rules, 2019, then the parties shall be free to take appropriate legal remedies for adjudication of their disputes.

(vi) The Courts having jurisdiction over the place where the contract was performed, except for enforcement of decree/judgment, shall be the court having jurisdiction to adjudicate the disputes between the parties.

10. **GENERAL**

15.1. Materials required for the works whether brought by the or supplied by the Owner shall be stored by the contractor only at places approved by Engineer-in- Charge/Site-in-Charge. Storage and safe custody of the material shall be the responsibility of the Contractor.

15.2. Owner and/or Engineer-in-Charge/Site-in-Charge connected with the contract, shall be entitled at any time to inspect and examine any materials intended to be used in or on the works, either on the site or at factory or workshop or at other place(s) manufactured or at any places where these are laying or from which these are being obtained and the contractor shall give facilities as may be required for such inspection and examination.

15.3. In case of any class of work for which there is no such specification supplied by the owner as is mentioned in the tender documents, such work shall be carried out in accordance with Indian Standard Specifications and if the Indian Standard Specifications do not cover the same the work should be carried out as per standard Engineering practice subject to the approval of the Engineer-in-Charge/Site-in- Charge.

15.4. Should the work be suspended by reason of rain, strike, lockouts or other cause the contractor shall take all precautions necessary for the protection of the work and at his own expense shall make good any damages arising from any of these causes.

15.5 The contractor shall cover up and protect from injury from any cause all new work also for supplying all temporary doors, protection to windows and any other requisite protection for the whole of the works executed whether by himself or special tradesmen or sub- contractors and any damage caused must be made good by the contractors at his own expense.

15.6 If the contractor has quoted the items under the deemed exports, then it will be the

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responsibility of the contractor to get all the benefits under deemed exports from the Government. The Owner's responsibility shall only be limited to the issuance of required certificates. The quotation will be unconditional and phrases like "subject to availability of deemed exports benefit" etc. will not find place in it.

11. Integrity Pact : Effective 1st September, 2007, all tenders and contracts shall comply with the requirements of the Integrity Pact (IP) if the value of such tenders or contracts is r 1crore & above. Failure to sign the Integrity Pact shall lead to outright rejection of bid.

12. Grievances of parties participating or intend to participate in the tender shall be addressed in writing to the officer designate of the Grievance Redressal Cell where the tenders have to be submitted within the stipulated period. Detailed mechanism of Grievance Redressal is available on the BGL website

13. The guidelines for Holiday Listing as adopted and available on BGL website shall be applicable to all tenders floated and all Purchase Orders/Contracts placed by BGL.

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Section V: Special Conditions of Contract (SCC)

Note for Bidders: Following Special Conditions of Contract (SCC) shall apply for this procurement. These Special Conditions shall modify/ substitute/ supplement the corresponding (GCC / GTC) clauses as indicated below. Whenever there is any conflict between the provision in the GCC/ GTC and that in the SCC, the provision contained in the SCC shall prevail.

Special Terms and Conditions – Works Contracts

GCC Clause No.	Topic	To be Read as
GTC 1.7	Order of Precedence	The Order of Precedence of documents shall be as follows with document at level 1 having the highest precedence: - 1. Contract Agreement 2. Detailed SOR attached with Tender document 3. Detailed Letter of Acceptance along with its enclosures 4. Letter of Award / Fax of Acceptance 5. Job Specifications (specific to particular job only) 6. Drawings 7. TIS 8. NIT 9. Special Conditions of Contract / Purchase 10. Technical Specifications 11. AITB 12. Instructions to Bidders 13. General Conditions of Contract 14. Other Documents Any amendment / change order issued after signing of formal contract shall take precedence over respective clauses of the formal contract and its annexures.

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GTC 3.5	Escalation in tender rates	No change in the referred clause.
GTC 4a	Earnest Money Deposit	No change in the referred clause.
GTC 4b	Security Deposits	N As defined in AITB against ITB clause 13.2.4
GTC 5b	Commencement of Work	No change in the referred clause. 15 days from the date of intimation by EIC/ BGL/PMC.
GTC 5g	Inspection of Works	No change in the referred clause.
GTC 5n	Defect Liability Period	No change in the referred clause.
GTC 6e	Insurance and Labour	The clause 6.e of General Terms and Conditions of Contract shall apply along with the following: Bidder shall carry out and maintain any and all Statutory Insurance(s) Requirements required under Indian laws and regulations, including Workmen Compensation Act/ Employee State Insurance/ Third Party Liabilities etc. and Insurances for their personnel engaged in performance of the work at Contractor's own cost. Irrespective of work acceptance, the responsibility to maintain adequate insurance coverage at all times during the period of Contract shall be that of Contractor alone. Contactor's failure in this regard shall not relieve him of any of his responsibilities and obligations under the contract. Contractor shall provide the Owner with a copy of all insurance policies and documents taken out by him in pursuance of the Contract. Such copies of documents shall be submitted to the Owner immediately upon the Contractor having taken such insurance coverage. Contractor shall also inform the Owner at least 60 (Sixty) days in advance regarding the expiry, cancellation and/or changes in any of such documents and ensure revalidation/renewal etc, as may be necessary well in time.

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GTC 7c	Retention Money	No change in the referred clause.
GTC 7d	Statutory Levies, Taxes and Duties	No change in the referred clause.
GTC 10	Price Reduction / Liquidated Damages Clause	**Liquidated Damages Clause** In case contractor fails to complete the work within the contract period as defined in Contract then unless such failure is due to force majeure as defined in Bid document, there will be reduction in contract price @ 0.5% for each week of delay or part thereof subject to maximum of 5% of contract price.
GTC 6a2	EMPLOYMENT LIABILITY OWARDS WORKERS EMPLOYED BY THE CONTRACTOR	In case of labour unrest/labour dispute arising out of non-implementation of any law, the responsibility shall solely lie with the CONTRACTOR and he shall remove/resolve the same satisfactorily at his cost and risk.
GTC 6a2	EMPLOYMENT LIABILITY OWARDS WORKERS EMPLOYED BY THE CONTRACTOR	The CONTRACTOR shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his staff and labour and to preserve peace and protection of persons and properly in the neighbourhood of the Works against such conduct
GTC 7 E 1	CONSTRUCTION EQUIPMENT, TOOLS & TACKLES	CONTRACTOR shall be solely responsible for making available for executing the WORK, all requisite CONSTRUCTION EQUIPMENTS, Special Aids, Barges, Cranes and the like, all Tools, Tackles and Testing Equipment and Appliances, including Customs of such equipment etc. as required. In case of Customs of the same the rates applicable for levying of Custom Duty on such Equipment, Tools, & Tackles and the duty drawback applicable thereon shall be ascertained by the CONTRACTOR from the concerned authorities of Government of India. It shall be clearly understood that OWNER shall not in any way be responsible for arranging to obtain Custom Clearance and/or payment of any duties and/or duty draw backs etc. for such equipment's so imported by the CONTRACTOR and the CONTRACTOR shall be fully responsible for all taxes, duties and documentation with regard to the same.

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GTC 7e & 7f	CEMENT & STEEL	In partial modification to Clause. 7.e and 7.f (GTC-WORK CONTRACT), unless until specified explicitly in the tender, supply of cement and steel shall be arranged by Contractor

		and the cost of the same shall be deemed to be included in the quoted rates
Appendix to SCC		
1	**SCOPE OF WORK / SUPPLY**	The scope of work covered in this Contract will be as described in particular job specifications, Technical specifications, Standard Specifications, Schedule of Rates etc. The scope of supply covered in this Contract will be as described in Particular Job Specifications, Technical Specifications, Standard Specifications, Schedule of Rates etc. It is however, explicitly understood that scope described is not limiting, in so far as the responsibilities of the contractor are concerned and shall include, inter alia, carrying out any and all works and providing any and all facilities as are required to complete the works in all respect. Materials to be supplied by the Owner on free issue basis, if any, under this Contract will be as described in tender document.

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2	**OTHER REQUIREMENT**	For specific requirements, Contractor shall refer to the Technical Specification. Status of all clearances required for the works shall be provided to the Successful Bidder or Contractor, should there be any other requirement for execution of works the same shall be obtained by the Contractor at its own cost and statutory payments shall be reimbursed by Owner based on documentary evidence. Contractor shall, at his own responsibility and cost, supply & provide water, power and cement and other utilities for the entire job in the quantities and at the times required for performance of work under the contract. The contract price shall be deemed to include the costs towards the same. The owner/consultant shall not supply water, power, cement and other utilities. Contractor shall obtain transport permit for the access roads and other permits required for the execution of the works conforming to all the requirements of the Governing authorities. Contractor shall, if required by him, for the entire duration of the execution of the work make available near the site, land for construction of Contractor's office, Warehouse, Workshops

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		and for any purpose in connection with providing infrastructure required for the execution of the Contract. The Contractor shall at his own cost construct all temporary buildings/ portable cabin and provide suitable water supply and sanitary arrangement as required. On completion of the work undertaken by the Contractor, he shall remove all temporary works erected by him and have the site cleared as directed by Engineer-in-Charge. If the Contractor shall fail to comply with these requirements, the Engineer-in-Charge may at the expense of the Contractor remove such surplus and rubbish materials and dispose off the same as he deems fit and get the site cleared as aforesaid, and the Contractor shall forthwith pay the amount of all expenses so incurred and shall have no claims in respect of any such surplus material disposed of as aforesaid. The CONTRACTOR shall not be permitted to enter on (other than for inspection purpose) or Take possession of site until instructed to do so by Owner / Consultant in writing. The portions of the site to be occupied by the CONTRACTOR shall be defined and/or marked on the site plan failing which these shall be indicated by Owner / Consultant at site and the operations beyond the areas, in respect of any land permitted by the Owner for the use of the CONTRACTOR for the purpose of or in connection with the Contract, the same shall be subject to the following and such other terms and condition as may be imposed by Owner. Such use or occupations shall not confer any right of tenancy of the land to the CONTRACTOR. The contractor shall submit fortnightly report covering all major activities indicating schedule / actual progress, near-misses, slippages & its reasons and catch up plan. The CONTRACTOR shall have no right to put up any construction of its own of any nature or type at the Site except temporary constructions for storage of equipment's for the work under the Contract or as a resting place for the laborer (workmen) employed by it for the work provided that it obtains the requisite previous permission in writing from Owner /Consultant. Owner may refuse such permission in its absolute discretion or grant conditional permission, as it may deem appropriate. Such construction will be erected at the CONTRACTOR's own

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		cost. The CONTRACTOR shall at its own cost demolish all such constructions and remove the debris thereof. As also all its materials and equipment's and clean and level the site thereof before handing over the completed work to the Owner. The CONTRACTOR shall provide if necessary or if required for the site all temporary access thereof and shall alter adapt and maintain the same as required from time to time and shall take up and clear them away as and when no longer required and as and when ordered by Owner/ Consultant and make good all damages done at /to the site. The CONTRACTOR shall note that the final bill will not be certified for payment till the action as above is completed by the CONTRACTOR to the entire satisfaction of Owner / Consultant. All drawings, tracings, photo prints and writing (except letter) shall be the sole property of Owner and must be returned to them on completion of work. The drawings maintained on the site are to be carefully mounted on boards of appropriate size. They are to be protected from ravages from termites, ants, silverfish and other insects. The completion of the work may require working in the monsoon also. The CONTRACTOR must maintain labour force as may be required for the job and plan and execute the construction and erection according to the prescribed schedule. No extra rate will be considered for such work in monsoon. The time schedule includes monsoon window period also. Hence request for time extension due to monsoon shall not ordinarily be entertained by Owner. During the execution of the work CONTRACTOR shall check its work with drawings. The CONTRACTOR shall be responsible for all the errors in this connection and shall have to rectify all defects and / or error at its own cost failing which BGL reserves the rights to get the same rectified at the risk and cost of the CONTRACTOR. During inclement weather the CONTRACTOR shall suspend concreting and plastering for such time as Owner/ Consultant may direct and shall protect from injury all works in the course of erection.

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		Should the work be suspended by reason of rain, strike, lockouts or other cause the CONTRACTOR shall take all precautions necessary for the protection of the work at its own expense shall make good any damages arising from any such cause. All rubbish including muck and water, as it accumulates from time to time during the progress of the work shall be cleared through proper drainage arrangement so as not to hamper the progress of various other site works in progress. The CONTRACTOR shall provide suitable pillar with flat tops and build the same in concrete for temporary benchmarks. All the pegs for setting out the works and fixing the necessary levels required for the execution thereof shall if desired by Owner/ Consultant likewise be built in masonry at such places and in such manner as the Owner may determine. The CONTRACTOR shall cover up and protect from injury due to any cause to all new work and any other requisite protection for the whole of the works executed whether by itself or special tradesman or sub- CONTRACTORs and any damage caused must be made good by the CONTRACTORs at its own expense. Cutting of trees shall not be permitted except in the case that tree is falling on the line of ROU/ROW. In such circumstances, details of such tree being cut shall be prepared and forest/ municipal authorities be informed, and necessary approval be obtained by contractor.

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3	**BID PRICES**	Price must be furnished in the Price Schedule format available online in e-tender portal of BGL. Quoted prices must be net of discount, if any. Conditional discounts, if offered by a bidder, shall not be considered for evaluation. Unless otherwise agreed to in the terms of the Work / Purchase Order, the price shall be firm and not subject to escalation for any reason whatsoever till the execution of entire order, even though it might be necessary for the order execution to take longer than the delivery period specified in the order. Price shall be exclusive of GST (CGST, SGST, IGST as applicable), Customs Duty and applicable cess, which are leviable by law on

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		sale of finished goods to Corporation. The nature and extent of such levies shall be shown separately. Quoted prices shall be inclusive of all testing and inspection requirements (including stage wise and final inspection by Owner/ Owner's Consultant for which no extra charges shall be paid) as specified in the bid document. It shall be contractor's sole responsibility to co-ordinate with all the stakeholders including vendors and expedite the equipment / package delivery to meet the project schedule. The Contractor's qualified QC engineer shall be present for all the Inspection activities along with Consultant / Owner at sub-vendors workshop / site. On award of contract, the bidder / contractor shall submit the detailed Inspection Categorization plan for all the packages / equipment's in the tendered works for Consultant / Owner's approval. In case the material gets rejected / does not fulfil acceptance criteria as per technical requirements then it shall be sole responsibility of the contractor to carry out rectification or arrange for replacement of part or full equipment / package as required, without any time and cost implication to the Owner / Consultant. Also in such an event, bidder shall be responsible for carrying out the re-inspections from consultant appointed TPIA at their own cost. Bidder's quoted prices shall be firm & fixed till the completion of the works in all respects and no escalation in prices on any other account shall be admissible to the contractor. The quoted prices shall be deemed to include entire scope of work and all obligations and responsibilities to be carried out/ executed by the Bidder as per terms of bid document. The quoted base price shall be inclusive of Mandatory Spares, Pre-Commissioning & Commissioning Spares, and Special Tools & Tackles for Complete items as per technical specifications. It shall be the responsibility of the Bidder to duly enquire of their own and comply with all applicable laws, rules, regulations, orders and formalities applicable to GST, Customs Duty, Countervailing Duty etc. on the manufacture, sale and/or supply

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		of any material / services to Owner / Consultant. The Bidder shall keep the Owner / Consultant indemnified from and against any and all claims, demands, prosecutions, penalties, damages, demurrages and/or other levies whatsoever made or levied by any Court, Tribunal or the Customs or other Authorities with respect to any alleged breach, evasion or infraction of such duties, taxes, charges or levies or any breach or infraction of such laws, rules, regulations, orders or formalities concerning the same and from the consequence thereof. Price quoted by the bidder, shall remain Firm & Fixed until complete execution of the Work / Purchase Order and shall not be subject to any variation, except statutory variation in taxes, duties & levies pursuant to relevant provisions in Special Terms and Conditions of Contract. The Bidder's quoted price shall also remain Firm and Fixed on account of Foreign Exchange (FE) Variation, unless otherwise any specific provision is indicated in IFB document. The bidder shall quote the prices after careful analysis of cost involved for the performance of complete work considering all parts of the IFB documents. In case, any activity though specifically not covered but is required to complete the work as per scope of work, scope of supply, specifications, standards, drawings, GTC, STC or any other part of IFB Document, the prices quoted shall deemed to be inclusive of cost incurred for such activity(ies). Bidder to note and consider the following: a) Suppliers/Contractors shall arrange Road Permits/Waybills by themselves and comply with the statutory laws of the concerned state. b) In case as per state laws the issuance of Road Permit/Waybill is to be arranged by the buyer, BGL will arrange to issue Road Permit/Waybill. In case of imposition of any Tax the same shall be discharged by the buyer and the same will be adjusted against the payments due to vendors against their bills. Bidders shall quote their prices in Indian Rupees and only indicate the following in their offer:

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		Site work Prices, if applicable as per the scope of work mentioned in tender documents, shall be exclusive of Prevailing GST. All necessary taxes & duties and registration, if required, for carrying out the site activities shall be done by the bidder and cost towards the same shall be included in quoted site work prices. GST Tax, payable extra on Site Work Services, as applicable. The entire work covered under this contract shall be treated as **"Works Contract".**
4	**TIME OF COMPLETION**	The work shall be executed strictly as per time Schedule mentioned elsewhere in the Bidding document. The period of completion given includes the time required for mobilization as well as testing, rectifications, if any, retesting and completion in all respects to the entire satisfaction of the Engineer-in-Charge. The work for each part shall commence concurrently. The Engineer-in-Charge and Contractor will prepare a joint program of execution of work. This program will take into account the time of completion mentioned above. Monthly/ weekly construction program will be drawn up by Engineer-in-Charge jointly with the Contractor based on availability of work fronts and the joint construction programs as per the above clause. The Contractor shall scrupulously adhere to these targets / programme by deploying adequate personnel, construction tools & tackles and it shall also supply itself all materials within its scope of supply in good time to achieve the targets set out in the weekly and monthly programme. In all matters concerning the extent of targets set out in the weekly and achievements, the decision of the Engineer-in-Charge shall be final and binding on the Contractor. If the Contractor fails to achieve the targeted progress schedule of each month as mentioned in the IFB, the Owner at its option, may terminate the Contract as Contractor's default and get the work completed from other sources at Contractor's risk, consequence and cost. Contractor shall give every day report on category wise labour and equipment deployed along with the progress of work done

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		on previous day in the proforma prescribed by the Engineer-inCharge. The Contractor shall submit fortnightly report covering all major activities indicating schedule /actual progress, slippages & its reasons and catch up plan.
5	**COMPENSATION FOR IDLE TIME**	The Owner shall make every reasonable effort to have free issue materials and right - of - use (ROU) available so as not to delay laying activities. No Idle time claim shall be entertained under any circumstances
6	**WORK ON SUNDAYS, HOLIDAYS AND DURING NIGHT HOURS:**	Contractor will be allowed to work on Sundays, holidays and during night hours only after obtaining prior written approval of Engineer-in-charge / Owner, but in no case at any extra cost or charges to the Owner for such work subject, however, to the statutory restrictions, if any, in respect thereof.
7	**PROGRESS REPORTS:**	All reports, progress charts etc. as required by Site Engineer or by the Owner shall be kept available at bidder's site office. The same shall be submitted to Site Engineer or the Owner as and when required without any charge to either the Site Engineer or Owner.
8	**LABOUR AT SITE:**	No labour shall be allowed to stay at site. The bidder shall obtain prior permission of the Owner for the watchman who will be required to stay at the site. The bidder shall arrange to provide due facilities to his labour at site. He will keep his temporary office, shed, etc. reasonably clean at all times
9	**LABOUR RELATIONS**	The following shall be appended as relevant clause of GTC-Works Contract. In case of labour unrest/labour dispute arising out of non-implementation of any law, the responsibility shall solely lie with the CONTRACTOR, and he shall remove/resolve the same satisfactorily at his cost and risk. The following shall be appended as sub clause no. 6.a.3 to clause no. 6.a of GTC-Works Contract.

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		The CONTRACTOR shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his staff and labour and to preserve peace and protection of persons and properly in the neighbourhood of the Works against such conduct.
10	**SITE FACILITIES:**	**Power Supply.** Contractor shall arrange at his own cost power supply distribution for the site. All works by the Contractor will be done as per Indian Electricity Act & Rules framed there under and passed by the Engineer-in –charge. The temporary lines will be removed forthwith, after completion of the work or if there is any hindrance caused to other work due to the alignment of these lines, the Contractor will re-route or remove the temporary lines at his own cost. The Contract Price shall be deemed to include all costs towards all above. **Water Supply.** The water required for construction and drinking shall be arranged by the Contractor at his own cost. The Contract Price shall be deemed to include all costs towards all above. Contractor shall be provided with some area within the site premises for Site Office / Fabrication Yard / Warehouse. Any additional area if required by Contractor for execution of the works shall be arranged by them at their own cost preferably at a location in close proximity to site. On completion of the relevant works undertaken by the Contractor, it shall remove all temporary works erected by it and have the site cleared as directed by Engineer-in-Charge. If the Contractor shall fail to comply with these requirements, the Engineer-in-Charge may at the expense of the Contractor remove such surplus and rubbish materials and dispose off the same as he deems fit and get the site cleared as aforesaid, and the Contractor shall forthwith pay the amount of all expenses so incurred and shall have no claims in respect of any such surplus material disposed of as aforesaid. Besides providing site facilities as per law of land, site camps with all related amenities shall be provided in line with the requirements of all Regulations/Acts and the Statutory

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		Authorities along with the following facilities at all work places where workmen are deployed / engaged by contractor: i) Arrangement for First Aid. ii) Arrangement for clean & potable drinking water & Tea, etc. iii) A creche where 10 or more women workers are having children below the age of 6 years. iv) Any other facility/utility as may be required under the Contract as per the existing legislation. v) Rest rooms / toilets for site staff / labour. vi) Proper Rest Facility with drinking water during lunch period.
11	**COMPLIANCE WITH LAWS:**	The Contractor shall abide by all applicable rules, regulations, statutes, laws, as amended from time to time governing the performance of works in India, including but not limited to the following: a. Indian Explosives Act, 1984. b. The Motor Vehicles Act, 1988. c. The Factories Act 1949. d. The Petroleum Act, 2002. e. Workman's Compensation Act 1923. f. Static/Mobile Pressure Vessel Act, g. Indian Electricity Act, h. Indian Boiler Act, 1923. i. Water (Prevention & Control Pollution) Act, 1974. j. Water (Prevention & Control of Pollution) Cess Act-1977. k. The Air (Prevention & Control of Pollution) Act-1981. l. The Radiation Protection Rules-1971 m. The Indian Forest Act-1927. n. The Environment [Protection] Act 1986. o. The Environment (Protection) Rules-1986.

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		p. The Hazardous Wastes (Management & Handling) Rules-1989. q. The Manufacture, Storage & import of Hazardous Chemicals Rules-1989. r. Wildlife Act 1972 and Wildlife [Protection] Act 2006. s. Contract Labour (Regulation & Abolition) Act 1970 & the centre rules1971 framed there under t. The Central Motor Vehicle Rule-1989. u. Payment of Wages Act 1936. v. Minimum Wages Act 1948. w. Employer's Liability Act 1938. x. Apprentices Act 1961. y. Industrial Disputes Act 1947. z. Merchant Maritime Act1920 aa. Building and other Construction workers Act 1996 bb. Employees' State Insurance Act 1948 cc. Employees' Provident Fund and Miscellaneous Provisions Act, 1952 dd. Any other Statute, Act, Law as may be applicable.
12	**PROVIDENT FUND**	The Contractor shall strictly comply with the provisions of Employees Provident Fund Act and register themselves with RPFC before commencing work. The Contractor shall deposit Employees and Employers contributions to the RPFC every month. The Contractor shall furnish along with each running bill, the challan/ receipt for the payment made to the RPFC for the preceding months.
13	**CONSTRUCTION EQUIPMENT, TOOLS & TACKLES**	Contractor shall be solely responsible for making available for executing the work, all requisite equipment, special aids, crane, tools, tackles and testing equipment and appliances suitable and required for the entire

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		job including the stations works for installation of both free issue material and contractor bought out items. Such equipment etc. shall have applicable safety/fitness certificates as applicable under Government Rules/Laws and shall be subject to examination and approval by Owner for the same being in first class operating condition. Any discrepancies pointed out by Owner shall be immediately got rectified, repaired or the equipment replaced altogether, by Contractor. Owner shall not in any way be responsible for providing any such equipment machinery, tools and tackles etc. The Contractor shall without prejudice to his overall responsibility to execute and complete the work as per specifications and time schedule, progressively arrange and deploy adequate equipment's and tools and tackles as per construction plan approved by Owner at construction site and augment the same as decided by the Engineer-in-Charge depending on the exigencies of the work so as to suit the construction schedule, without any additional cost to Owner. 16.3 Total Stations, Theodolite for survey, Dumpy levels, plump bobs, prismatic compass, chain, steel and metallic tape as a minimum and all other surveying instruments found necessary for the works at all the stations shall be provided by the CONTRACTOR for the due performance of their contracts as instructed by Owner/ Consultant. Owner/ Consultant. will use any or all measure instruments or tools belonging to the CONTRACTOR as and when he chooses for checking the completed works as well as the work in progress. All scaffolding and ladders that may be necessary for taking measurements at site will be provided by the CONTRACTOR. Contractor shall provide minimum requirement of equipment's / Machinery as per Annexure 1 of STC.
14	**CHANGE ORDERS**	A change order will be initiated in case: The Owner directs the Contractor to include any addition to the scope of work not covered under this contract or deletes any part of the scope of the work under the contract. Contractor requests to delete any part of the work which will not adversely affect the operational

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		capabilities of the project and if agreed by the Owner and for which cost and time benefits shall be passed on to the Owner. Any changes required by the Owner before giving their approval to detailed procedure or any other document relating to material procurement, layout plans etc for complying with the requirements of bidding document shall not be construed to be a change in the scope of work under the contract. Any change order as above comprising an alteration which involves a change in the cost of the works (which sort of alteration is hereinafter called a "Variation") shall be the subject of an amendment to the contract by way of an increase or decrease in the contract price and adjustment of the Construction Schedule if any. If the contract provides applicable rates for the valuation of the variation in question the contract price shall be increased or decreased in accordance with those rates. If the parties agree that the contract does not contain applicable rates then the parties shall negotiate a revision of the contract price which shall represent the change in cost of the works caused by the variations. Any change order must be duly approved by the Owner in writing. If there is a difference of opinion between Contractor and Owner whether a particular work constitutes a change order or not, the matter shall be handled in accordance with the procedures as defined below. Within 10 (Ten) working days of receiving the comments from the Owner on the documents submitted by the Contractor for approval, the Contractor's response in writing stating which item(s) is/are potential change (s), if applicable, will be submitted to the Owner. **Procedure** During execution of work if the Contractor observes that any new requirements which is not specific or intended in the bidding document has been indicated by Owner, they shall discuss the matter with Owner's representatives.

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		In case such requirement arises from the side of the Contractor they would also discuss the matter with Owner's Representative. In either of the two cases above, the representatives of both the parties shall discuss the project requirement and mutually decide whether the project requirement constitutes a change order. If it is mutually agreed that the project requirement/Inquiry constitutes a "Change Order" then a joint memorandum will be prepared to confirm a "Change Order" and basic ideas of necessary agreed modifications. Contractor will study the work required in accordance with the Joint memorandum and assess subsequent schedule and cost effect if any. The results of this study would be discussed mutually to enable Owner to give a final decision whether Contractor should proceed with the Change Order or not, in the best interest of the Project. If Owner's representative accepts the change order in writing, then Contractor shall proceed with the work stipulated in the Change order. Time worked by all workmen employed and a statement showing the description and quantity of all materials and plant utilised for extra work shall be submitted to Owner. The Owner's representative shall sign and return to the Contractor the statement, as agreed. At the end of each month the Contractor shall deliver to the Owner's representative a priced statement of the labour, materials and plant used. Whenever any dispute arises as to cost allocation between the Contractor and the Owner, the voucher shall nevertheless be signed by the Owner as a record of time worked and materials used. List and vouchers so signed will be the subject of negotiations between the Owner and the Contractor regarding their costs allocation. In case, mutual agreement as above that is whether Project Requirement constitutes a Change order or not, is not reached, then Contractor, in the interest of the project, shall take up the implementation of the work, if advised in writing to do so by Owner's representative pending settlement between the two

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		parties to the effect whether the Project Requirement constitutes a change order or not as per the terms and conditions of Contract Documents. The time and cost effect in such a case shall be mutually verified for the purpose of record. Should it be established that the said work constitutes a Change Order, the same shall be compensated taking into account the records kept and in accordance with the contract. Should the amount of extra work/ change order, if any, which the Contractor may be required to perform under instructions from the Owner, fairly entitle the Contractor to extensions of time beyond the scheduled completion date for completion of either the whole of the works or for such extra work only, the Owner and the Contractor shall mutually discuss and decide the extension of time, if any to be granted to the Contractor. Contractor should bring into notice of Owner/Owner representative if any quantity exceeds from the quantity mentioned in SOR and take approval before further execution of any such quantity, failing to which contractor is not liable for any extra claim for the same and no change order will be issued in this regard.
15	**CONSTRUCTION EQUIPMENT AND ORGANIZATION**	**CONSTRUCTION EQUIPMENT** The CONTRACTOR shall without prejudice to his overall responsibility to execute and complete the work as per specifications and time schedule deploy construction equipment and tools & tackles and augment the same as decided by the Engineer-in- Charge depending on the site requirement & exigencies of the work so as to complete all works within the contracted time schedule and without any additional cost to OWNER. No construction equipment shall be supplied by the OWNER. CONTRACTOR to ensure deployment of suitable equipment and take all safety precautions during execution of work. CONTRACTOR shall be solely responsible for making available for executing the WORK, all requisite CONSTRUCTION EQUIPMENTS, Special Aids, Barges, Cranes and the like, all Tools, Tackles and Testing Equipment and Appliances, including

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		imports of such equipment etc. as required. In case of import of the same the rates applicable for levying of Custom Duty on such Equipment, Tools, & Tackles and the duty drawback applicable thereon shall be ascertained by the CONTRACTOR from the concerned authorities of Government of India. It shall be clearly understood that OWNER shall not in any way be responsible for arranging to obtain Custom Clearance and/or payment of any duties and/or duty draw backs etc. for such equipment's so imported by the CONTRACTOR and the CONTRACTOR shall be fully responsible for all taxes, duties and documentation with regard to the same. Tenderer in his own interest may contact, for any clarifications in the matter, concerned agencies/Dept./Ministries of Govt. of India. All clarifications so obtained, and interpretations thereof shall be solely the responsibility of the CONTRACTOR. **Schedule of Labor Rates** Hiring / Recovery Rate for Deployment of Manpower attached as mentioned in clause no. 38 below shall be used for analysing rates for recovery for non- deployment of manpower. **SITE ORGANISATION** Subject to the provisions in the contract document and without prejudice to CONTRACTOR's liabilities and responsibilities to provide adequate qualified skilled, semiskilled and unskilled personnel on the work, CONTRACTOR shall deploy supervisory personnel as mentioned in tender documents and augment the same as decided by the Engineer-in-Charge depending upon the site requirement & the exigencies of work so as to complete all works within the contracted time schedule and without any additional cost to OWNER. Qualification and experience of Key Supervisory Personnel to be deployed for this work shall be as mentioned in Special Terms and Conditions.
16	**MEASUREMENT OF WORK**	Payments will be based on the actual measurements jointly taken by the Engineer-in-

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		Charge/Owner's representative and the Contractor. All payments will be made on the basis of actual measurements only
17	**PRICE REDUCTION FOR DELAY IN DELIVERY / LIQUIDATED DAMAGE**	In partial modifications of the General terms and conditions of Works contract, in the event of delay beyond the Contractual progressive delivery dates for reasons not attributable to Owner and not constituting conditions of force majeure, it will be at Owner's discretion, without prejudice to his other rights under the contract, to accept delayed delivery at the prices reduced as per the following: Time allowed for carrying out the work as mentioned in bidding document shall be strictly adhered to by the Contractor. Work shall be carried out with all the diligence throughout the stipulated period of the contract. Value/Quantum of completed job as on the date of Contractual Delivery Date (CDD) shall be recorded jointly by the Contractor, Consultant/Owner. The price reduction for slippage shall be equal to 0.5% per week of delay or part thereof and on the undelivered portion of the contract price as on CDD. Total Price reduction shall be subject to ceiling of 5% of the undelivered portion of the contract price. Second Crop/additional compensations to be paid to landowners due to fault of vendor will be recovered from the vendor.
18	**STATUTORY APPROVALS**	The approval from any authority required as per statutory rules and regulations of Central/State Government/Local Bodies shall be the contractor's responsibility unless otherwise specified in the bid document. The application on behalf of the Owner for submission to relevant authorities along with copies of required certificates complete in all respects shall be prepared and submitted by the Contractor well ahead of time so that the actual construction/ commissioning of the work is not delayed for want of the approval/inspection by concerned authorities. The Contractor shall arrange the inspection of the works by the authorities and necessary coordination and liaison work in this

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		respect shall be the responsibility of the contractor. However statutory fees paid, if any, for all inspections and approvals to such authorities shall be reimbursed at actual by the Owner to the contractor on production of documentary evidence. Any change/ addition required to be made to meet the requirements of the statutory authorities shall be carried out by the contractor without additional cost to Owner. The inspection and acceptance of the work by statutory authorities shall however, not absolve the contractor from any of his responsibilities under this contract.
19	**TESTS AND INSPECTION**	The Contractor shall carry out various tests as enumerated in the technical specifications of the bidding document and the technical documents that will be furnished to him during the performance of the work. All the tests either on the field or at outside laboratories concerning the execution of the work and supply of materials by the Contractor shall be carried out by Contractor at his own cost. The work is subject to inspection at all times by the BGL/TE. The contractor shall carry out all instructions given during inspection and shall ensure that the work is being carried out according to the technical specifications of bid document, the technical documents and the relevant codes of practice will be furnished to him during the performance of the work. The Contractor shall provide for purposes of inspection access ladders, lighting and necessary instruments at his own cost. Any work not conforming to execution drawings, specifications or codes shall be rejected forthwith and the Contractor shall carryout the rectifications at his own cost. All results of inspection and tests will be recorded in the inspection reports, proforma of which will be approved by the Engineer-in-Charge. These reports shall form part of the completion documents. For materials supplied by Owner, Contractor shall carryout the tests, if required by the Engineer-in- Charge, and the Owner

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		shall reimburse the cost of such tests at actual to the Contractor on production of documentary evidence. Statutory fees paid to IBR authorities and for repeat tests and inspection due to failures, repairs etc. such reasons attributable to the Contractor shall be borne by the Contractor. Inspection and acceptance of work shall not relieve the Contractor from any of his responsibilities under this Contract.
20	**INSPECTION OF SUPPLY ITEMS/ MATERIALS**	All inspection and tests on bought out items/ materials shall be made as per the specifications forming part of this contract. Various stages of inspection and testing (for ingredients/ execution quality/ execution workmanship/ Post execution) shall be identified after receipt of Quality Assurance Program from the Contractor/Manufacturer. Inspection calls shall be given for associations of Owner/ Consultant's representative as per mutually agreed program in prescribed proforma with 15 days margin, giving details of equipment and attaching relevant test certificates and internal inspection report of the Contractor. All drawings, General Arrangement and other contract drawings, specifications, catalogues etc. pertaining to equipment offered for inspection shall be got approved from Owner/Consultant and copies shall be made available to Owner/Consultant beforehand for undertaking inspection. The Contractor shall ensure full and free access to the inspection engineer of Owner/Consultant at the Contractor's or their sub-contractor's premises at any time during contract period to facilitate him to carry out inspection and testing assignments. The Contractor/sub-contractor shall provide all instruments, tools, necessary testing and other inspection facilities to inspection engineer of Owner/Consultant free of cost for carrying out inspection. Where facilities for testing do not exist in the Contractor's/sub-contractor's laboratories, samples and test pieces shall be drawn by the Contractor/Subcontractor in presence of Inspection Engineer of Owner/Consultant and duly sealed by the later and sent for testing in NABL approved Test House or

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		any other testing laboratories approved by the Inspection Engineer at the Contractor's cost. It is sole responsibility of Contractor to ensure facilitation of Inspection for all the bought-out items & timely completion of the delivery of such items to site locations without leading to impact the construction schedule. Any changes / re-inspection required to be carried out due to non-compliance to the technical requirements will be sole responsibility of the contractor. Contractor shall perform these actions without any time & cost implications to Owner / Consultant.
21	**TEST CERTIFICATES**	Bidder shall be required to submit recent test certificates for the material being used in works from the recognized laboratories. These certificates should indicate all properties of the materials as required in relevant IS Standards or International Standards. Contractor shall also submit the test certificate with every batch of material supplied which will be approved by Engineer-in-Charge. In case any test is to be carried out, the same shall be got done at the discretion of the Owner/Consultant in the approved laboratory at the cost of contractor. No secured advance will be given for the materials not having test Certificates.
22	**FINAL INSPECTION**	After completion of all tests as per specification the whole work will be subject to a final inspection to ensure that job has been completed as per requirement. If any defects noticed in the work attributable to Contractor, the Contractor at his own cost shall attend and rectify these defects, as and when the owner brings them to his notice. The Owner/Consultant shall have the right to have these defects rectified at the risk and cost of the contractor if he fails to attend to these defects immediately.
23	**HEALTH SAFETY AND ENVIRONMENT (HSE) MANAGEMENT**	The Contractor, during entire duration of the Contract, shall adhere to HSE requirement as per HSE MANAGMENENT Specifications provided in Tender Documents. The contractor shall engage qualified and experienced HSE Engineer at each location. The qualification and experience of

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		such personnel shall not be less than what specified in Tender Documents
24	**COMPUTERIZED CONTRACTORS BILLING SYSTEM**	Without prejudice to stipulation in Terms and Conditions of Works Contract, the Contractor should follow the printed / typed billing system. The bills will be prepared by the Contractor on their own PCs as per the standard formats and codification scheme proposed by Owner/Consultant. The Contractor will be provided with data entry format to capture the relevant billing data for subsequent processing. Contractor will submit these data to Owner/Consultant in an electronic media along with the hard copy of the bill, necessary enclosures and documents. The Contractor will also ensure the correctness and consistency of data so entered with the hard copy of the bill submitted for payment. Owner/Consultant will utilize these data for processing and verification of the Contractor's bill and payment.
25	**INSURANCE FOR FREE ISSUE MATERIAL**	Not Applicable for this tender.
26	**MAKE OF MATERIAL**	The materials required to be supplied by the Bidder under this Contract shall be procured only from Owner / Consultant approved vendors. Where the makes of materials are not indicated in the IFB, Bidder shall furnish the details (Past track record / credentials) of proposed makes and shall obtain prior approval of Owner / Consultant. Bidder shall not procure any item from vendors not approved by Consultant/ Owner. Bidder is also required to ensure that equipment qualification criteria, specified elsewhere in the bid document, are also simultaneously met. Bidder shall make an independent assessment of capability of all the vendors for timely deliveries of material / equipment. Any delays in deliveries by vendor(s) shall not be a cause of Schedule and cost implication. Non-acceptance of a particular proposed Makes /vendor due to any reasons whatsoever shall not be a cause of Schedule and cost implication to the Owner.

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		At any stage of the project, if it comes to the notice of Owner/ Consultant that Vendor has procured material / equipment, intentionally or unintentionally whatsoever, from an unapproved vendor and/or items not falling in approved range of vendor(s), the same shall be rejected forthwith and Vendor shall be liable to replace such material /plant / machinery without any Schedule and cost implication to the Owner. It is understood that should the name of Vendor be changed due to change in their Company or Corporate shareholding, Owner may accept such Vendors under its new name with prior approval. Any such approval shall however, not absolve the Vendor from any of his obligations under the contract; neither shall any such approval signify nominations or instruction to use such a vendor. All approved vendors are deemed to have been freely chosen by the VENDOR at his own risk.
27	**SETTLEMENT OF DISPUTE BETWEEN TWO PSUS**	In the event of any disputes or difference relating to the interpretation and application of the provisions of the contracts, such disputes or differences shall be referred by either party to the Arbitration in the Department of Public Enterprises nominated by the Secretary to the Govt. of India in charge of the Board of Public Enterprises, Govt. of India. The Arbitration and Conciliation of shall not be applicable to such arbitration. The award of the Arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may make a further reference for setting aside or revision of the award to the Law Secretary, Ministry of Law and Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary cc the Special Additional Secretary when so authorized by the Law Secretary whose decision shall bind the parties finally and conclusively. The parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator. Since this is a Domestic tender hence Conciliation clause is applicable in place of Arbitration.
28	**ADDITIONAL WORKS/ EXTRA WORKS**	Owner reserves their right to execute any additional works/ extra works, during the execution of work, either by themselves or by appointing any other agency even though such works are incidental to and necessary for the completion

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		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. No extra time/cost compensation will be made by Owner/Consultant.
29	**GUARANTEE**	Contractor needs to replace/repair or reinstall free of cost any material/equipment supplied by him in case it fails to operate due to defective materials or workmanship as per requirements of this specification within Twelve (12) months from the date of issue of completion certificate and/or the date of Owner taking over the work, whichever is earlier, in line to General Terms and Condition of Work Contract thereby acceptance of the entire system by Owner. Contractor shall replace at his own cost if any item found defective or missing before handing over the system to Owner. The decision of Engineer-in-Charge/Owner shall be final and binding in this regard. The guarantee for such rectified/replaced item shall be for a period of 12 months from completion of such rectification/replacement.
30	**LIMITATION OF LIABILITIES**	The final payment by the Owner in pursuance of the contract terms shall not mean release of the Contractor from all his liabilities under the contract. The Contractor will be liable and committed under this contract to fulfil all his liabilities and responsibilities, till such time the Owner releases Contract Performance Guarantee. Contractor's over all liability towards execution of the Contract will not exceed 100% (One hundred Percent) of the total Contract Price without prejudice to any other rights Owner may have as per terms & conditions of the Contract. Provided, this cap on liability of the Contractor shall not apply in case of loss or damage arising out of (i) negligence of the Contractor or any person engaged by the Contractor and or (ii) infringement of any intellectual property by Contractor or any person engaged by the Contractor and or (iii) statutory liability.
31	**GOVERNMENT OF INDIA NOT LIABLE**	It is expressly understood and agreed by and between Bidder and M/s BHAGYANAGAR GAS LIMITED is entering into

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		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 hereunder. It is expressly understood and agreed that M/s BHAGYANAGAR GAS LIMITED is an independent legal entity with power and authority to enter into contracts solely on its own behalf under the applicable Laws of India and general principles of Contract Law. The Bidder expressly agrees, acknowledges and understands that M/s BHAGYANAGAR GAS LIMITEDisnot 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, Bidder 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 to Government of India as to any manner, claim, cause of action or thing whatsoever arising of or under this agreement.
32	**ISSUE OF OWNER SUPPLIED MATERIAL**	Not Applicable for this tender.
33	**LOCATION OF DUMPYARD / WAREHOUSE / STORAGE YARD**	Not Applicable for this tender.
34	**QUALITY ASSURANCE/ QUALITY CONTROL**	Bidder shall include in his offer the Quality Assurance Program containing the overall quality management and procedures, which is required to be adhered to during the execution of contract. After the award of the 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. The Contractor shall establish document and maintain an effective quality assurance system outlined in recognized codes.

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		Quality Assurance System plans/procedures of the Contractor shall be furnished in the form of a 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. The quality assurance system should indicate organizational approach for quality control and quality assurance of the construction activities, at all stages of work at site as well as at manufacturer's works and dispatch of materials. The Owner/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. The contractor has to ensure the deployment of quality Assurance and Quality Control Engineer(s) depending upon the quantum of work. This QA/QC group shall be fully responsible to carry out the work as per standards and all code requirements. In case Engineer-in-charge feels that contractor's QA/QC Engineer(s) are incompetent or insufficient, contractor has to deploy other experienced Engineer(s) as per site requirement and to the full satisfaction of Engineer-In-Charge. 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 and until he complies with the instructions to the full satisfaction of Engineer-in-charge. The Contractor shall adhere to the quality assurance system as provided in tender documents. Contractor shall provide all information and along with the consultant maintain C.T.E Registers. 38.9 The contractor shall engage a full time Quality Assurance/QC Engineer for each location as defined in tender document. Contractor shall use stage wise Checklist to ensure that all the construction activities are carried out complying with Specifications, Codes & Standards, Typical formats of Checklist are as per Technical Specifications. These are attached separately with this Tender.

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35	**MOBILIZATION ADVANCE**	NOT APPLICABLE FOR THIS TENDER
36	**DISTINCTION BETWEEN FOUNDATION AND SUPERSTRUCTURE**	To distinguish between work in foundations and superstructures, the following criteria shall apply: For all Equipment pedestals, pipe racks, other foundation and R.C.C. Structures, work done up to 300 mm level above finished grade level will be taken as work in foundations and work above this level will be treated as work in superstructures and payments would be made accordingly. For Buildings only, all works upto level corresponding to finished floor level shall be treated as `Work in foundation' and all works above the finished floor level shall be treated as "Work in superstructure". Irrespective of what has been stated above, all pavements, R.C.C. Retaining wall, all pipe sleepers and any similar item would be taken as work done in foundations irrespective of locations, nomenclature and levels given anywhere. Where not specifically pointed out all works in Cellars/ sumps, Tank Pads, Cable trenches, or such similar item would be taken as work in foundation.
37	**SITE CLEANING**	The Contractor shall clean and keep clean the work site from time to time to the satisfaction of the Engineer- in-Charge for easy access to work site and to ensure safe passage, movement and working. If the work involves dismantling of any existing structure in whole or in part, care shall be taken to limit the dismantling up to the exact point and/or lines as directed by the Engineer-in-Charge and any damage caused to the existing structure beyond the said line or point shall be repaired and restored to the original condition at the Contractor's cost and risks to the satisfaction of the Engineer-in-Charge, whose decision shall be final and binding upon the Contractor. The Contractor shall be the custodian of the dismantled materials till the Engineer-in-Charge takes charge thereof. The Contractor shall dispose of the unserviceable materials, debris etc. to any area as decided by the Engineer-in-Charge.

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

No extra payment shall be paid on the account of site cleaning.</td></tr>
<tr><td>38</td><td>SITE ORGANISATION</td><td>Subject to the provisions in the contract document and without prejudice to Contractor’s liabilities and responsibilities to provide adequate qualified skilled, semi-skilled and unskilled personnel on the work and augment the same as workout basis earned value method and decided by the Engineer-in-Charge depending upon the site requirement & the exigencies of work so as to complete all works within the contracted time schedule and without any additional cost to OWNER. In case of any failure to augment resources as above Owner/Consultant reserve the right to deploy and deduct cost of such deployment from contractor’s bills.

42.2 Contractor shall mobilize the key personnel as detailed below. Contractor shall mobilize work force as per agreed schedule duly approved by Owner/ Consultant
<table>
<tr><th>Sr. No.</th><th>Category</th><th>Nos. of Key Personnel (Minimum)</th><th>Qualifications</th><th>Experience</th></tr>
<tr><td>1.</td><td>Construction Manager</td><td>1</td><td>Degree / Diploma in Civil Engineering</td><td>At least 5 years of experience for Degree holder or 7 years for Diploma holder in construction of relevant field.</td></tr>
</table></td></tr>
</table>

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		2.	QA / QC Engineer	1	Degree / Diploma in Mechanical / Metallurgy Engineering with ASNT	At least 3 years of experience for Degree holder or 5 years for Diploma holder in in Welding / Quality / NDT management in

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					Level-II in RT/UT	construction of relevant field.
		3.	Lead Planning / Billing Engineer	1	Degree / Diploma in Engineering/ Project Management	At least 3 years of experience for Degree holder or 5 years for Diploma holder in executing projects in construction of pipelines in relevant field.
		4.	Safety Officer	1	Diploma in Industrial safety	At least Diploma in Industrial Safety with minimum 3 years relevant Experience in Construction Safety.

NOTE:

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 and quoted price.

2. The Manpower as identified above should have required qualification and adequate relevant experience.

3. Contractor shall mobilize Construction Manager, QA/QC Engineer, Planning/ Billing Engineer and Safety Officer who will be the permanent employees of the Contractor and shall be available for the entire duration of job unless approved otherwise by BGL.

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		4. Contractor shall mobilize the required manpower as per agreed schedule (month-wise) duly approved by BGL. 5. Contractor shall submit bio-data of mandatory Key Supervisory Personnel meeting the requirement as above along with bid document. Contractor shall maintain record of actual mobilization of key personnel and work force and Joint record of mobilization will be maintained and offered to Owner/ Consultant for verification month-wise. In case of early mobilization or additional mobilization of manpower as compared to required manpower (based on approved schedule) to meet the schedule requirement, contractor shall not be entitled for any extra claim. Key personnel and manpower may be demobilized by the contractor on completion of work at site after written clearance of Engineer-in-charge. Price adjustment due to delayed mobilization or shortfall in mobilization of manpower shall be as below. a) The Key Supervisory Personnel as mentioned above shall be mobilized within 15 days of written instructions for mobilization given during Kick- off-meeting or by Engineer-in-charge based on front availability at site. In case of delay in mobilization or shortfall in Key personnel manpower, penal recovery shall be levied from 16th day onwards as per the recovery rates specified below till the date of mobilization of Key Supervisory personnel at site. b) All personnel of the contractor entering on work premises shall be properly and neatly dressed and shall wear uniform badges while working on premises of the Purchaser including work sites. c) In case Contract fails to depute required manpower, recovery will be made on contractor invoice at the following rate.

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		<table><tr><th>Sr. No.</th><th>Category</th><th>Rate Per Day of Normal Hours (In Rs.)</th></tr><tr><td>1.</td><td>Construction Manager</td><td>2,500</td></tr><tr><td>2.</td><td>QA / QC Engineer</td><td>2000</td></tr><tr><td>3.</td><td>Lead Planning / Billing Engineer</td><td>2000</td></tr><tr><td>4.</td><td>Safety Officer</td><td>2000</td></tr></table>
39	**COMPLETION DOCUMENTS**	Notwithstanding the provisions contained in standard specification, upon completion of work, the Contractor shall complete all of the related drawings and documents to the "AS BUILT" stage (including all vendor / sub-vendor drawings for bought out items), all Free-Issue-Material (FIM) documents and provide the Owner/Consultant, the following: i. One complete bound set of all original documents as mentioned but not limited to documents listed elsewhere in the bid document. ii. Three complete bound sets of documents as mentioned at (i) above, in original size and in 3 (three) pen drive. iii. Three complete bound sets of Contractor's specification including design calculations. iv. Three copies of Daily Progress Reports v. Three sets of all raw data collected / generated for and during execution of the entire job as specified in documents requirement. vi. Three sets of Closure report. **Completion Documents** The following documents shall be submitted in soft copy and hard binder by the Contractor in 3 (Three) sets, as a part of completion documents: (as per the applicability of work) i. Welding Procedure Qualification Report. ii. Welder Qualification Report. iii. Radiographic Procedure Qualification. iv. Radiographic Report along with radiographs (Radiographs only with the original).

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		v. Batch Test Certificate from manufacturers for electrodes. vi. Pre-testing & final Hydrostatic and other test results & reports. vii. Electronic Geometry Pigging results & reports as specified in technical document. vii. Pre-commissioning/ Commissioning checklist. ix. All other requirements as specified in the respective specifications. x. Approved Construction Drawing & As built drawings. xi. Any other drawing/document/report specified elsewhere in the bidding document xii. No Claim / No Dues certificate by the contractor. xiii. Copies of deviation statement and order of extension of time, if granted. xiv. Copies of all documents related to statutory requirement i.e. Labour License, CAR Policy, Open Transit Policy, WCP, EPF, ESI Challans etc. xv. Any other contractual documents required on completion. xvi. Soft Copy of Pipe Book and Alignment Drawing, Isometric Drawing and other relevant documents. xvii. Test Certificate, Warrantee/Guarantee certificates and copies of Purchase Order with Prices blank from manufacturers for all supply material. xviii. All other requirements as specified in the respective specifications. xix. One set of reproducible on polyester film of construction drawing showing therein the execution of the work duly approved by the Engineer-in-Charge. Note: The Contractor shall be eligible to apply for issue of completion certificate after submission of completion documents as mentioned above.

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40	**COORDINATION WITH OTHER AGENCIES**	Work shall be carried out in such a manner that the work of other agencies operating at the site is not hampered due to any action of the Contractor. Proper coordination with other agencies will be Contractor's responsibility. In case of any dispute, the decision of Engineer- in-Charge shall be final and binding on the Contractor.
41	**UNDERGROUND AND OVERHEAD STRUCTURES**	The information to possible extent regarding existing structures/ overhead lines, existing pipelines and utilities shall be informed to Contractor. Over and above Contractor may encounter other structures/ pipelines/ OFC etc., the Contractor is required to collect such information's on his own before commencing the work. The Contractor shall execute the work in such a manner that the said structures, utilities, pipelines etc. are not disturbed or damaged, and shall indemnify and keep indemnified the Owner from and against any destruction thereof or damages thereto.
42	**EXECUTION OF ELECTRICAL WORKS**	The Contractor shall engage an approved electrical agency for execution of electrical works so required for execution of the works under this Contract, holding valid electrical Contractor license. In case Contractor himself executes electrical works then he shall arrange valid electrical Contractor license before start of electrical works at site.
43	**RESPONSIBILITY OF CONTRACTOR**	It shall be the responsibility of the Contractor to obtain the approval for any revision and/or modifications decided by the Contractor from the Owner/ Engineer-in-charge before implementation. Also, such revisions and/or modifications if accepted/approved by the Owner/Engineer-in-charge shall be carried out at no extra cost to the Owner. Any changes required during and/or after approval for detailed construction drawings due to functional requirements or for efficient running of system keeping the basic parameters unchanged and which has not been indicated by the Contractor in the data/drawings furnished along with the offer will be carried out by the Contractor at no extra cost to the Owner. All expenses towards mobilization at site and de-mobilization including bringing in equipment, clearing the site etc. shall be deemed to be included in the prices quoted and no separate payments on account of such expenses shall be entertained.

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		It shall be entirely the Contractor's responsibility to provide, operate and maintain all necessary construction equipment, scaffoldings and safety gadgets, cranes and other lifting tackles, tools and appliances to perform the work in a workman like and efficient manner and complete all the jobs as per time schedules. Preparing approaches and working areas for the movement and operation of the cranes, levelling the areas for assembly and erection shall also be the responsibility of the Contractor. The Contractor shall acquaint himself with access availability, facilities such as railway siding, local labour etc. to provide suitable allowances in his quotation. The Contractor may have to build temporary access roads to aid his own work, which shall also be taken care while quoting for the work. The procurement and supply in sequence and at the appropriate time of all materials and consumables shall be entirely the Contractor's responsibility and his rates for execution of work will be inclusive of supply of all these items. Bidder shall note that any delays due to Sub-Vendor / Third Party appointed by contractor in Project execution & completion shall be sole responsibility of the contractor.
44	**GENERAL GUIDELINES DURING AND BEFORE ERECTION**	Contractor shall be responsible for organizing the lifting of the equipment in the proper sequence, that orderly progress of the work is ensured and access routes for erecting the other equipment's are kept open. Orientation of all foundation, elevations, lengths and disposition of anchor bolts and diameter of holes in the supports saddles shall be checked by contractor, well in advance. Minor rectifications including chipping of foundations as the case may be, shall be carried out at no extra cost by the contractor after obtaining prior approval of the Engineer-in-Charge. The Contractor shall also be provided with the necessary structural drawings and piping layouts etc., wherever required for reference. During the structural member need to be dismantled, to facilitate the equipment erection, same shall be done by the contractor after ensuring proper stability of main structure with prior permission of Engineer-in-Charge. All such dismantled members shall be put

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		in position back after the completion of equipment erection to satisfaction of Engineer-in-Charge. During the performance of the work the Contractor at his own cost, shall keep structures, materials and equipment adequately braced by guys, struts or otherwise approved means which shall be supplied and installed by the Contractor as required till the installation work is satisfactorily completed. Such guys, shoring, bracing, strutting, planking supports etc. shall not interfere with the work of other agencies and shall not damage or cause distortion to other works executed by him or other agencies. Manufacturer's recommendations and detailed specifications for the installation of the various equipment and machines will be passed on to the contractor to the extent available during the performance of work. The requirements stipulated in these clauses shall be fulfilled by the Contractor. Various tolerances required as marked on the drawings and as per specifications and instructions of the Engineer-in-Charge, shall be maintained. Verticality shall be maintained. Verticality shall be verified with the Theodolite.
45	**ERECTION OF EQUIPMENTS**	Any erection which may be required, shall be carried out by Cranes of suitable capacity. Erection by derrick shall not be permissible. The contractor shall arrange the crane of suitable capacity required for erection and include cost for same in respective items without any liability on the part of Employer/Consultant. Bidder shall submit the indicative erection scheme for compressor/equipment and shall undertake the erection only after obtaining approval of erection scheme by Engineer-in-charge. Grouting of equipment's, anchor bolts, pockets and under base plates shall be carried out as per technical specifications.
46	**REPAIR OF PIPE DEFECTS**	Immediately prior to aligning pipe for welding, the bevelled ends of each joint of pipe and the area immediately adjacent thereto (at least 25mm from the edge on the inside and outside of the pipe) shall be thoroughly cleaned of paint, rust, mill scale, dirty or other foreign matter by use of power drive

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		wire buffing wheels, disc sanders, or by other methods approved by Employer/Consultant. This shall be done at no extra cost to Employer/Consultant. All damaged ends of pipe that are bent, cut or otherwise mutilated to such an extent that in the opinion of the Employer/Consultant, faulty alignment or unacceptable welding would result, shall be repaired or cut-off and re-bevelled to the correct angle with a bevelling machine of a type approved by Employer/Consultant. No compensation shall be allowed by reason of such recutting or bevelling, except when required because of the original bevel being damaged before the pipe is "taken over" by Contractor. Dents in bevels with a depth of less than 1 mm shall be removed by Contractor during cleaning and grinding, ahead of the welding in the field. Contractor shall re-bevel dented bevel ends with a depth between 1 and 3 mm. Dents over 3mm depth shall be repaired by cutting and re-bevelling
47	**MECHANISED CONSTRUCTION**	Contractor shall without prejudice to his overall responsibility to execute and complete the work as per specifications and time schedule adopt as far as practicable, mechanized construction techniques for major site activities. Contractor agrees that he will deploy the required numbers and types of the plant & machinery applicable for different activities in consultation with the Engineer-in-charge during execution of works. Contractor further agrees that Contract price is inclusive of all the associated costs, which he may incur for actual mobilization, required in respect of use of mechanized construction techniques and that the Owner/Consultant in this regard shall not entertain any claim whatsoever in this regard.
48	**CHECKING OF LEVELS**	The Contractor shall be responsible for checking levels, orientation plan of all foundations, foundation bolts, etc., well in advance of taking up the actual erection work and bring to the notice of Engineer-in-Charge discrepancies, if any. In case of minor variations in levels etc. the Contractor shall carry out the necessary rectifications to the foundations within his quoted price.

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		The Contractor shall also be responsible for checking with templates, wherever necessary, the disposition of foundation bolts with the corresponding bases of structure and shall effect rectifications, as directed, within his quoted rate.
49	**REGISTRATION OF THE CONTRACT WITH STATUTORY AUTHORITIES**	Before submission of their first invoice for Running payment, the Contractor shall register themselves and the contract at their own cost with the Reserve Bank of India, Income Tax, Sales Tax and such other statutory authorities, as may be required under the governing rules and regulations in India. The Contract Price shall be deemed to include all costs towards the same. The copies of all the related documents to all such registrations shall be submitted by the Contractor to Owner for their records and reference when-ever required during the tenure of the contract period
50	**AUDITS OF CONTRACT**	The project is subject to inspection by various audit/vigilance agencies of government of India/bgl., if any inspection of works is carried by such agencies, CONTRACTOR shall extend his full cooperation to these agencies in examining records, works etc. On inspection by such agencies, if it is pointed out that CONTRACTOR has not carried out work according to guidelines laid down in the tender document, immediate rectifications shall be taken up at no extra cost; and also if any recoveries against some items are pointed out therein, the same shall be recovered from CONTRACTOR's RA bills/final bill. The items under dispute shall not be paid in full till the job is completed to satisfaction of the inspection agency.
51	**SUBSEQUENT LEGISLATION**	All duties, taxes (on works Order/ trade tax/ turnover tax/etc. as applicable), fees, charges, expenses, etc. (except where otherwise expressly provided in the Order) as may be levied/ imposed in consequence of execution of the works or in relation there to or in connection therewith as per the Acts, Laws, Rules, Regulations in force shall be to contractor's account
52	**SINGLE POINT RESPONSIBILITY**	The entire work as per scope of work covered under this Order shall be awarded on Overall Lowest Cost Basis (L1) on single point responsibility basis.

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53	**WORK FRONT**	The work involved under this Order may include such works as have to be taken up and completed after other agencies have completed their jobs. The CONTRACTOR will be required and bound to take up and when the fronts are available for the same and no claim of any sort whatsoever shall be admissible to the CONTRACTOR on this account.
54	**TEMPORARY WORKS**	All Temporary and ancillary works including enabling works connected with the work shall be responsibility of the Contractor and the price quoted by them shall be deemed to have included the cost of such works which shall be removed by the contractor at his cost, immediately after completion of his work.
55	**DEFECTS AFTER TAKING OVER OR TERMINATION OF WORK CONTRACT BY OWNER**	The Contractor shall remain responsible and liable to make good all losses or damages that may occur/appear to the work carried out under this Contract within a period of 12 months from date of issue of the Completion Certificate and/or the date of Owner taking over the work, whichever is earlier. The Contractor shall issue a Bank Guarantee to the Owner in the sum of 10% of the work entrusted in the Contract, from any Scheduled bank (other than Co- operative Bank) acceptable to the Owner and if however, the Contractor fails to furnish such a Bank Guarantee the Owner shall have right to retain the Security Deposit and Retention Money to cover the 10% of the Guarantee amount under this clause and to return/refund the same after the expiry of the period of 12 months without any interest thereon.
56	**GRIEVANCE REDRESSAL MECHANISM**	There is a grievance redressal mechanism in BGL for vendors participating in the tender, the details of which are available on BGL's website www.bglgas.com
57	**ROYALTY**	All royalties etc., as may be required for any entry permits, including right of way etc., to be arranged by Contractor shall be deemed to have been included in the quoted prices. Owner will not be able to obtain exemption from payment of royalty charges. Bidder's quoted rates shall include the royalty on different applicable items as per the prevailing State Government rates. Any increase in prevailing rate of royalty shall be borne by the Contractor at no extra cost to Owner.

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		Documentary evidence to be furnished by Contractor along with the bills.
58	**EXCAVATION BY BLASTING**	Not applicable for this tender.
59	**BREACH OF CONTRACT**	In case of separate orders issued for various Parts or locations / Schedule(s) of the works in respect of Composite Works for MS, The Contractor shall be responsible for execution of all orders to the entire satisfaction of the Owner and breach in one order shall constitute as breach in the other order and accordingly appropriate action shall be taken as per stipulations of the order.
60	**CONTRACTOR'S STANDARD CONDITIONS**	Contractor's standard conditions if any shall not be applicable to the Contract.
61	**PATENTS, INFRINGEMENT & INDEMNITY**	Contractor shall protect and fully indemnify Owner from any claims for infringement of patents, copyright, trademark or the like. Contractor shall also protect and fully indemnify Owner from any claims from Contractor's workmen/employees, their heirs, dependents, representatives etc. Or from any other persons/persons or bodies/companies etc. for any act of commission or omission while executing the Contract. Contractor shall be responsible for compliance with requirements under the laws and shall protect and indemnify completely Owner from any claims/penalties arising out of any infringements.
62	**IMPORT LICENCE**	Contractor shall arrange import of all materials required for permanent incorporation in the works in respect of Composite Works for MS as well as construction equipment as per the guidelines laid down by the Relevant Authorities. Owner/Consultant shall not provide import license.
63	**WITHHOLDING, ACCOUNTING AND TAX REQUIREMENTS**	Contractor agrees for withholding from wages and salaries of its agents, servants or employees all sums, required to be withheld by the laws of the Republic of India or any other agency having jurisdiction over the area where Contractor is conducting operations, and to pay the same promptly and directly when due to the proper authority. Contractor further agrees to comply with all accounting and reporting

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		requirements of any Nation having jurisdiction over the subject matter hereof and to conform to such laws and regulations and to pay the cost of such compliance. If requested, Contractor will furnish the evidence of payment of applicable taxes, in the country(ies) of the Contractor's and his sub-contractor(s) and expatriate employees.
64	**INTELLECTUAL PROPERTY**	Neither Owner/Consultant nor Contractor nor their personnel, agents nor any sub-contractor shall divulge to anyone (other than persons designated by the party disclosing the information) any information designated in writing as confidential and obtained from the disclosing party during the course of execution of the works so long as and to the extent that the information has not become part of the public domain. This obligation does not apply to information furnished or made known to the recipient of the information without restriction as to its use by third parties or which is demonstrated to be in recipient's possession at the time of disclosure by the disclosing party. Upon completion of the works or in the event of termination pursuant to the provisions of the Contract, Contractor shall immediately return to Owner/Consultant all drawings, plans, specifications and other documents supplied to the Contractor by or on behalf of Owner/Consultant or prepared by the Contractor solely for the purpose of the performance of the works, including all copies made thereof by the Contractor.
65	**DRAWINGS AND DOCUMENTS**	The drawings accompanying the bid document (if any) are of indicative nature and issued for bidding purpose only. Purpose of these drawing is to enable the Bidder to make an offer in line with the requirements of the Owner. However no extra claim whatsoever, shall be entertained for variation in the "Approved for Construction" and "Tender drawings" regarding any changes/units. Construction shall be as per drawings/specifications issued/approved by the Engineer-in-Charge during the course of execution of work. Detailed construction drawings (wherever required) on the basis of which actual execution of work is to proceed will be prepared by the Contractor. The drawings and documents to be submitted by the Contractor to Owner after award of the LOA as per the requirements enlisted in the IFB shall be for Owner's review,

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		information and record. The Contractor shall ensure that drawings and documents submitted to Owner are accompanied by relevant calculations, data as required and essential for review of the document/ drawings. All documents and drawings including those of Contractors' sub-vendor's manufacturer's etc. shall be submitted to Owner after having been fully vetted in detail, approved and co- opted by the Contractor & shall bear Contractor seal/ certifications to this effect. All documents/drawings & submissions made to Owner without compliance to this requirement will not be acceptable and the delay & liability owing to this shall be to the Contractor's account. The Contractor shall, upon request of the Owner, submit all drawing and documents as envisaged herein to the Consultant. The Consultant shall review the drawings/ documents within 15 days from the date of submission provided the same are accompanied by relevant calculations, data as required and essential for review. Upon review of the submitted documents, Consultant may give their comments and ask for redesign/ resubmission after necessary rectifications/ modifications and the time frame of 15 days will be applicable for the same. The review of documents and drawings by Owner/Consultant shall not absolve Contractor from its responsibility to meet the requirements of specifications, drawings etc. and liabilities for mistakes and deviations. Upon receiving the comments on the drawing/documents reviewed by Owner/Consultant, Contractor shall incorporate the comments as required and ensure compliance. Copies of all detailed working drawing relating to the works shall be kept at the Contractors' office at the site and shall be made available to the Engineer-in-charge/ Owner/Consultant at any time during execution of the Contract. However no extra claim what so ever shall be entertained for any variation in the "approved/issued for construction drawings" and "tender drawings "regarding any changes/units unless otherwise agreed. The Contractor shall rectify any inaccuracies, errors and or non-compliance of requirements envisaged in the Contract. Any delay occurring for reasons attributable to such

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		inaccuracies, error and or non-compliance shall not construe a reason for delay/ extension.
66	**HOUSE KEEPING**	It is the responsibility of the Contractor to maintain general cleanliness and proper housekeeping at work site. Contractor shall organize disposal of excavated earth /garbage/ rubbish/ scrape, electrode butts etc. on day to day basis to identified disposal areas/safe areas as per Owner / Consultant. The CONTRACTOR shall dispose off the unserviceable materials, debris etc. to the earmarked area within / outside the work site as decided by the Owner / Consultant. No extra payment shall be paid on this account. Serviceable materials shall be stored in designate area separately after obtaining acknowledgement of duly authorized officer of Owner.
67	**PROTECTION OF EXISTING FACILITIES**	Contractor shall obtain all safety clearance (viz. excavation, hot/cold work permit). Contractor shall obtain plans and full details of all existing and planned underground services from Owner / Consultant and shall follow these plans closely at all times during the performance of work. Contractor shall be responsible for location and protection of all underground lines and structures at its own cost. Despite all precautions, should any damage to any structure / utility etc. at Site occur, the Contractor shall contact the Owner / Consultant / authority concerned and Contractor shall forthwith carry out repair at its expenses under the direction and to the satisfaction of Owner / Consultant and Owner / Consultant/concerned authority. Contractor shall take all precautions to ensure that no damage is caused to the existing pipelines, cables etc., at Site during construction. Existing structures, existing compound wall, tiling and other items damaged / disturbed during construction shall be repaired and restored to their original condition by Contractor after completion of relevant works to the complete satisfaction of Owner. If required, CONTRACTOR shall in consultation with Owner and Consultant and the concerned authorities, take adequate measures for strengthening the existing electric poles, cast

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		iron pipes, sewer lines, GI pipelines telephone poles etc. in the proximity of proposed City Gate Station. CONTRACTOR shall take adequate protective measures to prevent damage to these facilities during execution of above said work. Contractor shall have to adopt such method of construction as will be suitable for working at Site using the limited space available and without causing any damage to Site. Contractor shall be deemed to have taken cognizance of all such constraints, etc. while working at Site and Contractor shall not be entitled to claim any extra at a later stage. All the monuments, articles of value of antiquity and structure or other remains of geological or archaeological discovered on the site of works shall be declared to be the property of the Owner during the entire course of execution of work. Site Contractor shall take reasonable precautions to prevent these workmen or any other persons from removing or damaging any such articles or thing and shall immediately inform the Owner / Engineer-in-charge and thereafter hand them over immediately back to Owner in their existing condition, as per the instructions of Owner / Engineer-in-charge, at no extra cost to Owner.
68	**CONSTRUCTION**	RULES AND REGULATIONS CONTRACTOR shall observe in addition to Codes specified in respective specification, all Applicable Laws and shall be responsible for any extra costs arising from non-adherence with the same. PROCEDURES Contractor shall prepare and submit all the plans, procedures and documents to Consultant / Owner as specified in the Contract. CONSTRUCTION EXECUTION PLAN Contractor shall submit Construction Execution Plan to Consultant / Owner for review and approval while providing the Project Execution Strategy. The Construction Execution Plan shall detail the execution methodology of the Contractor

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		during execution of City Gate Station covering the following aspects as minimum: Contractor's Construction Execution Plan shall include: Contractor's man-power and its deployment schedule on monthly basis. Other plans of Contractor and procedures to be submitted at least 04 weeks prior to start of respective activity at site include the following as minimum: Temporary facilities, etc. Scaffolding Plan Heavy Transport & Heavy Lifting Plan (Rigging Plan) Pre-Fabrication Plan Hydro-test Plan Other activity plans (eg. Piping, equipment and steel structure erection plan etc) Monsoon Counter measures and preparation. Emergency Evacuation Procedure Storm Management Plan.
69	**WORKING HOURS**	Normal working Hours shall be from 09:00 am to 05:30 pm. However, the same may be extended by Owner/Consultant on request and need basis. However, working hours for work within the work site shall be governed by the work permits issued by Owner. Depending upon the requirement, Works Time Schedule / drawing programmes and the target set to complete the relevant work in time, the works may have to continue beyond normal working hours to the extent of round the clock also, for which no extra claim shall be entertained.
70	**HYDROSTATIC TESTING**	The Bidder as per the technical specification along with its Tender taking into account the Completion Period shall furnish the detailed procedure proposed for the hydrostatic testing. The necessary piping, pumps etc. shall be provided by the Contractor. The final disposal of water after testing shall be

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		Contractor's responsibility and should be in such a way that neither the traffic movement even pedestrians nor the standing crop in nearby fields gets affected. Suitable drains shall be provided for this purpose as directed by the Engineer-in-Charge within the Contract Price. The Contractor shall propose and obtain approval of Engineer-in-Charge based on drawings, availability of water for hydro testing and keeping in view other exigencies, if any before starting hydro testing work. The Contractor will carry out the hydrostatic test for approved number of test section including preparation for test and tie-ins, without any time and cost implication on this account to Owner/Consultant. Any increase or decrease in number of test sections will not have any cost implication to Owner / Consultant.
71	**PROJECT PLANNING, SCHEDULING AND MONITORING SYSTEM**	The following schedules/documents/reports shall be prepared and submitted by the Contractor for review/approval at various stages of the Contract. Work Time Schedule at the time of submitting the Tender and Project Schedule after the Award of Contract a) Works Time Schedule The Works Time Schedule submitted by the Bidder for the execution of work (including mobilization period) shall be developed keeping in mind the Completion Period and the provisions of the IFB. The Contractor is required to submit a Works Time Schedule in Primavera. The Works Time Schedule shall cover all aspects like sub-ordering, manufacturing and delivery, indicated in the Tender Documents. The Owner interface activities shall be clearly identified with their latest required dates. Owner reserves the right to disqualify the Bidder if the above Works Time Schedule submitted by the Bidder is not in line with the overall requirement of the Project. b) Scheduling & Monitoring System The Bidders should describe their system of scheduling and monitoring the works in respect of execution of Composite

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		Works for MS, the extent of computerization, level of detailing, tracing methodology etc. with the name of computer package and sample outputs. c) Overall Project Schedule The Contractor shall submit within 1 week of LOA, a sufficiently detailed overall intended 'Project Schedule' in the activity network form, clearly indicating the major milestones, interrelationship/ interdependence between various activities together with analysis of critical path and floats. The intended 'Project Schedule' will be reviewed and approved by Engineer- in-Charge and the comments if any shall be incorporated in the network before issuing the same for implementation. The network thus finalized shall be referred as the 'Project Schedule' and form part of the Contract and the same shall not be revised without the prior permission from Engineer-in- Charge during the entire period of Contract. d) Progress Measurement Methodology The Contractor is required to submit within 1 week of award of LOA, the methodology of progress measurement of sub-ordering, manufacturing/ delivery, sub- contracting construction and commissioning works and the basis of computation of overall services/physical progress informed. Owner reserves the right to modify the methodology in part or in full. e) Functional Schedules The Contractor should prepare detailed functional schedules in line with network for functional monitoring and control and submit scheduled progress covers for each function viz. ordering, delivery and construction.
72	**Project Review Meetings**	The Contractor shall present the programme and status at various review meetings as required. **Weekly Review Meeting** Level of Participation Agenda

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		Contractor's / Consultant's construction Manager & Job Engineers. a. Weekly programme v/s actual achieved in the past week & programme for next week. b. Remedial Actions and hold up analysis. c. Client query/ approval. d. Status of HSE adherence / compliance Venue: Site Office **Monthly Review Meeting** Level of Participation Agenda Senior Officers of Owner/Consultant and Contractors. Progress Status/ Statistics a. Completion Outlook b. Major hold ups/slippages c. Assistance required d. Critical issues e. Client query/ approval f. Status of HSE adherence / compliance **Progress Reporting Proforma** A. **Monthly Progress Report** This report shall be submitted by the Contractor to Owner/Contractor on a monthly basis within 10 (ten) calendar days from cutoff date, as agreed upon covering overall scenarios of the Composite Works for MS. The report shall include, but not limited to the following: Brief Introduction of the work. a. Activities executed/ achievements during the month. b. Schedule versus actual percentage progress and progress curves for Detail Engg. Sub- ordering, manufacturing/delivery,

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		sub-contracting, construction, commissioning and overall and quantum wise status & orders against schedule. c. Area of concern/ problem/ hold-ups, impacts and action plans. d. Resources deployment status. e. Annexures giving status summary for drawings, MRs, deliveries, sub-contracting and construction. f. Procurement status for items to be supplied by Contractor. B. Weekly Reports The report will be prepared and submitted by the Contractor to Owner/Consultant on weekly basis and will cover following items: a. Activities programmed and completed during the week. b. Resource deployed men and machines. c. Quantities achieved against target in construction d. Record of man-days lost. e. Construction percentage progress schedule and actual. C. Daily Reports a. Activity programme for the day b. Progress of the previous day and commutative progress. c. Manpower & machinery deployed. D. Any other additional reports/ information as may be required by Engineer In Charge **Progress Reports** Contractor shall make every effort to keep the Owner adequately informed as to the progress of the works in respect of execution of work throughout the duration of the Contract. Contractor shall keep the Owner informed well in advance of the relevant Project Schedule so as to enable the Owner to arrange for requisite inspection to be carried out in such a manner as to minimize interference with progress of works. It

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		is imperative that close coordination be maintained with the Owner during all phases of Composite Works for MS. By the 10th (tenth) of each month, Contractor shall furnish the Owner a detailed report covering the progress as of the last day of the previous month. These reports will indicate actual and scheduled percentage of completion of construction as well as general comments of interest or the progress of various phases of execution of the work. The frequency of progress reporting by the Contractor shall be weekly. Once a week, Contractor shall submit a summary of the works accomplished during the preceding week in form of percentage completion of the various phases to the Owner. Progress reports shall be supplied by Contractor with documents such as chart, networks, photographs, test certificate etc. Such progress reports shall be in the form and size as may be required by the Owner and shall be submitted in at least 3 (three) copies. Contractor shall prepare daily progress report (DPR) in the desired format and submit it to Engineering-In-Charge along with schedule of next day to Engineer-In-Charge.
73	**PIPES FOR WELDING QUALIFICATION**	For the purpose of qualification of welding procedure, operators, Contractor may use the same pipes issued by Employer/Consultant. However, accounting of such pipes shall be done within the unaccountable wastage and scraps limit as defined in bidding document. The bare pipes for the purpose as above shall be issued within two week from the date of FOI/FOA. The contractor shall bear all cost towards lifting, carting from issue point to work site/Contractor's store, custody, handling, insurance and levies etc. and return of surplus/scrap materials to employer designated storage point. No separate payment shall be made for such expenditure.
74	**SPARES**	Contractor shall procure and supply all spare parts required during commissioning of the various items / materials supplied by him as enumerated in the Bidding Document. The quoted lumpsum prices shall be deemed to have been inclusive of all such provision of commissioning spares, required till

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		commissioning of such items. Contractor shall make available all the commissioning spares required at site at least 4 (four) weeks before start of commissioning. However, listed spares not used during commissioning shall be handed over to Employer at their designated place. Contractor shall also supply commissioning spares not listed but required during commissioning within the contracted price. In addition to above, special tools & tackles required, if any, for operation & maintenance shall also be supplied by the Contractor and the quoted prices shall be deemed to have been inclusive of all such provisions.
75	**STORAGE FACILITIES**	The Contractor shall store all materials / instruments required for calibration and testing of the instruments in suitable condition / environment conducive for the same at its own cost. The Contractor shall provide these facilities within the quoted rate.
76	**WORK PERMIT**	When Contractor is working at Site, Contractor shall note that Contractor would be required to obtain applicable hot work/ cold work permits on daily basis from the competent authority. Contractor shall also comply with all the conditions on the work permit / entry permits at no extra cost to Owner. Contractor shall be required to obtain police verification for obtaining work/entry permits to work inside the work site for all the employees and workers employed for the various works. The Contractor shall provide identity cards to all its staff/workmen who will be working inside the Site/Premises, The ID cards will have to be produced by the Contractors' workmen as and when demanded by the Owner's representatives or security personnel at Site/ Premises. Action where there is no specification: In case of any class of work for which there is no specification mentioned, the same shall be carried out in accordance with the latest edition of Indian Standard Specifications subject to the approval of the Owner. Typographical or Clerical Errors

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		Owner clarifications regarding partially omitted particulars or typographical or clerical errors shall be final and binding on the Contractor.
77	**BUILDING AND OTHER CONSTRUCTION WORKER'S ACT**	In order to govern welfare and working conditions of labourers engaged in construction activities, the Building and other Construction Workers' (Regulation of Employment and Conditions of Service "RE&CS") Act, 1996 came into force. RE&CS Act'1996 is applicable in respect of building and other construction work. Wherever applicable, The Contractor shall strictly comply with the following provisions pertaining to RE &CS Act'1996. a. The Contractor shall be registered with the concerned authorities under the Building and Other Construction Workers' (RE&CS) Act, 1996 or in case of non-registration; the CONTRACTOR shall obtain registration within one month of the award of LOA. b. The CONTRACTOR shall be responsible to comply with all provisions of the Building and Other Construction Workers' (RE&CS) Act, 1996, the Building and Other Construction Workers' Welfare Cess Act, 1996, the Building and other Construction Workers' (RE&CS) Rules, 1998 and the Building and Other Construction Workers Welfare Cess Rules, 1998. c. Cess as per the prevailing rate, shall be deducted at source from bills of the Contractor by the Engineer-In-Charge of the Contract and remitted to the "Secretary, Building and Other Construction Workers Welfare Board" of the concerned State. The Contractor shall be responsible to submit final assessment return of the cess amount to the assessing officer after adjusting the cess deducted at source. Before starting of work, the Contractor shall obtain a license from concerned authorities under the Contract Labour (Abolition and Regulation) Act, 1970, and furnish a copy of the same to the Engineer-in-Charge. Every worker engaged by the Contractor should be enrolled under the following scheme(s): i. Pradhan Mantri Jeevan Jyoti Bima Yojna (PMJJBY)

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		ii. Pradhan Mantri Suraksha Bima Yojna (PMSBY) Under the two schemes, applicable annual premium amount (presently Rs. 342/- per person) shall be considered by the prospective bidder while submitting the price bid. Proof of payment towards the above two scheme shall be submitted by the Contactor to EIC for verification of the same from time to time.
78	**BUILDING AND OTHER CONSTRUCTION WORKERS (BOCW) WELFARE CESS**	82.4.1 BOCW, if applicable, shall be paid extra at actual against the documentary proof of submission against payment of BOCW to relevant tax authorities. Notwithstanding the foregoing, Owner shall not bear any liability in respect of: a) Personal taxes on the personnel deployed by the Contractors, his sub-contractors and Agents, etc. b) The Corporate taxes in respect of Contractor and his Sub-contractors and other Agents, Indian or foreign based.”
79	**GOVT. ACTS/ REGULATIONS**	Any reference to the specific statutes/regulations in the IFB is only indicative, and it is entirely for the Bidder to ascertain the Applicable Laws.
80	**SUBSTITUTION, WRONG SUPPLIES AND SHORT SUPPLIES**	Unauthorized substitution or materials delivered in error, other than those mentioned in the Contract, or material of sub-standard quality or supplied in excess quantity (unless authorized by the buyer), shall be rejected and the rejected goods if any shall be returned to Contractor at Contractor 's cost and risk.
81	**CEMENT & STEEL**	In partial modification to Clause. 7.e and 7.f of (GTC-WORK CONTRACT), unless until specified explicitly in the IFB, supply of cement and steel shall be arranged by Contractor and the cost of the same shall be deemed to be included in the quoted rates.
82	**QUANTITY VARIATION FOR SUPPLY & WORKS**	Owner reserves the right, at the time of execution of Contract, to increase or decrease the quantity of goods for all items as specified in the IFB up to +/- 25% without any change in the unit prices (as well as lump sum prices, if any) and other terms and conditions. Bidder’s quoted rates shall be valid for such quantity variation.

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83	**RECOVERY OF FAILURE OF ITEMS FOR SUPPLY**	In case the items supplied by the Contractor fails during fabrication and or erection due to manufacturing defect the Contractor shall become liable to replace the items without any additional cost to Owner and in a timely manner so as not to deviate from the Completion Period. The Contractor shall bear the landed cost for replacing the defective items, including all costs incurred up to delivery thereof at site, all duties, freight, insurance, labour, material, charges for cutting, removing, replacement, engineering and construction supervision charges of consultant, and relaying of defective part(s), including cost of incidental activities.
84	**JURISDICTION**	The courts at Mumbai (India) shall have exclusive jurisdiction over all Disputes arising under or in connection with the CONTRACT.
85	**INTEGRITY PACT**	Integrity Pact: All tenders and contracts shall comply with the requirements of the Integrity Pact (IP) if the value of such tenders or contracts exceed Rs.1 crore. Failure to sign the Integrity Pact shall lead to outright rejection of bid. The successful tenderer shall execute Integrity Pact with Owner as per the enclosed Draft Integrity Pact Agreement. Hard copy of the same duly filled signed, stamped by authorized person and witnessed to be forwarded along with EMD in physical condition so as to be received at Tractebel Office prior to bid due date and time.
86	**EPMC CONSULTANT**	Notwithstanding anything contained elsewhere, Bidder acknowledges that the EPMC Consultant has been engaged by Owner for procurement assistance, tendering, evaluation of tenders and recommendation for placement of orders including expediting and inspection, and accordingly, the Bidder /Contractor shall be required to function in close co-ordination with the Consultant.
87	**PENALTIES**	BGL shall have right to levy following penalties on the Contractor and deduct applicable amount from the Contractor's Running Bills: 87.1 In case proper barricading, as per technical specification and instruction of EIC is not provided, the work shall be immediately suspended till such time proper barricading, as

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		per the technical specification is provided and penalty will be levied as per SCC clause “PENALTIES” 87.3. 87.2 In case required numbers of safety equipment like Safety Harness belts, helmets, fluorescent jackets etc as per the Technical Specifications and Special conditions of the contract of the tender, could not be provided by the contractor during execution, work shall be suspended, and penalty will be levied as per SCC clause “PENALTIES” 87.3. 87.3 Either of the case as in clause “PENALTIES” 87.1 & 87.2 above shall attract penalty of **INR 1000.00** per instance. Any subsequent instance shall attract penalty of **INR 5000.00** per instance with a notice to contractor. Subsequent non-compliance within 5 days shall lead to a deduction of up-to 1% from RA bill at the discretion of the EIC and may also lead to blacklisting of the contractor for future jobs. 87.4 In case of complete compliance of HSE norms throughout the contract period the contractor shall be issued a letter of appreciation by the Owner on recommendation by the consultant. 87.5 In case required numbers of equipment, Tools & Tackles, shuttering, vibrators, cubes auto level etc. as per the scope of work & Technical Specifications, could not be provided by the contractor at the time of need, a notice shall be issued to the contractor by Engineer- In charge and **INR 1000/-per day** shall be levied as penalty till such time the equipment, Tools & Tackles are made available for completion of the work. 87.6 Failure to submit weekly & monthly reports by 10th of every month, a penalty of **INR 500/- per instance per day** shall be levied till the time report is submitted to the Engineer-in Charge. 87.7 Failure to adhere to the timelines of project as mutually decided before start of project by Engineer In Charge and contractor, shall invite a penalty of **INR 5000 per week** (provided the delay is attributable to the contractor) unless such failure is due to force majeure. The deduction will be made in RA bills. In case of delay beyond the validity of

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		purchase order, penalty of ½% per week shall be levied subjected to a maximum of 5% of total purchase order value. 87.8 In case the contractor does not mobilize the required machines at site and fails to start the work within one week from the intimation received from Engineer-In charge adhering BGL safety standards. Owner at its sole discretion may get it executed from an alternate agency at the risk and cost of the contractor shall be borne by contractor. Also, an administrative charge @ 15% over and above the actual cost incurred shall be levied from contractor's bill. In case, no work is done, penalties will be deducted from CPBG. 87.9 Delay in submission of test reports within 7 days of intimation by Engineer in-charge shall invite a penalty of INR1000 per instance. 87.10 In case of installation of contractor's supplied material without inspection and prior approval EIC/sited in charge, **INR 5000/- per instance** shall be levied from the running bills. 87.11 For non-execution / poor quality of restoration work till completion of the work in respective area, a penalty of INR 5000/- per week or part thereof shall be imposed on contractor till satisfactory execution & acceptance by EIC following submission of NOC from respective Local Authority/statutory bodies. In addition to this, in case of any penalty imposed by statutory Authority / third party to Owner for non-execution/ poor quality of restoration, the same penalty shall be recovered from underground utilities. 87.12 In case of non- compliance of statutory provisions penalty will be imposed by the owner as detailed below: a) Contractor's failure to submit RPFC/ ESI challans of previous month along with the bills during the validity of the contract, Owner shall deduct 5% (Five percent) of payable amount from the contractor's running bill and retain the same as a deposit. Such retained amount shall be refunded to contractor on production of RPFC challan/ receipt. In case of non-submission of challans for a particular month, a penalty of INR 5000 /- shall be imposed for that particular month.

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		b) Delay of more than 21 days from the date of PO / LOI in obtaining / submitting WC cover or taken for shorter duration will result into penalty of **INR 5000/- per week** or part thereof. c) Delay of more than 21 days from the date of PO / LOI in obtaining / submitting the required insurance policies as specified in the tender document will result into a penalty **of INR 5000/- per week** or part thereof. d) The contractor must obtain labour licence at the start of work at allotted site. Delay of more than 30 days from the date of PO / LOI in submitting the labour licence shall attract a penalty of **INR 5000/- per week** or part thereof. 87.13 In case contractors sub-let his part or whole work, contractor shall be liable for a penalty of **INR 5000.00 per instance** on issuance of site memo. Any subsequent instance shall attract penalty of **INR 10,000.00** with a notice to contractor to remove the sub-contractor within 15 days. Subsequent non-compliance within 15 days shall lead to a deduction of penalty up to 1% of total executed work value from RA bill at the discretion of the EIC / Owner / Consultant and may also lead to blacklisting of the contractor for future jobs as per owner policy. The owner / Consultant may terminate the contract and the remaining work shall be carried out at the risk and cost of the contractor.
88	**SAFETY CODE**	The Contractor shall at his own expenses arrange for the Safety provisions as may be necessary for the execution of the work or as required by the Engineer-in-Charge in respect of all labours directly or indirectly employed for performance of the works and shall provide all facilities in connections therewith. In case the contractor fails to make arrangements and provide necessary facilities as aforesaid, the Owner shall be entitled but not bound to do so and recover the cost thereof from the Contractor. From the commencement to the completion of the works, the contractor shall take full responsibility for the care thereof and of all the temporary works (defined as meaning all temporary works of every kind required in or for the execution, completion or maintenance of the works). In case damage, loss or injury shall happen to the works or to any part thereof or to temporary works due to any cause whatsoever the contractor

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		shall repair at his (Contractor's) own cost and make good the same so that at the time of completion, the works shall be in good order and condition and in conformity in every respect with the requirement of the contract and Engineer-in Charge's instructions. In respect of all labour, directly or indirectly employed in the work for the performance of the Contractor's part of this agreement, the contractor shall at his own expense arrange for all the safety provisions as per relevant Safety Codes of C.P.W.D, Bureau of Indian Standards, the Electricity Act/I.E. Rules. The Mines Act and such other Acts as applicable. The Contractor shall observe and abide by all fire and safety regulations prescribed by the local government and/or the Owner. Before starting construction work, the Contractor shall consult the Owner's Safety Engineer or Engineer-in-Charge/Site-in-Charge and must make good to the satisfaction of the Owner any loss or damage due to fire to any portion of the work done or to be done under this agreement or to any of the Owner's existing property. The Contractor will be fully responsible for complying with all relevant provisions of the Contract Labour Act and shall pay rates of Wages and observe hours of work/conditions of employment according to the provisions under the applicable Law and rules in force from time to time. The Contractor will be fully responsible for complying with the provision including documentation and submission of reports on the above to the concerned authorities and does hereby indemnify the Owner from any such lapse for which the Government may take action against them.
89	**CLOSING OF PO**	Contractor to close the work order within Three (03 months, once the value is consumed or validity is expired (including time extensions for completion of scope of work, if required). In case contractor fails to close the work order within this period, Owner/PMC will short close the work order as per data available on the record. OWNER reserves the right to adjust any pending liability of the closed work order /contract from the any other running work order /contract.

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SPECIAL CONDITIONS OF CONTRACT

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45. BONUS FOR EARLY COMPLETION
46. PRADHAN MANTRI SURAKSHA BIMA YOJANA (PMSBY) AND PRADHAN MANTRI JEEVAN JYOTI BIMA YOJANA (PMJJBY)
47. FORCE MAJEURE (FOR COVID-19)

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1. GENERAL

1.0 Special conditions of contract (SCC) shall be read in conjunction with the General Conditions of Contract (GCC). Schedule of rates, specifications of work, drawings and any other document forming part of this contract wherever the context so requires.

1.1 Notwithstanding the sub-division of the document into these separate sections and volumes, every part of each with and into the contract so far as it may be practicable to do so.

1.2 Where any portion of the GCC is repugnant to or at variance with any provisions of the special conditions of contract, then unless a different intention appears, the provision(s) of the special conditions of contract shall be deemed to override the provision(s) of GCC only to the extent that such repugnancies of variations in the special conditions of contract are not possible of being reconciled with the provisions of GCC.

1.3 Wherever it is stated in this Bidding Document that such and such a supply is to be effected or such and such a work is to be carried out, it shall be understood that the same shall be effected/carried out by the contractor at his own cost, unless a different intention is specifically and expressly stated herein or otherwise explicit from the context. Contract value (also referred to as Contract price) shall be deemed to have included such cost.

1.4 The materials, design and workmanship shall satisfy the applicable relevant Indian Standards, the job specifications stipulate requirements in addition to those contained in the standard codes and specifications, these additional requirements shall also be satisfied. In the absence of any Standard/ Specifications/codes of practice for detailed specifications covering any part of the work covered in this Bidding on the contractor.

1.6 In partial modification to Clause No.21.0 of GCC-Works the following shall apply:

In case of contradiction between Indian or other applicable Standards, General Conditions of Contract, Special Conditions of Contract, Specifications, drawings, Schedule of Rates, the following shall prevail in order of precedence:

i) Letter of acceptance alongwith statement of Agreed variations. ii) Fax / Letter of Intent / Fax of Acceptance
iii) Schedule of Rates as enclosures to letter of acceptance
iv) Particular Job Specifications
v) Drawings
vi) Technical / Material Specifications
vii) Special Conditions of Contract
viii) General Conditions of Contract
ix) Indian Standards
x) Other Applicable Standards

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1.7 it will be contractor's responsibility to bring to the notice of Engineer-in-charge any irreconcilable conflict in the contract documents before starting the work(s) of making the supply with reference which the conflict exists.

In the absence of any specifications covering any material, design of work(s) in the same shall be performed / supplies / executed in accordance with Standards Engineering Practice as per the instructions / directions of the Engineer-in-charge, which will be binding on the Contractor.

1.8 The requirements of any statutory body and authority like Indian boiler regulation, Tariff Advisory Committee, Chief controller of Explosives, etc, shall govern where these are more stringent than the requirements specified above.

1.9 Owner's representative means authorized representative of Owner (i.e. M/s BHAGYANAGAR GAS LTD.) and / or Consultant (i.e. M/s LEPL).

2.0 THE WORK

2.1 Scope of work

The scope of work covered in this Contract will be as described in Annexure- 1 to SCC at Particular job specifications, Standard Specifications, Schedule of Rates etc.

2.2 Scope of Supply

The scope of supply covered in this Contract will be as described in Annexure-2 to SCC Particular Job Specifications, Standard Specifications, Schedule of Rates etc.

2.3 Time schedule

2.3.1 The work shall be executed strictly as per time schedule given in Annexure-3 to SCC. The period of completion given includes the time required for mobilization as well as testing, rectifications, if any, retesting, demobilization and completion in all respects to the satisfaction of the Engineer-in-Charge.

2.3.2 A joint program of execution of work will be prepared by the Engineer-in- Charge and Contractor. This program will take into account the time of completion mentioned in 2.3.1 above.

2.3.3 Monthly/Weekly execution program will be drawn up by the Engineer-in- Charge jointly with the Contractor based on availability of materials, work fronts and the joint program of execution as referred to above. The contractor shall scrupulously adhere to the Targets/Programs by deploying adequate personnel, Construction Equipment, Tools and Tackles and also by timely

supply of required materials coming within his scope of supply as per Contract. In all matters concerning the extent of target set out in the weekly/monthly program and the degree of achievement, the decision of the Engineer-in-Charge will be final and binding on the Contractor.

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2.3.4 Contractor shall give every day category-wise labour and equipment deployment report alongwith the progress of work done on previous day in the proforma prescribed by the Engineer-in-Charge.

2.4 Measurement of Works

In addition to the provisions of Clause 88.1 of the General Conditions of Contract and associated provisions thereof, the provisions of Annexure – 4 to SCC shall apply.

2.5 Terms of Payment

Terms of Payment will be as specified in Annexure – 5 to SCC.

2.6 Temporary Works

All temporary works, ancillary works, enabling works, including dewatering of surface and subsoil water, temporary drains at the work site, preparing approaches to working areas, wherever required, for execution of the work, shall be the responsibility of Contractor.

2.7 Temporary Fencing

The Contractor shall, at his own costs and expenses, erect and maintain in good condition temporary fences and gates along the boundaries of the site assigned to him wherever required as per instruction of Engineer-in-charge. Wherever trenching is being done specially at crossing site near habitation and public movement. The contractor shall provide barricading as per sketch enclosed and provide proper night light as per requirement and to the satisfaction of EIC. The Contractor shall, except when authorized by the Engineer-in-Charge, confine his men, materials and plant etc. within the site of which he is given possession. The Contractor shall not use any part of the site for purpose not connected with the works unless prior written permission or consent of the Owner/Engineer-in-Charge has been obtained. Access to site shall be made only through the approved gateways. The Contractor shall maintain sufficient watchmen at site to the satisfaction of the Owner/Engineer- in-Charge.

2.8 Contractor's Temporary Structure

The Contractor may, at his own costs and expenses and subject to the approval of the Engineer-in-Charge and statutory authorities, construct offices, stores, workshop and remove the same as per the orders of the Engineer-in-Charge on completion of the contract. Whenever required the Contractor shall furnish such details of his temporary works as may be called for by the Owner/Engineer-in-Charge as to their safety and efficiency. The Owner/Engineer-in-Charge may direct those temporary works which he considers unsafe or, inefficient be removed and replaced in a satisfactory manner. The Contractor shall immediately follow Owner/Engineer-in-Charge's direction/instruction, on maintenance of all the equipments and he shall ensure that they are suitable for the work and is maintained in such a manner as to ensure their efficient working. The Owner/Engineer-in-Charge, may if they deem fit, direct the Contractor to remove from site any equipment which are not efficient and/or prejudicial to the quality of work to be replaced by equipment to their satisfaction. The Contractor shall immediately follow Owner/Engineer-in-Charge's direction/instruction.

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2.9 Statutory Approvals

2.9.1 All associated activities required for obtaining necessary clearances, permissions, approvals, all licenses from all concerned authorities in respect of pipeline crossing & all related works shall be the responsibility of the Contractor and the cost of the same shall be deemed to have been included in the quoted prices.

The approval from any authority required as per statutory rules and regulations of Central/State Government shall be the Contractor's responsibility unless otherwise specified in the Bidding Document. The application on behalf of the Owner for submission to relevant authorities along with copies of required certificate complete in all respects shall be prepared and submitted by the Contractor well ahead of time so that the actual construction of the work is into delayed for want of the approval/inspection by concerned authorities. The inspection of the works by the authorities shall be arranged by the Contractor and necessary coordination and liaison work in this respect shall be the responsibility of the Contractor. However statutory fees paid, if any, for all inspections and approvals by such authorities shall be reimbursed at actual by the Owner to the Contractor on production of documentary evidence.

Any change/addition required to be made to meet the requirements of the statutory authorities shall be carried out by the Contractor free of charge. The inspection and acceptance of the work by statutory authorities shall however, not absolve the Contract from any of his responsibilities under this Contract.

2.10 Quality Assurance

2.10.1 Bidder shall 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.

2.10.2 The Contractor shall establish document and maintain an effective quality assurance system as outlined in recognized codes.

2.10.3 Quality Assurance System plans/procedures of the Contractor shall be furnished in the 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.

The quality assurance system should indicate organizational approach for quality control and quality assurance of the construction activities, at all stages of work at site as well as at manufacturer's works and dispatch of materials.

2.10.4 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 without any extra cost to Employer.

2.10.5 The Contractor has to ensure the deployment of quality Assurance and Quality Control Engineer(s) depending upon the quantum of work. This QA /QC

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group shall be fully responsible to carryout the work as per standards and all code requirements. In case Engineer- in-charge feels that contractor's QA/QC Engineer (s) are incompetent or insufficient, contractor has to deploy other experienced Engineer(s) as per site requirement and to the full satisfaction of engineer-in- charge.

2.10.6 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 until he complies with the instructions to the full satisfaction of Engineer –in –charge.

2.10.7 The contractor shall adhere to the quality assurance system as per LEPL specification enclosed in the bidding document as Annexure-6.

2.11 Notice and Licenses

The Contractor shall at his costs and expenses give to the Municipal or Panchayat, Police and other authorities all notices etc., that may be required in law to be given and obtain all necessary permissions and licenses etc., for temporary obstructions, enclosures and pay all fees, taxes charges etc. which may be leviable by such authorities for that purpose. The Contractor shall make good any damage to the adjoining property whether public or private.

2.12 Working Hours

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.

2.13 Responsibility of Contractor

Preparing approaches and working area for the movement and operation or the cranes, leveling the area for assembly and erection shall also be the responsibility of the Contractor. The Contractor shall acquaint himself with access availability, facilities such as railway siding, local labour etc.

The procurement and supply in sequence and at the appropriate time of all materials and consumables covered under Contractor's scope of supply shall be entirely the Contractor's responsibility. Contractor shall not use any of the equipment or materials issued to him by Owner for temporary works, manufacturing erection aids etc. Misuse of materials will be seriously viewed and deduction at penal rates will be made from the Contractors bill for such quantities that are misused.

Contract Price is deemed to be inclusive of all expenses towards above responsibilities.

2.14 Additional Works/Extra Works

Owner 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

2.15 Compensation for Idle Time

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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.

2.17 Power and Water Connection

The Purchaser/Consultant 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.

3.0 CONSTRUCTION

OWNER reserves the right to inspect all phases of Contractor's operations to ensure conformity to the SPECIFICATIONS. Owner will have Engineers, Inspectors or other duly authorized representatives, made known to the Contractor present during progress of the WORK and such representatives shall have free access to the WORK at all times. The presence or absence of an Owner's representative does not relieve the Contractor of the responsibility for quality control in all phases of the WORK. In the event that any of the WORK being done by the Contractor or any Sub-Contractor is found by
Owner's representatives to be unsatisfactory or not in accordance with the DRAWINGS, procedures and SPECIFICATIONS, the Contractor shall, upon verbal notice of such, revise the work in a manner to conform to the relevant DRAWINGS, procedures and SPECIFICATIONS.

3.1 Rules and Regulations

ontractor shall observe in addition to Codes specified in respective specification, all national and local laws, ordinances, rules and regulations and requirements pertaining to the work and shall be responsible for extra costs arising from violations of the same.

3.2 Procedures

Various procedures and method statements to be adopted by Contractor during the construction as required in the respective specifications shall be submitted to Engineer-in-Charge in due time for approval. No construction activity shall commence unless approved by Engineer-in-Charge in writing.

3.3 Security

If the work being in protected area, entry into the work area shall be restricted and governed by issue of photo gate passes by the Security/CISF. The Contractor shall arrange to obtain through the Engineer-in-Charge, well in advance, all necessary entry permits/gate pass for his staff and labour and entry and exit of his men and materials shall be subject to vigorous check by the security staff. The Contractor shall not be eligible for any claim or extension of time whatsoever on this account. Also for domestic installation works, contractor shall provide Identity cards to their employees/ workers to work inside the society / house premises.

3.4 Drawings and Documents

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3.4.1 The drawings accompanying the bid document (if any) are of indicative nature and issued for bidding purpose only. Purpose of these drawing is to enable the bidder to make an offer in line with the requirements of the Employer/Consultant. However no extra claim whatsoever, shall be entertained for variation in the "Approved for Construction" and "Bid document drawings" regarding any changes/units. Construction shall be as per drawings/specifications issued/approved by the Engineer-in-Charge during the course of execution of work. Detailed construction drawings (wherever required) on the basis of which actual execution of work is to proceed will be prepared by the contractor.

3.4.2 The drawings and documents to be submitted by the Contractor to Employer/Consultant after award of the work as per the requirements enlisted in the bidding document shall be for Employer/Consultant's review, information and record. The Contractor shall ensure that drawings and documents submitted to Employer/Consultant are accompanied by relevant calculations, data as required and essential for review of the document/ drawings. LEPL shall review the drawings/ documents within two weeks from the date of submission provided the same are accompanied by relevant calculations, data as required and essential for review.

manufacturer's etc. shall be submitted to Employer/Consultant after having been fully vetted in detail, approved and co-opted by the Contractor & shall bear Contractor seal/ certifications to this effect. All documents/drawings & submissions made to Employer/Consultant without compliance to this requirement will not be acceptable and the delay & liability owing to this shall be to the Contractor's account.

3.4.4 The review of documents and drawings by Employer/Consultant shall not absolve Contractor from his responsibility to meet the requirements of specifications, drawings etc. and liabilities for mistakes and deviations. Upon receiving the comments on the drawing/documents reviewed by Employer/Consultant, Contractor shall incorporate the comments as required and ensure their compliance.

3.4.5 Copies of all detailed working drawing relating to the works shall be kept at the contractors' office at the site and shall be made available to the Engineer- in-charge/ Employer/Consultant at any time during execution of the contract. However no extra claim what so ever shall be entertained for any variation in the "approved/issued for construction drawings" and "tender drawings" regarding any changes/units unless otherwise agreed.

3.4.6 The Contractor shall rectify any inaccuracies, errors and non-compliance to contractual requirements. Any delay occurring on this shall not construe a reason for delay/ extension.

3.5 DELETED.

3.6 Construction Equipment & Mechanization of Construction Activities

Contractor shall, without prejudice to his overall responsibility to execute and complete the Work as per specifications and time schedule, adopt as far as practicable, mechanized construction techniques for major site activities. However, Contractor agrees that he will deploy the required numbers and types of the part &

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machinery applicable for different activities in consultation with the Engineer-In-Charge during execution of works.

The Contractor shall mechanize the construction activities to the maximum extent by deploying all necessary construction equipment/machinery in adequate numbers and capacities.

Wherever Structural/Piping works are included in the scope, the Contractor's responsibilities shall include establishing and maintaining of a proper fabrication workshop with transportation facilities to site to carryout fabrication of steel structures, piping specials etc., preparing approaches working areas for the movement/operation of cranes and leveling the areas for assembly/erection to ensure effective mechanization on the works. The
Contractor shall acquaint himself with availability of access, facilities such as railway siding, local labour etc. and the Contractor may have to build temporary access roads to aid his work and the quoted and agreed rates shall be deemed to include the same. It may be noted that all fabrication work shall be carried out in fully mechanized workshops to reduce site fabrication to minimum.

Contractor may also ensure use of computer software for at least the following:

(i) Billing
(ii) Planning & Scheduling
(iii) Progress Reporting
(iv) Material Control & Warehousing
(v) Safety Records
(vi) Resource Deployment
(vii) Communication

Contractor further agrees that Contract price is inclusive of all the associated costs) which he may incur for actual mobilization, required in respect of use of mechanized construction techniques and that the Owner/Consultant in this regard shall entertain no claim whatsoever.

3.7 Site Organization

The Contractor shall provide all necessary superintendence during the design and execution of the Works and as long thereafter as the Engineer-in-Charge may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract. Such superintendence shall be given by sufficient persons having adequate knowledge of the operations to be carried out including the methods and techniques required the hazards likely to be encountered and methods of preventing accident for the satisfactory and safe execution of the Work. The workmen deployed, by the Contractor should also possess the necessary license etc., if required under any law, rules and regulations.

Subject to the provisions in the Contract Document and without prejudice to Contractor's liabilities and responsibilities to provide adequate qualified and skilled personnel on the Work, Contractor shall augment the same as decided by the Engineer-in-Charge depending on the exigencies of Work.

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3.7.1 SUPERVISION

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 BHAGYANAGAR GAS LTD. 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 BHAGYANAGAR GAS LTD.

The Contractor will appoint his own supervisors of minimum number instructed by EIC. These personnel will be responsible to the SE for monitoring construction standards and for ensuring that all detailed technical requirements are met on each and every job which is undertaken. The Contractor's supervisor(s) will have day to day liaison with the SE, and will provide the SE 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 or pagers to ensure that they can be contacted at all times. The Contractor will also nominate one person who can be contacted if necessary out of 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 BHAGYANAGAR GAS LTD.as is required. The normal day to day issue of work instructions, communication between BHAGYANAGAR GAS LTD.and the Contractor's supervisor and the SE. No deviation from the approved technical specification / issued construction drawings shall be undertaken without written approval of EIC.

3.8 Health Safety and Environment (HSE) Management

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, Client & PMC.

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

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 until he complies with the instructions to the full satisfaction of Engineer-in-charge.

The Contractor shall adhere to the Health, Safety and Environment (HSE) management system as per BHAGYANAGAR GAS LTD.Specification and General Conditions of Contract.

It will be the Contractor's responsibility to acquaint his site staff and operatives of all current safety legislation, statutory requirements and BHAGYANAGAR GAS LTD.'s safety standards. In addition, and before any work

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takes place all the Contractor's operatives shall be given training in site safety by the trained person under supervision of BHAGYANAGAR GAS LTD. If the Contractor wishes to start any new operatives on site, he must first inform the SE, who will arrange for such training to be arranged.

3.9 General Guidelines During and Before Erection

3.9.1 The Contractor shall be responsible for organizing the lifting of the structural element, equipment in the proper sequence, that orderly progress of the work is ensured and access routes for erecting the other structures/ equipments are kept open.

3.9.2 During the performance of the work the Contractor at his own cost, shall keep structures, materials and equipment adequately braced by guys, struts or otherwise approved means which shall be Supplied and installed by the Contractor as required till the installation work is satisfactorily completed.

Such guys, shoring, bracing, strutting, planking supports etc. shall not interfere with the work of other agencies and shall not damage or cause distortion to other works executed by him or other agencies.

3.9.3 Manufacturer's recommendations and detailed specifications for the installation of the various equipment and machines shall be fulfilled by the Contractor.

3.9.4 Various tolerances required as marked on the drawings and as per specifications and instructions of the Engineer-in-Charge, shall be maintained.

Verticality shall be maintained. Verticality shall be verified with the Theodolite/advanced instruments,

3.10 Construction Photographs

The Owner desires to have two sets of monthly progress reports with photographs showing the progress of construction. Before utilizing any photograph for publicity, the Contractor shall obtain prior approval of the Owner.

3.11 Schedule of Labour

Schedule of Labour Rates attached as Annexure-9 to SCC shall be used for analysing rates for extra items.

Schedule of equipment rates attached as Annexure-9 to SCC shall be used for analysing rates for extra items.

3.11.1. Construction Equipment

Minimum construction equipment to be deployed is enclosed as Annexure-8 to SCC. However, Any other equipment required for completion of pipeline laying work but

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not specifically mentioned here, shall be deployed by contractor without any additional cost. The list of equipments mentioned in Annexure-8 is the minimum to be deployed by contractor and contractor shall ensure the availability at site of listed equipments in good working condition.

3.12 Specific Requirements

Specific requirements spelt out in various technical parts of the Bidding Document shall be followed by Contractor.

3.13 SITE CLEANING

3.13.1 The BIDDER shall take care for cleaning the working site from time to time for easy access to work site and also from safety point of view.

3.13.2 Working site should be always kept cleaned up to the entire satisfactions of the Engineer-in-charge.

Before handing over and work to owner, the BIDDER in addition to other formalities to be observed as detailed in the document shall clear the site to the entire satisfaction of Engineer-in-charge.

3.14 SURVEY OF WORK

Before the WORK or any part thereof are begun, the Contractor's agent and the Engineer-in-Charge's representative shall together survey the SITE and decide the tentative route considering all obstructions on which the pipeline is to be laid and on which measurements of the WORK are to be based. Such particulars shall be plotted by the BIDDER and trial pits started thereon.

The Contractor shall be entirely responsible for the correctness of every part of the WORK and shall rectify any errors or imperfections therein. Such rectifications shall be carried out by the Contractor at his own cost, when instructions are issued to this effect by the Engineer-in-Charge or his representative.

WORK shall be suspended for such times as necessary for checking lines and levels on any part of the WORK.

The Contractor shall at his own expense provide all assistance, which the Engineer-in-Charge may require for checking the setting out to WORKS.

Before commencement of any activity, Contractor's quality control set up duly approved by company must be available at site.

4.0 TESTS, INSPECTION AND COMPLETION

4.1 Tests and Inspection of Material under Contractor’s Scope

Inspection and test prior to shipment of material and at final acceptance shall be as specified in Technical Specification. However, without prejudice to the provision of Technical Specification following shall hold good.

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The Owner/Consultant or its representative shall have the right to inspect ad or to test the material to conform their conformity to the specification.

If any inspected or tested material fail to conform the specification , the Owner/Consultant may reject them and the contractor shall either replace the rejected materials or make all the alteration necessary to meet the specification , free of cost to the purchaser/consultant.

The Purchaser / Consultant's right to inspect , test and where ever necessary reject the material after the material's arrival in the purchaser / consultant site shall in no way be limited to or waived by reason of the material having previously been inspected , tested and passed by the purchaser/ Consultant or their representative prior to the material shipment from the material supplier.

4.2 Tests and Inspection during execution

The Contractor shall carry out the various tests as enumerated in the technical specifications of this Bidding Document and technical documents that will be furnished to him during the performance of the work at no extra cost to the Owner.

All the tests either on the field or at outside laboratories concerning the execution of the work and supply of materials by the Contractor shall be carried out by Contractor at his own cost.

The work is subject to inspection at all times by the Engineer-in-Charge. The Contractor shall follow all instructions given during inspection and shall ensure that the work is being carried out according to the technical specifications of this Bidding Document, the technical documents that will be furnished to him during performance of work and the relevant codes of practice.

The Contractor shall provide for purposes of inspection access ladders, lighting equipment for testing, necessary instruments etc. at his own cost, low voltage lighting equipment for tray fixing and inspection work.

Compressed air for carrying out works shall be arranged by the Contractor at his own cost.

For material supplied by Owner, Contractor shall carryout the tests, if required by the Engineer-in-Charge, and the cost of such tests shall be reimbursed by the Owner at actual to the Contractor on production of documentary evidence.

Contractor shall inspect carefully all equipment before receiving them from Owner for installation purposes. Any damage or defect noticed shall be brought to the notice of Engineer-in- Charge immediately.

All results of inspection and tests will be recorded in the inspection reports, proforma of which will be approved by the Engineer-in-Charge. These reports shall form part of the completion documents. Any work not conforming to execution drawings,

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specifications or codes shall be rejected and the Contractor shall carryout the rectifications at his own cost.

Inspection and acceptance of the work shall not relieve the Contractor from any of his responsibilities under this Contract.

4.3 Final Inspection during execution

After completion of all tests as per specification the whole work will be subject to a final inspection to ensure that job has been completed as per requirement. If any defect is noticed, the Contractor will be notified by the Engineer-in-Charge and he shall make good the defects at his own cost and risk with utmost speed. If, however, the Contractor fails to attend to these defects within a reasonable time (time period shall be fixed by the Engineer- in-Charge) then Engineer-in-Charge may have defects rectified at Contractor's cost.

When these works are carried out at the risk and cost of the Contractor, the Engineer-in-charge would recover the actual cost incurred towards labour, supervisions and material, consumables or otherwise, plus 100% towards overheadsfrom any pending bill of the Contractor or the security deposit.

4.3 Documentation

4.3.1 As - Built Drawings

Notwithstanding the provisions contained in standard specifications, upon completion of commissioning, the BIDDER shall complete all of the related approved drawings along with bill of materials to the "AS BUILT" stage provide to a scale of 1:200 and submit to BHAGYANAGAR GAS LTD., the following:

a) One complete set in reduced size (279 mm x 432 mm).
b) One complete set of Soft Copy in CD of all original drawings.
c) Four complete sets of approved prints in A2 / A3 sizes.

4.3.2 Completion Document

The following documents shall be submitted in hard binder by the BIDDER in FOUR sets, as a part of completion documents: -

a) Copies of the Inspection reports, Laying Graphs, HDD Profiles (IF ANY) and valve pit drawings (IF ANY).

b) Pre testing, final Hydrostatic / pneumatic and other Test results and reports.

c) Consumption statements of PE / GI certified by Owner's Site Engineer.

d) Material Reconciliation, stores issue & return statements

e) All other requirements as specified in the respective specifications.

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f) Completion Certificate issued by Owner's Site Engineer.

g) No claim certificate by the BIDDER.

h) Completion certificate for embedded and covered up works wherever applicable.

i) Recovery statement, if any.

j) Deviation statement.

k) Statement for reconciliation of all the payments and recoveries made in the progress bills.

l) Copies of deviation statement and order of extension of time, if granted.

m) Any other contractual documents required on completion.

4.4 Statement of Final Bills-Issue of No Demand Certificate

The final bill of Contractor shall be accompanied by no-demand certificate from the following departments of the Owner:

i) Administration & Personnel Department regarding vacation of land, housing accommodation, recovery of tents etc.

ii) Fire and Safety Officer and CISF.

The Contractor shall obtain such no-demand certificates from the concerned authorities and furnish the same to the Engineer-in-Charge.

4.5 Issue and Reconciliation of Material

Refer Annexure-7 to SCC for details.

4.8 GOVERNMENT OF INDIA NOT LIABLE

It is expressly understood and agreed by and between the Contractor and the Employer that the Employer 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 there under. It is expressly understood and agreed that the Employer is an independent legal entity with power and authority to enter into contract, solely in its own behalf under the applicable laws of India and general principal of Contract Law. The Contractor expressly agrees, acknowledges and understands that the Employer is not an agent, representative or delegate of Govt. of India. It is further understood and agreed that the Govt. of India is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs

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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 Govt. of India arising out of this contract and covenants not to sue to Govt. of India as to any manner, claim, cause of action or thing whatsoever arising of or under this agreement.

5.0 REGISTRATION OF THE CONTRACT WITH STATUTORY AUTHORITIES (FOR FOREIGN BIDDER if applicable)

5.1 Within 30 days of execution of the Contract agreement, the Contractor shall register themselves and the Contract at their own cost with the Reserve Bank of India, Income Tax, Sales Tax and such other statutory authorities, as may be required under the rules and regulations governing in India. The Contract Price shall be deemed to include all costs towards the same. A copy of all documents related to all such registration shall be submitted to Employer for record.

6.0 LIMITATION OF LIABILITY

6.1 The final payment by the Employer in pursuance of the Contract terms shall not mean release of the Contractor from all of his liabilities under the Contract. The Contractor shall be liable and committed under this contract to fulfil all his liabilities and responsibilities, till the time of release of contract performance guarantee by the Employer.

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

7.0 Void

8.0 DELETED

9.0 DELETED

10. DELETED

11. DELETED

12.0 DELETED

13.0 VOID

14.0 DELETED

15 ISSUE OF CERTIFICATE- PERTAINING TO IMPORT

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BHAGYANAGAR GAS LTD.shall not provide any kind of certificate.

16.0 IMPORT LICENCE

16.1 Contractor shall arrange import of all materials required for permanent incorporation in the works as well as construction equipment as per the guidelines laid down by the Government of India. Employer shall not provide import license.

17.0 DELETED

18.0 INTELLECTUAL PROPERTY

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

19.0 FIRM PRICE

19.1 The quoted prices shall be firm and shall not subjected to price escalation till the work is completed in all respects.

20.0 WORKS CONTRACT

20.1 The work covered under this contract shall be treated as "Works Contract".

21.0 PROVIDENT FUND ACT

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

22.0 DELETED

23.0 TERMS OF PAYMENT

23.1 Basis and terms of payment for making “On Account Payment” shall be as set out in

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Annexure-5 to SCC.

24.0 DELETED

25.0 COORDINATION WITH OTHER AGENCIES

25.1 Work shall be carried out in such a manner that the work of other agencies operating at the site is not hampered due to any action of the Contractor. Proper coordination with other agencies will be Contractor's responsibility. In case of any dispute, the decision of Engineer-in-Charge shall be final and binding on the Contractor.

26.0 DELETED

27.0 ROYALTY

27.1 Contractor's quoted rate should include the royalty on different applicable items as per the prevailing Government rates. In case, Employer is able to obtain the exemption of Royalty from the State Government, the contractor shall pass on the same to Employer for all the items involving Royalty.

28.0 THE FACILITIES FOR WORKMEN

28.1 Following facilities are to be ensured at all work places where workmen are deployed/engaged by Contractor & any other, as required by law at the time of execution.

Arrangement of first aid
Arrangement for clean drinking water.
Toilets
Canteen where tea & snacks are available
A crèche where 10 or more women workmen are having children below the age of 6 years.

29.0 DELETED

30.0 PROJECT PLANNING, SCHEDULING AND MONITORING SYSTEM

33.1 The Contractor shall follow the specifications with respect to Project Planning, Scheduling and Monitoring system as giving in Bidding Document.

31.0 CHECKING OF LEVELS

31.1 The Contractor shall be responsible for checking levels, orientation plan of all foundations, foundation bolts, etc., well in advance of taking up the actual erection work and bring to the notice of Engineer-in-Charge discrepancies, if any. In case of minor variations in levels etc. the Contractor shall carry out the necessary rectifications to the foundations within his quoted price.

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31.2 The Contractor shall also be responsible for checking with templates, wherever necessary, the disposition of foundation bolts with the corresponding bases of structure and shall effect rectifications, as directed, within his quoted rate.

32.0 STORAGE FACILITIES

32.1 The Contractor shall maintain wherever required an air-conditioned room for the storage of the instruments as well as for calibration and testing of the instruments at his own cost. The contractor shall provide these facilities with in the quoted price.

33.0 ABNORMALLY HIGH RATED ITEMS (AHR ITEMS)

33.1 Clause No. 20.0 of GCC-Works is modified to the following extent:

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

i) Rates as per SOR, quoted by the Contractor.
ii) Rate of the item, which shall be derived as follows:

a) Based on rates of machine and labour as available from the contract (which includes contractor's supervision, profit, overheads and other expenses).

b) In case rates are not available in the contract, rates will be calculated based on prevailing market rates of machine, material and labour plus 15% to cover contractor's supervision profit, overhead & other expenses.

34.0 DELETED

35. DELETED

36. COMPUTERIZED BILLS

Contractor shall submit computerized bills with duly printed GST Registration no. etc.

37. ORDER PLACEMENT OF BOUGHT OUT ITEMS

The contractor is required to place firm order for all bought out items of adequate quantity (including 1st lot in those cases where items are required to be procured in more than one lot, if so stated in SOR/ SCC) within 30 days from the date of placement of order, failing which owner reserves the right to procure the same at the risk & cost of the contractor. However the contractor shall always take prior

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approval of owner and consultant for items required to be procured.

Further lots (for those cases where items are required to be procured in more than one lot, if so stated in SOR/ SCC) shall be procured after suitable period so as to ensure adequate availability of material at site through out the execution period).

38. REQUIREMENTS FOR CONTRACTOR AT SITE

38.1 Contractor shall establish site office in the respective areas with adequate facilities like tables, chairs, telephone, and computer with mailing facility etc. for effective communication and documentation.

38.2 Contractor shall provide as and when required a wagon(s) suitable for soil removal, for the delivery or reinstatement materials and for the transport of pipe to and from site.

38.3 Contractor shall supply transport for their technical staff and operatives to move from site to site, and to move tools and equipment from site to site, this vehicle will also be fitted with a tow bar suitable for the towing of a mobile air compressor or pipe trailer.

38.4 Contractor shall make appropriate arrangements to ensure that their supervisor(s) are adequately mobile and can attend sites or meeting with BGL/ LEPL & other authorities or customers as required, without any undue delay.

38.5 Contractors shall provide cell phones to their supervisors for day to day communication with BHAGYANAGAR Gas/ BGL PMC and site representatives of BGL/ PMC.

38.6 The RCM/ site in-charge must be a permanent employee of the contractor having desired qualification and work experience, Any change in key persons working at site shall be informed to the Owner promptly.

38.7 Owner will not allow switching/ swapping of key personnel of any contractor working at site from one contractor to another during the continuity of the contract.

39. COMPLIANCE WITH LAWS

39.1 The Contractor shall abide by all applicable rules, regulations, statutes, laws governing the performance of works in India, including but not limited to the following:

i) Contract Labour (Regulation & Abolition) Act 1970 & the centre rules, 1971 framed there under. ii) Payment of Wages Act. iii) Minimum Wages Act. iv) Employer's Liability Act. v) Factory Act. vi) Apprentices Act. vii) Workman's Compensation Act. viii) Industrial Dispute Act. ix) Environment Protection Act. x) Wild life Act. xi) Maritime Act. xii) Any other Statute, Act, Law as may be applicable.

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xiii) PNGRB Act.

40. NOTES TO SCHEDULE OF RATES (SOR)

i) The SOR items would be operatable as per job requirement.

ii) 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.

iii) 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 tender.

iv) Any other materials & activities not mentioned/covered in SOR , but otherwise required for satisfactory completion/safety of work as defined in tender has to be supplied /done by contractor with in the specified schedule at no extra cost to owner.

v) 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.

41.0 Insurance

All kind of Insurances including transit Insurance shall be borne & arranged by the bidder in line with clause no. 101 of GCC-Works. Price quoted in SOR shall be inclusive of this cost. Clause no. 16 of GCC-Goods, in this respect, shall stand superseded to this extent.

42.0 PRICE REDUCTION SCHEDULE

The Price reduction schedule shall be applicable as per clause no. 27 of GCC-Works. The Contract/order value shall exclude GST for the purpose of Price reduction schedule.

42.1. PRS is the reduction in the consideration/contract value for the goods/services covered under this contract. In case of delay in supply/ execution of the contract, the supplier/contractor/service provider should raise invoice for reduced value as per Price Reduction Schedule Clause (PRS clause). If the supplier/ contractor/ service provider has raised the· invoice for the full value, then the supplier/contractor/service provider should issue Credit Note towards the applicable PRS amount with applicable taxes

42.2. In such cases, if supplier/ contractor/ service provider fails to submit the invoice with reduced value or does not issue credit note as mentioned above, BHAGYANAGAR Gas will release the payment to supplier/ contractor/ service provider after giving the effect of the PRS clause with the corresponding reduction of taxes charged on vendor's invoice, to avoid delay in delivery/collection of material.

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42.3 In case any financial implication arises on BHAGYANAGAR Gas due to issuance of invoice without reduction in price or non-issuance of Credit Note, the same shall be· to the account of supplier/ contractor/ service provider. BHAGYANAGAR Gas shall be entitled to deduct /setoff / recover such GST amount (CGST & SGST/UTGST or IGST) together with penalties and interest, if any, against any amounts paid or becomes payable by

BHAGYANAGAR Gas in future to the Supplier/Contractor under this contract or under any other contract.

43.0 DIRECT PAYMENTS TO SUB-VENDORS/ SUPPORTING AGENCIES OF MAIN CONTRACTOR

Normally, the payment is to be made to vendor/ contractor only as per provision of contract. During execution, in case of financial constraints, BGL may make direct payment to their sub-vendor/ supporting agencies as an exception from the amounts due to the vendors/ contractors from any of their bills under process upon certification by EIC subject to receipt of such request from the vendor/ contractor. Further, the request for direct payments to the sub-vendor/ sub-contractor shall be considered in performance evaluation of such vendor/ contractor.

44.0 SUB-LETTING OF WORKS

Pursuant to Clause No. 37 of GCC-Works:
The contractor shall not, save with previous consent in writing of the Engineer-in-charge, sublet, transfer or assign the contract or any part thereof or interest therein or benefit or advantage thereof in any manner whatsoever. Provided, nevertheless, that any such consent shall not relieve the contractor from any obligation, duty or responsibility under the contract.
However, subletting of WHOLE WORKS is prohibited. Vendor/ Contractor shall submit undertaking to this effect along with each invoice/ bill.

45.0 BONUS FOR EARLY COMPLETION

The Clause 27.3 of GCC-Works for Bonus for early completion shall not be applicable in this Contract.

46. PRADHAN MANTRI SURAKSHA BIMA YOJANA (PMSBY) AND PRADHAN MANTRI JEEVAN JYOTI BIMA YOJANA (PMJJBY)

Contractor shall ensure that all its personnel deployed under this 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 BGL. The cost of the insurance premium amount for both the above

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schemes shall be borne by the contractor giving evidence/proof to BGL in this respect and the Contractor shall suitably consider the same in their bid.

Both the schemes are to be regulated continuously on yearly basis and the same should be renewed on each successive relevant date in subsequent years.

47. FORCE MAJEURE (FOR COVID-19)

Shall be as per Government of India Guide lines.

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ANNEXURES TO SCC

C O N T E N T S

Annexure-1	:	Scope of Work
Annexure-2	:	Scope of Supply
Annexure-3	:	Time Schedule
Annexure-4	:	Measurement of Work
Annexure-5	:	Terms of Payment
Annexure-6	:	Quality Assurance
Annexure-7	:	Conditions for issue & reconciliation of material
Annexure-8	:	Construction equipment to be deployed
Annexure-9	:	Schedule of Labour Rate
Annexure-10	:	Schedule of Equipment Hourly Rental Rate

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SCOPE OF WORK

(ANNEXURE-1 TO SPECIAL CONDITIONS OF CONTRACT)

ANNEXURE-1 TO SCC

1.0 SCOPE OF WORK

Scope of work shall be as detailed in Particular Job Specification / Technical Vol II of II, Technical Specifications, Schedule of Rates & various other parts of this Bidding Document.

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SCOPE OF SUPPLY

(ANNEXURE-2 TO SPECIAL CONDITIONS OF CONTRACT)

ANNEXURE-2 TO SCC 1.0

SCOPE OF SUPPLY

1.1 Owner's Scope of Supply (Free Issue Item)

Owner's scope of supply shall be as specified in Particular Job Specification, Technical Specifications, Schedule of Rates & various other parts of the Bidding Document.

In order to speed up the project Free Issue Materials shall be issued to the Contractor from the designated store(s) of BHAGYANAGAR Gas Ltd. Contractor shall be responsible for lifting the free issue materials from Owner's storage point(s) and transporting the same to work site(s) at his own cost.

Conditions for Issue and Reconciliation of Materials shall be as per Document enclosed as Annexure-7 to Special Conditions of Contract.

1.2 Contractor's Scope of Supply

All materials except what is under Owner's scope of supply as mentioned in Clause No. 1.1 above, and required for successful completion of works in all respects shall be supplied by the Contractor and the cost of such supply shall be deemed to have been included in the quoted price without any additional liability on the part of Owner.

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TIME SCHEDULE

(ANNEXURE-3 TO SPECIAL CONDITIONS OF CONTRACT)

ANNEXURE-3 TO SCC

TIME SCHEDULE

Name of Work	Time of Completion	
ELECTRICAL WORKS FOR CONSTRUCTION OF CNG MOTHER STATION IN HYDERABAD OF BHAGYANAGAR GAS LIMITED (The time schedule is inclusive of mobilization period)	HYDERABAD	Contract validity period of 01 year from the date of LOI/FOA.

Note:

1) Mobilization period is 15 days from the date of BGL EIC/PMC intimation.
2) The time of completion shall be reckoned from the date of award of contract, which shall be the date of issue of letter/ Fax of Intent.

3) The time indicated is for completing all the works in all respects as per specifications, codes, drawings and instructions of Engineer-in-charge.

4) It should be noted that the period of construction given above includes preparation of drawings , procurement and supply of materials including their inspection & testing, mobilization at site, construction, laying, fabrication, erection inspection, testing, rectification (if any), pre-commissioning, commissioning and demobilization works etc. complete in all respects to the entire satisfaction of Owner/ Engineer-in- charge.
5) However, bidder to note that execution to be completed within 06 months from the date of EIC intimation to ensure the timely completion of the project. Accordingly, bidder to plan for execution of the project.

_____

(STAMP & SIGNATURE OF BIDDER)

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MEASUREMENT OF WORK

(ANNEXURE-4 TO SPECIAL CONDITIONS OF CONTRACT – TECHNICAL)

ANNEXURE-4 TO SCC

MEASUREMENT OF WORK

1.0 GENERAL

1.1 The mode of measurement shall be as mentioned in relevant standard specification incorporated in the Bidding Document. Any other mode of measurements not covered in above specifications shall be followed in accordance with relevant BIS codes/ Schedule of Rates/ Specifications etc. and/ or as decided by Engineer-in- charge.

1.2 Payment will be made on the basis of joint measurements taken by Contractor and certified by Engineer-in-charge. Measurement shall be based on "Approved for Construction" drawings, to be the extent that the work conforms to the drawings and details are adequate.

1.3 Wherever work is executed based on instructions of Engineer-in-charge or details are not adequate in the drawings, physical measurements shall be taken by Contractor in the presence of Engineer-in-charge.

1.4 Measurements of weights shall be in metric tonnes corrected to the nearest Kilogram. Linear measurements shall be in meters corrected to the nearest centimeters.

1.5 The weights mentioned in the drawing or shipping list shall be the basis for payment. If mountings for panels etc. are packed separately, their erection weights shall include all mountings.

1.6 Welds, bolts, nuts, washers etc. shall not be measured. Rates for structural steel work shall be deemed to include the same.

1.7 No other payment either for temporary works connected with this Contractor for any other item such as weld, shims, packing plates etc. shall be made. Such items shall be deemed to have been included for in the rates quoted.

1.8 Measurement will be made for various items under schedule of rates on the following basis as indicated in the unit column.

i) Weight : MT or Kg
ii) Length : M (Meter)
iii) Number : No.
iv) Volume : Cu.M
v) Area : Sq.M

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TERMS OF PAYMENT

(ANNEXURE-5 TO SPECIAL CONDITIONS OF CONTRACT)

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ANNEXURE-5 TO SCC

1.0 TERMS OF PAYMENT

1.1 Advance

1.1.1 The Owner will not pay any advance in any circumstances.

1.2 The Payment terms shall be as follows:

The CONTRACTOR shall raise the RA bill on monthly basis and payment shall be made as per the following terms:

1.2.1 CIVIL / STRUCTURAL WORK

a) void

1.2.2 ELECTRICAL WORKS

a) 80 % on Supply, fabrication, installation and testing with other requisite document duly certified by Engineer In-Charge.

b) 10% on completion of all work and Certificate by Engineer-In -Charge

c) Balance 10% on contract closure and submission of all documents as per contract.

1.2.3 PAYMENT METHODOLOGY

a) The contractor shall raise GST invoices on monthly basis. Bidder shall enclose all relevant documents as per check list issued by BGL including during kick off meeting.

b) The payments to the Contractor will be released within a period of 30 days from the date of receipt of the complete invoice as per the terms and conditions of the Contract.

c) Employer will release payment through e-payments only as detailed in the Bidding Document.

d) Further break-up of Lump-sum Prices, if deemed necessary for any progressive payment of individual item may be mutually arrived at between Engineer-in-Charge and the Contractor.

e) All payments against running bills are advance against the work and shall not be taken as final acceptance of work / measurement carried out till the final bill.

1.2.4 PAYING AUTHORITY:

In charge- Finance ,
BGL-HO, Hyderabad.

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QUALITY ASSURANCE

(ANNEXURE-6 TO SPECIAL CONDITIONS OF CONTRACT)

(For details- Refer our Technical Specification enclosed in Vol.-II of tender document.)

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CONDITIONS FOR ISSUE AND RECONCILIATION OF MATERIAL

(ANNEXURE-7 TO SPECIAL CONDITIONS OF CONTRACT)

ANNEXURE-7 TO SCC

1.0 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.

1.1 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.

1.2 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.

1.3 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.

1.4 No material shall be allowed to be taken outside the plant without a gate pass.

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

1.6 Reconciliation of Owner supplied materials

1.6.1 Every month, the contractor shall submit an account for all materials issued by Owner in the proforma prescribed by the Engineer-in-charge. On completion of the work the contractor shall submit "Material Appropriation Statement" for all materials issued by the Owner in the proforma prescribed by the Engineer-in-charge.

Waste materials like part lengths of pipes and other partly used items are the property of BHAGYANAGAR GAS LTD. and must be returned to the store with the appreciate documentation so that they can be considered as part of the material reconciliation.

* In case supplied by Owner

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Unaccountable wastage/ scrap shall be at actual as per site assessment subject to maximum as stated above.

The percentage allowance shall be accounted on the basis of final measurement book.

1.6.2 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 yard(s). In case the Contractor fails to do so/ or exceeds the limits of allowances specified above for scrap/ serviceable materials, then recovery for such quantities not returned as well as returned in excess of permitted limit 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. Contractor shall be responsible for the adjustment/ weighment/ 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.

1.6.3 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.

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CONSTRUCTION EQUIPMENT TO BE DEPLOYED

(ANNEXURE-8 TO SPECIAL CONDITIONS OF CONTRACT)

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ANNEXURE-8

CONSTRUCTION EQUIPMENT TO BE DEPLOYED

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Sl. No.	Description of Item	Minimum Qty. to be Deployed*for each city
i.	Electro-fusion machine with Bar Code and control box with leads	2
ii.	Moling Equipment	As and when required
iii.	PE Squeeze Tools for all diameter Pipes	2
iv.	Universal pipe scrapper 20mm, 32mm / hand scrappers for all diameters	4
v.	Tapping tools for PE service tees	2 sets of all size
vi.	PE pipe cutter/ Guillotine for all diameters	3
vii.	Gas detection equipment, wherever required	As and when required
viii.	Cable and pipe locator	As and when required
ix.	PE closure plugs/ test ends for 20mm / 32mm pipes	As required
x.	Towing heads	As required
xi.	Pipe alignment clamps, jointing of elbow, tee, top loading clamps for top tee	4
xii.	Pipe straightners, re-rounding tools of all pipe sizes	3
xiii.	Jumping Jack compactor	As and when required
xiv.	Roller for asphalting	As and when required
xv.	Water tanker	As and when required
xvi.	Hammer Drill	3
xvii.	Portable Power Generator a) 5 kVA b) 3 kVA	2 2
viii.	Piston Drill	2 Gangs
xix.	Conversion Kit	2 Gangs as required
xx.	Pneumatic Test Pumps	2
xxi.	Die sets for thread preparation	2 per gang
xxii.	Soldier Torch	2
xiii.	Cleaning pads	6
xiv.	Cleaning Brush	6
xxv.	Lacquer and thinner	As Required

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xvi.	Safety Harness equipments with descent control	2
xvii.	Calibrated Pressure Gauge (0-6 Bar)	6

Notes:

1. Any other equipment required for completion of pipeline laying work but not specifically mentioned hereinabove, shall be deployed by contractor without any additional cost to Owner. Contractor shall deploy above mentioned equipments in good working condition.

2. Mobilization shall be considered complete only after equipments having quantity specifically mentioned hereinabove (in the min. qty. to be deployed column), are made available at site in good working condition as verified by EIC.

*) Number of equipment indicated hereinabove is a minimum requirement, however for completion of job, if additional equipment is required, same shall be deployed by the contractor at site without any additional cost to Owner.

_____

(SIGNATURE OF BIDDER)

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SCHEDULE OF LABOUR RATES

(ANNEXURE-9TO SPECIAL CONDITIONS OF CONTRACT)

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ANNEXURE –9 to SCC

SCHEDULE OF LABOUR RATES
(FOR EXTRA WORKS)

Sl. No.	Classification Personnel	Rates in INR for 8 hours	Rate per Hour for OT, Sunday & Holiday
		Standard Time (Rs)	In Rs
1.	Engineer	1500/-	650
2.	Surveyor Foreman	1200/-	430
3.	Pipe Fitter	750/-	150
4.	Pipe Welder	750/-	150
5.	Gas Cutter	700/-	170
6.	Grinder	700/-	170
7.	Mason	520/-	120
8.	Plumber	500/-	120
9.	Carpenter	500/-	130
10.	Painter	500/-	120
11.	Electrician	600/-	150
12.	Cable Jointer	780/-	190
13.	Instrument Technician	1000/-	190
14.	Rigger	400/-	110
15.	Watchman/Helper	350/-	80
16.	Concrete Mixer Operator	350/-	80
17.	Heavy Machine Operator	700/-	170
18.	Fusion Operation/ Jointer	500	120
19.	Civil labour	450	60

(SIGNATURE OF BIDDER)

NOTES:-

Above rates are final and Tenderer is to sign only without deviation.

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EQUIPMENT HOURLY RENTAL RATES FOR EXTRA WORKS

(ANNEXURE-10 TO SPECIAL CONDITIONS OF CONTRACT)

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ANNEXURE-
10 TO SCC

EQUIPMENT HOURLY RENTAL RATES FOR EXTRA WORKS

SL. NO.	DESCRIPTION OF EQUIPMENT	HOURLY RENTAL RATES FOR EXTRA WORKS INCLUDING CONSUMABLES
1)	Excavator/ JCB	Rs. 1000/-
2)	Moling machine	Rs. 600/-
3)	3) Compressors 210 CFM	Rs. 1500/-
4)	Dewatering Pumps	Rs. 600/-
5)	Fusion Jointing Machine	Rs. 900/-
6)	Power generators (5KVA)	Rs. 250/-
7)	Gas cutting set with cylinders	Rs. 150/-
8)	Trucks (small)	Rs. 400/-
9)	Car/Jeep	Rs. 200/-
10)	Tripod with 5 Tons Chain Pulley Block	Rs. 300/-
11)	Tractor Compressor	Rs. 600/-

NOTES:-

1) Rates are final and Tenderer is to sign only without deviation.
2) In case of foreign bidder, Conversion rate applicable on one day prior to price bid Opening date published by the State Bank of India will be considered.
3) Rates are inclusive of operators / drivers as applicable
4) Rates are inclusive of contractor's overhead & profit
5) The recovery rate shall be the rates provided above plus 20%

_____

(SIGNATURE OF BIDDER)

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Section VI: Schedule of Requirements

Background of Services

1) **Background and Services; and impact on performance/ objectives;**

As per tender terms and conditions.

2) **Purpose and Service Outcomes Statement**

As per tender terms and conditions.

3) **Short Description and Scope of Services**

The scope involves Supply, Erection and Commissioning of Civil, & architectural works & Miscellaneous works for Mother Station (MS) for CNG & PNG facilities for CGD projects.

For detailed scope of work & specification, refer Technical Volume including Corrigendum (if any).

4) **Contract Duration / Contract Period**

As per tender terms and conditions

5) **Form of BOQ/ Contract**
SOR Type

6) **Deliverables/ Outcomes and Timelines(frequency) thereof:**

As per tender terms and conditions.

7) **Facilities and Utilities to be provided by the Employer to service provider at Site:**

As per tender terms and conditions.

8) **Institutional and organisational arrangement for Services**
As per tender terms and conditions.

9) **Statutory and contractual obligations to be complied with by the contractor**

As per tender terms and conditions.

10) **Insurances**

As per tender terms and conditions.

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Section VII: Performance Standards and Quality Assurance

Note for Bidders: Regarding this Schedule and its sub-schedules, Bidders shall submit the following forms, as relevant for the form of BOQ/ Contract, or if asked:

1) Form 4: Performance

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Technical Volume II of II				
Sl.No.	Description	Attached File	Set Value	Supporting Doc. Req'd
1	Technical Volume II of II		-	
2	Technical Volume II of II	Technical Volume II of II.pdf	-	

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TECHNICAL DOCUMENTATION

Technical Vol II of II, Rev. 0

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ELECTRICAL WORKS OF MOTHER STATIONS
P.019141 G11031 M003

INTRODUCTION

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1.0 INTRODUCTION

Bhagyanagar Gas Limited (BGL) (hereinafter referred as Owner), is executing the City Gas Distribution project in Hyderabad GA.

VCS has been appointed as Project Management Consultant (hereinafter referred as PMC), by BGL for providing Design, Engineering & PMC services for a mentioned project.

BGL is now inviting tenders on Competitive Bidding basis for the below works under the same tender-

a) Supply & installation, testing & commissioning for Electrical works of Mother Station under Hyderabad GA

b) This part refers to Electrical part i.e. Supply & installation, testing & commissioning of Transformers, cables, UPS, earthing , lightning protection , distribution boards, APFC, CC cameras, solar panels, other associated supply, works including required statutory approvals, permissions for 02 no. of Mother stations in GA of Hyderabad.

The present document covers the technical specifications for the enquiry.

2.0 BRIEF SCOPE OF WORK OF CONTRACTOR

FOR MOTHER STATION

The scope of work not limited to design, manufacture, supply, Inspection & testing at workshop, marking, packing, handling, and dispatch of electrical systems as per SLD's , Plot Layout & specifications.

The scope of work is broadly divided into the following:

Procurement, manufacturing, inspection, testing, supply, storage & preservation

Project Management, Construction management, overall quality control including Document Management.

Construction, Installation, Erection and Testing

Pre-commissioning and Commissioning including supply of Manpower, Consumables, Non-sparking tools and tackles etc. Details of same shall be shared during execution.

Project Close Out

Supply, Installation, testing, and commissioning of Electrical Items:

Design, detailed engineering, Supply, installation, testing and commissioning of Electrical system comprising of the following.

(i) Electrical Distribution Boards (EDB, LT panel, Emergency DB) as per approved SLD,

(ii) AC UPS shall be 2 nos. X 100% ratings Parallel redundant, 6 KVA, 230 V AC. 2 Nos. X 50 % Sealed maintenance free (Valve regulated lead acid VRLA) battery bank for 4-hour back-up time. UPS DB for the UPS loads.

(iii) Power, Control & Signal FRLS Cables.

(iv) Earthing, Lightning & Bonding System.

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(v) Air conditionings

(vi) Outdoor LED Lighting and Outdoor lighting DB flame proof and weatherproof.

(vii) Indoor LED Lighting and Indoor lighting DB

(viii) Solar Panel 6 KWp (1 No. x 100% ratings) with charger controller. 1 No. x 100 % Sealed maintenance free (Valve regulated lead acid VRLA) battery bank suitable for solar system. Battery Charger, 415V, 50hz, 10KW Appx. for Solar Battery Charging.

(ix) Structural Steel, Cable trays, pipe/conduit and its accessories for cabling and miscellaneous items etc

(x) 63 KVA 3-phase CPCB II compliant Gas Genset, Prime Rated, radiator cooled, 65 KVA Equivalent electric alternator, microprocessor based Controller, Silencer, Anti-Vibration mountings, exhaust flexible connector, Batteries with cables, Acoustic Enclosure and Pressure converter valve.

(xi) Other Miscellaneous items as per BOQ.

(xii) To facilitate the power supply connection from state electricity board.

***Note: Refer SOR for detailed scope of work.**

QA AND QC

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REQUIREMENT FOR CONTROL OF MONITORING AND MEASURING DEVICES 8

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1.0 PURPOSE

The purpose of this document is for uniform understanding and implementation of quality management and quality control by contractor during construction to produce the product by combination of various activities and role of Owner/ Consultant in verification. The management of quality shall also cover co-ordination, review, approval audit and proper documentation of the works performed.

2.0 SCOPE

This document shall be applicable to all construction works to be executed by CONTRACTOR.

3.0 RESPONSIBILITY

It is CONTRACTOR's prime responsibility to arrange/produce the product conforming to contract specifications and inspect all equipment, materials and works at various stages of execution as per the approved QA Plans. In addition, they have to coordinate directly with the OWNER/ Consultant and other involved agencies to give adequate confidence that the activities are performed as per agreed ITPs and necessary documentation are available. Verification by Owner/ Consultant or his representative at any stage shall not relieve CONTRACTOR of his responsibility towards quality of the product.

The CONTRACTOR shall comply with all statutory rules & regulations in force during execution of work and interface with such authorities as required.

4.0 METHODOLOGY

The management of construction quality control is divided into the following categories: -

(1) Procurement of materials required for the construction work.

(2) Execution of work

(3) QA/QC Audits

4.1 Procurement of Materials Required for the Construction Work

The CONTRACTOR shall procure all the materials for CGS Station construction from the owner approved vendor list given in the tender document. Apart from the vendors detailed in the vendor list or items with no vendor list, the contractor may propose any other vendor having credentials for supply of respective items with the capability of the vendor to deliver the product in time with quality (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 head office, CONTRACTOR shall submit the Quality Assurance Plans for all major items and carry out their procurement in line with the approved plans. The CONTRACTOR can either provide his own adequate qualified staff for inspection or employ a separate third-party inspection agency with prior approval to Owner to carry out these functions. Involvement of Engineer-In-Charge / Consultant in the quality control plan, if required, shall be defined during approval of the same.

4.2 Execution of Work

4.2.1 The QA plans for execution shall be developed by the CONTRACTOR. OWNER/ Consultant's approval for the same shall be taken well before start of the work. The final Inspection & Test Plans (ITPs shall be developed by the CONTRACTOR as per contract specifications within fifteen (15) days after award of work for approval by OWNER/ Consultant. For the activities which are identified as Witness or Hold Point, specific inspection call shall be raised by the CONTRACTOR with OWNER/ Consultant in the requisite format well in advance.

4.2.2 CONTRACTOR shall be completely responsible for management of approved quality plans and OWNER/

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Consultant involvement will be only of Surveillance in nature to randomly check the works at selective/critical junctures. Their role shall be to monitor that the CONTRACTOR is executing the quality plans as per the approved drawings, employing adequately qualified staff and other resources for various items of works. Any deviation to the specifications shall be brought to the notice of OWNER/ Consultant in prescribed formats by CONTRACTOR for approval.

4.2.3 Sub-Contracting of entire work is not allowed in this tender. CONTRACTOR may engage sub-contractor / Vendors for performance of part work in special conditions. CONTRACTOR shall be responsible for ensuring the implementation of approved QA plan, contract specifications and contract conditions through their sub-contractors to achieve the quality during all stages of construction. It shall be the responsibility of the CONTRACTOR to ensure proper coordination between his sub- contractor(s) and other agencies working at site.

4.2.4 The sub-contractor(s)/vendors selection shall be done after evaluation by the CONTRACTOR in line with contract requirements and shall be got approved by Owner/ Consultant before engaging them for the works.

4.2.5 Storage

All the materials procured shall be stored/stacked as per the standard norms and as recommended in various clauses of relevant codes and contract document. The storage of material shall be such as to avoid damage to life/properties (physical and chemical) of the materials. The storage shall not cause deterioration, rusting, mix-up etc. and hamper the other related works in any way. CONTRACTOR shall submit his detailed warehouse plan for OWNER/ Consultant approval to manage the above in open/covered areas.

The materials susceptible to fire shall be kept away in a separate protected place.

In general, the materials shall be kept systematically in order of their class, batch number and identification number, so that they are accessible for the inspection by OWNER/ Consultant whenever required and to avoid the mix up in those materials.

4.2.6 Use

The materials shall be stacked in such a way that the lot, which is procured first, will be consumed first. For materials which are having specific expiry date/ shelf life shall not be used beyond that date and shall be removed from site. Wherever there is any doubt about the change in properties of the materials, such materials shall be sent to reputed approved laboratory for testing and acceptance.

4.2.7 Inspection

The CONTRACTOR shall be responsible for carrying out inspection of the materials brought at site and conducting tests/ checks (at site or in approved laboratories) at predefined frequencies as per contract. It is the responsibility of the CONTRACTOR to ensure that the materials used at site shall conform to relevant codes/ standards and Manufacturer Test Certificates are available for correlation as and when required. The CONTRACTOR shall maintain the records of all materials brought at site and tests conducted on them.

4.2.8 In process and final Inspection

CONTRACTOR shall be responsible to arrange verification of products during in- process and final inspection. Relevant checks and tests shall be arranged for the works performed and records maintained. Tolerances achieved with respect to contract specification and execution drawings for various activities/processes shall be ascertained and submitted to OWNER/ Consultant for approval. Efforts shall be made to keep checks and controls in such a way that a non-conforming product is avoided. However, if in an isolated case, the tolerances are beyond the acceptable values given in the contract/execution drawings/codes, non-conformance resolution/Deviation permit need to be raised by the CONTRACTOR and got approved/resolved from OWNER/Consultant.

4.2.9 Any Observation on quality aspects, Owner/ Consultant shall raise OQA format (attached as Attachment-II) which has to be acknowledged & compliance to be done by the contractor within the agreed time period.

4.2.10 The contractor shall follow the requirements given for control of monitoring and measuring devices as per Attachment-III.

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4.3 Documentation

All the necessary documentation & records shall be maintained by CONTRACTOR till completion of project and handed over to OWNER/ Consultant in requisite copies as a part of completion documents. Wherever OWNER/ Consultant personnel were directly involved particularly in witness and hold point, the copies of the records shall also be provided to personnel on completing inspection of those activities. The documentation & records shall include the following as a minimum but not limited to:

1. Approved Quality Assurance Plan
2. Approved Inspection and Test Plans
3. Inspection and test documents covering:
   - A. Manufacturer Test Certificate
   - B. Material Receipt Report including Inspection Release Note, if applicable and Site Inspection and acceptance Report on quality and quantity of material
   - C. Site test/laboratory test Report reviewed by CONTRACTOR for acceptance vis-à-vis to contract/code requirements for materials/including PMI report at warehouse
   - D. In process Verification reports of CONTRACTOR representative and OWNER/ Consultant as applicable
   - E. Final verification report including any test checks done for compliance
   - F. As built vis-à-vis to contract/drawings including tolerances
   - G. As built for erection
   - H. Non conformance resolution raised by Contractor/Owner/ Consultant
   - I. Concession/Deviation approval by OWNER/ Consultant
   - J. Change order approval by OWNER/ Consultant in case there is variation from contract
   - K. QA/QC Audit Reports and compliance Reports thereof
   - L. Mechanical Completion formats

4.4 QA/QC Audits

During the execution of the works, CONTRACTOR shall carry out periodical Quality Audits at least quarterly in all areas of work. These audits will be conducted by a team of specialists in the respective areas. The auditors shall not be directly involved in the jobs being audited.

The CONTRACTOR shall prepare an Audit Plan and Procedure and submit the same to OWNER/ Consultant for approval.

A copy of the Audit Report containing the findings of the Audit team will be submitted to OWNER/ Consultant. After completion of rectification/modifications/corrective actions on the issues indicated in Audit Report, Compliance Report shall be submitted by the CONTRACTOR to OWNER/ Consultant for review.

Over and above the Contractor's Internal QA/QC Audits outlined above, OWNER/ Consultant shall also reserve the right to conduct QA/QC audits at the frequency decided by them. CONTRACTOR shall participate and provide full support to the Audit Team and furnish all documents / reports / records as desired by the Audit Team. The CONTRACTOR shall take all actions required to comply with the findings of the Audit Report and issue regular Compliance Reports for the same to OWNER/Consultant till all the findings of the Audit Report are fully complied.

In case major Non conformities are observed during execution of the works OWNER/ Consultant reserves the right to appoint an independent person/Third Party Agency to conduct QA/QC Systems Audit for full/part of the facilities being executed by the CONTRACTOR. This audit will be in addition to the audits described above and may be carried out intermittently/continuously for all or part of the facilities being executed by the CONTRACTOR. CONTRACTOR shall bear the total cost of such audits and shall participate & provide full support to the Audit Team and ensure compliance of the audit observations.

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4.5 Waiver & Deviation

Contractor shall strictly comply with specifications and no deviation shall be permitted. However, if the need for deviation arises under exceptional circumstances, such deviation shall be subject to the approval of Owner/Owner's representative and shall be submitted through Owner / Owner's representative in the prescribed "WAIVER /DEVIATION /EXCEPTION REQUEST" format. The WAIVER /DEVIATION / EXCEPTION REQUEST shall also indicate the cost benefit to the Owner.

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ATTACHMENT –I : WAIVER / DEVIATION PERMIT

Report No.: _____

Date: _____

Waiver/Deviation Permit

(TO BE RAISED BY CONTRACTOR / VENDOR)

Project :
Client :
Consultant :
Third Party Insp. :
Order/Contract No. :
Originator :
Originator Ref. :

S. No	Requirement as per Specification / Drawing	Description of Waiver / Deviation Sought	Remarks
1.			
2.			
3.			

Why the Waiver / Deviation is required?

Contractual Implications if Waiver / Deviation is granted.

Time taken shall be More / Less / No Change

Cost of item shall be More / Less / No Change

(Detailed Break up of cost implication to be attached in a separate sheet)

Performance requirement shall be Satisfied / Not Satisfied

Under present constraints, requested waiver / deviation is most optimum for the project and does not involve any safety and security hazard.

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Date:	**Signature of the Originator:** **Name & Seal:**
Recommended by Consultant (Site): **Date:**	**Signature:** **Name & Seal:**
Justification by Consultant (HO) (When required): **Date:**	**Signature:** **Name & Seal:**
Recommended by Owner (Site): **Date:**	**Signature:** **Name & Seal:**
Recommended by TPIA (when required): **Date:**	**Signature:** **Name: & Seal**
Final Approval by PM Owner: **Date:**	**Signature:** **Name & Seal:**

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ATTACHMENT –II: FORMAT OBSERVATION ON QUALITY ASPECTS

OBSERVATION ON QUALITY ASPECTS	
Job No: No: Name of Work: Date of Issue: FOI/LOA No: Issued To : *M/s*	
Location Of Work: Item Of Work:	
Details Of Observation(Deficiency)	Recommended Course Of Action Time Allowed For Correction
Issued By: Name: Designation: Signature:	Received by: Name: Signature: Date and Time:
Corrective Action Report By Contractor/Vendor: Name: Date: Signature:	
Distribution Before Resolution: RCM/QA Mgr (EPC):	
a) Verification Of Resolution By Issuer/OWNER(Site)/PMC(Site): Name: Date: Signature:	
Distribution After Resolution: RCM/QA Mgr (EPC):	

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ATTACHMENT-III

REQUIREMENT FOR CONTROL OF MONITORING AND MEASURING DEVICES.

Sl. No.	Description	Calibration requirements	Frequency	Remarks
Civil-Survey				
1.	Theodolite	To check for permanent adjustments by traversing and observing the closing error	once in a year or project duration whichever is earlier	Record to be maintained (See note below)
2.	Levels	To check by Backsight/ Foresight readings, the temporary adjustments of level	Every use	Record to be maintained (See note below)
3.	Steel measurement tapes	a. "Freemans" make or BIS approved make shall be used b. Mutilated, or broken tapes shall not be used c. Legible markings	----	---
4.	Cross staff	Same as 3b&3c above	---	---
5.	Distomat	Actual Physical Verification at Site	Before using first time at site	Records to be maintained
6.	Total Station	To check for permanent adjustments by traversing and observing the closing error,etc.	once in a year or project duration whichever is earlier	Record to be maintained (See note below)
Civil Laboratory				
1.	All balances-Mechanical	Check for zero error	Whenever used	---
2.	Weigh Batcher/Batching Plant	Calibration of scales	Once in three months	Records to be maintained
3.	Cube testing machine	Calibration certificate from manufacturers or from reputed calibrating agency.	As per manufacturer specification or once a year whichever is earlier	Records to be maintained
4.	Moisture Meter	Calibration of scales	6 months	Records to be maintained
Mechanical/ Electrical/ Welding				
1.	Pressure Gauges	Calibration certificate from reputed laboratories or calibrate by dead weight testers with standard weights	Once in 6 months	Records to be maintained
2.	Dial gauges	Check for Zero Error	Whenever used	---

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3.	Dead Weight Tester	Calibration from manufacturer or reputed calibrating agency and calibration certificate shall not be older than one month from the date of mobilization.	As per manufacturer's recommendation or once in a six month whichever is earlier.	Records (Calibration certificate) to be maintained

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Sl. No.	Description	Calibration requirements	Frequency	Remarks
4.	Vernier caliper/ screw gauge	Check for Zero error	Whenever used	---
5.	Holiday tester	Calibration from manufacturer or reputed calibrating agency or by calibrating by zeep meter.	Once in 6 months	Records to be maintained
6.	Elcometer	Check with standard test films supplied by the manufactures	Before use	Records to be maintained
7.	Universal Testing Machine	Calibration Certificate from any reputed third party inspection agency. viz, CEIL, LRS, BV, ABS, DNV or IRS.	As per manufacturer's recommendation or once a year whichever is earlier	Records to be maintained
8.	Charpy V-notch Impact testing machine	Calibration Certificate from any reputed third party inspection agency. viz, CEIL, LRS, BV, ABS, DNV or IRS.	As per manufacturer's recommendation or once in a year whichever is earlier	Records to be maintained
9.	Hardness Testing Machine	Check with the standard test block supplied with the machine as per manufacturer's Recommendation	Before use	Records to be maintained
10.	Chemical Analysis, ex :PMI etc.	Check with the standard samples	Before use	Records to be maintained
11.	Various Digital and Analog meters (multi meter, clamp meter, etc)	Calibration Certificate from reputed laboratories or the manufacturer	Once in a year as per manufacturer's recommendation whichever is earlier.	Records to be maintained
12.	Variable current, voltage and resistance generators	Calibration Certificate from reputed laboratories	Once in Six months	Records to be maintained
13.	Temperature/ Pressure Recorders	Calibration from manufacturer or any reputed calibrating agency	Once in Six months	Records to be maintained
14.	Temperature gauges	Calibration Certificate from reputed laboratories	Once in Six months	To be discarded in case of damage or malfunctioning
15.	Thermocouples	Manufacturer's Certificate or Chemical Check	---	---
16.	Vibration probes	Calibration from reputed laboratory	Once in a year	To be discarded in case of damage or malfunctioning
17.	Decibel-meter	Calibration from reputed laboratory	Once in a Year	- do-

Note: If Error is found, it has to be sent to manufacturers or their agents for rectification and certification & reputed

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laboratory shall be NABL accredited for relevant testing.

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BHAGYANAGAR GAS LIMITED (BGL)

ELECTRICAL WORKS OF MOTHER STATIONS IN HYDERABAD GA

HEALTH, SAFETY & ENVIRONMENT

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1.0 SCOPE

This specification establishes the Health, safety, and Environment (HSE) aspects to be complied with by the contractor during construction at site.

2.0 REFERENCES

This document should be read in conjunction with following.

1) General Condition of Contract (GCC)
2) Special Condition of Contract (SCC)
3) Job Specifications
4) Relevant IS codes
5) Reporting Formats

3.0 RESPONSIBILITY & ORGANISATION

Safety activities at site shall be under control of contractor's RCM. He 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.

4.0 GENERAL REQUIREMENT

4.1 The contractor should follow HSE policy of owner as applicable to construction site.

4.2 The contractor shall deploy a full time HSE engineer / officer to co-ordinate the site.

4.3 The HSE officer shall be duly qualified in Industrial Health & Safety management with an experience of 5 years.

4.4 The contractor shall ensure that HSE requirements are clearly understood & faithfully implemented at all level, at each site.

4.5 The contractor shall organize safety awareness programs regularly.

4.6 The contractor shall ensure his participation in the every HSE meeting called by owner/owner representative.

4.7 The contractors shall conduct daily toolbox talk.

4.8 The contractor shall submit Monthly HSE reports (Form attached in ANNEXURES).

4.9 The contractor shall provide all help and support to the injured person got injury at site during construction work and arrange compensation as per insurance policy / Act.

4.10 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 without any cost time implication to owner. A penalty amount of Rs 1000/-shall be imposed on the contractor for the serious HSE violation.

4.11 Three times of this penalty may count as a serious violation of contractor in line with HSE. This may affect to new work assignment/award of contractor.

5.0 ACCIDENT, INCIDENT AND NEAR-MISS REPORTING

Accident

Unintended occurrence arising out of and in the course of employment of a person, which results into injury with or without damage to plant/equipment/materials.

Incident

means an unplanned and uncontrolled event which results in damage to plant or equipment or loss of material without causing any injury to persons, like fire, spill, leak, property damage etc.

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Near-miss

An unexpected, unwanted event not causing loss, injury, or illness but which under slightly altered conditions can lead to an accident.

can be defined as "Any event which under slightly unfavorable circumstances, may have resulted in any of the following:

- Injury, fatal or otherwise or ill health to people
- Loss of property, damage to plant or materials
- Damage to the environment
- A business interruption"

Accident, Incident and Near miss reporting form listed in ANNEXURES

6.0 HSE REQUIREMENTS AT SITE

6.1 Personnel Protective Equipment

The contractors shall provide sufficient numbers of following personal protective equipment (PPEs) to workmen and supervisors/engineers to use them properly at work site.

Following five numbers of Personnel protective equipment are identified as MANDATORY for all.

Safety Helmet

Coverall

Safety shoes/footwear

Safety Glasses

Hand Gloves (as per job requirement)

Other PPEs are depends upon nature of job like

Arc Welding – Welding face shield

Grinding – Grinding face shield

Height work – Full Body harness (above 2 meters)

Ask site supervisor for proper use and selection of protective clothing / equipment for specialized jobs

6.2 Welding

Ensure that welding machine is in order and approved by site engineer.

Ensure that welding cables are in order.

Ensure that welding machine is properly earthed.

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 welding machine is provided with ON/OFF switch and is earthed /grounding.

Do not overload electrical appliances and cable, Shocked pin etc.

Ground the work piece separately from the welding return connection only.

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6.3 Gas Cutting

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 cylinders in vertical position (Cylinder trolley) and 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.

Grinding Operation

- Grinding wheels should be stored in dry place.
- After expiry date, grinding wheel must be condemned, broken into 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 earthing of the body in case of metallic body.
- Wheel guard properly fitted in position.
- Machine body without any damage like crack etc.
- 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 sticker showing 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 break etc.)
- Don't chip off grinding/cutting wheel for achieving fast cutting rate.

6.4 PPEs:

- Use of helmet, safety walking boot face shield or safety goggles (where face shield is not possible.) and hand gloves.
- The provision of edge protection (fall prevention of people and materials)
- Access and egress

6.5 Pipe Transportation and lowering

- All drivers shall hold a valid driving license for the class of vehicle.

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- Securing of the load shall be according to established and approved methods.
- All overhangs shall be made clearly visible and restricted to acceptable limits.
- Load shall be checked before moving off and after traveling a suitable distance.
- All vehicles used by Contractors shall be in worthy condition and in conformance to the Land Transport requirement.
- Use of certified side booms after 3rd Party inspection.
- Effective communication should be done among all involved personals.
- Signaling shall be done by authorized foreman only.
- Ensure appropriate measures are taken for overhead hazards.
- Persons are not allowed towards trench side / under the boom at the time of lowering.
- Co-ordination of lowering in by a single man only.
- Inspection of equipment before use.
- All personnel should stay clear of moving equipment.
- Use of certified lifting tools and tackles.

6.6 Pressure / Leak Testing

Hydraulic 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, radiographic 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.

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- De-pressurization after pneumatic testing must be gradual

6.7 Scaffolding and Ladder

All working platform must be constructed with the specific requirement of job.

All portable ladders must be in good condition as per the site norms.

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.
- 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.
- Fall arrestor to be used wherever applicable.

6.8 Work Permit Procedure

For working at more than 1.5m height the permission must be obtained from site in-charge.

For doing any hot work in the fire risk areas the permission must be obtained from site in charge or safety officer.

For any Excavation work it must be ensured that there are no underground utilities like cables, Water pipeline etc.

For any work inside confined space, entry permit must be obtained from site engineer.

6.9 Barricades and Warning Signs

- Area where work is being carried out above man height or below 1’ ground depth must be barricad

  Follow the instruction of all types of warning signs like “NO SMOKING” “NO ENTRY” “DANGER” Work at height”

6.10 Emergency Plan and Procedures

1) All Contractor’s employees should be aware of site Emergency control plan
2) Periodic drill to train employees for their awareness & information should be followed.

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6.11 Road Safety Norms

1) For roadside working site to be barricaded as per approved barricading norms given in drg. No. TEIND-STD-G-M-9001. Penalty clause for road safety & barricading shall be applicable as per relevant clause of commercial part of tender.
2) Only eligible driver can drive required vehicle inside site
3) Speed limit norms of site must be followed
4) No riding or travelling on the back of open-end vehicle, forklift or trailers should be done.

6.12 Labour Welfare & Legal Requirement

1) All mandatory provisions with regard to safety as prescribed under contract Labour (Abolition & Regulation) Act 1970 and Rules made there under are applicable.
2) Workmen compensation insurance and registration under ESI should be maintained.
3) Time to time, all rules and regulations suggested by safety committee of site must be followed and implemented

6.13 Preventive measures for Project Sites from Covid -19

To protect from COVID-19 infection it is important to identify the source or way of infection during the various activities to be performed at sites. The following table will help to take the preventive measure but must be reviewed at site if any change of activity or new activities are identified:

Sr. No.	Activities	Precautionary Measure
1	Workforce Mobilization	• All employees and workers should not come on same day. They should come in phase wise manner based on their job/activity or as per the Government/Company Directives dictate.

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2	Site Entry	• Thermal screening for all contractor employees and workers, all others permitted to enter the site must be done on daily basis and on each shift. If body temperature will be normal (less than or equal to 37 degree centigrade or 98.6-degree Fahrenheit), then individuals will be allowed to site. • Nobody should be allowed to enter the site without mask and other PPE as required for construction activities. • Aarogya setu app must be installed in all contactor employees and workers.

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Sr. No.	Activities	Precautionary Measure
3	Movement of construction equipment, machinery, and material	• All the materials, equipment, machinery, and vehicles coming to the sites should be disinfected on daily basis and after each shift. • Disinfection tag should be pasted over the equipment and machinery to identify whether the same has been disinfected or not.

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4	Site construction activities	• Mask shall be worn by all the people all the time whilst working at site • Usage of nitril gloves during paperwork or while moving at site for supervision & inspection. • Sanitising of Drawings/documents exchanged and no direct contact transfer • Social distancing i.e. min 2 mtr. distance must be maintained even during the site activities. Activity should be planned accordingly, and risk assessed • All the construction materials used by the construction people must be sanitize on daily basis. • Adequate quantity of sanitizer must be provided at all work locations, meaning; accessible to workers so that they sanitize their hand as and when required. • Make sure that staff, contractors and visitors have access to places where they can wash their hands with soap and water. Portable and moveable hand washing facility (soap and water) must be provided at site (readily accessible to worker) • All visitors/vendors etc shall be indicted which shall include Covid-19 preparedness for that particular site • Display posters promoting handwashing at all areas where people traverse on work locations. • Avoid spitting. Gutka/tobacco and cigarette are

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Sr. No.	Activities	Precautionary Measure
		strictly prohibited at the workplace. • PPE such as Helmet, shoe, goggles, earplug etc. must be disinfected on daily basis by the individual. • Coveralls must be washed on daily basis. • Discourage the sharing of personal belongings, food, water etc.
5	Site Storage	• Storage facility must be disinfected on daily basis. • Hand sanitizer must be provided near the storage area. • Use disposable hand gloves while handling the materials. • Avoid gathering near the store, give the requirement in advance or inform the store officer about the requirement to avoid waiting near the store. • Lock and key must be disinfected every day and after each shift.
6	Workers meeting and training	• Worker meetings such as toolbox talks and training keeping social distancing norms on safe procedure is an essential part for safe execution of all work-fronts. large gatherings of worker shall be avoided at all times • Training and/or meetings shall be conducted in small groups and at a distance of minimal. 6 ft. must be maintained between workers. • During meeting and/or training everybody must wear the mask. • Every meeting and/or training must be start with the do's and don'ts and symptoms related to COVID-19

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7	Travelling (e.g. for leave, site transfer, daily commutation to site etc)	• Minimise the travel as much as possible. • Thermal screening must be done, and self-declaration must be taken from the people returned from leave or transferred from another

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Sr. No.	Activities	Precautionary Measure
		site • Vehicle must be sanitised on daily basis • Hand sanitizer must be provided inside the vehicle • As per government directives more than 2 person including driver is not allowed in a CAR. • Transport of the labours should be done through vehicle with capacity of no more than 40% • Drivers Health card checklist must be checked, and daily self-declaration must be obtained from him. • All drivers and/ passengers shall wear the appropriate face masks for the duration of the trip/s

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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 (Part – I)	:	Industrial Safety Gloves (Leather & Cotton)
IS : 1989 – 1986 (Part – I & III)	:	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 moulding sole
IS : 5983 – 1978	:	Eye protectors
IS : 9167 – 1979	:	Ear protectors.
IS : 3521 – 1983	:	Industrial Safety belts and harness

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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

PREPARED BY REVIEWED

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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				

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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				

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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				
Safety devices				
Proper cords				
Inspections and maintenance				
Other				
VEHICLE AND TRAFFIC				
Rules and regulations observed				
Inspection and maintenance				
Licensed drivers				
Others				

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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				

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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 extinguish HSErs 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.				

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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'shakle 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				

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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 programmes 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
RCM/SITE-IN-CHARGE 1 COPY

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SUPPLEMENTARY ACCIDENT, INCIDENT & NEAR MISS REPORT

Project:_____Supplementary to Report No.:_____

(Copy enclosed)

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

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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

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PAINTING SYSTEM & COLOUR CODE FOR FINAL LAYER

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1.0 INTRODUCTION

This Document (PTS - Particular Technical Specification for Painting) lists the Specification for the project.

This present document covers the technical specification for the procurement of Painting used in high pressure natural gas transmission systems. It describes the general requirements, controls, tests, QA/QC examination and final acceptance criteria which need to be fulfilled.

In case of any conflict of Specification, PTS will supersede General Technical specification (GTS) and Data sheet will supersede PTS.

2.0 DEFINITIONS

Client / Owner	Shall mean BGL
Manufacturer	Means the Manufacturer of the Paint.
Contractor	The party which carries out all or part of Engineering, Procurement, Construction, Pre-commissioning & Commissioning of the project. It shall mean Pipe laying contractor in the present context.
Third Party Inspection Agency (TPIA)	Means the Inspection Agency to be appointed by the Pipe laying contractor
Consultant / Owner Representative	Shall means PMC/ BGL / The entity of the purchaser or the company nominated by the purchaser to design the natural gas transport or distribution system and to specify the equipment
PTS	Means the present <<Particular Technical Specification P.014902 G11077 M012>>and its entire appendix, if any.

3.0 COLOUR CODE SYSTEM

The colour codes for final layer of Station Pipe Work & Metering Shed shall be as under:

S. No.	DESCRIPTION	FINAL LAYER COLOUR SHADE	RAL CODE
1	Pipe Work	Yellow	RAL 1004
2	Piping Support	Grey	RAL 7043
3	Handrail	Orange	RAL 2003
4	Gas O/L Actuator	Blue	RAL 5015
5	Valve Handle/Wheel	Black	RAL 9005
6	All Valves	Grey	RAL 7038

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S. No.	DESCRIPTION	FINAL LAYER COLOUR SHADE	RAL CODE
7	IJ	Grey	RAL 7038
8	Filter	Grey	RAL 7038
9	Pig launcher & Receiver	Grey	RAL 7038
10	Bolts & Nuts	Grey	RAL 7038
11	Grating	Hot Galvanized	
12	Metering Station Shed		
12.1	Steel Frame	Beige	RAL 1018
12.2	Roof / Vertical Shed	Grey	RAL 7030
12.3	Control Panel	Grey	RAL 7032

The recommended painting system should be of Category C5 – I Very high (Industrial) with high durability as specified in the Standard ISO 12944 Part 1 to 8. The proposed Painting system shall conform to Table A5 of ISO 12944 – 5 Standard.

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Table A.5 — Paint systems for low-alloy carbon steel for corrosivity categories C5-I and C5-M

Substrate: Low-alloy carbon steel

Surface preparation: For Sa 2½, from rust grade A, B or C only (see ISO 8501-1)

System No.	Priming coat(s)				Subsequent coat(s)	Paint system		Expected durability		
	Binder	Type of primer [a]	No. of coats	NDFT [b] in µm	Binder type	No. of coats	NDFT [b] in µm	Low	Med	High
C5-I										
A5I.01	EP, PUR	Misc.	1-2	120	AY, CR, PVC [c]	3-4	200			
A5I.02	EP, PUR	Misc.	1	80	EP, PUR	3-4	320			
A5I.03	EP, PUR	Misc.	1	150	EP, PUR	2	300			
A5I.04	EP, PUR, ESI [d]	Zn (R)	1	60 [e]	EP, PUR	3-4	240			
A5I.05	EP, PUR, ESI [d]	Zn (R)	1	60 [e]	EP, PUR	3-5	320			
A5I.06	EP, PUR, ESI [d]	Zn (R)	1	60 [e]	AY, CR, PVC [c]	4-5	320			
C5-M										
A5M.01	EP, PUR	Misc.	1	150	EP, PUR	2	300			
A5M.02	EP, PUR	Misc.	1	80	EP, PUR	3-4	320			
A5M.03	EP, PUR	Misc.	1	400	—	1	400			
A5M.04	EP, PUR	Misc.	1	250	EP, PUR	2	500			
A5M.05	EP, PUR, ESI [d]	Zn (R)	1	60 [e]	EP, PUR	4	240			
A5M.06	EP, PUR, ESI [d]	Zn (R)	1	60 [e]	EP, PUR	4-5	320			
A5M.07	EP, PUR, ESI [d]	Zn (R)	1	60 [e]	EPC	3-4	400			
A5M.08	EPC	Misc.	1	100	EPC	3	300			

Binder for priming coat(s)	Type	Water-borne possible	Binder for subsequent coat(s)	Type	Water-borne possible
EP = Epoxy	2-pack	X	EP = Epoxy	2-pack	X
EPC = Epoxy combination	2-pack		EPC = Epoxy combination	2-pack	
ESI = Ethyl silicate	1- or 2-pack	X	PUR = Polyurethane, aliphatic	1- or 2-pack	X
PUR = Polyurethane, aromatic or aliphatic	1- or 2-pack	X	CR = Chlorinated rubber	1-pack	
			AY = Acrylic	1-pack	X
			PVC = Poly(vinyl chloride)	1-pack	

[a] Zn (R) = Zinc-rich primer, see 5.2. Misc. = Primers with miscellaneous types of anticorrosive pigments.

[b] NDFT = Nominal dry film thickness. See 5.4 for further details.

[c] It is recommended that compatibility be checked with the paint manufacturer.

[d] It is recommended for ESI primers that one of the subsequent coats be used as a tie coat.

[e] It is also possible to work with an NDFT from 40 µm up to 80 µm provided the zinc-rich primer chosen is suitable for such an NDFT.

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HYDERABAD

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- Stranded Aluminum Conductor from 16 mm2 and above
- XLPE insulation- Type A
- Inner and outer Sheath will be extruded
- Inner sheath will be ST2
- Steel strip/wire armoured
- Outer sheath of cable will be FRLS XLPE, ST2 Type
- Voltage grade- 1100 V
- IS 1554/7098 Part 1

a. Control Cable

- Stranded Copper Conductor 2.5 sq. mm
- XLPE insulation type A.
- Inner and outer Sheath will be extruded
- Inner sheath and outer sheath will be ST2
- Steel strip/wire armoured
- Outer sheath of cable will be FRLS XLPE, ST2 type
- Voltage grade - 1100 V
- IS-1554/7098 Part I

b. Lighting Cable/Wire in conduit

- 2.5 mm2 stranded Copper XLPE/PVC insulated wire in concealed PVC conduit will be used in Lighting fixtures/ flameproof fixtures.
- 4 core 6 mm2 stranded Copper will be used from indoor lighting DB to junction box on the lighting poles.
- 3 core 2.5 sq. mm stranded copper cable (YWY} will be used from junction box on the lighting pole to lighting fixture.

Cable Sizing

Cables shall be heat and oil resistant and suitable for service in the maximum environmental conditions described for the Platforms/Terminal and can be expected at the respective locations. All nominal power cable ratings shall be based on maximum ambient temperatures (design temperature) as specified under site conditions. De-rating factors shall be applied as necessary to take account of Installation configuration and variation in ambient temperature. Conductor current ratings for distribution board feeders shall be established on the basis of 125 % of the rated actual load current at the ambient temperature and de-rated for grouping and method of installation. Cables for emergency duty equipment shall have fire performance characteristics to lEC 332-3 Category A. Safety critical circuit cables, such as certain Fire and Gas and communication signals required to maintain integrity during a fire, shall be fire resistant type to the requirements of IEC 331. Control & Instrument multicore cables shall have 20% spare conductors (cores).

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Cable Glands, Cable Accessories and Transit Frames

Each cable shall be provided with a number, which shall be tagged on the cable at regular intervals for easy identification. The numbering scheme to be adopted for the cables, shall match with the existing cable numbering philosophy.

All cables shall be fitted with FLP double compression type cable glands. All cable glands and adopters shall be made of non-ferrous/non-corrosive material and shall be fitted with soft sealing nylon washers. Fiber washers shall not be used. Flameproof double compression cable glands and flameproof plugs shall be certifi ed by CIMFR. Such transit frames shall include at least 20% spare capacity for future use.

17.0 LIGHTING SYSTEM

Plant lighting system shall comprise:

a) Normal Lighting

b) Emergency lighting

c) Normal lighting: - Normal lighting shall be fed by AC supply 240 V, 1 phase system(specifically required by DGMS). Normal lighting system shall provide enough illumination so as to enable plant operators to move safely within the accessible areas of plant to perform routine operation include reading of field instruments, operation of all valves etc. and to carry out all the necessary maintenance and adjustment to equipment.

d) Emergency lighting: - Lighting requirements provided during the failure of power supply for normal lighting are broadly indicated here below:

1. To facilitate carrying out of specified operations, for safe shutdown of the plant.
2. To gain access and permit ready identification of firefighting facilities such as firewater pumps, fire alarm stations etc.

Adequate number of self-contained portable hand lamps and battery-operated emergency lighting units shall be provided for immediate use for buildings where no DC supply is available.

LED Lamps shall generally be used for Indoor/outdoor plant lighting, non-process buildings and control room. All ballasts shall be with copper winding and capacitor for power factor improvement (to 0.95) shall be provided with fixtures as applicable.

All outdoor lighting shall be automatically controlled by means of photo switch or timers with manual control.

The Lighting panels shall be provided with MCB as incomer and miniature Circuits Breakers (MCBs + ELCB) for outgoing feeders control and protection of lighting circuits. MCBs shall not be loaded beyond 80% of rated capacity. A minimum of 25% of miniature circuit breakers of each board shall be left as spares.

17.1. Lux level in the plant area for calculation of lighting fixtures are as follows:

Control room	-	300 lux
Electrical room	-	150 lux
Office room	-	300 lux
Battery room	-	100 lux
Guard room	-	100 lux
Outdoor Area	-	20 Lux
Street/ Road	-	10 Lux

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Utilisation Factor - As per manufacturer's catalogues.

Maintenance Factor - 0.6 for Outdoor / 0.7 for Indoor

Note: Illumination level of other areas not mentioned here shall be as per IS: 6665. Lighting design shall confirm to relevant International Codes and Standards, IES Hand Book and shall take into consideration the requirements from point of view of safety and ease in operation and maintenance. Bidder shall submit illumination calculation to Owner/Owner's Engineer for approval during detail engineering.

Wiring for lighting and convenience outlets in outdoor areas shall be carried out with PVC/XLPE armored cables run along the column / platforms and structures. The armored cable shall enter lighting fixture / JB through double compression gland for safe area, Ex(e) or Ex(d) equipment and through flameproof glands for Ex(d) equipment. Where required suitable mechanical protection shall be provided for lighting fixtures (e.g. wire guard).

Two pole MCB shall be used for controlling fixtures in hazardous areas to isolate phase as well as neutral.

17.2. Outdoor street lighting system: Supply, installation, testing and commissioning of lighting pole of 9m/4.5m height, 100 mm nominal Diameter B class MS pipe, having base Plate 200mmx200mmx5mm along with Flameproof and Weatherproof 80/110W LED well glass light fitting complete with lamp and built in control gear and choke of approved make (Cat.No.WG/A/1234 of Sudhir Switchgears or equivalent approved make), including supply and installation of earthing conductor of 8 SWG GI wire, nuts, bolts, Neck portion of lighting pole shall made up be of 50mm diameter GI pipe(radius of neck shall be 250mm). The pole shall be painted with 01 coat of primer and 02 coats of aluminium paint. The job shall also include supply and installation of 4 way Flameproof/weather proof junction box(with 4 cable entries) having 8 Nos., 6A, 440V shrouded terminal, with double compression FLP glands/lugs with looping arrangement and supply and termination of 3C X 2.5 sq. mm. armoured copper PVC/XLPE insulated cable from JB to light fitting The job complete in all respects as per specifications, drawings and instructions of EIC / Site engineer.

17.3. WP Endura LED: Supply and fixing of surface mounted weather proof Endura LED WT 550 light fitting of PHILLIPS or equivalent approved make complete with all accessories such as LED module, driver, optics, thermal sink, connector blocks etc, including installation.

17.4. Type of Indoor Lighting Fixtures

Battery Room	LED Ceiling Point: Industrial Flame proof Supply and fixing of surface mounted LED ceiling light fitting type Mainstream spot Aura 15W of PHILLIPS or equivalent approved make complete with all accessories such as LED module, driver, optics, thermal sink, connector blocks etc including installation complete in all respects.
Control Room and other rooms	LED Ceiling Point: Supply and fixing of surface mounted LED ceiling light fitting type Mainstream spot Aura 15W of PHILLIPS or equivalent approved make complete with all accessories such as LED module, driver, optics, thermal sink, connector blocks etc including installation complete in all respects
Wall mounted fixture	Supply and fixing of LED wall light cat. no. 35022 9W fitting of PHILLIPS or equivalent approved make complete with all accessories such as LED module, driver, optics, thermal sink, connector blocks etc including installation

17.5. Ceiling Fan

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Electrical room & Guard room - 1200 mm Sweep Fan with Electronic regulator.

17.6. Exhaust Fan

Battery room	-	300/450 mm FLP Exhaust Fan with Louver.
Electrical room/Toilet	-	300/450 mm Exhaust Fan with Louver.

18.0 SILENT GEG SET

Rating	-	40 KVA (Minimum)
Voltage	-	415 V
Phase	-	3P, N
Frequency	-	50 Hz
Cooling	-	Air Cooled / Radiator cooled
Starting	-	Auto - Manual

Noise, Emission & Smoke limits-As per latest Amendment of Environment (Protection) Act 1986

Noise level	-	Less than 75 db (A) at a distance of 1M from Acoustic enclosure
Enclosure	-	Acoustic enclosure with Residential Silencer
Location	-	Outdoor
Battery Charger	-	To charge GEG.SET Battery

Note: GEG size mentioned here is minimum. Actual rating of GEG shall be decided by the bidder based on actual base load plus actual load one largest motor during starting, during detail engineering.

19.0 DISTRIBUTION BOARD

- Main Electrical Distribution Board (EDB)/ LT Panel/ Emergency Panel with changeover switch. Refer SLD.
  - Shall be Floor mounted, Stand-Alone type with cable alley and bus chamber
  - Shall have one incomers with suitably rated MCCB for EDB
  - Shall have one incomers with suitably rated MCCB for LT panel.
  - Shall have two incoming power sources (one from LT panel and other from DG with changeover switch) with suitably rated MCCB for Emergency Panel.
  - Shall have Outgoing feeders with suitably rated MCCB as per feeder requirement.
  - Motor Feeder if any shall be selected as per Type 2 coordination chart
  - Shall have spare feeders min 10% of each rating or one of each type, whichever is greater
  - Single Phase Load (If any) shall be equally distributed on each phase

- Normal LDB for Indoor and Outdoor lighting
  - Shall be wall mounted, recessed type

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- Shall have one incomer with suitably rated MCCB with RCCB (Residual Current Circuit Breaker), fed from LT Panel
- Shall have Outgoing feeders with suitably rated MCB as per feeder requirement for Indoor and Outdoor lightings.
- Single Phase Load shall be equally distributed on each phase
- Shall have spare feeders min 10% of each rating or one of each type, whichever is greater.

♣ Switchgear used for LV feeders shall incorporate the following protective devices:

a) Short Circuit
b) Earth fault

20.0 ELECTRICAL EQUIPMENTS FOR HAZARDOUS AREA

ELECTRICAL EQUIPMENT'S

The Electrical equipment's for hazardous areas shall be selected as per IS: 5571 and petroleum rules. The minimum requirements are summarized below

Equipments	Zone-1		Zone-2	
LV Ind.Motors	Ex-d	Ex-d	Ex-d	Ex-e
Push Button Stations	Ex-d	Ex-d	Ex-d	Ex-d
Motor Starter	Ex-d	Ex-d	Ex-d	Ex-d
Plug Sockets	Ex-d	Ex-d	Ex-d	Ex-d
Welding Receptacles	Ex-d	Ex-d	Ex-d	Ex-d
Lighting Fixtures,Lighting Fitting,Control gear	Ex-d	Ex-d	Ex-d	Ex-d
Hand Lamps i) Light Fitting ii) Transformer Unit iii) Plug & socket	Ex-d	Ex-d	Ex-d	Ex-d
Lighting Panels / Power Panels	Ex-d	Ex-d	Ex-d	Ex-d
Break Glass Units (Fire Alarm System)	Ex-d	Ex-d	Ex-d	Ex-d

21.0 SPLIT A.C. SYSTEM

♣ All A.C.s shall be 230V, 50 Hz, 1Ph & N, 2/1.5 TR, 5 star rating.

♣ One (1) no. of split AC shall be provided for office room and Control room each.

22.0 SWITCH SOCKET (IF APPLICABLE)

22.1. 16/6A or 15/5A, 3 pin, Switch Socket (PNE) – ROMA ANCHOR for each stations (If applicable).

- ♣ Control Room - 2 Nos.
- ♣ Office Room - 2 Nos
- ♣ Electrical Room - 1 Nos.
- ♣ Guard Room - 1 No.
- ♣ Chromatograph Room - 2 Nos

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22.2. 25 amps, 230 volts, SPN, industrial type switch socket outlet, with 2 poles and earth metal enclosed plug top along with 16 amps.rotary switch in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket outlet in Control/Scada and office room.

22.3. 32 amps, 230 volts, SPN, industrial type switch socket outlet, with 2 poles and earth metal enclosed plug top along with 32 amps. "C" series, SP MCB in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket outlet in Control/Scada and office room.

22.4. 63A, 415V AC (3Ph) Flame proof and weatherproof– Industrial Switch Socket unit fully interlocked with plug for each stations- one number

Note: All Equipment Rating mentioned in this specification are minimum. However, Bidder shall furnish actual rating to owner/consultant during detail engineering for approval.

23.0 ELECTRICAL INSTALLATION

Electrical installation design shall be in accordance with IS 732.

23.1. Cable Laying:

Cable shall be laid in the cable trays / ladders as specified in codes & Standard and Segregation / Separation of cables. Emergency and Instrumentation systems cables shall as far as practical be routed away from normal services systems. Special consideration shall be given to the routing and segregation of cables, to minimize the effects of fire on emergency and essential supplies and production operation. Wherever practicable the cables for duplicate feeds and equipment shall run via separate routes to increase security of supply. In addition, the minimum distances between power / control wiring and electronic / signal wiring on prolonged cable routes shall be as per code and standard

23.2. Lighting and Small Power

a) Lighting:

All external lighting and general area lighting shall be provided according to good engineering practice. LED fixtures shall be used for outdoor & Indoor lighting. Perimeter / fence lighting shall be provided using LED lighting fixtures with suitable spaced at an interval. The lighting fixtures and other equipment shall be suitable for the area of classification in which they are located. The illumination levels shall be as covered in the specifications & IS 6665.

b) Emergency/Critical Lighting:

Emergency/critical lighting fixtures shall be provided with 12 hours backup battery banks through Solar power System. Emergency/ Critical lighting fixtures shall be automatically activated on loss of mains.

c) Small Power:

3-Phase and single-phase socket outlet systems shall be provided in the facilities for:

• 240V, 50 Hz, 1 phase, neutral and earth, 16A, 5 pin, domestic type outlets for the office building and for general purpose use in the, Switchgear rooms, local equipment rooms, offices and workshops. • Socket outlets shall be provided in all switch rooms for special test equipment.

All single-phase socket outlets shall be protected by 30 mA earth leakage circuit breakers. All other earth leakage protection requirements shall be identified on the basis of minimising earth leakage protection where not required by statutory requirements, standards, or regulations to minimize nuisance tripping, and where reduction of such protection does not degrade safety.

• Nameplates shall be installed at each receptacle clearly indicating source of supply, voltage and amperage.

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24.0 ATTACHMENT

♣ GTS for GEG Set	-	E/02/2501
♣ PTS for GEG Set	-	
♣ GEG Set Datasheet		-
♣ GEG Set QAP	-	
♣ GTP for UPS	-	E/02-2502
♣ PTS for UPS	-	
♣ UPS Datasheet	-	
♣ UPS QAP	-	
♣ PTS for Solar		
♣ Solar datasheet		
♣ Solar QAP		
♣ GTP for Battery	-	E/02-2519
♣ Battery Datasheet	-	
♣ Battery QAP	-	
♣ GTP for Power and Control Cable	-	E/02-2510
♣ PTS for Power and Control Cable	-	
♣ Power and Control Cable Datasheet	-	
♣ Power and Control Cable QAP	-	
♣ GTP for Sheet Steel Distribution Board	-	E/02-2503
♣ PTS for Electrical Distribution Board	-	
♣ Electrical DB Datasheet	-	
♣ Electrical DB QAP	-	
♣ GTS – FLAMEPROOF & WEATHERPROOF EQUIPMENT	-	E/02-2512

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PTS – CABLE AND ACCESSORIES
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For technical specification for Cable and Accessories, please refer GTS-Cables and Accessories Doc. No. E/02/2510.

Below table in this PTS – Cable and Accessories contains the amendment to the GTS _ Cables and Accessories.

Wherever there is conflict between the requirements mentioned in GTS & PTS, the requirement laid down in the PTS shall prevail.

Sr. No.	Description	Reference Page No.	Clause/ Para/ Section	Amendment/Addition/Modification/Deletion	
General Technical Specification					
1	Cables and Accessories	Page 1 of 5	1.0	Modification	This specification covers requirement for the design, manufacture, inspection, testing and supply of the XLPE insulated cables (upto 1.1 kV). All power and control cable up to 1.1 KV shall be XLPE, Category C2, ST2, Armored FR-LS Type.
2	Cables and Accessories	Page 1 of 5	2.0	Modification	"The cables shall comply with the latest edition of the following standard" shall be read as **"The cables and its associated materials/parts shall be designed, manufactured & tested conforming to latest editions of the applicable Indian Standards, including the below mentioned standards"**
3	Cables and Accessories	Page 1 of 5	2.0	Addition	Vendor requirements: All cables shall be supplied as per approved vendor list in tender document.
4	Cables and Accessories	Page 1 of 5	3.0	Addition	All the cables shall be Improved fire performance cables suitable for Category C2 (Appendix A of IS 7098 Part-I Reaffirmed 2005). Outer PVC sheath of cables shall be flame retardant type conforming to category AF as per IS:10810.
5	Cables and Accessories	Page 1 of 5	3.0	Addition	1. The improved fire performance cables shall be designed to have minimum Oxygen index of 29 at 27 + 2 degree Celsius. 2. The improved fire performance cables shall be designed to have minimum temperature index of 21 at a temperature of 250 degree Celsius & maximum smoke density of 60% as per ASTM D2863. 3. The cables shall have a low smoke property and the minimum average value of light transmittance shall be 60% as per ASTM D2843

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Sr. No.	Description	Reference Page No.	Clause/ Para/ Section	Amendment/Addition/Modification/Deletion	
6	Cables and Accessories	Page 1 of 5	3.0	Addition	**Temperature Rise** Cables shall be suitable for use with conductor temperature rise up to 90 degree Celsius under normal operation and 250 degree Celsius under short circuit condition.
7	Cables and Accessories	Page 1 of 5	3.1	Deletion	PVC Cables
8	Cables and Accessories	Page 2 of 5	3.1.1	Modification	"All power/control cables for use on medium voltage systems shall be heavy duty type, 1100 V grade with aluminum/copper conductor, PVC insulated, inner sheathed, armored and overall PVC sheathed." shall be read as, "**All power/control cables for use on medium voltage systems shall be heavy duty type, 1100 V grade with copper conductor, XLPE insulated, inner sheathed, armored and overall PVC sheathed. "**
9	Cables and Accessories	Page 2 of 5	3.2.1	Modification	Power cables for 3.3 kV system shall be with Aluminium conductor, XLPE insulated (unearthed grade), screened, sheathed, armoured and overall PVC sheathed. Shall be read as **"Power cables for 1.1 kV grade shall be with Aluminum/Cu conductor, XLPE insulated (unearthed grade), screened, sheathed, armored and overall PVC sheathed. "**
10	Cables and Accessories	Page 4 of 5	4.1.5	Addition	h) Insulation Resistance (Volume Resistivity) Test i) Dimensional Check j) Meggar Test on each cable drum
11	Cables and Accessories	Page 5 of 5	5.1.2	Addition	Permissible Drum Tolerance shall be +/-5% of standard drum length.

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Sr. No.	Description	Reference Page No.	Clause/ Para/ Section	Amendment/Addition/Modification/Deletion	
12	Cables and Accessories			Addition	List of drawing document to be submitted during during detailed engineering ,despatch clearance and delivery of cable. 1. Data Sheet - To be submitted during bidding stage 2. Typical arrangement drawings in approved AutoCAD format.-To be submitted during bidding stage 3. Delivery schedule - To be submitted during bidding stage 4. Catalogues / References - To be submitted during bidding stage 5. Technical leaflets - To be submitted during bidding stage 6. List of Mandatory spares - To be submitted during detail engineering stage 7. Type tests reports and list of FAT and SAT- To be submitted during detail engineering stage 8. QA/QC program.- To be submitted during detail engineering stage 9. Inspection and test procedures.- To be submitted during detail engineering stage 10. Inspection & Test reports.- To be submitted during detail engineering stage 11. Structure drawing- To be submitted during detail engineering stage 12. Operator's instruction and maintenance manual,- To be submitted during detail engineering stage 13. Manual on method of installation, checkups and tests to be carried out before commissioning of equipment- To be submitted during detail engineering stage 14. QAP.- To be submitted during detail engineering stage 15. Transportation procedure to site & erection procedure of cables at site.- To be submitted during detail engineering stage 16. Maintenance and operating manuals.- To be submitted during detail engineering stage 17. Packing/shipping list with weights and dimensions.- To be submitted during detail engineering stage 18. FAT & SAT procedure- To be submitted during detail engineering stage 19. Final technical file- To be submitted during detail engineering stage
13	Cables and Accessories			Addition	The Owner/Consultant’s approval of the QAP / drawings shall not relieve the Vendor of his responsibility for supplying conforming with the relevant specifications

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PTS – ELECTRICAL DISTRIBUTION BOARDS
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1.0 SCOPE

Scope of work includes Design, Manufacturing, Supply, Installation, Testing & Commissioning of Electrical Distribution Board (EDB).

2.0 REFERENCE STANDARDS

• IEC 61869	:	Instrument transformers
• IEC 60005	:	Direct acting indicating analogue electrical measuring instruments and their accessories.
• IEC 60186	:	Voltage transformers
• IEC 60255	:	Electrical relays.
• IEC 60288	:	PVC-insulated cables for switchgear and control gear wiring.
• IEC 60417	:	Graphical symbols for use on equipment.
• IEC 60439	:	Low-voltage switchgear and control gear assemblies.
• IEC 60529	:	Degrees of protection provided by enclosures. (IP Code)
• IEC 60688	:	Electrical measuring transducers for converting a.c. electrical quantities to analogue or digital signals.
• IEC 60715	:	Dimensions of low-voltage switchgear and control gear. Standardized mounting on rails for mechanical support of electrical devices in switchgear and control gear installations
• IEC 60947	:	Low-voltage switchgear and control gear.
• IEC 61000-4	:	Electromagnetic Compatibility (EMC).
• IEC 61346-1	:	Industrial systems, installations and products – Structuring principles and reference designations.
• IS 8623 (Part 1)	:	Low Voltage switchgear and control gear assemblies: Part 1 Requirements for type tested and partially type tested assemblies
• IS 13947 (Part 1)	:	Low Voltage switchgear and control gear assemblies: (Part 1) General rules (Superseding IS 2147 and IS 4237).
• IS 13947 (Part 1)	:	Specification for Low Voltage switchgear and control gear : (Part 4) Contactors and motor starters, sec 1 Electromechanical contactors and motor starters (Superseding

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IS 2959 and IS 8544 (all parts))

- Indian Electricity Rule as amended up to date, any other relevant local law codes & regulations (Latest edition) applicable, shall meet requirement for switchboard & associated material.

3.0 AMBIENT CONDITIONS

Max/Min. Region Temperature	-	45□ C / 5□ C
Max/Min. Design Temperature	-	50□ C / 0□ C
Max/Min Region Relative Humidity	-	100% / 5%
Altitude above MSL-	:	Less than 1000 MTS
Atmosphere-	:	Tropicalized to withstand the site condition, dust & Vapour
Location-	:	Indoor

4.0 POWER SYSTEM DETAILS

Voltage with ±%	415 V ± 20%
Frequency with ±%	50 Hz ± 5%
No. of phase & wire	3P + 1N
Fault level	35kA for 1 sec – for EDB
Earthing mode	Solidly Earthed
Control supply & Auxiliary supply	230 volt for EDB , If any other Voltage required, same shall be derived internally, by manufacturer EPC shall take care during detail engineering

5.0 EXECUTION

Compartmental / Non compartmental	Compartmental – EDB

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Single front/ Double front	Single front
Draw out/Non draw out	Non-Draw out
Floor mounted	EDB
Installation	Ventilated Room

6.0 BUS BARS

Copper / Aluminum	Aluminum – EDB.
Bare/ insulated	Insulated
Type of insulation	PVC
Rating- as per SLD	Yes

7.0 EARTH BUS BAR COPPER / ALUMINIUM

: Aluminium (Sized for Full rating of the EDB).

8.0 METERING CURRENT TRANSFORMER

VA	:	As per SLD
Accuracy class	:	As per SLD (Class 1.0)

9.0 PROTECTION CURRENT TRANSFORMER

VA	:	As per SLD
Protection class	:	As per SLD (Class 5P10)

10.0 PROTECTION POTENTIAL TRANSFORMER

VA	:	As per SLD (50VA)
Protection class	:	As per SLD (Class 3P)
Voltage ratio	:	As per SLD (415V/√3 / 110V/√3)

11.0 METERING AND PROTECTION

A. Indicating Instrument

EDB: Digital Multifunction Meters Flush mounted (Having serial Link Communication ie., RS-485 for transfer of Signals, i.e. Voltage, Current, Frequency, Power Factor, kWH etc. to SCADA).

B. Protection

Incomer : EDB

Description	Per Station
EDB	1 No. at each Stn
OLDB, EOLDB	1 No. at each Stn
ILDB, EILDB	1 No. at each Stn

EDB: Microprocessor based MCCB having Overcurrent, Short Circuit and Earth Fault release protection.

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Outgoing: EDB: Overcurrent, Short Circuit and Earth Fault release protection

Note - Refer SLD for further details and scheme.

12.0	**CABLE ENTRY (TOP/ BOTTOM)**	:	BOTTOM
13.0	**SPACE HEATER**		
		:	EDB: Thermostatically Controlled Anti-Condensation Heaters with MCB
	Switch Socket & CFL Lamps	:	9 W CFL with Toggle switch in marshalling Panel
14.0	**CABLE GLANDS**	:	YES
15.0	**CABLE LUGS**	:	YES
16.0	**PAINTING – TYPE & SHADE**	:	**RAL -7032**
17.0	** The requirement of panels may be change or vary as per actual site condition.		

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18.0 SPECIFIC FEATURES

a) Ingress Protection for EDB IP 52 (min).

b) Necessary Potential free contacts (On off Trip) for RYB on grid

c) GTS-Sheet steel Distribution Board (E/02/2503) mention the general requirement, while PTS-Specification for Electrical Distribution Boards mention the project specific requirement and wherever there is conflict between the requirement mentioned in GTS & PTS, the requirement laid down in PTS shall prevail.

d) EDB shall be provided with surge arrestors in incomer.

e) Single phase feeders shall be derived and provided with two pole MCB. In this regard, Supplier shall used current limiting MCCB as incomer to these MCBs, to limit the fault current 10 kA and subsequently MCB shall be 10kA rating.

f) Single phase used for outdoor lighting shall be timer controlled.

g) Gland plate shall be of Aluminum and 3mm thick for EDB.

19.0 MANDATORY SPARES

MCCB of Each Rating	Nos.	1
Power Contactor of Each Rating	Nos.	1
Indicating lamp of each type	Nos.	1
Push button & switches (Set) of each type	Nos.	1
MCB of each rating	Nos.	1
RCCB of each rating	Nos.	1
Timer Switch of each type	Nos.	1
Switches of each rating	Nos.	1
HRC Fuses of each rating and each type	Nos.	10
Multi-function Meter	Nos.	1
Megger – 500V	Nos.	1

Spares for Electrical Distribution Board (EDB) (One Set for Each EDB as supplied
(Note- Quantities mentioned against each item are for one set only)

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BHAGYANAGAR GAS LIMITED (BGL)

TENDER DOCUMENT FOR CONSTRUCTION OF MOTHER STATIONS

PTS - UPS SYSTEM
P.019141 G11077 E104

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1.0 SCOPE OF WORK

Scope of work includes Supply, Installation, Testing and Commissioning, establishes the minimum requirements for the detailed design of UPS, UPS DB (with VRLA batteries & Rack) that meets the Instrumentation load requirement of control room building.

DESIGN AND OPERATIONAL REQUIREMENTS:

The UPS system shall be based on latest generation of IGBT based type.

Redundant scheme with by-pass:

In UPS system having this configuration two sets of rectifiers and inverters shall be provided. Under normal condition, when AC mains power is available, both the rectifiers shall operate in parallel and supply DC power on float/rapid charging the 2x50% batteries and simultaneously to inverters. In case of failure in one rectifier, the other rectifier shall feed the complete load and the battery without any interruption. These parallel redundant rectifiers shall be single phase. 415V, 3 -phase power shall be made available to these rectifiers from DB/grid supply. The rectifier/charger of the UPS system shall accept single phase input using automatic healthy phase selection logic for selection of any single available healthy phase (±10% of 415V, TPN supply) for supply to the inverter as well as to charge the battery bank. These rectifiers shall charge the battery at 0.2C rate.

- In case of incoming supply failure of both rectifiers the 2x50% batteries shall feed the inverters without any interruption. Each rectifier shall be designed for simultaneously feeding complete inverter load and float/rapid charging of the 2x50% batteries to its rated capacity. Each rectifier shall be equipped with 'On Line' automatic as well as manual charging facility.
- Normally both inverters will be synchronized with each other and with stabilized power supply. Both inverters shall operate in parallel and share the load equally.
- The load sharing controls shall not be subject to common mode failure and any failure of the load sharing controls shall not result in the loss of vital power.
- Manual by pass switch shall be provided.
- When a disturbance/fault occurs in any one of the inverters, the faulty unit shall automatically get disconnected and the entire load shall be fed from the other inverter. In case both the inverters develop a fault, the complete load shall be transferred to stabilized bypass supply through the static switches and retransfer of load from stabilized bypass supply to the inverter shall be possible in auto as well as in manual mode.
- Phase selection in auto/healthy phase scheme shall be such that in case all the three phases are healthy at 'auto/healthy phase selectors' of Rectifier-1 and Rectifier-2, different phases shall be selected in both the auto/healthy phase selectors to feed power to respective Rectifiers.
- The ventilation fans shall be supplemented by 100% redundant fan in normal operation.

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The power supply for fan shall be tapped from the inverter output. It should be possible to operate inverter even after the failure of the fan without temperature rise inside the inverter cubicle exceeding the safe operating temperature limits.

- UPS shall be designed for overload of 125% for 10 min. and 150% for 1 min.
- Battery shall be VRLA. The battery capacity shall be decided considering load power factor as 0.8, de rating factor for ageing 0.8 and de rating for minimum ambient temperature as applicable.
- Battery shall provide 4 hrs backup.
- Noise level at a distance or 1 m. from UPS panels shall be as per IEC standard.
- Enclosure shall be fabricated with cold rolled sheet annealed steel of minimum thickness 2.0 mm.
- The door hinges shall be concealed type. The doors and the removable covers shall be provided with non-deteriorating neoprene gaskets without any discontinuities. Gaskets shall be held in position in groove in shaped sheet steel work or these shall be of U type.
- All external hardware shall be cadmium/zinc plated steel.
- Terminal blocks shall be grouped according to circuit functions and suitably numbered. 20% extra terminals shall be provided in the terminal block.
- Removable bolted aluminium gland plate, heavy duty compression type rolled aluminium cable glands, crimping type aluminium cable lugs for Al. Cables and copper cable lugs for Cu. Cables, pressure clamp / bolted type terminals etc. shall be provided for each incoming and outgoing cable.

Valve Regulated Lead Acid cell/ battery

Valve Regulated Lead Acid(VRLA) shall be as per IS- 15549 -Specification for Stationary Valve Regulated Lead Acid Batteries Specification and IEC 60896-21 and IEC-60896-22.

VRLA cell/ battery shall be suitable for float duty operation at constant voltage permanently applied to its terminals which is sufficient to maintain it in a state close to full charge and shall be designed to supply load in the event of normal power supply failure. Battery shall be sealed maintenance free Type. The type of plate construction for batteries shall be fibrous in nature.

Battery shall be supplied in two parallel banks of 50% capacity each. The battery shall be suitable for being boost charged to fully charged condition from fully discharged condition within 10 hours unless otherwise specified.

COMPONENT DETAILS

All components shall conform to relevant IS/IEC standards and shall be of reputed make. Makes of all components shall be subject to purchaser's / consultant's approval.

Thyristors , Diodes and Transistors

The thyristors, diodes and transistors shall have adequate safety margins to withstand specified operating conditions. A factor of safety of minimum 4 shall be taken against voltage surges.

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STATIC SWITCH

Static switches shall be naturally commutated type with parallel inverse connected thyristors. These shall be rated for continuous duty for 100% load.

STABILIZER

Voltage stabilizer shall be static type and shall satisfy the following requirements:

i. Maximum output voltage variation under steady state condition shall be ± 2%.

ii. Maximum harmonic distortion shall be less than 5%.

iii. The output voltage shall be restored within ± 2% of nominal value in less than 2 secs.

TRANSFORMERS AND CHOKES

All transformers and chokes shall be of dry type and air cooled. This shall be class 'H' insulated, vacuum impregnated. Class F / Class B insulated cast resin transformers and chokes are also acceptable.

UPS DB -

UPS DB shall have min. IP-42 protection and suitable for wall mounting application and paint shall be RAL7032 and have ON OFF indication along with digital voltmeter and ammeter provision.

2.0 GENERAL

- Ref. Standard : IEC 62040 (LATEST)

3.0 AMBIENT CONDITIONS

- Max/Min. Region Temperature - 45°C / 5°C
- Max/Min. Design Temperature - 50°C / 5°C
- Max/Min Region Relative Humidity - 100% / 5%
- Altitude above MSL : Less than 1000 mts
- Atmosphere : Tropicalized
- Location : Indoor

4.0 VENDOR SHOP TESTS

Shall be as per Approved QAP by Owner/ Consultant

5.0 SUPPLY

- Parallel redundant Online UPS with static switch.
- Rectifier/Inverter
- VRLA maintenance free Batteries with Batteries rack and Flame proof Junction box.
- Isolation transformer and Static switch voltage stabilizer in Bypass supply
- Interconnecting cable

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6.0 ERECTION, TESTING & COMMISSIONING

EPC Contractor shall arrange site tests like overload, Load transfer, change over, Mains fail, all functions /alarm/indication and Battery charge discharge test. However, if any conflict for site tests, job procedure or method statement of testing commissioning of UPS SYSTEM and Battery approved by Owner / Consultant. EPC Contractor shall fulfill all requirement of UPS & BATTERY erection, testing and commissioning.

7.0 QUANTITY

S.NO	STATION	RATING	QUANTITY
1.	Hyderabad station, Hyderabad	**6 kVA	**1 No. at each**

Note: **During Detailed Engineering UPS Sizing shall be finalized by contractor based on actual load.

8.0 UPS- INPUT

- Rated Voltage : 415V ± 20%
- Rated frequency : 50 Hz ± 5%
- No. of Phase & wire : 3P + 4W
- Earthing mode : Solidly earthed
- Power factor : 0.8 – 0.9 lagging

9.0 UPS - OUT PUT

- Rated Power : During Detailed Engineering UPS Sizing shall be finalized by Contractor
- Voltage : 230V ± 1%
- Wave form : Sinusoidal
- Frequency : 50 Hz ± 1%
- No. of phases and wire : 1 Ph. + 2W
- Load Power factor range : 0.8 lag to 1.0
- Total Harmonic distortion : <3%LL< 5%NLL
- Current crest factor : Upto 3
- Unbalanced load : Upto 100%
- Overload capacity : 150% for 1 minute, 125% for 10 minutes
- UPS system overall efficiency : > 90%

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10.0 MONITORING

i) Output voltage of UPS (Common)

ii) Output current of UPS (Common)

iii) Battery DC Voltage

iv) Input voltage of each rectifier (ph to ph)

v) Input current of each rectifier

vi) Output current of each inverter

vii) Output voltage of each inverter

viii) Bypass frequency

ix) Output frequency of each inverter

11.0 BATTERY

TYPE : VRLA maintenance free

Back up time: 4 Hours

12.0 BATTERY RACK

It shall be Mild steel stand pre-treated and epoxy painted alkali resistance. It shall be Double row double tier type.

All the Nuts/Bolts/ washer shall be **SS** only.

Each set of battery shall be supplied with all accessories including but not limited to the following:

a. Inter cell, inter row and interbank connectors and end take offs. These shall be of Nickel-plated copper.

c. Cell number plates and fixing pings, Lugs for cable termination as required.

d. One number Cell testing voltmeter (3V –0-3V) complete with leads

e. Four pairs of Rubber gloves

f. One number Spanner

g. Any other accessories.

13.0 CABLE SIZE :

Refer Single Line Diagram

Final Cable sizing shall be considered according actual load during detail engineering.

All the UPS internal cables / serial link (UPS to Battery Junction box /Battery) shall be of FRLS.

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14.0 PAINTING TYPE & SHADE

: RAL-7032

15.0 SPECIFIC REQUIREMENTS

The Parallel Redundant UPS system shall be designed as follows:

- Each system includes one rectifier and one inverter.
- The battery and static and manual by pass power supply shall be provided for UPS system.
- Enclosure Degrees of Protection shall be min IP-42.
- Isolating transformer shall be provided at input & output.
- An isolating transformer shall be needed in the bypass power supply to comply with the required UPS neutral system.
- MCCB shall be provided for the battery, UPS inputs & outputs.
- Each UPS system is sized for 100% full load continuously.
- VRLA battery should have two banks. Each bank shall have facility to isolate each bank separately. This isolator shall be suitable to battery room.
- Each battery bank shall take care of 4hrs. backup time.
- RS485 communication capabilities (Modbus Protocol) of UPS shall transmit the health monitoring signal to RTU/SCADA.
- 03 Nos. Auxiliary contactors with potential free contacts (1NO + 1NC) wired upto terminal strip shall be provided in each UPS for any contact multiplication by owner at a later date.
- Refer below for mandatory spares for UPS system.

16.0 DRAWINGS AND DOCUMENTS

Contractor shall provide the following drawing/documents of UPS system during detail engineering for Owner/PMC review and approval. Nos of copy for drawings and documents shall be as per TENDER specification for this project.

- Specification sheet
- Technical Particulars
- Block Diagram
- General Arrangement drawings and foundation plan
- Calculation for battery sizing
- Feeder Details for UPSDB
- Descriptive literature and catalogues
- Bill of materials
- Schematic & Wiring Diagram

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- Installation, operation & maintenance manual
- Spare parts list with identification
- Test Certificates
- Guarantee Certificates

17.0 MANDATORY SPARES

For each set

System Control Card of each type	Nos.	1
SMPS Card of each type	Nos.	1
1-phase Charger Card of each type	Nos.	1
Gate Drive Card of each type	Nos.	1
Thyrsitor (Charger) of each rating and each type	Nos.	1
Thyristor (Static Switch) of each type	Nos.	1
DC capacitor of each rating and each type	Nos.	1
AC capacitor of each rating and each type	Nos.	1
Free Wheeling Diode (Charger) of each rating and each type	Nos.	1
IGBT of each rating and type	Nos.	1
Rectifier Input Fuses (Fast acting) of each rating and each type	Nos.	1
DC Fuses of each rating and each type	Nos.	1
By pass fuses of each rating and each type	Nos.	1
Choke of each rating and each type	Nos.	1
Cooling Fan	Nos.	1
Indication LED Lamp of each type	Nos.	10

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	PTS- GAS ENGINE GENERATOR SET	P.019141 G 11077 E001

PTS -GAS ENGINE GENERATOR SET

P.019141 G11077 E001

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SILENT GAS ENGINE GENERATOR SET

1.0 SCOPE OF WORK

Scope of work includes Supply, Installation, Testing and Commissioning, establishes the minimum requirements for the detailed design of complete GEG system with suitable pressure reduction system.

Scope also includes supply, laying, termination of all power, control/signal cables, glands and lugs from GEG/AMF Panel to EDB, RTU and GEG's own auxiliary interconnecting cables. All cables shall be XLPE insulated, FRLS PVC outer sheath, armoured.

2.0 GENERAL

2.1	Silent GEG Control Panel	-	REQUIRED
2.2	Max/Min. Region Temperature	-	45°C / 5°C
2.3	Max/Min. Design Temperature	-	50°C / 5°C
2.4	Max/Min Region Relative Humidity	-	100% / 5%
2.5	Altitude Above Sea Level	-	Less than 1000m
2.6	Atmospheric Pollution	-	Tropicalised to withstand site condition, Dust and vapour
2.7	Acoustic Enclosure	-	Required
2.8	Location	-	outdoor
2.9	Rating	-	Continuous

3.0 MAIN POWER SYSTEM DETAILS

Voltage ± %	-	415 V± 10%
Frequency ± %	-	50 HZ ±5%
Fault Level	-	25 KA for 1 Sec.
Earthing mode	-	Solidly earthed.

4.0 AUXILIARY POWER

- 230 V, 50 HZ, 1P, N

5.0 GENERATOR

Rated output power	-	63 KVA (min.)
Rated Voltage	-	415 V ± 5%
Rated Frequency	-	50 HZ ± 3%
Power factor	-	0.8 (lagging)
Insulation class of Generator	-	Insulation class H with Temperature rise limited to class F or class F with temperature rise limited to class B
Type of Excitation	-	Self excited and self regulator.
Voltage regulation	-	Less than 2%
Harmonic Content	-	Less Than 3%
Over load capacity	-	10% for one hour in every 12 hours
Over Speed	-	120% for 2 minute
Degree of Protection (w/o enclosure)	-	IP 23 for Generator IP 52 for Control Panel

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Acoustic and engine emission norms of CPCB shall followed.

6.0 GAS ENGINE

6.1	Lower Heat value of the Gas	-	8200 – 9100 Kcal/Sm^3
6.2	Gas Pressure regulator	-	In case any pressure reducing valve/ regulator is required to meet the engine requirement, same to be supplied by the engine supplier
6.3	Safety Control High water temperature Low Lube Oil Pressure Over speed		
6.4	Type of cooling	-	Radiator cooled

7.0 SPECIFIC FEATURES OF SILENT GEG SET

7.1	Governor	-	GEG set with hydraulic/ Electronic Governor.
7.2	Battery Charger	-	To charge the Battery of Silent GEG Set from 230 V AC Grid Supply.
7.3	A.V.R.	-	YES
7.4	Automatic/Manual Starting	-	Automatic / Manual starting for Silent GEG set through AMF panel placed in Electrical room at main control room building.
7.5	Gas Generator Control Panel	-	1 No. 4 pole, MCCB, Over current, short circuit & Earth Leakage Protective release. - 1 No. 4 pole, Power contactor, AC-3 duty with Aux. contact as required for AMF operation & interlock with down stream contactor at main electrical distribution Board. - Multifunctional digital meter comprising P.F., KWH, Frequency, Voltmeter, Ammeter. - 3 Nos. CT's for metering - Indication lamps for load on & set running - MCB's as required for control supply

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8.0 ACOUSTIC ENCLOSURE

- Modular construction
- All the four walls & roof to be covered with Insulating material conforming to IS:8183 for sound proofing
- Minimum thickness of insulating material 75-100 mm
- Minimum Density of Insulating Material 64 Kg / m^3
- Insulating material compressed between Fibre glass cloth/ vinyl sheet and nonferrous perforated sheet for anti droning effect
- Special Residential silencer to control exhaust noise
- Specially designed attenuators to control sound at air entry to the enclosure and exit from the enclosure
- Gas Generator Set mounted on specially designed anti vibration pads.
- Lift arrangement of Gas Generator set in the base frame
- High quality EDPN gaskets on all the doors. Lockable type door Handles
- Adequate ventilation to meet air requirement for combustion and heat removal
- Gas detection system shall be provided with alarm and trip contact

9.0 NOISE LEVEL

- 75 dB(A) at a distance of 1meter from Acoustic Enclosure.

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10.0 STATION INLET GAS PRESSURE

Rating	Station Inlet Gas pressure at site
63 kVA	Client will provide as per the available pressure as per site condition , bidder to regulate the required pressure.

11.0 MODES OF OPERATION

11.1 GEG Set shall function as per the following scheme.

- Auto start on mains failure scheme (AMF).
- Manual start - in service / test mode.
- Manual stop upon supply restoration.

11.2 Auto start on mains failure scheme (AMF)

This shall be effective in auto position of Auto/ manual selector switch located in control panel. The generator shall be normally at rest. Upon failure of normal supply, a start impulse from voltage monitoring relay shall be provided by GEG suppliers. Using this impulse, generator shall start automatically and rated speed & Voltage shall be built up. An impulse shall be given for closing of generator contactor. All accessories required for starting and completion of various sequence of operation for the above purpose shall be provided as part of generator supply.

11.3 Manual start - in service mode

This shall be effective in manual position of Auto/ manual selector switch and service position of service/ test selector switch located in control panel. The scheme of operation shall be same as of auto mode above, except the starting command shall be extended manually using push button from the control panel.

11.4 Manual start - in Test mode

This shall be effective in service position of service / test selector switch. The scheme of operation shall be same as that of manual start in service mode above except the closing command for generator contactor shall not be extended.

11.5 Stop upon restoration of grid mains supply

On restoration of normal supply, changeover to normal supply from the generator supply at main electrical distribution board shall be done automatically. Switching off the Generator set and generator contactor shall be done manually from local, after running the set for around one minute on idle condition.

12.0 SPECIFIC REQUIREMENTS

1. Separate Potential free contacts for Silent GEG ON & OFF & FAULT status shall be provided for owner's use in LCP Panel in addition to the RS 232/RS 485 port for signalling to the RTU system.
2. Contractor shall arrange the civil foundation for GEG sets based on approved Foundation calculation. Contactor shall furnish other related civil drawing for the same.
3. Contactor shall supply all materials required for erection, testing & commissioning of GEG sets. Transportation to site location, Erection, Testing & commissioning shall be in bidder's/Contactor's scope.
4. All routine tests as per relevant standards shall be carried out in the presence of purchaser's representative.

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5. The Gas Engine Generator set shall be tested for output, general performance, overloads and other tests sufficient to prove the correctness of the design both at works and at site.
6. These inspections shall, however, not absolve the vendor free from his responsibility for making good any defect which may be noticed subsequently.
7. Proper shed shall be provided by Contractor for GEG Set & AMF Panel/Control panel.
8. Contractor shall responsible to provide latest technology based AMF change over system for GEG Set.
9. Contractor shall responsible for any steel structure/ fabrication work for installation of Control panel/AMF Panel of GEG set.

13.0 MANDATORY SPARES

Mandatory spares shall be as per Manufacturer.

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PTS - TRANSFORMER

P.019141 G10777 E006

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1.0 SCOPE OF WORK

This specification covers, engineering, manufacture, assembly, stage testing, and inspection and testing before supply and delivery at site of mineral oil- immersed, natural air-cooled, outdoor type, double-wound 3 phase 11/0.433 KV Distribution Transformers for outdoor use in power distribution systems.
The specification is applicable Transformer capacity up to 630 KVA.

2.0 REFERENCE STANDARD

ISS–1180/Part-I/ 2014&Amendmentno.1 2016 to IS :1180-Part-1/2014	Outdoor/Indoor type Oil immersed distribution Transformer upto and including 2500 kVA, 33KV Specifications Mineral Oil Immersed
IS 5484	Specifications for Aluminum wire rods
IS 649	Testing of Steel sheet and strips for magnetic circuits
IS 191: 2007	Copper
IS 335 : 1993	New insulating oils
IS 554 : 1999	Pipe threads where pressure-tight joints are Made on the threads —Dimensions, tolerances and designation
IS 1576 : 1992	Solid pressboard for electrical purpose
IS 1608 : 2005	Mechanical testing of metals — Tensile testing
IS 1747: 1972	Nitrogen
IS 1885 (Part 38) :1993	Electro technical vocabulary: Part 38 Power transformers and reactors
IS 1897: 2008	Copper strip for electrical purpose
IS 2099: 1986	Bushings for alternative voltages above 1000volts
IS 13730	Specification for winding wires

IS 3024 : 2006	Grain oriented electrical steel sheets and strips
IS 3347	Dimensions for porcelain transformer bushings for use in lightly polluted atmospheres
IS 8603:2008	Dimensions for porcelain transformer bushings for use in heavily polluted atmospheres,12/17.5 KV
ISS 5/1961	Specification for colors for ready mixed paints.
ISS- 6600/1972 / IEC 76	Guide for loading of oil Immersed Transformers

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ISS-10028	Installation, Maintenance of Transformers
ISS-4257	Dimension for clamping arrangement for bushings (for porcelain and metal parts)
ISS- 3401	Silica gel
ISS-1866	Code of practice for maintenance & supervision of Mineral insulating oil in equipment
IS 3639: 1966	Fittings and accessories for power transformers
IS 6162	Paper-covered aluminum conductors
IS 7404 (Part1): 1991	Paper covered copper conductors: Part 1 Round conductors
IS 7421: 1988	Porcelain bushings for alternating voltages up to and including 1000 V

3.0 SYSTEM DETAIL

The distribution transformers shall be installed outdoor locations along 11 kV distribution networks, which consist of underground/ overhead networks. The HV winding shall be connected with HT SFU/OCB/VCB/SF6 CB of the ring main unit/ DO Fuse through 11kV (E) XLPE cable. LV winding shall be connected to LV distribution box/switch fuse Unitthrough 1.1 kV XLPEAluminum conductor Cable.

The transformers shall be suitable for outdoor installation, RCC foundation based with 3 phase 50 Hz, 11 KV systems in which the neutral is effectively earthed and they should be suitable for service under fluctuations in supply voltage up to plus 12.5% to minus 12.5%.

3.1 GENERAL DETAILS

Sr. No	Parameters	Values
1.	Location	At Universal Service station in West Bengal
2.	Max ambient air temperature (Degree C)	50
3.	Min. ambient air temperature (Degree C)	-2
4.	Max average daily ambient air temperature (Degree C)	45
5.	Max. yearly weighed average ambient temperature (Degree C)	40
6.	Max. altitude above mean sea level (meter)	1000
7.	Maximum relative humidity (%age)	0 to 100%

3.2 Total Quantity

01 Nos 630 KVA at EACH Mother station

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4.0 PRINCIPAL PARAMETERS

1.	System voltage (max.)	:	12 KV
2.	Rated voltage HV	:	11 KV
3.	Rated voltage LV	:	433 V
4.	Line currentHV	:	Vendor shall furnish
5.	Line current LV	:	Vendor shall furnish
6.	Frequency	:	50 Hz +/-3%
7.	HV Connection	:	Delta
8.	LV Connection	:	Star Neutral brought out
9.	Vector group	:	Dyn-11
10.	Type of cooling	:	ONAN
11.	Tap changing arrangement	:	7.5 %to +10% in Steps of 2.5 %
12.	Noise level	:	As per IS standard
13.	Permissible temperature rises over ambient:		35 Deg.C of top oil measured 40 Deg.C of winding measured by resistance
14.	HV Phase to Phase	:	255
	HV Phase to Earth	:	205
	LV Phase to Phase	:	75
	LV Phase/ Neutral to Earth	:	55
15.	Basic Insulation Level	:	95 KV
16.	Energy Efficient Level	:	**Min. 3 star**
17.	Impedance (%)	:	4.5

18. Transformer standard losses in watts at 50% ,100% load & No-load losses shall be provided by vendor for Energy efficient 3 star Transformer as per Beuro of Energy Efficiency (Govt of India) latest Amendment. No deviation shall be accepted for losses.

5.0 TECHNICAL REQUIREMENTS

A. CORE

Transformer core shall be stacked core type, shell type or with wound core construction using new and high quality CRGO core with heat resistant insulating coating. The core shall be of new high-grade cold rolled grain oriented annealed lamination core having low loss and good grain properties, coated with hot oil proof insulation, bolted together.

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The complete design of core must ensure permanency of the core losses with continuous working of the transformers. The complete design of core must ensure permanency of the core loss with continuous working of the transformers. The value of the maximum flux density allowed in the design and grade of lamination used shall be clearly stated in the offer.

B. CORE CLAMPING:

- MS channel shall be used on top and bottom.Core Channel on LV side to be reinforced at equidistance, if holes / cutting is done for LT lead in order to avoid bending of channel.
- MS Channels shall be painted with hot oil-resistant paint.The transformers core shall be suitable for over fluxing (due to combined effect of voltage and frequency) up to 112.5% without injurious heating at full load conditions and shall not get saturated. The nominal flux density in any part of the core shall not exceed 1.69 Tesla at 100% rated voltage and frequency and the maximum flux density in any part of the core and yoke at rated voltage and frequency shall be such that the flux density with 112.5 % combined voltage and frequency variation from rated voltage and frequency shall not exceed 1.9Tesla. (REF IS 1180) Clamping and Tie-rods shall be made from HT Bright Bars steel & shall be painted with hot oil resistant paint. (IS 1180) Clamping and Tie-rods shall be made from HT Bright Bars steel & shall be painted with hot oil resistant paint. (IS 1180).

C. AMOURPHOUS

The core shall be high quality Amorphous ribbons having very low loss formed into wound cores of rectangular shape, bolted together to the frames firmly to prevent vibration or noise. The complete design of core must ensure permanency of the core loss with continuous working of the transformers.

D. WINDINGS

Double paper covered Electrolytic Copper conductor or class H super enamel cover Electrolytic Copper conductor shall be used for 11 KV class Transformers.
A mix of Electrolytic copper conductors for HV & LV winding will not be permitted.

E. CURRENT DENSITY

Electrolytic copper conductor shall not be more than 2.5 A/sq.mm.

F. INTERNAL CLEARANCE AND COILS

Minimum Radial clearance of LV Coil to Core	:	4mm (For 100 to 500 KVA)
Minimum radial clearance between LV coil to HV coil	:	11 mm
Phase to phase clearance between HV conductors	:	10 mm
Minimum electrical clearance between inside surface of the Tank and outside edge of the winding	:	30 mm
Minimum No. of HV Coils up to 500 KVA	:	4 Nos
No. of LV coils per Phase	:	1 Nos

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G. TAPS

Tapings shall be provided on the higher voltage winding for variation of HV voltage within range of (-) 7.5% to +10% (For 200 KVA & 500KVA) in steps of 2.5%.
Tap changing shall be carried out by means of an externally operated self- Position rotary switch and when the transformer is in de-energized condition. Switch position No.1 shall correspond to the maximum plus tapping.
Each tap change shall result in variation of 2.5% in voltage.
Provision shall be made for locking the taping switch handle in position.

H. OIL

The insulating oil shall comply with the requirements of IS 335.
The specific resistance of the oil shall be as per IS 6103.
Oil shall be filtered and tested for break down voltage (BDV) and moisture content before filling.

Insulating oil for the first filling of the transformers including 20% extra shall be supplied in non-returnable sealed drums suitable for outdoor storage.

I. INSULATING MATERIAL

Insulation Kraft Paper & pressboard shall be standard make.
All spacers, axial wedges / runners used in windings shall meet the requirement of IEC 641.

6.0 TANK

The transformer tank shall be of rectangular in shape. The tank shall be made of prime quality MS sheet of thickness stated below with necessary stiffener to withstand the pressure built in during the expansion of oil due to temperature rise.
Tank shall be such that, it shall facilitate easy lifting of core with coils from the tank without dismantling LV bushings.

For sides	3.15 mm
For Top & Bottom	5 mm

The exterior of the transformer tank and other ferrous fitting shall be thoroughly cleaned, scraped /sand blasted and given a priming coat and two finishing coats of durable oil and weather resistant paint conforming to colour code 632 of IS-5/1961.

4 Nos of Lifting lugs shall be provided.

4 Nos. of welded heavy-duty pulling lugs of MS plate 8 mm thick shall be provided to pull the transformer.

7.0 GENERAL ASSESORIES

BREATHER & CONZERVATOR

A conservator tank of adequate capacity shall be provided on the transformer in such a position as not to obstruct the electrical connections to the transformer and shall have a capacity between highest and

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lowest visible levels to meet the requirement of expansion of the total cold oil volume in the transformer and cooling equipment from the minimum ambient temperature to 90° C.
The conservator tank shall be supported above the transformer tank or above the cooling radiator bank by suitable brackets and shall be so designed that it can be completely drained during service by removing plug from drain point. It shall also be possible to remove the conservator for cleaning purposes as and when required.

The conservator shall be fitted with magnetic type oil level gauge with low level electrically insulated alarm contact.

A valve shall be provided on the conservator side to cut off the oil supply to the transformer after providing a straight run of pipe for at least a length of five times the internal diameter of the pipe on the tank side of the Buchholz Relay.

Each conservator tank shall be fitted with a breather in which silica gel will be the dehydrating agent. It shall be designed such that the passage of air is through a dust filter and silica gel. The external atmosphere shall be continuously in contact with the silica gel and the moisture absorbed shall be indicated by a change in colour which can be easily observed from a distance.

Buchholz Relay

A double float type relay confirming to IS 3637 shall be provided. The relay shall be provided with a test cock suitable for a flexible pipe connection for checking its operation. A copper tube shall be connected from the gas collector to a valve located about 200 mm above ground level to facilitate sampling with the transformer in service. The device shall be provided with two electrically independent ungrounded contacts one for alarm on gas accumulation and the other for tripping on sudden rise of pressure.

Pressure Relief Device

The pressure relief device shall be provided of sufficient size for rapid release of any pressure that may be generated within the tank and which might result in damage to the equipment. The device shall operate at a static pressure of less than the hydraulic test pressure of transformer tank. Means shall be provided to prevent the ingress of rainwater inside the tank due to installation of this device. The diaphragm shall be of suitable design and material and situated above maximum oil level.

BUSHINGS

For 11 KV Transformers - 12 KV class bushings shall be used and for LV side, 1.1KV terminal bushing shall be used. Bushing shall be as per IS 3347.
Bushings of following or other makes having type tested as per IS 2099.

The winding terminals of all bushings shall be such as to facilitate the removal of the bushings without necessitating any major operation.

The ends of HV windings shall be brought out through bushings suitable for connection with 11KV cable box.

The ends of LV windings shall be brought out through bushing suitable for connecting with 1.1 KV Bus Duct/Cable Box.

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COOLING ARRANGEMENT

Detachable type, cooling radiator banks of adequate capacity and in requisite number shall be provided with each transformer.

Shut-off valves of adequate size and in requisite number shall be provided between radiator and headers and between tank and cooler banks.

The cooling radiator banks may be supported from the tank.

The cooling radiator shall be so designed as to avoid pockets in which moisture may collect and shall withstand the pressure tests.

All valves of the cooler connections shall be of gun metal or cast steel or may have cast iron bodies with gun metal fittings.

The valves shall be of full wave type with internal screw and shall be opened by turning counterclockwise when facing hand wheel.

Provision for padlocking the valves in open or closed positions shall be made.

Every valve shall be provided with an position indicator

All valves shall be provided with flanges having machined faces.

HOUSING /CABLE BOX AND TERMINAL ARRANGEMENT

The housing of Cable Box shall be min. IP 56.

The voltage windings of each transformer shall terminate on weatherproof insulated bushings of specified voltage level.

The insulated bushings shall be suitable for connection with specified cables.

All bushings shall be equipped with suitable terminal connectors of approved type and size and all terminals current carrying contact surfaces shall be adequately silver-plated.

8.0 TEMPERATURE INDICATORS /PROTECTIONS

The dial type, oil and winding temperature indicators for local and remote monitoring shall be provided by supplier. The alarm contacts of winding temperature indicators shall be adjustable to close between 50C and 100C and tripping contacts to close between 60C and 120C and both shall reopen when the temperature has fallen by about 10C. Potential free contacts shall be provided for OTI & WTI for monitoring

All contacts shall be adjustable on a scale and shall be accessible on removal of the cover. The temperature indicators shall be so designed that it shall be possible to check the operation of the contacts and associated equipment

Suitable current transformer shall be provided for input to WTI.

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Vendor shall provide NO/NC contacts in the relevant fittings / instruments for effecting the protections as mentioned below:

- Winding hot spot temperature indication with alarm and trip.
- Oil temperature indicator with alarm and trip.
- Low oil level alarms for conservator
- Buchholz relay with alarm & trip

Wiring liable to be in contact with oil shall have oil resisting insulation and the bare ends of strands shall be treated to prevent creepage of oil along wire.

There shall be no possibility of oil entering connection boxes used for cables or wiring. Panel connections shall be neatly and squarely fixed to the panel. All instruments and panel wiring shall be run in PVC or non-rusting metal cleats of the limited compression type. Wiring shall be terminated on suitable terminal boards placed in the marshalling box.

9.0 SURFACE TRATMENT & PAINTING

The internal and external surfaces including oil filled chamber and structural steel work shall be given proper treatment to remove all rust, scale, foreign adhering metal, grease, etc. The outside surface of the Transformer shall be primed with zinc rich two pack epoxy media followed by epoxy-based powder coating with a colour shade smoke grey colour paint corresponding of IS: 5 and shall appear smooth & elegant in finish.

All paints shall be carefully selected to withstand heat and extremes of weather. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling

GALVANIZING

Threads of nuts and bolts (cadmium plated) shall be so made that after cadmium plating; nuts will have a neat fit and can be turned through the full length of threads of the bolts.

10.0 FITTINGS

The following fittings and accessories shall be provided:

- Bushings with metal parts and gaskets to suit the specified termination arrangements
- Separate bushing for neutral
- Silica gel breather with oil seal and connecting pipe
- Pressure relief device
- Inspection windows
- Dial type winding temperature indicator fitted with maximum pointer and two sets of contacts for alarm and trip with CT
- Dial type oil temperature indicator fitted with maximum pointer and two sets of contacts for alarm and trip
- Air release plug

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- Cover lifting eyes, transformers lifting lugs, jacking pads, towing holes, core and winding lifting lugs, skids and pulling eyes on both sides
- Rating and diagram plates on transformers and auxiliary apparatus
- Two numbers earthing terminals

- Bottom & top filter valves with threaded male adopters
- Bottom sampling / drain valve
- Pocket on tank cover for thermometer
- Off Load Tap changing equipment along with all accessories
- Under carriage with 4 Nos. flanged bi-directional wheels with locking and bolting device
- Marshalling box (IP55)
- Requisite No. of radiators with shut off valves
- Complete wiring upto marshalling box with PVC insulated copper conductor cables of 1100 Volts grade
- Insulating oil in non-returnable steel barrels
- Buchholz Relay, double, float type with one set of alarm contacts, one set of trip contacts, one testing petcock and one shut-off valve on conservator side .

- Conservator with oil filling hole and cap isolation valve, drain valve, & magnetic type oil level gauge
- Low oil level switch

11.0 SPARES

Following spares shall be supplied free of cost along with the transformer

i. One complete set of gaskets
ii. 20% extra oil supplied in non-returnable sealed drums suitable for outdoor storage

12.0 BOUGHT OUT ITEMS

The documentations including product leaflets and test certificates shall be submitted for following brought out items:

a) Buchholz Relay
b) Winding temperature indicators
c) Oil temperature indicators
d) Bushings
e) Marshalling box
f) Tap changing equipment

13.0 INSPECTION & TESTING

Transformer shall be subjected to inspection by Owner/ Consultant or by an agency authorized by the owner at the manufacturer's works .

Acceptance test shall be carried out included but not necessarily limited to the followings:

- A general visual check shall be carried out along with checking of general arrangement, tap changing equipment, fittings & accessories, cable termination / bus duct arrangement etc.
- Dimensional & Electrical clearance test

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- Breakdown value (BDV) test shall be carried out on transformer oil samples before and after testing of the transformer. Bought out test certificate of the oil from the supplier is to be provided.
- Ratios at each tap and vector group
- Measurement of winding resistance
- Measurement of insulation resistance
- Measurement of no-load loss and current
- Load losses measurement
- Measurement of impedance at principal tap and load loss
- Induced over voltage withstand test
- Pressure relief device test
- Operational test for Buchholz relay
- Measurement of IR before and after HV test
- Di-electric test of oil
- Noise level check
- Magnetic balance test

Additional tests:

- Oil leakage test : All tanks and oil filled compartments shall be tested for oil tightness by being completely filled with air/oil of a viscosity not greater than that of insulating oil to IS: 335 at an ambient temperature and subjected to a pressure equal to the normal pressure plus 35 kN/m2 measured at the base of the tank. This pressure shall be maintained for a period of not less than 12 hours for oil and 1 hour for air, during which time no leakage shall occur.

- Vacuum test: One transformer tank of each size (applicable for system voltage upto 72kV) shall be subjected to a vacuum of 34.7kN/m2 gauge pressure (250 mm Hg) for one hour. The permanent deflection of flat plates after the vacuum has been released shall not exceed the value specified below without affecting the performance of the transformer.

Pressure test:
One transformer tank of each size shall be subjected to a pressure corresponding to twice the normal head of oil or to the normal pressure plus 35kN/m2 whichever is lower as measured at the base of the tank and will be maintained for one hour. The permanent deflection of the flat plates after the excess pressure is released shall not exceed the figures specified above

The following type test reports shall be submitted during inspection for review:
a. Impulse withstand voltage test on one leg (Primary and Secondary) of transformer (Only test report of prototype is to be submitted for this test)
b. Measurement of zero phase sequence impedance (type test report of prototype).
c. Measurement of noise level (type test report of prototype)

Apart from the above, Quality Assurance Plan shall be carried out.

For components/equipment bought from other sub-suppliers, copies of certified test reports (of test carried out at the respective manufacturer's works) shall be submitted.

14.0 DRAWINGS/DATA/MANUALS

Documents to be submitted during detailed engineering

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- Typical General arrangement drawing of the transformer including dimensions and showing fittings and accessories of transformers
- Data sheet duly filled up
- Outline dimensional drawing of transformer and accessories.
- Connection diagram.
- GA & Schematic diagram of tap changing mechanism
- Shipping drawing showing dimensions and weights of heaviest package.
- Nameplate diagram.
- Interconnecting / control cable schedule
- Bushing drawings and specification.
- Schematic diagram showing of flow of oil in cooling system as well as each limb and winding
- Foundation plan of the Transformer
- Cross sectional drawing of HV Cable box & LV Bus Duct flange / cable box
- Quality assurance plan
- Any other document / drawing requested by the Owner/ Consultant at the time of drawing approval

15.0 APPROVED MAKE

AS PER BGL APPROVED VENDOR LIST

16.0 TECHNICAL DATASHEET

(FULFILLED BY VENDOR)

Sl. No.	Description		
1.	Make		
2.	Name of Manufacturer		
3.	Place of Manufacture		
4.	Voltage Ratio		
5.	Rating in kVA	--	KVA
6.	Core Material used and Grade: a) Flux density b) Over fluxing without saturation (Curve to be furnished by the Manufacturer in support of his claim)		
7.	Maximum temperature rise of: a) windings by resistance method b) Oil by thermometer		
8.	Magnetizing (no-load) current at: a) 90% Voltage b) 100% Voltage c) 110% Voltage		
9.	Core loss in watts : a) Normal voltage b) Maximum voltage		

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10. Resistance of windings at 20 0C (with 5% tolerance) :
    a. HV Winding (ohms)

    b. LV Winding (ohms)
11. Full load losses (watts) at 75 0C

12. Total Losses at 100% load at 75 0C

13. Total Losses at 50% load at 75 0C

14. Current density used for : (Ampere/sq. mm)
    a) HV Winding
    b) LV Winding

15. Clearances: (mm)
    a) Core and LV
    b) LV and HV
    c) HV Phase to Phase
    d) End insulation clearance to earth e) Any point of winding to tank

16. Efficiency at 75 0C :
    a) Unity P.F. and
    b) 0.8 P.F.

    1) 125% load
    2) 100% load
    3) 75% load
    4) 50% load
    5) 25% load
17. Regulation at:
    a) Unity P.F.
    b) 0.8 P.F. at 75 0C

18. % Impedance at 75 0C
19. Flash Test:

    (i) HV 28 kV / 50 HZ for 1 minute
    (ii) LV 3 kV/50 Hz for 1 minute

20. Over potential Test (Double Voltage and Double frequency for 1 minute)

21. Impulse test

22. Mass of: (kg)

    a) Core lamination (minimum)
    b) Windings (minimum)
    c) Tank and fittings
    d) Oil
    e) Oil quantity (minimum) (liter)
    f) Total weight

23. Oil Data:

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1. Quantity for first filling (minimum) (liter)
2. Grade of oil used
3. Maker's name
4. BDV at the time of filling (kV)

24. Transformer:
1) Overall length x breadth x height (mm x mm x mm)
2) Tank length x breadth x height
3) Thickness of plates for
a) Side plate (min)
b) Top and bottom plate (min)
4) Conservator Dimensions
5) Stage wise inspection of transformer
6) GTP
7) Drawing approvals
8) Heat run test
9) Neutral current to be checked with clamp meters
10) Final inspection

25. Radiation:
1) Heat dissipation by tank walls excluding top and bottom
2) Heat dissipation by cooling tube
3) Diameter and thickness of cooling tube
4) Whether calculation sheet for selecting cooling area to ensure that the transformer is capable of giving continuous rated output without exceeding temperature rise is enclosed.

26. Inter layer insulation provided in design for:

1) Top and bottom layer
2) In between all layer
3) Details of end insulation
4) Whether wedges are provided at 50% turns of the HV coil

27. Insulation materials provided
a) For Conductors
(1) HV
(2) LV
b) For Core

28. Material and Size of the wire used
1) HV Dia (mm) (SWG)
2) LV

a) No. of Conductors in parallel
b) Total area of cross section (sq mm)

29. Whether the name plate gives all particulars as required in Tender

30. Particulars of bushings HV/LV
1) Maker's name
2) Type IS-3347/IS-2099/IS7421
3) Rating as per IS
4) Dry power frequency voltage withstand test
5) Wet power frequency voltage withstand test

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Transformer Works

Supply, transportation, installation and commissioning of:

1. 630 kVA, 11/0.433 kV OLTC transformer with CRGO core and copper winding.
2. 250 kVA, 11/0.433 kV OLTC transformer with CRGO core and copper winding.

- The transformers shall comply with IS:1180 Part-1 (2014) Amendment no-4, Level-1 and bear valid BIS certification.
- Supply and installation of RTCC Panel and AVR for each transformer.
- Apart from having BIS License for higher rating, it is mandatory to supply with ISI mark. Failure of this leads to rejection from CEIG at the time of releasing the power supply. Therefore, complete responsibility lies with the contractor.
- S/T/I/C of 630kVA 11/0.433KV On load tap changer, RTCC Panel, 3 Phase, 50Hz, Dynn11 Vector Group, Copper wound, CRGO Core, Oil Immersed Distribution Transformer with standard fittings confirming to IS1180 Level-I Standard. Meter Box with GI Piping and Wiring, etc
- Liasoning Work with EB Department including inclusive of preparation of drawings, load details, coordination, inspection, certification, agreement, liasoning, etc if any.
- CEIG Approvals inclusive of preparation of drawings, load details, coordination, inspection, certification, agreement, liasoning, etc if any
- S/T/I/C of 250kVA 11/0.433KV On load tap changer, RTCC Panel, 3 Phase, 50Hz, Dynn11 Vector Group, Copper wound, CRGO Core, Oil Immersed Distribution Transformer with standard fittings confirming to IS1180 Level-I Standard.

TECHNICAL SPECIFICATION OF TRANSFORMER- 630 kVA		
The transformer will be designed and manufactured as per IS:1180-2014 Level -1 and will be supplied with first filling of oil to IS:335 of 1993.		
1.01.	**GENERAL SPECIFICATIONS**	
1	Rated KVA	**630** Level 1
2	Service & Duty	Continuous
3	Make	**NANI**
4	Type	Core Type - Oil Immersed
5	Location	Indoor
6	Specifications & Standard as per IS	IS 1180, IS 335
7	Type of Cooling	ONAN
8	Wound	Copper Double Wound
1.02.	**SYSTEM PARTICULARS**	
1	Nominal Voltage (V)	11000
2	Highest System Voltage (V)	12100
3	No. Of Phases	3
4	Frequency (Hz)	50
5	Voltage Variation	+ / - 10%
6	Frequency Variation	+ / - 3 %
7	Combined Voltage & Frequency Variation	+ / - 5 %
8	Terminal Arrangement	HV - Cable Box
		LV - Cable Box
1.03.	**RATING**	

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1	Rated Voltage of H.V. (Volts)	11000 Current: 33.06Amps	
2	Rated Voltage of L.V. (Volts)	433 Current: 840Amps	
3	Max. Temperature rise above 50 C ambient		
	temperature of winding by resistance		
	method. (Deg. C)	45	
4	Max. Temperature rise in oil by		
	thermometer above 50 C ambient		
	temperature (Deg. C)	40	
5	Over load capacity	As per IS: 6600	
1.04.	**WINDING CONNECTION DETAILS**		
1	Connections		
	a. H.V. Winding	Delta	
	b. L.V. Winding	Star	
	c. Neutral brought out for earthing	Yes	
2	Tapings		
	a. No. of Positions	17	
	b. Range	+10 % to -10 % in steps of 1.25%	
	c. Voltage of each step	137.5V	
3	Vector Symbol	Dyn11	
1.05.	**LOSSES AND OTHERS**		
1	Total losses at rated current and rated		
	frequency at 75 deg. C (Watts) At 50% Load	1860W Max.	
2	Total losses at rated current and rated		
	frequency at 75 deg. C (Watts) At 100% Load	5300W Max.	
3	Percentage Impedance at 75 deg. C at		
	Normal Tap.	4.50 Subject to IS Tolerance	
4	No load Current Approx	1.5 % of full load current	
5	Regulation at full load at 75 deg. C u.p.f.	0.78%	
6	Regulation at full load at 75 deg. C 0.8 u.p.f.	3.26%	
1.06.	**EFFICIENCY**		
1	Efficiency at 75 deg. C	U.P.F.	0.8 P.F.
	a. 100 % full load	99.15	98.94
	b. 75% full load	99.26	99.08
	c.50 % full load	99.31	99.14
	d. 25% full load	99.14	98.93
2	Load at Which Maximum efficiency occurs in %		
	of Full Load	50.58	
3	Load at which Max. efficiency occurs	318.65	

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	KVA	
4	Maximum Efficiency	99.31
1.07. CONSTRUCTIONAL DETAILS		
1	Type of Construction	Core Type
2	Insulation between laminations	Carlit
3	Type of joint between core limb and yoke	Mitered
4	Type of Winding	
	a. HV Winding	Crossover
	b. LV Winding	Spiral
1.08. WINDING INSULATION LEVEL		
	a. HV Winding (KV uniform)	12
	b. LV Winding (KV uniform)	1.1
1.09. INSULATION OF CONDUCTORS		
	a. HV Winding turn Insulation	DPC
	b. LV Winding turn Insulation	DPC
	c. Between HV and LV Winding	Oil Duct + Solid Cylinder + Oil Duct
	d. Between LV Winding and Core	Solid Cylinder
1.10. TYPE OF JOINTS IN WINDING		Brazed
1.11. MINIMUM CLEARANCES		
	H.V.to Earth (mm)	
	In Oil	25
	Out of Oil	140
	L.V. to Earth (mm)	
	In Oil	10
	Out of Oil	25
1.12.TEST VOLTAGES		
	a. Impulse (1.2 / 50 micro second wave)	
	withstand voltage	
	H.V. Winding (KV peak)	75
	L.V. Winding (KV peak)	N. A.
	b. One minute power frequency	
	withstand voltage	
	H.V. Winding (KV)	28
	L.V. Winding (KV)	3
1.13. DETAILS OF TANK AND MATERIALS M.S.		
1	Thickness of side plates (mm)	4
2	Thickness of bottom plates (mm)	5
3	Thickness of cover plates (mm)	5
4	Thickness of radiator (pipes or sheets)	1.2mm
1.14. WEIGHTS AND DIMENSIONS (APPROX.)		
1	Net untanking Weight (Kg.)	1765
	(Core and windings with clamps)	
2	Volume of insulating Oil (Ltr.)	1275

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3	Tank and fittings (Kg.)	1450		
4	Total Weight of Transformer (Kg.)	4300		
5	Overall dimensions of the Transformer	Length	Breadth	Height
	(approx.) in mm	2950	2150	2050
1.15. PARTS TO BE DETACHED FOR TRANSPORT		Rollers, Breather, Radiators		
1.16. STANDARD FITTINGS AND ACCESSORIES				
S.No.	**DESCRIPTION**	**QTY.**		
1	Rating and terminal marking plate	One		
2	Earthing Terminals	Two		
3	Lifting Lugs	Four		
4	On Load Tap Changer (CTR/OLG Make)	One		
	with RTCC (Independent Operation) & AVR			
5	Conservator with Drain plug	One		
6	Oil filling hole with cap	One		
7	Oil Level Indicator	Two		
8	Dehydrating Silicagel Breather	One		
9	Air release device	One		
10	Thermometer Pockets	Two		
11	Drain valve with blanking plate	One		
12	Filter valve with blanking plate	One		
13	Explosion vent with double diaphragm	One		
14	Radiators with shut off valves	Adequate		
15	Buchholz Relay	One		
16	Uni-directional Flat Rollers	Four		
17	Separate Neutral Bushing	One		
18	Oil Temperature Indicator	One		
19	Winding Temperature Indicator	One		
20	Marshalling Box	One		
1.17. PAINTING				
1	Surface preparation	By Sand Blasting		
2	Paint	Enamel Light Grey, Shade No.631, of IS : 5		
1.18. TESTS				
1	**ROUTINE TESTS**			
	As per IS: 1180 all the routine tests are carried out at our works in the presence of your Engineer.			

TECHNICAL SPECIFICATION OF TRANSFORMER-250 kVA

The transformer will be designed and manufactured as per IS:1180-2014 Level -1 and will be supplied with first filling of oil to IS:335 of 1993.

1.01.	**GENERAL SPECIFICATIONS**		
1	Rated KVA	**250**	Level 1
2	Service & Duty	Continuous	
3	Make	**NANI**	
4	Type	Core Type - Oil Immersed	

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5	Location	Indoor
6	Specifications & Standard as per IS	IS 1180, IS 335
7	Type of Cooling	ONAN
8	Wound	Copper Double Wound
1.02.	**SYSTEM PARTICULARS**	
1	Nominal Voltage (V)	11000
2	Highest System Voltage (V)	12100
3	No. Of Phases	3
4	Frequency (Hz)	50
5	Voltage Variation	+ / - 10%
6	Frequency Variation	+ / - 3 %
7	Combined Voltage & Frequency Variation	+ / - 5 %
8	Terminal Arrangement	HV - Cable Box
		LV - Cable Box
1.03.	**RATING**	
1	Rated Voltage of H.V. (Volts)	11000 Current: 13.12Amps
2	Rated Voltage of L.V. (Volts)	433 Current: 333.34Amps
3	Max. Temperature rise above 50 C ambient	
	temperature of winding by resistance	
	method. (Deg. C)	45
4	Max. Temperature rise in oil by	
	thermometer above 50 C ambient	
	temperature (Deg. C)	40
5	Over load capacity	As per IS: 6600
1.04.	**WINDING CONNECTION DETAILS**	
1	Connections	
	a. H.V. Winding	Delta
	b. L.V. Winding	Star
	c. Neutral brought out for earthing	Yes
2	Tapings	
	a. No. of Positions	17
	b. Range	+10 % to -10 % in steps of 1.25%
	c. Voltage of each step	137.5V
3	Vector Symbol	Dyn11
1.05.	**LOSSES AND OTHERS**	
1	Total losses at rated current and rated	
	frequency at 75 deg. C (Watts) At 50% Load	980W Max.
2	Total losses at rated current and rated	
	frequency at 75 deg. C (Watts) At 100% Load	2930W Max.
3	Percentage Impedance at 75 deg. C at	
	Normal Tap.	4.50 Subject to IS Tolerance

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4	No load Current Approx	1.5 % of full load current	
5	Regulation at full load at 75 deg. C u.p.f.	0.99%	
6	Regulation at full load at 75 deg. C 0.8 u.p.f.	3.40%	
1.06. EFFICIENCY			
1	Efficiency at 75 deg. C	U.P.F.	0.8 P.F.
	a. 100 % full load	98.86	98.58
	b. 75% full load	99.00	98.75
	c.50 % full load	99.04	98.81
	d. 25% full load	98.75	98.45
2	Load at Which Maximum efficiency occurs in %		
	of Full Load	54.05	
3	Load at which Max. efficiency occurs KVA	135.13	
4	Maximum Efficiency	99.05	
1.07. CONSTRUCTIONAL DETAILS			
1	Type of Construction	Core Type	
2	Insulation between laminations	Carlit	
3	Type of joint between core limb and yoke	Mitered	
4	Type of Winding		
	a. HV Winding	Crossover	
	b. LV Winding	Spiral	
1.08. WINDING INSULATION LEVEL			
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	b. LV Winding (KV uniform)	1.1	
1.09. INSULATION OF CONDUCTORS			
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	c. Between HV and LV Winding	Oil Duct + Solid Cylinder + Oil Duct	
	d. Between LV Winding and Core	Solid Cylinder	
1.10. TYPE OF JOINTS IN WINDING		Brazed	
1.11. MINIMUM CLEARANCES			
	H.V.to Earth (mm)		
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	L.V. to Earth (mm)		
	In Oil	10	
	Out of Oil	25	
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	a. Impulse (1.2 / 50 micro second wave)		
	withstand voltage		
	H.V. Winding (KV peak)	75	
	L.V. Winding (KV peak)	N. A.	
	b. One minute power frequency		
	withstand voltage		

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	H.V. Winding (KV)	28		
	L.V. Winding (KV)	3		
1.13. DETAILS OF TANK AND MATERIALS M.S.				
1	Thickness of side plates (mm)	4		
2	Thickness of bottom plates (mm)	5		
3	Thickness of cover plates (mm)	5		
4	Thickness of radiator (pipes or sheets)	1.2mm		
1.14. WEIGHTS AND DIMENSIONS (APPROX.)				
1	Net untanking Weight (Kg.)	975		
	(Core and windings with clamps)			
2	Volume of insulating Oil (Ltr.)	975		
3	Tank and fittings (Kg.)	1000		
4	Total Weight of Transformer (Kg.)	2800		
5	Overall dimensions of the Transformer	Length	Breadth	Height
	(approx.) in mm	2750	2070	1750
1.15. PARTS TO BE DETACHED FOR TRANSPORT		Rollers, Breather, Radiators		
1.16. STANDARD FITTINGS AND ACCESSORIES				
S.No.	**DESCRIPTION**	**QTY.**		
1	Rating and terminal marking plate	One		
2	Earthing Terminals	Two		
3	Lifting Lugs	Four		
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	with RTCC (Independent Operation) & AVR			
5	Conservator with Drain plug	One		
6	Oil filling hole with cap	One		
7	Oil Level Indicator	Two		
8	Dehydrating Silicagel Breather	One		
9	Air release device	One		
10	Thermometer Pockets	Two		
11	Drain valve with blanking plate	One		
12	Filter valve with blanking plate	One		
13	Explosion vent with double diaphragm	One		
14	Radiators with shut off valves	Adequate		
15	Buchholz Relay	One		
16	Uni-directional Flat Rollers	Four		
17	Separate Neutral Bushing	One		
18	Oil Temperature Indicator	One		
19	Winding Temperature Indicator	One		
20	Marshalling Box	One		
1.17. PAINTING				
1	Surface preparation	By Sand Blasting		

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2	Paint	Enamel Light Grey, Shade No.631, of IS : 5
1.18. TESTS		
1	**ROUTINE TESTS**	
	As per IS: 1180 all the routine tests are carried out at our works in the presence of your Engineer.	

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Inspection before Dispatch: All routine tests shall be conducted before dispatch of equipment's. No equipment shall be dispatched out from the manufactures premises before such tests are conducted and test result recorded. These test certificates shall be given along the supply of equipment. The Engineer in-charge shall, if he so desires inspect and witness the pre-delivery tests. For this purpose, the agency shall give 07-day advance notice. The contractor shall arrange for inspection/Factory Acceptance Test (FAT) of the department authorized personnel. The main contractor has to organize the FAT inspections with BGL personnel by intimating them in advance. However, the inspection shall be done at the discretion of the Engineer-In-charge without any additional cost implication by the contractor to BGL for FAT but ROUTINE TEST & TYPE TEST Certificates shall have to be submitted for equipment.

Prior to dispatch, all equipment's shall be adequately protected & insured for the whole period of transit, storage and erection against corrosion and incidental damages etc. from the effect of vermin, sunlight, rain, heat, humid climate and accidents etc.

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SOLAR PANEL SYSTEM

P.019141 G11077 E005

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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
AC Alternating Current
DC Direct Current
CP Cathodic Protection
SCADA Supervisory Control and Data Acquisition
HV High Voltage
MV Medium Voltage
LV Low Voltage
ACDB Alternating Current Distribution Board
DCDB Direct Current Distribution Board
CT Current Transformer
PT Potential Transformer
IR Insulation Resistance
CTC Carbon Tetra Chloride
MMI Man Machine Interface ABBREVIATION

1.0 SCOPE

1.1 This Specification provides the minimum requirements for the design, manufacture, testing and supply of the Solar Electric Power System to be installed. The Solar Electric Power System shall independently meet the power requirement of continuous loads as defined in Data Sheet.

1.2 The exact number of solar electric power systems along with loads connected to each system and the load rating of each system shall be as indicated in the equipment Data Sheet.

1.3 Each solar electric power system when installed in accordance with Vendor's instructions shall form self-sufficient power system to meet the power requirements of continuous loads.

1.4 Scope also includes supply, laying, termination of all cables, lugs, glands from Solar Charger to EDB, Solar Panel to charger, Battery etc all interconnecting cables. All cables shall be XLPE insulated, FRLS PVC outer sheath, armoured.

2.0 REFERENCE DOCUMENTS

The equipment supplied shall comply with the requirements of the latest revision of the relevant standards of

NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
API	American Petroleum Institute
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
BIS	Bureau of Indian Standards
IEC	International Electro-technical Commission

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Any other recognized international codes or standards may be used in lieu of the above, subject to the approval of the Company.

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3.0 DEFINITION

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.

4.0 DESIGN

4.1 POWER SYSTEM

Power system shall include the following equipment. Photovoltaic solar cell array (solar panels). Battery bank, solar power controller the solar power system shall be self-sustained type. The photovoltaic solar cell array (solar panels) and the solar controller shall be sized to meet through battery back-up, the load cycle requirements of the connected loads with the solar energy availability at site under worst weather conditions the load requirement per day shall be determined on the basis of load data specified in the Data Sheet.

4.2 SOLAR PANELS

4.2.1 The photovoltaic solar panel array shall consist of required number of individual solar panels. The individual photovoltaic elements shall be connected in suitable series-parallel combinations too obtain the required voltage and current rating of a solar module. Individual solar modules shall be connected in suitable series parallel combinations to obtain the required voltage and current rating of a solar panel. Solar panel array shall consist of required number of panels in series parallel combination to meet the System requirements.

4.2.2 The Solar panels will be mounted on steel support structure of suitable height on the control room roof top.

4.2.3 The solar panel array shall be designed based upon isolation data (to be gathered by contractor from metrological department) and following design conditions:

a) Output current to be considered at operating point based on following operating conditions:

i) Cell temperature while delivering current corresponding to P max point on the I-V curve at specified ambient temperature.

ii) Operating voltage considering:

- Charging voltage of the battery.
- Voltage drops in cables between solar array and solar, controller and solar controller and battery.
- Voltage losses in solar controller.
- Negative tolerance, if any, on the output voltage at solar controller.

4.2.4 After working out the output current at operating point, the following derating factors shall be applied:

a) Deterioration factors over life span or 15% whichever is higher.
b) Losses due to dust deposit or 1% whichever is higher.
c) Losses due to module/branch mismatch or 2% whichever is higher.
d) Losses due to line resistance cables (panel to controller).
e) Losses in field wiring and array wiring. Losses in solar controller.
f) Battery charge/discharge efficiency or 93% whichever is lower.
g) Any other de-rating factor considered essential for satisfactory and guaranteed performance of Solar Power System (e.g. negative tolerance on nominal rating of solar panels)

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h) Derating factor of 2% or as applicable (whichever is higher) to account for panel orientation other than the specified one as per insulation data.

i) The solar panels shall be able to fully charge the battery bank after "3 NO SUN DAYS" cycle from the surplus power available from the solar panel in next 14 days with 70% Depth of Discharge of battery.

4.3 BATTERYBANK

4.3.1 BATTERYCELLS

a) The battery bank shall be charged from the surplus power available from the solar panel when the sunlight is available and will supply/supplement the solar electric power from the solar panel when the sunlight is inadequate under cloudy condition and during nights. The battery cells shall be low self-discharge up to 3% at 27°C per month) Sealed maintenance free (Valve regulated lead acid VRLA) suitable for photovoltaic application. The battery cells shall be provided with flame arresting type catalytic caps or ceramic plugs. The type of battery cells shall be as specified in equipment Data Sheet.

b) The battery shall incorporate the following features:

i) High charging efficiency.
ii) Good cycle life even for deep discharge.
iii) Extended life expectancy.
iv) Long maintenance interval Maintenance free for VRLA battery cell.
v) large electrolyte reservoir.

c) The type, AH capacity and no. of cells in the battery bank shall be decided on the following basis:

i) Geographical and climatic conditions prevalent at site.
ii) Back-up during low insulation periods considering the de-rated solar panel output and insulation data.
iii) Unless specified otherwise, the system voltage shall be 12 V (Nominal).
iv) Battery suitable for 4000 or more charge-discharge cycle for 10% depth of discharge and for 1600 or more charge discharge cycle for 70% depth of discharge.
v) Battery backup shall be considered as per Data sheet.
vi) Design ambient temperature minimum and maximum site temperatures as given in Specification- “Site Conditions and Climate".
vii) Deterioration-factor over the life span (Actual or 20% whichever is higher).
viii) Weight of individual cell shall be of the order of 55 Kg
ix) Self-discharge during low insulation periods considering average ambient temperature of 30°C.

4.3.2 The battery shall be able to fully charge after”3 no sun days” cycle from surplus power available from the solar panel in next 14 days with 70% depth of discharge.

4.3.3 General requirements and performance for VRLA batteries shall be as per manufacturer data available in market.

4.4 SOLAR POWER-CONTROLLER

4.4.1 TECHNICAL REQUIREMENTS

a) The solar power controller shall regulate the charge of the battery and shall monitor the charging current from the solar array power from the battery set shall be routed through the solar controller.

b) The controller shall be provided with low loss type, high efficiency, tested and tropicalized components with overall loss of the solar controller not exceeding 10%ofthe rated load. MCCBs and MCBs shall be used for the circuit or device protection in place of fuses. However, semiconductor grade fuses shall be used for diodes, SCRs etc.

c) Unless specified otherwise, the solar controller shall be wall mounted type with hinged and gasket door in the front. The cable entry shall be from top or bottom (to be decided at the time of detailed engineering.) through glands and access to all inside equipment shall be from the front only.

d) The supply system shall be suitable for both negative earthed and unearthed system as required. The provision of negative earthing shall be through an isolating link.

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e) Apart from required control elements, the following components/ features shall be provided in the controller as minimum requirements:

i) A 2-Pole MCCB with shunt trip to isolate the solar panel from the solar controller/battery on receipt of 60% LEL signal from the gas detection panel. (The signal will be in the form of a normally open potential-free contact).

ii) The battery bank shall be automatically disconnected from the solar panels when the state of charge of the battery reaches 110% or maximum permissible charge level (as indicated by the battery manufacturer) and from the load when the depth of discharge reaches 70%. The battery bank shall be automatically reconnected to the Solar Panel when the state of charge of the battery drops to 100%.

iii) Ammeters to measure load current and solar array current.

iv) An array fault indicator to indicate solar array failure.

v) Voltmeter to indicate system output voltage and Battery voltage.

vi) Charge-discharge Ammeter.

vii) Battery deep discharge alarm and indication.

viii) Control circuit fail alarm and indication.

ix) Switches mounted on the front to disconnect all alarms and indications.

x) Necessary transducers for providing two wire 4-20 mA signals for the following parameters :

- Battery voltage
- Solar array current
- Battery charging current
- Load current
- Solar panel fault indicators

xi) Current limiting features with active elements.

xii) Voltage regulator shall be switching mode type.

xiii) Digital Ampere hour meter.

g) Protection features to take care of faults in DCDB bus, solar controller, solar panel, battery circuit etc.

4.5 GENERAL REQUIREMENTS

4.5.1 BUS BARS

Bus bars shall be sufficiently sized and adequately braced for the supply conditions specified in data sheet. The bus bars shall be electrolytic copper and shall be sleeved with 1100V grade flame retardant PVC. Bus joints shall be bolted type and insulated by flame-retardant insulation tape.

4.5.2 EARTHING

An earth bus bar made of electrolytic copper shall be provided, running the complete length of the solar controller. All non-current carrying parts shall be bonded with flexible copper wires with the earth bus. The earth bus shall have provisions at both ends for connecting it to earth grid conductor.

4.5.3 SEGREGATION

All electrical devices and live parts in the solar controller panel shall be segregated by means of metallic screens. All power connections in case of solar controller shall be segregated from one another and from the electronic circuits

4.5.4 CABLING

All interconnecting cables between various solar panels and main JBs, included in scope of supply, shall be Flame Retardant Low Smoke (FRLS) type. Cables of sizes, as specified, connecting JBs to solar controller, solar controller to battery shall be supplied by contractor.

Adequate space shall be provided for termination of external cables. All required Nickel Chromium plated brass double

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compression cable glands and tinned copper plugs shall be included in the scope of supply.

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4.5.5 MATERIALS AND FINISH

All materials shall be selected and finished to resist the site conditions and climate specified.

All electronic circuit boards shall be tropicalized to prevent corrosion and fungus growth. Painting shall be suitable for the requirements specified in Specification.

4.5.6 IDENTIFICATION

All solar panels, batteries, solar controller and related devices and materials shall have permanent tags in contrasting colours affixed on them and lettering of at least 12 mm size. The tag inscription shall be in line with the equipment number list.

5.0 FABRICATION

5.1 PANEL CONSTRUCTION

5.1.1 The Solar modules shall have suitable encapsulation and sealing arrangements to protect the Silicon elements (Cells) from the environment. The arrangement and material of encapsulation shall be compatible with the thermal expansion properties of the silicon cells and the module framing arrangement/material. The encapsulation arrangement shall ensure complete moisture proofing for the entire life of the solar modules.

5.1.2 The solar panel shall have suitable supporting arrangement complete with adjustable mounts, solar module fixing accessories, inter-module connections, cable termination arrangement, double compression, nickel/chromium plated, brass cable glands and all other necessary equipment and hardware. The supporting arrangement shall be such as to utilize minimum space on the control room roof top. Unless specified otherwise width of the walkway is 1600mm. The panel dimension and its supporting structure shall be so sized as to leave a clear walking space of minimum 750mm. Materials used in the construction of panel frame to support the solar modules, supporting structure and all other accessories shall be suitable for location in extremely corrosive, dusty environment to be encountered. The solar module framing shall be copper free aluminum alloy. Arrangement, such as, vertical stainless steel rods or flexible rods shall be provided to prevent bird landing on the panels. Each panel shall be provided with a weatherproof Junction box with minimum IP 55 enclosure with removable gasket front cover for termination of external cables. The electrical terminals in the junction box shall be corrosion proof and anti-loosening type. Suitable bypass diodes shall be provided for partial shadowing of modules, if recommended by manufacturer.

6.0 INSPECTION AND TESTING

6.1 All tests shall be carried out as per relevant Standards at Vendor's works.

6.2 The Consultant/Owner reserves the right to have a representative to witness the final testing and inspection. Prior intimation of at least 20 days shall be given to enable the Consultant/Owner depute its representative to witness the tests.

6.3 Testing and inspection shall include but not necessarily limited to the following:

6.3.1 GENERAL (FOR ALL ITEMS)

a) A quantitative check to ensure that all items in specified quantity are present.
b) A visual inspection to check workmanship and compliance with submitted drawings.
c) Dimensional checks.

6.3.2 SOLAR PANELS

a) Following environmental tests shall be carried out on photovoltaic modules on sampling basis. Minimum 2% of ordered modules or 1 no. Module, whichever is higher, shall be subjected to following tests and performance of module before and after each test shall be tabulated and furnished. The tests shall be carried out sequentially on each module selected for testing and the tested module shall be discarded after tests.

b) In case on account of testing:

i) The overall deterioration in the performance of the tested modules after test exceed 5% of rated performance, or
ii) The tested module exhibits any open circuits and or ground faults, or

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iii) The tested module develops cracks or mechanical damage, or

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iv) The tested module fails to pass the electrical isolation tests

c) The entire ordered lot of modules shall be tested.

S.No	Test Details	Test Details
1	Cold	Temp. : (-) 40°C Duration : 16 Hrs.
2	Rapid Change of Temperature	Low Temp.: (-)40°C High Temp:+ 85°C No. of cycles :10 Duration of Exposure:30 Min.
3	Dry heat	Temp. : 85°C Duration : 16 Hrs.
4	Salt mist	Temp. : + 35°C Duration : 48 hrs.
5	Wind	Pressure equivalent to an air velocity of
6	Rain	Test as required in the mentioned Standards
7	Dust	Test as required in the mentioned Standards
8	Composite /Humidity Test	Test as required in the mentioned Standards.
9	Mould Growth	84 days
10	Hail Storm test	Test as required in the mentioned Standard
11	Shock Test	Peak Acceleration : 490m/sec 2 Duration : 11

* Vendor shall submit the test procedure for Owner's review. Vendor shall indicate test conditions like temperature limits and duration etc. and also mention the name of the applicable standards.

d) The following design qualification tests shall also be conducted:

i) Earth continuity test.
ii) Electrical isolation test.
iii) * Hot spot endurance test.

NOTE: Type test certificate can be accepted for the tests marked with asterisks (*).

6.3.3 SOLAR CONTROLLER

a) Tests in the following order shall be conducted for the panel:
b) General
c) Earth Continuity Test
d) Functional Tests
e) Insulation Resistance Measurement
f) Heat Run Test
g) Insulation Resistance Measurement
h) Functional Test

6.3.4 Burn out tests for 120 hrs. On the complete system in one assembly.

7.0 MARKING, PACKING AND SHIPMENT

The offered equipments along with accessories shall be shipped to site packed in wooden crates. They shall be wrapped with polythene sheets, before being placed in the crates to prevent damage to finish. Crates shall have skid bottom for handling.

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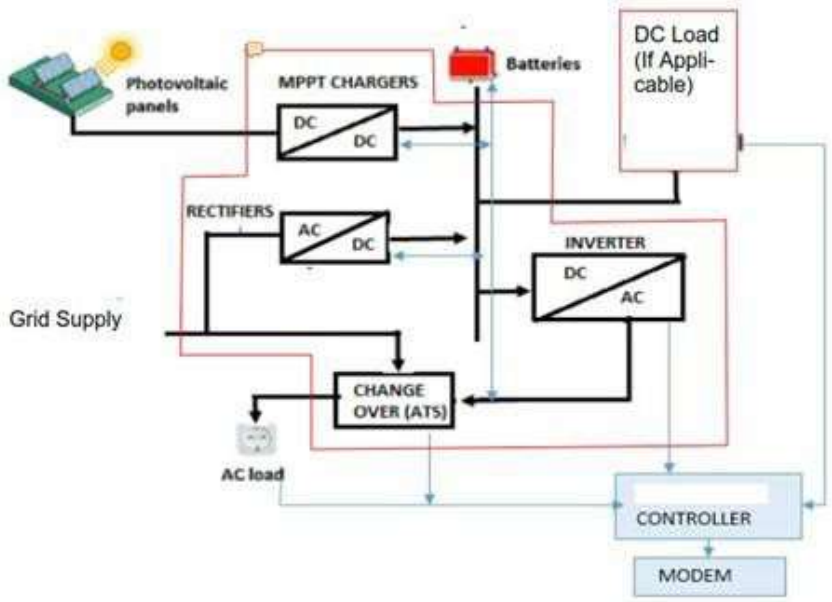
8.0 BLOCK DIAGRAM OF SOLAR SYSTEM



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FIELD INSPECTION, TESTING AND COMMISSIONINGH OF ELECTRICAL INSTALLATION

P.019141 G11074 E101

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	FIELD INSPECTION, TESTING AND COMMISSIONING OF ELECTRICAL INSTALLATION	P.019141 G11074 E101

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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
AC Alternating Current
DC Direct Current
CP Cathodic Protection
SCADA Supervisory Control And Data Acquisition
HV High Voltage
MV Medium Voltage
LV Low Voltage
ACDB Alternating Current Distribution Board
DCDB Direct Current Distribution Board
CT Current Transformer
PT Potential Transformer
IR Insulation Resistance
CTC Carbon Tetra Chloride
MMI Man Machine Interface ABBREVIATION

1.0 SCOPE

1.1 Specification defines the requirements for the installation, field inspection, testing and commissioning of electrical equipment, forming part of electrical power distribution and utilization system, including communication and fire alarm system.

2.0 REFERENCE DOCUMENTS

2.1 The work shall be carried out in the best workmanlike manner in conformity with this specification, Consultant Installation Standards, layout drawings and to the following specifications/ codes of practice of Bureau of Indian Standards and OISD standards.

SP: 30 (BIS)	Special Publication - National Electrical Code.
IS:1255	Code of practice for installation and maintenance-of power cables upto and including 33 KV rating.
IS:10810	Method of Test for cables; Part 43 Insulation resistance. (Part 43)
IS:10810	Method of Test for cables ; Part 45 High voltage test. (Part45)
OISD 147	Inspection and safe practice during electrical installation
OISD I 73	Fire prevention and protection system for electrical installation

2.2 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.

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3.0 DEFINITION

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.

4.0 FIELD INSPECTION, TESTING AND COMMISSIONING

4.1 Contractor shall carry out complete field inspection, testing and commissioning of el ectrical equipment as per Inspection Test plans.

4.2 Before the completed installation or an addition to the existing installation is put into service, inspection / pre - commissioning checks and tests shall be carried out by contractor. In the event of defects being found out, the same shall be rectified and the installation retested as applicable.

4.3 The pre-commissioning inspection among other requirements shall include visual inspection, checking the workmanship of the installation, the rating of equipment, safety clearances, sizes of cables installed, conformance to the AFC document, soundness of switchgear bus connections, wiring properly dressed and labeled, sealing of unused cable entries, checking of all safety interlocks, control/interface functions as per requirement etc.

4.4 Visual inspection for soundness of bus bar connections of bus ducts, terminal connections of equipment/motor shall be carried out. It shall be ensured that no foreign materials are present inside bus duct and equipment terminal boxes. After the visual inspection, all the covers of terminal boxes, inspection chambers shall be refitted with gaskets, bolts & nuts as per equipment manufacturer's instructions.

4.5 Pre-commissioning tests shall include but not be limited to the following:

a) Continuity test for each winding and power and control circuits.
b) Insulation test for each winding and power and control circuit
c) High voltage test for cables
d) Dielectric strength test on transformer oil.
e) Checking the correctness of wiring schemes, control circuit interlocks for intended functioning.
f) Verification of phase sequence.
g) Testing of all types of relays/releases for required operation. Testing of measuring instruments for proper functioning Earth continuity test for all circuits.
h) Checking of safety features for correctness of operation etc.
i) Checking of all wired interface contacts (analog, digital input/output contacts) for, DCS and ECS interface, at panel and equipment terminal chambers as applicable.
j) (Electrical contractor shall co-ordinate with other agencies involved for the above and, provide support services for checking interfaces of electrical equipment and the intended functioning)
k) k. Earth resistance measurement for each earth electrode, and the earthing
l) system as a whole.
m) Lighting installation shall be tested for correct illumination levels, with the fittings installed. Fittings shall be operated only with specified type of a lamp or tube.

4.6 After the above tests and inspection are completed, control circuits shall be tested for correct operation under all operating combinations and proved correct before applying power to main circuits.

4.7 Plant Communication, Fire alarm, telephone and security system shall be checked for correct operation and intended function.

4.8 A close visual inspection of electrical equipment in hazardous areas shall be made to ensure that equipment is suitable for the classified zone and gas group and correctly installed, with all covers, bolts, nuts and hardwares intact and there is no physical damage mark seen on the enclosure.

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4.9 Site Acceptance Test procedure for specific equipment shall be furnished by the respective equipment Vendor. The contractor shall provide necessary assistance to the equipment Vendor to perform site acceptance testing to enable the equipment Vendor to perform the same.

4.10 All pre-commissioning checks and tests shall be carried-out as per the directions of Engineer in-charge. In addition to the equipment manufacturer's instructions, pre-commissioning check requirements shall also be complied. All tests shall be carried out by contractor in the presence of Consultant /Owner's representatives

4.11 The contractor shall bring to site all required tools, tackles, and testing instruments for carrying out field testing. Contractor shall use only calibrated measuring and test instruments and shall maintain calibration records.

4.12 The Insulation Resistance test values for various electrical equipment shall be as below.

4.12.1 CABLES

The insulation resistance test values for cables shall be as per following table:

Rated voltage of the Cable	DC Test Voltage in Volts	Minimum Insulation resistance in Mega ohms
Lighting and power circuit Wiring	250	1
650/1100 V grade cables	1000	1

4.12.2 LV AND MISCELLANEOUS SWITCHBOARDS

The insulation resistance test values for the switchboards shall be as per following table:

Rated voltage of the Switchboard	DC Test Voltage in Volts	Minimum Insulation resistance in Mega ohms
415 V	1000	100
240 V	500	10
110 V	500	10

4.12.3 GENERATORS AND MOTORS

The insulation resistance test values for the Generators and Motors shall be as per following table:

Rated voltage of the Generator sand Motors	DC Test Voltage in Volts	Minimum Insulation resistance in Mega ohm 40 Degree
415 V	1000	15
240 V	500	12
110 V	500	10

It shall be ensured that during insulation tests; electronic devices and components that are liable to get damaged on applied test voltage shall be disconnected from circuit. The instructions of equipment/panel manufacturer shall be followed strictly in this regard.

4.12.4 HIGH-VOLTAGE TESTING

D.C. high voltage test shall be conducted asper following table on all H. V. feeder cables and also on 1100 V grade cables where straight through joints have been made.

Rated Voltage	TEST VOLTAGE (kV) BETWEEN		Duration (Minutes)
U0/U*(phase/line voltage)	Any Conductor and Metallic	Conductor to Conductor	
0.65/1.1	3	3	5

The cable cores must be discharged on completion of DC high voltage test and cable shall be kept earthed until it is put into service.

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DC test voltage for old cables shall be 1.5 times rated voltage or less depending on the age of cables, repair work or nature of jointing work carried out, etc. In any case, the test voltage shall not be less than the rated voltage.

All protective relays including thermal overload relays shall be tested by secondary injection current. Primary injection tests shall-be carried out for differential protection, restricted earth fault protection at full/reduced current to ensure correctness of complete wiring.

Before energizing any equipment, 'COMMISSIONING CLEARANCE FORM' as per standard format shall be, duly filed in by contractor and submitted to Consultant / Owner.

It shall be ensured that the electrical inspectorate approval is available before energizing the equipment.

5.0 RECORDS

Contractor shall keep up-to-date records of all activities carried out and test results. Field inspection / test reports shall be submitted to Consultant / Owner by the contract in bound volume (triplicate copies).

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UNINTERRUPTED POWER SUPPLY SYSTEM

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1. SCOPE

1.1. The specification covers the design, engineering, manufacturing, testing at works and dispatch in well packed condition of Uninterrupted Power Supply System required to supply AC power for nonlinear loads.

1.2. This standard shall be read in conjunction with relevant Specification Sheet, single line diagram & UPS distribution diagram.

1.3. The scope shall include the followings:

i) Full wave-controlled rectifier

ii) Inverter

iii) Static switches

iv) Ni-Cd battery

v) Static voltage stabilizer for bypass supply

vi) Manual bypass switches

vii) Isolation input and output transformers to achieve desired output voltage & isolation

viii) UPS Distribution Board

ix) Interconnecting cabling between various units of UPS

x) All other items required, but not specified for safe and reliable operation of UPS system.

2. STANDARDS TO BE FOLLOWED

2.1. The equipment shall conform to the latest issue of the following and relevant Indian Standard specifications or equivalent specification of the country of origin or IEC specifications.

IS : 13314 Solid state inverters run from storage batteries.

IS : 11260 Stabilized power supplies AC output.

IEC : 60146 Solid state inverters.

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IEC 62040	Uninterruptible Power Supply System

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2.2. The equipment shall also conform to the provision of Indian Electricity Rules, Indian Supply Act and any other statutory regulations in force from time to time.

3. AMBIENT CONDITIONS & ELECTRICAL SYSTEM CHARACTERISTICS

3.1. Included in Particular specification sheet (PTS).

4. DESIGN AND OPERATIONAL REQUIREMENTS.

4.1. The UPS unit and its associated equipment shall be suitable for operating at the specified rating continuously with the specified voltage and frequency variations under the ambient conditions indicated in specification sheet without exceeding the temperature rise limits specified in relevant standards and without any detrimental effect on any part.

4.2. The UPS system shall be based on latest generation of IGBT based, pulse width modulated (PWM) design with proven performance.

4.3. Redundant scheme with by-pass

Under normal operating conditions, both inverter units should run in parallel sharing 50% load in synchronism with by-pass power and supply uninterrupted a.c. power to load. on failure of one of these inverters, the faulty inverter should get automatically disconnected from the load and healthy inverter should supply 100% load in synchronism with by pass supply. in the event of second inverter also developing a fault, a no-break load transfer to standby power supply should take place through static switch.

4.4. Output frequency of the inverters must remain synchronised to one another, which in turn shall be synchronised to the standby power supply frequency provided the latter does not vary by more than ± 6%. It should be possible to change the setting of frequency range of synchronism between above limits in steps of ± 1%. Outside these limits, inverter should desynchronise with the bypass and run at its own frequency. When running at its own frequency, frequency variation shall be maintained less than ± 0.1%. Resynchronisation with bypass power supply must take place automatically with some time delay when frequency comes back to ± 6% range. Change-over from inverter to bypass or bypass to inverter shall also be possible in desynchronised mode of operation. Change-over time in both synchronised and desynchronised mode operation shall be indicated.

4.5. The UPS unit shall be suitable for 0.7 lagging to unity power factor loads. The overall load power factor may be taken as 0.8 lagging.

4.6. The maximum wave form distortion of the output voltage shall not exceed 5% r.m.s for linear load and 10% r.m.s. for non-linear loads. The UPS unit shall be suitable for operation for non-linear loads having crest factor of 3.

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4.7. The inverter steady state output voltage and frequency (free running) variation shall not exceed ±1% for specified input power supply condition and no-load to full load condition.

4.8. Voltage dip/rise on sudden application / throw of 100% load or on changeover from inverter to bypass or vice versa shall not exceed 15% and shall be recovered within 100 m.sec. to rated voltage.

4.9. UPS shall be designed for overload of 125% for 10 min. and 150% for 10 sec. After which drooping characteristic shall come into operation.

4.10. On failure of the main supply, inverter unit shall continue to supply rated load from the battery bank for 12 hours duration unless specified otherwise in the specification sheet.

4.11. Charger shall simultaneously supply entire power necessary for inverter and to keep the battery of required capacity in fully charged condition. Provision for automatic charging in both float and boost shall be made.

4.12. Battery shall be Ni-Cd pocket plate type. The battery capacity shall be decided considering load power factor as 0.8, derating factor for ageing 0.8 and derating for minimum ambient temperature as applicable. Above all, a 20% design margin shall be considered on the final capacity.

4.13. The ventilation fans, if provided shall be supplemented by 100% redundant fan in normal operation. Normal and redundant fan shall run together. The power supply for fan shall be tapped from the inverter output. It should be possible to operate inverter even after the failure of the fan without temperature rise inside the inverter cubicle exceeding the safe operating temperature limits.

4.14. In case of inverter failure due to any reason or overload, affected unit should be isolated and changeover to other inverter or to bypass should take place automatically.

4.15. Noise level at a distance or 1 m. from UPS panels shall not exceed 60 dB.

4.16. UPS system shall be provided with necessary control, protection, metering, indication, alarm & annunciation for reliable and safe operation of the system.

4.17. All semi-conducting devices shall be protected by fast acting semi-conducting fuses.

4.18. The battery may be taken out of service for maintenance during which period it shall be possible for the inverter to continue operation taking power from the rectifier. The input filter of the inverter shall be suitably designed to take care of this operational requirement.

4.19. It shall be possible to vary the output voltage steplessly within ± 5% of the specified output voltage. This adjustment shall be possible to be made when UPS is in operation.

4.20. UPS system shall be suitable for both floating output or earthing of one leg in case of single phase system / star-point in case of three phase system.

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4.21. The UPS system shall have very high system of reliability having minimum MTBF of 50,000 hrs. Vendor shall furnish the value of MTBF, MTTR and availability factor.

5. CONSTRUCTIONAL DETAILS

5.1. The equipment shall preferably be supplied in enclosed, dust & vermin proof, floor mounted, sheet steel enclosure. Minimum degree of protection for enclosure shall be IP-52 as per IS-13997.

5.2. Enclosure shall be fabricated with cold rolled sheet annealed steel of minimum thickness 2.0 mm.

5.3. The door hinges shall be concealed type. The doors and the removable covers shall be provided with non- deteriorating neoprene gaskets without any discontinuities. Gaskets shall be held in position in groove in shaped sheet steel work or these shall be of U type.

5.4. All external hardware shall be cadmium/zinc plated steel. Hardware for fixing the removable parts shall be provided with retaining devices.

5.5. Panels shall be liberally designed. All components shall be so mounted that they are easily accessible for inspection and maintenance.

5.6. UPS unit shall preferably have separate panels for each rectifier inverter units, bypass supply, distribution boards, etc. Various panels of UPS except distribution boards shall be mounted side-by-side & bolted together to form compact assembly.

5.7. Distribution boards shall be of fixed type single front execution in fully compartmentalised design and divided into distinct panels each comprising of bus-bar chambers, individual feeder modules and vertical cable alley.

5.8. Mounting height of components requiring operation and observations shall not be lower than 300 mm and higher than 1800 mm.

5.9. All the live parts which are accessible after opening the front cover / back cover shall be properly insulated or provided with insulating barrier to prevent accidental contact. Bus bars of distribution boards shall be PVC sleeved.

5.10. Nameplate consisting of black perpex with white engraving shall be provided for each panel and for each equipment mounted on the front of the panel. Suitable label identification for each component mounted inside the panel shall also be provided.

5.11. All the wirings shall be properly laid and ferruled at both ends. PVC channels may be used for wiring. For control wiring, minimum 0.5 sq.mm. copper conductor shall be used.

5.12. The power connections may be made by PVC insulated flexible copper cables or taped copper / aluminium strip.

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5.13. All power & control cables shall enter from the bottom unless otherwise specified in the specification sheet.

5.14. Removable bolted aluminium gland plate, heavy duty compression type rolled aluminium cable glands, crimping type aluminium cable lugs for Al. Cables and copper cable lugs for Cu. Cables, pressure clamp / bolted type terminals etc. shall be provided for each incoming and outgoing cable.

5.15. Terminal blocks shall be grouped according to circuit functions and suitably numbered. 20% extra terminals shall be provided in the terminal block.

5.16. A suitably sized earth bus shall be provided at the bottom of panel with provision for earth connection at both ends to purchaser's earth grid.

5.17. All panels shall be of same height so as to form a bank, which shall give good aesthetic appearance.

6. COMPONENT DETAILS

6.1. All components shall conform to relevant IS/IEC standards and shall be of reputed make. Makes of all components shall be subject to purchaser's / consultant's approval.

6.2. THYRISTORS, DIODES AND TRANSISTORS.

The thyristors, diodes and transistors shall have adequate safety margins to withstand specified operating conditions. A factor of safety of minimum 4 shall be taken against voltage surges.

6.3. PCBs

All electronic control & monitoring printed circuit cards shall be fixed type on ceramic insulators to avoid loose contacts due to vibration/long usage. Failure of each PCB shall be indicated by visual alarm and indication. The visual fault diagnostic shall preferably indicate fault into various sections of the cards. All printed circuit board shall be mounted on fixed ceramic insulator.

6.4. ELECTROLYTIC CAPACITORS

These may be polarised aluminium type I, suitable for long life and category I, as per IS:4317 or equivalent IEC. The capacitor shall preferably be self healing type. These shall be so located in inverter panels that the operating temperature does not exceed 65°C maximum.

6.5. TRANSFORMERS AND CHOKES

All transformers and chokes shall be of dry type and air cooled. This shall be class 'H' insulated, vacuum impregnated. Class F / Class B insulated cast resin transformers and chokes are also acceptable.

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6.6. INSTRUMENTS

Ammeters & voltmeters shall be moving coil type of class 1.0 accuracy as per IS:1248. These shall be flush mounting type of minimum size of 96 mm x 96 mm. Frequency meter shall be of reed type having range of 45 Hz to 55 Hz. Alpha-numeric Liquid Crystal Display for metering various parameters is also acceptable.

6.7. STATIC SWITCHES

Static switches shall be naturally commutated type with parallel inverse connected thyristors. These shall be rated for continuous duty for 100% load. Short time rated static switches are not acceptable.

6.8. VOLTAGE STABILIZER

Voltage stabilizer shall be static type and shall satisfy the following requirements:

i) Maximum output voltage variation under steady state condition shall be less than1%.

ii) Maximum harmonic distortion shall be less than 5%.

iii) The output voltage shall be restored within $\pm$1% of nominal value in less than 2 secs.

6.9. INDICATION LAMPS / LCD DISPLAY

All indication lamps shall be of LED type suitable for the specified control voltage, having minimum illumination of 40 millicandella. The colour of the LEDs shall be as follows :

ON : Red

OFF : Green

FAULT : Yellow

- LCD display is acceptable for Audio and visual alaram.

6.10. MCB

For isolating devices of various equipment, MCB shall be used. These shall be provided with overload and short circuit protective devices and shall conform to IS:2516.

Battery Circuit Breaker shall have under voltage trip and reverse polarity protection device.

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7. MONITORING SYSTEM

7.1. Microprocessor based monitoring system for UPS to supervise the UPS operation on PC shall be provided to indicate following data:

i) Output voltage of UPS (Common)

ii) Output current of UPS (Common)

iii) Battery DC Voltage

iv) Input voltage of each rectifier (ph to ph)

v) Input current of each rectifier

vi) Output current of each inverter

vii) Output voltage of each inverter

viii) Bypass frequency

ix) Output frequency of each inverter

7.2. Print out facility shall be available for all the Alarms and Faults conditions.

8. PAINTING

8.1. The enclosure after pre-treatment, shall be painted with two coats of anti-rust paint followed by two coats of anticorrosive paint.

8.2. All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.

8.3. Unless otherwise specified, the finishing shade shall be light grey Shade No. 631 as per IS:5.

8.4. Electrostatic powder paint shall be preferred.

9. TESTS AND INSPECTION

9.1. The UPS units shall be subjected to test as per relevant standards. The test shall include, but not limited to the following:

i) Rectifier & inverter soft starting

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ii) Regulation test

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iii) Heat run test for 8 hours

iv) Overload test

v) Test for changeover time in synchronised and desynchronised mode.

vi) Test for dynamic response and transient performance

vii) Sequence & transfer test

viii) Noise level measurement

ix) Test to check the selectivity of protective devices

x) Alarm test (simulation of various fault conditions)

xi) Measurement of harmonic distortion

xii) Ventilation test (operation without redundant fan)

xiii) Insulation test

xiv) Current division in parallel UPS

9.2. All the above tests shall be carried out in presence of purchaser's representative. In addition, the equipment shall be subjected to stage inspection during process of manufacture at works and site inspection.

9.3. These inspection, shall, however, not absolve the vendor from his responsibility for making good any defects, which may be noticed subsequently.

10. DRAWINGS AND DOCUMENT

10.1. Drawings and documents as per Annexure-I shall be supplied.

10.2. All drawings and documents shall have the following description written boldly:

-- Name of client

-- Name of Consultant

-- Order Number Code No. and Description

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11. SPARES

11.1. Item wise unit prices for spare parts as listed in Annexure-III shall be offered along with main equipment with recommended quantity for the period as stipulated in Specification Sheet.

11.2. Any other spare parts required, but not specified, shall also be offered.

12. PACKING

12.1. The board shall be properly packed before despatch to avoid damage during transport, storage and handling.

12.2. The packing box shall contain a copy of the installation, operation and maintenance manual.

12.3. A sign to indicate the upright position of the panels to be placed during transport and storage shall be clearly marked. Also proper arrangement shall be provided to handle the equipment.

13. DEVIATIONS

13.1. Deviations, if any, from this standard shall be clearly indicated in the offer with reasons thereof. Deviations from the data indicated in specification sheet shall be shown clearly by encircling it and indicating the revised data in specification sheet.

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ANNEXURE I

DRAWINGS & DOCUMENTS

FOLLOWING DRAWINGS AND DOCUMENTS FOR ALL EQUIPMENT OF UPS SYSTEM SHALL BE PROVIDED:

SI. No.	Description	With BID	After Order		
			For ApprovaI		FinaI
		No. of copies	No. of copies	No. of weeks	No. of copies
1.	Technical Particulars	1	6	2	8
2.	Block Diagram	1	6	2	8 + 1R
3.	General Arrangement drawings and foundation plan	1	6	2	8 + 1R
4.	Calculation for battery sizing	1	6	2	-
5.	Feeder Details for Distribution Boards	1	6	2	8 + 1R
6.	Bill of materials	-	6	2	8 + 1R
7.	Schematic & Wiring Diagram	-	6	2	8 + 1R
8.	Installation, operation & maintenance manual	-	-	-	8
9.	Spare parts list with identification	1	-	-	8
10.	Test Certificates	-	-	-	8
11.	Guarantee Certificates	-	-	-	8

Note :

1. R-Reproducible.
2. Period of submission of drawings for approval shall be counted from the date of LOI.
3. All final documents shall be submitted prior to despatch of equipment. These shall be made in bound sets.

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ANNEXURE II

METERING INDICATIONS AND ALARM SCHEDULE

A. METERING

1. Incoming Voltmeter with selector switches for each incomer
2. Ammeter with selector switches for each incomer
3. Ammeter & Voltmeter at each inverter output and bypass output
4. Frequency meter & power factor meter at one common point of output
5. Ammeter & Voltmeter at incoming of each UPS distribution boards
6. Battery charge / discharge Ammeter

B. LED INDICATION

1. A.C. Mains 'ON'
2. Load on inverter
3. Battery on float
4. Battery on boost
5. Fault (one lamp for all types of fault)
6. Fan failure indication

C. AUDIO-VISUAL ALARM (with Accept & Reset facilities)

1. Mains failure
2. Inverter output overvoltage
3. Inverter output undervoltage
4. Inverter temperature high
5. Static switch failure

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ANNEXURE III

LIST OF SPARES - MANDATORY

The following spare parts shall be quoted along with the offer:

a) Control Card
b) SMPS Card
c) Charger Card
d) Gate Drive Card
e) One of each type of thyristors, diodes & IGBT
f) One of each type of capacitors, resistors and chokes
g) Semi-conductor fuses of each rating
h) Signal lamps.

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BATTERY

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1.0 SCOPE

The intent of this specification is to define the design, manufacture and testing of batteries for the DC Power system.

2.0 CODES AND STANDARDS

The equipment shall comply with the requirements of latest revision of following standards of BIS (Bureau of Indian standards/IEC/BS/VDE/JEEE/NEMA) unless otherwise specified.

IS- 8340	General Requirements and Methods of Tests for Lead Acid Storage Batteries
IS-1651	Stationary Cells and Batteries, lead acid type with tubular positive plates
IS-1652	Stationary Cells and Batteries, lead acid type with plante positive plates

2.1 The equipment shall also conform to the provisions of Indian Electricity Rules and other statutory regulations currently in force in the country.

3.0 GENERAL REQUIREMENTS

The offered Battery shall be brand new with sate of art technology and proven field track record.

4.0 SITE CONDITIONS

Battery shall be suitable for operating satisfactorily in humid corrosive atmosphere found in gas processing plants. Service conditions shall be as specified in PTS elsewhere.

5.0 TECHNICAL REQUIREMENTS

5.1 The cell/ battery shall be suitable for float duty operation at constant voltage permanently applied to its terminals which is sufficient to maintain it in a state close to full charge and shall be designed to supply load in the event of normal power supply failure. Battery shall be sealed maintenance free Type. The type of plate construction for batteries shall be fibrous in nature.

5.2 The rated Ampere-Hour capacity of the cell/ battery shall be at reference temperature of 27 deg C, constant current discharge at 10 hours rate (C10) and an end cell voltage of 1.75 V/ cell.

5.3 Ampere hour of the battery shall be selected based on following:

a. Minimum site ambient temperature to suit the project requirement
b. End cell voltage
c. Ageing factor of 1.25
d. Design margin of 1.1.

5.4 Number of cells and cell voltage shall be decided by the vendor on the basis of maximum permissible voltage to the load when batteries are float charged while feeding the load and minimum DC system voltage. However the number of cell and end cell voltage shall be as per project datasheet unless other wise specified.

5.5 Battery shall be supplied in two parallel banks of 50% capacity each. The battery shall be suitable for be ing boost charged to fully charged condition from fully discharged condition within 10 hours unless other wise specified.

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5.6 Battery assembly shall be supplied in dry and uncharged condition. Dry electrolyte and required quantities of electrolyte liquid with 10% extra quantity shall be delivered with the battery in a suitable, non-returnable, sealed containers unless otherwise specified.

5.7 Each cell shall have a separate container. The cell container shall be of high strength alkali resistant translucent material and designed to withstand mechanical stresses, shocks and vibrations.

5.8 The components such as containers, lids/ covers and seals used in the manufacture shall meet the Fire, flame and smoke resistance rating as defined in ANSI/UL94 and have an oxygen Index of at least 28 in accordance with ASTM D-2863.

5.9 The terminal posts shall be nickel-plated steel. The terminals shall be suitable for short circuit current and specified discharge current without damage to cell as a result of terminal heating.

5.10 Cells shall be designed to withstand the mechanical stresses encountered during normal transportation and handling. The battery shall be suitable for satisfactory operation at remote unattended sites. The batteries shall need minimum maintenance, which shall not be earlier than 6 months. The battery shall be installed in battery room having restricted ventilation.

5.11 A Flame arrestor shall be mounted on the cell so that all vented gasses diffuse through the arrestor to the outside environment. The construction of the arrestor shall be such that hydrogen burning on the external surface of the arrestor shall not propagate back in to the cell to cause explosion.

5.12 The following information shall be permanently marked on the cell:

- Nominal voltage
- Name of manufacturer/model reference
- Rated capacity in ampere hours (Ah) with End Cell Voltage
- Voltage for float operation of 27 deg C with tolerance of ± 1%
- Month and year of manufacture.

5.13 Each set of battery shall be supplied with all accessories including but not limited to the following:

a. Battery stand. Mild steel stand pretreated and epoxy painted / PVC coated.
b. Inter cell, inter row and inter bank connectors and end take offs. These shall be of Nickel plated copper.
c. Cell number plates and fixing pings, Lugs for cable termination as required.
d. One number Cell testing voltmeter (3V –0-3V) complete with leads
e. Four pairs of Rubber gloves
f. One number Spanner
g. Any other accessories.

6.0 PERFORMANCE

Batteries shall be type tested to meet the performance requirements for each design and AH rating of cells as per IS 8340.

7.0 INSPECTION AND TESTING

Batteries shall be subject to inspection by Consultant / Owner or by a third agency authorized by the owner, to access the progress of work. Consultant / Owner's representative shall be given free access in the works from time to time for stage wise inspection and progress reporting. Two weeks advance notice shall be given to witness the final routine test and other tests as agreed upon.

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Following routine tests shall be carried out as a minimum as part of acceptance tests for each AH rating of cells/ battery. For long duration type test, type test certificates of identical Ampere Hour ratings shall be furnished.

a. Physical examination
b. Polarity and absence of short circuit
c. Marking and packing
d. Verification of dimensions
e. Air pressure test
f. Test for voltage during discharge
g. Test for AH capacity
h. Test for charges retention if specified in the date sheet.
i. Insulation resistance.

Load test shall be carried out on the Battery at site after installation as part of commissioning.

8.0 PACKING AND DESPATCH

All the equipment shall be divided into several sections for protection and case of handling during transportation. The equipment shall be properly packed for transportation by ship/ rail or trailer. The equipment shall be wrapped in polythene sheets before being placed in crates/ cases to prevent damage to finish. Crates/ cases shall have skid bottoms for handling. Special notations such as "Fragile', "This sideup" "Centre of gravity", "'Weight', "Owner's particulars", 'PO nos"' etc., shall be clearly marked on the package together with other details as per purchase order. The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains/ high ambient temperature unless otherwise specified.

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CABLES AND ACCESSORIES

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1. SCOPE

This specification covers requirements for the supply of PVC cables for Medium Voltage, XLPE cables for High Voltage Systems and cable accessories for high voltage systems.

2. STANDARDS

The cables shall comply with the latest edition of the following standards:

IS: 1554 (Part-I)	-	PVC insulated (heavy duty) electric cables – Part I for working voltages up to and including 1100V.
IS: 1753	-	Aluminium conductors for insulated cables.
IS: 3961 (Part II)	-	Recommended current ratings for cables: Part II PVC insulated and PVC sheathed heavy duty cables.
IS: 5831	-	PVC insulation and sheath of electric cables.
IS: 7098 (Part II)	-	Cross-linked Polyethylene insulated PVC sheathed cables: Part-II for Working Voltage from 3.3 kV upto and including 33 kV.
IS: 8130	-	Conductors for insulated electric cables and flexible cords
IEC: 183	-	Guide for Selection of HV Cables.
IEC: 227	-	PVC Insulated Electrical Cables.
IEC: 502		Extruded solid dielectric insulated power cables for rated voltages from 1 kV up to 30 kV.
IEC: 885	-	Electric Test methods for Electrical Cables.

3. GENERAL CONSTRUCTION

These shall be suitable for laying in trays, trenches, ducts, conduits and underground buried installation with uncontrolled backfill and possibility of flooding by water. Extra PVC/Rubber end caps for each XLPE Cable size shall be supplied. The terminating and straight through joint kits for the cables shall be suitable for the type of cables offered and for storage without deterioration upto 50 Deg. C ambient temperature.

3.1. PVC CABLES

All the power cables of 16 sq. mm. And above shall be of aluminium and all the control cables and power cables upto 6 sq. mm. shall be of copper. The control cables shall have conductors of minimum 2.5 sq. mm. Copper.

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3.1.1. All power/control cables for use on medium voltage systems shall be heavy duty type, 1100 V grade with aluminium/copper conductor, PVC insulated, inner sheathed, armoured and overall PVC sheathed.

3.1.2. The construction of the conductors shall be 'stranded' for all cables. Conductors of nominal area less than 25 sq. mm. shall be circular only. Conductors of nominal area 25 sq. mm. And above may be circular or shaped.

3.1.3. The core insulation shall be with PVC compound applied over the conductor by extrusion and shall confirm to the requirements of Type 'A' compound of IS:5831. Control cables having 6 core and above shall be identified with prominent and indelible Arabic numerals on the outer surface of the insulation. Colour of the numbers shall be white with a spacing of maximum 500 mm between two consecutive numbers.

3.1.4. The inner sheath shall be applied over the laid-up cores by extrusion and shall be of PVC confirming to the requirements of Type ST2 PVC compound of IS:5831. The extruded inner sheath shall be of uniform thickness of size not less than those stipulated in IS: 1554.

3.1.5. For multicore cables, the armouring shall be by single round galvanized steel wires where the calculated diameter below armouring does not exceed 13 mm and galvanized steel strips where this dimension is greater than 13 mm.

3.1.6. The outer sheath for the cables shall be applied by extrusion and shall be PVC compound conforming to the requirements of Type ST2 compound of IS: 5831. To protect the cables against rodent and termite attack, suitable chemicals shall be added into the PVC compound of the outer sheath.

3.2. XLPE CABLES

3.2.1. Power cables for 3.3 kV system shall be with Aluminium conductor, XLPE insulated (unearthed grade), screened, sheathed, armoured and overall PVC sheathed.

3.2.2. The construction of the conductors shall be stranded and compacted circular for all cables.

3.2.3. The cables shall be provided with both conductor screening and insulation screening. The conductors shall be provided with non-metallic extruded semi-conducting shielding.

3.2.4. The core insulation shall be with cross-linked polyethylene unfilled insulating compound. It shall be free from void and shall withstand all mechanical and thermal stresses under steady state and transient operating conditions.

3.2.5. The insulation shielding shall consist of non-metallic extruded semi-conducting compound in combination with a non-magnetic metallic screening of copper. The insulation screen shall be strippable without application of heat. The copper screen shall be capable of carrying the single line to ground fault current of 1 kA for a duration of one (1) second.

3.2.6. The conductor screen XLPE insulation and insulation screen shall all be extruded in one operation by "Triple Extrusion" process to ensure perfect bonding between the layers. The core identification shall be coloured strips or by printed numerals.

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3.2.7. The inner sheath shall be applied over the laid up cores by extrusion and shall conform to the requirements of Type ST2 compound of IS:5831. The extruded inner sheath shall be of uniform thickness of size not less than 0.7 mm for all sizes of cables.

3.2.8. For multicore cables, the armouring shall be by galvanized steel strips armouring for single core cables shall be with hard-down aluminium round wire of 2.5 mm diameter.

3.2.9. The outer sheath for the cables shall be supplied by extrusion over the armouring and shall be of PVC compound confirming to the requirements of Type ST2 compound of IS: 5831. To protect cable against rodent and termite attack, suitable chemicals shall be added into the PVC compound of the outer sheath.

3.3. CABLE ACCESSORIES

The termination and straight through joint kits for use on high voltage system shall be suitable for the type of cables offered as per this specification. The termination and joints shall be supplied in kit form. The kit shall include all insulating and sealing materials apart from conductor fitting and consumable items. An installation instruction shall also be included in each kit.

3.3.1. Terminating Kits

The terminating kits shall be suitable for termination of the cable to an indoor switchgear / alternator / motor.

4. TESTING AND INSPECTION

The cables shall be tested and examined at the manufacturer's works. All the materials employed in the manufacture of the cable shall be subjected, both before and after manufacture of the cable, to examination, testing and approval by OWNER/CONSULTANT. Manufacturer shall furnish all necessary information concerning the supply to Owner's Representative. The Owner's Representative shall have free access to the manufacturer's works for the purpose of inspecting the process of manufacture in all its stages and he will have the power to reject any wire or other material which appears to him to be of unsuitable description or of unsatisfactory quality.

4.1. Cables

4.1.1. After completion of manufacture of cables and prior to despatch, cables shall be su *b*jected to type, routine, acceptance and special tests as detailed below. OWNER / CONSULTANT reserves the right to witness all tests with sufficient advance notice from Bidder. The test reports for all cables shall be got approved from the Owner's Representative before despatch of the cables.

4.1.2. All routine tests, acceptances tests, type tests as well shall be carried out on PVC cables as listed in IS:1554, Part-I.

4.1.3. The inner and outer sheath of XLPE cables shall be subjected to all the tests applicable for PVC cables. The test requirements for insulation and sheath of PVC cables shall be as per latest revisi on of IS:5831.

The following tests shall be carried out on XLPE cables as per IS:7098, Part-II.

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4.1.4. Type Tests

The following shall constitute type tests:

a) Tensile test

b) Wrapping test

c) Conductor resistance test

d) Test for armour wires

e) Test for thickness of insulation and sheath

f) Physical tests for insulation

g) Physical tests for PVC sheath:

   a) Fire Resistance

   b) Cold Impact

   c) Bleeding & Blooming

h) Partial discharge test

i) Bending tests

j) Heating cycle test

k) High voltage tests

4.1.5. Acceptance Tests

a) Tensile test (for aluminium)

b) Wrapping test (for aluminium)

c) Conductor resistance test

d) Test for thickness of insulation and sheath

e) Partial discharge test

f) High voltage test

g) FRLS test

4.1.6. Routine Tests

a) Conductor resistance test

b) Partial discharge test

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c) High voltage test

4.2. Cable Accessories

Type tests shall have to be carried out to prove the general qualities and design of a given type of termination/jointing system. The type test shall be conforming to the latest IEC:502-2, 466 specifications.

5. PACKING AND MARKING

5.1.1. Cables shall be despatched in wooden drum of suitable barrel diameter, securely battened, with the take-off end fully protected against mechanical damage. The wood used for construction of the drum shall be properly seasoned, sound and free from defects. Wood preservatives shall be applied to the entire drum.

5.1.2. On the flange of the drum necessary information such as manufacturer's name, type size voltage grade of cable, length of cable in meters, drum no. cable code, ISI Certification mark, gross weight etc. shall be printed. An arrow shall be printed on the drum with suitable instruction to show the direction of rotation of the drum.

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GTS – FLAMEPROOF & WEATHERPROOF EQUIPMENT

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GTS – FLAMEPROOF & WEATHERPROOF EQUIPMENT

1.0 SCOPE

R1

This specification covers the requirements of design, manufacture, testing, packing and supply of flameproof & weatherproof Power Distribution Boards, Lighting Fixtures, Junction Box, Control Stations, plugs, sockets, transformers, hand lamps and accessories suitable for installation in locations handling flammable liquids and gases.

2.0 CODES AND STANDARDS

2.1. The equipment shall comply with the requirements of latest revision of the following standards issued by BIS:

Standards		Description
IS-5	-	Colours for ready mixed paints and enamels
IS-1248	-	Direct acting indicating analogue measuring instruments and accessories
IS-2148	-	Flameproof enclosures for electrical apparatus
IS-6381	-	Electrical apparatus for explosive gas atmosphere – increased safety's'
IS/IEC -60079-0	-	Electrical apparatus for explosive atmosphere (General Requirements)
IS / [EC 60079-1	-	Electrical apparatus for explosive gas atmospheres (Equipment Protection by Flameproof Enclosures "d").
IS / IEC 60079-7	-	Electrical apparatus for explosive gas atmospheres (Equipment Protection by Increased Safety "e").
IS / IEC 60529	-	Degrees of protection provided by enclosures (IP Code).
IS / IEC 60947	-	LV switchgear and control gear.

2.2. In case of imported equipment, standards of the country of origin shall be applicable if these standards are equivalent or more stringent than the applicable Indian standards.

2.3. The equipment shall also conform to the provisions of CEA Regulations and other statutory regulations currently in force in the country.

2.4. In case Indian standards are not available for any equipment, standards issued by IEC/ BS/ VDE/ IEEE/ NEMA or equivalent agency shall be applicable.

2.5. In case of any conflict between requirements specified in various applicable documents for the project, the most stringent one shall prevail. However, Owner's decision in this regard will be final and binding.

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3.0 GENERAL REQUIREMENT

3.1. The offered equipment shall be brand new with state of art technology and proven field track record. No prototype equipment shall be offered.

3.2. Vendor shall ensure availability of spare parts and maintenance support services for the offered equipment for at least 10 years from the date of supply.

4.0 SITE CONDITION

R1

The equipment shall be suitable for installation and satisfactory operation in classified hazardous locations in tropical, humid and corrosive atmosphere as prevalent in refineries, petrochemical and fertilizer plants. The lighting and power panels shall be designed to operate under site condition. If not specifically mentioned, ambient temperature of 50° C & design temperature of 55° C and an altitude not exceeding 1000 m above mean sea level shall be considered.

5.0 CERTIFICATION

R1

The equipment shall have test certificates issued by recognized independent test house (CIMFR/ CPRI/ERTL/Baseefa/LCIE/UL/FM or equivalent) and accepted to PESO and must also be approved by PESO and/ or any other statutory authority such as UL/ FM/ BASEEFA/ PTB/LCIE/ RIIS in its country of origin as required. All indigenous equipment shall conform to Indian standards and shall be certified by Indian testing agencies. All equipment (indigenous & imported) shall also have valid statutory approvals as applicable for the specified location. All indigenous flameproof equipment shall have valid BIS license and marking as required by statutory authorities.

6.0 TECHNICAL REQUIREMENTS

6.1. Construction

R1

6.1.1. The enclosures of the plugs, sockets, transformers and hand lamps shall be made of cast light metal alloy and shall be free from frictional sparking hazard. The magnesium content in the alloy shall be as per IS-13346.

6.1.2. The equipment shall be suitable for use in outdoor open locations and shall have IP-55 degree of protection. The sockets for fixed installation, i.e. 415 V three phase sockets and 240 V single phase sockets, shall preferably be provided with integral canopy. However, where the enclosure has been certified without integral canopy, a separate canopy can be accepted. The separate canopy shall be made of at least 14 SWG (2mm) galvanized sheet steel or FRP. The canopy shall be suitable for providing protection against rain from top and two sides.

6.1.3. The enclosures shall be provided with gaskets made of non inflammable and self extinguishing material.

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6.1.4. Indicating lamp(s) wherever provided shall be clustered LED type (with minimum 3 numbers LEDs, preferably connected in parallel), mounted inside an enclosures of minimum diameter of 15mm.

6.1.5. All internal wiring shall employ 2.5 mm2, 660V grade, PVC insulated copper conductor wires.

R1

6.1.6. Bus bars in the lighting and power panels shall be made of high conductivity copper, and shall be supported by non-hygroscopic insulators. Bus bars shall be colour coded for identification of phases and neutral.

6.1.7. The outgoing feeders shall be provided with double pole MCBs having overload and short-circuit releases.

6.1.8. All MCBs (except isolators) and ELCBs shall be with 10kA breaking capacity.

6.1.9. Wherever the size of incoming cable to lighting panels is more than 35 sq.mm. a suitable cable adapter box shall be provided and attached to the panel.

6.1.10. All metal surfaces shall undergo manufacturer's standard cleaning painting cycle. After preparation of under surface, the equipment shall be painted with two coats of epoxy based final paint with colour shade as below:

-Flame proof (Gas group IIAI IIB)	: Dark admiralty grey shade 632 of IS-5/RAL 7035
-Flame proof (Gas group IIC)	: Light yellow shade 355 ofIS-5

R1

Flameproof enclosure shall be suitable for zone 1 & 2, gas group IIA / IIB or IIC(wherever specified) & temperature class T3.

All unpainted steel parts shall be suitably treated to prevent rust formation. If these parts are moving elements then they shall be greased.

6.1.11. A warning inscription "Isolate power supply elsewhere before opening" shall be provided on each enclosure. The warning inscription shall be embossed on the enclosure or a separate Warning plate with above inscription shall be fixed to the enclosure with screws. The Warning plate shall be of nickel plated brass or stainless steel.

6.1.12. All accessories like nuts, bolts, washers etc. shall be made of stainless steel SS-3 04.

6.1.13. All the non current carrying metallic parts of the equipment shall be inherently bonded together. The TPN sockets shall be provided with two earthing studs, with lugs on the exterior of the enclosure, suitable for termination of 10 mm dia. GI wire rope. Internal earth terminals shall be provided in each enclosure for all single phase plugs and sockets for connecting the earth core of the cables.

6.1.14. The terminal block enclosures shall be adequately sized to properly terminate the cables by taking into account the required bending radii of cable cores and shall have the following minimum gland to terminal distances:

Conductor Size	Up to 2.5mm^2	Above 2.5mm^2 & Up to 10mm^2	Above 10mm^2 & Up to 35mm^2	Above 35mm^2 & Up to 70mm^2

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Gland to Terminal Distance	40mm	60mm	100mm	150mm

6.1.15. The sockets shall be provided with 2 nos. suitably sized cable entries at the bottom for specified cable sizes and complete with 2 nos. flameproof double compression type nickel plated brass flameproof cable glands. The plugs shall be supplied with 1 no. suitably sized cable entry for specified cable size and complete with 1 no. double compression type nickel plated brass flameproof cable gland. Each socket shall be supplied with 1 no. flameproof nickel plated brass sealing plug, for plugging the unused cable entry.

6.1.16. The sockets shall have external fixing lugs for mounting on wall or column. The holes provided on these lugs shall be of oblong type.

6.1.17. A nameplate indicating Tag Number shall be provided on each socket. Separate nameplate shall also be provided to indicate the details of testing agency (CIMFR or equivalent), test certificate no. with date, statutory approval no. with date and agency (PESO/CCE/DGFASLI/DGMS), BIS license number and date, applicable gas group etc. The nameplates shall be engraved type and permanently fixed on the equipment. In case the standard details given above are embossed on the enclosures, the same need not be repeated on the nameplate.

R1

6.2. **Socket Outlets & Plugs and Welding Receptacles**

6.2.1. The sockets shall be provided with a switch and a mechanical interlock so as to break the electrical circuit before the plug is completely withdrawn and make the circuit after the plug is fully inserted.

6.2.2. In order to prevent accidental removal of plug from socket, the engagement and disengagement shall be by two separate and distinct movement and positions.

6.2.3. 415V, 63A three phase flameproof plugs and socket meant for welding receptacle/ any other three phase auxiliary load, shall be provided with 4 pins (3P+E).

6.2.4. 4 pin sockets shall be provided with 63A, three pole heavy duty switch; whereas, 5 pin sockets shall be provided with four pole (TPN) heavy duty switch.

6.2.5. 24V and 240V, I5A single phase flameproof plug and socket shall be provided with 3 pins (2P+E).

6.2.6. Provision shall be made so that it shall not be possible to insert 24V plug on to a 240V socket.

6.2.7. The sockets shall be provided with either a spring loaded hinged cover, or with a cap connected through metallic chain, to close the same when not in service.

6.2.8. Scraping earth connection shall be provided between the plug and socket. Earth pin of plug shall first engage with earth pin of switch socket.

6.2.9. The plug assembly shall be mechanically rugged, light and shall not unduly stress the socket or its own pins when fitted on to the socket. The diameter of the earth pin of the plug and socket shall be at least 1.1 times the diameter of the phase pins.

6.3. **240V/ 24V Portable Transformer Units**

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6.3.1. The 240V/ 24V portable transformer unit shall be supplied complete with 240V/ 24V transformer having a 24V socket on the secondary side and 5 meter length of 3 x l.5 mm^2 copper conductor, PVC insulated, metal braided flexible cable, duly terminated in the transformer primary at one end and having 240V plug on the other end. The socket outlets and plugs shall meet the requirements of clause 6.2 above.

6.3.2. The 240V/ 24V transformer shall be designed for 100VA rating on continuous basis. HRC fuses shall be provided on primary and secondary side of the transformer. The transformer shall have an earthed screen between primary and secondary winding.

6.3.3. Suitable handle for carrying the transformer unit shall be provided.

6.4. **24V Hand Lamp Units**

6.4.1. Each hand lamp unit shall be supplied complete with l5 meter length of 3 x l.5 mm^2 copper conductors, PVC insulated, metal braided flexible cable, duly terminated in the hand lamp at one end and having 24V plug on the other end. The plug shall meet the requirements of clause 6.2 above.

6.4.2. The well glass provided shall be clear and toughened type.

6.4.3. Hand lamp shall be provided with either galvanised steel or epoxy powder coated mild steel protective wire cage using minimum 5mm welded steel construction and having mesh dimension not exceeding 50mm x 70mm.

6.4.4. The lamp holder of the hand lamp shall be suitable for 60W, 24V, 50Hz lamp with ES cap.

6.4.5. Suitable handle for carrying the hand lamp unit and a stand type guard suspension hook shall be provided.

R1

6.5. **Flame Proof and weather Proof Junction Box and Control Stations**

6.5.1. Push buttons for START and STOP shall be of GREEN and RED colour respectively. Unless otherwise specified, each push button shall have one normally open and one normally closed contact. The STOP push button shall be mushroom type with stay put feature and lockable in pressed position.

6.5.2. All control switches shall be provided with a pistol grip handle. Unless otherwise specified, all selector switches shall have minimum two poles for each position. Each position of switch shall be indelibly marked on the control station.

6.5.3. All ammeters shall be of moving iron type having an accuracy class of 3 and suitable for 1Ampere CT secondary. Unless otherwise specified, min. size of ammeter shall either be 72mm x 72mm or min. 65mm dia. 80% of the scale length shall cover 100% of the CT current uniformly and the balance 20% of the scale cover 100-600% of the CT primary. A red mark corresponding to the full load current of the motor shall be provided on the ammeter dial. The ammeter front glass shall be toughened (Type 'A' glass).

6.5.4. All push button and control switch contacts shall be rated for min. 5Amps at 240V AC-15.

6.5.5. For increased safety junction boxes, the terminals shall be provided with positive locking

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device against loosening.

6.5.6. The enclosure shall be in addition, of increased safety execution, Exe, as per relevant standard and shall be suitable for installation specified in specification sheet.

6.5.7. The junction boxes shall be liberally dimensioned in order to avoid temperature rise inside the enclosure which may damage the insulating materials or gaskets employed therein.

6.5.8. Cables shall enter the terminal box through increased safety compression type cable glands. From the terminal chamber to the main enclosure, the connections shall be made through proper bushings.

6.5.9. An additional earthing terminal inside the terminal chamber shall be provided.

6.5.10. The junction boxes shall be provided with Brass-Nickel plated shorted links. The terminal block shall be made of non-hygroscopic compound. Bakelite / Hylam shall not acceptable.

6.5.11. All screws / bolts and nuts shall be of stainless steel.

6.5.12. Junction boxes and cable glands must be certified by Statutory Authorities for use in the specified hazardous area. Equipments certified by overseas authorities shall obtain certificate of compliance / letter of opinion from respective statutory authorities.

6.5.13. Duly wired prototype samples for junction boxes shall be submitted for scrutiny as and when called for.

6.5.14. Type Test certificates for increased safety type junction boxes and cable glands along with blanking plugs shall be supplied.

R1

6.6. **Flameproof and weatherproof lighting fixture**

6.6.1. The construction of lighting fixtures shall be such that replacement of lamp or any normal maintenance of fixture shall not affect their suitability for use in classified area.

6.6.2. Glass used for lighting fixture shall be clear suitable for use under conditions involving exceptional risk of mechanical damage.

6.6.3. Well glass lighting fixture for Zone 2 classified area shall meet requirement IS 6381.

6.6.4. Mechanical strength of well glass shall satisfy requirement of IS 2206 (for type A glass) for flameproof lighting fixtures and IS 6381 for Div. 2 lighting fixtures. All well glass fixtures shall be provided with a galvanised steel wire protective cage having mesh dimensions not exceeding 50 mm.

6.6.5. Glass used for aviation and navigational lighting fixture shall be coloured in itself.

6.6.6. The fixing parts of the enclosure, which is to be opened for replacement of bulb, shall be so fastened that they can be unfastened only with special tools. All fixtures shall carry a special warning inscription in English “Isolate supply elsewhere before opening”.

6.6.7. All lighting fixtures which are not certified as flameproof construction but approved for use in Zone-2 are shall have approved enclosed break lamp holder and complete enclosure certified as having restricted breathing type construction. Lamp holder shall be screw type.

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6.6.8. All lighting fixtures suitable for discharge lamps shall be provided with one ¾" ET threaded entry and supplied with approved type double compression nickel-plated brass cable gland.

6.6.9. All lighting fixtures suitable for incandescent lamps shall be provided with two ¾" ET threaded entry. Two entries shall be used for looping of circuit wherever required. The fixtures shall be supplied with approved type two double compression nickel-plated brass cable glands and one threaded plug for sealing unused entry.

6.6.10. The top of all well glass lighting fixtures shall be identically drilled/ threaded to facilitate the installation on pole / column or ceiling.

6.6.11. All flood lighting fixtures shall be supplied with adjustable mounting arrangement both in horizontal and vertical plane.

6.6.12. Lighting fixtures suitable for discharge lamps shall be provided with power factor correction capacitor, choke starter, etc. housed in separate control gearbox. The choke shall be copper wound. The complete control gear shall have power factor not less than 0.9. All components shall be of approved make.

6.6.13. Control gearbox shall be provided with three ¾" ET threaded entry (incoming, supply to lighting fixture and for looping to other fixture/ control gear box). The control gearbox shall be supplied with approved type three double compression nickel-plated brass cable glands and one threaded plug for sealing used entry.

6.7. **Terminals & Wiring**

6.7.1. All equipments shall be provided with sufficient number of terminals. More than 2 wires per terminal shall not be permitted. If required, additional terminal with shorting link may be used. The terminals shall be suitable for termination of solid conductors up to 6 mm^2 and stranded conductors above 6 mm^2. Tinned copper lugs shall be provided for cable termination.

6.7.2. All internal wiring shall employ adequately sized, 660V grade, PVC insulated Copper conductor wires, colour coded for phase, neutral and earth, with minimum conductor sizes as below:

TPN Plugs and sockets:	16 mm^2
SPN Plugs and sockets:	2.1 mm^2

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6.7.3. For flameproof equipments, terminal box can be provided in 'Exe' execution.

7.0 INSPECTION, TESTING AND ACCEPTANCE

7.1. During fabrication, the equipment shall be subjected to inspection by Owner or by an agency authorised by the Owner, if specified agreed in Inspection Test Plan. Manufacturer shall furnish all necessary information concerning the supply to Owner/ Owner's inspector. All routine acceptance tests shall be carried out at manufacturer's works, under his care and expense.

7.2. Type test certificates from CIMFR or equivalent test house, applicable PESO / CCE / DGFASLI / DGMS approval certificates, BIS license and original drawings referred in type test certificates shall be shown to the inspection agency on demand during inspection. The certificates and BIS license must be valid at the time of despatch.

7.3. Test certificates of bought out components shall be shown to the inspection agency on demand during inspection.

7.4. All equipments shall be subjected to various acceptance tests as per standards but not limited to the following:

7.4.1. General visual inspection

7.4.2. Dimensional inspection

7.4.3. Verification of mechanical and electrical operations

7.4.4. Dielectric tests

7.4.5. Over pressure test (for flameproof plugs and sockets)

7.4.6. Static hydraulic test for flameproof lighting fixtures

7.4.7. Thermal shock test for flameproof lighting fixtures

7.4.8. Durability test for flameproof lighting fixtures

7.4.9. Any other routine and acceptance test as per applicable standards.

8.0 PACKING AND DESPATCH

All the equipment shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for the selected mode of transportation, i.e. by ship/rail or trailer, and shall be wrapped in polythene sheets before being placed in crates/ cases to prevent damage to finish. The crates/ cases shall have skid bottom for handling. Special notations such as 'Fragile', 'This side up', 'Center of gravity', 'Weight', 'Owner's particulars', 'PO no.' etc., shall be

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clearly marked on the packages together with other details as per purchase order. The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage, in areas with heavy rains/ high ambient temperature.

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SHEET STEEL DISTRIBUTION BOARDS

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1. SCOPE

1.1. This standard covers the technical requirements of design, manufacture, testing at works and delivery in well-packed condition of Sheet Steel Distribution Boards.

1.2. This standard shall be read in conjunction with relevant Specification Sheets and Feeder details.

2. STANDARDS TO BE FOLLOWED

2.1. The Design, manufacture and testing of the equipment shall comply with the latest issue of the following Indian Standards, unless otherwise specified.

IS : 8623	--	Specification for low voltage switchgear and control gear assemblies.
IS : 13947	--	General requirement for switchgear and control gear for voltages not exceeding 1000 V AC and 1200 V DC.
IS : 5578	--	Guide for marking of insulated conductors.
IS : 11353	--	Guide for uniform system of marking and identification of conductors and apparatus terminals.
IS : 10118	--	Code of practice for selection, installation and maintenance of switchgear and control gear.

Various components housed in the distribution board shall conform to the Indian Standard Specification as mentioned against the component details.

2.2. The design and operational features of the equipment offered shall also comply with the provisions of the latest issue of the Indian Electricity Rules and other Statutory Acts and Regulations. the supplier shall, wherever necessary, make suitable modifications in the equipment to comply with the above.

2.3. Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specification the requirement specified herein shall prevail.

3. SERVICE CONDITIONS

3.1. AMBIENT CONDITIONS

These shall be as indicated in Specifications Sheet.

3.2. SYSTEM DETAILS

These shall be as indicated in Specification Sheet.

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4. OPERATING REQUIREMENTS

The distribution board shall be suitable for operating at the specified rating continuously with the specified voltage and frequency variations under the ambient conditions indicated in Specification Sheet, without exceeding the permissible temperature rise and without any detrimental effect on any part.

5. DESIGN AND CONSTRUCTIONAL FEATURES

5.1. GENERAL

5.1.1. The distribution board shall consist of an assembly of a series of floor mounting, identical, metal clad, dead front type panels of unitised design. The panels shall be placed side by side to form a compact assembly and shall be extensible on either side.

5.1.2. The complete assembly shall be dust, damp and vermin proof having minimum degree of protection equivalent to IP-52 as per IS:13947.

5.1.3. The frame work of the cubicles shall be of bolted/welded construction. The minimum thickness of steel shall be 2 mm for load bearing members, 1.6 mm for non-load bearing members and 3 mm for base channel. The doors and covers shall be fabricated from cold rolled sheet steel. Suitable reinforcement, wherever necessary, shall be provided.

5.1.4. The door hinges shall be concealed type.

5.1.5. All external hardware shall be cadmium plated/zinc passivated. The hardware for fixing the removable parts shall be provided with retaining devices.

5.1.6. The doors and the removable covers shall be provided with non-deteriorating neoprene gaskets. Gaskets without any discontinuity shall be preferred. Gaskets shall be held in position in groove of shaped sheet steel work or these shall be of U type. Adhesive cement, if used, shall be of good quality so that the gasket do not come off during service.

5.1.7. All the components shall be accessible for inspection and maintenance without the necessity for removal of the adjacent ones. In case of single front design all components shall be accessible from the front for maintenance and back opening doors/openable covers for maintenance shall not be acceptable.

5.1.8. The layout of the components inside a module shall be liberal to facilitate maintenance and the interconnection of wiring between the components shall not be subjected to any undue stress at the bends.

5.1.9. Mounting height of components requiring operation and observation shall not be lower than 300 mm and higher than 1800 mm.

5.1.10. Inter panel barriers shall be provided.

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5.1.11. Adequate arrangement for earthing shall be provided to safeguard the operator or other personnel from electric hazards under all conditions of operation.

5.2. PANEL ARRANGEMENT

5.2.1. The distribution board shall be drawout/non-drawout type in single front/double front configuration as specified in Specification Sheet.

5.2.2. Each Panel shall have its horizontal bus-bar chamber running on the top with multi-tier module units in the centre and having vertical bus-bar chamber and cable alley on either side.

5.2.3. The modules shall be enclosed on all sides and shall be so arranged that larger ones are placed at the bottom portion of the panel. Fixed type modules shall be at least 300 mm from the base channel.

5.2.4. The number of modules in the panel shall not exceed six for motor starter feeders and eight for switch fuse/MCB/MCCB feeders. The minimum size of module shall be 300 mm and 200 mm for starter and switch fuse feeders. The incomer and bus coupler module sizes for ratings upto 400 A shall be half the panel size. For higher ratings they shall be housed in single panel.

5.2.5. The module door shall be so interlocked that it shall not be possible to open the door with switch/MCCB in closed position. Defeat interlock facility shall be provided.

5.2.6. The relay, meters, switches/MCCB and lamps shall be flush mounted. All components of one module shall be mounted on the same module on a rigid sheet steel chassis. A 20 mm dia rotating knob on the door shall be provided for closing and opening.

5.3. BUS BARS AND CONNECTIONS

5.3.1. The bus-bar shall be suitable for the supply system specified in the Specification Sheet. The bus-bar and connections shall be made of electrolytic copper or high conductivity aluminium alloy conforming to Grade E91E of IS:5082.

5.3.2. The bus-bar shall be amply sized to carry the rated continuous current under the specified ambient temperature without exceeding the temperature of 90°C. The bus-bars shall also be designed to withstand the system fault current for 1 second without exceeding the temperature of 200°C for bare aluminium and 250°C for bare copper. The minimum acceptable size of bus-bars shall be 250 Sq.mm (Al). Calculation for the bus-bar sizing shall be furnished for review.

5.3.3. In case of double front arrangement of distribution boards different sets of vertical bus-bars shall be provided. The vertical bus-bars shall be PVC sleeved or shrouded by insulating barriers which shall have cutouts to permit entry of power wires. It shall be possible to remove the shroud for inspection and maintenance. Neutral-bars shall be provided in this chamber.

5.3.4. Horizontal bus-bars shall be of same cross-section through out. Stepped bus-bars shall not be acceptable.

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5.3.5. All bus-bars shall be arranged and colours coded according to IS:5578/11353.

5.3.6. The horizontal bus-bar shall run in a separate bus chamber located at the top shall have separate screwed cover for inspection purpose.

5.3.7. The bus-bars shall be rigidly supported at equal intervals to withstand maximum short circuit stresses. The supports shall be of moulded construction with built-in anti tracking barriers. The support material shall be of fibre glass reinforced thermosetting plastic.

5.3.8. All joints shall be suitably treated to avoid oxidation of contact surfaces and bimetallic corrosion. A minimum of two bolts with spring washers shall be used for horizontal bus-bar joints.

5.3.9. Horizontal bus bars shall be insulated with heat shrinkable PVC sleeves of reputed makes. Insulating shrouds shall be provided for all joints of insulated bus-bars.

5.4. CLEARANCE AND CREEPAGE DISTANCES

5.4.1. The clearance and creepage distances shall not be lower than the values specified below:

i)	Minimum clearance between two live conductors	--	20 mm
ii)	Minimum clearance between live part and accidentally dangerous part	--	20 mm
iii)	Minimum creepage distance	--	28 mm

5.4.2. The clearances and the creepage, as specified above, shall definitely be maintained in the bus-bar system. Provision of bus-bar insulations, separator or barriers shall not be considered to reduce the clearance from the values specified above.

5.4.3. At the termination points in the equipment, e.g. MCCB, switches, contactors, thermal relays, etc. it is realised that above clearance may not always be possible to be maintained. All such points where above clearance are not possible to be maintained should, therefore, be insulated or taped.

5.5. INSULATION

5.5.1. The insulation used shall be non-hygroscopic and may be of porcelain, Epoxy-resins or fibre glass moulded with plastic. It shall be of adequate electrical and mechanical strength to give trouble free service during normal operation and short circuit conditions.

5.5.2. The insulation shall be treated suitably to withstand the tropical conditions and atmospheric pollution as specified in Specification Sheet.

5.6. POWER WIRING

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5.6.1. The connections from bus-bar including neutral to individual units on the modules shall consist of PVC insulated flexible copper cable or tapped copper strip.

5.6.2. The power wiring size shall be decided based on the rating of the switch, MCCB after using a rating factor of not more than 50% over the current rating in free air. In any case the minimum size of power wiring shall not be less than 4 Sq.mm copper.

5.6.3. the size of connection from incomer to horizontal bus-bar and from horizontal bus-bar to bus coupler shall not be less than the size adopted for horizontal bus-bar.

5.7. CONTROL WIRING

5.7.1. The switch board shall be completely factory wired and ready for external connections.

5.7.2. The wiring shall be carried out with flexible stranded PVC insulated copper conductor cables of 1100 Volt grade. The size of wires shall be as follows:

C.T. Circuit	--	2.5 Sq.mm
V.T. and Control Circuits	--	1.5 Sq.mm

5.7.3. All wiring shall be provided with dependent both end marking as per IS:5578. Numbered ferrules, reading from the terminals outwards, shall be provided at both ends of all wiring for easy identification. These shall be interlocking type plastic ferrules.

5.7.4. Control wiring circuits, fed from a supply common to a number of feeders, shall be so protected that failure of a circuit in one feeder does not affect the operation of the other feeders.

5.7.5. The wiring to the equipment mounted on the doors shall be carried out with flexible multi strand copper conductor cable and supported so that opening of the door, there is no undue strain on wire leads.

5.7.6. The control cables shall be neatly arranged and properly supported.

5.8. EXTERNAL CABLE TERMINATION

5.8.1. All power and control cables shall enter the distribution board from the bottom unless otherwise specified in Specification sheet. Sufficient space shall be provided for ease of connection and termination of cables.

5.8.2. All cables shall be of 1.1 KV grade PVC insulated armoured and PVC sheathed except for single core cable which may be unarmoured. The number and sizes of cable shall be as indicated in Feeder details.

5.8.3. Compression type cable glands alongwith the cable lugs as required and shall be provided for termination of cables.

5.8.4. The cable glands shall be of rolled Aluminium or Nickel/Cadmium plated brass heavy duty double compression type and shall be mounted on a removable gland plate, provided at a minimum height of 75 mm from

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the bottom of the distribution board. Two numbers spare knockouts of size 20 mm shall also be provided on the gland plates for future use.

5.8.5. For all power cables crimped type aluminium lugs for aluminium cables and tinned copper lugs for copper cables shall be provided.

5.8.6. Terminal Block for control cable are pressure clip type and Terminal Block for power cables are bolted type. These shall be protected type and rated for 1100 Volts service. The minimum current rating of terminal block shall be 16 Amp. The construction shall be such that after the connection of cables by means of lugs, necessary clearance and creepage distance are available.

5.8.7. Where more than two cables in parallel are required to be terminated, a system of bus links shall be provided with adequate clearance and spacing.

5.8.8. Suitable clamps to support the vertical run of cables shall be provided.

5.8.9. The terminal block shall be grouped according to circuit functions and suitably numbered. 20%extra terminals shall be provided in the terminal block.

5.8.10. For power connections, suitable marking on the terminals shall be provided to identify the phases.

5.9. FEEDER DETAILS

5.9.1. The requirements of incomer, bus coupler and outgoing feeders shall be as indicated in the single line diagram, feeder details and corresponding schematic diagram.

5.9.2. The bus coupler shall be so located that it is possible to maintain half of the bus-bars while the other half is still alive. Complete segregation of bus-bar connections to bus coupler shall be provided.

5.9.3. Castle key type mechanical interlocks shall be provided between incomers and bus section modules to avoid paralleling of incomers. In addition padlocking facilities shall be provided in OFF position.

5.9.4. Single phase loads shall be distributed as far as possible on all the three phases.

6. COMPONENT DETAILS

6.1. The make of the components shall be as specified in Specification Sheet and shall conform to type of co-ordination C as per IS:13947.

6.2. MOULDED CASE CIRCUIT BREAKERS

6.2.1. The MCCB shall conform to IS:13947 (Part 2) and shall having rupturing capacity as specified in Specification Sheet.

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6.2.2. The MCCB shall be provided with quick make, quick break type manually operated trip free mechani sm, thermal tripping devices of inverse characteristics, instantaneous short circuit tripping devices and necessary auxiliary and alarm switches.

6.2.3. The thermal and short circuit tripping device shall be adjustable type.

6.2.4. In addition, under voltage trip shall be provided, if specified.

6.3. SWITCHES

6.3.1. The switches shall be Motor duty type AC23 category and shall comply with the requirements laid down in IS:13947 (Part 3). Switches upto 63 Amps shall be rotary type and those of 100 Amp and above shall be link type.

6.3.2. 'ON' and 'OFF' positions of the switches shall be indicated on the panel. Provision shall be made to lock the switch in the 'OFF' position.

6.3.3. The fixed contacts shall be shrouded and the contacts shall be silver plated.

6.3.4. Two Pole switches shall also isolate the neutral circuit alongwith phase circuit. 4 Pole / 2 Pole switches shall be used for 3 Phase/1 Phase circuits respectively.

6.4. FUSES

The fuses shall be of non-deteriorating HRC cartridge link type and conform to IS:9224. They shall be suitable for the load and the service required in the circuit.

6.5. AIR BREAK CONTACTORS

6.5.1. The Air Break Contactor shall be of AC3 category unless otherwise specified, conforming to IS:13947 (Part-4).

6.5.2. The dropout voltage shall not exceed 65% of rated voltage.

6.5.3. Each contactor shall be provided with auxiliary contacts as required. The rating of the auxiliary contacts shall be 5 Amps. AC or 1 Amp. DC at the specified control voltages. The spare auxiliary contacts shall also be wired terminal block.

6.6. BIMETAL THERMAL OVERLOAD RELAYS

6.6.1. The contactor shall be provided with three pole bimetal thermal overload relays unless otherwise specified. The bimetal relays shall be of suitable range, ambient temperature compensated and shall be separate mounting type. They shall be adjustable through graduated scale and shall be provided with changeover contact.

6.6.2. Bimetal relays shall conform to IS:3231 and shall have built in single phasing preventor.

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6.6.3. The bimetal relays shall be provided with a manual reset device resettable after opening the cubicle door. Auto reset thermal relays are not acceptable.

6.7. CURRENT TRANSFORMERS

6.7.1. The current transformers shall conform to IS:2705.

6.7.2. Current Transformers shall be cast resin. The Current Transformers shall be rigidly mounted and shall be easily accessible for maintenance and testing.

6.7.3. The Current Transformers shall be of 5 VA output or as specified in SLD/Data Sheet. The output shall be adequate for the instrument and metering duties involved with sufficient margin. The Current Transformers shall have the accuracy Class-1 for the metering duty.

6.7.4. All the Current Transformers shall be provided with terminals and shorting links. One of the terminals of C.T. shall be earthed. The polarity of the C.T. shall be clearly marked.

6.7.5. The C.T.s shall be capable of withstanding momentary open-circuit on the secondary side without injurious effects.

6.8. INSTRUMENTS AND METERS

6.8.1. All instruments shall be flush mounting type with square face and shall be tropicalized and dust tight.

6.8.2. The size of the instruments shall be 96 mm x 96 mm for full and half size modules and 72 mm x 72 mm for lower size modules.

6.8.3. Dials shall be parallax free with scale marked in black on white background and shall be suitable for direct reading.

6.8.4. Zero adjusters shall be provided for operation from the front of the cases.

6.8.5. All ammeters and voltmeters shall have $0 - 90^{o}$ scale moving iron spring controlled type and of Class 1.5 accuracy as per IS:1248. The scale range of the ammeter and voltmeter shall be as indicated in the feeder details.

6.8.6. In case of motor feeders, the ammeter shall be graduated uniformly upto C.T. primary current and with a compressed end scale upto 6 times the C.T. primary current. Red pointer shall be provided, which can be adjusted at site for indicating full load current.

6.8.7. KWH meter shall be 3 phase 4 wire type. These shall conform to the requirements of IS:722 and shall be C.T. operated. The current coil shall be rated for 5 Amp.

6.8.8. All kWh meters shall be provided with test blocks for current and voltage coils for testing them at site without interrupting their recording while in service.

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6.9. PUSH BUTTON AND CONTROL SWITCHES

6.9.1. The switches and push buttons shall conform to utilization category AC 11 / DC 11 as per IS:13947 (Part-5). The contact shall be rated to make, break and carry inductive current of 5 Amp. At 415 V AC and 1 Amp at 220 V DC.

6.9.2. The control switches shall be spring return rotary type unless otherwise specified and provided with pistol grip type handle. The control switches for circuit breakers shall be additionally fitted with lost motion devices and sequencing devices.

6.9.3. The selector switches shall be stay-put rotary type and provided with oval shape handles.

6.9.4. The push buttons shall be of momentary contact spring loaded type with a set of normally close and open contacts. The push button for 'Start' shall be shrouded type and coloured green, stop push button shall be enshrouded type and coloured red and other push buttons shall be enshrouded type coloured black. The fixing ring shall be metallic white.

6.9.5. Emergency stop push buttons, if specified, shall be lockable in pushed position.

6.10. MINIATURE CIRCUIT BREAKERS

6.10.1. The miniature circuit breakers shall conform to IS:13032 and shall be of duty category M-9.

6.10.2. It shall be provided with overload and short circuit protective devices in a heat resistant housing.

6.10.3. A certificate of short circuit rating and current time tripping curve shall be furnished alongwith the offer.

6.11. SIGNAL LAMPS

6.11.1. Signal lamps shall be provided to indicate the various circuit conditions as shown in scheme drawings. The colour of the lamps for various functions shall be as follows:

Red -- Switch/Contactor closed.

Green -- Switch/Contactor open.

6.11.2. The lamps shall be LED type having lumen output 200 millicandella in axial direction.

6.11.3. It shall be possible to remove the globe from outside for replacement of lamps.

6.12. CIRCUIT BREAKER

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6.12.1. The circuit breakers shall be of air break and of horizontal drawout construction, with 3 poles and isolable bolted neutral link.

6.12.2. Circuit breakers may be hand operated or power operated as called for in the data sheets.

The closing mechanism of the circuit breakers shall be of one of the following types :-

1. Hand operated, spring charged, independent manual type.

2. Motor wound, spring charged with a provision of manual charging

6.12.3. The operating mechanism shall be mechanically and electrically trip-free and non-pumping. Anti-pumping feature may be built in for a separate anti-pumping relay may be provided. A mechanical closing device may be provided, if feasible.

6.12.4. A mechanical trip device suitable for front of board operation and a mechanical 'ON-OFF' indicator shall be provided. Trip device should be shrouded to prevent inadvertent mal operation.

6.12.5. A series or shunt trip coil, as called for in the Data Sheets shall be provided for tripping the circuit breakers. Wattage of shunt trip coils will be sufficiently high to prevent it from picking up or holding on with specified number of indicating lights wired in series with the same.

6.12.6. Provision shall be made for remote closing and tripping of the circuit breakers, with electrically operated mechanism. A 'local/remote' selector switch shall also be provided wherever called for in the Data Sheets.

6.12.7. A maintenance closing device for slow closing and slow opening of circuit breakers shall also be provided, if feasible.

6.12.8. In case of spring charged mechanism, 'Spring Charged' indication (mechanical) shall be provided.

6.12.9. Interlock shall be provided to prevent plugging in or withdrawal of circuit breaker trolley unless it is open. Any attempt to do so shall trips the circuit breaker.

6.12.10. Interlock to prevent closing of circuit breaker, unless it is in 'SERVICE' or ' TEST' position, shall be provided.

6.12.11. Main contacts shall have ample area and adequate contact pressure to carry the rated and short time current without excessive temperature rise. The contacts shall be adjustable for wear and easily replaceable. Main contacts shall open before and close after the arcing contacts, when these are provided. Arcing contacts shall be easily accessible for inspection and replacement.

6.12.12. The tips of main and arcing contacts shall be silver plated or shall be of suitable material, to minimise erosion of contacts due to arcing.

6.12.13. Auxiliary switches directly operated by the breaker mechanism shall be provided for control and interlocks. A minimum of six normally open and six normally closed contacts shall be provided. The contacts shall be preferably convertible from NO to NC and vice versa. The contacts shall also be capable of adjustments to enable early closing or delayed opening with reference to breaker main contacts. The contacts shall be rated for 10 Amp. at 240V A.C. / D.C. All spare contacts shall be wired upto terminal block. Auxiliary contacts in the "trip" circuit shall close before the breaker main contacts close and shall open after the main contacts have opened. All other contacts shall operate simultaneously with the main contacts.

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7. ACCESSORIES

7.1. The supplier shall include the following accessories.

-- Fuse Puller.

-- Test plug for kWh meters.

7.2. SPACE HEATER

Each vertical section shall be provided with a thermostatically controlled space heater, rated for 240 V, 50 Hz and controlled through double pole miniature circuit breaker.

7.3. NAME PLATES

7.3.1. The distribution board shall have large name plate. Each single front panel shall have name plate both in front and back.

7.3.2. Each feeder shall be provided with name plate. Each single front panel shall have name plate both in front and back.

7.3.3. All control switches, push buttons, lamps, etc. shall have functional identification labels.

7.3.4. Name plate shall be of black perspex with white engraving and of minimum 3 mm thick.

7.3.5. Any other accessories required, but not specified shall also be supplied to make the distribution board complete in all respects to ensure safe and proper operation.

7.3.6. Load Manager

- Load Manager will display KWH, Real Time, Date, Voltage, Current, Power Factor, Frequency, Instantaneous Load (KW), MD-KW, KV Arh, KVAH, KVA.
- Load Manager shall have RS 232/RS 485/MODBUS protocol for communication to SCADA.
- Load Manager shall communicate KWH, MDKW, Voltage, Current, Power Factor, Frequency, etc. to Supervisory Control and Data Acquisition (SCADA).

8. PAINTING

8.1. The enclosure after degreasing, pickling in acid, cold rinsing phosphatising, passivating etc. shall be painted with two coats of anti-rust paint followed by two coats of anticorrosive paint.

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8.2. Epoxy based paint shall be used, if indicated in Specification Sheet.

8.3. All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.

8.4. Unless otherwise specified, the finishing shade shall be light grey Shade No. 631 as per IS:5.

8.5. One litre of paint shall be supplied alongwith each board for touch up at site.

9. TESTS AND INSPECTION

9.1. THE DISTRIBUTION BOARDS SHALL BE SUBJECTED TO ROUTINE TEST AS PER IS:8623.

9.2. Additional tests, wherever specified, shall be carried out.

9.3. All the above tests shall be carried out in presence of purchaser's representative. In addition, the equipment shall be subjected to stage inspection during process of manufacture at works and site inspection.

9.4. These inspection shall however, not absolve the vendor from his responsibility for making good any defect which may be noticed subsequently.

10. DRAWINGS AND DOCUMENT

10.1. DRAWINGS AND DOCUMENTS AS PER ANNEXURE-I SHALL BE SUPPLIED.

10.2. ALL DRAWINGS AND DOCUMENTS SHALL HAVE THE FOLLOWING DESCRIPTION WRITTEN BOLDLY:

-- Name of client

-- Name of Consultant .

-- Enquiry / Order Number with Plant/Project Name.

-- Code No. and Description.

11. SPARES

11.1. Itemwise unit prices for spare parts as listed in Annexure-II shall be offered along with main equipment with recommended quantity for the period as stipulated in Specification Sheet.

11.2. Any other spare parts required, but not specified, shall also be offered.

12. PACKING

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12.1. The distribution board shall be properly packed before despatch to avoid damage during transport, storage and handling.

12.2. The packing box shall contain a copy of the installation, operation and maintenance manual.

12.3. A sign to indicate the upright position of the panels to be placed during transport and storage shall be clearly marked. Also proper arrangement shall be provided to handle the equipment.

13. DEVIATIONS

Deviations, if any, from this standard shall be clearly indicated in the offer with reasons thereof. Deviations from the data indicated in Specification Sheet shall be shown clearly by encircling it and indicating the revised data in Specification Sheet.

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ANNEXURE - I

DOCUMENTATION FOR SHEET STEEL DISTRIBUTION BOARDS

Sl. No.	Description	With BID	After Order			
			For Approval		Final	
		No. of copies	No. of copies	No. of weeks	No. of copies	No. of weeks
1.	Specification sheet	1	6	2	8	2
2.	Technical Particulars	1	6	2	8	2
3.	Feeder Details	1	6	2	8 + 1R	2
4.	General Arrangement and Foundation Drawings	1	6	2	8 + 1R	2
5.	Schematic Diagrams with Terminal arrangement drawings	-	6	2	8 + 1R	2
6.	Calculation for Bus-bar sizing	1	6	2	-	
7.	Illustrative and Descriptive literature	1	-	-	8	2 weeks after Inspec-tion
8.	Catalogues for bought out accessories	1	-	-	8	
9.	Installation, operation & maintenance manual	-	-	-	8	
10.	Test Certificates					
	-- Type (for MCCB / MCB / ACB)	1	-	-	-	
	-- Routine	-	-	-	8	
11.	Guarantee Certificates	-	-	-	8	
12.	Spare Parts List	1	-	-	8	

Note :

1. R-Reproducible.
2. Period of submission of drawings for approval shall be counted from the date of LOI.
3. All final documents shall be submitted prior to despatch of equipment. These shall be made in sets and shall be supplied in fine plastic coated folder.

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ANNEXURE III

THE FOLLOWING SPARE PARTS SHALL BE QUOTED ALONG WITH THE OFFER

1. LIST OF SPARES - MANDATORY

a) MOULDED CASE CIRCUIT BREAKER (OF EACH RATING)

b) INDICATING LAMPS

2. LIST OF SPARES - FOR 2 YEARS OPERATION

A. MOULDED CASE CIRCUIT BREAKER (OF EACH RATING)

i) Complete Breaker Assembly

B. SWITCHES (OF EACH RATING)

i) Assembled switch in open execution

i) FUSES Single pole moving blade assembly

ii) Single pole base assembly

C. FUSES (OF EACH RATING)

i) Fuse links

ii) Fuse fittings

D. CONTROL SWITCHES

i) Trip-Neutral-Close Control Switch

ii) Local-Remote Selector Switch

iii) Heater Switch

iv) Thermostat

v) Ammeter Selector Switch

vi) Voltmeter Selector Switch

vii) Push Button

viii) Push Button element

ix) Push Button Actuator of each type.

E. CONTRACTOR (OF EACH RATING)

i) Contractor with Auxiliary Contacts

ii) Operating Coil

iii) Auxiliary Contact Block

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iv) INDICATING LAMPS
v) Indicating lamps globes of each colour
vi) Indicating lamp fittings
vii) Indicating lamp bulbs

F. METERS

i) Ammeter
ii) Voltmeter

G. PROTECTIVE RELAYS

i) Relays
ii) Thermal overload relay of each type

NOTE: All spare parts shall be identical to the parts used in the distribution boards.

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GAS ENGINE GENERATOR SET

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1.0 SCOPE

1.1 This specification covers the technical requirements of design, manufacture, assembly, testing at works and delivery in well packed condition of Gas engine generator Set with Control Panel complete with all required accessories and control equipment to supply continuous electrical power. The Gas engine generator set shall comply with noise, emission and smoke limit norms as per latest amendment of Environment (Protection) Act, 1986.

1.2 This specification shall be read in conjunction with Particular Technical Specification

1.3 The scope of supply shall include, but not limited to the following:

1.3.1 Gas engine, complete with all the required accessories and components.

1.3.2 Generator set, for operation with the above Gas engine, complete with all the required accessories and components.

1.3.3 Lubrication oil system comprising of lube oil pump, filter, cooler, piping, valves, fittings etc.

1.3.4 Radiator cooled/heat exchanger cooled with cooling tower and necessary piping.

1.3.5 Starting system complete with battery, battery charger, battery leads, control system etc.

1.3.6 All inter connecting piping, valves, and fittings up to the battery limit.

1.3.7 First fill of lubricants.

1.3.8 Common base frame suitable for assembly of engine and generator with accessories. Anti-vibration mounting pads shall also be supplied

1.3.9 Acoustic enclosure to reduce the noise level to 75 dB at 1 meter from the enclosure.

1.3.10 Exhaust manifold complete with residential silencer with lagging, metallic expansion bellow and piping as per requirement.

1.3.11 All necessary instrument interlocks, controls with necessary annunciation and indication for monitoring and safe starting, and stopping of the Gas Engine Generator set, their auxiliaries complete with tubing and cabling.

1.3.12 180 KVA Silent Gas Engine Generator control panel shall be mounted in acoustic enclosure. 125 KVA Silent gas engine generator AMF Control Panel shall be mounted in Electrical room.

1.3.13 Power and Control cable between control panel and all equipment within the battery limit including cable racks, earthing terminating materials etc.

1.3.14 All safety and protective devices.

1.3.15 All other items, not specified here but, necessary for safe, satisfactory operation of Gas Engine generator Set.

1.3.16 Set of special tools and tackles required for operation & maintenance.

1.3.17 Spare parts.

1.3.18 Erection, site testing and commissioning of the Gas Engine Generator at site.

1.3.19 25%, 50%, 100% & 110 % load test shall be carried out 4 hours at works & 8 hours at site.

1.3.20 Noise Level shall be measured at works and site at a distance of 1 meter.

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2.0 STANDARDS TO BE FOLLOWED

2.1 The design, manufacture and testing of the equipment covered by this standard shall comply with the latest issue of the following codes and other relevant Indian standard specifications unless otherwise specified in the Particular Technical Specification.

i) IS 4722 – Rotating Electrical Machines.

ii) IS 13364 (Part 2) – A C Generators driven by reciprocating internal combustion engines.

2.2 Equipment designed and manufactured to other national standards shall be acceptable provided they are in no way inferior to the above mentioned standards.

2.3 The design and operation features of the equipment offered shall also comply with the provisions of latest issue of the Indian Electricity Rules and other statutory regulations. The supplier shall, wherever necessary, make suitable modification in the equipment to comply with the above.

2.4 Wherever any requirement, laid down in this specification, differs from that in Indian standard/IEC, the requirement specified here in shall prevail.

3.0 SERVICE CONDITIONS

3.1 Ambient Conditions

These shall be as indicated in Particular Technical Specification.

3.2 System Details

These shall be as indicated in Particular Technical Specification.

4.0 OPERATING REQUIREMENTS

4.1 The Gas Engine Generator Set shall be suitable for "black start" operation. The equipment offered shall be suitable for operating at their rated capacity continuously under the ambient conditions and voltage and frequency variations indicated in Particular Technical Specification, without exceeding the temperature rise limits specified in relevant standards and without any detrimental effect on any part.

4.2 The Gas engine generator set shall be designed for continuous operation at full load or partial load and have the capability to run at 110% of the MCR for one hour in every 12 hours.

4.3 The Gas engine generator Set should start manually after prolonged idle period. Under such conditions, the auxiliary power shall not be available. The starting and lubrication system shall be suitably designed to take care of these conditions and allow easy, safe and quick starting.

4.4 The Gas engine generator Set loading sequence is not automatic and hence need not be defined by Owner/client.

4.5 The Gas engine generator Set shall be manually controlled and can be started manually both from local panel and Gas engine generator Set control panel in Electrical room.

5.0 ENGINE

5.1 General Design Feature

5.1.1 The Gas engine shall be of multistroke, multicylinder with mechanical fuel injection arrangement and complete with all the required accessories.

5.1.2 The engine output shall be suitable to meet rated load at the generator terminal.

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5.1.3 The engine shall be suitable for trouble free operation.

5.1.4 The unbalance force transmission to the foundation shall be minimum. Critical speed of the assembly shall be sufficiently higher than the rated speed of the engine.

5.1.5 The engine shall be provided with residential silencer at the exhaust.

5.2 Cooling System

5.2.1 The engine upto 125 KVA GEG set shall be radiator cooled and the engine 180 KVA and above GEG set shall be heat exchanger cooled with cooling tower & necessary piping. Supplier shall supply 2 Nos. of secondary water pump (1R +1S)

5.3 Lube Oil System

5.3.1 Proper lube oil system shall be provided for all lubricating points of the engine.

5.4 Starting System

5.4.1 The Electrical starting system shall be provided.

5.4.2 Manual starting scheme from local panel and Gas Engine Generator Set control panel in Electrical room shall be provided.

5.4.3 The starting system shall be such that the Gas Engine Generator Set shall start come up to rated speed and be ready to accept full load within the period as indicated in PTS.

5.4.4 The electric starting system shall comprise of starter motor, battery, battery charger, necessary cabling, required instruments and accessories.

5.4.5 The sealed lead acid battery shall be heavy duty type and suitable for 4 successive starting attempts of the engine without draining. The charger shall have both float / boost charging facilities. The battery shall be complete with suitable stand and other required accessories. A static battery charger of suitable capacity shall be provided to charge the battery during the time when generator is not running.

5.5 Exhaust System

- Exhaust gas turbo generator
- Exhaust manifold
- Silencer : Residential silencer
- Flexibile pipe for silencer
- Exhaust temperature monitoring

5.6 Fuel System

- Carburator
- Ist stage pressure regulator
- IInd stage Indegenous pressure regulator
- Hydraulic/Electronic Governor
- 24 volts DC solenoid gas shut off valve
- Mechanical gas shut off valve

5.7 Intake Air System

- Air intake manifold
- Dry type Air cleaner with precleaner
- Vacuum indicator

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5.8 Non shielded Ignition system

- Ignition generator(Low Tension)
- Transformer
- Spark Plugs
- Wiring harness

5.9 Coupling Arrangement

- Flexible coupling
- Flywheel to suit flexible coupling
- Flywheel Housing

5.10 Safety Control (trip Indications)

- High water temperature
- Low lube oil pressure
- Overspeed

5.11 Engine Instrument Panel (Engine Mounted)

- Starting switch with Key (outgoing)
- Water Temperature gauge
- Lube oil pressure gauge
- Lube oil temperature gauge
- Tachometer with hour meter
- Ammeter
- Push button

5.12 Speed Governing System

5.12.1 The speed governing system of the gas engine shall satisfy the following requirements:

- Steady state speed regulation shall be adjustable between 0 to 5% manually.
- Steady state speed regulation once fixed, shall not vary beyond +0.5%.
- Transient speed regulation shall not exceed 4.5% of rated speed. Momentary under speed and over speed shall not exceed 2% and 8% respectively.
- Recovery time shall be within 3 seconds.

5.12.2 The governor system shall be hydraulic/ electronic.

5.12.3 A mechanical over speed trip device shall be provided to operate at 110% of rated speed.

5.12.4 An engine mounted emergency push button shall be provided to trip the engine in case of emergency.

6.0 GENERATOR

6.1 General Design Features

6.1.1 The generator shall be directly coupled to the engine by SAE flange.

6.1.2 The ingress protection class of the enclosure shall be IP23 as per IS:4691.

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6.1.3 The generator and its accessories shall be capable of withstanding electrical, mechanical and thermal stresses while meeting the performance requirements.

6.1.4 The generator shall be synchronous A.C. generator, star connected and shall have C.M.R. of specified output at 0.8 lag p.f. at rated voltage and frequency.

6.2 Winding And Insulation

6.2.1 The stator and rotor coils shall be made out of electrolytic grade copper conductors. Successive coils shall be connected by accessible and well brazed joints.

6.2.2 The coils shall be class F or H insulated and treated with tropical and fungicidal treatments.

6.2.3 The windings shall be dried, properly impregnated with suitable varnish to withstand the site conditions and properly baked. At least two additional impregnations and baking shall be applied to the assembled coil making a total of three impregnations and bakings. Finally the windings shall be painted with special anti acid and anti alkali paints to withstand the site condition.

6.2.4 The leading wire between the windings and the outside terminals shall be through bushings.

6.3 Performance Requirement

6.3.1 The generator and the gas engine shall match properly to deliver the rated load under the specified ambient and system conditions.

6.3.2 The specified rating of the Gas Engine Generator Set indicated are net electrical power output required for owner's use and does not include the power required by the auxiliaries of the Gas Engine Generator Set. The actual output rating of the generator to be offered by vendor shall take into account the power requirement of the auxiliaries, 15% extra margin.

6.3.3 The generator shall have an overload capacity of 10% for 1 hour in any consecutive period of 12 hours after having attained the thermal equilibrium corresponding to the rated load. The terminal voltage shall be equal to the rated value. At the time of switching 'ON' the emergency loads, restarting or re-acceleration of squirrel cage motors shall be required, in addition to switching 'ON' of the lighting loads, which will be six times the rated load at power factor of 0.35 lagging. The generator and its accessories shall be capable of supplying this load at the above mentioned low power factor. Limitations, if any, shall be clearly indicated by the vendor.

6.3.4 Largest Motor Starting Requirement

The Gas Engine Generator Set shall be designed such that it can start squirrel cage induction motor of specified rating by Star delta starting method when already loaded with specified base load. The voltage dip at the generator terminal shall not exceed 15% of its rated voltage during the entire starting period which will not exceed 5 seconds. The bidder shall mention largest motor starting requirement for which the Gas Engine Generator Set shall be designed.

6.3.5 The short circuit ratio, of the generator at rated KVA and rated voltage shall not be less than 0.5.

6.3.6 The generator shall withstand 20% over speed for 2 minutes without any damage to any part.

6.3.7 The generator shall be capable of withstanding the three phase short circuit at its terminals while operating at its voltage without sustaining any damage.

6.4 Excitation System

6.4.1 The generator shall be provided with static brushless excitation system comprising of shaft driven rotor exciter, thyristor and other associated items.

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6.4.2 The capacity of the system shall be adequate to meet the performance and largest motor starting requirement of the generator.

6.5 **Voltage Regulator**

6.5.1 The generator shall have electronic voltage regulators to be mounted on the Alternator. The regulator system shall be suitable to meet the following requirements.

- Allow the generator to meet the performance requirements.
- Prevent automatic rise of field voltage in the event of excitation supply failure.
- Operated by the output current and voltage of the generator.
- Facility to regulate both locally and from control panel in Electrical room.

6.6 **Terminal Boxes**

6.6.1 All the terminal boxes shall have IP-54 degree of protection.

6.6.2 The power terminal box shall be spacious and have adequate clearance between the terminals and the cable gland for proper termination of required nos. of aluminium cables.

6.6.3 The power terminal boxes shall be provided with tinned copper sockets suitable for crimping.

6.6.4 The control terminal boxes shall be provided with pressure type terminal blocks.

6.6.5 All terminal boxes shall be complete with a heavy duty double compression type aluminium cable glands suitable for the cable sizes required.

7.0 CONTROL PANEL

7.1 Requirements

a) The control panel shall comprise of control & instrument section, , power & protection section and distribution section for satisfactory and trouble free operation of the set.

b) The control and instrument section shall house the following:

- All the required controlling elements for the engine, generator and exciter control for both manual and automatic operations..
- Panel mounted instrument.
- The required protective devices for the engine.
- The audiovisual annunciation system indicating abnormal operating conditions.
- Control switches and indicating lamps.
- All other items, as required.

c) The power and protection section shall house the following:

- ACB / MCCB, with in-built O/C & S/C, Earth fault release, C.T.s Ammeters, Voltmeters, KWH meters, Frequency meters, ON/OFF indicating lamps, control switches etc. for the control of generator.

7.2 General Design Features

7.2.1 The GEG control panel shall be free standing, floor mounting metal clad cubicle type in construction dust /

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damp and vermin proof type equivalent to IP-52 as per IS:2147.

7.2.2 The thickness of sheet steel members shall not be less than 2/1.6 mm for cold rolled steel. Suitable reinforcement, wherever necessary, shall be provided. The base channel shall be more than 3 mm thick.

7.2.3 The door hinges shall be concealed type. All threaded screws in the removable parts shall be provided with retaining rings.

7.2.4 All the components shall be accessible for checking and taking off without the necessity of removing the adjacent ones. Their mounting shall be accessible and ensure the necessary degree of safety.

7.2.5 The meters, switches and lamps shall be flush mounted type.

7.2.6 The bus bars shall be for three phase and neutral and made of aluminium of required cross section and PVC sleeved. These shall be amply sized to carry the rated continuous current under the specified ambient temperature without exceeding the total temperature of 85 ° C.

7.2.7 The clearances and creepage distance shall not be lower the values specified below:

i) Minimum clearance between two live conductors – 20 mm.

ii) Minimum clearance between live parts and accidentally dangerous part – 20 mm.

iii) Minimum creepage distance – 28 mm.

7.3 Control Wiring

7.3.1 The GEG control panel shall be completely factory wired and ready for external connections.

7.3.2 The wiring shall be carried out with flexible stranded PVC insulated copper conductor cables for 1100 volts grade.

The size of wires shall be as follows:

C.T. Circuit	:	2.5 sq. mm. Copper
Control circuits	:	1.5 sq. mm. Copper.

7.3.3 All wiring shall be marked in accordance with IS:375. Numbered Ferrules reading from the terminals outwards shall be provided at both ends of all wiring for easy identification. These shall be interlocking type plastic ferrules.

7.4 Control Fuses

The fuses shall be of non-deteriorating HRC cartridge link type and conform to IS:2208. They shall be suitable for the load and the service required in the circuit.

7.5 Current Transformers

7.5.1 C.T.'s shall be cast resin, accuracy Class 1 as per IS: 2705, for metering.

7.5.2 All the C.T.'s shall be provided with terminals and shorting links. One of the terminals of the C.T.s shall be earthed. The polarity of the C.T.s shall be clearly marked.

7.6 Instruments And Metering

7.6.1 All instruments shall be flush mounting type with square face. They shall be tropicalised and dust tight. Make and type of instruments shall be as approved.

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7.6.2 For Analogue instrument Marking of the scale shall be black on white background and suitable for direct reading.

7.6.3 All indicating instruments shall be Digital & Accuracy Class 1 accuracy.

7.6.4 The KWH meter shall be as per IS:732 and provided with test blocks for current and voltage coils for testing them at site without interrupting their recording while in service.

7.6.5 The Multifunctional meter shall have

i) Voltmeter with selection for Phase to Phase.
ii) Ammeter with selection for all three phases.
iii) Frequency meter.
iv) Power factor meter.
v) KWH meter

7.7 Signal Lamps

LED type signal lamps shall be provided to indicate the various circuit conditions and these shall be placed at suitable height.

7.8 Name Plate

7.8.1 The panel shall have a large name plate on the top to indicate is name and designation.

7.8.2 All control switches, push buttons, lamps etc. shall have function identification labels.

7.9 Cable Termination

Necessary cable glands and lugs for power and control cables shall be provided.

7.10 4 POLE MCCB - Moulded Case Circuit Breaker

a) MCCB shall confirm to relevant ISS/International standard.
b) MCCB shall have Trip free mechanism.
c) Short Circuit and O/C, Circuit mechanism.

8.0 INSTRUMENTATION

8.1 The instrumentation requirement shall include field / panel mounted instruments, push buttons, lamps, audio-visual alarm system and other accessories as required.

8.2 The provision required in the control panel board shall include the followings:

- Audio-visual alarm & shut down system for:

  a) Low lube oil pressure
  b) High water temperature
  c) Over speed
  d) All shutdown condition
  e) Other abnormal conditions, as required
  f) Failure of engine to start after a preset time for 125 KVA.
  g) Other faults, as required

- Engine control system complete with:

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a. Remote / Manual switch
b. Push buttons and other control equipment for manual start
c. Equipment and circuitry for repeated attempt to start.
d. Indicating lamps for fail to start
e. Audio visual alarm as specified and required
f. Instrumentation as specified and required
g. Operation hour counter
h. All other items, as required.

8.3 The field mounted instruments shall include the followings:

a) Pressure gauge for lube oil.
b) Other items, as required.

8.4 The supply shall be complete with all instrument erection materials with 10% extra provision.

8.5 All instruments shall be suitable for site maximum ambient temperature. All electrical and electronic instruments shall be tropicalised and fungus proof.

9.0 ACCESSORIES

The Gas Engine Generator set shall be complete with all required accessories, whether indicated or not, to make the installation complete in all respects and to ensure its safe and proper operation.

10.0 ACOUSTIC ENCLOSURE

The acoustic enclosure shall be made of 2 mm (Min) CRCA sheet. The salient feature of the acoustic enclosures is:

i. The enclosure shall be of modular construction with provision to assemble and dismantle easily at site.
ii. The sheet metal components shall be hot dip seven tank pretreated before powder coating.
iii. The enclosure shall be powder coated (inside as well outside) with a special pure polyester based powder. All nut & bolts / external hardware shall be made from stainless steel.
iv. External drain plugs shall be provided for draining lube oil.
v. The door shall be gasketed with high quality EDPN gaskets to prevent leakage of sound.
vi. The door handles shall be lockable type.
vii. Sound proofing of the enclosure shall be done with high quality Fibre glass /rock wool / mineral wool conforming to IS : 8183 . The insulating material for sound proofing shall be further covered with fibre glass tissue and perforated sheet.
viii. Acoustic hoods with noise splitters, if required, shall be used to block and reduce the sound leakage.
ix. A high efficiency residential silencer along with associated piping and flexible bellow shall be provided in the enclosure to reduce exhaust noise.
x. Specially designed attenuators shall be provided to control sound at air entry and exit points.
xi. Adequate ventilation shall be provided to meet total air requirement. If required, a blower shall be provided to meet total air requirement.
xii. Temperature of enclosure should not exceed beyond 5°C of ambient temperature
xiii. The enclosure shall be provided with high enclosure temperature safety trip.
xiv. There shall be provision of emergency shut down from outside the enclosure.
xv. There shall be arrangement for illuminating the enclosure from inside.
xvi. Noise level shall be 75 dBA at 1 m distance from enclosure.
xvii Earthing points on the body of the enclosure shall be isolated through DMC insulator mounted on the enclosure .
xviii Alarm system.

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11.0 COUPLING AND MOUNTING ARRANGEMENT

The engine and alternator shall be directly coupled by a SAE flange and mounted through AVM pads on a heavy duty steel base frame. The arrangement ensures that there will be no chance of misalignment of the Gas Engine generator and vibrations of the Gas Engine Generator set shall not be transmitted to the base frame and to the enclosure. The battery shall be kept in a separate tray inside the enclosure.

12.0 PAINTING

The enclosures, after suitable pre-treatment, shall be painted with two coats of anti rust paint followed by two coats of anti-corrosive epoxy based paints or Powder coated.

13.0 TESTS AND INSPECTION

13.1 All routine tests as per relevant standards shall be carried out in the presence of purchaser's representative.

13.2 The Gas Engine Generator set shall be tested for output, general performance, overloads and other tests sufficient to prove the correctness of the design both at works and at site.

13.3 In addition, the equipment shall be subjected to stage inspection during process of manufacture at works and site inspection.

13.4 These inspections shall, however, not absolve the vendor free from his responsibility for making good any defect which may be noticed subsequently.

13.5 Third party inspection shall be arranged by the contractor and charge so incurred shall be borne by the contractor.

14.0 SPARES

Item wise unit prices for spare parts with recommended quantity shall be quoted along with main equipment. The spares quoted shall include, in addition to, the items listed in Annexure-I, any other spares considered to be necessary.

15.0 DRAWING AND DOCUMENTS

Drawings and documents as per Annexure-II shall be supplied. All drawings and documents shall have the following descriptions written boldly.

- Name of client
- Name of consultant
- Project / Plant name
- Order no.
- Description of equipment.

16.0 DEVIATIONS

Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning. Deviations, if any, from the data indicated in Particular Technical specification sheet shall be shown clearly by encircling it and the revised data shall be indicated besides the same.

17.0 PACKING

17.1 The equipment shall be properly packed before despatch to avoid damage during transport, storage and handling.

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17.2 The equipment shall be wrapped in polythene to make it water proof. Bags of silica gel shall be kept inside to absorb moisture present during transport and storage. An additional wrapping with bitumen paper shall also be provided before the equipment is packed in wooden crates.

17.3 A sign indicating the position of the equipment placed during transport and storage shall be clearly marked. Also proper arrangement shall be provided to handle the equipment.

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ANNEXURE - I

1. LIST OF SPARES – MANDATORY

The spare parts as listed below shall be quoted for the Gas Engine Generator set along with the offer with item wise unit prices:

1. Kit comprising of water filter, lube oil filter, for 2 years of operation, considering 6 hours operation per day.
2. Air filter – 2 Nos.
3. Spark Plug – 6 Nos.
4. Fuses of all ratings.

2. EMERGENCY SPARES

(1) AVR – 1No.

(2) Diodes – 6 Nos (3 Nos. for forward operation & 3 Nos for backward operation).

3. LIST OF SPARES – FOR 2 YEARS OPERATION

A. FUSES (OF EACH RATING)

i) Fuse links

ii) Fuse fittings

B. CONTROL SWITCHES

i) Local-Remote Selector Switch

ii) Push Button

C. AUX. CONTACTOR

D. INDICATING LAMPS – of each colour with accessories e.g. globe, holder etc.

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ANNEXURE – II

DOCUMENTATION FOR GAS ENGINE GENERATOR SET

S.No	Description	With Bid No. of copies	After Order			
			For Review		Final	
			No of Copies	No. of weeks	No. of copies	No. of weeks
1	Technical Particulars	1	6	2	8+1R	2 W
2	General arrangement and foundation drg. For all the equipment	-	6	2	8+1R	2 W
3	GA, schematic and wiring diagram of AMF panel & control panel.	-	6	2	8	2 weeks
4	Terminal arrangement drg. And interconnection	-	6	2	8+1R	2 W
5	Sectional view of Gas Engine Generator set	-	-	-	8+1R	2 W
6	Illustrative and descriptive literature.	-	-	-	8	2 W after inspection
7	Catalogue for bought out accessories	-	-	-	8	-do
8	Installation operation & maintenance manual	-	-	-	8	-do
9	Type test certificates for engine, alternator and circuit breaker	-	6	2	8	-do-
10	Guarantee certificate	-	-	-	8	-do-
11	Spare parts list with identification	1	6	2	8	2 W
12	Bill of Material	-	6	2	8	2W
13	QAP	1	6	2	8	2W
14	Cable Schedule	-	6	2	8	2 W
15	Routine test Certificate	-	-	-	8	2W after inspection
16	As Built drawing for GEG set	-	-	-	8	

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QUALITY ASSURANCE PLAN
VRLA BATTERY

Drawing No. P.019141 G11013 E001
Date: 23.09.2024
Project:-Mother station Hyderabad , Composite works)
Client: BGL
Consultant:PMC

SR.NO	COMPONENTS	QUALITY CHARATERSTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE / ACCEPTA NCE	FORMAT /RECORD	AGENCY			REMARKS
								M	C	TPIA	
RAW MATERIAL AND BOUGHT OUT ITEMS											
1	Cell Container (Polypropylene)	Dimensional conformance	Major	Measurement	Sampling as per IS- 2500,2000 part-1 inspection level(S-4)	Drg.Specs	Inspection Report	P	R	R	
		Material quality	Major	Impact strength	1 NO of every	As per IS 1146 TI-Section 17	Inspection Report	P	R	R	
		Colour shade,warpage at top & side walls,flash on edges & parting line etc	Major	Visual inspection	Sampling as per IS- 2500,2000 part-1 inspection level(S-4)	Drg.Spec s	Inspection Report	P	R	R	
2	Terminal Post	Dimensional confirm	Major	Measurement	Sampling as per IS- 2500,2000 part-1			P	R	R	
		Thread size	Major	Visual inspection	Sampling as per IS- 2500,2000 part-2			P	R	R	
		Free from defects	Major	Visual inspection	Sampling as per IS- 2500,2000 part-1			P	R	R	
3	Spacing ring	Dimensional confirm	Major	Measurement	per IS-2500,2000 part-1 inspection	Drg.Specs	Inspection report	P	R	R	
		Plating quality	Major	Thickness Measurement	Sampling as per IS-2500,2000 part-1 inspection level(S-4)	Drg.Specs	Plating report	P	R	R	
4	Stud &Nut	Dimensional confirm	Major	Measurement	Sampling as per IS-2500,2000 part-1 inspection level(S-4)	Drg.Specs	Inspection report	P	R	R	
		Thread size	Major	Gauging & visual inspection	Sampling as per IS-2500,2000 part-1 inspection level(S-4)	Drg.Specs	Inspection report	P	R	R	
		Free from defects	Major	Visual inspection	Sampling as per IS-2500,2000 part-1 inspection level(S-4)	Drg.Specs	Inspection report	P	R	R	
5	Inter cell connector	Material conformance	Major	Hardness&cond activity check	one sample	Drg.Specs	Test Report	P	R	R	
		Dimensional conformance	Major	Measurement	per IS-2500,2000 part-1	Drg.Specs	Inspectionreport	P	R	R	
6	Tab	Dimensional conformance	Major	Measurement	per IS-2500,2000 part-1	Drg.Specs	Inspectionreport	P	R	R	
		Plating quality	Major	Thickness	per IS-2500,2000 part-1	Drg.Specs	Plating report	P	R	R	
7	Plastic/Nylon Component	Dimensional conformance	Major	Measurement	per IS-2500,2000 part-2	Drg.Specs	Inspectionreport	P	R	R	
		Free from defects	Major	Visual inspection	Sampling as per IS-2500,2000 part-2	Drg.Specs	Inspection report	P	R	R	
8	Rubber components(Gasket & Sealing ring etc)	Material quality	critical	Shore hardness(Rubb er	Sampling as per IS-2500,2000 part-3	Drg.Specs	inspectionreport & Test	P	R	R	
		Dimensional conformance	Major	Measurement	per IS-2500,2000	Drg.Specs	inspection report	P	R	R	
		Free from defects	Major	Visual inspection	PER IS-2500,2001	Drg.Specs	inspection report	P	R	R	
IN PROCESS INSPECTION											
1	Plateblank manufacturing	Dimensional conformance	Major	Measurement	part-1 inspection level(S-4)	MPI Section:7	Process quality reports	P	R	R	
		Conformance of plate blank weights	Major	Weighting	part-1 inspection level(S-4)	MPI Section:7	Process quality reports	P	R	R	
		Absence of defects	Major	Visual inspection for empty	100%	MPI Section:7	Process quality reports	P	R	R	
2	Plate assembly	Dimensional conformance	Major	Measurement of plate thickness & width	IS:2500,2000 part-1 inspection level(S-4)	MPI Section:7	Process quality reports	P	R	R	
		quality of spot welding	Major	visual inspection	100%	MPI Section:8	Process quality reports	P	R	R	
		Absence of defects and damages	Major	visual inspection	100%	MPI Section:8	Process quality reports	P	R	R	
3	Plate block assembly	Assembly correctness of +ve &-ve groups	Major	Visual inspection and cofirmation for	100%	MPI section-13	Process quality reports & route tags	P	R	R	
		Correctness of insulation	Major	visual inspection	100%	MPI section-13	Process quality reports &	P	R	R	
		Tightness of strapping & damages	Major	Visual inspection for position and No of straps	100%	Mpi Section 14	Process quality reports & route tags	P	R	R	
		Plate block tightness	critical	Torqing of stud nuts	100%	Mpi Section 14	process auality	P	R	R	
		Correctness of plate blocks	Major	visual inspection	100%	Mpi Section:1 8,19	Process quality reports & route tags	P	R	R	
		Correctness of plate blocks	Major	visual inspection	100%	MPI:18,19	Process quality reports & route tags	P	R	R	

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QUALITY ASSURANCE PLAN
VRLA BATTERY

Drawing No. P.019141 G11013 E001
Date: 23.09.2024
Project:-Mother station Hyderabad ,jind sonipat (Composite works)
Client: BGL
Consultant:PMC

SR.NO	COMPONENTS	QUALITY CHARATERSTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE / ACCEPTA NCE	FORMAT /RECORD	AGENCY			REMARKS
								M	C	TPIA	
		position of inner sealing parts	Major	visual inspection	100%	MPI:18,19	Process quality reports & route tags	P	R	R	
4	Cell assembly	Lock washer sealing parts	Major	visual inspection for proper locking	100%	MPI :21	Process quality reports & route tags	P	R	R	
		Polaity of terminals	Major	Checking according to polarity marking	100%	MPI :21	Process quality reports & route tags	P	R	R	
		Soundness of sealing & welding(leak test)	Major	Pnematic pressure test at 0.5 kg/sq.cm	100%	MPI :23	Process quality reports & route tags	P	R	R	
FINAL INSPECTION AND TESTING											
1	CELL Testing	Physical examination	Major	viaual inspection	sample as per IS-8320	IS:10918	Acceptance test certificate	P	W	W	
		Cell Designation	Major	visual inspection for cell type Si.No	sample as per IS-8320	IS:10918	Acceptance test certificate	P	W	W	
		Dimension,mass & layout	Major	Measurement of cell dimension,weig ht & GAD	sample as per IS-8320	Drg spec& GAD	Acceptance test certificate	P	W	W	
		Cell marking & content of type stickers	Major	Identification of cells	sample as per IS-8320	IS:10918	Acceptance test certificate	P	W	W	
2		Polarity and absence of short circuit	Major	Voltage measurement according to polarity	sample as per IS-8320	IS:10918	Acceptance test certificate	P	W	W	
		Air Pressure Test	Major	Measurement og pressure drop with in 15 seconnds	sample as per IS-8320	IS:10918	Acceptance test certificate	P	W	W	
		Insulation Resistance Test	Major	Megger test(250v dc)	sample as per IS-8320	IS:10918	Acceptance test certificate	P	W	W	
		AH capacity test	Major	Discharge performance of cells at 0.22c5 rate	sample as per IS-8320	IS:10918	Acceptance test certificate	P	W	W	
PRESERVATION & PACKING											
1	Packing and despatch	Comformance of packing spec	Major	Verification of packing method	100%	MPI:30	Packing check list	P	R	R	
		Conformance quality product to spec	Major	visual as per check sheat	100%	MPI:30	Packing check list	P	R	R	
2	IRN	Inspection Release Note						H	H	P	
LEGEND:											
R:Review		H-HOLD		M-Manufacturer							
P:Performed		C-Contractor		W:Witness							
ority : Owner/Engineer or their Authorised Inspection Agency.											

Note:	1. The Above Testing and acceptance criteria are minimum requirements, however, equipment supplier shall ensure and that the product also comply to the additional requirements as per Technical specifications and data sheets.
	2. The supplier shall submit their own detailed QAP prepared on the basis of the above for approval of Owner/Owner's representative and TPIA.
	3. Supplier shall submit Calibration certificates of all Instruments/Equipment to be used for Inspection and Testing to TPIA with relevant procedures and updated standards for TPIA review/Approval.
	4. TPIA will have Right to Inspect minimum 10% of all manufacturing activities on each day or as specified above.
	5. TPIA along with Owner/Owner representative shall review/approve all the documents related to QAP/Quality manuals/Drawings etc.submitted by supplier.
	6. TPIA shall also Review the Test certificates submitted by the manufacturer.
	7. Contractor shall in coordination with Supplier/Sub vendor shall issue detailed Production and Inspection schedule indicating the dates and the locations to facilitate Owner/Owner's representative and TPIA to organise Inspection.

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QUALITY ASSURANCE PLAN UPS SYSTEM

Drawing No. P.019141 G11013 E002
Date: 23.09.2024
Project: Hyderabad Mother Station (Composite Works)
Client: BGL
Consultant:PMC

SR.NO.	ITEM/COMPONENT	CHARACTERSTICS	TYPE OF CHECK	QUANTUM	REFERENCE DOCUMENT	ACCEPTANCE NORMS	RECORD	AGENCY			REMARKS
								M	C	TPIA	
	Raw Material Inspection										
1	Power Transformer Current Transformer	Dimension,HV,NL Voltages, Finishing, Marking/ Labeling	Visual Physical Check	100%	GRN,WI Drawing,Mfr TR	Compliance to the Applicable Document.	Test Certificate	P	R	R	
2	Enclosures	Dimension,Coating,Thickness	Visual Measurement	01/Batch	GRN,WI Drawing,Mfr TR	Compliance to the Applicable Document.		P	R	R	
3	Fabricated & Punched Items.	Dimension, Punching	Visual	01/Batch	GRN,WI Drawing,Mfr TR	Compliance to the Applicable Document.		P	R	R	
4	Heat Sink	Dimension,Surface,Finishin g,Mounting holes	Visual Measurement	100%	GRN,WI Drawing,Mfr TR	Compliance to the Applicable Document.		P	W	W	
5	Rubber items	Dimension, Finish	Visual Measurement	10%	GRN,WI Drawing,Mfr TR	Compliance to the Applicable Document.		P	W	W	
6	Bus-bars & Hardware	Dimension, Finish	Visual Measurement	100%	GRN,WI Drawing,Mfr	Compliance to the Applicable Document.		P	W	W	
7	Switch gears	Physical, NO/NC, Auxiliary contacts	Visual Inspection	100%	GRN,WI Drawing,Mfr TR	Compliance to the Applicable Document.	Test Certificate	P	R	R	
8	Fuses & Fuse Holder	Physical, continuity type	Visual	100%	GRN,WI Drawing,Mfr TR	Compliance to the Applicable Document.		P	W	W	
9	Capacitor	Physical/Rating	Visual	100%	GRN,WI Drawing,Mfr	Compliance to the Applicable Document.		P	R	R	
10	Semiconductor Device	Physical	Visual	100%	GRN,WI,Catalog	Compliance to the Applicable Document.	Test Certificate	P	W	W	
11	Wires, Cables	Physical,HV,Type	Visual Measurement	100%	GRN,WI,Catalog	Compliance to the Applicable Document.	Test Certificate	P	W	W	
12	Fans	Smooth runing,Physical	Visual Measurement	100%	GRN,WI,Catalog	Compliance to the Applicable Document.		P	W	W	
13	Indicating Devices	Physical & Test	Visual Measurement	100%	GRN,WI,Catalog	Compliance to the Applicable Document.		P	W	W	
14	Meters	Physical ,Accuracy	Visual Measurement	100%	GRN,WI,Cat along	Compliance to the Applicable Document.	Test Certificate	P	R	R	
15	PCBS	Material,Tracks,Levelling	Visual	100%	GRN,WI,Catalog	Compliance to the Applicable Document.	Test Certificate	P	R	R	
16	Rating Plate	System Details	Visual	100%	Drawing	Compliance to the Applicable Document.		P	W	W	
17	Cabling& wiring	Routing,Tying,finishing,colo r code,ferulling	Visual continuity	100%		Compliance to the Applicable Document.	Internal Test Report	P	R	RW	
	In process Inspection										
1	Enclosure	Degreasing,Derusting,Deburring,Phosphatising,P assivation , Cable gland plate				IS 6005 & No burrs & as per drawing	Test Certificate	P	R	RW	
2	Busbar	Material (Cu),. Size (Thickness/Width	Visual	100%	IS 5082	IS 5082	Test Certificate	P	R	RW	
		Finish Uniformity	Visual	100%		No Burrs	Test Certificate	P	R	RW	
3	PCB&Electronic componentsub assemblies	Burn in test for 96 hrs at 50 degree	Electrical	100%	Spec./Data sheet		Test Certificate	P	R	R	

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QUALITY ASSURANCE PLAN UPS SYSTEM

Drawing No. P.019141 G11013 E002
Date: 23.09.2024
Project: Hyderabad Mother Station (Composite Works)
Client: BGL
Consultant:PMC

SR.NO.	ITEM/COMPONENT	CHARACTERSTICS	TYPE OF CHECK	QUANTUM	REFERENCE DOCUMENT	ACCEPTANCE NORMS	RECORD	AGENCY			REMARKS
								M	C	TPIA	
FUNCTIONAL TEST											
1	Functional Test /Acceptance Test	Dimensions, setting of parameters, Load Test, HV Test,Transfer-Re transfer, Performance test ,Regulation, Efficiency, Noise Levek,Auxilary Modules,Annuciation,Alarm s Over load,THD(at Linear Load),Transient & Dynamic response test (50%,75% & 100% load),Fault diagonstc check, RTU-Modbus interface test, AC input failure & return test, Simulation of parallel retundant UPS fault,short circuit capability test,short circuit fuse clearance test,	Electrical Visual Physical	100%	IEC-6240-3 ,IS-8624/25,Specification and Test Report	Internal Test Report Format	TEST REPORT	P	W	W	
2	Heat run test	Continious full load test fopr 32 hrs at 0.8 pf with temp.rise measurement		1 sample	IEC-6240-3 ,IS-8624/25,Specification and Test Report		TEST REPORT	P	W	W	
3	UPSDB, & Cell booster	Visual ,rating details, All acceptance tests	Visual Electric	100%	Approved docs/spec.		TEST REPORT	P	W	W	
4	Paint shade& thickness	Uniform Coating, Colour	Visual	100%	IS 5 & Approved Data sheet	IS 5 & Approved Data sheet	TEST REPORT	P	W	W	
5	Degree of protection	Degree of Protection	Certificate		IS 2147	IS 2147		P	R	R	
6	Inspection Release Note			100%	IRN		Inspection Report	H	H	P	

LEGEND:						
R:Review	H-HOLD		M-Manufacturer			
P:Performed	C-Contractor		W:Witness			

TPIA: Third Party Inspection Agency; Control Authority : Owner/Engineer or their Authorized Inspection Agency.

Note: 1. The Above Testing and acceptance criteria are minimum requirements, however, equipment supplier shall ensure and that the product also comply to the additional requirements as per Technical specifications and data sheets.

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	2. The supplier shall submit their own detailed QAP prepared on the basis of the above for approval of Owner/Owner's representative and TPIA.
	3. Supplier shall submit Calibration certificates of all Instruments/Equipment to be used for Inspection and Testing to TPIA with relevant procedures and updated standards for TPIA review/Approval.
	4. TPIA will have Right to Inspect minimum 10% of all manufacturing activities on each day or as specified above.4.
	5. TPIA along with Owner/Owner representative shall review/approve all the documents related to QAP/Quality manuals/Drawings etc.submitted by supplier.
	6. TPIA shall also Review the Test certificates submitted by the manufacturer.
	7. Contractor shall in coordination with Supplier/Sub vendor shall issue detailed Production and Inspection schedule indicating the dates and the locations to facilitate Owner/Owner's representative and TPIA to organise Inspection.

QUALITY ASSURANCE PLAN
POWER & CONTROL CABLES

Drawing No.P.019141 G11013 E003
Date: 23.09.2024
Project: Hyderabad Mother Station (Composite Works)
Client: BGL
Consultant:PMC

SL NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	AGENCY			REMARKS
								M	C	TPIA	
I	RAW MATERIALS										
1	CONDUCTOR: Copper/Aluminum (As Applicable)	1. Surface Finish	B	Visual	Each cable Drum	The Conductor Shall be Smooth & free from scratches & burrs	The Conductor Shall be Smooth & free from scratches & burrs	P	R	R	
		2. Diameter/ Dimensions	B	Physical	One Sample from lot of 10 Bobbins/drums or part there of	approved Datasheet	approved Datasheet & IS 8130'84	P	R	R	
		3. Conductor Resistance at 20 deg C	C	Physical	----DO.....	--DO—	----DO-----	P	R	R	
		4. Annealing Test	C	Physical	----DO.....	----DO-----	--DO—	P	R	R	
		5. Tensile Test	C	Physical	----DO.....	----DO-----	--DO—	P	R	R	
		6. Wrapping Test	C	Physical	----DO.....	----DO-----	----DO-----	P	R	R	
2	PVC Compound (Insulation & Sheath)	1. Visual Check of PVC Granules	A	Visual	Two samples per lot of 10 MT or part there of Each lot	Should be free from foreign particles	Should be free from foreign particles	P	W	W	
		2. Type of Compound	C	Visual		Specification of PVC Compound IS 10810 part 7 IS 5831	Specification for PVC Compound	P	R	R	
		3. Tensile Strength & Elongation	C	Physical	One samples per lot of 10 MT or part there of Each lot		----DO-----	P	R	R	
		4. Thermal Stability	C	Physical		IS 10810 Part 60	----DO-----	P	R	R	
		5. Insulation Resistance at 27^0 C & 70^0 C	C	Electrical		IS 1554 Part I 1988	Min.required $1x10^{13}$OHM-CM at 27^0 C & Min.required $1x10^{10}$OHM-CM at70^0	P	R	R	
3	ARMOUR	1. Surface Condition	A	Visual	Three samples per lot of 10 MT or part there of Each lot	Should be free from white spots , oxidation	Should be free from white spots , oxidation	P	R	R	
		2. Uniformity of Zinc Coating	C	Chemical	—DO.....	IS 2633	IS 2633	P	R	R	
		3. Mass of Zinc Coating	B	Chemical	—DO.....	----DO-----	----DO-----	P	R	R	
		4. T.S. & Elongation	B	Physical	—DO.....	IS 3957	IS 3957	P	R	R	
		5.Torsion/ Winding	B	Physical	—DO.....	----DO-----	----DO-----	P	R	R	
II	PROCESS INSPECTION										
4	Insulation	1. type of Insulation Compound	B	Visual	Each setting & once in shift each setting & the end of each drum length	Approved Datasheet	Approved Datasheet & Costumer's Spec.	P	R	R	
		2. Dia. Over Conductor	B	Physical		Approved Datasheet	Approved Datasheet	P	R	R	
		3. Dia over Core	B	Physical	Each Setting & twice in a shift	Approved Datasheet	Approved Datasheet	P	R	R	
		4. Thickness of Insulation (Avg. Min)	C	Physical	—DO.....	Approved Datasheet & IS 1554-Part I	Approved Datasheet & IS 1554-Part I	P	R	R	
		5. Spark Testing	C	Electrical	100% each setting & twice in a shift , Each setting & twice in a Shift	Approved Datasheet	Approved Datasheet	P	R	R	
		6. Surface Finish	B	Visual		Should be smooth & free from porosity	Should be smooth & free from porosity	P	R	R	
		7. Colour	B	Visual		Approved Datasheet & Customer's Specs.	Approved Datasheet & Costumer's Spec.	P	R	R	

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		8. Core Printing	B	Visual	100%			P	R	R	
		9. Continuity of Conductor as applicable	C	Electrical			Conductor of core should show continuity	P	W	W	
5	Core rewinding as required	1. Spark Test	C	Electrical	On each std. length & in multiple of it as required	No spark test failures during mfg/rewinding at specified voltage	No Failure allowed	P	R	R	
6	LAYING -UP	1. Sequence of Cores	C	Visual	Each Setting & twice in a shift	Approved Datasheet & IS 1554-I	Should be free from foreign particles	P	R	RW	
		2. Directing of Lay	C	Visual	—DO.....	----DO-----	Specification for PVC Compound	P	R	RW	
		3. Diameter of Over Laid up	B	Physical	----DO-----	Approved Datasheet	----DO-----	P	R	RW	
		4. Lay Length	B	Physical	----DO-----	Approved Datasheet	----DO-----	P	R	RW	
7	Inner Sheath	1. Type of PVC	B	Visual	Each Setting & at the end of each Drum Length	Approved Datasheet & IS 1554-I	Approved Datasheet & IS 1554-I	P	R	R	
		2. Diameter over Indup Cores	B	Physical	Each Setting & at the end of each Drum Length	Approved Datasheet & IS 1554-I	Approved Datasheet & IS 1554-I	P	R	R	
		3. Thickness of Inner sheath	C	----DO-----	—DO.....	Approved Datasheet & IS 1554-I	Approved Datasheet & IS 1554-I	P	R	R	
		4. Surface Finish & Colour	B	Visual	—DO.....	Should be generally free from porosity	Should be generally free from porosity	P	R	R	
8	Armouring	1. No. of Strips / wires	B	Visual	Each Setting & Once in a Shift	Approved Datasheet	Approved Datasheet	P	R	R	
		2. Dimension of Strips/wires	B	Physical	—DO.....	Approved Datasheet & IS 3975 -88	Approved Datasheet & IS 3975 -88	P	R	R	
		3. Direction of Lay	B	Visual	Each Setting & in each Drum	----DO-----	----DO-----	P	RW	RW	
		4. Lay Length	B	Physical	Each Setting	----DO-----	----DO-----	P	RW	RW	
		5. Strips / wire welding	B	Visual	In Each Drum	The Joint shall be smooth without burrs	The Joint shall be smooth without burrs	P	R	R	
		6. Diameter over armour	B	Visual	Each Setting & once in Shift	Approved Datasheet	Approved Datasheet	P	R	R	
9	Outer Sheath	1. Type of PVC Compound	C	Physical	Each Setting & twice in a shift	Approved Datasheet & IS 1554-I	Approved Datasheet & IS 1554-I	P	R	R	
		2. Thickness Average/Minimum	C	Physical	At Each Steeing twice in a shift	----DO-----	----DO-----	P	R	R	
		3. Dia over Outer Sheath	B	Physical	Each Setting &	Approved Datasheet	Approved Datasheet	P	R	R	
		4. Colour	B	Visual	----DO.....	Approved Datasheet	Approved Datasheet	P	R	R	
		5. Surface Finish	B	Visual	----DO.....	Surface shall be smooth & free from porosity	Surface shall be smooth & free from porosity	P	R	R	

QUALITY ASSURANCE PLAN
POWER & CONTROL CABLES

Drawing No.P.019141 G11013 E003
Date: 23.09.2024
Project: Hyderabad Mother Station (Composite Works)
Client: BGL
Consultant:PMC

SL NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	AGENCY			REMARKS
								M	C	TPIA	
		6.Embossing/Printing/Sequential Marking	B	Visual	Each Setting & twice in a shift	Approved datasheet & Customer's Specification	Approved datasheet & Customer's Specification	P	R	R	
10	Cable	High Voltage Test	C	Electrical	Applying 3 KV for 5 Min.Between Each Core to all other Core & armoured	Approved Datasheet & IS 5831-1984	Approved Datasheet & IS 5831-1984	P	W	W	
III	**Routine Test**										
11	(Test by Manufacturer only)	1. Conductor Resistance	B	Physical	One Sample from lot of 10 Bobbins/drums or part there of	Approved Datasheet	Approved Datasheet & IS 8130-84	P	W	W	
		2. High Voltage Test	C	Electrical	Min.Between Each Core to all other Core & armoured	Approved Datasheet & IS 5831-1984	Approved Datasheet & IS 5831-1984	P	R	R	
IV	**Acceptance Test**										
12	(Sampling as per IS Spec.)	1. High Voltage Test	C	Electrical	Applying 3 KV for 5 Min.Between Each Core to all other Core & armoured	Approved Datasheet & IS 5831-1984	Approved Datasheet & IS 5831-1984	P	W	W	
		2. Conductor Resistance	B	Physical	One Sample from lot of 10 Bobbins/drums or part there of	Approved Datasheet	Approved Datasheet & IS 8130-84	P	W	W	
		3. Thickness of Insu. & Sheath	C	Physical	Each Setting & twice in a shift	Approved Datasheet & IS1554-Part I	Approved Datasheet & IS1554-Part I	P	W	W	
		4. Insulation Resistance at 27^0 C & 70^0 C	C	Electrical	One samples per lot of 10 MT or part there of Each lot	The Joint shall be smooth without burrs	The Joint shall be smooth without burrs	P	W	W	
		5. Tensile Strength & Elongation	B	Visual	Each Setting & in each Drum	Approved Datasheet	Approved Datasheet & IS 8130-84	P	W	W	

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VI		IRN			Document			H	H	P		
LEGEND:												
R:Review		H-HOLD		M-Manufacturer								
P:Performed		C-Contractor		W:Witness								
TPIA: Third Party Inspection Agency; Control Authority : Owner/Engineer or their Authorised Inspection Agency.												
Note:	1. The Above Testing and acceptance criteria are minimum requirements, however, equipment supplier shall ensure and that the product also comply to the additional requirements as per Technical specifications and data sheets.											
	2. The supplier shall submit their own detailed QAP prepared on the basis of the above for approval of Owner/Owner's representative and TPIA.											
	3. Supplier shall submit Calibration certificates of all Instruments/Equipment to be used for Inspection and Testing to TPIA with relevant procedures and updated standards for TPIA review/Approval.											
	4. TPIA will have Right to Inspect minimum 10% of all manufacturing activities on each day or as specified above.4.											
	5. TPIA along with Owner/Owner representative shall review/approve all the documents related to QAP/Quality manuals/Drawings etc.submitted by supplier.											
	6. TPIA shall also Review the Test certificates submitted by the manufacturer.											
	7. Contractor shall in coordination with Supplier/Sub vendor shall issue detailed Production and Inspection schedule indicating the dates and the locations to facilitate Owner/Owner's representative and TPIA to organise Inspection.											

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QUALITY ASSURANCE PLAN
DISTRIBUTION BOARD

Drawing No. P.019141 G11013 E004
Date: 23.09.2024
Project: Hyderabad Mother Station (Composite Works)
Client: BGL
Consultant:PMC

S.No.	COMPONENT/OPERATION	CHARACTERISTICS CHECKED	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
								M	C	TPIA	
1	**BOUGHT OUT ITEMS**										
1.1	Sheet Steel	1. Dimensions (L* W * T) 2. Bend Test 3 Chemical Analysis	Measuring Tape Physical Test Verification of Test Certificate	1 in Lot	Approved Drawing	Test Certificate		P	R	W	
1.2	Wire	1. Dimensions, Size 2. Routine test	Micrometer Multimeter	1 in Lot	Approved drawing	Test Certificate		P	R	W	
1.3	Bus Bars	1. Dimension 2. Conductivity 3. Material Grade	Measuring Tape Conductivity meter Verification of Test Certificate	1 in Lot	Approved drawing	Test Certificate		P	R	W	
1.4	ACB's, MCCB's, Switches, Fuse Contactors, O/L Relay, Timers, MCBs Terminal Blocks, Control, Indicating & Measuring Instruments, CT, PT, Control Transformer & Protection Relays etc.	1. Physical Check 2. Type & Rating 3. Make 4. Coil Voltage 5. Operation 6. Continuity (ON-OFF) 7. Test Certificate (if any)	Visual Visual Visual Visual Electrical Electrical For Record	100%	Approved Drawing	Manufacturer's Catalogue		P	R/W	W	
1.5	Paint	1. Shade & Type	Verification of Packing Slip	100%	Approved Drawing	Approved Drawing		P	W	W	
1.6	Push Buttons, SFU, Indicating lamps, Fuse etc.	1. Physical Check 2. Type & Rating 3. Operation 4. Continuity (ON-OFF)	Visual Visual Electrical Multimeter	100% 100% 10% 10%	Approved Drawing	Approved Single Line Diagram		P	W	W	
2	**IN-PROCESS**										
2.1	Fabrication	1. Welding 2. Frame Size 3. Door Size & dimensions Cut outs 4. Workmanship	Visual Measurement	Sample 100%	Approved Drawings/Specs	Smooth & at same gap As per GA No dent, wrinkle etc.		P	R/W	W	
2.2	Painting	1. Surface preparation 2. Paint Thickness 3. Finish Uniformity	Visual Coat Guage Visual Measurement	100%	Approved Drawings/Specs	No rust Same & Uniform texture As per drawing As per drawing As per specified torque > 25 mm. > 19 mm.		P	W	W	
2.3	Busbaring	1. Material (Al/Cu) 2. Size (Thickness/Width) 3. Busbar Tightening 4. Phase to phase clearance 5. Phase to earth clearance 6. Spacer b/n //el busbar 7. Check for burrs	Visual Visual	100% Sample		equal to busbar size NO Burrs		P	W	W	
2.4	Wiring	1. Size of wire	VERNIER CALIPER	Sample	Approved Drawings/Specs	As per drawing		P	R/W	R/W	
		2. Colour of wire	Visual	100%		AS PER STANDARD		P	R/W	R/W	
		3. Ferrules	Visual	100%	Approved Drawings/Specs	As per drawing		P	R/W	R/W	
		4. Sleeve Size	Visual	100%		AS PER STANDARD		P	R/W	R/W	
		5. Terminals	Visual	100%		As per requirement		P	R/W	R/W	
		6. Wiring Layout	Visual	100%		As per requirement		P	R/W	R/W	
		7.Accessibility	Visual	100%		As per requirement		P	R/W	R/W	
		8.Correctness of wiring	Electrical	100%	Approved Drawings/Specs	As per drawing		P	R/W	R/W	
2.5	Gasket	Fitment	Visual	100%		As per requirement		P	R	R	
2.6	Functional	Functional & interlock checks	Electrical	100%	Approved Drawings/Specs	As per Drawing Scheme		P	W	W	
3	**FINAL INSPECTION**							P			
		a) Verification Of BOM	Visual	100%	Approved Drawings/Specs	As per GA, SLD & BOM		P	R	R	
		Layout & Dimensions						P			
		b) IR-HV-IR Test	Electrical	100%		as per IS 13947		P	W	W	
		c) Functional Checks	Electrical	100%	Approved Drawings/Specs as per IS 13947	as per IS 13947		P	W	W	
								P			

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		d) Fixing Of Gasket	Visual	100%		Proper closing of door		P	W	W	
		e) Operation Of Equip.	Electrical	100%		As per Drawing Scheme		P	W	W	
		g) Finishing Of Panel	Visual	100%		No scratch, dent etc.		P	W	W	

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QUALITY ASSURANCE PLAN
DISTRIBUTION BOARD

Drawing No. P.019141 G11013 E004
Date: 23.09.2024
Project: Hyderabad Mother Station (Composite Works)
Client: BGL
Consultant:PMC

S.No.	COMPONENT/OPERATION	CHARACTERISTICS CHECKED	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
								M	C	TPIA	
		h) Fitting Of Equipments	Visual	100%		No Loose fitting		P	W	W	
		i) CT Ratio / Current Injection	Electrical	on client request				P	R	R	
		j) Physical Inspection	Visual	100%	IS 13947	IP - 42(min)		P	R	R	
4	**PACKING FOR DESPTCH**										
		1.Weather proof packing	Visual	100%	Approved Drawings/Specs	As per requirement		P			
		2. Wooden packing	Visual	100%		As per requirement		P			
		(if required by client)						P			
		3. Each panel Identification	Visual	100%		Project & Panel Name		P			
		4. Display of Top & Front	Visual	100%		Display in Bold letters		P			
	Documentation							P	R	R	
	IRN	INSPECTION RELEASE NOTE						P	H	P	
5	**Commissioning at site**	1. Commissioning as per client requirement		100%				P			
								P	W	W	
								P			
LEGEND:								P			
R:Review		H-HOLD		M-Manufacturer				P			
P:Performed		C-Contractor		W:Witness				P			
TPIA: Third Party Inspection Agency; Control Authority : Owner/Engineer or their Authorised Inspection Agency.								P			
								P			

Note:	1. The Above Testing and acceptance criteria are minimum requirements, however, equipment supplier shall ensure and that the product also comply to the additional requirements as per Technical specifications and data sheets.
	2. The supplier shall submit their own detailed QAP prepared on the basis of the above for approval of Owner/Owner's representative and TPIA.
	3. Supplier shall submit Calibration certificates of all Instruments/Equipment to be used for Inspection and Testing to TPIA with relevant procedures and updated standards for TPIA review/Approval.
	4. TPIA will have Right to Inspect minimum 10% of all manufacturing activities on each day or as specified above.4.
	5. TPIA along with Owner/Owner representative shall review/approve all the documents related to QAP/Quality manuals/Drawings etc.submitted by supplier.
	6. TPIA shall also Review the Test certificates submitted by the manufacturer.
	7. Contractor shall in coordination with Supplier/Sub vendor shall issue detailed Production and Inspection schedule indicating the dates and the locations to facilitate Owner/Owner's representative and TPIA to organise Inspection.

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QUALITY ASSURANCE PLAN SILENT GEG SET

Drawing No P.019141 G11013 E005
Date: 23.09.2024
Project:- Hyderabad mother station (composite works)
Client: BGL
Consultant:PMC

S.No	COMPONANTS	CHARACTERSTICS	CLASS	METHOD OF CHECKS	QUALITY OF CHECK	REF. DOCUMENT	ACCEPTANCE NORMS	M	C	TPIA	REMARKS
STAGE - 1											
1	BASE FRAME	DIMENSIONS	MAJOR	STEEL TAPE	100%	Approved DRG.	Approved DRG.	P	R	R	
		FLATNESS	MAJOR	STEIGHT EDGE	100%	Approved DRG.	Approved DRG.	P	R	R	
		FDN HOLES	MAJOR	MEASUREMENT	100%	Approved DRG.	Approved DRG.	P	R	R	
		COMPONANT MOUNTING	MAJOR	BY SCALE / FIXTURE	100%	Approved DRG.	Approved DRG.	P	R	R	
		HOLES									
2	FUEL TANK	CAPACITY CHECKING	MAJOR	DIMENSION MEASUREMENT	100%	Approved DRG.	Approved DRG.	P	R	R	
		LEAKAGE	MAJOR	WATER FILLING / DIESEL FILL	100%			P	R	R	
		THICKNESS AND FITTINGS	MAJOR	GUAGE AND VISUAL	100%			P	R	R	
3	BATTERIES	DAMAGE	MAJOR	VISUAL	100%			P	W	W	
4	LEADS	DAMAGE	MAJOR	VISUAL	100%			P	W	W	
5	ALTERNATOR	DEMAGES DURING TRANSIT	MAJOR	VISUAL	100%			P			
		INSULATION TEST	MAJOR	MEGER	100%	T.C.	T.C.	P	R	R	
		MEASUREMENT OF SHAFT	MAJOR	DIAL							
		AND KEY		CALLIPER	100%	Approved DRG.	Approved DRG.	P	R	R	
		DIMENSIONS TO DETERMINE									
		HUB MACHINING FOR COUPLING	MAJOR	DIAL/CALIPER				P	R	R	
		ENGINE COMPONENTS	MAJOR	VISUAL	100%	Packing list		P	R	R	
6	AMF PANEL	DIMENSIONS	MAJOR	VISUAL	100%	Approved DRG.	Approved DRG.	P	R	R	
		STEEL THICKNESS	MAJOR	VISUAL	100%	Approved DRG.	Approved DRG.	P	R	R	
		IP CLASS	MAJOR	VISUAL	100%	Approved DRG./IS 2147	Approved DRG./IS 2147	P	R	R	
		TERMINAL BLOCK/WIRING	MAJOR	VISUAL	100%	Approved DRG.	Approved DRG.	P	R	R	
		MCCB's, Switches, Fuse Contactors, O/L Relay, MCBs Terminal Blocks, Control, Indicating & Measuring Instruments, CT, PT,	MAJOR	VISUAL ELECTRICAL	100%	Approved DRG.	Approved DRG./Manufacturer's Catalogue/As per owner's approved vendor list and as per IS 3156, IS 2705	P	R	R	
		KWH/KW/AMMETER/FREQUENCY METER	MAJOR	VISUAL	100%	Approved DRG.	Approved DRG./Calibration Reports	P	R	R	
		HV /IR TEST	MAJOR	ELECTRICAL	100%	IS4722/IEC 34	T.C.	P	W	W	
STAGE - 2											
7	HUB HEATING	TEMPERATURE	MAJOR	TEMPERATURE PYROMETER	RANDOM			P	R	R	
8	ALLIGNMENT	RADIAL AND AXIAL DISPLACEMENT	MAJOR	BY DIAL GAUGE & FIXTURES	100%	Spec. Sheet	As per reference standard.	P	R	R	
9	END PLAY	AXIAL CRANK SHAFT	MAJOR	DIAL & MAGNETIC BASE	100%	Spec. Sheet		P	R	R	
10	HT NUTS,BOLTS	TIGHTNESS	MAJOR	TORQUE WRENCH	RANDOM	Spec. Sheet		P	R	R	
11	ACCESSORIES, FITTINGS,HOSE, CONNECTIONS	LOSE FITTINGS	MAJOR	VISUAL	RANDOM	Genset Check List		P	R	R	
12	FUAL,WATER,LUB, OIL LEAKAGES	LEAKAGES	MAJOR	EACH SET IS RUN FOR							
				30 min. TO VERIFY LEAKS	100%	NIL		P	R	R	
				INCLUDING ANY ABNORMAL							
				SOUND.							

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			QUALITY ASSURANCE PLAN SILENT GEG SET				Drawing No P.019141 G11013 E005				
							Date: 23.09.2024				
							Project:- Hyderabad mother station (composite works)				
							Client: BGL				
							Consultant:PMC				
S.No	**COMPONANTS**	**CHARACTERSTICS**	**CLASS**	**METHOD OF CHECKS**	**QUALITY OF CHECK**	**REF. DOCUMENT**	**ACCEPTANCE NORMS**	**M**	**C**	**TPIA**	**REMARKS**
STAGE - 3											
12	TRANSIENT DAMAGES OF PANEL BOX	CHECKING DENT / BEND	MAJOR	VISUAL	100%		PANEL SHOULD BE OK EXTERNAL	P	R	R	
13	METERS / INSTRUMENTS	RANGE / MAKE TERMINATION FITTINGS	MAJOR	VISUAL	100%	AS PER DRG	DRG	P	R	R	
14	RELAYS	WIRING TRIP SETTING AUX-V FUNCTIONING	MAJOR	SECONDARY INJECTION & SUPPLY VOLT PHYISICAL / FUNCTIONAL TEST	100%	DRG MAKERS	AS PER REQ. BY CUSTOMER	P	R	R	
15	CURRENT TRANFORMERS	VA	MAJOR	VISUAL	100%	AS SPECIFIED		P	R	R	
16	TRANSFORMERS	CLASS OF ACCURACY	MAJOR	VISUAL	100%	AS SPECIFIED		P	R	R	
		CTR	MAJOR	VISUAL	100%	AS SPECIFIED		P	R	R	
		POLORITY	MAJOR	POLORITY TESTER	100%	AS SPECIFIED	Approved Data Sheet	P	R	R	
17	OVERALL WIRING	FUNCTIONAL	MAJOR	PHYISICAL FUNCTIONAL TEST	100%	AS SPECIFIED		P	R	R	
		INSULATION		1000 V MEGER	100%	AS SPECIFIED		P	R	R	
		FINISH		VISUAL	100%	AS SPECIFIED		P	R	R	
18	BREAKER	FUNCTIONAL	MAJOR	PHYISICAL OPERATION	100%			P	R	R	
		TRIP SETTING	MAJOR	REFERENCE TEST CHECK				P	W	W	
				SPECIFIED BY MAKER							
STAGE - 4											
19	**LOAD TEST**	OPERATING / FUNCTIONAL PARAMETERS	MAJOR	BY WATER RESISTANCES METHOD AT UNITY P.F.	100%	AS PER APPROVED DATA SHEET / DRAWINGS	During load test - This parameters to be recorded. A) Measurment of all performance parameters like Volatge Current, Power, Frequency, speed, temperatures, RPM droop B) Voltage regulation at 100% load (No Load to full Load) C) Recording of waveform at 100% load. D) Check of fuel consuption at 100% load.	P	W	W	
		R-Y-B PHASE CURRENT ,	MAJOR	BY WATER RESISTANCES	100%			P	W	W	
		VOLTAGE FREQUENCY		METHODS AT UNITY P.F.				P	W	W	
		LUB OIL AND WATER TEMPERATURE	MAJOR	BY WATER RESISTANCES	100%			P	W	W	
				METHODS AT UNITY P.F.				P	W	W	
		R.P.M.DROOP	MAJOR	BY WATER RESISTANCES	100%			P	W	W	
				METHODS AT UNITY P.F.				P	W	W	
		FUNCTIONAL TEST OF OSS.HWT.LOP	MAJOR	BY CREATING EXTERNAL CONDITIONAL	100%			P	W	W	
		H.V.TEST,NOISE LEVEL TEST	MAJOR	BY H.V.TEST KIT AND	100%			P	W	W	
		& Vibration Test		MEASURING LEAKAGE CURRENT,VIBROMETER							
		LOAD TRIAL	MAJOR	BY WATER RESISTANCES / LOAD BANK METHOD S AT UNITY P.F	100%	**NOTE** : LOAD TEST WILL BE WITNESSED BY CLIENT / CLIENT'S REPRESENTATIVE			W	W	
		(a) 0% Load without Load									
		(b) 25% Load		…do…							
		(c)50% Load		…do…		* LOAD TEST WILL BE CARRIED AT WORKS					
		(d) 100% Load		…do…		* LOAD TEST WILL BE ALSO CARRIED AT SITE AS PER AVAILABLE LOAD					
		(e) 110% Load		…do…							

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			QUALITY ASSURANCE PLAN SILENT GEG SET				Drawing No P.019141 G11013 E005				
							Date: 23.09.2024				
							Project:- Hyderabad mother station (composite works)				
							Client: BGL				
							Consultant:PMC				
S.No	**COMPONANTS**	**CHARACTERSTICS**	**CLASS**	**METHOD OF CHECKS**	**QUALITY OF CHECK**	**REF. DOCUMENT**	**ACCEPTANCE NORMS**	**M**	**C**	**TPIA**	**REMARKS**
STAGE - 5											
20	**PAINTINGS**	THICKNESS & ATHESTIC ASPECTS		METHOD	VISUAL CHECKS	RANDOM		P	R	R	
21	**DOCUMENTS**	1) ENGINE TEST CERTIFICATE			VISUAL	100%		P	R	R	
		2)OPERATION MANNUAL									
		3) MAINTENANCE MANNUAL									
		4) PARTS CATALOG									
		5) ALTERNATOR USER'S HANDBOOK									
		6) ALTERNATOR TEST CERTIFICATE									
		7) ALTERNATOR WARRANTY CARD									
		8) ENGINE WARRANTY CARD									
		9)PANEL DRAWING									
		10) BPPL TEST CERTIFICATE									
		11) BATTERY WARRANTY CARD									
		12) PO/MTC/COMPLIANCE REPORT									
22	**Final Release**	IRN					As Per Specification	H	H	P	
LEGEND:											
R:Review		H-HOLD		M-Manufacturer							
P:Performed		C-Contractor		W:Witness							
TPIA: Third Party Inspection Agency; Control Authority : Owner/Engineer or their Authorised Inspection Agency.											

Note:	1. The Above Testing and acceptance criteria are minimum requirements, however, equipment supplier shall ensure and that the product also comply to the additional requirements as per Technical specifications and data sheets.
	2. The supplier shall submit their own detailed QAP prepared on the basis of the above for approval of Owner/Owner's representative and TPIA.
	3. Supplier shall submit Calibration certificates of all Instruments/Equipment to be used for Inspection and Testing to TPIA with relevant procedures and updated standards for TPIA review/Approval.
	4. TPIA along with Owner/Owner representative shall review/approve all the documents related to QAP/Quality manuals/Drawings and Test Certificates submitted by supplier/manufacturer.

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	5. Wherever W/R is indicated, Inspection Engineer shall decide the option to be exercised for the particular stage and supplier.
	6. TPIA shall issue 3.2 certificate as per BS EN 10204.

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QUALITY ASSURANCE PLAN
TRANSFORMER

Drawing No. P.019141 G 11013 E006
Date: 23.09.2024
Project: MS Hyderabad Composite Works
Client: BGL
Consultant:PMC

S.No	COMPONENTS	CHARACTERSTICS	TYPE OF CHECK	QUANTUM OF CHECK	REF. DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	M	C	TPIA	REMARKS
1	MATERIAL										
1.1	COPPER CONDUCTOR	DIMENSIONS	Actual Measure	15%	IS-12444 IS-7404/IS 13730	As Per Design	T.C	P	R	R	
		SURFACE FINISH	Visual Examination	15%		Visual	T.C	P	R	R	
		CONDUCTIVITY	Actual Measure	-		-	T.C	P	R	R	
1.2	LAMINATIONS	DIMENSIONS	Actual Measure	25%	As Per Design	To the Permitted tolerance	Inspection Record	P	R	R	
		SURFACE FINISH	Visual Examination	25%	Supplier Scope	Visual	Inspection Record				
1.3	PRESS BOARD	DIMENSIONS	Actual Measure	10%	IEC-60641-2-2004/IS-1576-1992	To the Permitted tolerance	Supplier Test Certificate	P	R	R	
1.4	OIL	RESISTIVELY TAN DELTA	Chemical Analysis	As Per Sample		-	Supplier Test Certificate	P	R	R	
1.5	FINISH PAINT	COLOR,TOUCH,DRY,Covering CAPACITY	Chemical Analysis	10%		-	Supplier Test Certificate	P	R	R	
2	IN PROCESS INSPECTION										
2.1	CORE BUILDING	Window Dimension	Actual Measure	100%	Internal sheet Design	To Manufacturing Tolerance	Process Inspection record	P	R	R	
		Core Length	Actual Measure	100%	Internal sheet Design	To Manufacturing Tolerance	Process Inspection record	P	R	R	
		Megger Test For Core Yoke Bolts	Actual Measure	100%	As Per IS 2026	> 500 Mega Ohm	Process Inspection record	P	R	R	
		Core Diameter	Actual Measure	100%	Internal sheet Design	To Manufacturing Tolerance	Process Inspection record	P	R	R	
2.2	WINDING	Conductor Dimensions	Actual Measure	50%	Internal Design	To Permitted Tolerance	Process Inspection record	P	R	R	
		Diameter of Formers	Actual Measure	100%	Internal Design	To Permitted Tolerance	Process Inspection record	P	R	R	
		OD of Winding	Actual Measure	100%	Internal Design	To Permitted Tolerance	Process Inspection record	P	R	R	
		Transposition	Visual	100%	Internal Design	To Permitted Tolerance	Process Inspection record	P	R	R	
		Continuity	Continuity Test	100%	Internal Design	As Per Design Sheet	Process Inspection record	P	R	R	
2.3	COIL ASSEMBLY	Top & Bottom Insulation	Visual	100%	Internal Design	To Manufacturing Tolerance	Process Inspection record	P	R	R	
		Internal Insulation	Visual	100%	Internal Design	To Manufacturing Tolerance	Process Inspection record	P	R	R	
2.4	CORE COIL ASSEMBLY	Maximum Dia Of Core	Actual Measure	100%	Internal Design	To Manufacturing Tolerance	Process Inspection record	P	R	R	
		ID Of Coil Assembly	Actual Measure	100%	Internal Design	To Manufacturing Tolerance	Process Inspection record	P	R	R	
		Lead Position	Visual	100%	Internal Design	As Per Design	Process Inspection record	P	R	R	
		Connection	Visual	100%	As Per Design	As Per Design	Process Inspection record	P	R	R	
		Joints	Visual	100%	As Per Design	As Per Design	Process Inspection record	P	R	R	
		Clearance	Actual Measure	100%	Internal Design	Minimum To Be Maintained	Process Inspection record	P	R	R	
		Drying	Insulation Resistance Test	100%	As Per Design	As Per Design Sheet	Process Inspection record	P	R	R	
		Megger	Testing	100%	As Per Design	> 500 Mega Ohm	Process Inspection record	P	R	R	
		Clamping & Pressing	Wdg-Height	100%	As Per Design	As per Design	Process Inspection record	P	R	R	
		HV Test Of Clamp & Core	Testing	100%	As Per IS 2026	As Required	Process Inspection record	P	R	R	

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QUALITY ASSURANCE PLAN
TRANSFORMER

Drawing No. P.019141 G 11013 E006
Date: 23.09.2024
Project: MS Hyderabad Composite Works
Client: BGL
Consultant:PMC

S.No	COMPONENTS	CHARACTERSTICS	TYPE OF CHECK	QUANTUM OF CHECK	REF. DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	M	C	TPIA	REMARKS
2.5	Tanking	Clearance In Tank	Visual	100%	As Per Design	As Per Design	Process Inspection Record	P	R	R	
2.6	Tank Fabrication	Plate Making & Preparation	Visual	100%	As Per Design	As Required	Process Inspection Record	P	R	R	
		Welding	Visual	100%	As required	As Required	-	P	R	R	
2.7	Unit Assembly	Final Dimension	Actual Measure	100%	Manufacturing Tolerance	Manufacturing Tolerance	Inspection Record	P	R	R	
		Painting	Visual	100%	Visual	Visual	Inspection Record	P	R	R	
3	**FINAL INSPECTION**										
3.1		Measurement Of Resistance	Actual Test	100%	IS 1180/2026	To Withstand	Final Test Report	P	W	W	
3.2		Measurement Of Ratio Test	Actual Test	100%	IS 1180/2026	To Withstand	Final Test Report	P	W	W	
3.3		No Load Test at 100 % rated Volatge	Actual Test	100%	IS 1180/2026	To Withstand	Final Test Report	P	W	W	
3.4		Exciation Current Measurement At rated Volatge	Actual Test	100%	IS 1180/2026	To Withstand	Final Test Report	P	W	W	
3.5		Separate Source Volatge Withstand Test	Actual Test	100%	IS 1180/2026	To Withstand	Final Test Report	P	W	W	
3.6		Induced Over VolatgeWithstand Test	Actual Test	100%	IS 1180/2026	To Withstand	Final Test Report	P	W	W	
3.7		Measuremnet Of Insulation resitance	Actual Test	100%	IS 1180/2026	To Withstand	Final Test Report	P	W	W	
3.8		Measurement of Load loss at 50 % &100% Load Impedance	Actual Test	100%	IS 1180/2026	To Withstand	Final Test Report	P	W	W	
3.9		Measurement of Vector Group Test	Actual Test	100%	IS 1180/2026	To Withstand	Final Test Report	P	W	W	
3.10		Oil Leekage Test	Actual Test	100%	IS 1180/2026	As Required	Final Test Report	P	W	W	
3.11		Temperature Rise Test	Actual Test	100%	IS 1180/2026	As per Design	Final Test Report	P	W	W	
		Tank Pressure Test	Actual Test	100%	IS 1180/2026	To Withstand	Final Test Report	P	W	W	
4	**Final Release**	IRN				As Per Specification		H	H	P	

LEGEND:			
R:Review	H-HOLD	M-Manufacturer	
P:Performed	C-Contractor	W:Witness	

TPIA: Third Party Inspection Agency; Control Authority : Owner/Engineer or their Authorised Inspection Agency.

Note:	1. The Above Testing and acceptance criteria are minimum requirements, however, equipment supplier shall ensure and that the product also comply to the additional requirements as per Technical specifications and data sheets.
	2. The supplier shall submit their own detailed QAP prepared on the basis of the above for approval of Owner/Owner's representative and TPIA.
	3. Supplier shall submit Calibration certificates of all Instruments/Equipment to be used for Inspection and Testing to TPIA with relevant procedures and updated standards for TPIA review/Approval.
	4. TPIA along with Owner/Owner representative shall review/approve all the documents related to QAP/Quality manuals/Drawings and Test Certificates submitted by supplier/manufacturer.
	5. Wherever W/R is indicated, Inspection Engineer shall decide the option to be exercised for the particular stage and supplier.
	6. TPIA shall also Review the Test certificates submitted by the manufacturer.

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	TECHNICAL DATA SHEET UPS SYSTEM	P.019141 G11087 E101

AC UPS SYSTEM

P.019141 G11087 E101

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TECHNICAL DATA SHEET UPS SYSTEM:

A	**Site conditions**				
1	Ambient temperature,		3	Altitude:	<1000m
	Maximum ambient temperature:	45°C	4	Atmospheric condition:	Highly corrosive
	Minimum ambient temperature:	5°C	5	Location: Indoor-Air-conditioned room.	
	Design ambient temperature:	50/0 °C	6	Applicable specification - PTS UPS	
2	Design temperature for battery sizing	10 °C			
B	**Input power supply**				
1	Voltage :	415V ±10%	3	Phase : TPN	
2	Frequency :	50Hz ± 3%	4	System fault level : 35 KA : As per SLD	
C	**System requirements**				
1	Equipment tag no.:		11	Type of battery : VRLA	
2	Type of inverter:	IGBT/Transistorised	12	Battery backup time : Refer PTS-UPS system	
3	Rating :	kVA(0.8 P.F.)		Description / kVA / Backup time (mins.)	
4	Phase :			Instrumentation	
5	Output voltage :	230V ±1%		Telecom	
6	Output frequency :	50Hz ±1%		Critical Lighting	
7	Mode of operation :				
8	Load power factor		13	Battery rack : Double row double tier	
	Rated : 0.8 (lag)		14	IP of enclosure: IP-42 min.	
	Variation : 0.6-1.0 (lag)		15	Cable entry: bottom	
9	Fault diagnostic unit :		16	Colour shade: RAL 7032	
10	Cell booster				
D	**UPS distribution board** (Outgoing feeder details)				
	1 Incomer Rating 2 Mounting - wall 3 Nos of outgoing feeders 4 KVA rating of feeders 5 Switching rating of fuse 6 Voltmeter - yes 7 Busbar material - copper 8 Paint - RAL 7032 * Refer SLD for more detail of UPSDB				
F	**Specific requirements**				
	a) All interconnecting cables between all panels of UPS system are included in vendor's scope				
G	**UPS system**				

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1	Make :	9	Noise level : db
2	Type designation :	10	Guaranteed overall dimensions of UPS system except

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3	Rating : kVA at 0.8 p.f.			UPSDB and battery,		
4	Mode of operation :			- Length:		mm
5	Output voltage distortion under the following conditions,			- Depth:		mm
	For 50% step load : V± %			- Height:		mm
	For 100% step load : V± %		11	Efficiency of each rectifier and inverter module including input and output transformer		
	For 100% step unload : V± %					
	Power supply interruption and restoration : V± %			At 100% load : %		
				At 75% load : %		
	Load transferred to bypass line : V± %			At 50% load : %		
	When one inverter gets faulty and load transferred to healthy inverter : V± %			At no load : %		
			12	Efficiency of bypass stabiliser including input transformer,		
6	Phase angle distortion under the following conditions, (for three phase inverter only)			At 100% load : %		
	For 50% step load : 120°± %			At 75% load : %		
	For 100% step load : 120°± %			At 50% load : %		
	For 100% step unload : 120°± %			At no load : %		
	Power supply interruption and restoration : 120°± %		13	Heat loss for the total system : kW		
			14	Overall efficiency of UPS system		
	Load transferred to bypass line : 120°± %					
	When one inverter gets faulty and load transferred to healthy inverter : 120°± %					
7	Maximum recovery time to reach steady state after above disturbances : milli sec.			At 100% load : %		
				At 75% load : %		
8	Redundancy of cooling system :			At 50% load : %		
				At no load %		
H	**Inverter**					
1	Rating : kVA		10	Short circuit capacity & duration :		
2	No. of phase(s) :		11	Output voltage/phase angles (for 3 phase only),		
3	Steady state output voltage,			For 30% unbalance load :		
	Nominal : V			For 40% unbalance load :		
	Variation : V			For 50% unbalance load :		
4	Output voltage adjustment range at rated load :			For 100% unbalance load :		
			12	Type of control circuit :		
5	Input DC voltage,		13	Max. allowable rating of outgoing feeders for fault clearance of feeder fault by UPS with mains bypass supply back up,		
	Nominal : V					
	Range : V					
6	Frequency variation limit for inverter when phase locked with mains :			- With fast acting semiconducting fuses :		amps.
7	Allowable unbalance between phases : (for 3 phase only)			- With normal HRC fuses :		amps.
8	Harmonic distortion at inverter output at rated load,					
	For linear load:					
	For non linear load:					

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9	Overload capacity & duration :		
	For 110% load: min.		
	For 125% load: min.		
	For 150% load: sec.		
I	**Static switches**		
1	No. of static switches in the UPS system :	3	Type of static switch :
2	Current rating at specified ambient,	4	Transfer time,
	Continuous : A		Synchronised mode : milli sec
	Short time : A		Unsynchronised mode : milli sec
J	**Battery charger (Connected to Grid Supply)**	4	Output voltage range under,
1	Current rating :		Float charging condition : V
2	Output voltage accuracy under specified input		Boost charging condition : V
3	Maximum ripple content on DC side with battery	5	Maximum harmonic content in input current :
	Connected :	6	Input transformer rating : kVA
	Dis Connected :		
K	**Manual transfer devices**	3	Rating
1	Make		Continuous :
2	Type designation		Short time :
L	**Battery**		
1	Make :	11	Overall rack dimension
2	Type designation		Length : mm
3	Type :		Depth : mm
4	AH rating :		Height mm
5	End cell voltage :	12	Battery charging requirements,
6	Nominal Voltage :	13	Nominal voltage/cell : V
7	Boost charging time :	14	Float voltage/cell V
8	No. of cells in each bank :	15	Boost charging voltage/cell :
9	No. of battery banks :	16	Container type :
10	No. of racks :	17	No. of recommended air changes/hour for battery room : m3
M	**Step-down bypass transformer with solid state voltage stabiliser**		
1	Make :	5	Accuracy of stabiliser : %
2	Type designation	6	Type of control :
3	Rating : kVA	7	Type of cooling :
4	Voltage ratio :	8	Type of stabiliser :
N	**UPS distribution board**		
1	Make :	6	Overall dimensions,
2	Type designation :		Length : mm
3	Rating :		Depth : mm
4	Degree of protection		Height mm
5	No. of outgoing Feeder / rating of each		
O	**Cell booster**		

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1	Make :	5	Overall dimensions
2	Type designation :		Length: mm
3	Voltage range		Depth: mm
4	Current range		Height mm
P	**Reliability**		
1	Safety factor used for selecting the components	4	MTBF/MTTR:
2	Electronic devices	5	Availability factor:
3	Electrical devices		

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BHAGYANAGAR GAS LIMITED (BGL)

TENDER DOCUMENT FOR CONSTRUCTION OF MOTHER STATIONS IN HYDERABAD GA.

POWER & CONTROL CABLE

P.019141 G11087 E002

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	TECHNICAL DATA SHEET – POWER & CONTROL CABLE	P.019141 G11087 E002

TECHNICAL DATA SHEET (To be furnished by Vendor)

1.0	Make	
2.0	Voltage Grade 1.1 KV	
3.0	Type of cable FRLS A2XFY/A2XWY/2XWY/2XFY	
4.0	Standard referred	
5.0	Conductor	
	a) Normal cross sectional area b) Shape of the conductor c) Max. D.C. resistance at 20 Deg. C. d) Number of strands e) Material - H4 Grade Aluminium as per IS:8130 latest/ Annealed plain copper as per IS:8130 latest f) Type (stranded/solid) - Stranded	
6.0	Insulation	
	a) Type and material of Insulation : XLPE confirming to IS:7098, Pt.-1 b) Thickness of insulation mm c) Color Scheme/Core Identification d) Extruded e) Diameter over insulation f) Dielectric strength (kV/mm)	
7.0	Armor	
	Type Material Galvanized steel strip/ Round wire Nominal Thickness Diameter over armor	
8.	Outer Sheath	
	a) Nominal thickness/OD of each strip b) Material FRLSH-C2, Type-ST-2 of IS:5831 c) Minimum Thickness d) Extruded	
9	Approximate overall diameter	
	1. Diameter over armour (mm) 2. Diameter under the armour (mm)	

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10	Normal drum length Standard length of cable per drum (m)	
11	AC resistance of the conductor at maximum operating Temperature	
12	Approximate reactance per phase at 50 Hz.	

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14	Current Rating	
a)	In ground 20° C (A)	
b)	In air 30°C (A)	
c)	Maximum conductor temperature during continuous Operation	
d)	Maximum conductor temperature during short Circuit	
e)	Short circuit rating	
f)	Maximum permissible bending radius	
g)	1. Overloading a) Current rating (A) b) Cycle 2 Heat stability °C a) Under continuous operation (°C) – 90 b) Under short circuit (°C) - 250 3 Short circuit capacity for one second(KA) 4 Minimum bending radius (where D is the overall diameter of cable)- 12 X D 5 Approx. Weight of the cable(Kg/cm) 6 Maximum DC resistance of cable at 20° C (Ohm/km) Main / Neutral 7 Maximum AC resistance of cable at 70° C (Ohm/km) 8 Reactance per phase at 50 Hz.(Ohm/km) 9 Capacitance per phase (μF/km)	
NOTE: Station wise Quantities of cables shall be worked out by EPC on the sizing calculations.		

** Refer PTS for further details.

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BHAGYANAGAR GAS LIMITED

TENDER DOCUMENT FOR CONSTRUCTION OF MOTHER STATIONS IN HYDERABAD GA

ELECTRICAL DISTRIBUTION BOARD

P.019141 G11087 E103

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2.0 BUS BAR 1

3.0 MINIATURE CIRCUIT BREAKER 2

4.0 CURRENT TRANSFORMER 2

5.0 POTENTIAL TRANSFORMER 2

6.0 SWITCHES 2

7.0 FUSE 2

8.0 RELAYS 3

9.0 INSTRUMENTS AND METERS 3

10.0 CONTRACTOR 3

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TECHNICAL DATA SHEET (TO BE FURNISHED BY VENDOR)

1.0 GENERAL

1.1	Make	:	
	IP Class of Enclosure	:	Min IP 52
	Rating	:	415 V AC, 3Ph N, 50 Hz, (Refer SLD & PTS Elect.)
	Thickness of Sheet Steel	:	2mm CRCA sheet steel
	Treatment	:	
	Painting	:	RAL 7032
	Overall Dimension	:	
	LBH	:	
	Space heater rating of each panel	:	
	Weight of the Distribution Board	:	
	Earth bus Details	:	
	Method of fixing	:	
	Method of Cable Entry	:	
	Type	:	Fixed type

2.0 BUS BAR

2.1	Size		
	a) Horizontal Bus Bar	:	
	b) Vertical Bus Bar	:	
	c) Ground	:	
2.2	Minimum Clearance		
	a) Between Phases	:	
	b) Between Phase and earth	:	
2.3	Minimum creepage distance	:	
2.4	Current Rating	:	Refer SLD
	a) Continuous	:	
	b) Short Time for 1 second	:	
2.5	Temp. rise over ambient	:	
	a) For Continuous Load	:	
	b) For Short Time Load	:	
2.6	Fault Level	:	
2.7	Supports :		
	a) Materials	:	
	b) Make	:	
	c) Voltage	:	

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d) BIL :

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2.8	Bus bar insulation	:
2.9	Bus bar phase identification mark	:

3.0 MINIATURE CIRCUIT BREAKER

3.1	Make
3.2	Rated Voltage
3.3	a) Rated Insulation Voltage b) Breaker rated voltage c) Short time Breaking capacity. d) Trip Curve

4.0 CURRENT TRANSFORMER

4.1	Make	:
4.2	Type of primary winding	:
4.3	Ratio	:
4.4	Rated Burden	:
4.5	Accuracy class 1 for metering & 5P10 for protection	:
4.6	Type – Cast Resin	

5.0 POTENTIAL TRANSFORMER

5.1	Make
5.2	Type – Cast Resin
5.3	Type of primary winding
5.4	Rated primary voltage – 500V
5.5	Rated output
5.6	Ratio
5.7	Rated Burden
5.8	Accuracy class I

6.0 SWITCHES

6.1	Make
6.2	Material of contracts
6.3	Rated Voltage
6.4	Rated Thermal Current
6.5	Duty

7.0 FUSE

7.1	Make

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7.2 Type of HRC fuse

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7.3	Rated Voltage
8.0	**RELAYS**
8.1	Application
8.2	Make
9.0	**INSTRUMENTS AND METERS**
9.1	Application
9.2	Make
9.3	Maker's type
9.4	Ref. Standard
9.5	Operating Principle
9.6	Rated Voltage / current
9.7	Burden at rated voltage / current
9.8	Operating range
9.9	Scale range
9.10	Accuracy class min. 1
10.0	**CONTRACTOR**
10.1	Make & Model
10.2	Rated Voltage
10.3	Rated Current
	AC3 Duty
	AC4 Duty
10.4	Rated Thermal current
10.5	Short Circuit capacity
10.6	Making Capacity
10.7	Breaking Capacity
10.8	Switching frequency
10.9	Life
10.10	Coil burden (VA) - Pickup & Hold
10.11	Nos of auxiliary contacts (NO + NC)
11.0	**MOULDED CASE CIRCUIT BREAKER**
11.1	Make
11.2	Rated Voltage
11.3	Power Frequency withstand
	a) Impulse withstand voltage
	b) No. of Poles / Ph
	c) Rated Insulation Voltage

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d) Breaker rated voltage

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e) Type of release for incomer feeder – Microprocessor based

f) Type of release for outgoing feeders: - Thermo magnetic / static for overload and short circuit. Additional module for earth fault to be provided.

g) Indications for on / off / Trip: - Required

h) Rotary handle with door interlock facility: Required

i) Settings for microprocessor-based release:

Adjustable overload time characteristic

Time delayed short circuit

Instantaneous short circuit

j) Setting for thermal magnetic release: -

Adjustable overload

Rated thermal current in air inside panel at design temperature short circuit capacity.

12.0 PROTECTIVE RELAYS

i. Type of relays numerical as per BOM / SLD

ii. Type of release microprocessor based for incomers – thermos magnetic / static for outgoing feeders

iii. Make

A. UNDER VOLTAGE RELAY

i. Type microprocessor based (numerical type)

ii. Make

** Refer SLD for relay/switches/breaker or any further requirement.

13.0 Quantity

Refer SOR.

Refer PTS – Electrical Distribution Board

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BHAGYANAGAR GAS LIMITED (BGL)

TENDER DOCUMENT FOR CONSTRUCTION OF MOTHER STATIONS IN HYDERABAD GA

TECHNICAL DATASHEET –VRLA BATTERY
P.019141 G11087 E104

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Date: 2026.02.13 19:41:32 IST

	TECHNICAL DATA-SHEET VRLA BATTERY	P.019141 G11087 E104

TECHNICAL DATA SHEET (To be furnished by Vendor)

1	Item No. as per MR	
2	Manufacturer's name	
3	Type of Construction– VRLA maintenance free	
4	Type and catalogue no of cell–	**VRLA Maintenance free**
5	Ampere hour capacity	
6	No. of Cells	
7	Nominal cell voltage	
8	Cell voltage at the end of full discharge at 10 hours/ 5 hours rate	
9	Specific gravity of electrolyte at the end of full charging at 27 ° C.	
10	Specific gravity of electrolyte at the end of full discharge at 10 hours/5 hours rate at 27 ° C	
11	Quantity of electrolyte per cell (liters)	
12	Weight of each cell with electrolyte (kg)	
13 a	Max safe boost charging rate (amperes)	
13 b	Permissible ripple content	
14	Suggested boost charging rate (amperes)	
14 a	Suggested boost charging time (hrs)	
14 b	No. of recommended air changes/ hour for battery room(m3)	
15	Max boost charging voltage per cell	
16 a	Recommended Float charging voltage per cell	
16 b	Maximum float charging voltage range per cell	
17 a	Float charging current range (amperes))	
17 b	Permissible ripple content	
18	AH Efficiency at 10 hours / 5 hour rate	
19	Short circuit current of the battery bank	
20	Short circuit withstand time (sec.)	
21	Max. Allowable temp. of electrolyte which the cells can with stand without injurious effect	

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	i) Continuously	
	ii) For short periods	
22	Type of positive plate	
23	Type of negative plate	
24	No. of +ve and –ve plates per cell	

	TECHNICAL DATA-SHEET VRLA BATTERY	**P.019141 G11087 E104**

25	Material and thickness of separators	
26	Amp hour capacity at min. ambient 27^0C	
26.1	10 hours rate to end cell voltage at Sl. No. 8 above	
26.2	5 hours rate to end cell voltage at Sl. No. 8 above.	
26.3	2 hours rate to end cell voltage at Sl. No. 8 above.	
26.4	1 hour rate to end cell voltage at Sl. No 8 above.	
26.5	30 minutes rate to end cell voltage at Sl. No. 8 above	
26.6	No. of cells in each banks	
26.7	No. of racks	**02**
27	Dimensions of battery rack(W X D X H) in mm	
28	Battery bank back up hours	**Refer PTS**

**** Refer PTS - Electrical UPS for further detail.**

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BHAGYANAGAR GAS LIMITED (BGL)

TENDER DOCUMENT FOR CONSTRUCTION OF MOTHER STATIONS IN HYDERABAD GA

SILENT GAS ENGINE GENERATOR SET

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Date: 2026.02.13 19:41:32 IST

1	**GAS ENGINE**	
1.1	Engine Make & Model No.	*
1.2	Reference Standards.	*
1.3	Number of cylinders.	*
1.4	Continuous output at N.T.P.	*
1.5	Continuous output at the site condition as specified in specification sheet.	*
1.6	Fuel gas consumption at	
	a) 100% load.	*
	b) 75% load.	*
1.7	Specification of the recommended gas and its calorific value.	*
1.8	Lubricating oil consumption.	*
1.9	Time interval from the moment of mains failure.	
	a) to come to full speed.	*
	b) to take 100% of rated load.	*
1.10	Time interval between each successive attempt.	*
1.11	Efficiency of the Engine at	
	a) 75% of rated load.	*
	b) 100% of rated load.	*
1.12	Method of Engine starting.	-Electronics.
1.13	Type of cooling system.	-Radiator Cooling
1.14	Approximate A Hr. Capacity at 10 hr. rate of discharge at 24 volts for starting and control system.	*
1.15	Over load capacity for 1 hour.	*
1.16	Over load capacity for 5 minutes.	*

GENERATOR

1.1	Make	*
1.2	Maker's type	Industrial Power train
1.3	Reference Standards	*
2	**RATING**	
2.1	Rated voltage with ± (KV)	*
2.2	Rated Frequency with ± (Hz)	*
2.3	Rated Speed (RPM)	*

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2.4	Rated output (KW)	*
	i) Continuous under site conditions.	
3	**EXECUTION**	
3.1	Type of Enclosure.	*
3.2	Degree of Protection.	*
3.3	Rotation (as Viewed from the engine side)	*
3.4	Cooling method.	Radiator Cooling
4	**INSULATION**	
4.01	Class of insulation	
	i) Stator	*
	ii) Rotor	*
4.02	Material of Insulation	
	i) Stator	*
	ii) Rotor	*
4.03	Winding Replaceable at site (Yes/No).	*
5	**PERFORMANCE**	
5.01	Current at	
	a) 100% load	*
	b) 75% load	*
5.02	Voltage regulation and efficiency at 0.8 power factor and at	
	a) 100% load	*
	b) 75% load	*
5.03	Power factor at	
	a) 100% load	*
	b) 75% load	*
6	**LOSSES**	
6.1	Total guaranteed losses (KW).	*
6.2	Efficiency.	*
7	**COOLING**	
7.1	Type of Cooling.	*
7.2	Type of Fan	*
7.3	Material of construction of fan.	*

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8	**LUBRICATION SYSTEM**	
8.01	Type	
	a) Grease	*
	b) Oil bath	*
8.02	Bearing type and Nos.	
	a) Driving end	*
	b) Non-driving end	*
8.3	On-line lubrication facility	*
8.4	Specification of Lubrication.	*
8.5	Interval of lubrication	*
8.6	Quantity of Lubrication	
	a) Recharging	*
	b) Replacement	*
9	**MECHANICAL DATA**	
9.1	Frame Size	*
9.2	Dimensional Drg. No.	*
9.3	Total Weight of Generator	*
9.4	Permissible vibration limits	*
9.5	Noise level	*
10	**ACCESSORIES INCLUDED**	
10.1	Anti vibration mounting pads	*
10.2	Cable glands	*
10.3	Cable lugs / connectors	*
10.4	Earthing Terminals	*
10.5	Lifting eye bolt	*
10.6	Name Plate	*
10.7	Drain Plug	*
11	**CABLE BOX**	
11.1	Mains cable box	*
11.2	Neutral cable box	*

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12 CONTROL PANEL

12.1 Make *

12.2 Maker's type *

12.3 Reference Standard *

12.4 IP class of enclosure *

12.5 Type of Sheet Steel *

12.6 Thickness of Sheet Steel *

12.7 Treatment *

12.8 Painting *

12.9 Maximum temperature rise *

12.10 Overall dimension *

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13 BUSBARS

13.1 Material *

13.2 Size

a) Horizontal Bus bar *
b) Vertical Bus bar *
c) Ground *

13.03 Minimum clearances

a) Between phases *
b) Between phase and earth*

13.4 Minimum creepage distances.

13.5 Current Rating

a) Continuous *
b) Short time for 1 Second *

13.06 Temperature rise over ambient

a) for continuous load *
b) for short time current *

13.07 Supports

a) Material *
b) Make*
c) Voltage class *
d) BIL *

13.8 Bus bar insulation *

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13.9 Bus bar phase identification mark. *

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14	**MCCB / ACB**	
14.1	Make	*
14.2	Maker's type	*
14.3	Reference Standard	*
14.4	Short circuit capacity	*
14.5	Short circuit category	*
14.6	Type Testing Authority	*
14.7	Rated Voltage	*
14.8	Maximum Operating Voltage	*
14.9	No. of poles	*
14.10	Rated operating duty	*
14.11	Over Current & Short Circuit Protection	*
15	**CURRENT TRANSFORMER**	
15.1	Make	*
15.2	Maker's type and reference standard	*
15.3	Type of primary winding	*
15.4	Ratio	*
15.5	Rated Burden	*
15.6	Accuracy class	*
15.7	Insulation Material	*
15.8	Insulation class	*
16	**INSTRUMENT AND METERS**	
16.1	Application	*
16.2	Make	*
16.3	Maker's type	*
16.4	Reference Standard	*
16.5	Operating Principle	*
16.6	Rated Voltage / Current	*
16.7	Burden at rated voltage/current	*
16.8	Operating range	*
16.9	Scale range	*

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16.10	Type of Scale	*
16.11	Accuracy	*
17	**CONTROL SWITHCES**	
17.1	Make	*
17.2	Maker's type	*
17.3	Reference Standard	*
17.4	Rated voltage	*
17.5	Rated thermal current	*
17.6	Utilization category	*
18	**PUSH BUTTON**	
18.1	Make	*
18.2	Maker's type	*
18.3	Reference Standard	*
18.4	Current rating of contacts at rated voltage	*
19	**ACOUSTIC ENCLOSURE**	
19.1	Modular Construction (Yes / No)	*
19.2	Material of construction	*
19.3	Overall Dimension	*
	L B	
	H	
19.4	Thickness of material of construction (SWG)	*
19.5	Type of painting	*
19.6	Material of insulation	*
19.7	Density of insulation (KG / M^3)	*
19.8	Thickness of insulation (MM)	*
19.9	Type & Thickness of insulation covering	*
19.10	Type & thickness of overall metallic covering sheet	*
19.11	Type of silencer used for engine exhaust	*
19.12	Type of attenuators at air inlet and exhaust	*
19.13	Capacity of Air blower / Fan	*
19.14	Noise level inside the enclosure (dB) (A)	*

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19.15	Noise level at 1 meter from enclosure (dB) (A)	*

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20	**SIGNAL LAMPS**	
20.1	Make	*
20.2	Maker's type	*
20.3	Reference Standard	*
20.4	Rated voltage(V)	*
20.5	Rated Wattage(W)	*
20.6	Type	*

N.B -'*' marked information to be furnished by vendor.

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BHAGYANAGAR GAS LIMITED (BGL)

TENDER DOCUMENT FOR CONSTRUCTION OF MOTHER STATIONS IN HYDERABAD

SOLAR PANEL SYSTEM

P.019141 G11087 E005

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1. **TECHNICAL DATASHEET (To be furnished by vendor)**

Applicable To: Proposal Purchase As Built
Vendor shall complete Data Sheet with information not otherwise provided by Owner. Owner:
Facility:
Tag Number:
Location:
Manufacturer/Model No.:
Service:

1. Site / Environment conditions:
2. No. of systems / service:
3. Application:
4. Type/model no. & country of origin *:
5. Load / Output voltage: 6 kW/ 415V
6. Total output required:
7. Ripple output:
8. Daily load demand:
9. Earthing:
10. Battery backup required for: 30 mins
11. Battery type: VRLA
12. Battery rating:
13. Make/model no. Country of origin of battery *:
14. Type of alternative energy source available location
    a. Solar panels:
    b. Power controller:
    c. Battery:
15. Location of power controller: Indoor
16. Expected life span *:
17. Area classification: Safe
18. Insulation data:
19. Degree of protection of power controller enclosure & temp. Class:
20. Power controller unit painting type *:
21. Color shade of finish coat:
22. No. Of panels / modules required *:
23. Battery charging and power control scheme:
24. Type & material of hardware to be used:
25. Whether erection, testing & commissioning in vendor's scope: Yes No
26. Additional information / requirements:
27. Refere

nce codes: Note:

- Data to be filled by supplier with its bid in the supplier data column, those data shall be in accordance with standard specification

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	SCOPE OF WORK- INSTRUMENTATION	P.019141 G11039 I001

BHAGYANAGAR GAS LIMITED (BGL)

MOTHER STATION COMPOSITE WORKS (CIVIL, MECHANICAL, INSTRUMENTATION AND ELECTRICAL WORKS) IN HYDERABAD GA.

SCOPE OF WORK

INSTRUMENTATION

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	SCOPE OF WORK- INSTRUMENTATION	P.019141 G11039 I001

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1.0 INTRODUCTION

1.1 BHAGYANAGAR GAS LIMITED (BGL), (hereinafter referred as Owner), has been authorized by PNGRB for setting up infrastructure and operation of City Gas Distribution Network. Natural gas will be transported to residential, commercial, industrial (PNG) and automobile consumers (CNG) in the city.

1.2 BGL is now inviting tenders on Competitive Bidding basis for Supply, laying, erection, testing and commissioning of Mechanical piping & fittings, Civil works, Electrical works and Instrumentation works.

1.3 Brief scope

- Scope of work shall comprise of system Design, Detail Engineering, Procurement of Materials, manufacturing or fabrication, Supply, Installation, Inspection & Factory Acceptance Testing & Testing of system, Packaging, forwarding, Insurance, Shipping related all formalities, Inland Transportation to site, and Supply of all type of Erection Items, site engineering, Pre-Commissioning activity, Testing, Interconnection, Trial Run, Commissioning, Training, support and Warranty Including any civil works etc., & documentation of total system, Testing certificates, calibration certificates of equipment required to complete in all respect.(for details refer Scope Matrix).
- Scope includes Loading from site store, unloading at project site, erection, installation, testing and assistance during commissioning of third-party equipment as per site requirement including required cable and cabling from JB to control system if any.

2.0 POWER SUPPLY

In general, the following power supply shall be used:

- 230 VAC +/- 10%, 50 Hz +/- 3%, Single Phase UPS power supply for all control systems such as Fire detection panel, Gas Detection panel, CCTV panel, Odoriser unit, RTU, telecom and all the associated facility available at station.
- Contractor shall do necessary required voltage conversion from AC to DC (24 V or 48 or 12) as per the system & instrument requirement inside cabinet/panel or else.
- 230 VAC +/- 10%, 50Hz +/- 3%, Single Phase Non-UPS Utility Power for maintenance activities, miscellaneous requirements, utility sockets, Odoriser control unit etc.

3.0 APPLICABLE CODES & STANDARDS

The following Indian/ international or relevant codes and standards shall be used for designing the system. In all cases, latest revisions with amendments, if any, to be followed Apart from the specific codes mentioned herein, all other relevant and related codes concerning the specific job under consideration and/or referred to in these codes and technical specifications shall be followed wherever applicable. All codes shall be of the latest revision as on the date of issuing the tender/ bid document.

In the event of any conflict between this specification, related standards and codes, any other attachment to this tender, the Contractor shall refer the matter to OWNER'S/OWNER' REPRESENTATIVE for clarification and only after obtaining the confirmation on the same, should proceed with the manufacture/ supply / engineering of the item in question. The decision of the OWNER'S/OWNER' REPRESENTATIVE shall be binding on the Contractor.

CONTRACTOR shall seek COMPANY's final interpretation of any conflicts prior to the execution of

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work. Rework of engineering and relevant scope arising out of underestimation shall be done at no additional cost to the COMPANY.

Sr. No	Codes	Description
1	ANSI/ISA S 51.1	Process Instrumentation Terminology.
2	ISA 5.4	Instruments Loop diagrams.
3	IEC 60529 / IS 2147 / NEMA	Specification for Weatherproof Enclosure.
4	IEC 60079	Specification for Flame Proof Enclosure
5	IEC 61000	Electromagnetic Compatibility for Industrial Process Measurement and Control equipment.
6	IEC 60801	EMI and RF interference
7	IS-1554 Part 1	PVC insulated (heavy duty) electric cables- working voltage up to and including 1100V.
8	BS-5308 Part 1, Type 2	Specification for PVC insulated cables.
9	IS 8130	Conductors of insulated cables
10	IS 5831	Specification for PVC insulation and sheath of insulated cables.
11	IS-3975	Mild steel wires, formed wires and tapes for armouring of cables.
12	ASTM D 2843	Test method for Max smoke density for cable
13	ASTM D 2863	Test method for measuring of Temp and O2 Index.
14	IEC 60754	Acid generation test
15	IEC-332-3 Part 3	Tests on bunched wires and cables.
16	BS 6121, EN 50262	Cable gland – flame proof Ex”d” or Exe increase safety.
17	DIN- 50049	Document on Material Testing.
18	ASME PTC 19.3	Temperature Measurement- calculation of natural frequency.

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19	IEC 751 / DIN 43760	RTD

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Sr. No	Codes	Description
20	IEC 584/DIN 43710 / ANSI MC 96.1	Thermocouple
21	ISO 5167	Measurement of fluid flow by means of orifice plates, Nozzles and Venturi tube inserted in filled piping circular profile.
22	IS 3624 / BS EN 837	Pressure gauge
23	OISD	Oil Industry Safety Directorate Government of India
23.1	OISD 118	Layouts for Oil & Gas installations
23.2	OISD 152	Safety Instrumentation for Process System in Hydrocarbon Industry
23.3	OISD 153	Maintenance and Inspection of Safety Instrumentation in Hydrocarbon Industry
23.4	OISD 163	Process Control Room Safety
23.5	OISD 195	Safety in Design, Operation, Inspection and Maintenance of Hydrocarbon Gas Compressor stations and Terminals
23.6	OISD-STD-226	Natural Gas Transmission Pipelines and City Gas Distribution Networks.
24	NFPA	National Fire Protection Association
24.1	NFPA-70	National Electrical Code
24.2	NFPA-497	Electrical installation, classification of Class1 & Class 2 hazardous locations
24.3	NFPA-101	Life Safety Code
24.4	NFPA 325M	Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids for LEL of Gases
25	PNGRB/T4S	Technical & safety standards statutory requirements for natural gas pipelines.

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4.0 STATUTORY APPROVALS / CERTIFICATES (AFTER GETTING ORDER)

4.1 The bidder shall be responsible for obtaining all statutory approvals, as applicable for all instruments and instrumentation systems.

4.2 Equipment / instrument / systems located in electrically hazardous areas shall be certified for use by statutory authorities for their use in the area of their installation. In general, following certification shall be provided by the bidder.

a. For all flameproof equipment / instrument / systems, which are manufactured abroad (outside India) certification by any approving authority like BASEFA, FM, UL, PTB, LCIE, CENELEC etc. shall be required.

b. For all flameproof equipment / instrument / systems manufactured locally (within India), certification shall be carried out by any of the approved testing houses – Central Mining Research Institute (CMRI) etc. The manufacturer shall hold a valid Bureau of Indian Standards (BIS) license.

c. Approval certificate from Chief Controller of Explosives (CCE) or Petroleum and Explosive Safety organisation (PESO) is mandatory for all electronic / electrical instruments / equipment to be installed in India, irrespective of country of origin.

5.0 ENGINEERING UNITS

a	Flow	
	Gas	Sm^3/hr / MMSCMD
	Mass flow	kg/hr.
	Volumetric flow	m^3 / hr.
b	Pressure	Barg
c	Temperature	°C.
d	Level	%.

6.0 CONTRACTOR SCOPE OF WORK

6.1.1 Contractor shall procure and supply all materials other than Company supplied materials, required for permanent installation of I&C items in sequence and at appropriate time. All equipment, materials, components etc. shall be for the intended service, with high reliability and a proven track record.

6.1.2 Recommended vendor list has been enclosed with the bid package for various items. For items which are not covered in the Vendor list, Contractor shall obtain approval from OWNER'S/OWNER' REPRESENTATIVE prior to supply. Necessary details like PTR, data sheets & specifications for the items shall be enclosed.

6.1.3 Stores management includes receipt, warehousing, preserving the material in good condition, issue of material to construction site, reconciling / handing over surplus material to OWNER.

6.1.4 Carryout proper documentation of inspection and quality assurance program for bulk materials duly approved by OWNER'S/OWNER' REPRESENTATIVE. Contractor shall maintain an accurate and traceable listing of procurement records for the location, quality and character of all permanent materials in the Project.

6.1.5 Contractor shall immediately report to the OWNER'S/OWNER' REPRESENTATIVE any defect or change in material which will affect material quality, and necessary corrective actions to be taken as directed by OWNER'S/OWNER' REPRESENTATIVE.

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6.1.6 All construction works shall be carried out as per "Approved for Construction" drawings, procedures, specifications and applicable codes and standards. Any changes at site shall need prior approval from the Company followed by subsequent revision of relevant drawings upon approval.

6.1.7 Contractor shall also inform all local authorities in advance and obtain all necessary approvals for works wherever encountered along the system. Contractor shall be required to carry out all the works as mentioned in the work permit.

6.1.8 In some areas where machine excavation is not possible, Contractor shall have to do manual excavation also. Contractor shall consider all these eventualities while bidding.

6.1.9 Providing schedules, progress reporting, organization chart at construction site, quality assurance plan and developing quality control procedures, as per requirements of the bid package.

6.1.10 Providing all equipment, manpower, machinery, consumables, apparatus, tools and tackles for fabrication, installation, inspection, testing, pre-commissioning and commissioning complete as required.

6.1.11 Coordination and supervising the work of Sub-Contractors.

6.1.12 Transportation of appropriate materials to worksite, intermediate storage points, maintaining and operating an adequate material control procedure at worksite.

6.1.13 Fabrication of all small piping, stand, tubing, structural components as per approved drawings or site conditions.

6.1.14 All associated civil, structural, electrical, instrumentation; and telecom works shall be performed in accordance with relevant specifications, drawings and requirements.

6.1.15 Provide, maintain and operate all temporary facilities required for the construction related works and remove after completion of work.

6.1.16 Mobilizing and providing all equipment's, manpower (skilled and unskilled), consumables and other resources etc. as required for the execution of complete work.

6.1.17 Preparation of as built drawings, documents, photographs, project records as per specification and instructions of the Company including furnishing of all Test Certificates/Inspection Reports for all materials used for permanent installation.

6.1.18 All incidental and associated works and any other works not specifically listed herein but are required to be carried out to complete entire work and the associated facilities and making the entire system ready for operation.

6.1.19 The scope of work under this contract shall be inclusive of breaking of walls and floors, and chipping of concrete foundations necessary for the installation of equipment, materials, and making restoration of the same.

6.1.20 Minor modifications wherever required to be done in the OWNER'S/OWNER' REPRESENTATIVE free supplied equipment's or devices to enable cable entry, termination, etc.

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6.1.21 Sealing of openings made in the walls / floors for cable trays, cables, bus ducts, etc. suitably using acceptable practice and standards.

6.1.22 As-built drawing & document shall be provided for all work done including old systems where any integration has been done. All documentation to be provided as printed documents and computer files compatible with MS Office and Autocad.

6.1.23 Contractor shall be responsible for installation, field testing, calibration and providing assistance for pre-commissioning and commissioning of all instrumentation items.

6.1.24 During trial run/startup/commissioning, Contractor shall provide skilled personnel and supervision round the clock at Contractor's cost. Any defect or changes of setting, recalibration, etc., if any during the above activity shall be rectified / done immediately to the satisfaction of OWNER'S/OWNER' REPRESENTATIVE. The number and category of the personnel shall be as decided by OWNER'S/OWNER' REPRESENTATIVE. The cost of the above is deemed to be included by the Contractor in the rate quoted.

6.2 All system grounds of various cards and equipment, shields of signals (instrument) cables shall connect to system ground bus, which is electrically isolated from the AC mains earthing bus. The equipment shall provide separate earthing strip for the same. The system ground bus shall have independent ground buses through insulated wires.

a) System grounding/Instrument earth (earth resistance less than 1 ohm)

b) Power earth (earth resistance less than 5 ohms)

6.3 Lightning protection

Where connections between control systems and/or distant equipment may be affected by lightning surges or by other inducted high voltages, the connection cables shall be equipped with over-voltage arresters.

6.4 Contractor shall also carry all the calibration equipment/ testing equipment like multi-meter, handheld calibrator, 4-20mA simulator, modbus simulators, diagnostic tools etc.

6.5 Supply and laying of power, signals, control and communication cables, earthing cables. Including supply, laying of cable tray including terminations, ferruling, cable numbering, marking, testing including hot & cold loop testing. Branch cable shall be laid in cable tray and cable from Junction box or field local panel shall be buried. Tentative distance are given below as applicable

- Tentative distance between field instruments to junction box is contractor discretion.
- Tentative average aerial distance between Field JB to control room is 80 mtrs.
- Tentative average aerial distance from ACDB/DCDB to equipment cabinet is 50 mtrs

Note –Contractor shall choose the cable size and type according to need bases to reduce the number of runs but cable size and type shall be according tender only.

6.6 **SCOPE MATRIX**

Part A

Sr. No	Equipment/Packages	Works Packages (Contractor) Scope of work	Free issue material

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1	Pressure gauges, Temperature Gauge with thermowell (as per P&ID)	Design, Detail Engineering, Procurement of Materials, manufacturing or fabrication, Supply, installation of field instruments (including supply, fabrication of canopies, mounting stands, supports etc as per situ conditions), testing, integration with System, configuration/programming, commissioning as per user requirement, test run, and handover as per "PTS-Instrumentation with Appendices" and other tender documents. Scope also includes supply and installation all the erection hardware such as impulse tubing, fittings, protection shed/canopy, SS tag plates with SS Chain, mounting bracket as applicable, mounting stands including associated civil works	None
2	Fire Detection system	Supply, inspection, Testing, factory calibration, installation, erection, site calibration, commissioning and site acceptance, documentation & drawing and handover to Owner etc. "PTS-Instrumentation with Appendices". Scope also includes supply and installation all the erection hardware such as detectors, controller panel, MCP, Exit Sign, Hooter & beacon, Control panel etc. cabling, mounting stands (if any) including all associated works	none
3	CCTV Package	Supply, inspection, Testing, factory testing, installation, erection, site testing, commissioning and site acceptance, documentation & drawing and handover to Owner etc. PTS-Instrumentation with Appendices " Scope also includes supply and installation all the erection hardware , mounting poles, along with the cable accessories, including all associated works, Cable, JB etc. Size and height of mounting pole given in SOR is tentative. Same shall be supply and installed as per site conditions.	None

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4	Cables (Signal cable, control cable, communication cable, LAN cable, RS-232/485 cables etc. Optical fiber cable) Fire detection system and CCTV	Cable supply, laying, glanding, termination (field instrument, JB end, panel end), ferruling, lugging, tagging, clamping, marking etc. Scope includes supply of cable tag plates, Cable ferrule, clamps and all the required items to complete the laying works. Cable laying from as below as per cable schedule. Preparation of earthing pit, Laying of earthing cables/ strips for instrument enclosures, junction boxes, cabinet to earth grid. Installation of GI / copper strips for grounding of racks / cabinets / panels in the terminal building with earth pit; Preparation of buried cable trenches (if applicable) including excavation, back filling, compacting, providing of brick protection by second-class bricks, spreading of fine river sand, including all supplies. The job includes repairing of all civil works damaged during installation of electrical facilities.	None

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		Complete loop checking and megger testing of cables.	
5	Cable Tray with cover-branch tray	Supply and laying of perforated branch cable tray (50mm /100m/300m) as per site requirement Scope also includes supply and installation of all the erection hardware such as angle/channels supports, CS/MS plates, including associated civil works.	None
6	Field test	Hydraulic testing of instrument impulse lines (piping/tubing). Field instrument, detectors site calibration,	

Part B

		Scope		
Sr. No.	**Item Description**	**Contractor**	**Client**	**Remarks**
1	Unloading the material/equipment received from vendors to site, shifting of equipment/material from store to installation location etc.	YES		
3	Staff and labor transportation	YES		
4	Labor accommodation.	YES		
5	Labor license.	YES		
6	Wooden sleeper as required.	YES		
7	Required material for preparation of platform	YES		
8	Obtaining statutory approval (if any) for instrumentation system of project.	YES		
9	Preparation of Job Planning and schedule and DPR	YES		
10	All statutory compliance for Hazardous area instruments.	YES		
11	All civil work for earthing pits, repairing of plaster (If required during conceal wiring work).	YES		
12	Scaffolding material and installation	YES		As per requirement.

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13	Welding machines	YES		As per requirement.
14	Documentation like procedure preparation, work schedule, calibration reports, inspection report, progress report, termination details etc. test certificates compliance reports	YES		
15	Temporary Illumination at work site	YES		

7.0 QUALITY ASSURANCE AND QUALITY CONTROL

Contractor shall be fully responsible for their Quality Assurance and associated Quality Control process.

Unless otherwise agreed by the PURCHASER, the Contractor's quality system shall meet the requirements of ISO 9001:2015 Quality System and shall be accredited by a recognized authority.

Contractor is required to establish an acceptable Quality Plan, inclusive of quality manual and procedures that cover all activities of the order, in order to comply with the Quality System requirements.

Contractor shall be responsible for arranging/liaising with the Third-Party Inspection Agency and other agencies for design appraisal, inspection, survey and certification requirements as required by the specification/requisition.

When required, waiver and acceptance of non-conformances shall be subjected to Third Party Inspection Agency approval before COMPANY endorsement. These concession records shall be included in the Manufacturer's Final Documentation.

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	PTS – INSTRUMENTATION WITH APPENDICES	**P.019141 G11077 I001**

BHAGYANAGAR GAS LIMITED

(BGL)

MOTHER STATION COMPOSITE WORKS (INSTRUMENTATION AND ELECTRICAL WORKS) HYDERABAD GA

INSTRUMENTATION WITH APPENDICES

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1.0 SCOPE

1.1 This document covers design, engineering, testing at works, supply, installation, calibration, erection, testing at site and commissioning, guarantee run, handing over of control and instrumentation system package which includes all field instruments, fire detection system, instrument cables and armoured OFC cables and CCTV system for this PROJECT.

1.2 Scope also includes the supply, erection and installation of material, fabrication, cable laying, fittings, flanges, connectors, impulse tubing and all the associated accessories as required. Refer Scope of work for details.

2.0 DEFINITIONS

Subject to the requirements of the context, the terms (hereafter listed in alphabetical order) used in this specification are given the following meaning:

AGREEMENT	Designates the agreement concluded between the CLIENT and the CONTRACTOR, under which the latter undertakes to the former the GOODS and/or SERVICES according to the stipulations which are agreed and specified in the form of an order.
CLIENT	Designates the purchaser of the GOODS and/or SERVICES which are the subject of the AGREEMENT.
CONTRACTOR	Designates the individual or legal entity with whom the order has been concluded by the CLIENT. The term "CONTRACTOR" may be used indifferently for a supplier, a manufacturer, an erection contractor, etc.
DAYS - WEEKS – MONTHS	Specify the number of calendar days, weeks or months and not of working days, weeks or months.
ENGINEER	Designates the individual or legal entity to which the CLIENT has entrusted various tasks in relation with the carrying out of his PROJECT
GOODS and/or SERVICES	Designate, depending on the case, all or part of the drawings or documents, substances, materials, materiel, equipment, structures, plant, tools, machinery to be studied, designed, manufactured, supplied, erected, built, assembled, adapted, arranged or put into service by the CONTRACTOR under the AGREEMENT, including all the studies, tasks, works and services specified by the order. The Terms GOODS or SERVICES may by indifferently used one for the other as required by the context.
PROJECT	Designates the aggregate of GOODS and/or SERVICES to be provided by one or more CONTRACTORS.

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3.0 REVIEW AND/OR APPROVAL

Whenever CLIENT and/or ENGINEER review and/or approval is requested on a document to be submitted by the CONTRACTOR, or before an action is implemented by the CONTRACTOR, such review and/or approval shall always be requested in writing by the CONTRACTOR to the CLIENT and/or the ENGINEER, before any action subject of this review and/or approval is taken.

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CLIENT and/or ENGINEER approval shall always be given in writing.

4.0 APPLICABLE CODES & STANDARDS

The following Indian/ international or relevant codes and standards shall be used for designing the system. In all cases, latest revisions with amendments, if any, to be followed Apart from the specific codes mentioned herein, all other relevant and related codes concerning the specific job under consideration and/or referred to in these codes and technical specifications will be followed wherever applicable. All codes will be of the latest revision as on the date of issuing the tender/ bid document.

In the event of any conflict between this specification, related standards and codes, any other attachment to this tender, the Contractor shall refer the matter to OWNER'S/OWNER' REPRESENTATIVE for clarification and only after obtaining the confirmation on the same, should proceed with the manufacture/ supply / engineering of the item in question. The decision of the OWNER'S/OWNER' REPRESENTATIVE shall be binding on the Contractor.

CONTRACTOR shall seek CLIENT final interpretation of any conflicts prior to the execution of work. Rework of engineering and relevant scope arising out of underestimation shall be done at no additional cost to the CLIENT.

Sr. No	Codes	Description
1	ANSI/ISA S 51.1	Process Instrumentation Terminology.
2	ISA 5.4	Instruments Loop diagrams.
3	IEC 60529 / IS 2147 / NEMA	Specification for Weatherproof Enclosure.
4	IEC 60079	Specification for Flame Proof Enclosure
5	IEC 61000	Electromagnetic Compatibility for Industrial Process Measurement and Control equipment.
6	IEC 60801	EMI and RF interference
7	IS-1554 Part 1	PVC insulated (heavy duty) electric cables- working voltage up to and including 1100V.
8	BS-5308 Part 1, Type 2	Specification for PVC insulated cables.
9	IS 8130	Conductors of insulated cables
10	IS 5831	Specification for PVC insulation and sheath of insulated cables.

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11	IS-3975	Mild steel wires, formed wires and tapes for armouring of cables.
12	ASTM D 2843	Test method for Max smoke density for cable
13	ASTM D 2863	Test method for measuring of Temp and O2 Index.

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Sr. No	Codes	Description
14	IEC 60754	Acid generation test
15	IEC-332-3 Part 3	Tests on bunched wires and cables.
16	BS 6121, EN 50262	Cable gland – flame proof Ex"d" or Exe increase safety.
17	DIN- 50049	Document on Material Testing.
18	ASME PTC 19.3	Temperature Measurement- calculation of natural frequency.
19	IEC 751 / DIN 43760	RTD
20	IEC 584/DIN 43710 / ANSI MC 96.1	Thermocouple
21	ISO 5167	Measurement of fluid flow by means of orifice plates, Nozzles and Venturi tube inserted in filled piping circular profile.
22	IS 3624 / BS EN 837	Pressure gauge
23	OISD	Oil Industry Safety Directorate Government of India
23.1	OISD 118	Layouts for Oil & Gas installations
23.2	OISD 152	Safety Instrumentation for Process System in Hydrocarbon Industry
23.3	OISD 153	Maintenance and Inspection of Safety Instrumentation in Hydrocarbon Industry
23.4	OISD 163	Process Control Room Safety
23.5	OISD 195	Safety in Design, Operation, Inspection and Maintenance of Hydrocarbon Gas Compressor stations and Terminals
23.6	OISD-STD-226	Natural Gas Transmission Pipelines and City Gas Distribution Networks.
24	NFPA	National Fire Protection Association
24.1	NFPA-70	National Electrical Code
24.2	NFPA-497	Electrical installation, classification of Class1 & Class 2 hazardous locations
24.3	NFPA-101	Life Safety Code

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Sr. No	Codes	Description
24.4	NFPA 325M	Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids for LEL of Gases
25	PNGRB/T4S	Technical & safety standards statutory requirements for natural gas pipelines.

5.0 STATUTORY APPROVALS / CERTIFICATES (AFTER GETTING ORDER)

5.1 The bidder shall be responsible for obtaining all statutory approvals, as applicable for all instruments and instrumentation systems.

5.2 Equipment / instrument / systems located in electrically hazardous areas shall be certified for use by statutory authorities for their use in the area of their installation. In general, following certification shall be provided by the bidder.

a. For all flameproof equipment / instrument / systems, which are manufactured abroad (outside India) certification by any approving authority like BASEFA, FM, UL, PTB, LCIE, CENELEC etc. shall be required.

b. For all flameproof equipment / instrument / systems manufactured locally (within India), certification shall be carried out by any of the approved testing houses – Central Mining Research Institute (CMRI) etc. The manufacturer shall hold a valid Bureau of Indian Standards (BIS) license.

c. Approval certificate from Chief Controller of Explosives (CCE) or Petroleum and Explosive Safety organisation (PESO) is mandatory for all electronic / electrical instruments / equipment to be installed in India, irrespective of country of origin.

6.0 ABBREVATIONS

- ISO (International Standards Organisation)
- IS (Indian Standards).
- IEC (International Electro technical Commission).
- ASTM (American Society for Testing Materials).
- EIA (Electronics Industry Association).
- BIS (Bureau of Indian Standards).
- IEEE (International Electrical and Electronics Engineers).

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- CCE (Chief Controller of Explosives, Nagpur).
- PT – Pressure transmitter
- TE – Temperature element

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- TT – Temperature Transmitter
- RTU – Remote terminal unit
- SCADA – Supervisory control and data acquisition system
- GOOAV – Gas over oil actuated valve
- HOV – Hydraulic operated valve

7.0 ENGINEERING UNITS

a	Flow	
	Gas	Sm³/hr / MMSCMD
	Mass flow	kg/hr.
	Volumetric flow	m³ / hr.
b	Pressure	Barg
c	Temperature	°C.
d	Level	%.

8.0 DESIGN PRINCIPLES

8.1 GENERAL

Instrumentation and control and monitoring systems shall be in accordance with this specification and as defined in the P & I Diagrams.

8.2 INSTRUMENT SELECTION

Instruments and instrumentation systems of proven reliability and latest technology shall be used.

Selection of instrumentation shall be made from the RECOMMENDED Instrument Supplier Lists.

Any exception has to be justified and is subject to approval by the CLIENT.

8.3 TAGGING

All instruments and instrumentation equipment shall be permanently identified by tags, labels and/or nameplates. Use of adhesive tapes shall not be allowed.

8.4 PAINTING

Manufacturer's standard colours shall be used for all instrumentation equipment in control and instrument rooms, unless otherwise specified.

Field instruments shall generally be epoxy painted, unless otherwise specified.

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8.5 TRANSMISSION SYSTEMS

Transmission of the process variables shall generally be by means of electronic or low level signals. The output signal for electronic instruments shall be 4 to 20 mA DC or digital.

No process fluid shall be piped into the control rooms or the instrument rooms.

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8.6 ENCLOSURES AND MATERIALS

All instruments shall be suitable to withstand the environmental conditions specified for the plant location.

All parts subject to moisture, fungus growth or insect attack shall be suitably treated (Tropicalisation).

Local instrument housings shall be weather-proof (IP 65 minimum) and meet the electrical area classification requirements.

All parts of instruments exposed to process fluids shall be resistant to corrosion by the corresponding fluid.

8.7 ELECTRONIC INSTRUMENTATION IN HAZARDOUS AREAS

In hazardous areas, intrinsically safe instrumentation shall be provided in general.

If not possible or not practical, flameproof protection concepts may also be used wherever applicable.

All electrical instruments to be installed in hazardous locations shall be ATEX certified. Contacts shall be encapsulated, hermetically sealed and, if used in intrinsically safe circuits, contacts shall be gold plated.

8.8 R.F. IMMUNITY

All instruments and control systems shall be immune from the effects of any R.F. interference that may occur at the plant location in accordance with IEC 801 "Electromagnetic compatibility for industrial-process measurement and control equipment".

Equipment to be installed inside the control room shall be in compliance with the European Community directive requirements, denoted by the "CE mark". This compliance shall extend to each relevant item.

8.9 ELECTROMAGNETIC INTERFERENCE

The equipment offered shall incorporate the most effective techniques available to minimize the electromagnetic interference effects to ensure that other electronic systems neither adversely affect nor get adversely affected by the system supplied by the contractor. The contractor shall ensure that the electromagnetic interference generated by the system is well below the permissible levels as per applicable standards.

The equipment shall be required to meet one or more of the following standards:

a) IEC 801 – 3 –Latest edition

b) BS 6667- PART 3 - Latest edition

c) ANSI/ IEEE C 37.1- Latest edition

d) MIL – STD - 461

e) VDE 0871

The equipment to be supplied shall be type tested for Electromagnetic Compatibility if certificate of compliance from an independent test authority or test laboratory cannot be furnished.

8.10 ENGINEERING AND DESIGN DOCUMENTATION & DRAWINGS

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The documents and drawings to be prepared by the CONTRACTOR are listed hereunder.

8.10.1 DOCUMENTS

As a minimum requirement, the following documents shall be provided, whenever applicable.

- Instrument data sheets

The data sheets shall comprise all necessary technical data associated with the Instruments as per the enclosed format.

- Certification files

They shall contain copies of all electrical safety certificates and all documents applicable to the safety of electrical equipment installed in hazardous areas (e.g. intrinsically safe loop specifications, " Explosion proof certificate, CCOE certificate etc").

8.10.2 DRAWINGS

As a minimum requirement, the following drawings shall be prepared, when applicable.

- Logic drawing

Plant logic drawings with all the interlocks details for GOOAV, fire detection system, gas detection system and wherever applicable.

- Cable schedule

The cable schedule shall indicate details of the required cables (e.g. cable number, type, length, termination points, pair no, colour code etc.).

- Cable layout drawings

The cable layout drawings shall show the main routing of instrument cables and the location of all instrument junction boxes and local panels.

- Wiring diagrams

The wiring drawings shall show all cable termination details for junction boxes, cross boards, control cabinets, power supply cabinets, auxiliary cabinets, control panels, desks, etc.

- Earthing drawings

The earthing drawings shall show the requirements of earth strip / cable cabling up to the earthing systems.

- Loop diagrams

The loop diagrams shall show the connections between components of each loop with identification of terminals and cables.

- Control room layout drawings

Those layout drawings shall show the location of panels inside control room, front and rear arrangements and all the main sizes of panels, cabinets and desks.

- Process hook-up drawings

The process hook-up drawings shall show installation details for the various instruments, complete with

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schedule of required material. Contractor to refer attached standard drawings.

9.0 INSTRUMENTATION EARTHING SYSTEM

9.1 General

The earthing for electrical earth and electronic earth shall be arranged to provide safe installations, and to prevent electrical interference with their operation.

All earthing and shielding shall comply with the requirements of all standards applicable to the area classification in which the equipment is installed.

9.2 Instrument cases, panels. etc.

a) All parts of field installations, e.g. Cable trays, junction boxes, local panels, instrument housings, conduits, cable armour, etc.., shall be effectively grounded via the general plant earthing system.

b) Earthing of cable trays shall be in accordance with the IEC requirements as a minimum.

9.3 Each supplied instruments, local control panel, fire detection panel, gas detection panel system shall have earthing lugs with their frames. All these lugs/ strips shall properly secured to the electrical earthing bus.

9.4 All system grounds of various cards and equipment, shields of signals (instrument) cables shall connect to system ground bus, which is electrically isolated from the AC mains earthing bus. The equipment shall provide separate earthing strip for the same. The system ground bus will have independent ground buses through insulated wires.

a) System grounding (earth resistance less than 1 ohm)

b) Frame and AC mains grounding (earth resistance less than 5 ohms)

9.5 Lightning protection

Where connections between control systems and/or distant equipment may be affected by lightning surges or by other inducted high voltages, the connection cables shall be equipped with over-voltage arresters.

10.0 ENVIRONMENTAL SPECIFICATIONS

All equipment shall be designed for operation, storage and transportation under the following environmental condition:

Max. / Min. Temperature	:	0 °C / 55 °C
Design temperature	:	(-) 20 °C to 60 °C
Relative Humidity	:	95%
Hazardous Area Classification	:	Zone 2, Gas Group II A or B, Temp. Class T 3
Control Room & Electrical Room	:	Safe Area

11.0 POWER SUPPLY

Electrical power supply shall be provided at one point inside the battery limit as per the details provided below. Further distribution shall be in the scope of the CONTRACTOR. If any other voltage levels are required, then all necessary conversions shall be in the scope of CONTRACTOR.

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Normal supply : 230 V AC UPS power supply shall be provided at all the stations for F&G panel. Necessary power conversion 24 VDC or 48 V DC as required shall be done by contractor.

12.0 INSTRUMENTS SPECIFICATION

Follow these specifications as applicable as per P&ID

12.1 PRESSURE GAUGES (PG)

PG shall be Direct-mounting type having element of bourdon tube and dial size of 150 mm. It shall have shatterproof glass. Connection shall be ½" NPT (M) from bottom. Enclosure shall be weatherproof to IP65. Protection shall be 130% over range. Accuracy shall be ±1% of FSD. PG shall have blown out disc facility. For higher pressure applications (above 60 Barg), it shall be solid front type.

Pressure gauge dial shall be white, non-rusting plastic with black figures. The dial face shall be marked with pressure element material. Pointers shall have micrometer adjustment.

Pressure gauge sensing element shall be of SS 316 and moving elements of SS 304, as a minimum.

12.2 THERMOWELL

All temperature measuring instruments shall be provided with thermowell. The process connection shall be flange type. Minimum line size for thermowell connection shall be 4". For lower line size, same shall be expanded to 4".

The thermowell shall be constructed from drilled bar stock of SS316 material. Thermowell shall have a sufficient internal bore to properly accommodate the devices, which are to be placed in the bore.

All thermowells shall be stress analysed for velocity conditions. Calculation shall be done as per ASME PTC 19.3 code. 100% radiography shall be conducted for all fabricated thermowells. Thermowells of long length shall be provided with alternate arrangements as per standards.

Immersion length of thermowell shall be a follows

Line size	Immersion length
From 4" to 6"	280mm
From 8" onward	320mm
Vessel/ Column	400mm

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13.0 INSTRUMENT CABLES

13.1 DESIGN & CONSTRUCTION

13.1.1 All cables shall be Flame retardant low smoke (FRLS) type.

13.1.2 Voltage Grade of cables shall be 650/1100 V.

13.1.3 1Px1.5 mm², 1Qx1.5mm², 2Px1.5 mm², 12Tx1.5mm², 6Px 0.5 mm², 12Px0.5 mm², 1Tx1.5mm² cables shall be used for instrumentation purposes. No other combination shall be acceptable.

13.1.4 Cable shall be supplied in drum and negative tolerance in cable length for each drum shall not be acceptable.

13.1.5 1T x 1.5mm² shall be used for gas detection system. Quad cable shall be used for RTD. Single pair or two pair cable shall be used from field instruments to junction box.

13.1.6 Multi pair cable individual and over all shielded shall be used for all the along signals from junction box to control room and panel to panel inside the control room as applicable

13.1.7 Multi pair over all shielded cable shall be used for all the digital input /output signals from junction box to control room and panel to panel inside the control room as applicable.

13.2 SINGLE PAIR AND QUAD SHIELDED CABLE

13.2.1 Each core shall be 1.5 mm2 made of 7 stranded annealed electrolytic copper conductor. Each strand shall be 0.53 mm dia.

13.2.2 For Intrinsically safe application, primary insulation shall be low density poly ethylene (LDPE). For non-intrinsically safe application, primary insulation shall be 85°C polyvinyl chloride (PVC) as per IS5831 Type C. Thickness shall be 0.5 mm minimum.

13.2.3 A pair shall have twisted cores and number of twists shall be not less than 10 per metre. Colour of core insulation shall be black blue in pair and black, blue and brown in triad.

13.2.4 Individual pair shall be shielded. Shield shall be Aluminium backed by Mylar/polyester tape with the metallic side down helically applied with either side 25% overlap and 100% coverage. Minimum shield thickness shall be 0.05 mm. Drain wire shall be 0.5 mm2 multi-strand bare tinned annealed copper conductor. The drain wire shall be in continuous contact with Aluminium side of the shield.

13.2.5 Inner and outer jacket shall be made of extruded flame retardant 90oC PVC to IS 5831-Type ST2. Oxygen index of PVC shall be over 30%. Temperature Index shall be over 250°C. The thickness of the jacket shall be as per IS-1554 Part 1.

13.2.6 Inner jacket colour shall be black. Outer jacket colour shall be black except, for cables to be used in intrinsically safe systems it shall be light blue. A rip cord shall be provided for inner jacket.

13.2.7 Armour over inner jacket shall be galvanized steel wire as per IS-1554 Part 1.

13.3 MULTIPAIR CABLE WITH INDIVIDUAL PAIR SHIELD AND OVERALL SHIELD:

13.3.1 Generally the cable shall be same as single pair shielded cable except conductor sizes shall be 0.5 mm2 made of 7 strands of annealed electrolytic copper conductor. Each strand shall be of 0.3 mm dia.

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13.3.2 Overall shield shall be of Aluminium backed up by Mylar/polyester tape helically applied with the metallic side down with either side 25% overlap and 100% coverage. Minimum shield thickness shall be 0.05 mm. Drain wire shall be similar to individual pair drain wire and shall be of the overall shield.

13.3.3 A pair of communication wire shall be provided for multipair cables. Each wire shall be 0.5 mm2 of plain annealed single or multi-strand copper conductor with 0.4 mm thick 85°C PVC insulation. Insulation shall be green and red colour coded.

13.3.4 Pair identification shall be with numbers at interval of not more than 250 mm as per vendor's standard.

13.4 MULTIPAIR CABLE WITH ONLY OVERALL SHIELD

13.4.1 These cables shall be same as above except that the individual pair shall not have shielding.

13.5 ELECTRICAL CHARACTERISTICS

13.6 RESISTANCE:

Maximum DC resistance of the conductor of the completed cable shall not exceed 12.3 Ω / km at 20°C for cables with 1.5 mm^2 conductors and 39.7 Ω / km at 20°C for cables with 0.5 mm^2 conductors.

13.6.1 Capacitance:

Mutual Capacitance:

The mutual capacitance of the pairs or adjacent cores shall not exceed a maximum of 250 pF / m at a frequency of 1 kHz.

Capacitance between any core or screen:

The capacitance between any core or screen shall not exceed a maximum of 400 pF / m at a frequency of 1kHz.

13.6.2 L/R ratio of adjacent core shall not exceed 40 µH / Ω for cables with 1.5 mm2 conductors and 25 µH / Ω for cables with 0.5 mm2 conductors.

13.6.3 The drain wire resistance including shield shall not exceed 30 Ω / km.

13.6.4 Electrostatic noise rejection ratio shall be over 76 dB.

13.7 INSPECTION AND TESTING

CLIENT reserves the right to test and inspect all the items at the manufacture's works.

Manufacturer shall furnish documents such as test certificates to prove the quality and composition of the materials used for manufacturing the cable to the satisfaction of CLIENT/CLIENT's Representative during expediting and inspection.

13.7.1 Type Test:

a) Type Certificates shall be furnished.

b) Cable shall be flame retardant to IEC 332-3 Part 3 Cat A.

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13.7.2 Routine Tests:

a) These tests shall be carried out by manufacturer during various stages of manufacturing. CLIENT shall review the related documents.

b) Insulation and Sheaths: All tests as per IS-5831 except insulation resistance, voltage and spark test shall be as per BS-5308 Part 2.

c) Armour test as per IS-3975.

d) Conductor resistance.

e) Cable capacitance, L/R ratio.

13.7.3 Acceptance Test:

These tests shall be carried out in the presence of CLIENT / CLIENT's Representative.

13.7.4 Continuity test:

a) Voltage test as per BS-5308 Part 2.

b) Conductor resistance and drain wire resistance.

c) Cable capacitance and L/R ratio test.

d) Electrostatic noise rejection test, type wise for each lot.

e) Tests for uniformity of galvanization of armour as per IS-2633.

f) Oxygen index test as per ASTM D 2863, temp. index test, smoke density rating test, acid gas generation test and flammability test.

g) Dimensional check for overall diameter and under armour/over armour diameter.

h) Overall finish check. In case of any lump purchaser shall have the right to cut outer sheath for lump portion and reject the cable.

i) Check of Drum length and overall length tolerances.

Immediately after completion of electrical tests, the ends of the cable shall be sealed to prevent ingress of moisture with suitable PVC/Rubber caps.

13.8 CABLE GLANDS

13.8.1 Cable gland shall be provided for all the above mentioned cables both at field instrument, junction boxes and local control panel.

13.8.2 Instrument cable gland shall be ½" NPTM insulating glands double compression type, weather proof (WP) IP 65 in field instrument side only for underground instruments tapping to protect the CP current drainage.

13.8.3 Except that, all other shall be standard metallic gland. All cables glands shall be of nickel-plated brass WP IP65 and they shall be double compression type suitable for armoured cables.

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13.8.4 Flame proof Ex (d) glands in hazardous area shall be supplied and along with Ex (d) certification.

13.8.5 Cable gland shall have PVC shroud.

13.8.6 Reducer/adapter & plug shall be supplied as per requirement. These shall be Nickel plated brass, Weather proof and Flame proof as require.

13.9 CABLE TRAYS AND CABLE DUCTS

13.9.1 All branch cables/trench cable shall run on cable trays.

13.9.2 These cable trays shall be made out of galvanized iron-perforated type of 2.5 mm thickness. These trays are supported with suitable clamps shall be supplied for binding the cables/tubes at every 500 mm interval. All the cable/tubes will be laid in trench, false flooring/ ceiling trays, instrument support structures and supported with 50 mm x 50 mm angles as a minimum.

13.9.3 Maximum width of the cable tray shall be 600mm and height 50mm, 75mm or 100mm as applicable. 25% spare capacity shall be provided in cable trays.

13.9.4 The above ground outdoor field cables shall be laid in durable, non-corrosive hot dipped galvanized perforated cable trays of suitable sizes shall be provided for cable routing between junction boxes/ instruments and buried trench in the station/unit facilities. The cable trays shall be supported at regular intervals.

13.9.5 Contractor shall submit details of cable trays including size, layout drawings etc. during detailed engineering stage. Supply, installation and fixing of Prefabricated hot dipped galvanized perforated cable trays of width 50 mm / 100 mm / 150 / 300 mm as per site requirement for laying of cables. The work includes cutting to size, fixing with all accessories on concrete / wall / structures etc.

13.9.6 The proper NEMA strength classification trays shall be used in accordance with loading requirements. The tray shall be installed with standard vendor/contractor components and shall be covered with perforated covers (of same material) after laying cables.

13.9.7 Cable tray shall be rigidly supported to carry the weight of the cables laid within, as well as any vibrations which may be experienced in normal operation of work. At no time shall the cable tray be used to sit or stand on, nor shall tools or pipe be placed on the tray.

13.9.8 Cable trays and supporting steel structure etc. to be painted as per standard procedures of painting to meet the corrosive area requirement. Proper color shall be provided in the cable trays. Epoxy based paint is to be applied on the all MS structures including support structures. Cable trays shall be installed with cabling etc as per site requirements. Cable laid in horizontal trays shall be fixed to the trays by means of suitable detachable type, non-corrosive straps at intervals not exceeding 500 mm.

13.9.9 Cable trays shall be supported at each 2500 mm or less of horizontal run and shall be so routed that there is no danger of mechanical damage. Routing shall follow major structure axis.

13.9.10 Cable trays for Hydrocarbon detectors cabling etc as per site requirement.

13.10 JUNCTION BOXES

13.10.1 Junction boxes shall be provided for intrinsically safe and non-intrinsically safe instruments also as required for packages such as gas detection system, fire detection system etc.

13.10.2 For non-intrinsic safe signals, junction box shall be explosion proof to Exd. IIA/IIB, T3 and weatherproof to IP 65 and made up of dia cast aluminium.

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13.10.3 For intrinsic safe signals, junction box shall be weatherproof to IP 65 made up of di-cast aluminium.

13.10.4 Enclosure: Cast in corrosion resistant light aluminium alloy (LM-6) suitable for Group C & D gases. The construction shall comply to IS: 2148 - 1981 and relevant international standard (IEC - 79.1), BS: 229 - 1957). The enclosure shall have ample space for proper termination of cables as per summary of requirement attached and as mentioned in these specifications.

13.10.5 In addition, the enclosure shall be totally dust, vermin and weatherproof suitable for outdoor installation without any canopy. Degree of protection should be minimum IP-65 as per IS/IEC: 60529 – 2001.

13.10.6 Terminals: Junction boxes shall be provided with vibration proof terminals (as per vendor list) clip on type 2.5 sq.mm suitable for 500 VAC working voltage. Arrangement of fixing terminals strip shall be made such that cable connections can be made easily.

13.10.7 Earthing: External and internal earthing terminals complete with set of washers shall be provided.

13.10.8 Mounting: The junction boxes shall be suitable for field mounting on M.S supporting structures.

13.10.9 Painting: Junction boxes shall be pre-treated by first coat of epoxy zinc chromate primer followed by anti-corrosive industrial epoxy grey paint shade IS 631.

13.10.10 Cable entries: The junction boxes shall have bottom entry and should be of NPT threads only.

14.0 FIRE DETECTION SYSTEM

14.1 Fire detection system shall be Conventional/Addressable Type Microprocessor based system. Fire detection system shall be comprised of multisensory detectors, includes optical photo electric type smoke detectors and heat detectors based on rate of raised. Multi sensor detectors shall be installed in the miscellaneous rooms like electrical room, control room/equipment room battery room, false ceiling, and false flooring as applicable of the different stations along the pipeline network. Two detectors shall be connected in loop to avoid false notification.

14.2 Multi sensor shall have combined feature of smoke detectors and thermal sensor (heat detectors). Smoke activity shall be monitored by optical sensing technology in a single detectors/base assembly. Heat detectors shall be fixed with selectable rate of rise setting.

14.3 Optical/photo electric type smoke detectors for timely detection of smoke/fire. Smoke detectors installed above the false ceiling and below false flooring wherever applicable in order to sense the fire occurred in the electrical wiring & fittings etc. The smoke detectors above the false ceiling and below false flooring are not be visible, these detectors shall be fitted with remote Response Indicators located below the false ceiling, and above false flooring (on adjacent wall) which shall glow in the event of actuation of these detectors.

14.4 The Fire Detection and Alarm System shall be of high quality fast-acting conventional system. The system shall consist of compatible microprocessor-based fire alarm control panel, junction boxes, detectors, hooters, beacons, exit signs, response indicators, with starter, Break glass unit (Manual call points) etc. with associated wiring.

14.5 The detecting units shall be installed, tested and commissioned in accordance with NFPA-72, IS & other international standards on Automatic fire detectors.

14.6 All system components and devices shall be connected to two wire loop circuits in such a way that removal or disconnection of any device from the loop shall not affect the functioning and performance of the system.

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14.7 The system should also have provision to give fault signal which shall be a distinct signal audible and/or visual indicating a failure of electric supply, presence of a break, an earth or other electrical fault on a circuit or system of circuits.

14.8 Devices like hooters, horns, or like which give the sound signals shall be installed to give sounds with the electrical alarm signals from the detectors or when there is fault in the system.

14.9 Electrical wiring must conform to IS: 732-1963 or equivalent International Standards.

14.10 All electrical cables shall conform to IS: 1554 / BS: 5308 Part 2 or equivalent international Standards with latest amendments. All cables to be laid underground in the field shall be armoured type. Cables laid inside conduits in buildings may be unarmoured type

14.11 On the alarming, Hooter outside building area will be actuated.

14.12 A break glass unit (BGU) shall be installed at the outer side of each room and in field wherever feasible (decided during engineering stage) for manual actuation of the fire alarm.

14.13 When a detector is in alarm condition, the information shall be sent to the central unit and the central unit shall send to RTU. The alarm situation of the detector shall remain "ON" until a manual reset device is activated on the central unit. An indicating LED shall permit the direct identification of the detector that is the cause of alarm.

14.14 The fire control panel will derive its power from a 24V DC main, which will be converted to require voltage (DC) level by the contractor inside the panel if require. The fire control panel shall provide the required power to the sensors and accessories and will monitor the zonal circuits for open and short circuit faults. The fire control panel shall also be provided with a secondary power source comprising Maintenance free batteries, for 30 min alarm condition with 24 Hrs back up which automatically takes over the system in the event of failure of main power supply.

14.15 Contacts used in intrinsically safe circuit shall be gold plated. All electronic circuits used in the system shall be free from the effects of any RF interference.

14.16 Fire detection system shall be suitably hooked up with CO2/Clean agent fire suppression system for auto/manual flooding in control room/equipment room and electrical.

14.17 Fire detection system shall have provision of hardwire signals common potential free contact fire detected & sensor fault for interface with RTU/SCADA system.

14.18 HEAT DETECTORS

Heat detectors shall be used negative temperature coefficient thermistor for sensing and for reference. The detectors shall be designed to give a response that depend on both absolute temperature and rate of raise.

The rate of raise element shall be carefully calibrated to ignore any normal fluctuation in temperature, but to respond quickly when the temperature rise is 9 °C or more per minute (also decided during detailed engineering stage).

The fixed temperature feature should be entirely independent of the rate of raise element. The operating temperature of fixed temperature element should be factory set at 57 °C ±5 °C.

The detectors shall be self-restoring type ensuring repeated use and easy maintenance.

14.19 OPTICAL/PHOTO ELECTRIC SMOKE DETECTORS

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Optical smoke detectors shall work on the principle of light scattering utilizing a light emitting diode.

14.20 Input/output signals

The input signals of the central unit of the fire detection system shall be from:

a) Multisensor detectors etc.

b) Break glass units for a manual actuation of the fire alarm,

c) Break glass units connected in series, located in the plant and actuated manually when fire is detected.

d) LED type Exit sign board

e) Ex proof beacon with hooter field mounted

14.21 SYSTEM COMPONENTS

The system shall for each site comprise:

a) Smoke detectors and Heat detectors (Multisensor)

b) Safe & hazardous area hooter & beacon.

c) Break glass units, (Exit gate of each room)

d) A central unit equipped with “silence alarms” and “reset” key push-button.

14.22 THE FOLLOWING TECHNICAL DATA SHALL BE SUPPLIED BY THE CONTRACTOR:

a. Power supply:

- Operating
- minimum
- maximum

b. Consumption during normal condition.

c. Consumption during alarm condition.

d. Operating temperature range.

e. Operating humidity range.

f. Sensibility,

14.23 DETECTOR

The detector shall consist of:

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a) an I.R. source LED,

b) a SI-diode receiver,

c) electronic connections and electric contacts with high impedance,

d) heat sensor

e) a metallic protection,

f) sensitive elements impregnated with silicone rubber,

g) an anti-condensation system,

h) an indicating LED,

i) A mounting base.

14.24 CENTRAL UNIT

The central unit shall consist mainly of:

a) A power supply module comprising power supply and charger for one 24 V safeguard battery.

b) A monitor module for earth leak faults, short-circuits, lamp or LED test and general reset push button,

c) A monitor module for power supply and battery failures associated with a general alarm switch and an indicating lamp or LED,

d) A general alarm module associated with a reset push button of the audio signal,

e) A module able to monitor the state of the input signals and to generate the right action with regard to the output signals,

f) A front panel with lamps or LEDS to indicate the state of the input and output signals.

g) Sensor fault shall be provided from Fire Alarm Control Panel (FACP) to RTU.

h) All devices connected at the inputs of the central unit shall be supplied with electronic connections and electric contacts with high impedance to facilitate the immediate detection of short-circuit or line cuts.

i) Fire detection panel shall be wall mounted.

14.25 Input supply and battery backup

- Input Supply 24 V DC
- 24 hrs backup (normal state) & 30 min in alarm state
- Batteries VRLA

14.26 Battery charger provided in the FACP shall be modular mounted on a draw out chassis. Charger module shall be located on the front allowing withdrawal with the help of handlebars for maintenance.

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14.27 Logic of operation shall be preferably built on "Fail safe" feature i.e. NC contact of field devices shall be considered as healthy condition and NO as fire condition. 1 NO+ 1 NC contact of output relays shall be wired to terminal block for interface with Owner's other equipment.

14.28 It shall be possible to test lamps, hooters, flasher circuit, and carry out functional tests etc. through common "Test" push button.

14.29 The circuit shall be so designed that silencing of the current alarm by ACCEPT push button shall not prevent annunciation of subsequent fire alarm received from any other location.

14.30 Signal-to noise ratio shall be high to avoid spurious actuation due to noise induced in the field wiring because of proximity with power cables. Cables for field devices shall be multicore copper conductor, unscreened, armoured, copper conductor cable.

14.31 Detectors and BGUs shall be wired through 1.5 mm2 multi-core, copper conductors, PVC insulated, armoured FRLS cable.

14.32 LEDs shall be provided for fire/ fault visual annunciation on the panel front. LED shall also be provided for Power supply healthy, Battery backup ON, Battery/ Charger status.

14.33 If zone is protected with clean agent/CO2 system, the detectors and BGUs of the zone shall be wired in cross-zones by providing minimum two signaling circuits in a zone. The last device in each circuit shall be provided with end of line resistor of suitable value as per circuit design to facilitate cable open circuit and short circuit detection.

14.34 Vendor shall decide the zones according to area/rooms. These zones shall be created in coordination with CO2/Clean agent supplier. Zone wise alarm output signals shall go to the Beacon, Hooter, Siren actuation, CO2/Clean agent flooding system and RTU.

14.35 SCHEME FOR FIRE/ FAULT ANNUNCIATION:

System condition	AUDIO	VISUAL
NORMAL	OFF	OFF
FIRE	ON	Flasher ON, Fire LED Steady ON
Accept	OFF	Flasher steady, Fire LED steady ON
Reset	OFF	Flasher OFF, Fire LED OFF

15.0 CCTV System

15.1 POE CCTV system will be provided at all stations in each GA in order to provide enhanced security and movement control at each station.

15.2 All the Cameras and NVR shall be ONVIF compliant.

15.3 CCTV system is required to selectively display real time video signals of the field area in the control building. This system shall monitor video signal from various cameras installed at different locations within GA. It shall be able to select individual camera without interfering with the off-line functioning of the CCTV system since recording of all cameras shall be simultaneous and in real time environment.

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15.4 CCTV system shall have provision for superimposing text in order to identify camera positions with a time and date stamp facility and shall have facility of both i.e. viewing and for recording as well. This system shall have an extensive self-diagnostic program to detect and report any system fault.

15.5 Network Video Recorder (NVR) will be provided to record CCTV camera video feed. Recording shall be on a continuous basis for 30 days and suitable storage shall be provided in order to store the recorded video. It shall have programmable facility to restrict access through password. It shall have real time clock.

15.6 CCTV camera shall be color camera (day / night) with high resolution. Camera shall be able to generate alarm on detecting loss of video. All outdoor cameras shall be ingress protected to a minimum of IP 65. Camera installed in hazardous area shall be explosion proof Ex'd' as a minimum.

15.7 The CCTV system shall include, but not limited to, the following equipment:

- Network Video Recorder (NVR) with storage
- Workstation with monitor
- Big screen
- Fixed Camera – Outdoor.
- Camera Poles.

16.0 INSTALLTION MATERIAL SPECIFICATION

16.1 All instruments impulse line (1/2" tubes) shall be consist of tubing and piping. The impulse tube shall be SS316. Compressed type ferrule fitting such as ½" NPT (M) to NPT (F) fittings (male/female connectors), ½" tee, ½" union including ½" isolation needle/ball valves & other accessories shall be according piping material specifications.

16.2 Instrument Impulse tubing

1/2" OD x 0.065" and 1/4" OD x 0.065" (if applicable) wall thickness, seamless, fully annealed 316 stainless steel tubing shall be used.

Tubes shall be cold drawn as per ASTM A 269.

Hardness of the tubes shall be Rockwell RB 70 – 79.

16.3 Compression fittings

- Compression fittings shall be of the two-ferrule type in 316 stainless steel.
- Fittings shall be of flareless compression type and four-piece (for double compression type) construction consisting of two ferrules, nut and body suitable for use on SS tubes conforming to ASTM A 269 TP 316 with hardness in the range of RB 70 to 79.
- Hardness of the ferrules shall be in the range of RB 85-90 so as to ensure a hardness difference of the order of 5 to 10 between tubes and fittings for better sealing.
- Nuts and ferrules of a particular size shall be interchangeable for each type.
- Spanner hold shall be metric.
- Threaded ends of fittings shall be NPT as per ANSI B 1.20.1

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- Specific techniques like silver plating shall be used over threading in order to avoid jamming and galling.
- It shall be ensured by the contractor that all fittings shall match the seamless ½" OD SS 316 instrument tube with wall thickness of 0.065" conforming to ASTM A 269

16.4 Instrument valves and manifolds

- Vendor shall supply instrument valves (miniature type) and valve manifolds wherever required.
- Body rating shall be as per piping class or higher.
- Valve body and trim material shall be 316 SS unless otherwise specified. Superior trim material shall be selected as required by process conditions. Packing material in general shall be of PTF
- The isolation valves for instrument service shall be 316 stainless steel, unless process conditions require another material.

16.5 Instrument Sunshades

Instrument sunshades shall be made from Fiber glass reinforced, polyester/Metallic, supplied with mounting clamp (epoxy coated) suitable for a 2" instrument stand.

For instruments located in hazardous area, sunshades shall be as described here above but anti-static type.

16.6 Instruments supports/structural steel

The supports for instruments and junction boxes shall be in accordance with the "Instrumentation Standard hook up drawing "as attached. Vendor shall supply instrument stands, stanchions and other structural steel material required for supporting the cable trays, impulse line and instruments.

16.7 Cable Ties

All cable ties shall be constructed from black PVC and have a breaking load greater than 20 kg. They shall be of a self-locking style and non-slip but shall be releasable for the addition of extra cables. Cable ties for use on trays shall fix into the tray slots (two-piece ties).

16.8 Nameplates Tags labels

The nameplates, tags and labels for identifying junction boxes, instruments, panels, cabinets, etc shall be made from engraved trifoliate.

17.0 INSPECTION AND TESTING

17.1 The manufacturer shall carry out inspection and testing as per relevant codes and service requirements of this specification, for all items of work prior to shipment. Manufacturer's test certificates in proper format must be sent with the despatch paper of all supply items.

17.2 All instruments and system-oriented items shall undergo factory testing and inspection by Contractor's authorized representatives, Owner/Consultant unless specified otherwise.

17.3 Wherever inspection at manufacturer's shop is waived because of any reason, the sub vendor's own testing reports shall be verified before dispatch. In no case, items shall be released without proper inspection/ verification.

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17.4 The instrumentation inspection and testing shall be carried out as per inspection and test plan attached with bid document, other specifications and documents. Where, the inspection and test plan is not available, Contractor shall develop the inspection and test plan and submit for review/approval by the Owner/Consultant.

17.5 Testing and inspection of all instrumentation items shall be carried out as per approved factory testing procedures. For instrumentation items where no testing is witnessed by the Owner/Consultant, following test certificates shall be forwarded for review before dispatch of such instrument:

- Verification of certificates as applicable for the material certificates, NDT reports like radiography/ X-ray/ die-penetration/ MP etc., statutory certificates for Intrinsic safety and explosion proof, certificates of conformity etc.
- Visual verification for quantity, quality and workmanship.
- Hydro testing and pneumatic testing as applicable.
- Functional and performance test certificates including calibration, accuracy, and repeatability testing of instruments.
- Test certificates for pressure relief valves, set pressure & seat leakage test
- Radiographic test for pressure relief valves and thermowells.

17.6 Contractor shall submit all instrumentation test records / test results for records to Owner/Consultant as bound volume along with the test procedure for each test carried out.

17.7 Acceptance test

After completion of the CONTRACTOR tests, the CONTRACTOR shall perform, at the CONTRACTOR's facility, a functional test on 100 % of inputs and outputs with simulation panel provided and wired up by the CONTRACTOR.

All deficiencies shall be recorded, and corrections made.

Appropriate tests shall be run to demonstrate that the deficiencies have been corrected and that there has been no degradation to the system.

17.8 On-site acceptance test

These tests shall be basically a repeat of the system factory acceptance test. To the extent possible, the simulation of I/O signals shall be replaced by the actual signals.

18.0 PAINTING, MARKING AND SHIPMENT

All items shall be painted and marked as per manufacturer's standard before shipment. All items shall be properly packed and protected to avoid damage during shipment. Insurance during shipment shall be ensured by the manufacturer.

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PRESSURE GAUGE

UNITS: Flow<-> Liquid- m*3/hr Gas- Sm*3/hr Steam- kg/hr Pressure-> Barg Temperature<-> oC Level/Length<-> mm

1	Type:-	Direct	
2	Mounting:-	Local	
3	Dial Size:-	150 mm	
	Colour:-	White with black inscriptions	
4	Case Material:-	SS316	
5	Bezel Ring:-	Beyonet type SS316	
6	Window Material:-	Shatterproof glass	
7	Enclosure:-	WP to IP 65 as per IEC 60529 / IS 2147	
8	Pressure Element:-	Bourdon	
9	Element Material:-	SS316	
10	Socket Material	SS316	
11	Accuracy:-	+/-1% of FSD	
12	Zero adjustment:-	Micropointer	
13	Connection:-	1/2" NPT(M)	
	Connection Location:-	Bottom	
14	Movement:-	SS316	
15	Diaphargm Seal:-	--	
	Type:-	--	
	Wetted Parts Material:-	--	
	Others Material:-	--	
	Process Connection: Size & Rating	--	
	Facing & Finish:-	--	
	Capillary Material:-	--	
	Armour - Flexible Material:-	--	
	Capillary Length:-	--	
	Flushing/Filling connection with:-	--	
16	Over Range Protection:-	130% of FSD	
17	Blow Out Protection:-	Yes	
18	Options :-	a) Snubber	
	b) Syphon	c) Gauge Saver	
	d) Liquid Filled casing	e) Vaccum Protection	
	f) Solid front	g) Two valve manifold	
19	Quantity :-	*	

SL. NO.	TAG NO.	RANGE Kg/Cm²	PRESSURE			TEMPERATURE			SERVICE	OPTIONS
			OP.	MAX.	DES.	OP.	MAX.	DES.		
	As per P&ID	0 to 60							Natural gas	g required

* Venodr to furnish

1 Contractor shall develop details data sheet with all the required information like make/model etc, during detail engineering

☐ DEVIATION ☐ NO DEVIATION VENDOR'S SIGNATURES WITH SEAL

	P.019141 G11049 I001						
Sheet No. 01 of 14	CLIENT:	BGL					
	PROJECT:	HYDERABAD GA					
			0	25.09.24			
	VENDOR:		REV.	DATE	ATHR	CHKD	APPD

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JUNCTION BOXES

General	1	Tag No.	Quantity	*	*
	2	Application		For Instrumentation Non-IS cables	
	3	Area Classification		Zone 2, Gr. IIA / IIB, T3	
	4	Enclosure		**WP to IP 65 as per IEC60529 & Exd IIB T6 as per IEC 60079 / IS 2148**	
	5	Material of Construction		Die cast aluminium (LM6 alloy)	
	6	Overall Dimension		*	
	7	Cover		Screwed	
	8	Painting		Surface : grey & Inside : White	
	9				
Single Cable	10	No. of Entry	Left Side	6 nos. - 1/2" NPT(F)	
	11		Right Side	6 nos. - 1/2" NPT(F)	
	12		Top Side	-	
	13		Bottom Side	-	
	14		Other	-	
	15	Cable Gland	Type	Double compression, Nickel plated brass & WP to IP 65 & EExd IIB T6 as per IEC 60079 / IS 2148	
	16		Size	1/2" NPT(M)	
	17				
	18				
	19				
Multi Cable	20	Entry		2 Nos, 1 1/2" NPT, Bottom	
	21	Cable Gland	Type	Double compression, Nickel plated brass & WP to IP 65 & EExd IIB T6 as per IEC 60079 / IS 2148	
	22		Size	11/2" NPT(M)	
	23				
	24				
Terminals	25	Type		Spring loaded, antiloosening & vibration-proof, screwless clamp type	
	26	Quantity		48 Nos.	
	27	No. of Rows		2 Nos.	
	28	Numbering System		Terminal strips & terminals shall be suitably numbered	
	29	Size		2.5 mm2	
	30	Make		*	
	31				
Options	32	Telephone Socket & Plugs		Required	
	33	Plug		1/2" NPT(M) & 11/2" NPT(M)	
	34	Ground Busbar		Required	
	35	Rail(s) for terminals		Required	
	36	PVC hood alongwith Cable gland		Required	
	37	Hinges		Required	
	38	Nameplate Fixture		Required	
	39	Gasket		Neoprene Rubber	
	40	Hardware		MS Zinc passivated	
	41	Mounting		Suitable for mounting wall, column, steel structure	
Others	42	Manufacturer		As per Approved /Recommended vender list	
	43	Model		*	
	44				
	45				
	46				
	47				

NOTES:

* : Vendor to furnish

1 Junction boxes shall have detachable cover which is fixed to the box by means of cadmium plated triangular head / hexagonal head screws.
2 Junction boxes shall have a warning engraved / integrally cast on the cover as "ISOLATE POWER SUPPLY ELSEWHERE BEFORE OPENING".
3 Quantity of Cable glands & plugs shall be as per requirement.
4 Junction box numbers based on cable schedule along with data sheet shall be submitted by contractor for approval

☐ DEVIATION ☐ NO DEVIATION VENDOR'S SIGNATURE WITH SEAL

	P.019141 G11049 I002						
Sheet No. 02 of 14	CLIENT:	BGL					
	PROJECT:	HYDERABAD GA					
	VENDOR:						

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INDOOR DOME FIXED CCTV CAMERA SPECIFICATION			
SYSTEM	1	**Type**	Fixed POE based Note-1
	2	**Video Standard**	PAL/NTSC
	3	**Scaning System**	Progressive
	4	**Image Sensor**	1 / 3" 4 Megapixel progressive CMOS or Better
	5	**Resolution**	4MP
	6	**Number Of Pixels**	2688(H) x 1520(V)
	7	**Minimum illumination**	0.005 Lux/F1.5 (Color,30IRE), 0 Lux/F1.5 (IR ON) or Better
	8	**Compression**	H.265/H.264 sub-stream: H.265/H.264//MJPEG
	9	**Frame Rate for Main & Sub Stream**	Main Stream: *4MP - 25/30 fps Sub Stream: * 2MP - 25/30 fps
	10	**Video Output**	4M (2688 x 1520); 3M (2304 x 1296); 1080p (1920 x 1080); 1.3M (1280 x 960); 720p (1280 x 720); D1 (704 x 576/704 x 480); VGA (640 x 480); CIF (352 x 288/352 x 240)
	11	**Video Frame Rate**	25fps or better
	12	**Sync System**	Internal
	13	**Automatic Electronic Shutter**	1/20 to 1/15000 sec or better
LENS	14	**Lens**	2.7 mm~13.5 mm, Motorized
	15	**Angle of View**	H:26°-90° , V:20°-60°
	16	**IR LED'S**	Yes

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CAMERA FEATURES	17	**IR Illumination Distance**	Up to 40m or Better
	18	**SNR**	More than 30db
	19	**Day / Night**	Auto
	20	**Automatic Gain Control**	Auto
	21	**White Balance**	Auto
	22	**Digital Noise Reduction**	3DNR
	23	**Wide Dynamic Range**	120 Db
	24	**Backlight Compensation**	BLC / HLC / WDR
	25	**OSD**	YES
	26	**On Board Storage**	Built-in microSD/SDHC/SDXC slot, up to 256 GB (min.) or Better
ANALYTICS	27	**Analytics**	Motion Detection, Video Tamper,Smart Tripwire, Intrusion
NETWORK	28	**Ethernet**	RJ-45 (10 / 100 Base-T) or Better
	29	**Connector**	RJ-45
	30	**Security**	Password Protected access, IP address filtering & user access log facility
	31	**Compatibilty**	ONVIF Profile S / G / M / T
BITRATE	32	**Bit Rate Control**	*
	33	**Bit Rate**	*
ELECTRICAL	34	**Input Voltage**	*
	35	**Power Consumption**	*

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MECHANICAL	36	**Dimensions**	*
	37	**Weight**	*
	38	**Construction**	*
ENVIROMENTAL	39	**Operating Temperature**	-10°C to + 50˚C
	40	**Relative humidity**	Less than 95%, non-condensing IP
	41	**IP Rating**	IP 65 or better
	42	**Vandal Resistance**	IK10 or better
REGULATORY	43	**Certifications/Approvals**	UL,BIS,FCC,CE
	44	**Emissions**	*
	45	**Immunity**	*
	46	**Safety**	*
GENERAL	47	**Make**	*
	48	**Model**	*

Notes:

a)	Vendor to specify.*
b)	Vendor to confirm the below points :
1	If the distance is not within range, then the vendor shall supply & lay power cable and optical cable along with a media converter.
2	Vendor shall supply & install the CCTV's with microSD/SDHC/SDXC card of suitable Capacity (min- 256 GB).
3	For installation of Dome CCTV's JB's along with SPD shall be provided as per the site conditions with each camera .

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OUTDOOR WP FIXED BULLET CCTV CAMERA SPECIFICATION			
SYSTEM	1	**Type**	Fixed POE based Note-1
	2	**Video Standard**	PAL/NTSC
	3	**Scaning System**	Progressive
	4	**Image Sensor**	1 / 3" 4 Megapixel progressive CMOS or Better
	5	**Resolution**	4MP
	6	**Number Of Pixels**	2688(H) x 1520(V)
	7	**Minimum illumination**	0.005 Lux/F1.5 (Color,30IRE), 0 Lux/F1.5 (IR ON) or Better
	8	**Compression**	H.265/H.264 sub-stream: H.265/H.264//MJPEG
	9	**Frame Rate for Main & Sub Stream**	Main Stream: *4MP - 25/30 fps Sub Stream: * 2MP - 25/30 fps
	10	**Video Output**	4M (2688 x 1520); 3M (2304 x 1296); 1080p (1920 x 1080); 1.3M (1280 x 960); 720p (1280 x 720); D1 (704 x 576/704 x 480); VGA (640 x 480); CIF (352 x 288/352 x 240)
	11	**Video Frame Rate**	25fps or better
	12	**Sync System**	Internal
	13	**Automatic Electronic Shutter**	1/20 to 1/15000 sec or better
LENS	14	**Lens**	2.7 mm~13.5 mm, Motorized
	15	**Angle of View**	H:26°-88° , V:20°-60°
	16	**IR LED'S**	Yes

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CAMERA FEATURES	17	**IR Illumination Distance**	Up to 50m or Better
	18	**SNR**	50db or Better
	19	**Day / Night**	Auto
	20	**Automatic Gain Control**	Auto
	21	**White Balance**	Auto
	22	**Digital Noise Reduction**	3DNR
	23	**Wide Dynamic Range**	120 Db
	24	**Backlight Compensation**	BLC / HLC / WDR
	25	**OSD**	YES
	26	**On Board Storage**	Built-in microSD/SDHC/SDXC slot, up to 256 GB (min.) or Better
ANALYTICS	27	**Analytics**	Motion Detection, Video Tamper,Smart Tripwire, Intrusion
NETWORK	28	**Ethernet**	RJ-45 (10 / 100 Base-T) or Better
	29	**Connector**	RJ-45
	30	**Security**	Password Protected access, IP address filtering & user access log facility
	31	**Compatibilty**	ONVIF Profile S / G / M / T
BITRATE	32	**Bit Rate Control**	*
	33	**Bit Rate**	*
ELECTRICAL	34	**Input Voltage**	*
	35	**Power Consumption**	*

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MECHAN CAL	36	**Dimensions**	*
	37	**Weight**	*
	38	**Construction**	*
ENVIROMENTAL	39	**Operating Temperature**	-10°C to + 50˚C
	40	**Relative humidity**	Less than 95%, non-condensing IP
	41	**IP Rating**	IP 66 or better
	42	**Vandal Resistance**	IK10 or better
REGULATORY	43	**Certifications/Approvals**	UL,BIS,FCC,CE
	44	Emissions	*
	45	Immunity	*
	46	Safety	*
GENERAL	47	Make	*
	48	Model	*

Notes:

a)	Vendor to specify.*
b)	Vendor to confirm the below points :
1	If the distance is not within range, then the vendor shall supply & lay power cable and optical cable along with a media converter.
2	Vendor shall supply & install the CCTV's with microSD/SDHC/SDXC card of suitable Capacity (min- 256 GB).
3	For installation of Bullet CCTV's JB's (IP-65) along with SPD shall be provided as per the site conditions with each camera .

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OUTDOOR EXPROOF FIXED BULLET CCTV CAMERA SPECIFICATION			
SYSTEM	1	**Type**	POE/AC/DC Power based Note-1
	2	**Video Standard**	PAL/NTSC
	3	**Scaning System**	Progressive
	4	**Image Sensor**	1 / 2.8" 2 Megapixel progressive CMOS or Better
	5	**Resolution**	2MP
	6	**Number Of Pixels**	1920(H) x 1080(V)
	7	**Minimum illumination**	0.005 Lux/F1.8 (Color), 0 Lux/F1.8 (IR ON) or Better
	8	**Compression**	H.265/H.264; sub-stream: H.265/H.264//MJPEG
	9	**Frame Rate for Main & Sub Stream**	Main Stream: *2MP - 50/60 fps Sub Stream: * 2MP - 25/30 fps
	10	**Video Output**	1080p (1920 x 1080); 1.3M (1280 x 960); 720p (1280 x 720); D1 (704 x 576/704 x 480); VGA (640 x 480); CIF (352 x 288/352 x 240)
	11	**Video Frame Rate**	25fps or better
	12	**Sync System**	Internal
	13	**Automatic Electronic Shutter**	1/20 to 1/8000 sec or better
LENS	14	**Lens**	4.3 mm~129 mm
	15	**Optical Zoom**	30X
	16	**Angle of View**	H:2.3°-60° , V:1.7°-37°
CAMERA FEATURES	17	**SNR**	50 db or Better
	18	**Day / Night**	Auto
	19	**Automatic Gain Control**	Auto
	20	**White Balance**	Auto
	21	**Digital Noise Reduction**	3DNR
	22	**Wide Dynamic Range**	120 Db or Better
	23	**Backlight Compensation**	BLC / HLC / WDR
	24	**OSD**	YES

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	25	**On Board Storage**	Built-in microSD/SDHC/SDXC slot, up to 256 GB (min.) or Better
ANALYTICS	26	**Analytics**	Motion Detection, Video Tamper,Smart Tripwire, Intrusion
NETWORK	27	**Ethernet**	RJ-45 (10 / 100 Base-T) or Better
	28	**Connector**	RJ-45
	29	**Security**	Password Protected access, IP address filtering & user access log facility
	30	**Compatibilty**	ONVIF Profile S / G / T
BITRATE	31	**Bit Rate Control**	*
	32	**Bit Rate**	*
ELECTRICAL	33	**Input Voltage**	*
	34	**Power Consumption**	*
MECHANICAL	35	**Dimensions**	*
	36	**Weight**	*
	37	**Construction**	*
ENVIROMENTAL	38	**Operating Temperature**	-40°C to + 60˚C
	39	**Relative humidity**	Less than 95%, non-condensing IP
	40	**IP Rating**	IP 68 or better
	41	**Housing**	*
REGULATORY	42	**Certifications/Approvals**	ATEX/IECEx , BIS , PESO
	43	**Emissions**	*
	44	**Immunity**	*
	45	**Safety**	*

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	46	**Hazardous Certifications**	*
GENERAL	47	**Make**	*
	48	**Model**	*

Notes:

a)	Vendor to specify.*
b)	Vendor to confirm the below points :
1	If the distance is not within range, then the vendor shall supply & lay power cable and optical cable along with a media converter. The convertor etc . will be placed in an Ex-Proof Junction Box. For installation of Ex-Proof CCTV's JB's (IP-65 IIC Exd , T3) along with SPD shall be provided as per the site conditions with each camera .
2	Vendor shall supply & install the CCTV's with microSD/SDHC/SDXC card of suitable Capacity (min- 256 GB).

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	CLIENT:	BGL					
	PROJECT:	HYDERABAD GA					
	Vendor						

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NVR, CCTV WORKSTATION SPECIFICATION			
GENERAL	1	**Make**	*
	2	**Model No.**	*
	3	**Type**	NVR , ONVIF compliant
	4	**Qty**	As per SOR
INPUT	5	**Type**	*
	6	**IP Video Input**	16 - channel
	7	**Two - way audio Input**	1 - channel, RCA (2.0 vp-p, 1 KΩ) or Equivalent
	8	**Incoming Bandwidth**	80 mbps or better
OUTPUT	9	**Decoding Resolution**	5 MP/ 4 MP/ 3 MP/ 1080P or better
	10	**HDMI/VGA Output**	1 - Channel resolution: 1920x1080P/60Hz, 1600x1200/60Hz, 1280x1024/60Hz, 1280x720/60hz,
	11	**Audio Output**	1 - Channel RCA (Linear, 1kΩ) or Equivalent
	12	**Playback Resolution**	5 MP/ 4 MP/ 3 MP/ 1080P or better
	13	**Synchronous Playback**	16 Channel 4CIF / 8-CH 720P / 4-CH 1080P /2-Ch 5MP
HARD DISK	14	**SATA**	2 SATA HDD interfaces per port support upto 10TB
	15	**Capacity**	2TB or better
DISPLAY	16	**Work Station**	32" Client Workstation along with licensed Operating System Software, Keyboard along with required cables, connectors, interfaces complete as per specifications.
EXTERNAL INTERFACE	17	**Network Interface**	Ethernet Interface
	18	**USB Interface**	2 x USB 2.0 or better

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PROCESS	19	**Power Supply**	240 VAC UPS supply
	20	**Consumption**	*
	21	**Operating Temperature**	-10 to 55 Deg c
	22	**Operating Humidity**	10% to 90%
	23	**Chassis**	19-inch rack-mounted 1U chassis
	24	**Dimension(WxDxH)**	*
	25	**Weight**	*

Notes:

a) Vendor to specify.*

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CCTV MONITOR SPECIFICATION		
1	Make	*
2	Model	*
3	LED Screen Size	32" or Better
4	Resolution (per LED Cabinet)	Min 1920 x 1080 (Full HD)
5	Contrast Ratio	3,000:1 or Better
6	Bezel Width	Slim
7	LED Type	3-in-1 Black SMD
8	Environment/Application	Indoor; Fixed,
9	Standard Mounting Configurations	Fixed, Self-Standing
10	Installation, Service	Rear
11	Pixel Configuration	SMD 3-in-1 (1R1G1B)
12	LED Configuration	1 Red, 1 Green, 1 Blue
13	LED Surround	Black
14	Brightness	600 nits
15	Brightness, Uniformity	0.97
16	Viewing Angle	160° (horizontal), 140° (vertical) or Better
17	Color Space	92% NTSC
18	Color Uniformity	0.97
19	Colors	200 trillion
20	Frame Rate	50, 60 Hz
21	LED Refresh Rate	3,000 Hz
22	Runtime Duty Cycle	24x7
23	Acoustic noise	Fan less Operation
24	Operating Temperature/Humidity (degrees F/C, relative humidity)	+14° to +104°F (-10° to +40°C) at 10-80% RH
25	Storage Temperature/Humidity (degrees F/C, relative humidity)	-4° to 140°F (-20° to +60°C) at 10-85% RH
26	Redundancy	Optional dual power supply, optional redundant video cabling
27	Line Voltage	100-240 Volts AC, 50 & 60Hz
28	Input Analogue	RGB
29	Input external control	RS 232C
30	Input USB	2 nos USB 2.0
31	Input wired LAN	RJ 45

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32	Input Wi-Fi	Yes
33	Audio output	Yes
34	Video Input Type	HDMI
35	Accessories	Remote controller including 2 nos spare batteries, mounting brackets etc.

Notes:

a) Vendor to specify.*

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Datasheet-Conventional /Addressable type Fire Detector Controller

1	Fire Detection Panel	**Make**	*
2		**Model**	*
3		**Panel Type**	Wall Mounting
4		**Panel Size (W X D X H)**	as per OEM standard
5		**MOC**	as per vendor
6		**Cable Entry**	Bottom
7		**Colour**	RAL 7035
8		**Internal Wiring**	0.5, 1.5 & 2.5 Sq MM Flexible Wires
9		**Protection Class**	IP 42 minimum
10		**Indication on Panel**	UPS/battery charger supply ON-OFF, 24VDC ON-Off , Lamp Test , Battery On-Off
11		**System capacity**	Expandable to 1.5 times
12		**Rest / Acknowledge**	Push Button/soft buttonss for Reset and Acknowledge
13		**SIL 2 certification**	-
14	CONTROLLER	**Type**	*
15		**Power Supply**	24 VDC
16		**Power Conversion**	Vendor to decide if any
17		**Current in Noraml condition**	*
18		**Current in Alarm condition**	*
19		**Sensor Input**	*
20		**Alarm output**	Following ouput shall be provided
21		**Zoneswise**	Zonewise potential free contact for Flooding system to initiate flooding after getting alarm
22		**Hooter**	Potential free contact to Field mouned dual tone hooter (Note 2) and wall mounted hooter with flasher
23		**Repeater**	All zone wise alarm shall be repeated to repeater panle in Guard room (Note 4)
24		**Hooter**	Common alarm signal from all the zones (Potential free contact)
25			
26		**Front Panel Indication**	Zones wie alrm indication, Power indication, fault & Alarm. Reset / Accept Button, Battery healthiness indication
27		**Operating Temp**	0 deg C to + 50 Deg C
28	RTU Interface (Note 6)	**RS 485**	-
29		**Common Alarm**	24 V DC Potentail free contract (Separate terminal block is required)
30		**Common Alarm (MCP)**	24 V DC Potentail free contract (Separate terminal block is required)
31		**Sensor fault**	24 V DC Potentail free contract (Separate terminal block is required)
32		**Battery**	24 hrs backup (normal state) & 30 min in alarm state

NOTE :

1	All Alarm signals from all the sensor shall be connected in series and provided common alarm for RTU
2	Fire detection system shall be in compliace with NFPA 72. All required certificate shall be submitted
3	-
4	Supply of all the fire detectors signals, power and communication cables shall be in contractor scope incluidng laying and termination

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Sheet 08 of 14	CLIENT:	BGL					
	PROJECT:	HYDERABAD GA					
	VENDOR:		0	25.09.24	PP	SD	MS
			REV.	DATE	PREP	CHKD	APPD

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DATA SHEET- MULTI SENSOR OPTICAL-PHOTO ELECTRIC SMOKE / THERMAL DETECTOR			
Genral	1	**Equipment Name**	Multi Sensor Photo Electric Smoke/Thermal Detector
	2	**Type**	Conventional/Addressable
	3	**Make**	As per approved/Recommended vendor list
	4	**Model**	*
	5	**Mfg.Std.**	EN 54 Part 5(2000)
Function	6	**Principle of Detection**	Light Scattering & Thermistor
	7	**Maximum current stand by - mA**	*
	8	**Operating Voltage**	24 VDC
	9	**Max Permissible Alarm Current - mA**	*
MOC	10	**Body**	*
	11	**Mounting**	Surface
	12	**Dimension**	*
	13	**Colors**	*
	14	**Weight**	*
Service Condition	15	**Application**	Indoor
	16	**Indication**	Alarm condition : RED LED Healthy condition : GREEN LED
	17	**Humidity Range**	5% to 95% Rh(Non condensing)
	18	**Temp. Range**	0 to +50 ° C
	19	**Detector wire size**	*
Approval	20	**Product Certification**	LPCB/Vds/CE

NOTE :	
1	* - Vendor to Furnish
2	Bidder shall provide necessary Test / Calibration certificate
3	Bidder shall give more details as on above for better clarity of detector.
4	Bidder shall submit product catlogue with technical datasheet for reference , review and approval.
5	Refer the applicable PTS
6	Remote response indicator for detectors installed above flase ceiling and in the cable trenches shall be considered along with detectors
7	Mounting accessories and tag plate shall be provided for detectors.

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	CLIENT:	
	PROJECT:	
	VENDOR:	

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MANUAL CALL POINT			
Genral	1	**Equipment Name**	Manual Call Point with LED indication
	2	**Type**	Addressable/ Conventional (Break glass type)
	3	**Make**	As per approved/Recommended vendor list
	4	**Model**	*
	5	**Mfg.Std.**	EN 54 Part 11
Function	6	**Principle of MCP**	PRESS - Type Re-Settable
	7	**Operating Voltage**	24 VDC
	8	**Current Consumption - A**	*
MOC	9	**Body Material**	Manifacturing std/PC/ABS
	10	**Mounting**	Surface
	11	**Dimension**	*
	12	**Colors**	*
	13	**Weight**	*
Service Condition	14	**Application**	Indoor/safe area
	15	**Indication**	Required, Alarm LED
	16	**Humidity Range**	0-to 95% Rh(Non condensing)
	17	**Temp. Range**	0 to +50 ° C
	18	**MCP wire size**	*
Approval	19	**Product Certification**	LPCB/Vds/CE
	20	WP Protection	IP 42

Note	
1	* - Vendor to Furnish
2	Bidder shall provide necessary Test / Calibration certificate
3	Bidder shall give more details as on above for better clarity of Manual call point during detail engineering.
4	Bidder shall submit product catalogue with technical datasheet for reference , review and approval.
5	Refer the applicable PTS

	P.019141 G11049 I010						
Sheet 10 of 14							
	CLIENT:						
	PROJECT:						
	VENDOR:						

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EXIT SIGN			
Genral	1	**Equipment Name**	Exit Sign
	2	**Type**	Conventional/Addressable
	3	**Make**	Std
	4	**Model**	*
	5	**Mfg.Std.**	*
	6	**Mounting**	Wall mounted
	7	**Operating Voltage**	24 VDC/battery operated
	8	**Current Consumption - A**	*
Technical	10	**Housing**	Aluminium
	11	**Weight**	*
	14	**Diamension**	*
	15	**colour**	Green background white text
	16	**Back light**	Required
	17	**Battery backup**	3-4 Hrs
	18	**Rechargeble Battery**	Required Ni-CD
Approval	19	**Recharge time**	*
	20	**Protection**	IP 42

Note	
1	* - Vendor to Furnish
2	Bidder shall provide necessary Test / Calibration certificate
3	Bidder shall give more details as on above for better clarity during detail engineering.
4	Bidder shall submit product catalogue with technical datasheet for reference , review and approval.
5	Refer the applicable PTS

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DATA SHEET - EX PROOF HOOTER WITH FLASHING BEACON			
1	General	**Model**	*
2		**Make**	*
3		**Type**	Dual tone sound with Flashing Light
4		**Ingress Protection**	IP 65
5		**Material of Construction**	CAST Aluminium Alloy LM6
6		**Finish**	Inside & Outside light grey Epoxy Powder coating
7		**Field Mounted Reset Push Button**	Required
8		**Humidity**	0 - 95 % R.H.
9		**Temperature**	0 - 65 degc
10		**Certification**	PESO/CCOE
11		**Mounting accessories**	Mounting Bracket/Plate lncluding all accessories,
12		**Power consumption**	*
13		**Supply Voltage**	24 V DC
14	BEACON	**Type**	Xenon Lamp , red colour
15		**Flashing Frequency**	Beacon flashing frequency shall be 1 flash/sec
16		**Flashing colour**	Red
17		**Glass**	Shatter-Proof Heat Resistant Clear Glass
18	HOOTER	**Type**	Dual tone with Adjustable sound level
19		**Sound Level**	90 to 110 db @ 1 Mtr.
20		**Cable Entry**	Power entry and Two seperate entey for fire and Gas detetion system alarm cable
21		**Field Mounted Reset Push Button**	Required

NOTE :

1	" * " Indicate Vendor to fill data
2	
3	
4	

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	PROJECT:						
	VENDOR:						

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WP HOOTER WITH FLASHER			
Genral	1	**Equipment Name**	Hooter with flasher
	2	**Type**	Conventional
	3	**Make**	As per approved/Recommended vendor list
	4	**Model**	*
	5	**Mfg.Std.**	*
	6	**Mounting**	Wall mounted
	7	**Operating Voltage**	24 VDC
	8	**Current Consumption - A**	*
Hooter with flasher	10	**Flashing Frequency**	1 flash/sec
	11	**Flashing colour**	Red
	14	**Sound Level**	80 @ 1 Mtr.
	15	**Cable Entry**	*
	16	**Loation**	Safe Area
	17	**Temp. Range**	0 to +50 ° C
	18	**wire size**	*
Approval	19	**Product Certification**	
	20	**Protection**	IP 42

Note	
1	* - Vendor to Furnish
2	Bidder shall provide necessary Test / Calibration certificate
3	Bidder shall give more details as on above for better clarity during detail engineering.
4	Bidder shall submit product catalogue with technical datasheet for reference , review and approval.
5	Refer the applicable PTS

	P.019141 G11049 I013						
Sheet 13 of 14							
	CLIENT:						
	PROJECT:						
	VENDOR:						

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	QUALITY ASSURANCE PLAN FOR INSTRUMENT CABLES	P.019141 Q 11013 I001
		Consultant: TE-IN

SL. No.	Component/Operation	Charachteristics	Type of Check	Quantum of Check	Reference Doc	Acceptance Norms	Inspection Agency		
							Manifacturer /Vendor	Contractor's TPIA	Remark
1	**Raw Material Inspection**								
1.1	Copper / Aluminium wire (As Applicable)	1. Surface Finish	Visual	100% Sample	IS 8130/ BS 5308(P-2) & Relevant Standard as per Specification	IS 8130/ BS 5308(P-2) Relevant Standard as per Specification	P	R	
		2. Diameter/Dimension	Physical						
		3. Resistance	Electrical						
		4. Chemical property (Persulphate test for tinned copper)	Chemical						
		5. Annealing Test	Physical						
1.2	Insulation & Sheathing compound	1. Tensile & Elongation before & after ageing	Visual	One sample per batch	IS 5831/ BS 5308(P-2)Relevant Standard as per Specification	IS 5831/ BS 5308(P-2)Relevant Standard as per Specification	P	R	
		2. Type of compound	Visual						
		3. Thermal Stability	Physical						
	FR Test for FR PVC only	1. Oxygen Index	Enviro		ASTM-D2863	Min. 30%			
		2. Temperature Index	Enviro			Min 250deg C			
1.3	Armour-Galvanised steel round wire/strip	1. Surface Condition	Visual	One sample per batch	IS 3975/ BS 5308(P-2) Relevant Standard as per Specification	IS 3975/ BS 5308(P-2) Relevant Standard as per Specification	P	R	
		2. Uniformity of Zinc Coating	Chemical						
		3. Tensile strength & elongation	Physical						
		4. Torsion/ Winding	Physical						
2	**Process Inspection**								
2.1	Insulated core	1. Type of Material	Visual	Each setting & during run of M/c	BS 5308(P-2) & Relevant Standard as per Specification	BS 5308(P-2) & Relevant Standard as per Specification	P	R	
		2. Thickness of Insulation (Avg. Min.)	Physical						
		3. Core Identification	Visual						
		4. Surface Finish	Visual						
		5. Spark test	Electrical						
		6. Volume Resistivity	Electrical						
2.2	Pair/Triad- laying	1. Sequence of laying	Visual	Setting & During Process			P	R	
		2. Continuity of conductor	Electrical						
		3. Continuity of common pair	Electrical						
		4. Dimension	Physical						
		5. Lay Length	Physical						
2.3	Pair/Triad screeing & Overall screeing	1. Tape thickness	Physical				P	R	
		2. Tape overlap	Visual						
		3. Drain wire size	Physical						

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	QUALITY ASSURANCE PLAN FOR INSTRUMENT CABLES					**P.019141 Q 11013 I001**			
						Consultant	**TE-IN**		
SL. No.	**Component/Operation**	**Charachteristics**	**Type of Check**	**Quantum of Check**	**Reference Doc**	**Acceptance Norms**	**Inspection Agency**		
2.6	Inner sheath and outer sheath	1. Type of PVC	Visual	Each setting & at the running of M/c			P	R	
		2. Dimension	Physical						
		3. Thickness of Inner Sheath	Physical						
		4. Surface finish & Colour	Visual						
		5. Embossing/ Printing/Sequential Markingon outer sheath	Visual						
2.7	Armouring	1. No. of strips/wires	Visual	Starting of M/c & during process			P	R	
		2. Dimension of strips/wires	Physical						
		3. Direction of lay	Visual						
2.8	Conductor	1. Make up	Visual	100% spools at start & end	IS 8130/ BS 5308(P-2) & Relevant Standard as per Specification	IS 8130/ BS 5308(P-2) Relevant Standard as per Specification	P	R	
		No. of strands	counting						
		2. Size/Dimensions	Physical						
		3. DC Resistance at 20deg C	Electrical						
		Annealing (Before stranding) for copper	Physical						
3	Routine Test	1. Conductor Resistance	Electrical	100% Drums	IS 8130/ BS 5308(P-2) & Relevant Standard as per Specification	IS 8130/ BS 5308(P-2) & Relevant Standard as per Specification	P	W	
		2. Mutual Capacitance	Electrical	10% Drums	BS 5308(P-2) & Relevant Standard as per Specification	BS 5308(P-2) & Relevant Standard as per Specification	P	W	
		3. Capacitance between core & screen	Electrical	10% Drums					
		4. L/R Ratio	Electrical	10% Drums					
		5. HV Test a) Core to core b) Core to shield/Armour	Electrical	100% Drums					
		6. Spark Test a. Core b. Sheath			BS 5308(P-2) / BS 5099 & Relevant Standard as per Specification	Relevant Standard as per Specification	P	W	
		7. Test for rodent & termite repulsion					P	W	
		1. HV Test a) Core to core b) Core to shield/Armour	Electrical	10% Sample	BS 5308(P-2) & Relevant Standard as per Specification	BS 5308(P-2) & Relevant Standard as per Specification			

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2. Conductor Resistance	Electrical	10% Sample	IS 8130/ BS 5308(P-2) & Relevant Standard as per Specification	IS 8130/ BS 5308(P-2) & Relevant Standard as per Specification

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	QUALITY ASSURANCE PLAN FOR INSTRUMENT CABLES	P.019141 Q 11013 I001	
		Consultant	TE-IN

SL. No.	Component/Operation	Charachteristics	Type of Check	Quantum of Check	Reference Doc	Acceptance Norms	Inspection Agency		
4	Acceptance Test	3. Continuity test	Electrical	10% Sample	BS 5308(P-2) & Relevant Standard as per Specification	BS 5308(P-2) & Relevant Standard as per Specification	P	W	
		4. Insulation Resistance (Before & After HV) a. Individual Conductor b. Individual Screens	Electrical	One sample per lot					
		5. Tensile Strength & Elongation for Insulation & sheath before ageing	Physical	10% Sample					
		6. Dimension	Visual	10% Sample					
		7. Cable Capacitance between core & screen & L/R ratio test	Electrical	10% Sample					
		8. Spark Test a. Core b. Sheath			BS 5308(P-2) / BS 5099 & Relevant Standard as per Specification	Relevant Standard as per Specification			
		9. Test for rodent & termide repulsion.	Chemical	One sample per lot	"	"			
		10. Uniformity of zinc coating on armour	Chemical	"	"	"			
		11. Oxygen Index test as per ASTMD:2863	Chemical	"	"	"			
		12. Temperature Index test as per ASTMD:2864	Chemical	"	"	"			
		13. FR test as per IS:10810	Thermal	"	"	"			
		14. Overall finish & drum length	Visual	"	"	"			
5	**Flammability Test for FRLS PVC only**	1. Oxygen Index	Enviro	One sample per lot	ASTM-D2863	Min. 30%	P	W	
		2. Temperature Index	Enviro			Min 250deg C			
		3. Flammability test	Fire		IEC 332-1	Shall Pass			
		4. Smoke Density	As Applicable		ASTM 2843				
		5. Acid Gas Generation	As Applicable		IEC-754-1				
		6. Swedish Chimmney Test	As Applicable		As per Relevant Staandard				

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6	**Type Test**								
6.1	Tests For Conductor	1. Conductor Resistance	Electrical	One sample per lot	IS 8130/ BS 5308(P-2) & Relevant Standard as per Specification	IS 8130/ BS 5308(P-2) & Relevant Standard as per Specification	P	R	
		2. Annealing Test on Cu	Physical		BS 6360 & Relevant Standard as per Specification	BS 6360 & Relevant Standard as per Specification	P	R	

		QUALITY ASSURANCE PLAN FOR INSTRUMENT CABLES				**P.019141 Q 11013 I001**			
						Consultant	**TE-IN**		
SL. No.	**Component/Operation**	**Charachteristics**	**Type of Check**	**Quantum of Check**	**Reference Doc**	**Acceptance Norms**	**Inspection Agency**		
6.2	Test on Armour wire/strip	1. Tensile strength	Physical	One sample per lot	BS 5308(P-2) & Relevant Standard as per Specification	BS 5308(P-2) & Relevant Standard as per Specification	P	R	
		2. % Elongation	Physical						
		3. Torsion/Winding	Physical						
		4. Wt. of zinc coating	Chemical						
		5. Dimensions	Physical						
		6. Uniformity of coating	Chemical						
6.3	Thickness of Insulation & Sheath	Thickness of Insulation & Sheath	Physical	One sample per lot	BS 5308(P-2) & Relevant Standard as per Specification	BS 5308(P-2) & Relevant Standard as per Specification	P	R	
6.4	Physical tests on Insulation & Outer Sheath	1. Elongation & T. S. Before & After Ageing	Physical	One sample per lot	BS 5308(P-2) & Relevant Standard as per Specification	BS 5308(P-2) & Relevant Standard as per Specification	P	R	
		2. Ageing in Air oven	Physical						
		3. Shrinkage test	Physical						
		4. Hot Deformation	Physical						
		5. Heat Shock	Physical						
		6. Thermal stability	Physical						
		7. Flammability Test	Physical						
		8. Loss of Mass	Physical						
6.5	Insulation Resistance test at room & rated temperature	Volume resistivity	Electrical	One sample per lot	BS 5308(P-2) & Relevant Standard as per Specification	BS 5308(P-2) & Relevant Standard as per Specification	P	R	
6.6	H.V. test at room temperature	H.V. test at room temperature	Electrical	One sample per lot	BS 5308(P-2) & Relevant Standard as per Specification	BS 5308(P-2) & Relevant Standard as per Specification	P	R	

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6.7	Noise Test	Electrostatic noise rejection ratio test	Electrical	One sample per lot	BS 5308(P-2) & Relevant Standard as per Specification	BS 5308(P-2) & Relevant Standard as per Specification	P	R	
7	packing in drum	Finish	Visual	100%	As per Relevant Standard	As per Relevant Standard	P	R	
		Marking on drum							
LEGEND:	**R: Review of Docs**		**C: Critical**	**B: Major**		**RW-Random witness**		**M-Manufacturer,**	
	A: Minor		**W: Witness**	**TPIA-Third Party Inspection Agency**		**H-HOLD**		**P-Perfomer,**	

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	QUALITY ASSURANCE PLAN FOR JUNCTION BOX	P.019141 Q 11013 I002

Sl.No	Description	Characterisitc	Quantum of Check	Record	Inspection Agency			Remark
					Manifacturer /Vendor	TPIA	Client	
1	**Material Inspection**							
1.1	Incoming materials like Castings, Terminals etc.	Material Identification, Visual, Pressure test on castings for hazardous area Junction boxes.	100%	Material Test Certificates / Lab test certificates /Relevant Standard as per Specification	P	R	R	
2	**In process Inspection**							
2.1	Machining of components	Visual, Dimensions	100%	Test Records / Relevant Standard as per Specification	P	R	-	
3	**Final Inspection**							
3.1	Final Inspection	· Visual, dimensional, clearance & Paint shade check for all items. JB TAG no. Plate · Verification of Terminal Nos., sizes and no. of entries · Bill of material verification. · Warning plate for junction boxes and marking on cable glands, Adapters, Plugs etc. · Pressure test on casting for flameproof junction boxes. · High Voltage and insulation resistance test.	100% by Supplier	Supplier's Test Records / Relevant Standard as per Specification	P	W	W/R	

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		· Air leak test report on pneumatic JBs.						

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	QUALITY ASSURANCE PLAN FOR JUNCTION BOX	P.019141 Q 11013 I002

Sl.No	Description	Characterisitc	Quantum of Check	Record	Inspection Agency			Remark
					Manifacturer /Vendor	TPIA	Client	
4	**Painting**							
4.1	(Painting of JBs prior to assembly)	Pre treatment, primer, final paint shade, thickness	100%	Suppliers Internal Test Reports	P	R	R	
5	**Documentation and IC**							
5.1	Documentation and IC	· Certificate from authority like BASEEFA, FM, PTB, ATEX, UL, CIMFR etc. for use in specified hazardous area. · Statutory approval certificates for instruments from CCOE/PESO for use in specified hazardous area. · Degree of protection certificate for instrument housing. · Traceability of record. · Suppliers Internal Test Records	Prototype for type tests / 100% for others	Statutory Approval Certificates / Type Test Certificates / Suppliers Internal test records	P	R	R	

LEGEND :	**R: Review of Docs**	**C: Critical**	**B: Major**	**RW-Random witness**	**M-Manufacturer,**	
	A: Minor	**W: Witness**	**TPIA-Third Party Inspection Agency**	**H-HOLD**	**P-Perfomer,**	

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QUALITY ASSURANCE PLAN
FOR PRESSURE GAUGE

P.019141
Q 11013
I003

Sr. No.	Component Operation	Charactristics Checked	Category	Type/Method of Check	Extent of Check		Referrence Document	Acceptance Norm	Format of Plan	Agency			Remarks
					P	W				M	TPIA	C	
1	Raw Material	a) Dimensions	MA	Mechanical	100%	100%	PO approved	PO approved	TC	P	R	W/R	
		b) Chemical Analysis	MA	Chemical	Sample	_	Spec/Drg.	Spec/Drg.	TC	P	R	W/R	
		c) Marking, Tagging	MA	Visual	100%	100%	Approved Spec/PO	Approved Spec/PO	TC	P	W	W/R	
2	Routine test	Accuracy Hystresis Repeatability	CR	Measurement 5 Points	100%	100%	EN 837-1	EN 837-1	Calibration Report	P	W	W/R	
		Over range protection	CR	Visual	100%	100%	EN 837-1	EN 837-1	Test Report	P	W	W/R	
	Accessories (If applicable) Guage Saver in SS 316	1) Chemical Analysis 2) Dimensions 3) Leak Tightness	MA MA CR	Chemical Measurement Hydrotest	Sample 100% 100%	 100% 100%	Approved/PO specs/Datasheet/Drawing	Approved/PO specs/Datasheet/Drawing	TC Work Certificate Test Certificate	P	W	W/R	
3	IRN										P	R	

Note: 1) Material and Type shall be as per tender specification / datasheet.

Category: CR - Characteristics affecting safety of equipment and personnel
MA - Characteristics affecting safety of Performance
MT - Charactristics affecting safety of Appearance

M-Manufacturer
TPIA-Third Party Inspection Agency
C-Client/ Counsaltanr

P-Perform

W-Witness

R-Review

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		QUALITY ASSURANCE PLAN FOR PRESSURE GAUGE						P.019141 Q 11013 I004			
SL. No.	**Component Operation**	**Characteristics Checked**	**Type/ Method of check**	**Extent of check**	**Reference document**	**Acceptance norm**	**Format of plan**	**Inspection**			**Remarks**
TG Assemblies								**VENDOR**	**TPIA**	**Client**	
1	Bimetal Temp.Gauge assemblies	a) Chemical composition of Raw material (case , tube , etc.)	Testing	100%	As per Relevant STD / PTC 19.3	As per Approved Datasheet and Drawing	Test certificate	P	R	W/R	
			*	100%	As per Relevant STD / PTC 19.3	As per Approved Datasheet and Drawing		P	R	W/R	
			*	100%	As per Relevant STD / PTC 19.3	As per Relevant STD / PTC 19.3		P	W	W/R	
			Testing	Sample of design	As approved data sheet	As approved data sheet		P	R	W/R	
			analysis	_	As per Approved Datasheet and Drawing	As per Approved Datasheet and Drawing		P	R	W/R	
2	Routine test	Accuracy Hysteresis Repeatability Response Time	Measurement	100%	EN 13190	Calibration Report		P	W	W / R	
		Over range protection	Visual	100%	EN 13190	Test Report		P	W	W / R	
3	Thermowell	a) dimension	measuring	100%	Approved Drawing	Approved Drawing	Log book test report	P	W	W/R	The results logged in the log book would be issued in the form of test certificates as per DIN
		b) hydro test	testing	100%	As per Approved Datasheet and Drawing	No leakage	Log book test report	P	W	W/R	
		c) bore concentricity test	go- no gauge	100%	As per Relevant STD / PTC 19.3	As per Relevant STD / PTC 19.3	Log book	P	W	W/R	
		d) visual	observation	100%	As per Relevant STD / PTC 19.3	As per Relevant STD / PTC 19.3	Log Book	P	W	W/R	
		e)workmanship/finish	observation	100%	As per Relevant STD / PTC 19.3	As per Relevant STD / PTC 19.3	Log Book	P	W	W/R	
		f) Spec/ tagging	visual	100%	As per Approved Datasheet and Drawing	As per Approved Datasheet and Drawing	Log book	P	W	W/R	
		g) threading	thread gauge	100%	As per Relevant STD / PTC 19.3	As per Relevant STD / PTC 19.3	Log book	P	W	W/R	
		h) surface finish	visual	100%	As per Relevant STD / PTC 19.3	As per Relevant STD / PTC 19.3	Log book	P	W	W/R	
4	IRN				Page 1 of 1				R	R	

Sr.No	Name of ITEM/Package	Recommended Vendor List
1	**COALESCENT FILTER / REGULATORS**	ASEA BROWN BOVERI LTD.
2	COALESCENT FILTER / REGULATORS	BLUE STAR LTD
3	COALESCENT FILTER / REGULATORS	PLACKA INSTRUMENTS & CONTROLS PVT. LTD
4	COALESCENT FILTER / REGULATORS	SHAH PNEUMATICS

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5	COALESCENT FILTER / REGULATORS	SHAVO NORGREN (I) PVT. LTD
6	COALESCENT FILTER / REGULATORS	PARKER
7	COALESCENT FILTER / REGULATORS	WEH
8	COALESCENT FILTER / REGULATORS	V AUTOMAT & INSTRUMENTS PVT. LTD.
9	COALESCENT FILTER / REGULATORS	VELJAN HYDRAIR PVT. LTD.
10	COALESCENT FILTER / REGULATORS	COMPAC NEWZEALAND
11	COALESCENT FILTER / REGULATORS	GASOREX
12	COALESCENT FILTER / REGULATORS	OEM
13	**PRESSURE RELIEF VALVE**	ALSTHOM FLUIDS SAPAG
14	PRESSURE RELIEF VALVE	ANDERSON GREENWOOD CROSBY
15	PRESSURE RELIEF VALVE	BHEL (TRICHY)
16	PRESSURE RELIEF VALVE	DRESSER INC.
17	PRESSURE RELIEF VALVE	FUKUI SEISAKUSHO CO. LTD.
18	PRESSURE RELIEF VALVE	INSTRUMENTATION LTD. (PALGHAT)
19	PRESSURE RELIEF VALVE	NAKAKITA SEISAKUSHO CO LTD.
20	PRESSURE RELIEF VALVE	PARCOL SPA
21	PRESSURE RELIEF VALVE	SAFETY SYSTEMS UR LTD.
22	PRESSURE RELIEF VALVE	SARASIN RSBD
23	PRESSURE RELIEF VALVE	SEBIN VALVES INDIA PVT. LTD.
24	PRESSURE RELIEF VALVE	TAI MILANO SPA
25	PRESSURE RELIEF VALVE	TYCO SANMAR LTD.
26	PRESSURE RELIEF VALVE	TYCO VALVES & CONTROLS INDIA PVT. LTD
27	PRESSURE RELIEF VALVE	SWAGELOK
28	PRESSURE RELIEF VALVE	PARKER
29	PRESSURE RELIEF VALVE	COMPAC NEWZEALAND
30	PRESSURE RELIEF VALVE	ASPRO
31	PRESSURE RELIEF VALVE	NUOVO PIGNONE SPA (ITALY)
32	PRESSURE RELIEF VALVE	FARINOSLA
33	PRESSURE RELIEF VALVE	FAINGER LASER
34	PRESSURE RELIEF VALVE	MERCER
35	PRESSURE RELIEF VALVE	FISHER ROSEMOUNT (EMERSON)
36	PRESSURE RELIEF VALVE	OFE & OE GROUP KEYSTONE VALVES PVT. LTD
37	PRESSURE RELIEF VALVE	HALOL
38	PRESSURE RELIEF VALVE	M/s Nirmal
39	PRESSURE RELIEF VALVE (PRV)	FMC SANMAR LTD.
40	PRESSURE RELIEF VALVE (PRV)	PROTEGO INDIA PVT. LTD.
41	PRESSURE RELIEF VALVE (PRV)	L&T VALVES LTD.
42	PRESSURE RELIEF VALVE (PRV)	MEKASTER (FORMERLY SEBIM) VALVES INDIA PVT. LTD.
43	PRESSURE RELIEF VALVE (PRV)	RMG REGAL + MESSTECH GMBH, GERMANY
44	PRESSURE RELIEF VALVE (PRV)	TYCO VALVES
45	**HOSES**	PARKER
46	HOSES	EATON
47	HOSES	SWAGELOK

Sr.No	Name of ITEM/Package	Recommended Vendor List

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48	HOSES	TRANSFER OIL
49	HOSES	M/s. ZEC S.p.A Italy
50	**BREAKAWAY COUPLING**	OPW
51	BREAKAWAY COUPLING	STAUBLI
52	BREAKAWAY COUPLING	WEH
53	BREAKAWAY COUPLING	PARKER
54	BREAKAWAY COUPLING	OASIS
55	**FLAMEPROOF GLANDS**	COMET/OEM MAKE
56	**SURGE PROTECTOR**	PHONEX
57	SURGE PROTECTOR	MTL
58	SURGE PROTECTOR	P&F
59	SURGE PROTECTOR	OEM MAKE
60	SURGE PROTECTOR	MEGGITT AVIONICS
61	SURGE PROTECTOR	GENERAL MONITORS/ MSA
62	SURGE PROTECTOR	SPECTREX
63	SURGE PROTECTOR	DETRONICS
64	SURGE PROTECTOR	HONEYWELL
65	SURGE PROTECTOR	NET SAFETY
66	SURGE PROTECTOR	CROW ON
67	SURGE PROTECTOR	SIEGER
68	SURGE PROTECTOR	ISOLATORS
69	SURGE PROTECTOR	BARRIERS
70	SURGE PROTECTOR	ESP
71	SURGE PROTECTOR	Schneider
72	SURGE PROTECTOR	ASPRO
73	**NGV NOZZLES**	OPW
74	NGV NOZZLES	WEH
75	NGV NOZZLES	STAUBLI
76	NGV NOZZLES	PARKER
77	NGV NOZZLES	COMPAC
78	NGV NOZZLES	SHEREX
79	NGV NOZZLES	OASIS
80	**STATION PIPE**	MAHARASHTRA SEAMLESS LTD.
81	STATION PIPE	INDIAN SEAMLESS METAL TUBES
82	STATION PIPE	SURYA GLOBAL STEEL & TUBES
83	STATION PIPE	INTERFORGE
84	STATION PIPE	HEAVY METAL & TUBES LTD.
85	STATION PIPE	JINDAL SAW LTD.
86	STATION PIPE	MAHA LAKSHMI SEAMLESS LTD.
87	STATION PIPE	RATANAMANI METAL TUBES LTD.
88	**BALL VALVES**	FLOW CHEM
89	BALL VALVES	L&T VALVES LIMITED
90	BALL VALVES	MICROFINISH VALVES PVT. LTD.
91	BALL VALVES	STEEL STRONG VALVES (I) PVT LTD.
92	BALL VALVES	OSWAL INDUSTRIES LTD.
93	BALL VALVES	NILON VALVES PVT LTD.

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94	BALL VALVES	PETRO VALVES PVT. LTD.

Sr.No	Name of ITEM/Package	Recommended Vendor List
95	BALL VALVES	ZED VALVES CO. PVT LTD.
96	BALL VALVES	HAWA ENGINEERING LTD. INDIA
97	BALL VALVES	GM ENGINEERING
98	BALL VALVES	LEADER VALVES LTD.
99	BALL VALVES	VIRGO VLAVES
100	BALL VALVES	AUDCO
101	BALL VALVES	ROTEX
102	BALL VALVES	TUBEFIT
103	**INSULATING JOINTS**	IGP ENGINEERS PVT. LTD., CHENNAI, TAMIL NADU, INDIA
104	INSULATING JOINTS	ADVANCE ELECTRONICS SYSTEM, GUJARAT, INDIA
105	INSULATING JOINTS	NUPROS INC. GUJRAT
106	INSULATING JOINTS	VEE KAY VIKRAM & CO. LLP, AHMEDABAD - 380054 ,GUJARAT, INDIA
107	**GLOBE VALVES**	NSSL
108	GLOBE VALVES	OSWAL INDUSTRIES LTD.
109	GLOBE VALVES	L&T VALVES LIMITED
110	GLOBE VALVES	ZED VALVES CO. PVT LTD.
111	GLOBE VALVES	STEEL STRONG VALVES (I) PVT LTD.
112	GLOBE VALVES	LEADER VALVES LTD.
113	GLOBE VALVES	NILON VALVES PVT LTD.
114	GLOBE VALVES	NITON VALVES PVT. LTD.
115	GLOBE VALVES	PETRO VALVES PVT. LTD.
116	GLOBE VALVES	FLOWCHEM INDUSTRIES
117	GLOBE VALVES	GM ENGINEERING
118	GLOBE VALVES	WEIR BDK VALVES
119	**CHECK VALVES**	ECONO VALVES PVT. LTD.
120	CHECK VALVES	L&T VALVES LTD.
121	CHECK VALVES	OSWAL INDUSTRIES LTD
122	CHECK VALVES	NILON VALVES PVT LTD.
123	CHECK VALVES	WEIR BDK VALVES
124	CHECK VALVES	FLOWCHEM INDUSTRIES
125	CHECK VALVES	NSSL LIMITED
126	CHECK VALVES	LEADER VALVES LTD.
127	CHECK VALVES	NITON VALVES IND. PVT. LTD.
128	**TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES**	**SWAGELOK**
129	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	PARKER
130	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	COMPAC
131	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	HAMLET
132	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	
133	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	
134	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	OASIS
135	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	SSP
136	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	DK-LOK

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137	TWO WAY / THREE WAY VALVES/ 2-WAY DRAIN VALVES	OASIS
138	**INSTRUMENT SS FITTINGS/ VALVES**	SWAGELOK
139	INSTRUMENT SS FITTINGS/ VALVES	PARKER
140	INSTRUMENT SS FITTINGS/ VALVES	
141	INSTRUMENT SS FITTINGS/ VALVES	HYLOK

Sr.No	Name of ITEM/Package	Recommended Vendor List
142	INSTRUMENT SS FITTINGS/ VALVES	DKLOK
143	INSTRUMENT SS FITTINGS/ VALVES	
144	INSTRUMENT SS FITTINGS/ VALVES	SSP
145	INSTRUMENT SS FITTINGS/ VALVES	
146	INSTRUMENT SS FITTINGS/ VALVES	ABAC
147	INSTRUMENT SS FITTINGS/ VALVES	STAUFF
148	INSTRUMENT SS FITTINGS/ VALVES	M/s Fluid Controls
149	INSTRUMENT SS FITTINGS/ VALVES	
150	INSTRUMENT SS FITTINGS/ VALVES	-
151	**SS TUBING**	SANDVIK
152	SS TUBING	FAE
153	SS TUBING	TUBACEX
154	SS TUBING	PARKER
155	SS TUBING	RATANAMANI
156	SS TUBING	
157	**PIPE FITTINGS (SEAMLESS / WELDED)**	TEEKAY TUBE
158	PIPE FITTINGS (SEAMLESS / WELDED)	AMFORGE INDUSTRIES
159	PIPE FITTINGS (SEAMLESS / WELDED)	PIPEFIT ENGINEERS PVT. LTD.
160	PIPE FITTINGS (SEAMLESS / WELDED)	C D ENGINEERING CO. GHAZIABAD
161	PIPE FITTINGS (SEAMLESS / WELDED)	CHW FORGE PVT LTD., GHAZIABAD
162	PIPE FITTINGS (SEAMLESS / WELDED)	SANGHVI FORGING & ENGINEERING, VADODARA
163	PIPE FITTINGS (SEAMLESS / WELDED)	GOOD LUCK ENGINEERING CO. / GOOD LUCK INDIA LTD., GHAZIABAD
164	PIPE FITTINGS (SEAMLESS / WELDED)	UTSAH ENGINEERING PVT. LTD, GHAZIABAD
165	PIPE FITTINGS (SEAMLESS / WELDED)	JINDAL FORGINGS PVT LTD
166	PIPE FITTINGS (SEAMLESS / WELDED)	SHAKTI FORGE INDUSTRIES
167	PIPE FITTINGS (SEAMLESS / WELDED)	A.M. ENGINEERS
168	PIPE FITTINGS (SEAMLESS / WELDED)	KUNJ FORGING (P) LTD GHAZIABAD
169	PIPE FITTINGS (SEAMLESS / WELDED)	VIVIAL FORGE (P) LTD.
170	PIPE FITTINGS (SEAMLESS / WELDED)	PIPEFIT ENGINEERS PVT. LTD.
171	PIPE FITTINGS (SEAMLESS / WELDED)	UNITED FORGE INDUSTRIES
172	PIPE FITTINGS (SEAMLESS / WELDED)	SKY FORGE PVT. LTD.
173	PIPE FITTINGS (SEAMLESS / WELDED)	SAWAN ENGINEERS PVT. LTD.
174	PIPE FITTINGS (SEAMLESS / WELDED)	DEE PIPING SYSTEM (EARLIER DEE DEVLOPMENT ENGINEERS PVT. LTD.)
175	PIPE FITTINGS (SEAMLESS / WELDED)	SIDDHARTH & GAUTAM INDIA
176	PIPE FITTINGS (SEAMLESS / WELDED)	M.S. FITTINGS MANUFACTURING COMPANY PVT. LTD.
177	PIPE FITTINGS (SEAMLESS / WELDED)	GUJRAT INFRA PIPES PVT. LTD.
178	PIPE FITTINGS (SEAMLESS / WELDED)	TOPAZ PIPING INDUSTRIES
179	PIPE FITTINGS (SEAMLESS / WELDED)	COMMERCIAL SUPPLYING AGENCY, MUMBAI

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180	PIPE FITTINGS (SEAMLESS / WELDED)	EBY INDUSTRIES, MUMBAI
181	**PIPE FITTINGS (FORGED)**	SIDDHARTH & GAUTAM
182	PIPE FITTINGS (FORGED)	C D ENGINEERING CO. GHAZIABAD
183	PIPE FITTINGS (FORGED)	CHW FORGE PVT LTD., GHAZIABAD
184	PIPE FITTINGS (FORGED)	SANGHVI FORGING & ENGINEERING, VADODARA
185	PIPE FITTINGS (FORGED)	AMFORGE INDUSTRIES
186	PIPE FITTINGS (FORGED)	GOOD LUCK ENGINEERING CO. /GOOD LUCK INDIA LTD., GHAZIABAD
187	PIPE FITTINGS (FORGED)	UTSAH ENGINEERING PVT. LTD, GHAZIABAD
188	PIPE FITTINGS (FORGED)	JINDAL FORGINGS PVT LTD

Sr.No	Name of ITEM/Package	Recommended Vendor List
189	PIPE FITTINGS (FORGED)	SHAKTI FORGE INDUSTRIES
190	PIPE FITTINGS (FORGED)	A.M. ENGINEERS
191	PIPE FITTINGS (FORGED)	KUNJ FORGING (P) LTD GHAZIABAD
192	PIPE FITTINGS (FORGED)	VIVIAL FORGE (P) LTD.
193	PIPE FITTINGS (FORGED)	PIPEFIT ENGINEERS PVT. LTD.
194	PIPE FITTINGS (FORGED)	UNITED FORGE INDUSTRIES
195	PIPE FITTINGS (FORGED)	SKY FORGE PVT. LTD.
196	PIPE FITTINGS (FORGED)	DEE PIPING SYSTEM (EARLIER DEE DEVLOPMENT ENGINEERS PVT. LTD.)
197	**FLOW TEES**	TECHNOGORGE- ITALY (INTERNATIONAL PIPING GROUP)
198	FLOW TEES	PIPEFIT ENGINEERS PVT. LTD.
199	FLOW TEES	VIVIAL FORGE PVT LTD
200	FLOW TEES	UNITED FORGE PVT LTD
201	FLOW TEES	MULTITEX FILTRATIONS
202	FLOW TEES	SAWAN ENGINEERS PVT. LTD.
203	**FLANGES**	ECHJAY INDUSTRIES PVT. LTD.
204	FLANGES	CD INDUSTRIES
205	FLANGES	CHW FORGE (CHOUDHARY HAMMER WORKS)
206	FLANGES	METAL FORGINS (P) LTD.
207	FLANGES	PUNJAB STEEL WORKS
208	FLANGES	AMFORGE INDUSTRIES
209	FLANGES	JAV FORGINGS PVT. LTD.
210	FLANGES	C D ENGINEERING CO.
211	FLANGES	GOOD LUCK ENGINEERING CO. /
212	FLANGES	GOOD LUCK INDIA LTD., GHAZIABAD
213	FLANGES	UTSAH ENGINEERING PVT. LTD, GHAZIABAD
214	FLANGES	JINDAL FORGINGS PVT LTD
215	FLANGES	SHAKTI FORGE INDUSTRIES
216	FLANGES	A.M. ENGINEERS
217	FLANGES	KUNJ FORGING (P) LTD GHAZIABAD
218	FLANGES	VIVIAL FORGE (P) LTD.
219	FLANGES	J K FORGINGS
220	FLANGES	SANGHVI FORGING & ENGINEERING LTD.
221	FLANGES	PIPEFIT ENGINEERS PVT. LTD.

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222	FLANGES	SAWAN ENGINEERS PVT. LTD.
223	**WELDING ELECTRODE**	FOR MAINLINE- LINCOLN / BOHLER MAKE
224	WELDING ELECTRODE	FOR TERMINAL / STATION PIPING- LINCOLN/D&H
225	WELDING ELECTRODE	FOR Mainline/Terminal/Station Piping- M/s. ITW HOBART
226	**NDT AGENCIES**	NDT SERVICES, AHMEDABAD
227	NDT AGENCIES	RTD , MUMBAI
228	NDT AGENCIES	SIEVERT, MUMBAI
229	NDT AGENCIES	X-TECH - VIZAG
230	NDT AGENCIES	GEECY INDUSTRIAL SERVICES PVT. LTD. MUMBAI
231	**FASTENERS**	MULTI FASTENERS PVT. LTD.
232	FASTENERS	PRECISION ENGINEERING INDUSTRIES
233	FASTENERS	PRECISION AUTO ENGINEERS
234	FASTENERS	NITIN FASTENERS
235	FASTENERS	DEEPAK FASTENERS LTD.

Sr.No	Name of ITEM/Package	Recommended Vendor List
236	FASTENERS	FIX FIT FASTING MFG. PVT. LTD.
237	FASTENERS	PACIFIC FORGING & FASTNERS PVT LTD., MUMBAI
238	FASTENERS	MULTI FASTNERS PVT LTD., VADODARA
239	FASTENERS	AEP COMPANY, ANAND
240	FASTENERS	HARDWIN FASTENERS PVT LTD., MUMBAI
241	FASTENERS	SYNDICATE ENGINEERING INDUSTRIES, MUMBAI
242	FASTENERS	PIONEER NUTS AND BOLTS PVT. LTD., LUDHIANA
243	FASTENERS	MULTI THREAD FASTENERS, VADODARA
244	FASTENERS	PRESIDENT ENGINEERING WORKS, MUMBAI
245	FASTENERS	UDHERA FASTNERS LTD. LUDHIANA
246	FASTENERS	NEXO INDUSTRIES LIMITED, LUDHIANA
247	FASTENERS	CONSOL ENGINEERING & FASTENERS INDUSTRIES, HOWRAH
248	FASTENERS	NIREKA ENGG CO. PVT. LTD.
249	**GASKETS**	GOODRICH GASKETS. PVT. LTD.
250	GASKETS	IGP ENGINEERS PVT. LTD., CHENNAI, TAMIL NADU, INDIA
251	GASKETS	MADRAS INDUSTRIAL PRODUCTS
252	GASKETS	BANCO PRODUCTS (P) LTD.
253	GASKETS	UNI KLINGER LIMITED, NEW DELHI
254	GASKETS	GASKET INDIA PRIVATE LTD., CHENNAI
255	GASKETS	STARFLEX SEALING INDIA PVT. LTD.
256	**HEAT SHRINKABLE SLEEVES**	SHRI NARAYAN IMPAC INDIA LLP (SNI) (HSS and HDD Sleeves)
257	HEAT SHRINKABLE SLEEVES	DENSO GMBH
258	HEAT SHRINKABLE SLEEVES	SEAL FOR LIFE INDUSTRIES HTLP-80 (HSS) & DIREX SLEEVE (HDD)
259	HEAT SHRINKABLE SLEEVES	CYG CHANGTONG NEW MATERIAL CO. LTD., CHINA
260	**COLD APPLIED TAPES**	BERRY PLASTICS CORPORATION, BELGIUM- COVALENCE BRAND
261	COLD APPLIED TAPES	DENSO GMBH
262	COLD APPLIED TAPES	CANUSA-CPS A DIVISION OF SHAWCOR INC.
263	**PUR (TAR-FREE) COATING**	DENSO GMBH
264	PUR (TAR-FREE) COATING	BERRY PLASTICS CORPORATION, OMAN/ HOUSTON- POWERCRETE BRAND

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265	**CASING END CLOSURE**	RAYCHEM RPG LIMITED
266	CASING END CLOSURE	SEAL FOR LIFE INDUSTRIES
267	CASING END CLOSURE	RACI, ITLAY
268	**ROCKSHIELD**	RAYCHEM RPG LIMITED
269	ROCKSHIELD	SEAL FOR LIFE
270	ROCKSHIELD	DENSO GMBH
271	**SPACER / INSULATOR**	RAYCHEM RPG LIMITED
272	SPACER / INSULATOR	MALON TECHNICAL PRODUCTS
273	SPACER / INSULATOR	ADVANCE PRODUCTS & SYSTEM INC.
274	SPACER / INSULATOR	RACI, ITLAY
275	**WARNING MAT**	AMBICA PLASTIC INDUSTRIES
276	WARNING MAT	SPARCO MULTIPLAST PVT. LTD.
277	WARNING MAT	SHRI VIJAY WIRE PVT. LTD.
278	WARNING MAT	SINGHAL INDUSTRIES PVT LTD
279	WARNING MAT	BINA ENTERPRISE
280	**GI PIPES**	TATA BSL LTD
281	GI PIPES	SWASTIK PIPE LTD.
282	GI PIPES	JINDAL INDUSTRIES LTD.

Sr.No	Name of ITEM/Package	Recommended Vendor List
283	GI PIPES	VISHAL PIPES LTD.
284	GI PIPES	INDUS TUBES LTD.
285	GI PIPES	ADVANCE STEEL TUBES LTD.
286	GI PIPES	SURYA ROSHNI LIMITED
287	GI PIPES	RAMA STEEL TUBES
288	GI PIPES	P S STEEL TUBES
289	GI PIPES	M/s Goodluck India Ltd
290	**GI FITTINGS**	SARIN INDUSTRIES LTD.
291	GI FITTINGS	JUPITER METAL INDUSTRIES LTD.
292	GI FITTINGS	JAINSONS INDUSTRIES LTD.
293	GI FITTINGS	JINAN MEIDE
294	GI FITTINGS	GREEN MALLEABLE PVT LTD
295	GI FITTINGS	RAJNESH MALLEABLE LTD., DELHI
296	GI FITTINGS	INDUSTRIAL VALVES & COMPONENTS, DELHI
297	GI FITTINGS	EXCEL METAL & ENGINEERING INDUSTRIES,MUMBAI
298	GI FITTINGS	MODERN STORES & ENGINEERING CONCERN, KOLKATA
299	GI FITTINGS	CHOKHAWALA DISTRIBUTORS (FOR JINAN MEIDE)
300	**FORGED FITTINGS**	JAINSONS INDUSTRIES LTD JALANDHAR
301	FORGED FITTINGS	MODERN STORES & ENGINEERING CONCERN, KOLKATA
302	FORGED FITTINGS	BHARAT FORGE & PRESS INDUSTRIES BARODA
303	FORGED FITTINGS	B M METERS PVT LTD, JALANDHAR
304	**ISOLATION BALL VALVE & APPLIANCE VALVE**	ENOLOGAS BONOMI S.P.A.
305	ISOLATION BALL VALVE & APPLIANCE VALVE	NINGBO ZHIQING INDUSTRIAL CO. LIMITED
306	ISOLATION BALL VALVE & APPLIANCE VALVE	ZHEJIANG VALOGIN TECHNOLOGY CO. LTD.
307	ISOLATION BALL VALVE & APPLIANCE VALVE	UMESH ENTERPRISES

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308	ISOLATION BALL VALVE & APPLIANCE VALVE	PARKER HANNIFIN S.P.A.
309	ISOLATION BALL VALVE & APPLIANCE VALVE	CHANDAN ENTERPRISES
310	ISOLATION BALL VALVE & APPLIANCE VALVE	ZHEJIANG YIFAN TECHNOLOGY CO., LTD.
311	**PE (FITTING/VALVES/TRANSITION FITTINGS)**	GEORG FISCHER PIPING SYSTEM
312	PE (FITTING/VALVES/TRANSITION FITTINGS)	KIMPLAS PIPING SYSTEMS
313	PE (FITTING/VALVES/TRANSITION FITTINGS)	INNOGAZ & M/S FRIALEN OF M/S ALIAXIS UTILITIES & INDUSTRY PVT. LTD. (FORMERLY GLYNWED PIPE SYSTEMS)
314	PE (FITTING/VALVES/TRANSITION FITTINGS)	RMG AUTOMETERS GAS TECHNOLOGIES
315	PE (FITTING/VALVES/TRANSITION FITTINGS)	FRIATECH AG, GERMANY (REPRESENTED BY SHERMAN SALES IN INDIA)
316	PE (FITTING/VALVES/TRANSITION FITTINGS)	AL-AZIZ PLASTICS (P) LTD.
317	**STEEL REINFORCED RUBBER HOSE (TYPE-4)**	SUPER SEAL FLEXIBLE HOSE LTD.
318	STEEL REINFORCED RUBBER HOSE (TYPE-4)	SURAKSHA PRODUCTS PVT. LTD.
319	STEEL REINFORCED RUBBER HOSE (TYPE-4)	VANSH INDUSTRIES
320	STEEL REINFORCED RUBBER HOSE (TYPE-4)	T & L GASES
321	**CORRUGATED FLEXIBLE METAL HOSE (ANACONDA)**	KPC FLEX TUBES
322	CORRUGATED FLEXIBLE METAL HOSE (ANACONDA)	VESTAS HOSE DIVISION
323	CORRUGATED FLEXIBLE METAL HOSE (ANACONDA)	ALFA HOSES & BELLOWS MFG. CO.
324	CORRUGATED FLEXIBLE METAL HOSE (ANACONDA)	ALPHA FLEXI TUBES
325	CORRUGATED FLEXIBLE METAL HOSE (ANACONDA)	CHANDAN ENTERPRISES
326	CORRUGATED FLEXIBLE METAL HOSE (ANACONDA)	VIKRAM & CO.
327	**MDPE PIPE**	HARI UDYOG PVT. LTD
328	MDPE PIPE	JAIN IRRIGATION SYSTEMS LTD.

Sr.No	Name of ITEM/Package	Recommended Vendor List
329	MDPE PIPE	ORI PLAST LTD.
330	MDPE PIPE	VISHAKHA IRRIGATION PVT. LTD.
331	MDPE PIPE	DURALINE INDIAN PVT. LTD.
332	MDPE PIPE	KRITI INDUSTRIES (I) LTD., INDORE
333	MDPE PIPE	VEEKAY PLAST
334	MDPE PIPE	M/s Venuka Polymers Pvt. Ltd
335	**COPPER TUBES & FITTINGS**	RAJCO METAL
336	COPPER TUBES & FITTINGS	MEHTA TUBES
337	COPPER TUBES & FITTINGS	JAY BANAS METALS PVT. LTD
338	COPPER TUBES & FITTINGS	PARAS INDUSTRIES LTD. (ONLY FOR FITTINGS)
339	COPPER TUBES & FITTINGS	CHANDAN ENTERPRISE
340	COPPER TUBES & FITTINGS	JANYA EXTRUSIONS PVT LTD.
341	**BRASS FITTINGS**	PARAS INDUSTRIES LTD.
342	BRASS FITTINGS	CHANDAN ENTERPRISES
343	BRASS FITTINGS	PARAS INDUSTRIES LTD.
344	BRASS FITTINGS	OM BRASS ENTERPRISES
345	BRASS FITTINGS	CHOKHAWALA DISTRIBUTORS
346	**THIRD PARTY INSPECTION AGENCY**	AMERICAN BUREAU SERVICES
347	THIRD PARTY INSPECTION AGENCY	TECHNISCHE ULIERWACHUNGS VEREIN (TUV)
348	THIRD PARTY INSPECTION AGENCY	DNV-GL

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349	THIRD PARTY INSPECTION AGENCY	MS EDLIPSE ENGINEERING GLOBAL PVT. LTD
350	THIRD PARTY INSPECTION AGENCY	INTERNATIONAL CERTIFICATION SERVICES PVT LTD
351	THIRD PARTY INSPECTION AGENCY	BUREAU VERITAS
352	THIRD PARTY INSPECTION AGENCY	CERTIFICATION ENGINEERS INTERNATIONALLIMITED (CEIL)
353	THIRD PARTY INSPECTION AGENCY	LLOYD REGISTER OF INDUSTRIAL SERVICES
354	THIRD PARTY INSPECTION AGENCY	SGS
355	THIRD PARTY INSPECTION AGENCY	TUV INDIA PVT. LTD. (TUV - NORD)
356	THIRD PARTY INSPECTION AGENCY	TUV-SUD SOUTH ASIA
357	THIRD PARTY INSPECTION AGENCY	M/s. Industrial Inspection & Verification Services (I) Pvt. Ltd
358	THIRD PARTY INSPECTION AGENCY	M/s Hertz Inspection Services pvt. Ltd
359	**HDPE Pipe**	DURALINE INDIA
360	HDPE Pipe	JAIN IRRIGATION SYSTEMS LIMITED
361	HDPE Pipe	KRITI INDUSTRIES INDIA LTD.
362	HDPE Pipe	ORIPLAST LTD.
363	HDPE Pipe	VEE KAY PLAST
364	HDPE Pipe	VISHAKHA IRRIGATION PVT. LTD.
365	HDPE Pipe	HARI PLAST
366	HDPE Pipe	CLIMAX SYNTHETICS (P) LTD., VADODRA
367	HDPE Pipe	SANGIR PLASTICS (P) LTD., MUMBAI
368	HDPE Pipe	HIMALYAN PIPE INDUSTRIES, SOLAN
369	HDPE Pipe	DUTRON POLYMERS LTD.
370	HDPE Pipe	PARIXIT IRRIGATION LIMITED
371	HDPE Pipe	VEEKAY PLAST
372	**HDPE DUCT FOR OFC**	JAIN IRRIGATION SYSTEM LTD
373	HDPE DUCT FOR OFC	KIRTI INDUSTRIES
374	HDPE DUCT FOR OFC	ORIPLAST
375	HDPE DUCT FOR OFC	DURA-LINE

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376	HDPE DUCT FOR OFC	VEEKAY PLAST
377	HDPE DUCT FOR OFC	VEDANTA POLYMER PVT LTD
378	HDPE DUCT FOR OFC	HARIPLAST
379	HDPE DUCT FOR OFC	PARIXIT INDUSTRIES LTD
380	HDPE DUCT FOR OFC	PENNWALT AGRU PLASTIC LT
381	**CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)**	HEAVY METAL & TUBES LTD., MEHSANA
382	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	ISMT LIMITED
383	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	JINDAL SAW LTD.
384	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	MAHARASHTRA SEAMLESS LIMITED
385	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	MAHALAXMI METAL CORPORATION
386	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	SAINEST TUBES PVT. LTD.
387	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	RATNADEEP METAL & TUBES LTD.
388	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	JFE STEEL CORPORATION
389	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	MANNESMANN S.A.
390	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	ARCELORMITTAL TUBULAR PRODUCTS ROMAN SA
391	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	SUMITOMO METAL IND.LTD

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392	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	NIPPON METAL INDUSTRY CO
393	CARBON STEEL PIPE (ASTM A106 Gr. B , A333 Gr.6 Station Pipe)	TENARIS
394	**CARBON STEEL PIPES (API 5L GRADE - PSL2)**	RATNAMANI METALS & TUBES LTD. - FOR UP TO 18” ERW PIPES & SAW PIPES OF 18” & ABOVE.
395	CARBON STEEL PIPES (API 5L GRADE - PSL 2)	TATA BHUSHAN STEEL LIMITED- FOR UP TO 18” ERW PIPES
396	CARBON STEEL PIPES (API 5L GRADE - PSL 2)	JINDAL INDIA LTD - FOR UP TO 18” ERW PIPES
397	CARBON STEEL PIPES (API 5L GRADE - PSL 2)	JINDAL SAW – FOR 16” & ABOVE SAW PIPES
398	CARBON STEEL PIPES (API 5L GRADE - PSL 2)	SURYA ROSHINI LTD-- FOR UP TO 16” ERW PIPES & SAW PIPES OF 18” & ABOVE
399	CARBON STEEL PIPES (API 5L GRADE - PSL 2)	MAHARASHTRA SEAMLESS LIMITED - SEAMLESS PIPES, ERW PIPES,
400	CARBON STEEL PIPES (API 5L GRADE - PSL 2)	WELSPUN CORP LTD - ERW PIPES & SAW PIPES
401	**QUICK CONNECT BODY & STEM**	PARKER (double shut off valve type)
402	QUICK CONNECT BODY & STEM	SWAGELOK (double shut off valve type)
403	**QUICK CONNECT BODY & STEM**	PSL LTD.
404	QUICK CONNECT BODY & STEM	JINDAL SAW LIMITED
405	**HOT INDUCTION BEND**	WELSPUN GUJRAT STAHAL ROHERN LTD
406	HOT INDUCTION BEND	SAWAN ENGINEERS PVT LTD
407	HOT INDUCTION BEND	FABRICOM
408	HOT INDUCTION BEND	LALIT ROHR FITTINGS PVT LTD
409	**FLAME ARRESTOR**	FLUIDYNE INSTRUMENTS PVT. LTD.
410	FLAME ARRESTOR	PROTEGO India Pvt. Ltd.
411	FLAME ARRESTOR	NIRMAL INDUSTRIAL CONTROLS PVT. LTD.
412	FLAME ARRESTOR	SUPER SAFETY SERVICES
413	FLAME ARRESTOR	A PLUS PROJECTS & TECHNOLOGY (P) LTD.
414	**ON OFF SS BALL/NEEDLE /NON RETURN VALVE FOR CNG APPLICATION**	PARKER
415	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	SWAGELOK
416	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	ABAC
417	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	SPIRAX SARCO
418	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	WORCESTER
419	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	WAREE / BAUMER
420	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	STAUFF
421	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	SSP
422	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	L&T

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423	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	SANKEY CONTROLS
424	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	ROTEX
425	ON OFF SS BALL/NEEDLE /NON RETURN VALVE	AUDCO
426	**SPLIT TEES FOR HOT TAPPING**	TD WILLIAMSON
427	SPLIT TEES FOR HOT TAPPING	ADVANTICA
428	SPLIT TEES FOR HOT TAPPING	FURMANITE INTERNATIONAL LTD - UK
429	**QUICK OPENING END CLOSURE**	FORAIN SRL, ITALY
430	QUICK OPENING END CLOSURE	G.D.ENGINEERING
431	QUICK OPENING END CLOSURE	PERRY EQUIPMENT CORPORATION
432	QUICK OPENING END CLOSURE	PIPELINE ENGINEERING
433	QUICK OPENING END CLOSURE	SIIRTEC NIGI S.P.A
434	QUICK OPENING END CLOSURE	GROUPE GENOYER (PHOCEENNE)

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435	QUICK OPENING END CLOSURE	ROSEN GROUP
436	QUICK OPENING END CLOSURE	TD WILLIAMSON
437	**PIG SIGNALLER / PIG ALERTS**	G.D.ENGINEERING
438	PIG SIGNALLER / PIG ALERTS	FORAIN S.R.L
439	PIG SIGNALLER / PIG ALERTS	TD WILLIAMSON
440	PIG SIGNALLER / PIG ALERTS	GROUPE GENOYER (PHOCEENNE)
441	**EGP/ INTELLIGENT PIGGING**	ROSEN GROUP
442	EGP/ INTELLIGENT PIGGING	PIPELINE ENGINEERING
443	EGP/ INTELLIGENT PIGGING	SPETSNEFTEGAZ NPO JSC (NGKS), RUSSIA
444	EGP/ INTELLIGENT PIGGING	TD WILLIAMSON
445	**VACCUM DRYING**	CORRTECH INTERNATIONAL PVT. LTD.
446	VACCUM DRYING	TOTALINE, AUSTRALIA
447	**PAINTS FOR INTERNAL COATING**	DUPONT, INDIA
448	PAINTS FOR INTERNAL COATING	PERFORMANCE COATING GMBH
449	PAINTS FOR INTERNAL COATING	COPAN
450	**FIRE EXTINGUISHER**	SAFEX FIRE SERVICES
451	FIRE EXTINGUISHER	BRIJBASI HI-TECH UDYOG
452	FIRE EXTINGUISHER	NITIN FIRE PROTECTION INDUSTRIES LTD.
453	FIRE EXTINGUISHER	SUPERMEX EQUIPMENTS
454	FIRE EXTINGUISHER	KOOVERJI DEVSHI & CO.
455	**HIRE HYDRANT, MONITORS, DELUGE VALVES & NOZZLES**	MINIMAX
456	HIRE HYDRANT, MONITORS, DELUGE VALVES & NOZZLES	VIJAY FIRE
457	HIRE HYDRANT, MONITORS, DELUGE VALVES & NOZZLES	NEWAGE
458	HIRE HYDRANT, MONITORS, DELUGE VALVES & NOZZLES	ZENITH
459	HIRE HYDRANT, MONITORS, DELUGE VALVES & NOZZLES	NITIN FIRE PROTECTION INDUSTRIES LTD.
460	**HOSES & HOSES ACCESSORIES**	GAYATRI INDUSTRIAL CORPORATION
461	HOSES & HOSES ACCESSORIES	ROYAL INDIA CORPORATION
462	HOSES & HOSES ACCESSORIES	BRIJBASI HI-TECH UDYOG
463	HOSES & HOSES ACCESSORIES	NITIN FIRE PROTECTION INDUSTRIES LTD.
464	HOSES & HOSES ACCESSORIES	ZAVERCHAND MARKETING PVT. LTD.
465	HOSES & HOSES ACCESSORIES	NEWAGE
466	HOSES & HOSES ACCESSORIES	SIMPLEX RUBBER PRODUCTS
467	**CONTRACTORS FOR HDD WORK**	CHERINGTON ASIA (INDIA) PVT. LTD.
468	CONTRACTORS FOR HDD WORK	ESSAR CONSTRUCTION LTD.
469	CONTRACTORS FOR HDD WORK	MERSING CONSTRUCTION AND ENGINEERING SDN BHD., SELANGOR (MALAYSIA)

Sr.No	Name of ITEM/Package	Recommended Vendor List
470	CONTRACTORS FOR HDD WORK	HERRENKNECHT (ASIA) LTD. (THAILAND)
471	CONTRACTORS FOR HDD WORK	MID EAST PIPELINE
472	CONTRACTORS FOR HDD WORK	N.R. PATEL & CO.,
473	CONTRACTORS FOR HDD WORK	TRENCHLESS
474	**CONTRACTORS FOR VACCUM DRYING**	CORRTECH INTERNATIONAL PVT. LTD.
475	CONTRACTORS FOR VACCUM DRYING	TOTALINE, AUSTRALIA
476	**PAINTS FOR OUTER SURFACE**	ASIAN PAINTS LTD.
477	PAINTS FOR OUTER SURFACE	SIGMA PAINTS S.A. LTD.

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478	PAINTS FOR OUTER SURFACE	BERGER PAINTS INDIA LTD.
479	PAINTS FOR OUTER SURFACE	KANSAI NEROLAC PAINTS LTD.
480	**VITREOUS CHINA SANITARYWARE**	PARRYWARE
481	VITREOUS CHINA SANITARYWARE	HINDUSTAN
482	VITREOUS CHINA SANITARYWARE	CERA
483	**STAINLESS STEEL SINKS**	AMC
484	STAINLESS STEEL SINKS	NEELKANTH
485	**C.P FITTINGS**	PARCO
486	C.P FITTINGS	GEM
487	**C.P ACCESSORIES, WASTE FITTINGS**	ESS
488	C.P ACCESSORIES, WASTE FITTINGS	LOTUS
489	C.P ACCESSORIES, WASTE FITTINGS	ORIENT
490	**PVC PIPES**	SUPREME
491	PVC PIPES	PRINCE
492	**COMPOSITE PIPES & FITTINGS**	KITEC
493	**GUN METAL VALVES AND LOCKS**	LEADER
494	GUN METAL VALVES AND LOCKS	ZOLOTE
495	**CI DOUBLE FLANGED SLUICE VALVES, NON**	KIRLOSKAR
496	**STONE WARE PIPE AND GULLY TRAPS**	PERFECT
497	**WATER TANKS**	SINTEX
498	**ALUMINIUM HARDWARE**	EARIBIHARI
499	**GLASS**	MODIGUARD
500	GLASS	ATUL
501	**ALUMINIUM DOOR/WINDOW SECTION**	HINDALCO
502	ALUMINIUM DOOR/WINDOW SECTION	ULTRATECH CEMENTS
503	**CEMENT**	AMBUJA
504	CEMENT	ACC
505	CEMENT	BIRLA
506	**PAINTS**	ASIAN
507	PAINTS	BERGER
508	PAINTS	NEROLAC
509	PAINTS	SHALIMAR
510	PAINTS	BOMBAY
511	**CERAMIC/VITRIFILED/VITREOUS TILES**	KAJARIA
512	CERAMIC/VITRIFILED/VITREOUS TILES	JOHNSON
513	CERAMIC/VITRIFILED/VITREOUS TILES	SOMANY
514	STRUCTURAL STEEL	SAIL
515	**REINFORCEMENT STEEL**	TISCO
516	REINFORCEMENT STEEL	SAIL

Sr.No	Name of ITEM/Package	Recommended Vendor List
517	**MIXED METAL OXIDE (MMO) ANODES**	TITANOR COMPONENTS LTD., GOA
518	**SPARK GAP ARRESTOR / SURGE DIVERTER**	DHEN, GERMANY
519	SPARK GAP ARRESTOR / SURGE DIVERTER	MC MILLER

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520	SPARK GAP ARRESTOR / SURGE DIVERTER	DAIRY LAND ELECTRICAL INDUSTRIES
521	**CU/CUSO4 REFERENCE CELLS**	MC MILLER, USA
522	CU/CUSO4 REFERENCE CELLS	BORIN, USA
523	CU/CUSO4 REFERENCE CELLS	KRICK
524	**THERMIT WELD MATERIAL**	ERICO EUROPA
525	**PETROLEUM COKE BREEZE**	GOA CARBON , GOA
526	PETROLEUM COKE BREEZE	INDIA CARBON, DURGAPUR(WB)
527	**MG/ZN ANODE**	CORTECH INTERNATIONAL PVT. LTD.
528	MG/ZN ANODE	TITANOR COMPONENT LTD., GOA
529	MG/ZN ANODE	SCIENTIFIC METAL ENGINEERS KARAIKUDI
530	**PIN BRAZING**	BAC
531	PIN BRAZING	SAFETRACK
532	**CABLE LUGS**	ISMAIL, RANCHI
533	CABLE LUGS	DOWELS, MUMBAI
534	**CABLE GLANDS**	FLEXPRO ELECTRICAL PVT. LTD., MUMBAI
535	CABLE GLANDS	FLAMEPROOF EQUIPMENT PVT. LTD., MUMBAI
536	CABLE GLANDS	BALIGA LIGHTING EQUIPMENT LTD., CHENNAI
537	**BACKFILL**	INDIA CARBON
538	BACKFILL	GOA CARBON
539	**POLARIZATION CELL**	MC MILLER
540	POLARIZATION CELL	KRIK ENGINEERING
541	JUNCTION BOX	FLEXPRO
542	JUNCTION BOX	FELP CONTROL GEARS
543	**TEST STATION/ JUNCTION BOX (WEATHERPROOF)**	UNDTS
544	TEST STATION/ JUNCTION BOX (WEATHERPROOF)	CORRTECH INTERNATIONAL
545	TEST STATION/ JUNCTION BOX (WEATHERPROOF)	CCS, MUMBAI
546	TEST STATION/ JUNCTION BOX (WEATHERPROOF)	RAYCHEM RPG PVT LTD
547	**MIXED METAL OXIDE (MMO) ANODES**	TITANOR COMPONENTS LTD., GOA
548	**SOLID STATE DECOUPLER**	KRISTRON SYSTEMS
549	SOLID STATE DECOUPLER	DEHN GERMANY
550	SOLID STATE DECOUPLER	RUSTROL, USA
551	SOLID STATE DECOUPLER	DAIRYLAND ELECTRICALS,USA
552	**GAS OVER OIL ACTUATORS**	BIFFI ITALIA S.R.L, ITALY
553	GAS OVER OIL ACTUATORS	ROTORK FLUID SYTEM S.R.L
554	GAS OVER OIL ACTUATORS	SHAFER ACTUATORS
555	GAS OVER OIL ACTUATORS	SCHUCK
556	GAS OVER OIL ACTUATORS	BETTIS CORPORATION (EMERSON GROUP)
557	GAS OVER OIL ACTUATORS	LEEDEN
558	GAS OVER OIL ACTUATORS	NELES
559	**AIR FILTER REGULATORS**	ASEA BROWN BOVERI LTD.
560	AIR FILTER REGULATORS	BLUE STAR LTD
561	AIR FILTER REGULATORS	DIVYA CONTROL ELEMENTS PVT. LTD.
562	AIR FILTER REGULATORS	PLACKA INSTRUMENTS & CONTROLS PVT. LTD
563	AIR FILTER REGULATORS	SHAH PNEUMATICS

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Sr.No	Name of ITEM/Package	Recommended Vendor List
564	AIR FILTER REGULATORS	SHAVO NORGREN (I) PVT. LTD
565	AIR FILTER REGULATORS	VELJAN HYDRAIR PVT. LTD.
566	AIR FILTER REGULATORS	PARKER
567	AIR FILTER REGULATORS	SWAGELOK
568	AIR FILTER REGULATORS	VANAZ ENGINEERS LIMITED
569	PRESSURE RELIEF/SAFETY VALVE	ANDERSON GREENWOOD CROSBY
570	PRESSURE RELIEF/SAFETY VALVE	BHEL (TRICHY)
571	PRESSURE RELIEF/SAFETY VALVE	ASPRO
572	PRESSURE RELIEF/SAFETY VALVE	DRESSER INC.
573	PRESSURE RELIEF/SAFETY VALVE	FUKUI SEISAKUSHO CO. LTD.
574	PRESSURE RELIEF/SAFETY VALVE	INSTRUMENTATION LTD. (PALGHAT)
575	PRESSURE RELIEF/SAFETY VALVE	NAKAKITA SEISAKUSHO CO LTD.
576	PRESSURE RELIEF/SAFETY VALVE	NUOVO PIGNONE SPA (ITALY)
577	PRESSURE RELIEF/SAFETY VALVE	PARCOL SPA
578	PRESSURE RELIEF/SAFETY VALVE	SAFETY SYSTEMS UR LTD.
579	PRESSURE RELIEF/SAFETY VALVE	SARASIN RSBD
580	PRESSURE RELIEF/SAFETY VALVE	SEBIN VALVES INDIA PVT. LTD.
581	PRESSURE RELIEF/SAFETY VALVE	TAI MILANO SPA
582	PRESSURE RELIEF/SAFETY VALVE	TYCO SANMAR LTD.
583	PRESSURE RELIEF/SAFETY VALVE	TYCO VALVES & CONTROLS INDIA PVT. LTD
584	PRESSURE RELIEF/SAFETY VALVE	FARINOSLA
585	PRESSURE RELIEF/SAFETY VALVE	FAINGER LASER
586	PRESSURE RELIEF/SAFETY VALVE	MERCER
587	PRESSURE RELIEF/SAFETY VALVE	FISHER ROSEMOUNT (EMERSON)
588	PRESSURE RELIEF/SAFETY VALVE	OFE & OE GROUP KEYSTONE VALVES PVT. LTD
589	PRESSURE RELIEF/SAFETY VALVE	BARODA SEBIM VALVES PVT. LTD.
590	PRESSURE RELIEF/SAFETY VALVE	HALOL
591	**SUCTION & DISCHARGE FILTER**	BEKO FILTER
592	SUCTION & DISCHARGE FILTER	ULTRA FILTER
593	SUCTION & DISCHARGE FILTER	FILTERATION AND SEPERATION TECHNOLOGY
594	SUCTION & DISCHARGE FILTER	FILTERATION TECHNIQUE
595	SUCTION & DISCHARGE FILTER	PARKER
596	**CARTRIDGE FILTERS**	BEKO FILTER
597	CARTRIDGE FILTERS	FILTERATION & SEPERATION TECHNOLOGY
598	CARTRIDGE FILTERS	ULTRA FILTER
599	CARTRIDGE FILTERS	FILTRATION TECHNIQUE
600	CARTRIDGE FILTERS	ZANDER GMBH (GERMANY)
601	CARTRIDGE FILTERS	GRAND PRIX FAB (PVT.) LTD., NEW DELHI
602	CARTRIDGE FILTERS	MULTITEX FILTRATION ENERGY PVT. LTD.,
603	**AIR COMPRESSOR**	C (IR)
604	AIR COMPRESSOR	ELGI
605	AIR COMPRESSOR	ANESTA IWATA MOTHERSON
606	AIR COMPRESSOR	CHICAGO PNEUMATICS
607	AIR COMPRESSOR	ATLAS COPCO/INGERSOL RAND

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608	**CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM**	GINGEKERR
609	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	CEODUEX (ROTAREX)
610	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	KIDDE

Sr.No	Name of ITEM/Package	Recommended Vendor List
611	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	FIKE
612	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	ANSUL
613	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	LPG
614	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	VTI
615	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	ROTEX
616	CO2 CYLINDER VALVE WITH ACTUATORFOR CO2 FLODDING SYSTEM	KEW
617	**FLP SWITCH**	BALIGA
618	FLP SWITCH	FCG
619	FLP SWITCH	FPE
620	FLP SWITCH	FLEXPRO
621	**SWITCHES/FUSES/CONTRACTORS**	L&T
622	SWITCHES/FUSES/CONTRACTORS	GEC
623	SWITCHES/FUSES/CONTRACTORS	SIEMENS
624	RTDs	ALTOP
625	**PLUG VALVE**	AIR & NORDSTROM VALVES INC
626	PLUG VALVE	XOMOX
627	PLUG VALVE	SANMAR INDIA LTD, NEW DELHI
628	PLUG VALVE	AIR & NORDSTROM VALVES INC
629	PLUG VALVE	SERCK AUDCO VALVES
630	PLUG VALVE	SUMITOMO CORPORATION
631	PLUG VALVE	FISHER XOMOX SANMAR
632	PLUG VALVE	L&T (AUDCO INDIA LTD, CHENNAI)
633	PLUG VALVE	PARKER
634	PLUG VALVE	STAUFF
635	**GAS ENGINE**	CUMMINS
636	GAS ENGINE	CATERPILLAR
637	**PRESSURE RELIEF/SAFETY VALVE**	SWAGELOK
638	PRESSURE RELIEF/SAFETY VALVE	PARKER
639	PRESSURE RELIEF/SAFETY VALVE	STAUFF
640	PRESSURE RELIEF/SAFETY VALVE	M/s Nirmal
641	**PRESSURE SAFETY VALVE**	BESTOBELL / HEROSE / AUDCO VALVES / FORBES MARSHALL
642	**AIR COMPRESSOR**	EMTEX
643	AIR COMPRESSOR	KPCL
644	**COMPRESSOR MAIN MOTOR**	CROMPTON GREAVES
645	COMPRESSOR MAIN MOTOR	SIEMENS
646	COMPRESSOR MAIN MOTOR	WEG
647	COMPRESSOR MAIN MOTOR	ABB
648	COMPRESSOR MAIN MOTOR	LHP
649	COMPRESSOR MAIN MOTOR	KIRLOSKAR
650	COMPRESSOR MAIN MOTOR	BHARAT BIJLEE

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651	**MAIN MOTOR VFD STARTER**	SIEMENS
652	MAIN MOTOR VFD STARTER	SCHNIEIDER
653	MAIN MOTOR VFD STARTER	FUJI
654	MAIN MOTOR VFD STARTER	ABB
655	**SOFT STARTER**	SIEMENS
656	SOFT STARTER	SCHNEIDER
657	SOFT STARTER	ABB

Sr.No	Name of ITEM/Package	Recommended Vendor List
658	SOFT STARTER	FUJI
659	**INSTRUMENTATION**	
660	**FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)**	ABB AUTOMATION LTD.
661	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	FISHER ROSEMOUNT SINGAPORE PTE LTD.
662	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	FUJI ELECTRIC CO. LTD.
663	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	HONEYWELL INC.
664	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	HONEYWELL
665	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	YOKOGAWA ELECTRIC CORPORATION
666	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	YOKOGAWA BLUE STAR LTD.
667	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	ASHCROFT
668	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	MURPHY
669	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	WIKA
670	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	DRUCK
671	FIELD INSTRUMENTS TRANSMITTERS (P, DP, F,L,T)	WAREE
672	**CORIOLIS MASS FLOW METERS**	EMERSON PROCESS MANAGEMENT
673	CORIOLIS MASS FLOW METERS	COMPAC,NEW ZELAND
674	CORIOLIS MASS FLOW METERS	ENDRESS & HAUSER CMBH & COMPANY
675	THERMAL MASS FLOW METER	MAGNETROL
676	THERMAL MASS FLOW METER	PROCESS CONTROL DEVICES (PCD)
677	**PRESSURE GAUGES**	AN INSTRUMENTS PVT. LTD.
678	PRESSURE GAUGES	ALTOP
679	PRESSURE GAUGES	GENERAL INSTRUMENTS CONSORTIUM
680	PRESSURE GAUGES	WAAREE INSTRUMNETS CONSORTIUM
681	PRESSURE GAUGES	GENERAL INSTRUMENTS CONSORTIUM
682	PRESSURE GAUGES	MANOMETER (INDIA) PVT. LTD.
683	PRESSURE GAUGES	WIKA INSTRUMENTS INDIA PVT. LTD.
684	PRESSURE GAUGES	DRUCK
685	PRESSURE GAUGES	BADOTHERM PROCESS INSTRUMENTS B. V.
686	PRESSURE GAUGES	BOURDON HAENNI S.A
687	PRESSURE GAUGES	BRITISH ROTOTHERM CO. LTD
688	PRESSURE GAUGES	BUDENBERG GUAGE CO. LTD.
689	PRESSURE GAUGES	DRESSER INC.
690	PRESSURE GAUGES	NAGANO KEIKI SEISAKUSHO LTD.
691	PRESSURE GAUGES	BAUMER
692	PRESSURE GAUGES	WALCHANDNAGER INDUSTRIES LTD.

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693	PRESSURE GAUGES	WIKA ALEXANDER WIEGAND & CO GMBH
694	PRESSURE GAUGES	ASHCROFT /PRECISON MASS
695	PRESSURE GAUGES	H. GURU
696	**TEMPERATURE GAUGE WITH THERMOWELL**	PRECISON MASS
697	TEMPERATURE GAUGE WITH THERMOWELL	AN INSTRUMENTS PVT. LTD.
698	TEMPERATURE GAUGE WITH THERMOWELL	GENERAL INSTRUMENTS LTD
699	TEMPERATURE GAUGE WITH THERMOWELL	WIKA INSTRUMENTS INDIA PVT. LTD.
700	TEMPERATURE GAUGE WITH THERMOWELL	BAUMER TECHNOLOGIES INDIA
701	TEMPERATURE GAUGE WITH THERMOWELL	ALTO INDUSTRIES
702	**RTD WITH THERMOWELL AND SKIN TYPE**	A.N.INSTRUMENTS
703	RTD WITH THERMOWELL AND SKIN TYPE	GENERAL INSTRUMENTS PVT LTD
704	RTD WITH THERMOWELL AND SKIN TYPE	NAGMAN SENSORS PVT LTD

Sr.No	Name of ITEM/Package	Recommended Vendor List
705	RTD WITH THERMOWELL AND SKIN TYPE	PYRO ELECTRIC INSTRUMENTS
706	RTD WITH THERMOWELL AND SKIN TYPE	WIKA
707	RTD WITH THERMOWELL AND SKIN TYPE	WAREE
708	RTD WITH THERMOWELL AND SKIN TYPE	BAUMER
709	RTD WITH THERMOWELL AND SKIN TYPE	ALTOP
710	RTD WITH THERMOWELL AND SKIN TYPE	TEMPSENS INSTRUMENTS INDIA PVT LTD, INDIA
711	RTD WITH THERMOWELL AND SKIN TYPE	THERMO ELECTRIC COMPANY INDIA PVT. LTD, INDIA
712	RTD WITH THERMOWELL AND SKIN TYPE	TECHNO INSTRUMENTS, INDIA
713	RTD WITH THERMOWELL AND SKIN TYPE	TM TECNOMATIC SPA, ITALY
714	RTD WITH THERMOWELL AND SKIN TYPE	THERMAL INSTRUMENT (I) P LTD
715	**PRESSURE/DIFFERENTIAL /TEMP SWITCH**	SWITZER
716	PRESSURE/DIFFERENTIAL /TEMP SWITCH	DELTA
717	PRESSURE/DIFFERENTIAL /TEMP SWITCH	UNITED ELECTRIC
718	PRESSURE/DIFFERENTIAL /TEMP SWITCH	SOR
719	PRESSURE/DIFFERENTIAL /TEMP SWITCH	GAUGE BOURDON
720	PRESSURE/DIFFERENTIAL /TEMP SWITCH	DRESSER
721	PRESSURE/DIFFERENTIAL /TEMP SWITCH	INFOS
722	**ULTRASONIC FLOW METER**	DANIEL MEASUREMENT AND CONTROLS PVT LTD (EMERSON)
723	ULTRASONIC FLOW METER	SICK , INDIA
724	ULTRASONIC FLOW METER	RMG,
725	ULTRASONIC FLOW METER	ELSTER- HONEYWELL
726	ULTRASONIC FLOW METER	KROHNE
727	ULTRASONIC FLOW METER	ENDRESS & HAUSER (E&H)
728	ULTRASONIC FLOW METER	FLEXIM
729	ULTRASONIC FLOW METER	GE
730	**RPD Meter**	DRESSER
731	RPD Meter	ROMET
732	RPD Meter	ELSTER-HONEYWELL
733	RPD Meter	RMG REGEL + MESSTECHNIL GmbH
734	RPD Meter	ITRON

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735	RPD Meter	RAYCHEM RPG LTD
736	RPD Meter	CAMERON
737	RPD Meter	FMG
738	**TURBIN FLOW METER**	DRESSER
739	TURBIN FLOW METER	ROCKWIN
740	TURBIN FLOW METER	ELSTER-HONEYWELL
741	TURBIN FLOW METER	RMG REGEL + MESSTECHNIL GmbH
742	TURBIN FLOW METER	DANIEL/EMERSON
743	TURBIN FLOW METER	ITRON
744	TURBIN FLOW METER	VEMTECH
745	**FLOW COMPUTER**	DANIEL/EMERSON
746	FLOW COMPUTER	OMNI
747	FLOW COMPUTER	FMC
748	FLOW COMPUTER	HONEYWELL
749	FLOW COMPUTER	ELSTER
750	FLOW COMPUTER	SCHNEIDER

Sr.No	Name of ITEM/Package	Recommended Vendor List
751	FLOW COMPUTER	ABB
752	**ELECTRONIC VOLUME CONVERTER**	PLUM
753	ELECTRONIC VOLUME CONVERTER	ELGAS
754	**SELF ACTUATED PR. CONTROL VALVE**	DANIEL INDUSTRIES INC
755	SELF ACTUATED PR. CONTROL VALVE	DRESSER PRODUITS INDUSTRIES
756	SELF ACTUATED PR. CONTROL VALVE	ESME VALVES LTD.
757	SELF ACTUATED PR. CONTROL VALVE	FISHER ROSEMOUNT SINGAPORE PTE LTD.
758	SELF ACTUATED PR. CONTROL VALVE	FISHER EXMOX SANMAR LIMTED
759	SELF ACTUATED PR. CONTROL VALVE	GORTER CONTROLS B.V.
760	SELF ACTUATED PR. CONTROL VALVE	INSTROMET INTERNATIONAL NV
761	SELF ACTUATED PR. CONTROL VALVE	KEYE & MACDONALD INC
762	SELF ACTUATED PR. CONTROL VALVE	NUOVO PIGNONE SPA (ITALY)
763	SELF ACTUATED PR. CONTROL VALVE	PIETRO FIORENTINI SPA
764	SELF ACTUATED PR. CONTROL VALVE	RICHARDS INDUSTRIES (FORMERLY TRELOAR)
765	SELF ACTUATED PR. CONTROL VALVE	RMG REGEL + MESSTECHNIK GMBH
766	SELF ACTUATED PR. CONTROL VALVE	COMPAC INDUSTRIES LTD., NZL.
767	SELF ACTUATED PR. CONTROL VALVE	ASPRO
768	SELF ACTUATED PR. CONTROL VALVE	VANAZ
769	SELF ACTUATED PR. CONTROL VALVE	NIRMAL INDUSTRIES LIMITED
770	**SOLENOID VALVES**	ALCON ALEXANDER CONTROLS LIMITED
771	SOLENOID VALVES	JEFFERSONS
772	SOLENOID VALVES	ASCO (INDIA) LIMITED
773	SOLENOID VALVES	ASCO JOUCOMATIC LTD.
774	SOLENOID VALVES	ASCO JOUCOMATIC SA
775	SOLENOID VALVES	PARKER HANNIFIN, USA

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776	SOLENOID VALVES	AVCON CONTROLS PVT. LTD.
777	SOLENOID VALVES	BARKSDALE INC.
778	SOLENOID VALVES	BLUE STAR LTD.
779	SOLENOID VALVES	HERION WERKE
780	SOLENOID VALVES	SCHRADER SCOVILL DUNCAN LIMITED
781	SOLENOID VALVES	SEITZ AG
782	SOLENOID VALVES	COMPAC NEW ZEALAND
783	SOLENOID VALVES	ROTEX AUTOMATION LIMITED
784	SOLENOID VALVES	OPERATED VALVES ASCO
785	SOLENOID VALVES	HABONIM VASS
786	SOLENOID VALVES	FESTO
787	SOLENOID VALVES	MICROMECANICA
788	**SPECIAL CONTROL VALVES**	FISHER ROSEMOUNT SIGAPORE PTE. LTD.
789	SPECIAL CONTROL VALVES	FLOWSERVE PTE. LTD. (FORMERLY DURIRON)
790	SPECIAL CONTROL VALVES	HOPKINSONS LIMITED
791	SPECIAL CONTROL VALVES	METSO AUTOMATION PTE LTD. (FORMERLY NELES)
792	SPECIAL CONTROL VALVES	NUOVO PIGNONE SPA (ITALY
793	SPECIAL CONTROL VALVES	SPX VALVES & CONTROLS (FORMERLY DEXURIK)
794	SPECIAL CONTROL VALVES	COMPAC IND. LTD. NZL
795	**REGULATORS**	COMPAC IND. LTD.
796	REGULATORS	FISHER ROSEMOUNT SIGAPORE PTE. LTD

Sr.No	Name of ITEM/Package	Recommended Vendor List
797	REGULATORS	FLOWSERVE PTE. LTD. (FORMERLY DURIRON)
798	REGULATORS	SWAGELOK
799	REGULATORS	PARKER
800	REGULATORS	COMPAC
801	REGULATORS	HAMLET
802	REGULATORS	HYLOCK
803	REGULATORS	DK-LOK
804	REGULATORS	SEALEXCEL
805	REGULATORS	SSP
806	REGULATORS	OASIS
807	**GAS DETECTOR SYSTEM**	DETRONICS
808	GAS DETECTOR SYSTEM	HONEYWELL
809	GAS DETECTOR SYSTEM	NET SAFETY
810	GAS DETECTOR SYSTEM	GENERAL MONITORS/ MSA
811	GAS DETECTOR SYSTEM	CROW ON
812	GAS DETECTOR SYSTEM	SIEGER
813	GAS DETECTOR SYSTEM	ESP SAFETY
814	GAS DETECTOR SYSTEM	SENSITRON
815	GAS DETECTOR SYSTEM	ROSEMOUNT EARLIER KNOWN AS NET SEFETY
816	GAS DETECTOR SYSTEM	DRAEGER SAFETY
817	GAS DETECTOR SYSTEM	EMERSON PROCESS MANAGEMENT INDIA PVT LTD

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818	GAS DETECTOR SYSTEM	RESPO PRODUCTS
819	GAS DETECTOR SYSTEM	DET-TRONICS
820	**FIRE DETECTION/ALARM SYSTEM**	APOIIO
821	FIRE DETECTION/ALARM SYSTEM	AGNI PVT LTD
822	FIRE DETECTION/ALARM SYSTEM	ASES/IRIS
823	FIRE DETECTION/ALARM SYSTEM	HONEYWELL
824	FIRE DETECTION/ALARM SYSTEM	RAVEL
825	FIRE DETECTION/ALARM SYSTEM	NEW FIRE ENGINEERS (P) LTD, INDIA
826	**FLAME DETECTOR/ SURGE PROTECTORS**	GENERAL MONITORS/ MSA
827	FLAME DETECTOR/ SURGE PROTECTORS	SPECTREX
828	FLAME DETECTOR/ SURGE PROTECTORS	DETRONICS
829	FLAME DETECTOR/ SURGE PROTECTORS	HONEYWELL
830	FLAME DETECTOR/ SURGE PROTECTORS	NET SAFETY
831	FLAME DETECTOR/ SURGE PROTECTORS	CROW ON
832	FLAME DETECTOR/ SURGE PROTECTORS	SIEGER
833	FLAME DETECTOR/ SURGE PROTECTORS	ESP SAFETY
834	**SURGE PROTECTORS/BARRIER/ISOLATORS/SIGNAL MULTIPLYER**	PHOENIX
835	SURGE PROTECTORS/BARRIER/ISOLATORS/SIGNAL MULTIPLYER	P&F
836	SURGE PROTECTORS/BARRIER/ISOLATORS/SIGNAL MULTIPLYER	MTL
837	SURGE PROTECTORS/BARRIER/ISOLATORS/SIGNAL MULTIPLYER	HANS TURCK GMBH & CO. KG INDIA / GERMANY
838	**RELAYS**	OMRON
839	RELAYS	OEN
840	RELAYS	JYOTI
841	RELAYS	PHOENIX
842	**PLC/RTU**	ALLEN BRADLEY

Sr.No	Name of ITEM/Package	Recommended Vendor List
843	PLC/RTU	GE FANUC
844	PLC/RTU	BRISTOL BABCOCK INC.
845	PLC/RTU	HONEYWELL
846	PLC/RTU	SCHNIEDER
847	PLC/RTU	ABB
848	PLC/RTU	SIEMENS
849	PLC/RTU	EMERSON
850	PLC/RTU	SYNERGY
851	PLC/RTU	INVENSYS
852	PLC/RTU	ELECTRONIC CORPORATION OF INDIA
853	PLC/RTU	M/s. Phoenix Contact India Pvt Ltd
854	**MCT**	NEIMEX
855	MCT	SIGNET INTERNATIONAL
856	MCT	G.K Gmbh, GERMANY
857	MCT	ROTEX
858	**OFC**	FINOLEX CABLE

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859	OFC	BIRLA ERICSSION OPTICAL LTD
860	OFC	RPG CABLE LTD
861	OFC	TAMILNADU TELECOMMUNICATION LTD
862	OFC	U M Cables
863	OFC	HIMACHAL FUTURISTIC COMMUNICATION LTD
864	OFC	STERLITE INDUSTRIESLTD
865	OFC	KEC INTERNATIONAL LTD,INDIA
866	**ELECTRONIC MARKER AND LOCATOR**	3M
867	ELECTRONIC MARKER AND LOCATOR	MOELLER
868	**FIBER TERMINAL CLOSER (FTC)**	RAYCHEM
869	FIBER TERMINAL CLOSER (FTC)	3M
870	FIBER TERMINAL CLOSER (FTC)	SIEMENS
871	FIBER TERMINAL CLOSER (FTC)	F&G
872	FIBER TERMINAL CLOSER (FTC)	KEPTEL
873	FIBER TERMINAL CLOSER (FTC)	ALCOA FUJIKURLA LTD
874	**INSTRUMENT PANEL**	RITTAL
875	INSTRUMENT PANEL	ACCUSONIC CONTROLS PVT LTD, INDIA
876	INSTRUMENT PANEL	INSTRUMENTATION LTD, INDIA
877	INSTRUMENT PANEL	INDUSTRIAL CONTROLS & APPLIANCES PVT LTD,INDIA
878	INSTRUMENT PANEL	POSITRONICS PVT LTD,INDIA
879	INSTRUMENT PANEL	RADHA KRISHNA CONTROLS,INDIA
880	INSTRUMENT PANEL	ICA SOLUTIONS LTD, U.K
881	INSTRUMENT PANEL	PYROTECH CONTROLS, INDIA
882	INSTRUMENT PANEL	ENCLOTEK, INDIA
883	INSTRUMENT PANEL	CONTROL SYSTEM ENGINEERS
884	INSTRUMENT PANEL	IRIS AUTOMATION PVT. LTD.
885	**JUNCTION BOX**	BALIGA LIGHTING EQUIPMENT (P) LTD, INDIA
886	JUNCTION BOX	FLEXPRO ELECTRICALS PVT.LTD ,INDIA
887	JUNCTION BOX	FLAMEPROOF EQUIPMENT PVT.LTD, INDIA
888	JUNCTION BOX	FCG POWER INDUSTRIES PVT. LTD,INDIA
889	JUNCTION BOX	FCG FLAMEPROOF CONTROL GEARS PVT. LTD, INDIA

Sr.No	Name of ITEM/Package	Recommended Vendor List
890	JUNCTION BOX	SUDHIR SWITCHGEARS PVT.LTD, INDIA
891	JUNCTION BOX	EXPROTECTA
892	**CABLE GLAND/PLUGS**	BALIGA LIGHTING EQUIPMENTS PVT. LTD, INDIA
893	CABLE GLAND/PLUGS	COMET BRASS PRODUCTS , INDIA
894	CABLE GLAND/PLUGS	COMET INDUSTRIES, INDIA
895	CABLE GLAND/PLUGS	FLEXPRO ELECTRICALS PVT.LTD,INDIA
896	CABLE GLAND/PLUGS	FLAMEPROOF EQUIPMENTS (P) LTD, INDIA
897	CABLE GLAND/PLUGS	FCG POWER INDUSTRIES PVT.LTD, INDIA
898	CABLE GLAND/PLUGS	FCG FLAMEPROOF CONTROL GEARS PVT LTD, INDIA
899	CABLE GLAND/PLUGS	STANDARD METAL INDUSTRIES,INDIA
900	CABLE GLAND/PLUGS	SUDHIR SWITCHGEARS PVT.LTD, INDIA
901	CABLE GLAND/PLUGS	KAYSONS TECHNO EQUIPMENT P LTD.

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902	CABLE GLAND/PLUGS	STANDARD METAL INDUSTRIES
903	**INSTRUMENT CABLES**	CORDS CABLES INDUSTRIES
904	INSTRUMENT CABLES	ASSOCIATED CABLES
905	INSTRUMENT CABLES	INCAB
906	INSTRUMENT CABLES	UNIVERSAL CABLES LTS/OEM Cables
907	INSTRUMENT CABLES	ASEAN
908	INSTRUMENT CABLES	CCI
909	INSTRUMENT CABLES	FORT GLOSTER
910	INSTRUMENT CABLES	FINOLEX
911	INSTRUMENT CABLES	KEI
912	INSTRUMENT CABLES	POLYCAB
913	INSTRUMENT CABLES	HAVELLS
914	INSTRUMENT CABLES	THERMO CABLES LTD, INDIA
915	INSTRUMENT CABLES	UDEY PYROCABLES PVT.LTD, INDIA
916	INSTRUMENT CABLES	SUYOG ELECTRICALS LTD, INDIA
917	**TELECOM SYSTEM**	COMMTEL NETWORK
918	TELECOM SYSTEM	ECI TELECOM LTD
919	TELECOM SYSTEM	FIBCOM INDIA LTD
920	TELECOM SYSTEM	TEJAS NETWORK LTD
921	TELECOM SYSTEM	ABB LTD
922	**LANSWITCH/ROUTER/FIRE WALL**	3COM
923	LANSWITCH/ROUTER/FIRE WALL	CISCO
924	LANSWITCH/ROUTER/FIRE WALL	NORTEL
925	LANSWITCH/ROUTER/FIRE WALL	DELL
926	LANSWITCH/ROUTER/FIRE WALL	CHECK POINT
927	LANSWITCH/ROUTER/FIRE WALL	PALO ALTO
928	LANSWITCH/ROUTER/FIRE WALL	IBM
929	**CCTV**	PELCO
930	CCTV	AXIS
931	CCTV	SAMSUNG
932	CCTV	PANASONIC
933	CCTV	HONEYWELL
934	CCTV	CP PLUS
935	**CORROSIVE MONITORING SYSTEM (CMS)**	CAPROCO, UK
936	CORROSIVE MONITORING SYSTEM (CMS)	CORRPRO, SHARJA

Sr.No	Name of ITEM/Package	Recommended Vendor List
937	CORROSIVE MONITORING SYSTEM (CMS)	METAL SAMPLES, USA
938	CORROSIVE MONITORING SYSTEM (CMS)	CORMON, UK
939	CORROSIVE MONITORING SYSTEM (CMS)	ATEL, ITALY
940	CORROSIVE MONITORING SYSTEM (CMS)	KOROSI SPECINDO
941	**VIBRATION SWITCH**	MURPHY
942	VIBRATION SWITCH	METRIX
943	VIBRATION SWITCH	ROBERTSHAW CONTROL
944	**TELEPHONES/EPABX SYSTEM**	ALCATEL

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945	TELEPHONES/EPABX SYSTEM	AVAYA
946	TELEPHONES/EPABX SYSTEM	ERICSSION
947	TELEPHONES/EPABX SYSTEM	SIEMENS
948	TELEPHONES/EPABX SYSTEM	PANASONIC
949	TELEPHONES/EPABX SYSTEM	TATA
950	TELEPHONES/EPABX SYSTEM	SAMSUNG
951	**PRESSURE SWITCHES**	ASCO JOUCOMATIC LTD,UK, C/O ASCO (INDIA) LTD, INDIA
952	PRESSURE SWITCHES	DAG PROCESS INSTRUMENTS PVT LTD, INDIA
953	PRESSURE SWITCHES	DELTA CONTROLS LTD, UK
954	PRESSURE SWITCHES	INDFOS INDUSTRIES LIMITED, INDIA
955	PRESSURE SWITCHES	KAUSTUBHA UDYOG, INDIA
956	PRESSURE SWITCHES	PYROPRESS ENGG CO LTD, UK
957	PRESSURE SWITCHES	ROBERTSHAW CONTROLS CO, USA
958	PRESSURE SWITCHES	REGULATEURS GEORGIN S.A, FRANCE
959	PRESSURE SWITCHES	SWITZER INSTRUMENT LTD, INDIA
960	PRESSURE SWITCHES	SOR INC, USA
961	PRESSURE SWITCHES	SIRCO CONTROLS LIMITED, UK
962	PRESSURE SWITCHES	UNITED ELECTRIC CONTROLS CO, USA, C/O UNITED
963	PRESSURE SWITCHES	ELECTRIC CONTROLS CO., INDIA
964	PRESSURE SWITCHES	INDFOS,ASCHCROFT
965	**LEVEL GAUGE GLASSES & COCKS**	BLISS ANAND PVT LTD, INDIA
966	LEVEL GAUGE GLASSES & COCKS	CHEMTROLS SAMIL (INDIA) PVT LTD, INDIA
967	LEVEL GAUGE GLASSES & COCKS	CESARE BONNETTI S.P.A., ITALY, C/O BONETTI WAAREE (I) PVT.
968	LEVEL GAUGE GLASSES & COCKS	GAUGES BURDON (I) PVT. LTD.(GENERAL INSTRUMENTS)
969	LEVEL GAUGE GLASSES & COCKS	JERGUSON GAUGE & VALVE,USA
970	LEVEL GAUGE GLASSES & COCKS	KLINGER SPA, ITALY
971	LEVEL GAUGE GLASSES & COCKS	LEVCON INSTRUMENTS PVT LTD,INDIA
972	LEVEL GAUGE GLASSES & COCKS	NIHON KLINGAGE CO LTD, JAPAN
973	LEVEL GAUGE GLASSES & COCKS	PRATOLINA INSTRUMENTS PVT LTD, INDIA
974	LEVEL GAUGE GLASSES & COCKS	SIGMA INSTRUMENTS CO, INDIA
975	LEVEL GAUGE GLASSES & COCKS	NISAN SCIENTIFIC PROCESS EQUIP. P LTD
976	LEVEL GAUGE GLASSES & COCKS	PUNE TECHTROL PVT LTD
977	LEVEL GAUGE GLASSES & COCKS	PRATOLINA INSTRUMENTS PVT LTD
978	**LEVEL INSTRUMENT**	ABB INC,USA, C/O ABB LTD, INDIA
979	LEVEL INSTRUMENT	EMERSON PROCESS MANAGEMENT INDIA PVT LTD, INDIA
980	LEVEL INSTRUMENT	ENDRESS+HAUSER (I) PVT. LTD, INDIA
981	LEVEL INSTRUMENT	KROHNE MESSTECHNIK GMBH & CO KG, GERMANY
982	LEVEL INSTRUMENT	L & J TECHNOLOGIES, USA, C/O L&J TECHNOLOGIES INC,

Sr.No	Name of ITEM/Package	Recommended Vendor List
983	LEVEL INSTRUMENT	MAGNETROL INTERNATIONAL
984	LEVEL INSTRUMENT	VEGA GRIESHABER KG, GERMANY, C/O VEGA INDIA LEVEL AND PRESSURE MGMT PVT. LTD, INDIA

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985	**Panel mounted 24 V DC Power supply**	SITOP, INDIA
986	Panel mounted 24 V DC Power supply	PHEONIX, INDIA
987	Panel mounted 24 V DC Power supply	WAGO
988	Panel mounted 24 V DC Power supply	COSEL
989	**CABLE – FIRE ALARM & COMMUNICATION CABLES**	CORDS CABLE INDUSTRIES LTD.
990	CABLE – FIRE ALARM & COMMUNICATION CABLES	CMI
991	CABLE – FIRE ALARM & COMMUNICATION CABLES	DELTON CABLES LTD.
992	CABLE – FIRE ALARM & COMMUNICATION CABLES	ELKAY TELELINKS
993	CABLE – FIRE ALARM & COMMUNICATION CABLES	KEI INDUSTRIES LTD.
994	CABLE – FIRE ALARM & COMMUNICATION CABLES	RELIANCE ENGINEERS LTD.
995	**CABLE – LT POWER & CONTROL(XPLE)**	CORDS CABLE INDUSTRIES LTD.
996	CABLE – LT POWER & CONTROL(XPLE)	UNIVERSAL CABLE LTD.
997	CABLE – LT POWER & CONTROL(XPLE)	KEI INDUSTRIES LTD.
998	CABLE – LT POWER & CONTROL(XPLE)	HAVELLS
999	CABLE – LT POWER & CONTROL(XPLE)	DELTON
1000	CABLE – LT POWER & CONTROL(XPLE)	ELKAY TELELINKS
1001	CABLE – LT POWER & CONTROL(XPLE)	EVERSHINE ELECTRICALS
1002	CABLE – LT POWER & CONTROL(XPLE)	ECKO
1003	CABLE – LT POWER & CONTROL(XPLE)	RAVIN
1004	CABLE – LT POWER & CONTROL(XPLE)	RALLISON
1005	CABLE – LT POWER & CONTROL(XPLE)	SUYOG
1006	CABLE – LT POWER & CONTROL(XPLE)	NETCO
1007	CABLE – LT POWER & CONTROL(XPLE)	UNIFLEX
1008	CABLE – LT POWER & CONTROL(XPLE)	PARAMOUNT
1009	CABLE – LT POWER & CONTROL(XPLE)	GLOSTER
1010	CABLE – LT POWER & CONTROL(XPLE)	ASSOCIATED CABLES PVT. LTD.
1011	CABLE – LT POWER & CONTROL(XPLE)	CMI
1012	CABLE – LT POWER & CONTROL(XPLE)	GEMSCAB
1013	CABLE – LT POWER & CONTROL(XPLE)	INDUSTRIAL CABLES
1014	CABLE – LT POWER & CONTROL(XPLE)	NICCO
1015	CABLE – LT POWER & CONTROL(XPLE)	POLYCAB
1016	CABLE – LT POWER & CONTROL(XPLE)	TORRENT
1017	CABLE – LT POWER & CONTROL(XPLE)	FASCO GUARDON
1018	CABLE – LT POWER & CONTROL(XPLE)	Swadeshi Cable
1019	**CABLE – GLAND**	BALIGA
1020	CABLE – GLAND	COMET
1021	CABLE – GLAND	FLEXPRO
1022	CABLE – GLAND	FLAMEPROOF
1023	CABLE – GLAND	FCG
1024	CABLE – GLAND	ELECTRO WERKE
1025	CABLE – GLAND	DOWELS
1026	CABLE – GLAND	CCI
1027	CABLE – GLAND	IVECO GUARDPLUS
1028	**CABLE – LUGS**	DOWELS

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1029	CABLE – LUGS	JAINSON
1030	CABLE – LUGS	ISMAL
1031	CABLE – LUGS	IVECO GUARDPLUS
1032	CABLE – LUGS	Guardplus
1033	**CABLE – TRAY**	ERCON COMPOSITES
1034	CABLE – TRAY	YAMUNA POWER & INFRASTRUCTURE LTD.
1035	CABLE – TRAY	IVECO RENO
1036	**EARTHING MATERIALS**	RUKMANI ELECTRICAL & COMPONENTS PVT LTD.
1037	EARTHING MATERIALS	INDIANA GRATING PVT LTD.
1038	EARTHING MATERIALS	JEF TECHNO SOLUTIONS PVT LTD
1039	EARTHING MATERIALS	IVECO-RENO
1040	**FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES**	FCG
1041	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	SUDHIR
1042	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	PROMPT ENGINEERING WORKS
1043	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	FLAME PROOF EQUIPMENTS PVT. LTD.
1044	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	BALIGA LIGHTING EQUIPMENTS PVT. LTD.
1045	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	FLEXPRO ELECTRICALS PVT. LTD.
1046	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	ERGON
1047	FLAME PROOF LDB'S/ JB,S/CONTROL STATION/ SWITCHES	Equipments Pvt. Ltd
1048	**LIGHTING FIXTURES**	GE LIGHTING PVT. LTD.
1049	LIGHTING FIXTURES	BAJAJ ELECTRICALS LTD.
1050	LIGHTING FIXTURES	CROMPTON GREAVES LTD.
1051	LIGHTING FIXTURES	PHILIPS INDIA LTD.
1052	LIGHTING FIXTURES	HAVELL'S
1053	**LIGHTING FIXTURES (FLAMEPROOF)**	BAJAJ ELECTRICALS LTD.
1054	LIGHTING FIXTURES (FLAMEPROOF)	BALIGA LIGHTING EQUIPMENT PVT. LTD.
1055	LIGHTING FIXTURES (FLAMEPROOF)	CROMPTON GREAVES LTD.
1056	LIGHTING FIXTURES (FLAMEPROOF)	CEAG FLAMEPROOF CONTROLGEAR PVT. LTD.
1057	LIGHTING FIXTURES (FLAMEPROOF)	FLEXPRO ELECTRICALS PVT. LTD.
1058	LIGHTING FIXTURES (FLAMEPROOF)	PHILIPS INDIA LTD.
1059	LIGHTING FIXTURES (FLAMEPROOF)	SUDHIR SWITCHGEARS PVT. LTD.
1060	LIGHTING FIXTURES (FLAMEPROOF)	FCG
1061	**GI-OCTOGONAL POLE**	BAJAJ
1062	GI-OCTOGONAL POLE	TRANSRAIL
1063	GI-OCTOGONAL POLE	WIPRO
1064	GI-OCTOGONAL POLE	IVECO ROSHNI
1065	**LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB**	ABB
1066	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	BCH
1067	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	C&S
1068	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	ELECMECH SWITCHGEAR & INSTRUMENTATION
1069	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	KMG ATOZ
1070	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	L&T
1071	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	PYROTECH ELECTRONICS PVT. LTD.

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1072	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	RISHA CONTROL ENGINEERS PVT. LTD.
1073	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	SIEMENS LTD.
1074	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	TRICOLITE ELECTRICAL INDUSTRIES
1075	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	UNILEC ENGINEERS LTD.

Sr.No	Name of ITEM/Package	Recommended Vendor List
1076	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	VIDYUT CONTROL INDIA PVT. LTD.
1077	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	CONTROL AND SCHEMATIC
1078	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	ZENITH ENGINEERING
1079	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	NATURGY CONTRA
1080	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	EXPERT ENGINEERS
1081	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	SYNERGY SYSTEMS
1082	LOW VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	M/S SHOREY E SOLUTION
1083	**MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB**	ABB
1084	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	HAGGER
1085	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	HAVELL'S INDIA LTD.
1086	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	INDO ASIAN FUSEGEAR LTD.
1087	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	LEGRAND
1088	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	MDS SWITCHGEAR LTD.
1089	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	SCHNEIDER
1090	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	SIEMENS LTD.
1091	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	HPL
1092	**MOULDED CASE CIRCUIT BREAKER (MCCBS)**	ABB
1093	MOULDED CASE CIRCUIT BREAKER (MCCBS)	ANDREW YULE
1094	MOULDED CASE CIRCUIT BREAKER (MCCBS)	LARSEN & TOUBRO
1095	MOULDED CASE CIRCUIT BREAKER (MCCBS)	SCHNEIDER
1096	MOULDED CASE CIRCUIT BREAKER (MCCBS)	SIEMENS
1097	MOULDED CASE CIRCUIT BREAKER (MCCBS)	CONTROL & SWITCHGEAR
1098	**INDICATING METERS**	ABB
1099	INDICATING METERS	AMCO
1100	INDICATING METERS	AE
1101	INDICATING METERS	ALSTOM LTD.
1102	INDICATING METERS	CONZERV/SCHNEIDER
1103	INDICATING METERS	ELECON MEASUREMENT PVT. LTD.
1104	INDICATING METERS	HPL ELECTRIC & POWER PVT. LTD.
1105	INDICATING METERS	MECO INSTRUMENTS LTD.
1106	INDICATING METERS	MINILEC
1107	INDICATING METERS	RISHABH INSTRUMENTS PVT. LTD.
1108	INDICATING METERS	TRINITY ENERGY SYSTEM
1109	INDICATING METERS	KAYCEE
1110	INDICATING METERS	SALZER
1111	**CONTRACTORS – AC POWER**	ANDREW YULE
1112	CONTRACTORS – AC POWER	ABB
1113	CONTRACTORS – AC POWER	BHEL
1114	CONTRACTORS – AC POWER	C&S
1115	CONTRACTORS – AC POWER	HAVELL'S

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1116	CONTRACTORS – AC POWER	L&T
1117	CONTRACTORS – AC POWER	SCHNEIDER
1118	CONTRACTORS – AC POWER	SIEMENS LTD.
1119	CONTRACTORS – AC POWER	TELEMECHANIQUE
1120	**CONTROL TRANSFORMER**	AE
1121	CONTROL TRANSFORMER	INDUSHREE
1122	CONTROL TRANSFORMER	INTRA VIDYUT
1123	CONTROL TRANSFORMER	KALPA ELECTRIKALS

Sr.No	Name of ITEM/Package	Recommended Vendor List
1124	CONTROL TRANSFORMER	TRANSPOWER INDUSTRIES LTD.
1125	CONTROL TRANSFORMER	SIEMENS
1126	**INDICATING LAMPS**	ALSTOM LTD.
1127	INDICATING LAMPS	BCH
1128	INDICATING LAMPS	L&T
1129	INDICATING LAMPS	SIEMENS LTD.
1130	INDICATING LAMPS	VAISHNO ELECTRICALS
1131	**PROTECTION RELAYS – THERMAL**	BCH
1132	PROTECTION RELAYS – THERMAL	L&T LTD.
1133	PROTECTION RELAYS – THERMAL	SIEMENS LTD.
1134	PROTECTION RELAYS – THERMAL	TELEMENCHANIQUE & CONTROLS (INDIA) LTD.
1135	**PUSH BUTTONS**	BCH
1136	PUSH BUTTONS	ALSTOM LTD.
1137	PUSH BUTTONS	L&T
1138	PUSH BUTTONS	SIEMENS LTD.
1139	PUSH BUTTONS	TELEMENCHANIQUE & CONTROLS (INDIA) LTD.
1140	PUSH BUTTONS	VAISHNO ELECTRICALS
1141	**SWITCHES – CONTROL**	BCH
1142	SWITCHES – CONTROL	EASUM REYROLLE RELAYS & DEVICES LTD.
1143	SWITCHES – CONTROL	ALSTOM
1144	SWITCHES – CONTROL	KAYCEE INDUSTRIES LTD.
1145	SWITCHES – CONTROL	L&T
1146	SWITCHES – CONTROL	SIEMENS LTD.
1147	**SWITCHES – 5/15A PIANO/ PLATE, SWITCH SOCKET**	ANCHOR ELECTRONICS & ELECTRICALS PVT. LTD.
1148	SWITCHES – 5/15A PIANO/ PLATE, SWITCH SOCKET	KINGAL ELECTRICALS PVT. LTD.
1149	SWITCHES – 5/15A PIANO/ PLATE, SWITCH SOCKET	NORTH-WEST SWITCHGEAR LTD.
1150	**SWITCH SOCKET OUTLETS (INDUSTRIAL)**	ALSTOM LTD.
1151	SWITCH SOCKET OUTLETS (INDUSTRIAL)	BEST & CROMPTION ENGINEERING LTD.
1152	SWITCH SOCKET OUTLETS (INDUSTRIAL)	BCH
1153	SWITCH SOCKET OUTLETS (INDUSTRIAL)	CROMPTON GREAVES LTD.
1154	SWITCH SOCKET OUTLETS (INDUSTRIAL)	ESSEN ENGINEERING COMPANY PVT. LTD.
1155	**TERMINALS BLOCKS**	CONNECTWELL
1156	TERMINALS BLOCKS	CONTROLS & SWITCHGEAR CO. LTD.
1157	TERMINALS BLOCKS	ELMEX CONTROLS PVT. LTD.
1158	TERMINALS BLOCKS	ESSEN ENGINEERING CO. PVT. LTD.

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1159	**UPS SYSTEM AND INVERTER**	VERTIV (EARLIER DB POWER & EMERSON)
1160	UPS SYSTEM AND INVERTER	APLAB
1161	UPS SYSTEM AND INVERTER	KELTRON
1162	UPS SYSTEM AND INVERTER	HI-REL
1163	UPS SYSTEM AND INVERTER	DUBAS
1164	UPS SYSTEM AND INVERTER	TOSHIBA CORPORATION
1165	UPS SYSTEM AND INVERTER	FUZI ELECTRIC CO LTD
1166	UPS SYSTEM AND INVERTER	SYNERGY SYSTEMS
1167	UPS SYSTEM AND INVERTER	IVECO PLUS
1168	UPS SYSTEM AND INVERTER	BPE
1169	UPS SYSTEM AND INVERTER	M/S SHOREY E SOLUTION
1170	**BATTERIES**	AMCO BATTERIES LTD.

Sr.No	Name of ITEM/Package	Recommended Vendor List
1171	BATTERIES	HBLNIFE POWER SYSTEMS LTD.
1172	BATTERIES	EXIDE INDUSTRIES LTD
1173	BATTERIES	AMARA RAJA
1174	BATTERIES	ERGON GREEN
1175	**CHANGE OVER SWITCH**	CGM
1176	CHANGE OVER SWITCH	L&T
1177	CHANGE OVER SWITCH	SIEMENS
1178	**SOLAR STREET LIGHTING**	TATA BP SOLAR (I) LTD.
1179	SOLAR STREET LIGHTING	REIL, JAIPUR.
1180	SOLAR STREET LIGHTING	CEIL, SAHIBABAD.
1181	SOLAR STREET LIGHTING	HBL POWER
1182	SOLAR STREET LIGHTING	NATURGY GREENS
1183	**AVR AND STABLISERS**	JINDAL
1184	AVR AND STABLISERS	ERGON POWER
1185	**CHEMICAL/PLATE/G.I. EARTHINGS/G.I. PATTI/LCV EARTHING SYSTEM**	IVECO RENO
1186	CHEMICAL/PLATE/G.I. EARTHINGS/G.I. PATTI/LCV EARTHING SYSTEM	JEF TECH EARTHINGS
1187	CHEMICAL/PLATE/G.I. EARTHINGS/G.I. PATTI/LCV EARTHING SYSTEM	INDIANA GRATINGS
1188	**GEG SET**	CHROMA-ATOR
1189	GEG SET	MAHINDRA
1190	GEG SET	KIRLOSKAR
1191	**TRANSFORMER**	ABB
1192	TRANSFORMER	GE, BHEL, NANI ELECTRO TECHNICS PVT LTD
1193	TRANSFORMER	CROMPTON GREAVES, TOSHIBA TRANSFORMERS
1194	TRANSFORMER	SIEMENS
1195	TRANSFORMER	TRANFORMERS & RECTIFIERS INDIA LTD
1196	TRANSFORMER	KIRLOSKAR ELECTRIC
1197	TRANSFORMER	GUJARAT TRANSFORMER , POWER TECH TRANSFORMERS,
1198	TRANSFORMER	KOTSONS PVT LTD
1199	**AIR CONDITIONING SYSTEM**	CARRIER
1200	AIR CONDITIONING SYSTEM	HITACHI

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1201	AIR CONDITIONING SYSTEM	DAIKIN
1202	AIR CONDITIONING SYSTEM	BLUE STAR
1203	AIR CONDITIONING SYSTEM	VOLTAS
1204	**VENTILATION FAN**	ADVANCE VENTILATION PVT LTD.
1205	VENTILATION FAN	CB DOCTOR INDIA PVT.LTD.
1206	VENTILATION FAN	SK SYSTEMS PRIVATE LIMITED
1207	VENTILATION FAN	SARALA (Suburban Industrial Works)
1208	**VENTILATION INTAKE LOUVER, BACK DRAFT DAMPER**	ADVANCE VENTILATION PVT LTD.
1209	VENTILATION INTAKE LOUVER, BACK DRAFT DAMPER	RUSKIN TITUS INDIA PVT. LIMITED
1210	**LNG STORAGE TANK**	INOX
1211	LNG STORAGE TANK	VRV
1212	LNG STORAGE TANK	CHART
1213	LNG STORAGE TANK	TAYLOR WHARTON
1214	LNG STORAGE TANK	CRYOGAS
1215	LNG STORAGE TANK	New Field Industrial Equipment Pvt Ltd
1216	**MANUAL CRYOGENICC GLOBE /CHECK VALVE**	BESTOBELL
1217	MANUAL CRYOGENICC GLOBE /CHECK VALVE	HEROSE

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1218	**EP OPERATED CRYOGENIC VALVES**	HEROSE
1219	EP OPERATED CRYOGENIC VALVES	HABONIM
1220	EP OPERATED CRYOGENIC VALVES	BESTOBELL
1221	EP OPERATED CRYOGENIC VALVES	MECAINOX
1222	**ESD VALVES**	BESTOBELL
1223	ESD VALVES	HEROSE
1224	ESD VALVES	MECAINOX
1225	**INSTRUMENT VALVES FITTING, TUBE FITTINGS & AIR MANIFOLD**	SWAGELOK
1226	INSTRUMENT VALVES FITTING, TUBE FITTINGS & AIR MANIFOLD	PARKER
1227	**LEVEL GAUGE**	WIKA
1228	LEVEL GAUGE	CHEMTROL
1229	LEVEL GAUGE	KRONE
1230	**CRYO REGULATOR & PRESSURE REGULATOR**	SAMSON
1231	CRYO REGULATOR & PRESSURE REGULATOR	CASH
1232	CRYO REGULATOR & PRESSURE REGULATOR	BESTOBELL
1233	CRYO REGULATOR & PRESSURE REGULATOR	REGO
1234	**PRESSURE CONTROL REGULATOR**	NIRMAL INDIA
1235	PRESSURE CONTROL REGULATOR	PIETRO FIORENTIN
1236	PRESSURE CONTROL REGULATOR	REGO
1237	**SAFETY VALVE**	HEROSE
1238	SAFETY VALVE	LESSER
1239	SAFETY VALVE	ROCKWOOD
1240	**THERMAL RELIEF VALVE**	HEROSE
1241	THERMAL RELIEF VALVE	REGO
1242	**PRESSURE GAUGE & DIFFERENTIAL PRESSURE GAUGES**	WIKA
1243	PRESSURE GAUGE & DIFFERENTIAL PRESSURE GAUGES	GENERAL INSTRUMENT

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1244	PRESSURE GAUGE & DIFFERENTIAL PRESSURE GAUGES	WAREE INSTRUMENTS LTD
1245	PRESSURE GAUGE & DIFFERENTIAL PRESSURE GAUGES	A.N. INSTRUMENTS PVT. LTD
1246	**TEMPERATURE ELEMENTT**	GENERAL INSTRUMENT
1247	TEMPERATURE ELEMENTT	TEMPSEN
1248	TEMPERATURE ELEMENTT	PYROELECTRIC
1249	**PRESSURE/ DIFFERENTIAL PRESSURE /TEMPERATURE TRANSMITTER**	EMERSON
1250	PRESSURE/ DIFFERENTIAL PRESSURE /TEMPERATURE TRANSMITTER	SIEMENS
1251	PRESSURE/ DIFFERENTIAL PRESSURE /TEMPERATURE TRANSMITTER	YOKOGAWA
1252	PRESSURE/ DIFFERENTIAL PRESSURE /TEMPERATURE TRANSMITTER	HONEYWELL
1253	**JUNCTION BOX**	BALIGA
1254	JUNCTION BOX	FLEXPRO ELECTRICALS PVT. LTD.
1255	JUNCTION BOX	EXPROTECTA ELECTRICALS
1256	**FIRE & GAS DETECTION SYSTEM**	DETECTION ELECTRONIC
1257	FIRE & GAS DETECTION SYSTEM	HONEYWELL
1258	FIRE & GAS DETECTION SYSTEM	TYCO
1259	FIRE & GAS DETECTION SYSTEM	CHEMTROL ENGINEERING
1260	**PLC SYSTEM HARDWARE WITH COMPLETE CONTROL PANEL**	ALLEN BRADLEY
1261	PLC SYSTEM HARDWARE WITH COMPLETE CONTROL PANEL	SIEMENS
1262	PLC SYSTEM HARDWARE WITH COMPLETE CONTROL PANEL	HONEYWELL
1263	PLC SYSTEM HARDWARE WITH COMPLETE CONTROL PANEL	YOKOGAWA
1264	**CONTROL CONSOLE**	EVAN

Sr.No	Name of ITEM/Package	Recommended Vendor List
1265	CONTROL CONSOLE	PYROTECH
1266	**SCADA**	HONEYWELL
1267	SCADA	YOKOGAWA
1268	SCADA	SIEMENS
1269	SCADA	ALLEN BRADLEY
1270	**MASS FLOW METER**	EMERSON
1271	MASS FLOW METER	E&H
1272	MASS FLOW METER	SICK
1273	**USM METER**	Daniel/ Insromet International/ Krohne
1274	USM METER	Insromet International
1275	USM METER	Krohne
1276	**LAN SWITCH**	CISCO
1277	LAN SWITCH	NORTEL
1278	LAN SWITCH	MOXA
1279	**LASER JET COLOUR PRINTER**	HP
1280	LASER JET COLOUR PRINTER	Canon
1281	LASER JET COLOUR PRINTER	Epson
1282	**ZENER BARRIERS/ISOLATORS**	MTL
1283	ZENER BARRIERS/ISOLATORS	P & F
1284	**POWER SUPPLY UNIT**	ELNOVA
1285	POWER SUPPLY UNIT	APLAB

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1286	**SERVER & HMI**	DELL
1287	SERVER & HMI	HP
1288	**PRIORITY PANEL**	PARKER
1289	PRIORITY PANEL	TULSA
1290	**LEL NG GAS DETECTOR /DETECTION SYSTEM**	CROWCON DETECTION INSTRUMENTS LTD
1291	LEL NG GAS DETECTOR /DETECTION SYSTEM	DETECTION INSTRUMENTS (I) PVT LTD
1292	LEL NG GAS DETECTOR /DETECTION SYSTEM	DETECTOR ELECTRONICS CORPORATION
1293	LEL NG GAS DETECTOR /DETECTION SYSTEM	DRAGER SAFETY AG & CO.
1294	LEL NG GAS DETECTOR /DETECTION SYSTEM	KGAA MSA MINESSAFETY APPLIANCES
1295	LEL NG GAS DETECTOR /DETECTION SYSTEM	OLDHAM FRANCE S.A. HO
1296	LEL NG GAS DETECTOR /DETECTION SYSTEM	HONEYWELL
1297	**EMERGENCY STOP PUSH BUTTON STATION NEAR TANK**	BALIGA/KAYSON/SUDHIR
1298	**ELECTRICAL CABLES**	M/S ASSOCIATED CABLES/
1299	ELECTRICAL CABLES	M/S DELTON CABLES LTD, INDIA /
1300	ELECTRICAL CABLES	M/S KEI INDUSTRIES LTD INDIA /
1301	ELECTRICAL CABLES	M/S - CORDS CABLE INDUSTRIES LTD, INDIA
1302	ELECTRICAL CABLES	M/S POLYCAB WIRES PVT LTD, INDIA
1303	ELECTRICAL CABLES	T. C. COMMUNICATION PVT. LTD., DELHI
1304	ELECTRICAL CABLES	M/S SUYOG
1305	ELECTRICAL CABLES	M/S THERMO CABLES
1306	**CONTROL & INSTRUMENT CABLES**	KEI
1307	CONTROL & INSTRUMENT CABLES	CORDS
1308	CONTROL & INSTRUMENT CABLES	POLYCAB
1309	CONTROL & INSTRUMENT CABLES	DELTON
1310	**CRYOGENIC PUMP CENTRIFUGAL / SUBMERGED**	CRYOSTAR
1311	CRYOGENIC PUMP CENTRIFUGAL / SUBMERGED	ACD NIKISSO

Sr.No	Name of ITEM/Package	Recommended Vendor List
1312	CRYOGENIC PUMP CENTRIFUGAL / SUBMERGED	VANZETTI
1313	CRYOGENIC PUMP CENTRIFUGAL / SUBMERGED	CRYOMECH
1314	CRYOGENIC PUMP CENTRIFUGAL / SUBMERGED	ICL
1315	**LNG DISPENSER**	CRYOSTAR
1316	LNG DISPENSER	ACD NIKISSO
1317	LNG DISPENSER	CRYOGAS
1318	LNG DISPENSER	INOX
1319	**CNG DISPENSER**	TULSA
1320	CNG DISPENSER	PARKER
1321	**MOTOR**	ABB
1322	MOTOR	SIEMENS
1323	MOTOR	CGL
1324	MOTOR	BBL
1325	MOTOR	MARATHON
1326	**VFD**	ABB
1327	VFD	SIEMENS
1328	VFD	HITACHI

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1329	VFD	SCHNEIDER
1330	**FIRE PUMP**	LUBI
1331	FIRE PUMP	KIRLOSKAR
1332	FIRE PUMP	WILO
1333	FIRE PUMP	FLOWMORE
1334	FIRE PUMP	VARAT PUMPS
1335	**HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE**	NEWAGE
1336	HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE	SBJ
1337	HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE	WINCO
1338	HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE	VIMAL FIRE
1339	HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE	SUKAN
1340	HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE	SUPREMEX
1341	HYDRANT VALVE / WATER MONITOR / HOSE BOX / FIRE HOSE / BRIGADE INLET / BRANCH PIPE	UNITED FIRE
1342	**FIRE EXTINGUISHERS**	MINIMAX
1343	FIRE EXTINGUISHERS	CEASE FIRE
1344	FIRE EXTINGUISHERS	KANEX
1345	FIRE EXTINGUISHERS	SUPREMEX
1346	**FIRE WATER PIPES (MS)**	TATA
1347	FIRE WATER PIPES (MS)	JINDAL
1348	FIRE WATER PIPES (MS)	SURYA ROSHNI
1349	FIRE WATER PIPES (MS)	WELSPUN
1350	FIRE WATER PIPES (MS)	RATNAMANI
1351	FIRE WATER PIPES (MS)	MAHARASHTRA SEAMLESS
1352	FIRE WATER PIPES (MS)	SWASTIK

Sr.No	Name of ITEM/Package	Recommended Vendor List
1353	FIRE WATER PIPES (MS)	ESSAR
1354	FIRE WATER PIPES (MS)	GOODLUCK
1355	**OS & Y GATE VALVES**	KARTAR
1356	OS & Y GATE VALVES	KIRLOSKAR
1357	OS & Y GATE VALVES	HD FIRE
1358	OS & Y GATE VALVES	L&T
1359	OS & Y GATE VALVES	OSWAL
1360	**BUTTERFLY VALVES (FIRE SERVICE)**	TYCO / INTERVALVE / L&T / FOURESS / AV VALVES / ADVANCE / DELVAL / LEADER
1361	BUTTERFLY VALVES (FIRE SERVICE)	INTERVALVE
1362	BUTTERFLY VALVES (FIRE SERVICE)	L&T
1363	BUTTERFLY VALVES (FIRE SERVICE)	FOURESS
1364	BUTTERFLY VALVES (FIRE SERVICE)	AV VALVES

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1365	BUTTERFLY VALVES (FIRE SERVICE)	ADVANCE
1366	BUTTERFLY VALVES (FIRE SERVICE)	DELVAL
1367	BUTTERFLY VALVES (FIRE SERVICE)	LEADER
1368	**NON-RETURN VALVES (FIRE SERVICE)**	TYCO
1369	NON-RETURN VALVES (FIRE SERVICE)	L&T
1370	NON-RETURN VALVES (FIRE SERVICE)	WEIR BDK
1371	NON-RETURN VALVES (FIRE SERVICE)	OSWAL
1372	NON-RETURN VALVES (FIRE SERVICE)	FLOTEK
1373	NON-RETURN VALVES (FIRE SERVICE)	STEEL STRONG
1374	NON-RETURN VALVES (FIRE SERVICE)	FLUIDLINE
1375	**STRAINERS (FIRE SERVICE)**	SANT
1376	STRAINERS (FIRE SERVICE)	TELEFLOW
1377	STRAINERS (FIRE SERVICE)	FLAIR
1378	STRAINERS (FIRE SERVICE)	VENUS
1379	STRAINERS (FIRE SERVICE)	LEADER
1380	**FIRE PUMP TEST METER**	TYCO
1381	FIRE PUMP TEST METER	RAPIDROP
1382	**PIPE FITTINGS (FIRE SERVICE)**	UNIK
1383	PIPE FITTINGS (FIRE SERVICE)	ZOLOTO
1384	PIPE FITTINGS (FIRE SERVICE)	VENUS
1385	PIPE FITTINGS (FIRE SERVICE)	FITWELL
1386	PIPE FITTINGS (FIRE SERVICE)	WELDFIT
1387	PIPE FITTINGS (FIRE SERVICE)	JK FORGE
1388	PIPE FITTINGS (FIRE SERVICE)	OMEGA
1389	PIPE FITTINGS (FIRE SERVICE)	HB
1390	PIPE FITTINGS (FIRE SERVICE)	DRP-M
1391	PIPE FITTINGS (FIRE SERVICE)	GREENLINE
1392	PIPE FITTINGS (FIRE SERVICE)	HARDIK FORGING
1393	PIPE FITTINGS (FIRE SERVICE)	METRO METAL
1394	**LEVEL GAUGE FOR FIRE WATER APPLICATION**	LEVCON
1395	LEVEL GAUGE FOR FIRE WATER APPLICATION	SIGMA
1396	LEVEL GAUGE FOR FIRE WATER APPLICATION	CHEMTROL
1397	LEVEL GAUGE FOR FIRE WATER APPLICATION	DK INSTRUMENT
1398	LEVEL GAUGE FOR FIRE WATER APPLICATION	V AUTOMAT
1399	**FLOW DIVERTER**	BESTOBELL

Sr.No	Name of ITEM/Package	Recommended Vendor List
1400	FLOW DIVERTER	REGO
1401	**CONTROL ROOM EQUIPMENT CONTROL PANEL & ACCESSORIES**	M/S KELTRON CONTROLS LTD
1402	CONTROL ROOM EQUIPMENT CONTROL PANEL & ACCESSORIES	M/S ITTAL
1403	CONTROL ROOM EQUIPMENT CONTROL PANEL & ACCESSORIES	M/S PYROTECH
1404	CONTROL ROOM EQUIPMENT CONTROL PANEL & ACCESSORIES	M/S POSITRONICS PVT. LTD.
1405	CONTROL ROOM EQUIPMENT CONTROL PANEL & ACCESSORIES	RITTAL
1406	CONTROL ROOM EQUIPMENT CONTROL PANEL & ACCESSORIES	PYROTECH CONTROLS
1407	**INDICATORS**	M/S ABB

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1408	INDICATORS	M/S EUROTHERN
1409	INDICATORS	M/S TATA HONEYWELL
1410	INDICATORS	M/S MASIBUS
1411	**LIGHTING FIXTURES (NORMAL)**	HAVELLS INDIA/ GE LIGHTING PVT. LTD/ PHILIPS INDIA LTD/ BAJAJ ELECTRICALS LTD/ CROMPTON GREAVES LTD
1412	LIGHTING FIXTURES (NORMAL)	GE LIGHTING PVT. LTD
1413	LIGHTING FIXTURES (NORMAL)	PHILIPS INDIA LTD
1414	LIGHTING FIXTURES (NORMAL)	BAJAJ ELECTRICALS LTD
1415	LIGHTING FIXTURES (NORMAL)	CROMPTON GREAVES LTD
1416	**DIESEL ENGINE**	CUMMIN
1417	DIESEL ENGINE	GREAVES
1418	DIESEL ENGINE	EICHER
1419	DIESEL ENGINE	KOEL
1420	**VAPORIZER**	CRYOGAS
1421	VAPORIZER	INOX
1422	VAPORIZER	VRV
1423	VAPORIZER	ACD NIKISSO
1424	**DEWATERING PUMP**	CROMPTON
1425	DEWATERING PUMP	KIRLOSKAR
1426	DEWATERING PUMP	LUBI
1427	DEWATERING PUMP	VARAT PUMPS
1428	**STEEL PLATES**	Arcelor Mittal, Romania/ France/ Germany
1429	STEEL PLATES	Azovstahl, Ukraine
1430	STEEL PLATES	Nippon Steel Corporation, Japan [Formerly known as Nippon Steel & Sumitomo Metal Corp. (NSSMC)]
1431	STEEL PLATES	Baoshan Iron & Steel Co. Ltd., Shanghai, China
1432	STEEL PLATES	Dillinger, Germany
1433	STEEL PLATES	Essar Steel, India
1434	STEEL PLATES	Ilva (Riva Group), Italy
1435	STEEL PLATES	JFE Steel, Japan
1436	STEEL PLATES	Jindal Steel & Power Ltd. (upto 20.6 mm)
1437	STEEL PLATES	JSW Steel, USA
1438	STEEL PLATES	Mannesmann Salzgitter Roehrenwerke, Germany
1439	STEEL PLATES	POSCO, South Korea
1440	STEEL PLATES	SAIL, Rourkela Steel Plant (up to 23.8 mm)
1441	STEEL PLATES	Usiminas, Brazil
1442	STEEL PLATES	Voestalpine, Austria
1443	STEEL PLATES	Welspun PCMD, India
1444	**STEEL COILS**	AHMSA (Altos Hornos De Mexico), Mexico
1445	STEEL COILS	Angang Steel Co.Ltd., China

Sr.No	Name of ITEM/Package	Recommended Vendor List
1446	STEEL COILS	Anyang Iron & Steel Group Co.Ltd. China
1447	STEEL COILS	Arcelor Mittal,France/ Germany
1448	STEEL COILS	Baoshan Iron & Steel Co. Ltd., Shanghai, China

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1449	STEEL COILS	Benxi Iron & Steel, China
1450	STEEL COILS	Erdemir, Turkey
1451	STEEL COILS	Essar Steel, India
1452	STEEL COILS	Hadeed Saudi Iron & Steel Co., Saudi Arabia/ UAE
1453	STEEL COILS	HBIS Hebei Iron & Steel Group Co.Ltd, China
1454	STEEL COILS	Hunan Valin Lianyuan Steel Co. Ltd. China (Arcelor Mittal Group)
1455	STEEL COILS	Hyundai Steel, South Korea
1456	STEEL COILS	Jiangsu Shagang (Group), China
1457	STEEL COILS	Jinan Iron & Steel Co. Ltd., China
1458	STEEL COILS	JSW steel limited, Dolvi (earlier Ispat (upto X-70, WT-11.7mm)
1459	STEEL COILS	JSW, Bellary India
1460	STEEL COILS	Lloyd Steel, India (upto X-70, WT-11.7mm)
1461	STEEL COILS	Maanshan Iron & Steel Co. Ltd., China
1462	STEEL COILS	Megasteel, Malaysia (upto X-70, WT-10.3mm)
1463	STEEL COILS	POSCO, South Korea
1464	STEEL COILS	SAIL, Bokaro (uptoX-70, WT-11.1mm)
1465	STEEL COILS	Shou-gang Qian Iron & Steel Co. Ltd., China
1466	STEEL COILS	ThyssenKrupp, Germany
1467	STEEL COILS	TISCO (Group) Co. Ltd, China
1468	STEEL COILS	US Steel Kosice, Slovak Republic
1469	STEEL COILS	Wuhan Iron & Steel, China
1470	STEEL COILS	Tata Steel Ltd., Jamshedpur (upto API 5L X-60 & WT upto 9.35 mm)
1471	STEEL COILS	Tata Steel Ltd., Kalinganagar (upto API 5L X-70 & WT upto 16.0 mm)
1472	STEEL COILS	Tata Steel BSL Ltd., Meramandali (upto API 5L X-70 & WT upto 12.7 mm)
1473	**TEMPORARY CATHODIC PROTECTION**	
1474	CATHODIC PROTECTION AGENCY	Corrtech , Ahemdabad
1475	CATHODIC PROTECTION AGENCY	Corrosion Technology Services Pvt. Ltd., Mumbai
1476	CATHODIC PROTECTION AGENCY	Sark EPC, Ahmedadbad
1477	CATHODIC PROTECTION AGENCY	UNDTS, Noida
1478	CATHODIC PROTECTION AGENCY	Mitcorr, Baroda
1479	CATHODIC PROTECTION AGENCY	BSS Tech, Mumbai
1480	CATHODIC PROTECTION AGENCY	Vijaya Engineering
1481	CATHODIC PROTECTION AGENCY	Universal Corrosion Prevention India , Kolkata
1482	CATHODIC PROTECTION AGENCY	AMR Engineering Products , Mumbai
1483	CATHODIC PROTECTION AGENCY	Himoya Corrosion Technology , Kolkata
1484	CATHODIC PROTECTION AGENCY	Consultech ,Baroda
1485	CATHODIC PROTECTION AGENCY	M.Tech Engineers , Surat
1486	CATHODIC PROTECTION AGENCY	Cortigo Technologies Pvt. Ltd , Ahmedabad
1487	CATHODIC PROTECTION AGENCY	AA Projects Cathodic Protection
1488	**JUNCTION BOXES (CLASSIFIED TYPE)**	Flame Proof Equipment Pvt. Ltd.(FEPL), Bombay
1489	JUNCTION BOXES (CLASSIFIED TYPE)	Baliga Lighting, Chennai
1490	JUNCTION BOXES (CLASSIFIED TYPE)	CEAG Flame Proof Control Gears, Bombay
1491	JUNCTION BOXES (CLASSIFIED TYPE)	Flexpro Electricals, Navsari, Gujarat
1492	JUNCTION BOXES (CLASSIFIED TYPE)	Sudhir Switchgear

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Sr.No	Name of ITEM/Package	Recommended Vendor List
1493	JUNCTION BOXES (CLASSIFIED TYPE)	FCG flame proof control gears P. Ltd., Daman
1494	JUNCTION BOXES (CLASSIFIED TYPE)	Pepperl & Fuchs manufacturing (I) Pvt. Ltd.,Kanchipuram
1495	JUNCTION BOXES (CLASSIFIED TYPE)	Kaysons Techno equipments Pvt. Ltd., India
1496	JUNCTION BOXES (CLASSIFIED TYPE)	R Stahl Pvt. Ltd. Kanchipuram
1497	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	Kristron systems, Mumbai
1498	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	Raychem RPG Pvt Limited
1499	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	Corrtech International Pvt Ltd
1500	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	Sukrit Industries Ahemdabad
1501	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	Silverline Integrity Services
1502	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	UNDTS
1503	JUNCTION BOXES/ TEST STATION (NON- CLASSIFIED TYPE)	SARK EPC
1504	**CABLES**	Netco Cable
1505	CABLES	KEI
1506	CABLES	Fort Gloster
1507	CABLES	Polycab
1508	CABLES	Universal
1509	CABLES	CCI
1510	CABLES	CMIL
1511	CABLES	Suyog Electricals
1512	CABLES	Victor cables
1513	CABLES	Finolex cables
1514	CABLES	Asian Cables
1515	CABLES	Radiant Cables
1516	CABLES	Icon cables
1517	CABLES	Gemscab
1518	CABLES	Torrent
1519	CABLES	Nicco
1520	CABLES	KEC International
1521	CABLES	Uniflex
1522	CABLES	Havells
1523	CABLES	Crystal Cable Corporation
1524	CABLES	Ravin
1525	**PORTABLE/ PERMANENT REFERENCE ELECTRODES**	Permacell/Harco, USA
1526	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Borin Manufacturer, USA
1527	PORTABLE/ PERMANENT REFERENCE ELECTRODES	M.C.Miller, USA
1528	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Tinker & Rasor, USA
1529	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Ceranoda Technologies, USA
1530	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Telpro USA
1531	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Grouppo De nora, Goa
1532	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Oranzio De nora, Italy
1533	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Silvion, UK
1534	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Harco, USA
1535	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Electrochemical devices, USA
1536	**SURGE DIVERTOR (EX-d type)**	Dehn (Germany)

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1537	SURGE DIVERTOR (EX-d type)	OBO Betterman (Germany)
1538	**SOLID STATE POLARISTATION CELL**	Dairyland
1539	SOLID STATE POLARISTATION CELL	Metricorr, Denmark

Sr.No	Name of ITEM/Package	Recommended Vendor List
1540	SOLID STATE POLARISTATION CELL	Rustrol
1541	SOLID STATE POLARISTATION CELL	Dehn, Germany
1542	SOLID STATE POLARISTATION CELL	Kristron Systems, Mumbai
1543	SOLID STATE POLARISTATION CELL	Corrpro system
1544	SOLID STATE POLARISTATION CELL	Caltech
1545	**THERMIT WELDS**	Erico, USA
1546	THERMIT WELDS	Thermoweld, USA
1547	THERMIT WELDS	Erico,Europe
1548	THERMIT WELDS	Bac, UK
1549	**PINBRAZING**	Safe Track
1550	PINBRAZING	Bac, UK
1551	**MAGNESIUM & ZINC ANODES**	Sargam Metal , Chennai
1552	MAGNESIUM & ZINC ANODES	Scientific Metal, Chennai
1553	MAGNESIUM & ZINC ANODES	Shakti enterprises, Ahemdabad
1554	MAGNESIUM & ZINC ANODES	PSL Holding Pvt. Ltd., Mumbai
1555	MAGNESIUM & ZINC ANODES	Cathodic Controls, Bangalore
1556	MAGNESIUM & ZINC ANODES	Impalloy International
1557	MAGNESIUM & ZINC ANODES	Electro protection services, India
1558	MAGNESIUM & ZINC ANODES	Cathodic Control Company Pvt. Ltd., India
1559	MAGNESIUM & ZINC ANODES	Nippon Corrosion, Japan
1560	MAGNESIUM & ZINC ANODES	AFIC, KSA
1561	MAGNESIUM & ZINC ANODES	Platt Bros. and Company, USA
1562	MAGNESIUM & ZINC ANODES	Impalloy International, UK
1563	MAGNESIUM & ZINC ANODES	Corrpro International, Canada
1564	MAGNESIUM & ZINC ANODES	Nakabohtec, Japan
1565	MAGNESIUM & ZINC ANODES	Metal Founder, Mumbai
1566	MAGNESIUM & ZINC ANODES	Corrosion Matters, Hyderabad
1567	**ANODE BACKFILL MATERIAL**	Goa carbon, Goa
1568	ANODE BACKFILL MATERIAL	India Carbon, Kolkata
1569	ANODE BACKFILL MATERIAL	Petrocarbon & Chemical Company, Kolkata
1570	ANODE BACKFILL MATERIAL	Loresco, USA
1571	**PERMANENT CATHODIC PROTECTION SYSTEM**	Corrtech , Ahemdabad
1572	PERMANENT CATHODIC PROTECTION SYSTEM	Corrosion Technology Services Pvt. Ltd., Mumbai
1573	PERMANENT CATHODIC PROTECTION SYSTEM	Sark EPC, Ahmedadbad
1574	PERMANENT CATHODIC PROTECTION SYSTEM	UNDTS, Noida
1575	PERMANENT CATHODIC PROTECTION SYSTEM	Mitcorr, Baroda
1576	PERMANENT CATHODIC PROTECTION SYSTEM	BSS Tech, Mumbai
1577	PERMANENT CATHODIC PROTECTION SYSTEM	Vijaya Engineering
1578	PERMANENT CATHODIC PROTECTION SYSTEM	Cortigo Technologies Pvt. Ltd., Ahmedabad
1579	**TRANSFORMER- RECTIFIER UNITS**	Raychem RPG Pvt Ltd.(Canara Electric), Mumbai

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1580	TRANSFORMER- RECTIFIER UNITS	Kristron Systems Mumbai
1581	TRANSFORMER- RECTIFIER UNITS	Cathodic Control Co Pvt. Ltd,
1582	TRANSFORMER- RECTIFIER UNITS	Golconda Corrosion Control Pvt. Ltd., India
1583	TRANSFORMER- RECTIFIER UNITS	Hind Rectifiers Ltd., India
1584	**JUNCTION BOXES (CLASSIFIED TYPE)**	Flame Proof Equipment Pvt. Ltd.(FEPL), Bombay
1585	JUNCTION BOXES (CLASSIFIED TYPE)	Baliga Lighting, Chennai
1586	JUNCTION BOXES (CLASSIFIED TYPE)	Ceag Flame Proof Control Gears, Bombay

Sr.No	Name of ITEM/Package	Recommended Vendor List
1587	JUNCTION BOXES (CLASSIFIED TYPE)	Flexpro Electricals, Navsari, Gujarat
1588	JUNCTION BOXES (CLASSIFIED TYPE)	Sudhir Switchgear
1589	JUNCTION BOXES (CLASSIFIED TYPE)	FCG flame proof control gears P. Ltd., Daman
1590	JUNCTION BOXES (CLASSIFIED TYPE)	Pepperl & Fuchs manufacturing (I) Pvt. Ltd.,Kanchipuram
1591	JUNCTION BOXES (CLASSIFIED TYPE)	Kaysons Techno equipments Pvt. Ltd., India
1592	JUNCTION BOXES (CLASSIFIED TYPE)	R Stahl Pvt. Ltd. Kanchipuram
1593	**JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)**	Kristron systems, Mumbai
1594	JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)	Raychem RPG Pvt Limited
1595	JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)	Corrtech International Pvt Ltd
1596	JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)	Sukrit Industries Ahemdabad
1597	JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)	Silverline Integrity Services
1598	JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)	UNDTS
1599	JUNCTION BOXES/ Test Stations (NON- CLASSIFIED TYPE)	SARK EPC
1600	**CABLES**	Netco Cable
1601	CABLES	KEI
1602	CABLES	Fort Gloster
1603	CABLES	Polycab
1604	CABLES	Universal
1605	CABLES	Cable Corporation of India
1606	CABLES	CMIL
1607	CABLES	Suyog Electricals
1608	CABLES	Victor cables
1609	CABLES	Finolex cables
1610	CABLES	Asian Cables
1611	CABLES	Radiant Cables
1612	CABLES	Icon cables
1613	CABLES	Gemscab
1614	CABLES	Torrent
1615	CABLES	Nicco
1616	CABLES	KEC International
1617	CABLES	Uniflex
1618	CABLES	Havells
1619	CABLES	Crystal Cable Corporation
1620	CABLES	Ravin
1621	**PORTABLE/ PERMANENT REFERENCE ELECTRODES**	Permacell/Harco, USA
1622	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Borin Manufacturer, USA

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1623	PORTABLE/ PERMANENT REFERENCE ELECTRODES	M.C.Miller, USA
1624	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Tinker & Rasor, USA
1625	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Ceranoda Technologies, USA
1626	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Telpro USA
1627	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Grouppo De nora, Goa
1628	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Oranzio De nora, Italy
1629	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Silvion, UK
1630	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Harco, USA
1631	PORTABLE/ PERMANENT REFERENCE ELECTRODES	Electrochemical devices, USA
1632	**SURGE DIVERTOR (EX-d)**	Dehn (Germany)
1633	SURGE DIVERTOR (EX-d)	OBO Betterman (Germany)

Sr.No	Name of ITEM/Package	Recommended Vendor List
1634	**AC CORROSION COUPON**	MC Miller
1635	AC CORROSION COUPON	Farwest Corrosion
1636	**THERMIT WELDS**	Erico, USA
1637	THERMIT WELDS	Thermoweld, USA
1638	THERMIT WELDS	Erico,Europe
1639	THERMIT WELDS	Bac, UK
1640	**PINBRAZING**	Safe Track,Sweden
1641	PINBRAZING	Bac, UK
1642	**ER PROBE**	Rose Corrosion Service, UK
1643	ER PROBE	Metal Samples. USA
1644	ER PROBE	Roharbak Cosasco, USA
1645	ER PROBE	Caproco, UK
1646	ER PROBE	Korosi Specindo, Indonesia
1647	**MMO WIRE ANODE**	Titanor Components Ltd., Goa
1648	MMO WIRE ANODE	Oranzio De Nora, Italy
1649	MMO WIRE ANODE	Eltech System, USA
1650	MMO WIRE ANODE	Ceranode Technologies, USA
1651	MMO WIRE ANODE	Matcor, USA
1652	MMO WIRE ANODE	Covalence, USA
1653	MMO WIRE ANODE	Berry Plastics
1654	MMO WIRE ANODE	Grouppo De nora, Goa
1655	MMO WIRE ANODE	Telpro USA
1656	**MMO TUBULAR /STRIP/RIBBON ANODE**	Titanor Components Ltd., Goa
1657	MMO TUBULAR /STRIP/RIBBON ANODE	Oranzio De Nora, Italy
1658	MMO TUBULAR /STRIP/RIBBON ANODE	Magnetocheme, Holland
1659	MMO TUBULAR /STRIP/RIBBON ANODE	Actel Ltd., UK
1660	MMO TUBULAR /STRIP/RIBBON ANODE	Eltech System, USA
1661	MMO TUBULAR /STRIP/RIBBON ANODE	Ceranode Technologies, USA
1662	MMO TUBULAR /STRIP/RIBBON ANODE	Matcor, USA
1663	MMO TUBULAR /STRIP/RIBBON ANODE	Grouppo De nora, Goa
1664	MMO TUBULAR /STRIP/RIBBON ANODE	Cathodic Control Co Pvt. Ltd, India
1665	MMO TUBULAR /STRIP/RIBBON ANODE	Electro Protection Services India P Ltd

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1666	MMO TUBULAR /STRIP/RIBBON ANODE	Emirates Techno Casting, UAE
1667	MMO TUBULAR /STRIP/RIBBON ANODE	Corrosion Matters, Hyderabad
1668	**SOLID STATE POLARISTATION CELL**	Dairyland
1669	SOLID STATE POLARISTATION CELL	Metricorr, Denmark
1670	SOLID STATE POLARISTATION CELL	Rustrol
1671	SOLID STATE POLARISTATION CELL	Dehn, Germany
1672	SOLID STATE POLARISTATION CELL	Kristron Systems, Mumbai
1673	SOLID STATE POLARISTATION CELL	Corrpro system
1674	**HEAT SHRINK CAP FOR ANODE TO CABLE JOINT**	Raychem, USA
1675	HEAT SHRINK CAP FOR ANODE TO CABLE JOINT	Matcor, USA
1676	**MAGNESIUM & ZINC ANODE'S**	Sargam Metal , Chennai
1677	MAGNESIUM & ZINC ANODE'S	Scientific Metal, Chennai
1678	MAGNESIUM & ZINC ANODE'S	Shakti enterprises, Ahemdabad
1679	MAGNESIUM & ZINC ANODE'S	PSL Holding Pvt. Ltd., Mumbai

Sr.No	Name of ITEM/Package	Recommended Vendor List
1680	MAGNESIUM & ZINC ANODE'S	Cathodic Controls, Bangalore
1681	MAGNESIUM & ZINC ANODE'S	Impalloy International
1682	MAGNESIUM & ZINC ANODE'S	Electro protection services, India
1683	MAGNESIUM & ZINC ANODE'S	Cathodic Control Company Pvt. Ltd., India
1684	MAGNESIUM & ZINC ANODE'S	Nippon Corrosion, Japan
1685	MAGNESIUM & ZINC ANODE'S	AFIC, KSA
1686	MAGNESIUM & ZINC ANODE'S	Platt Bros. and Company, USA
1687	MAGNESIUM & ZINC ANODE'S	Impalloy International, UK
1688	MAGNESIUM & ZINC ANODE'S	Corrpro International, Canada
1689	MAGNESIUM & ZINC ANODE'S	Nakabohtec, Japan
1690	MAGNESIUM & ZINC ANODE'S	Metal Founder, Mumbai
1691	MAGNESIUM & ZINC ANODE'S	Corrosion Matters, Hyderabad
1692	**ANODE BACKFILL MATERIAL**	Goa carbon, Goa
1693	ANODE BACKFILL MATERIAL	India Carbon, Kolkata
1694	ANODE BACKFILL MATERIAL	Petrocarbon & Chemical Company, Kolkata
1695	ANODE BACKFILL MATERIAL	Loresco, USA
1696	**INSTRUMENTS, TOOLS AND SPARES**	
1697	HAND HELD DATA LOGGER	ECD, Mumbai
1698	HAND HELD DATA LOGGER	M C Miller, USA
1699	HAND HELD DATA LOGGER	Cath-tech
1700	**GSM BASED DIGITAL DATA LOGGER**	Raychem, USA
1701	GSM BASED DIGITAL DATA LOGGER	M C Miller, USA
1702	GSM BASED DIGITAL DATA LOGGER	Kriston, Mumbai
1703	**CORROSION VOLTMETER**	Rishabh
1704	CORROSION VOLTMETER	MECO
1705	CORROSION VOLTMETER	Fluke
1706	CORROSION VOLTMETER	Yokogawa

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1707	**MULTI-COMBINATION METER**	Rishabh
1708	MULTI-COMBINATION METER	MECO
1709	MULTI-COMBINATION METER	Fluke
1710	**CPL SURVEY DATA LOGGER**	MC Miller
1711	CPL SURVEY DATA LOGGER	Roger
1712	**DCVG SURVEY KIT**	DCVG
1713	**HOLIDAY DETECTOR**	Associate Electronics
1714	**PIPE LOCATOR**	Radio Detection
1715	PIPE LOCATOR	Vivax
1716	**ELCOMETER FOR COATING THICKNESS MEASUREMENT**	Olympus
1717	**4 PIN SOIL RESISTIVITY METER**	Tinkor & Rasor
1718	4 PIN SOIL RESISTIVITY METER	Nillson
1719	4 PIN SOIL RESISTIVITY METER	Fluke
1720	**SINCORDER**	MC Miller
1721	**CP SOFTWARE(FOR REMOTE MONITORING)**	Kristron
1722	**ELECTRICIAN TOOL BOX WITH TOOL SET**	Taparia
1723	ELECTRICIAN TOOL BOX WITH TOOL SET	Stanley
1724	**CAT /CAT A FRAME SURVEY EQUIPMENT**	Radio Detection
1725	CAT /CAT A FRAME SURVEY EQUIPMENT	Vivax
1726	**AC/DC INTERFRENCE SURVEY AGENCY**	Jeff Techno Solutions Pvt. Ltd.

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Sr.No	Name of ITEM/Package	Recommended Vendor List
1727	AC/DC INTERFRENCE SURVEY AGENCY	Dehn India Pvt. Ltd.

1. Any other vendor(s) apart from as mentioned above may be accepted subject to approval by Owner/Owners representative on submission of refusal letter from the existing approved vendor, non-responsiveness of existing approved vendor, existing approved vendor not complying with the project delivery schedule etc. Evidence of such reasons must be provided with the request and based on past track record (PTR). PTR document shall be submitted by the contractor for review. PTR must contain at least 3 nos. past executed purchase order copy.

2. For the vendors of items not covered in above vendor list, but required for completion of project successfully, supplier shall take approval form Owner/Owners representative for the same during project execution. Bidder shall submit the required certifications, documents, PTR and Performance letters from clients for the same.

3. Refer approved vendor list for applicable items of the subject tender.

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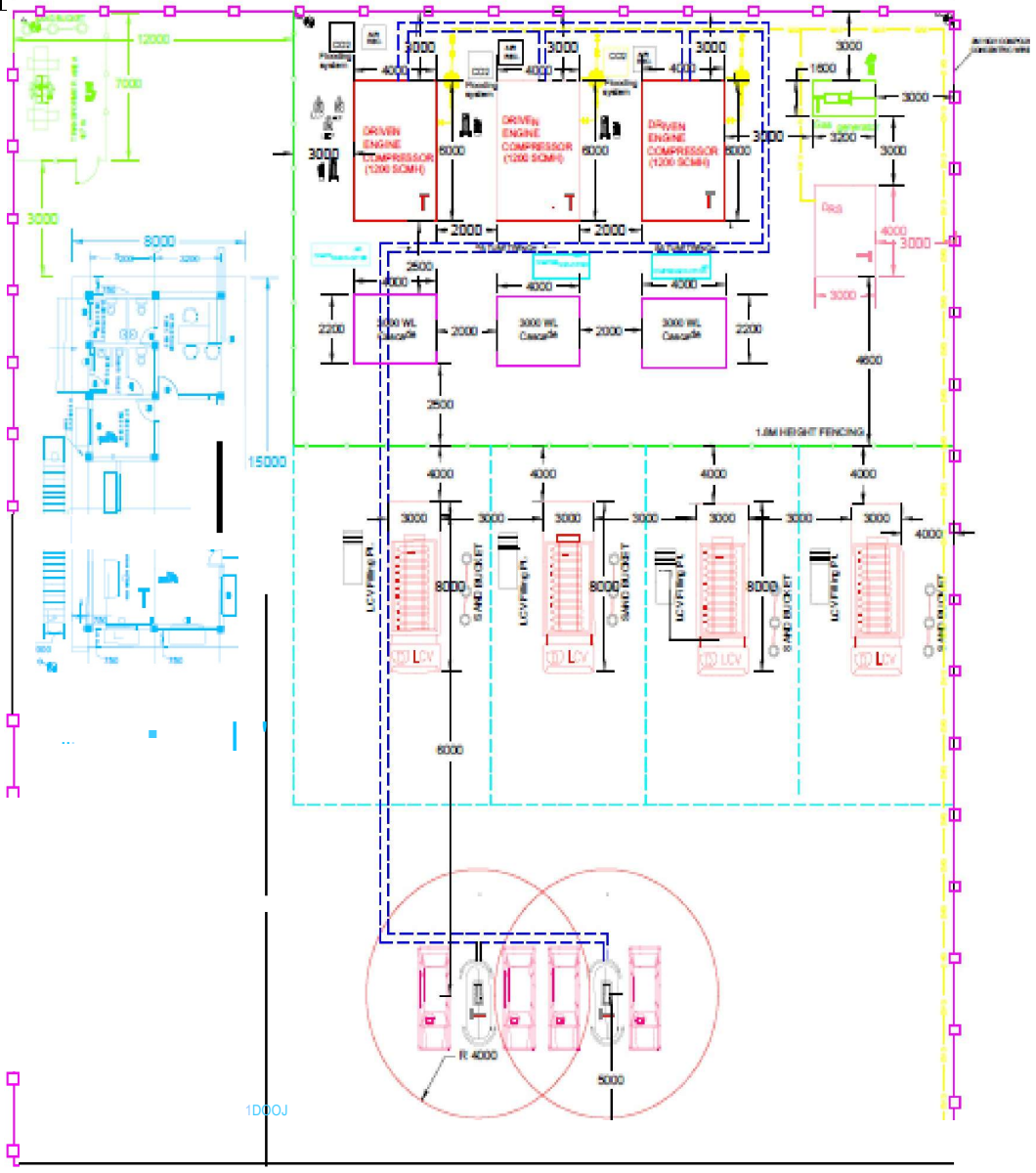

Note : The drawings, layouts, and sketches provided in the tender documents are indicative in nature and are intended only for general understanding of the scope of work. The actual layouts and drawings shall be finalized based on site conditions and execution requirements, duly approved by the Engineer-in-Charge. Payment shall be made based on the actual quantities executed at site, measured jointly, and shall be in accordance with the applicable Schedule of Rates (SOR).

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SECTION 8: SCHEDULE OF RATES

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SCHEDULE OF RATE (SOR)					
TENDER NAME: ELECTRICAL WORKS FOR MOTHER STATION IN BGL HYDERABAD GA					
TENDER NO.- BGL/694/2025-26					
		Name of the Bidder:			
ITEM NO.	**Description**	**Unit**	**Qty**	**UNIT RATE - INCLUSIVE OF ALL TAXES AND DUTIES,LEVIES, FREIGHT, INSURANCE INCLUDING TRANSIT INSURANCE OF FREE ISSUE MATERIALS AS DEFINED IN BID DOCUMENT (EXCLUDING GST)**	**TOTAL RATE - INCLUSIVE OF ALL TAXES AND DUTIES, LEVIES, FREIGHT, INSURANCE INCLUDING TRANSIT INSURANCE OF FREE ISSUE MATERIALS AS DEFINED IN BID DOCUMENT (EXCLUDING GST)**
PART A - Indresham					
	ELECTRICAL				
	SUPPLY, INSTALLATION, TESTING & COMMISSIONING				
	EARTHING & LIGHTNING SYSTEM :				
10	Supply, Installation, testing & commissioning of Earthing with Copper earth plate 600mm x 600 mm x 3mm thick including accessories and providing masonary enclosure with cover plate having locking arrangement and watering pipe etc, with charcoal / coke and salt as required as per IS 3043. Final resistance Value shall be submitted for clint/ consultantant review.	Nos	12	15,170.10	1,82,041.24
20	Supply, Installation, testing & commissioning of Earthing with GI earth pipe, 3.0 mtr long, 100 mm dia including accessories and providing masonary enclosure with cover plate having locking arrangement etc, (with charcoal and salt) as required as per IS 3043.	Nos	18	9,124.25	1,64,236.44
30	Supply, Installation & Laying, excavation & restoration, testing & commissioning of 50mm X 6 mm G.I strip complete with all accessories.	Meter (M)	690	254.68	1,75,731.82
40	Supply, Installation & Laying, excavation & restoration, testing & commissioning of 25mm X 3 mm G.I strip complete with all accessories.	Meter (M)	400	185.47	74,186.64
50	Supply, Installation & Laying, excavation & restoration, testing & commissioning of 25mm X 3 mm Cu strip complete with all accessories.	Meter (M)	120	697.50	83,699.57
60	Supply, Installation & Laying, testing & commissioning of 10 sq mm. copper, earthing wire complete with all accessories.	Meter (M)	50	160.62	8,030.97
70	Supply, Installation & Laying, testing & commissioning of 25 sq mm copper Earthing wire complete with all accessories.	Meter (M)	50	261.78	13,089.15
80	Supply, Installation & Laying, testing & commissioning of 50 sq mm copper Earthing wire, lugs, nuts, bolts complete with all accessories.	Meter (M)	50	473.11	23,655.64
90	Supply, Installation, testing & commissioning of 16 Ways Earthing copper Plate with accessaries	Number (NO)	4	3,444.00	13,776.00
100	Supply, Erection, Testing, and Commissioning of Vehicle Copper Earthing Wire Two Nos with each 5 METERS Length- 50 SQ.MM With Clamp/Clip for Connecting HCV at two points, reel and stand , Complete with all hardwares and accessories.	Set	5	22,216.06	1,11,080.30
	OUTDOOR LIGHT FITTINGS :				-
110	Supply, Installation, testing & commissioning of area light Fixtures FLP 110 W LED for mounting on 7 m Hexagonal light pole mounted Industrial light fixture complete in all respects suitable for Hazardous Zone-2 area.	Number (NO)	15	11,927.54	1,78,913.15

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120	Supply, Installation, testing & commissioning of 7 mtr. High pole with suitable size of FLP junction box including wiring of 3 x 2.5 sqmm from junction box to fixture complete with all accessories. suitable for Hazardous Zone-2 area.	Number (NO)	15	10,344.42	1,55,166.33
	Note: Supply and installation of the following including the supply of necessary clamp, bolts, rawl plugs etc. breaking and making good of walls, if required, and including all labour and materials complete as per directions of Engineer-In-Charge, applicable standards and Indian Electricity rules.				
130	Caution boards (Danger, High Voltage) including supply of necessary clamps, bolts and other hardware. SUPPLY AND INSTALLATION OF VITREOUS ENAMEL CAUTION BOARDS SUITABLE FOR 440 V AS PER IS 2551 INCLUDING FIXING ON THE WALL WITH ALL THE REQUIRED HARDWARE ETC.COMPLETE IN ENGLISH / HINDI/ LOCAL LANGUAGE. Size 200mmx250mm	Number (NO)	2	1,379.91	2,759.81
140	Shock hazard charts complete with Wooden frame with front glass and laminated A3 size colour print. Frame size A3 and glass thickness 2mm	Number (NO)	2	1,379.91	2,759.81
150	Supply and laying of Insulating Mats 11kV grade (as per IS:15652 - 2006) of 1000mm width, required for maintenance of electrical equipment in substation as required including cutting to, required shape in running length and including all labour and materials etc. complete and as per directions of Engineer-In-Charge, as per applicable Indian or International standards and Indian Electricity Rules.	Meter (M)	20	925.56	18,511.16
160	Single Line Diagram complete in Wooden frame with front glass and laminated A2 size colour print. Frame size A2 and glass thickness 2mm	Number (NO)	1	3,590.42	3,590.42
170	Supply, Installation & Laying of Cable Tray 150mm Hot dip GI, Perforated	Meter (M)	100	681.52	68,152.32
180	Supply, Installation & Laying of Cable Tray 300mm Hot dip GI, Ladder	Meter (M)	100	781.80	78,179.94
190	Supply, Installation & Laying of Cable Tray 450mm Hot dip GI, Ladder	Meter (M)	100	1,133.21	1,13,320.98
	CABLE & TERMINATIONS :				
	Supply, laying, termination, testing and commissioning of 1.1kV grade, XLPE insulated, armoured, for power cable, control cable and signal cable, PVC sheathed, FRLS power and control cables (conforming to IS:7098 and specification) of following sizes in trenches/ excavated under ground trench /trays, pulling through pipes and its proper sealing, cutting of paved area, roads etc. Cable shall include with supply and installation of electrical accessories including, cable tags, cable marker, nickel plated lugs, double compressed brass cable glands(CCOE approved), brass adapter/reducers/nipples, fixing of metallic anchor fasteners for supporting of cable trays and misc. electrical switchgear including all labour and materials complete as required and as per directions of Engineer-In-Charge.				
	3.5x 300 mm2 A2XFY (From Transformer to MEDB Panel)				
200	Supply	Meter (M)	200	1,610.00	3,22,000.00
210	Laying, termination, testing and commissioning	Meter (M)	200	90.00	18,000.00
	FLP Cable gland suitable to 3.5x 300 mm2 A2XFY				
220	Supply	Nos	8	2,750.00	22,000.00
230	Termination, testing and commissioning	Nos	8	600.00	4,800.00
	Cable lugs suitable to 3.5x 300 mm2 A2XFY				
240	Supply, laying, termination, testing and commissioning	Nos	24	100.00	2,400.00
	3.5x 240 mm2 A2XFY (From MEDB Panel to APFC Panel)				
250	Supply	Meter (M)	20	1,380.00	27,600.00
260	Laying, termination, testing and commissioning	Meter (M)	20	70.00	1,400.00

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	FLP Cable gland suitable to 3.5x 240 mm2 A2XFY				-
270	Supply	Nos	2	1,550.00	3,100.00
280	Termination, testing and commissioning	Nos	2	500.00	1,000.00
	Cable lugs suitable to 3.5x 240 mm2 A2XFY				-
290	Supply, laying, termination, testing and commissioning	Nos	8	80.00	640.00
300	3.5x 70 mm2 A2XFY (From MEDB Panel to GEG)				-
310	Supply	Meter (M)	100	475.00	47,500.00
320	Laying, termination, testing and commissioning	Meter (M)	100	40.00	4,000.00
	FLP Cable gland suitable to 3.5x 70 mm2 A2XFY				-
330	Supply	Nos	6	800.00	4,800.00
340	Termination, testing and commissioning	Nos	6	300.00	1,800.00
	Cable lugs suitable to 3.5x 70 mm2 A2XFY				-
350	Supply, laying, termination, testing and commissioning	Nos	24	60.00	1,440.00
	3.5Cx25 mm2 2XWY (From MEDB Panel to UPS incomers)				-
360	Supply	Meter (M)	60	1,370.00	82,200.00
370	Laying, termination, testing and commissioning	Meter (M)	60	30.00	1,800.00
	FLP Cable gland suitable to 3.5Cx25 mm2 2XWY				-
380	Supply	Nos	8	500.00	4,000.00
390	Termination, testing and commissioning	Nos	8	250.00	2,000.00
	Cable lugs suitable to 3.5Cx25 mm2 2XWY				-
400	Supply, laying, termination, testing and commissioning	Nos	32	80.00	2,560.00
	3Cx 16 mm2 2XWY				-
410	Supply	Meter (M)	100	750.00	75,000.00
420	Laying, termination, testing and commissioning	Meter (M)	100	25.00	2,500.00
430	**FLP Cable gland suitable to 3Cx 16 mm2 2XWY**				-
440	Supply	Nos	6	450.00	2,700.00
450	Termination, testing and commissioning	Nos	6	150.00	900.00
460	Cable lugs suitable to 3Cx 16 mm2 2XWY	Nos	24	6.21	149.08
470	Supply, laying, termination, testing and commissioning	Nos	24	50.00	1,200.00
	4Cx 4 mm2 A2XWY (From Solar system to MEDB/ILDB OLDB incomers)				
480	Supply	Meter (M)	200	100.00	20,000.00
490	Laying, termination, testing and commissioning	Meter (M)	200	15.00	3,000.00
	FLP Cable gland suitable to 4Cx 4 mm2 A2XWY				
500	Supply	Nos	20	100.00	2,000.00
510	Termination, testing and commissioning	Nos	20	15.00	300.00
	Cable lugs suitable to 4Cx 4 mm2 A2XWY				
520	Supply, laying, termination, testing and commissioning	Nos	40	25.00	1,000.00
	3Cx 2.5 mm2 2XWY (For pole lights)				
530	Supply	Meter (M)	500	165.00	82,500.00
540	Termination, testing and commissioning	Meter (M)	500	15.00	7,500.00
	FLP Cable gland suitable to 3Cx 2.5 mm2 2XWY				
550	Supply	Nos	50	350.00	17,500.00
560	Termination, testing and commissioning	Nos	50	150.00	7,500.00
	4Cx 2.5 mm2 2XWY (Borewell/small motors)				
570.00	Supply	Meter (M)	1200	200.00	2,40,000.00
580.00	Termination, testing and commissioning	Meter (M)	1200	15.00	18,000.00
	FLP Cable gland suitable to 4Cx 2.5 mm2 2XWY				

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590.00	Supply	Nos	50	200.00	10,000.00
600.00	Termination, testing and commissioning	Nos	50	150.00	7,500.00
	Supply, laying, termination, testing and commissioning				
610.00	5Cx 1.0 mm2 2XWY Screen	Meter (M)	50	191.68	9,583.92
620.00	12Px1.0 mm2 2XWYScreen	Meter (M)	50	116.25	5,812.47
	DISTRIBUTION PANELS, DISTRIBUTION BOARD & Lighting Panel				
	Supply, Installation, testing & commissioning of Electrical / Control Panels suitable for 415 Volt,3phase,3wire 50Hz AC supply system fabricated in compartmentlized from CRCA sheet steel not less than 2mm thick duly treated with 7 tanks process, powder coated with approved shade and oven dried . The complete panel will have a short circuit with stand capacity of 35 KA for 1 Second, IP 52 rating. It will have a suitable MS base channel powder coated. The panel will be fabricated in transportable sections. The panel shall have a common copper earth bar of size 25mm x 5mm at the rear with 2 Nos. earth studs. The LT panel will have suitable arrangement for bus-ducting/ cable termination into various incoming/outgoing switchgear as required. Cable termination will be at suitable terminal block at top/bottom of the panel and from the terminal block to switch, connection will be made with solid insulated strip/PVC insulated copper conductor cable of required current rating as required as per SLD. Spares for these LT Panels are included, based on PTS.				
630.00	415V, 1000A, 50 KA single front Floor mounted type indoor MEDB to receive input power at Mother Station consisting of bus bar chamber, cable alley with APFC bank 180 KVAR etc including all labour and materials with operating mechanism, all accessories, mandatory spares as per data sheet, auxiliaries etc complete in all respects as specified in technical specification, data sheet & SLD. Incomer - 1000A FP ACB (50KA) MDO - 1 Nos, Outgoings. : 400A TP MCCB -4 Nos. 250A TP MCCB -3 Nos. 160A FP MCCB -2 Nos., Suitable TP MCCB -APFC capacitor bank complete with capacitors, detuned reactor 14% and contactor of suitable size, pf should be 1.0	Number (NO)	1	7,09,969.55	7,09,969.55
	LIGHTING DISTRIBUTION BOARDS				
	Supply, Installation, connection, testing, and commissioning of 415V/240V lighting/power panels, Surface/Recess mounting type sheet steel enclosure of approved make having 4 Pole 35kA MCCB with current limiting 10 kA (LSIG)/RCCB as incoming and SP/DP/TP MCB (10KA type) for out going circuit complete with wiring,indication lamp, ammeter etc including all labour and materials as per specification and the direction of Engineer-in-charge.				
640.00	Surface/Recess mounted Lighting Panel (Normal ILDB) for Building Lighting consisting of one no. 63 Amp (100mA sensitivity) 4 Pole MCCB with RCCB as incomer, 08 Nos. 25A SPN MCBs, 6 Nos. 16A SPN MCBs & 10 Nos. 6A SPN MCBs as out goings complete with ammeter ,indication lamp etc. Refer SLD.	Number (NO)	1	51,939.52	51,939.52
	UPS & UPS Panel				

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650.00	Supply, Installation, testing & commissioning of UPS ;- PARALLEL REDUNDANT UPS of 2 X 100% , with BYPASS 230V, 6 kVA rating with battery charger each. Installation, testing & commissioning of Parallel redundant UPS should be DSP (Digital Signal Processing), controlled true on line double conversion 3 phase input and 1 phase output UPS system with each UPS module having IGBT based rectifier, THD shall be less than 5% at 100% linear load. input power factor should be 0.90 across the load spectrum DSP (Digital signal processing) technology invertor. Supply of UPS DB as mentioned above & SLD Supply of Battery Bank:- Installation, testing and Commissioning of sealed maintenance free batteries for 6 kVA load, battery charger of suitable capacity, battery MCCB, input panel, Battery racks,connectors and accessories, cable from UPS to batteries etc. 2 nos x 50% VRLA, 12V battery with backup 4 hour .	Lot (LOT)	1	11,53,054.00	11,53,054.00
	SUPPLY, INSTALLATION, TESTING & COMMISSIONING				
	Building Internal lighting Wiring				
	Supply, Installation, testing & commissioning of Wiring for light point with 2.5 sq. mm FRLS PVC insulated copper conductor three core cable/wire in surface/ recesses steel conduit in roof & PVC conduit in wall, with modular switch (AHOSXXW061/101 or equivalent), modular plate, suitable GI box and earthing the point with 1.5 sq.mm.FR PVC insulated copper conductor single/ three core wire etc as required.				
660.00	Primary Wiring 12 M	Points (P)	20	1,001.87	20,037.49
670.00	Secondary Wiring 4 M	Points (P)	20	669.10	13,381.99
	Supply, Installation, testing & commissioning of Wiring for mm dia Exhaust Fan and ceiling fan point with 2.5 sq. mm FRLS PVC insulated copper conductor three core cable/wire in surface/ recesses steel conduit, with modular switch (AHOSXXW061/101 or equivalent), modular plate, suitable GI box and earthing the point with 1.5 sq.mm.FR PVC insulated copper conductor single/ three core cable/wire complete with Junction box. etc as required.				
680.00	Primary Wiring 12 M	Points (P)	10	1,001.87	10,018.75
690.00	Secondary Wiring 4 M	Points (P)	10	781.80	7,817.99
700.00	Supply, Installation, testing & commissioning of suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 6 pin 15/16 & 5/6 amps modular socket outlet and 15/16 amps modular switch (AHOSIG101 or equivalent), connection, painting etc. as required.	Number (NO)	5	1,145.63	5,728.17
710.00	Supply, Installation, testing & commissioning of wall / ceiling/recess mount, decorative Fixture 40 W or equivalent LED Indoor Industrial light fixture complete in all respects.	Number (NO)	5	2,913.33	14,566.67
720.00	Supply, Installation, testing & commissioning of wall / ceiling mount Fixture 1x40 W or equivalent LED Indoor Industrial light fixture complete in all respects.	Number (NO)	50	1,723.33	86,166.54
730.00	Supply, Installation, testing & commissioning of wall / ceiling/recess mount, Fixture 9W or equivalent LED Indoor Industrial light fixture complete in all respects.	Number (NO)	50	1,529.88	76,493.88
740.00	Supply, Installation, testing & commissioning of wall / ceiling mount FLP Fixture 2x40 W or equivalent LED Indoor Industrial light fixture complete in all respects.	Number (NO)	25	6,028.11	1,50,702.71
750.00	Supply, Installation, testing & commissioning of 25 amps, 230 volts, SPN, industrial type switch socket outlet, with 2 poles and earth metal enclosed plug top along with 16 amps.rotary switch in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket outlet, and complete with connections, testing and commissioning etc. as required.	Number (NO)	25	2,939.07	73,476.72

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760.00	Supply, Installation, testing & commissioning of Ceiling Fan of 1200mm sweep complete erected in position with all accessories.	Number (NO)	5	1,753.50	8,767.51
770.00	Supply, installation, Testing and Commissioning of wall mounted single phase decorative fan ,High Air Delivery ,Corrosion protection ,standard make with all accessories.	Number (NO)	5	1,952.28	9,761.40
780.00	Supply, installation, Testing and Commissioning of 1.5 Tr. Split AC , 5+ star rating, complete with piping and all accessories.	Number (NO)	3	58,371.40	1,75,114.19
790.00	Supply, Installation, testing & commissioning of 450 mm dia FLP Exhaust Fan with louvers complete in all respects.	Number (NO)	5	8,779.05	43,895.24
800.00	Supply, Installation, testing & commissioning of 300 mm dia ,single phase Exhaust Fan with louvers complete in all respects.	Number (NO)	5	2,110.24	10,551.19
810.00	Supply, Installation, testing & commissioning of FLP JB for FLP exhaust fan	Number (NO)	3	859.00	2,577.01
820.00	Supply, Installation of 25 mm PVC/MS Conduit	Meter (M)	500	102.05	51,025.50
830.00	Supply, Installation, testing & commissioning of lightning conductor finial made of 25 mm dia 1800 mm long GI tube having single prong at top with 85 mm dia 3 mm thick GI base plate including holes etc. complete as required.	Number (NO)	5	2,695.92	13,479.61
840.00	Supply, Installation, testing & commissioning of GI strip of 25 x 3 mm thick on parapet or surface of wall for lightning conductor complete with joints and other accessories as required.(for horizental run).	Meter (M)	150	105.60	15,840.09
850.00	Supply, Installation, testing & commissioning of GI Tape of 25 x 3 mm thick on parapet or surface of wall for lightning conductor complete with joints and other accessories as required.(for vertical run).	Meter (M)	100	105.60	10,560.06
860.00	Supply, Installation, testing & commissioning of Steel Structure Angle, Chanels, Sq. bar, round Bar. Scope including Cutting, fabrication, painting & installation at site works	Kilogram (KG)	500	93.18	46,588.50
870.00	Supply, Installation of Chequred plate 6 mm thick, Scope including Cutting, fabrication, painting & installation at site works	Kilogram (KG)	500	100.28	50,138.10
880.00	Supply, Installation of 100 mm Dia Double corugated HDPE Pipe. Scope including Cutting & installation, excavation & restoration at site works	Meter (M)	800	346.97	2,77,578.72
890.00	Supply, Installation of 100 mm NB 500 mm bending radius	Nos	50	499.61	24,980.31
900.00	Supply, Installation of 50 mm Dia Double corugated HDPE Pipe. Scope including Cutting & installation, excavation & restoration at site works	Meter (M)	500	212.98	1,06,488.00
910.00	Supply, Installation of 50 mm NB 300 mm bending radius	Nos	40	249.36	9,974.38

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920.00	Supply in well packed condition at site and erection, testing & commissioning of of 63 KVA, 3-phase gas generator set complete with acoustic enclosure,Control panel with auto changeover facility & AMF Panel, including 30mtrs length of sch.80 inlet pipe,4 nos. of socket welded elbows,2 (TWO) nos. of isolation ball valve of 800# with socket welded ends and Pressure regulators suitable to reduce the incoming gas pressure from 14 to 49 kg/cm2(g) to the required generator presuure for connecting to Gen set, flanges, nut, bolts, gasket, pipe, clamps, structural supports etc all required accessories, including hookup with the steel pipeline and control equipment to supply continuous electrical power as per the specification. 63 kVA, 3 phase TSPCB/ CPCB IV compliant Gas Genset, Prime Rated, radiator cooled, 63 KVA Equivalent electric alternator,AMF Panel, microprocessor based Controller, Silencer, Anti-Vibration mountings, exhaust flexible connector, Batteries with cables, Acoustic Enclosure and Pressure converter valve etc. in complete as per specification, data sheet.	Nos	1	12,50,000.00	12,50,000.00
930.00	Solar System Supply, Installation, testing & commissioning of SOLAR PANEL WITH CONTROLLER AND BATTERY BANK for 6 KW LOAD - Solar power supply system Outgoing shall be 415 V, AC, 3Ph, N, (Solar Panels have 1 X 100 % & Charge controller have 1 X 100 %) along Sealed maintenance free battery banks suitable for solar charging, as per specification and datasheet) suitable for sufficient backup time at full load shall be provided. for meeting critical loads that cannot withstand even a momentary interruption in voltage. Following loads shall be connected to the Solar power system. Battery Banks (1 No. x 100% sealed maintenance free Battery banks suitable for 6 KW with 30 mins. battery backup Supply, installation, termination, laying of all Cables: from Solar system to Main DB, and other own auxiliaries.	Set	1	5,90,653.44	5,90,653.44
940.00	**11kV VCB Panel** Supply, installation, testing, commissioning of 11kV VCB Panel : 11kV, 26.3 KA for 3 sec single front, floor mounted, indoor type, with CT & PT, necessary protection relay to be provided before 11kV Transformer etc. including all labour and materials with operating mechanism, all accessories, mandatory spares, erection & commissioning spare and recommended spares for 2 years operation and maintenance, auxiliaries etc., complete in all respects as specified in technical specification, data sheet. **(Note: Panel should be restricted to 1000mm (D) and 700mm (W) due to space constraint)** 630A, 3P VCB Panel with CT/PT, relay as per PTS	Nos	1	4,88,070.00	4,88,070.00
950.00	Supply installation and testing commissioning of 630kVA , 11/0.433KV On load tap changer, RTCC Panel, 3- Phase, 50Hz, Dynn11 Vector Group, Copper wound, CRGO Core, Oil Immersed Distribution Transformer with standard fittings confirming to IS1180 Level-I Standard. with its accessories including handling ,transportation of transformers and it's accessories/ parts supplied loose from owner's store to place of erection , unpacking and inspection, placing in position on base channels / flats / rails provided on foundation assembly of all loose accessories and parts , Operational and functional checking of all work, labour vehicle/Crane and materials complete as per drawing and documents, specification, codes and standard and direction of engineer in-charge . Termination arrangement for HV side & LV side and all miscellaneous civil materials required to complete HT & LT installation as indicated in the tender specifcation. Cu wound with onload tap changer facility shall be considered. Make shall be as per Electricity Board approved make.	Nos	1	16,95,000.00	16,95,000.00

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960.00	Supply installation, testing and commissioning of 11kV double pole structure with 11 mtr RCC poles including cross bracing's of ISMC ,GOS with earth switch, polymeric type LA's & pin insulator, HG fuses, ACSR conductor, stay sets, earthing, alkathine tube etc. as per the specification including civil works. Make of all components shall be as per Electricity Board approved make.	Nos	1	1,25,000.00	1,25,000.00
970.00	Supply installation, testing and commissioning of 11kV, 630 A Load break switch panel with metering cubical, Make of all components shall be as per Electricity Board approved make.	Nos	1	1,45,000.00	1,45,000.00
980.00	Supply installation, testing and commissioning of 11kV 630A,3 way Ring Main Unit (RMU), 2 OD +1VL (One incomer + One breaker + one outgoing) with copper bus bar. RMU shall be as per Electricity Board approved specification and make.	Nos	1	2,15,000.00	2,15,000.00
990.00	Supply installation, testing and commissioning of 630A,Operating breaker panel (OD), with copper bus bar. Breaker panel shall be as per Electricity Board approved specification and make.	Nos	1	1,80,000.00	1,80,000.00
1000.00	Supply installation, testing and commissioning of 1 No. 1000A 4P Isolator complete in all respects.	Nos	1	85,000.00	85,000.00
	Cable-HT Supply, laying, termination, testing and commissioning of 11kV grade, XLPE insulated, armoured power cable, PVC sheathed (conforming to IS:7098 and specification) of required sizes in trenches/ excavated under ground trench /trays, pulling through pipes and its proper sealing etc from Metering Panel (In metering Room) to Bidder supplied VCB Panel, from VCB Panel to Transformer. Cable shall include with supply and installation of electrical accessories including, HDPE Cable conduit, cable tags, cable marker, nickel plated lugs, cable glands, cable termination kits, including all labour and materials complete as required and as per directions of Engineer-In-Charge.				
1010.00	11kV, 3Cx240 Sqmm Al, XLPE, PVC inner and outer sheathed, armored cable as per PTS	Meter (M)	340	1,560.00	5,30,400.00
1020.00	Indoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs for 11kV, 3Cx240 Sqmm Al, XLPE Cable as per above.	set	4	10,648.80	42,595.20
1030.00	Outdoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs for 11kV, 3Cx240 Sqmm Al, XLPE Cable as per above.	set	4	13,311.00	53,244.00
D	**INSTRUMENTATION**				
	supply, Design, engineering , testing, inspection, calibration, packing , forwarding, including thrid party inspection, insurance, Erection & Installation, along with mounting accessories, Poles , fittings, and commissioning etc				
1040.00	Pressure Gauge of range 0 to 60 kg/cm2 with two way valve manifold as per the technical specifications.	Number (NO)	2	13,100.00	26,200.00
1050.00	Temperature Gauge with thermowell of range 0 to 60 °C as per the technical specifications attached in tender	Number (NO)	2	21,500.00	43,000.00

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	Fire detection system - supply, Design, engineering , testing, inspection, calibration, packing , forwarding, including thrid party inspection, insurance, Erection, installation and commissioning of Fire detection system along with controller, smoke detectors, multisensor detectors, manual call point including Supply, Laying of wiring inside building between detectors, MCP, exist sign, hooter including glanding, termination, ferruling, dressing etc. at both ends. Supply & installation of cable trays (if necessary), supply of erection materials, cable ferrules, cable lugs, cable tie etc. **FDS system:**				
1060.00	Controller along with wall mounted cabinet as per specification	Number (NO)	2	2,23,946.00	4,47,892.00
1070.00	Smoke Detectors with relay output as per the tender specifications along with all mounting & other accessories as per the tender specifications.	Number (NO)	32	5,560.00	1,77,920.00
1080.00	Multisensor Detectors (Battery room , electrical room) with relay output as per the tender specifications along with all mounting & other accessories as per the tender specifications.	Number (NO)	12	8,422.00	1,01,064.00
1090.00	Manual Call Point (Weather Proof) along with all mounting & other accessories as per the tender specifications.	Number (NO)	12	5,374.00	64,488.00
1100.00	Explosion Proof and Weather Proof Hooters (for hazardous area) along with all mounting & other accessories as per the tender specifications.	Number (NO)	2	21,498.00	42,996.00
1110.00	Exit sign along with all mounting & other accessories as per the tender specifications.	Number (NO)	12	6,550.00	78,600.00
1120.00	supply of fire resistance Cable, cable tray , gland, ferrulling , termination for complete Fire Detection System.	Lot (LOT)	2	1,61,242.00	3,22,484.00
	CCTV System - supply, design, engineering , testing, inspection, calibration, packing , forwarding, including thrid party inspection, insurance, erection & installation, along with mounting accessories, Poles , fittings, etc and commissioning of CCTV system camera, work stations etc **Note : Owner shall provide 230VAC at Site .**				
1130.00	Supply , Installation , Testing of CCTV - 4MP True POE IP Network Indoor Dome Fixed Camera with in built IR illuminator along with housing accessories, junction box, lightning & surge protection, Media Convertor, microSD/SDHC/SDXC card of suitable Capacity (min- 256 GB) & all other accessories as per specification.	Number (NO)	5	40,325.00	2,01,625.00
1140.00	Supply , Installation , Testing of CCTV - 4MP True POE IP Network Outdoor Weatherproof Bullet Fixed Camera with in built IR illuminator along with Weatherproof housing accessories, junction box, lightning & surge protection, Media Convertor, microSD/SDHC/SDXC card of suitable Capacity (min- 256 GB), mounting arrangement -Pole & all other accessories as per specification.	Number (NO)	5	47,100.00	2,35,500.00
1150.00	Supply , Installation , Testing of CCTV - 2MP AC/DC input power/True POE IP Network Outdoor Ex-Proof Bullet Fixed Camera along with Ex-proof housing accessories, junction box, lightning & surge protection, Media Convertor, microSD/SDHC/SDXC card of suitable Capacity (min- 256 GB), mounting arrangement -Pole, Power Convertor & all other accessories as per specification.	Number (NO)	3	4,71,154.50	14,13,463.50

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1160.00	Network Digital Video Recorder (NVR) of 16 channel video & audio,2 SATA interface with 2 TB or better storage facility along w	Number (NO)	1	3,70,313.00	3,70,313.00
1170.00	32" Client Workstation along with licensed Operating System Software, Keyboard along with required cables, connectors, interfaces complete as per specifications.	Number (NO)	1	65,504.00	65,504.00
1180.00	Workstation console/furniture (wooden) with revolving chair from standard make for mounting monitor, CPU, keyboard ,	Number (NO)	2	14,036.00	28,072.00
	Supply of signals, power, communicaation and Optical fiber cable,(As applicable), Installation & Laying, testing & commissioning , loop testing with including cable glands, lugs and termination.				
1190.00	1P x 1.5mm2	Meter (M)	100	413.00	41,300.00
1200.00	3C x 2.5 mm3	Meter (M)	250	625.00	1,56,250.00
1210.00	Cat 6 with conduit , glands, cable tray	Meter (M)	500	477.00	2,38,500.00
1220.00	4 core Armoured fiber optical cable with optical to ether conveter at each end.	Meter (M)	240	423.00	1,01,520.00
1230.00	ALL WORK RELATED TO STATUTORY APPROVALS FOR THE CONSTRUCTION FROM THE COMPETENT AUTHORITY, to obtain all necessary permissions/approvals by the concerned authorities. All necessary work related to the same shall be in contractor's scope i.e. including preparation, submission of all drawing & documents , liaisoning required for making the station completely operational. All permissions mentioned below shall be acquired by contractor/bidder in complete manner and no separate payment shall be made to contractor other than below. Liasoning Work with EB Department including inclusive of preparation of drawings, load details, coordination, inspection, certification, agreement, liasoning, etc if any & CEIG Approvals inclusive of preparation of drawings, load details, coordination, inspection, certification, agreement, liasoning, etc if any. Note:Payment shall be made for obtaining each permission (all other work related to get the permission shall be in the scope of contractor/bidder).	EACH	1.00	1,96,000.00	1,96,000.00
1240.00	Supply of rubber hand gloves duly tested and approved for use on system service 415V.	Pair	1	2,500.00	2,500.00
1250.00	Supply & installation of first aid box with front door having clear glass and first aid material, Rules conforming to IE.	Nos	1	4,500.00	4,500.00
1260.00	Supply & installation of sand buckets with sand, mounted on steel hook (01 set- stand+4 buckets)	Nos	1	3,500.00	3,500.00
				Sub total Excluding GST for Indresham (A)	**1,55,34,395.09**
PART B -Katedan					

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	ELECTRICAL				
	SUPPLY, INSTALLATION, TESTING & COMMISSIONING				
	EARTHING & LIGHTNING SYSTEM :				
10	Supply, Installation, testing & commissioning of Earthing with Copper earth plate 600mm x 600 mm x 3mm thick including accessories and providing masonary enclosure with cover plate having locking arrangement and watering pipe etc, with charcoal / coke and salt as required as per IS 3043. Final resistance Value shall be submitted for clint/ consultantant review.	Nos	12	15,170.10	1,82,041.24
20	Supply, Installation, testing & commissioning of Earthing with GI earth pipe, 3.0 mtr long, 100 mm dia including accessories and providing masonary enclosure with cover plate having locking arrangement etc, (with charcoal and salt) as required as per IS 3043.	Nos	18	9,124.25	1,64,236.44
30	Supply, Installation & Laying, excavation & restoration, testing & commissioning of 50mm X 6 mm G.I strip complete with all accessories.	Meter (M)	690	254.68	1,75,731.82
40	Supply, Installation & Laying, excavation & restoration, testing & commissioning of 25mm X 3 mm G.I strip complete with all accessories.	Meter (M)	400	185.47	74,186.64
50	Supply, Installation & Laying, excavation & restoration, testing & commissioning of 25mm X 3 mm Cu strip complete with all accessories.	Meter (M)	120	697.50	83,699.57
60	Supply, Installation & Laying, testing & commissioning of 10 sq mm. copper, earthing wire complete with all accessories.	Meter (M)	50	160.62	8,030.97
70	Supply, Installation & Laying, testing & commissioning of 25 sq mm copper Earthing wire complete with all accessories.	Meter (M)	50	261.78	13,089.15
80	Supply, Installation & Laying, testing & commissioning of 50 sq mm copper Earthing wire, lugs, nuts, bolts complete with all accessories.	Meter (M)	50	473.11	23,655.64
90	Supply, Installation, testing & commissioning of 16 Ways Earthing copper Plate with accessaries	Number (NO)	4	3,444.00	13,776.00
100	Supply, Erection, Testing, and Commissioning of Vehicle Copper Earthing Wire Two Nos with each 5 METERS Length- 50 SQ.MM With Clamp/Clip for Connecting HCV at two points, reel and stand , Complete with all hardwares and accessories.	Set	5	22,216.06	1,11,080.30
	OUTDOOR LIGHT FITTINGS :				
110	Supply, Installation, testing & commissioning of area light Fixtures FLP 110 W LED for mounting on 7 m Hexagonal light pole mounted Industrial light fixture complete in all respects suitable for Hazardous Zone-2 area.	Number (NO)	15	11,927.54	1,78,913.15
120	Supply, Installation, testing & commissioning of 7 mtr. High pole with suitable size of FLP junction box including wiring of 3 x 2.5 sqmm from junction box to fixture complete with all accessories. suitable for Hazardous Zone-2 area.	Number (NO)	15	10,344.42	1,55,166.33
	Supply and installation of the following including the supply of necessary clamp, bolts, rawl plugs etc. breaking and making good of walls, if required, and including all labour and materials complete as per directions of Engineer-In-Charge, applicable standards and Indian Electricity rules.				

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130	Caution boards (Danger, High Voltage) including supply of necessary clamps, bolts and other hardware. SUPPLY AND INSTALLATION OF VITREOUS ENAMEL CAUTION BOARDS SUITABLE FOR 440 V AS PER IS 2551 INCLUDING FIXING ON THE WALL WITH ALL THE REQUIRED HARDWARE ETC.COMPLETE IN ENGLISH / HINDI/ LOCAL LANGUAGE. Size 200mmx250mm	Number (NO)	2	1,379.91	2,759.81
140	Shock hazard charts complete with Wooden frame with front glass and laminated A3 size colour print. Frame size A3 and glass thickness 2mm	Number (NO)	2	1,379.91	2,759.81
150	Supply and laying of Insulating Mats 11kV grade (as per IS:15652 - 2006) of 1000mm width, required for maintenance of electrical equipment in substation as required including cutting to, required shape in running length and including all labour and materials etc. complete and as per directions of Engineer-In-Charge, as per applicable Indian or International standards and Indian Electricity Rules.	Meter (M)	20	925.56	18,511.16
160	Single Line Diagram complete in Wooden frame with front glass and laminated A2 size colour print. Frame size A2 and glass thickness 2mm	Number (NO)	1	3,590.42	3,590.42
170	Supply, Installation & Laying of Cable Tray 150mm Hot dip GI, Perforated	Meter (M)	100	681.52	68,152.32
180	Supply, Installation & Laying of Cable Tray 300mm Hot dip GI, Ladder	Meter (M)	100	781.80	78,179.94
190	Supply, Installation & Laying of Cable Tray 450mm Hot dip GI, Ladder	Meter (M)	100	1,133.21	1,13,320.98
	CABLE & TERMINATIONS :				
	Supply, laying, termination, testing and commissioning of 1.1kV grade, XLPE insulated, armoured, for power cable, control cable and signal cable, PVC sheathed, FRLS power and control cables (conforming to IS:7098 and specification) of following sizes in trenches/ excavated under ground trench /trays, pulling through pipes and its proper sealing, cutting of paved area, roads etc. **Cable shall include with supply and installation of electrical accessories including, cable tags, cable marker, nickel plated lugs, double compressed brass cable glands(CCOE approved), brass adapter/reducers/nipples, fixing of metallic anchor fasteners for supporting of cable trays and misc. electrical switchgear including all labour and materials complete as required and as per directions of Engineer-In-Charge.**				
	3.5x 300 mm2 A2XFY (From Transformer to MEDB Panel)				
200	Supply	Meter (M)	200	1,610.00	3,22,000.00
210	Laying, termination, testing and commissioning	Meter (M)	200	90.00	18,000.00
	FLP Cable gland suitable to 3.5x 300 mm2 A2XFY				
220	Supply	Nos	8	2,750.00	22,000.00
230	Termination, testing and commissioning	Nos	8	600.00	4,800.00
	Cable lugs suitable to 3.5x 300 mm2 A2XFY				
240	Supply, laying, termination, testing and commissioning	Nos	24	100.00	2,400.00
	3.5x 240 mm2 A2XFY (From MEDB Panel to APFC Panel)				
250	Supply	Meter (M)	20	1,380.00	27,600.00
260	Laying, termination, testing and commissioning	Meter (M)	20	70.00	1,400.00
	FLP Cable gland suitable to 3.5x 240 mm2 A2XFY				
270	Supply	Nos	2	1,550.00	3,100.00

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280	Termination, testing and commissioning	Nos	2	500.00	1,000.00
	Cable lugs suitable to 3.5x 240 mm2 A2XFY				
290	Supply, laying, termination, testing and commissioning	Nos	8	80.00	640.00
300	**3.5x 70 mm2 A2XFY (From MEDB Panel to GEG)**				
310	Supply	Meter (M)	100	475.00	47,500.00
320	Laying, termination, testing and commissioning	Meter (M)	100	40.00	4,000.00
	FLP Cable gland suitable to 3.5x 70 mm2 A2XFY				
330	Supply	Nos	6	800.00	4,800.00
340	Termination, testing and commissioning	Nos	6	300.00	1,800.00
	Cable lugs suitable to 3.5x 70 mm2 A2XFY				
350	Supply, laying, termination, testing and commissioning	Nos	24	60.00	1,440.00
	3.5Cx25 mm2 2XWY (From MEDB Panel to UPS incomers)				
360	Supply	Meter (M)	60	1,370.00	82,200.00
370	Laying, termination, testing and commissioning	Meter (M)	60	30.00	1,800.00
	FLP Cable gland suitable to 3.5Cx25 mm2 2XWY				
380	Supply	Nos	8	500.00	4,000.00
390	Termination, testing and commissioning	Nos	8	250.00	2,000.00
	Cable lugs suitable to 3.5Cx25 mm2 2XWY				
400	Supply, laying, termination, testing and commissioning	Nos	32	80.00	2,560.00
	3Cx 16 mm2 2XWY				
410	Supply	Meter (M)	100	750.00	75,000.00
420	Laying, termination, testing and commissioning	Meter (M)	100	25.00	2,500.00
430	**FLP Cable gland suitable to 3Cx 16 mm2 2XWY**				
440	Supply	Nos	6	450.00	2,700.00
450	Termination, testing and commissioning	Nos	6	150.00	900.00
460	Cable lugs suitable to 3Cx 16 mm2 2XWY	Nos	24	6.21	149.08
470	Supply, laying, termination, testing and commissioning	Nos	24	50.00	1,200.00
	4Cx 4 mm2 A2XWY (From Solar system to MEDB/ILDB OLDB incomers)				
480	Supply	Meter (M)	200	100.00	20,000.00
490	Laying, termination, testing and commissioning	Meter (M)	200	15.00	3,000.00
	FLP Cable gland suitable to 4Cx 4 mm2 A2XWY				
500	Supply	Nos	20	100.00	2,000.00
510	Termination, testing and commissioning	Nos	20	15.00	300.00
	Cable lugs suitable to 4Cx 4 mm2 A2XWY				
520	Supply, laying, termination, testing and commissioning	Nos	40	25.00	1,000.00
	3Cx 2.5 mm2 2XWY (For pole lights)				
530	Supply	Meter (M)	500	165.00	82,500.00
540	Termination, testing and commissioning	Meter (M)	500	15.00	7,500.00
	FLP Cable gland suitable to 3Cx 2.5 mm2 2XWY				
550	Supply	Nos	50	350.00	17,500.00
560	Termination, testing and commissioning	Nos	50	150.00	7,500.00
	4Cx 2.5 mm2 2XWY (Borewell/small motors)				
570.00	Supply	Meter (M)	1200	200.00	2,40,000.00

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580.00	Termination, testing and commissioning	Meter (M)	1200	15.00	18,000.00
	FLP Cable gland suitable to 4Cx 2.5 mm2 2XWY				
590.00	Supply	Nos	50	200.00	10,000.00
600.00	Termination, testing and commissioning	Nos	50	150.00	7,500.00
	Supply, laying, termination, testing and commissioning				
610.00	5Cx 1.0 mm2 2XWY Screen	Meter (M)	50	191.68	9,583.92
620.00	12Px1.0 mm2 2XWYScreen	Meter (M)	50	116.25	5,812.47
	DISTRIBUTION PANELS, DISTRIBUTION BOARD & Lighting Panel				
	Supply, Installation, testing & commissioning of Electrical / Control Panels suitable for 415 Volt,3phase,3wire 50Hz AC supply system fabricated in compartmentlized from CRCA sheet steel not less than 2mm thick duly treated with 7 tanks process, powder coated with approved shade and oven dried . The complete panel will have a short circuit with stand capacity of 35 KA for 1 Second, IP 52 rating. It will have a suitable MS base channel powder coated. The panel will be fabricated in transportable sections. The panel shall have a common copper earth bar of size 25mm x 5mm at the rear with 2 Nos. earth studs. The LT panel will have suitable arrangement for bus-ducting/ cable termination into various incoming/outgoing switchgear as required. Cable termination will be at suitable terminal block at top/bottom of the panel and from the terminal block to switch, connection will be made with solid insulated strip/PVC insulated copper conductor cable of required current rating as required as per SLD. Spares for these LT Panels are included, based on PTS.				
630.00	415V, 1000A, 50 KA single front Floor mounted type indoor MEDB to receive input power at Mother Station consisting of bus bar chamber, cable alley with APFC bank 180 KVAR etc including all labour and materials with operating mechanism, all accessories, mandatory spares as per data sheet, auxiliaries etc complete in all respects as specified in technical specification, data sheet & SLD. Incomer - 1000A FP ACB (50KA) MDO - 1 Nos, Outgoings. : 400A TP MCCB -4 Nos. 250A TP MCCB -3 Nos. 160A FP MCCB -2 Nos., Suitable TP MCCB -APFC capacitor bank complete with capacitors, detuned reactor 14% and contactor of suitable size, pf should be 1.0	Number (NO)	1	7,09,969.55	7,09,969.55
	LIGHTING DISTRIBUTION BOARDS				
	Supply, Installation, connection, testing, and commissioning of 415V/240V lighting/power panels, Surface/Recess mounting type sheet steel enclosure of approved make having 4 Pole 35kA MCCB with current limiting 10 kA (LSIG)/RCCB as incoming and SP/DP/TP MCB (10KA type) for out going circuit complete with wiring,indication lamp, ammeter etc including all labour and materials as per specification and the direction of Engineer-in-charge.				
640.00	Surface/Recess mounted Lighting Panel (Normal ILDB) for Building Lighting consisting of one no. 63 Amp (100mA sensitivity) 4 Pole MCCB with RCCB as incomer, 08 Nos. 25A SPN MCBs, 6 Nos. 16A SPN MCBs & 10 Nos. 6A SPN MCBs as out goings complete with ammeter ,indication lamp etc. Refer SLD.	Number (NO)	1	51,939.52	51,939.52
	UPS & UPS Panel				

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650.00	Supply, Installation, testing & commissioning of UPS ;- PARALLEL REDUNDANT UPS of 2 X 100% , with BYPASS 230V, 6 kVA rating with battery charger each. Installation, testing & commissioning of Parallel redundant UPS should be DSP (Digital Signal Processing), controlled true on line double conversion 3 phase input and 1 phase output UPS system with each UPS module having IGBT based rectifier, THD shall be less than 5% at 100% linear load. input power factor should be 0.90 across the load spectrum DSP (Digital signal processing) technology invertor. Supply of UPS DB as mentioned above & SLD Supply of Battery Bank:- Installation, testing and Commissioning of sealed maintenance free batteries for 6 kVA load, battery charger of suitable capacity, battery MCCB, input panel, Battery racks,connectors and accessories, cable from UPS to batteries etc. 2 nos x 50% VRLA, 12V battery with backup 4 hour .	Lot (LOT)	1	11,53,054.00	11,53,054.00
	SUPPLY, INSTALLATION, TESTING & COMMISSIONING				
	Electrical Building Internal lighting Wiring				
	Supply, Installation, testing & commissioning of Wiring for light point with 2.5 sq. mm FRLS PVC insulated copper conductor three core cable/wire in surface/ recesses steel conduit in roof & PVC conduit in wall, with modular switch (AHOSXXW061/101 or equivalent), modular plate, suitable GI box and earthing the point with 1.5 sq.mm.FR PVC insulated copper conductor single/ three core wire etc as required.				
660.00	Primary Wiring 12 M	Points (P)	20	1,001.87	20,037.49
670.00	Secondary Wiring 4 M	Points (P)	20	669.10	13,381.99
	Supply, Installation, testing & commissioning of Wiring for mm dia Exhaust Fan and ceiling fan point with 2.5 sq. mm FRLS PVC insulated copper conductor three core cable/wire in surface/ recesses steel conduit, with modular switch (AHOSXXW061/101 or equivalent), modular plate, suitable GI box and earthing the point with 1.5 sq.mm.FR PVC insulated copper conductor single/ three core cable/wire complete with Junction box. etc as required.				
680.00	Primary Wiring 12 M	Points (P)	10	1,001.87	10,018.75
690.00	Secondary Wiring 4 M	Points (P)	10	781.80	7,817.99
700.00	Supply, Installation, testing & commissioning of suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 6 pin 15/16 & 5/6 amps modular socket outlet and 15/16 amps modular switch (AHOSIG101 or equivalent), connection, painting etc. as required.	Number (NO)	5	1,145.63	5,728.17
710.00	Supply, Installation, testing & commissioning of wall / ceiling/recess mount, decorative Fixture 40 W or equivalent LED Indoor Industrial light fixture complete in all respects.	Number (NO)	5	2,913.33	14,566.67
720.00	Supply, Installation, testing & commissioning of wall / ceiling mount Fixture 1x40 W or equivalent LED Indoor Industrial light fixture complete in all respects.	Number (NO)	50	1,723.33	86,166.54
730.00	Supply, Installation, testing & commissioning of wall / ceiling/recess mount, Fixture 9W or equivalent LED Indoor Industrial light fixture complete in all respects.	Number (NO)	50	1,529.88	76,493.88

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740.00	Supply, Installation, testing & commissioning of wall / ceiling mount FLP Fixture 2x40 W or equivalent LED Indoor Industrial light fixture complete in all respects.	Number (NO)	25	6,028.11	1,50,702.71
750.00	Supply, Installation, testing & commissioning of 25 amps, 230 volts, SPN, industrial type switch socket outlet, with 2 poles and earth metal enclosed plug top along with 16 amps.rotary switch in sheet steel enclosure, on surface or in recess, with chained metal cover for the socket outlet, and complete with connections, testing and commissioning etc. as required.	Number (NO)	25	2,939.07	73,476.72
760.00	Supply, Installation, testing & commissioning of Ceiling Fan of 1200mm sweep complete erected in position with all accessories.	Number (NO)	5	1,753.50	8,767.51
770.00	Supply, installation, Testing and Commissioning of wall mounted single phase decorative fan ,High Air Delivery ,Corrosion protection ,standard make with all accessories.	Number (NO)	5	1,952.28	9,761.40
780.00	Supply, installation, Testing and Commissioning of 1.5 Tr. Split AC , 5+ star rating, complete with piping and all accessories.	Number (NO)	3	58,371.40	1,75,114.19
790.00	Supply, Installation, testing & commissioning of 450 mm dia FLP Exhaust Fan with louvers complete in all respects.	Number (NO)	5	8,779.05	43,895.24
800.00	Supply, Installation, testing & commissioning of 300 mm dia ,single phase Exhaust Fan with louvers complete in all respects.	Number (NO)	5	2,110.24	10,551.19
810.00	Supply, Installation, testing & commissioning of FLP JB for FLP exhaust fan	Number (NO)	3	859.00	2,577.01
820.00	Supply, Installation of 25 mm PVC/MS Conduit	Meter (M)	500	102.05	51,025.50
830.00	Supply, Installation, testing & commissioning of lightning conductor finial made of 25 mm dia 1800 mm long GI tube having single prong at top with 85 mm dia 3 mm thick GI base plate including holes etc. complete as required.	Number (NO)	5	2,695.92	13,479.61
840.00	Supply, Installation, testing & commissioning of GI strip of 25 x 3 mm thick on parapet or surface of wall for lightning conductor complete with joints and other accessories as required.(for horizental run).	Meter (M)	150	105.60	15,840.09
850.00	Supply, Installation, testing & commissioning of GI Tape of 25 x 3 mm thick on parapet or surface of wall for lightning conductor complete with joints and other accessories as required.(for vertical run).	Meter (M)	100	105.60	10,560.06
860.00	Supply, Installation, testing & commissioning of Steel Structure Angle, Chanels, Sq. bar, round Bar. Scope including Cutting, fabrication, painting & installation at site works	Kilogram (KG)	500	93.18	46,588.50
870.00	Supply, Installation of Chequred plate 6 mm thick, Scope including Cutting, fabrication, painting & installation at site works	Kilogram (KG)	500	100.28	50,138.10
880.00	Supply, Installation of 100 mm Dia Double corugated HDPE Pipe. Scope including Cutting & installation, excavation & restoration at site works	Meter (M)	800	346.97	2,77,578.72
890.00	Supply, Installation of 100 mm NB 500 mm bending radius	Nos	50	499.61	24,980.31
900.00	Supply, Installation of 50 mm Dia Double corugated HDPE Pipe. Scope including Cutting & installation, excavation & restoration at site works	Meter (M)	500	212.98	1,06,488.00
910.00	Supply, Installation of 50 mm NB 300 mm bending radius	Nos	40	249.36	9,974.38

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920.00	Supply in well packed condition at site and erection, testing & commissioning of of 63 KVA, 3-phase gas generator set complete with acoustic enclosure,Control panel with auto changeover facility & AMF Panel, including 30mtrs length of sch.80 inlet pipe,4 nos. of socket welded elbows,2 (TWO) nos. of isolation ball valve of 800# with socket welded ends and Pressure regulators suitable to reduce the incoming gas pressure from 14 to 49 kg/cm2(g) to the required generator presuure for connecting to Gen set, flanges, nut, bolts, gasket, pipe, clamps, structural supports etc all required accessories, including hookup with the steel pipeline and control equipment to supply continuous electrical power as per the specification. 63 kVA, 3 phase TSPCB/ CPCB IV compliant Gas Genset, Prime Rated, radiator cooled, 63 KVA Equivalent electric alternator,AMF Panel, microprocessor based Controller, Silencer, Anti-Vibration mountings, exhaust flexible connector, Batteries with cables, Acoustic Enclosure and Pressure converter valve etc. in complete as per specification, data sheet.	Nos	1	12,50,000.00	12,50,000.00
930.00	Solar System Supply, Installation, testing & commissioning of SOLAR PANEL WITH CONTROLLER AND BATTERY BANK for 6 KW LOAD - Solar power supply system Outgoing shall be 415 V, AC, 3Ph, N, (Solar Panels have 1 X 100 % & Charge controller have 1 X 100 %) along Sealed maintenance free battery banks suitable for solar charging, as per specification and datasheet) suitable for sufficient backup time at full load shall be provided. for meeting critical loads that cannot withstand even a momentary interruption in voltage. Following loads shall be connected to the Solar power system. Battery Banks (1 No. x 100% sealed maintenance free Battery banks suitable for 6 KW with 30 mins. battery backup Supply, installation, termination, laying of all Cables: from Solar system to Main DB, and other own auxiliaries.	Set	1	5,90,653.44	5,90,653.44
940.00	**11kV VCB Panel** Supply, installation, testing, commissioning of 11kV VCB Panel : 11kV, 26.3 KA for 3 sec single front, floor mounted, indoor type, with CT & PT, necessary protection relay to be provided before 11kV Transformer etc. including all labour and materials with operating mechanism, all accessories, mandatory spares, erection & commissioning spare and recommended spares for 2 years operation and maintenance, auxiliaries etc., complete in all respects as specified in technical specification, data sheet. **(Note: Panel should be restricted to 1000mm (D) and 700mm (W) due to space constraint)** 630A, 3P VCB Panel with CT/PT, relay as per PTS	Nos	1	4,88,070.00	4,88,070.00
950.00	Supply installation and testing commissioning of 630kVA , 11/0.433KV On load tap changer, RTCC Panel, 3- Phase, 50Hz, Dynn11 Vector Group, Copper wound, CRGO Core, Oil Immersed Distribution Transformer with standard fittings confirming to IS1180 Level-I Standard. with its accessories including handling ,transportation of transformers and it's accessories/ parts supplied loose from owner's store to place of erection , unpacking and inspection, placing in position on base channels / flats / rails provided on foundation assembly of all loose accessories and parts , Operational and functional checking of all work, labour vehicle/Crane and materials complete as per drawing and documents, specification, codes and standard and direction of engineer in-charge . Termination arrangement for HV side & LV side and all miscellaneous civil materials required to complete HT & LT installation as indicated in the tender specifcation. Cu wound with onload tap changer facility shall be considered. Make shall be as per Electricity Board approved make.	Nos	1	16,95,000.00	16,95,000.00
960.00	Supply installation, testing and commissioning of 11kV double pole structure with 11 mtr RCC poles including cross bracing's of ISMC ,GOS with earth switch, polymeric type LA's & pin insulator, HG fuses, ACSR conductor, stay sets, earthing, alkathine tube etc. as per the specification including civil works. Make of all components shall be as per Electricity Board approved make.	Nos	1	1,25,000.00	1,25,000.00

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970.00	Supply installation, testing and commissioning of 11kV, 630 A Load break switch panel with metering cubical, Make of all components shall be as per Electricity Board approved make.	Nos	1	1,45,000.00	1,45,000.00
980.00	Supply installation, testing and commissioning of 11kV 630A,3 way Ring Main Unit (RMU), 2 OD +1VL (One incomer + One breaker + one outgoing) with copper bus bar. RMU shall be as per Electricity Board approved specification and make.	Nos	1	2,15,000.00	2,15,000.00
990.00	Supply installation, testing and commissioning of 630A,Operating breaker panel (OD), with copper bus bar. Breaker panel shall be as per Electricity Board approved specification and make.	Nos	1	1,80,000.00	1,80,000.00
1000.00	Supply installation, testing and commissioning of 1 No. 1000A 4P Isolator complete in all respects.	Nos	1	85,000.00	85,000.00
	Cable Supply, laying, termination, testing and commissioning of 11kV grade, XLPE insulated, armoured power cable, PVC sheathed (conforming to IS:7098 and specification) of required sizes in trenches/ excavated under ground trench /trays, pulling through pipes and its proper sealing etc from Metering Panel (In metering Room) to Bidder supplied VCB Panel, from VCB Panel to Transformer. Cable shall include with supply and installation of electrical accessories including, HDPE Cable conduit, cable tags, cable marker, nickel plated lugs, cable glands, cable termination kits, including all labour and materials complete as required and as per directions of Engineer-In-Charge.				
1010.00	11kV, 3Cx240 Sqmm Al, XLPE, PVC inner and outer sheathed, armored cable as per PTS	Meter (M)	340	1,560.00	5,30,400.00
1020.00	Indoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs for 11kV, 3Cx240 Sqmm Al, XLPE Cable as per above.	set	4	10,648.80	42,595.20
1030.00	Outdoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs for 11kV, 3Cx240 Sqmm Al, XLPE Cable as per above.	set	4	13,311.00	53,244.00
D	**INSTRUMENTATION**				
	supply, Design, engineering , testing, inspection, calibration, packing , forwarding, including thrid party inspection, insurance, Erection & Installation, along with mounting accessories, Poles , fittings, and commissioning etc				
1040.00	Pressure Gauge of range 0 to 60 kg/cm2 with two way valve manifold as per the technical specifications.	Number (NO)	2	13,100.00	26,200.00
1050.00	Temperature Gauge with thermowell of range 0 to 60 °C as per the technical specifications attached in tender	Number (NO)	2	21,500.00	43,000.00
	Fire detection system - supply, Design, engineering , testing, inspection, calibration, packing , forwarding, including thrid party inspection, insurance, Erection, installation and commissioning of Fire detection system along with controller, smoke detectors, multisensor detectors, manual call point including Supply, Laying of wiring inside building between detectors, MCP, exist sign, hooter including glanding, termination, ferruling, dressing etc. at both ends. Supply & installation of cable trays (if necessary), supply of erection materials, cable ferrules, cable lugs, cable tie etc. **FDS system for Bari and Amandeep**				

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1060.00	Controller along with wall mounted cabinet as per specification	Number (NO)	2	2,23,946.00	4,47,892.00
1070.00	Smoke Detectors with relay output as per the tender specifications along with all mounting & other accessories as per the tender specifications.	Number (NO)	32	5,560.00	1,77,920.00
1080.00	Multisensor Detectors (Battery room , electrical room) with relay output as per the tender specifications along with all mounting & other accessories as per the tender specifications.	Number (NO)	12	8,422.00	1,01,064.00
1090.00	Manual Call Point (Weather Proof) along with all mounting & other accessories as per the tender specifications.	Number (NO)	12	5,374.00	64,488.00
1100.00	Explosion Proof and Weather Proof Hooters (for hazardous area) along with all mounting & other accessories as per the tender specifications.	Number (NO)	2	21,498.00	42,996.00
1110.00	Exit sign along with all mounting & other accessories as per the tender specifications.	Number (NO)	12	6,550.00	78,600.00
1120.00	supply of fire resistance Cable, cable tray , gland, ferrulling , termination for complete Fire Detection System.	Lot (LOT)	2	1,61,242.00	3,22,484.00
	CCTV System - supply, design, engineering , testing, inspection, calibration, packing , forwarding, including thrid party inspection, insurance, erection & installation, along with mounting accessories, Poles , fittings, etc and commissioning of CCTV system camera, work stations etc **Note : Owner shall provide 230VAC at Site .**				
1130.00	Supply , Installation , Testing of CCTV - 4MP True POE IP Network Indoor Dome Fixed Camera with in built IR illuminator along with housing accessories, junction box, lightning & surge protection, Media Convertor, microSD/SDHC/SDXC card of suitable Capacity (min- 256 GB) & all other accessories as per specification.	Number (NO)	5	40,325.00	2,01,625.00
1140.00	Supply , Installation , Testing of CCTV - 4MP True POE IP Network Outdoor Weatherproof Bullet Fixed Camera with in built IR illuminator along with Weatherproof housing accessories, junction box, lightning & surge protection, Media Convertor, microSD/SDHC/SDXC card of suitable Capacity (min- 256 GB), mounting arrangement -Pole & all other accessories as per specification.	Number (NO)	5	47,100.00	2,35,500.00
1150.00	Supply , Installation , Testing of CCTV - 2MP AC/DC input power/True POE IP Network Outdoor Ex-Proof Bullet Fixed Camera along with Ex-proof housing accessories, junction box, lightning & surge protection, Media Convertor, microSD/SDHC/SDXC card of suitable Capacity (min- 256 GB), mounting arrangement -Pole, Power Convertor & all other accessories as per specification.	Number (NO)	3	4,71,154.50	14,13,463.50
1160.00	Network Digital Video Recorder (NVR) of 16 channel video & audio,2 SATA interface with 2 TB or better storage facility along w	Number (NO)	1	3,70,313.00	3,70,313.00

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1170.00	32" Client Workstation along with licensed Operating System Software, Keyboard along with required cables, connectors, interfaces complete as per specifications.	Number (NO)	1	65,504.00	65,504.00
1180.00	Workstation console/furniture (wooden) with revolving chair from standard make for mounting monitor, CPU, keyboard ,	Number (NO)	2	14,036.00	28,072.00
	Supply of signals, power, communicaation and Optical fiber cable,(As applicable), Installation & Laying, testing & commissioning , loop testing with including cable glands, lugs and termination.				
1190.00	1P x 1.5mm2	Meter (M)	100	413.00	41,300.00
1200.00	3C x 2.5 mm3	Meter (M)	250	625.00	1,56,250.00
1210.00	Cat 6 with conduit , glands, cable tray	Meter (M)	500	477.00	2,38,500.00
1220.00	4 core Armoured fiber optical cable with optical to ether conveter at each end.	Meter (M)	240	423.00	1,01,520.00
1230.00	ALL WORK RELATED TO STATUTORY APPROVALS FOR THE CONSTRUCTION FROM THE COMPETENT AUTHORITY, to obtain all necessary permissions/approvals by the concerned authorities. All necessary work related to the same shall be in contractor's scope i.e. including preparation, submission of all drawing & documents , liaisoning required for making the station completely operational. All permissions mentioned below shall be acquired by contractor/bidder in complete manner and no separate payment shall be made to contractor other than below. Liasoning Work with EB Department including inclusive of preparation of drawings, load details, coordination, inspection, certification, agreement, liasoning, etc if any & CEIG Approvals inclusive of preparation of drawings, load details, coordination, inspection, certification, agreement, liasoning, etc if any. Note:Payment shall be made for obtaining each permission (all other work related to get the permission shall be in the scope of contractor/bidder).	EACH	1.00	1,96,000.00	1,96,000.00
1240.00	Supply of rubber hand gloves duly tested and approved for use on system service 415V.	Pair	1	2,500.00	2,500.00
1250.00	Supply & installation of first aid box with front door having clear glass and first aid material, Rules conforming to IE.	Nos	1	4,500.00	4,500.00
1260.00	Supply & installation of sand buckets with sand, mounted on steel hook (01 set- stand+4 buckets)	Nos	1	3,500.00	3,500.00
				Sub total Excluding GST for Katedan (B)	**1,55,34,395.09**
				Total Excluding GST (A+B)	**3,10,68,790.18**
				Percentage to be quoted by the bidder(%)	**-**
				GST 18.00%	**55,92,382.23**
				Total including GST (A+B)	**3,66,61,172.41**

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SECTION 9: DRAWINGS

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1 2 3 4

A B C D E

TYPICAL CABLE TRAY INSTALLATION DETAILS

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS

Size	Scale	Sheet
A3	NTS	01 of 62

Drawing No.	Rev.
GGNG-E-20714-3010	0

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NOTES

NOTES :

1– IN THE FOLLOWING SHEETS, EXACT DIMENSIONS X, Y, Z FOR CABLE SUPPORTS SHOULD BE DETERMINED ON SITE ACCORDING TO THE LOCATION,INSTALLATION DRAWING DONE FOR BUILDINGS AND AREAS.

2– THESE ERECTION DETAILS COULD BE ADAPTED ACCORDING TO NEEDS ON SITE.

3– THIS DOCUMENT IS A GUIDE LINE FOR CABLE TRAY INSTALLATION CONTRACTOR TO HELP HIM IN THE DEFINITION OF ITS SCOPE OF DESIGN AND SUPPLY.

4– MATERIAL SHOWN IN THIS DOCUMENT CAN BE ADAPTED BY CABLE TRAY INSTALLATION CONTRACTOR

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS

Size	Scale	Sheet
A3	NTS	02 of 62

Drawing No.	Rev.
GGNG-E-20714-3010	0

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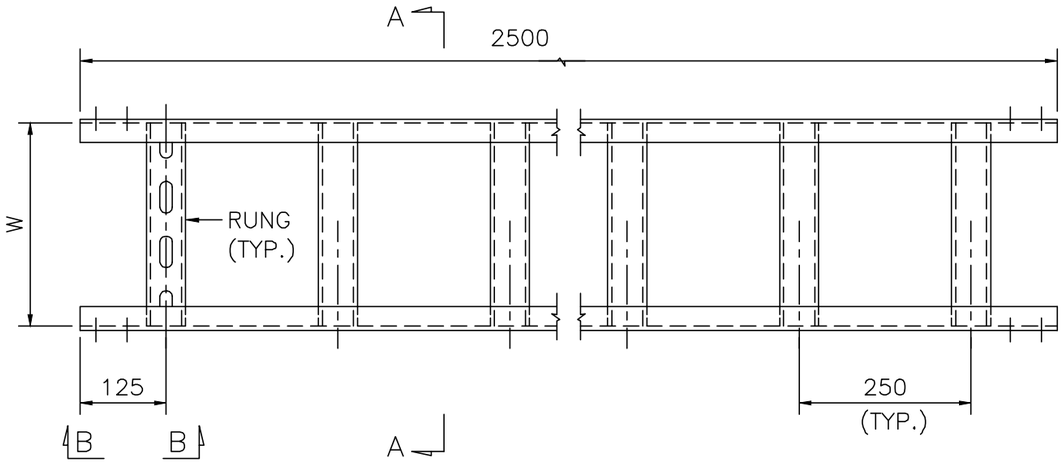
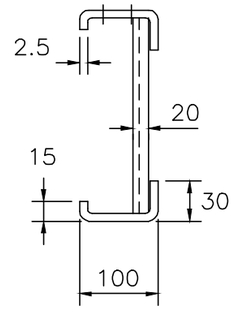
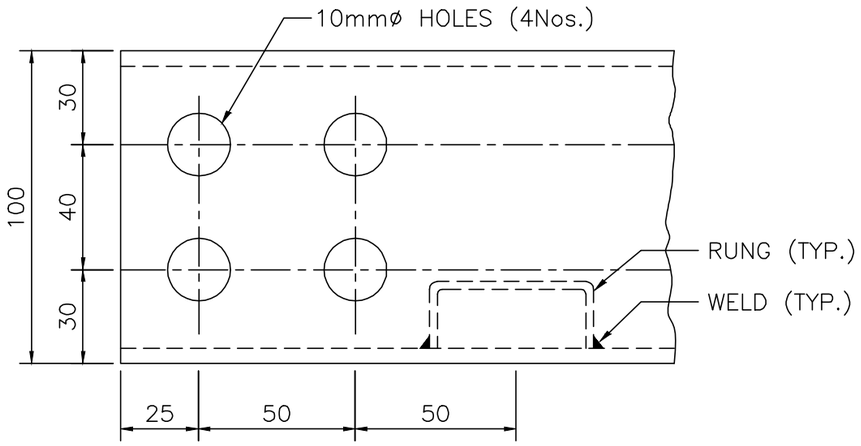


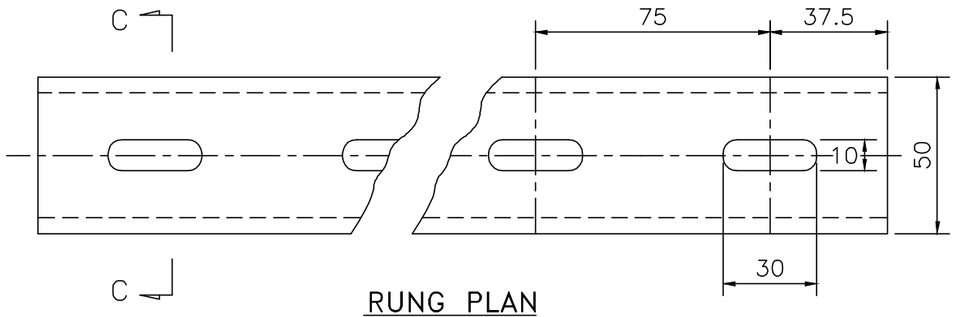
P L A N



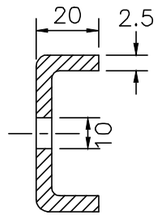
SECTION 'A–A'



SECTION 'B–B'



RUNG PLAN



SECTION 'C–C'

MATERIAL – 12 GAUGE (2.5MM) M.S.SHEET/G.S/AL/FRP (AS PER BOQ)
INSIDE TRAY WIDTH (W) – 150,300,450,600,800MM (AS PER BOQ)

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. M.S. SHEET SHALL CONFORM TO IS2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. CABLE TRAY SUPPLIED WITH OTHER MATERIALS SHALL CONFIRMED TO RELEVANT IS/INTERNATIONAL STANDARDS.
3. THE MATERIAL DIMENSIONAL DETAILS SHOWN ARE TYPICAL FOR GS STRESS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRED HARDWARE.
5. CABLE TRAYS SHALL DESIGN FOR 3000mm SUPPORT SPAN UNLESS NOTED OTHERWISE FOR SPECIFIED TRAY LOADING.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
LADDER TYPE CABLE TRAY

Size	Scale	Sheet	Rev.
A3	NTS	03 of 62	0

Drawing No. GGNG-E-20714-3010

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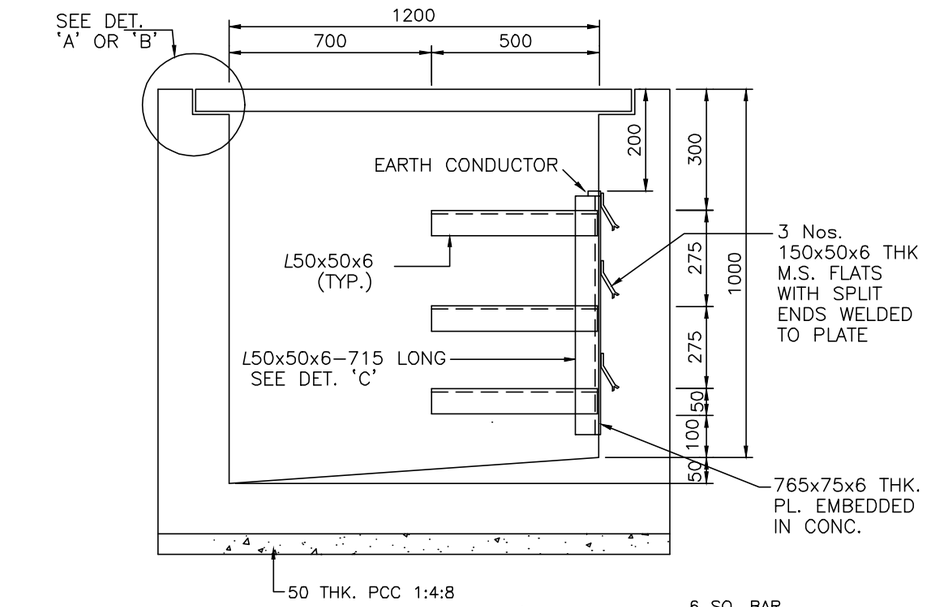
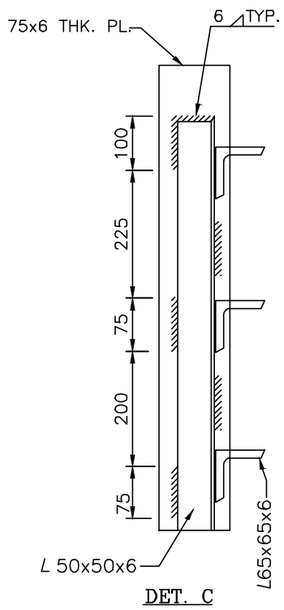
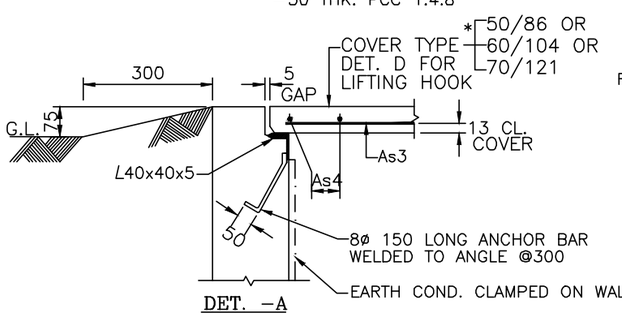
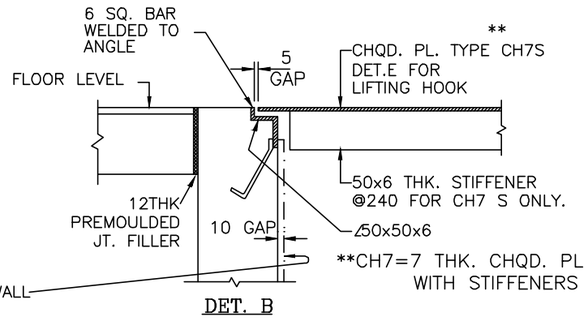




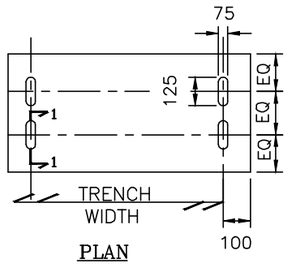
DET. C



DET. –A



DET. B

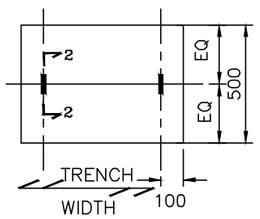


PLAN

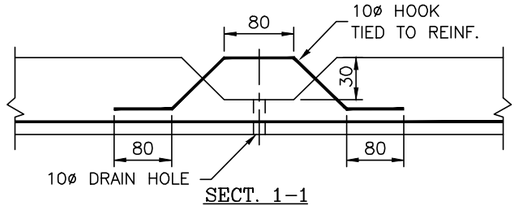
*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/86	50	7–6ø	9–6ø
60/86	60	6–8ø	7–8ø
70/181	70	5–8ø	7–8ø

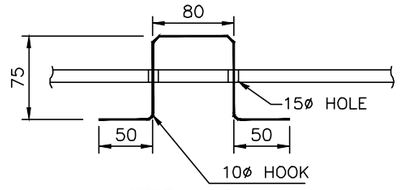
60/104 MEANS 60mm. THK.x86 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



PLAN



SECT. 1–1
DET. D



SECT. 2–2
DET. E

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRENCH TYPE

Size A3 | Scale NTS | Sheet 04 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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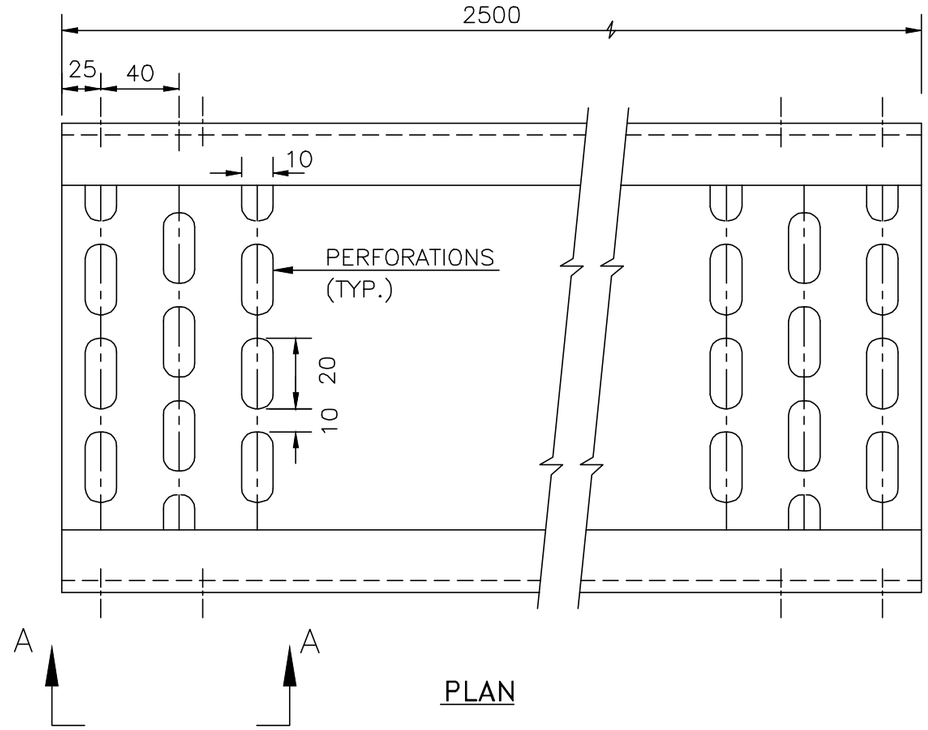
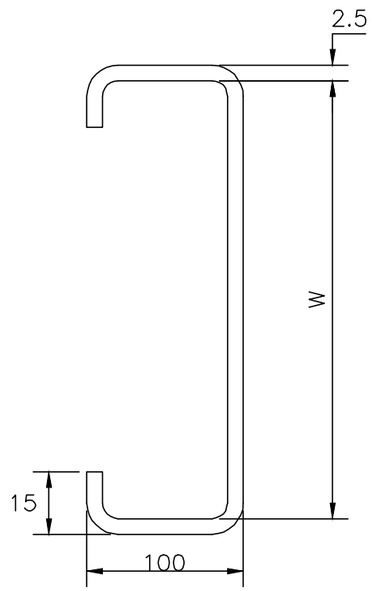
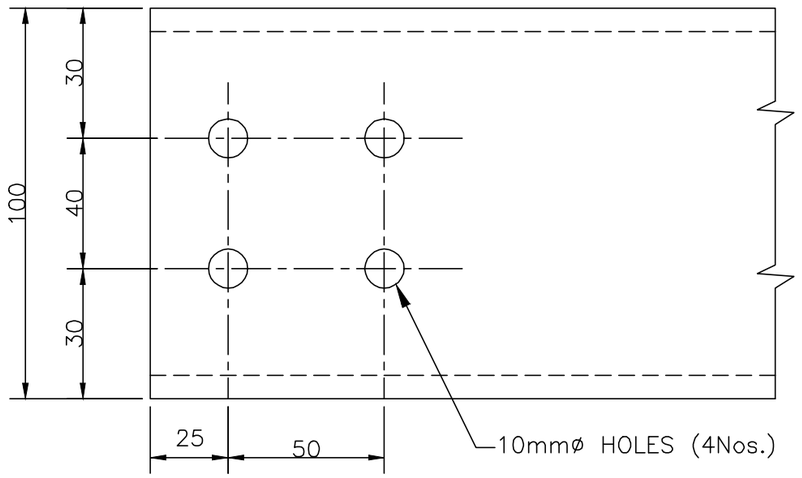


PLAN



END VIEW



SECTION 'A–A'

INSIDE WIDTH (W) – 100,150,300,450,600,800MM (AS PER BOQ)
MATERIAL – 12 GAUGE (2.5MM) M.S.SHEET/G.S./AL/FRP (AS PER BOQ)

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. M.S. SHEET SHALL CONFORM TO IS2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. CABLE TRAY SUPPLIED WITH OTHER MATERIALS SHALL CONFIRMED TO RELEVANT IS/INTERNATIONAL STANDARDS.
3. THE MATERIAL DIMENSIONAL DETAILS SHOWN ARE TYPICAL FOR GS STRESS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRED HARDWARE.
5. CABLE TRAYS SHALL DESIGN FOR 3000mm SUPPORT SPAN UNLESS NOTED OTHERWISE FOR SPECIFIED TRAY LOADING.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
PERFORATED TYPE CABLE TRAY

Size A3 | Scale NTS | Sheet 05 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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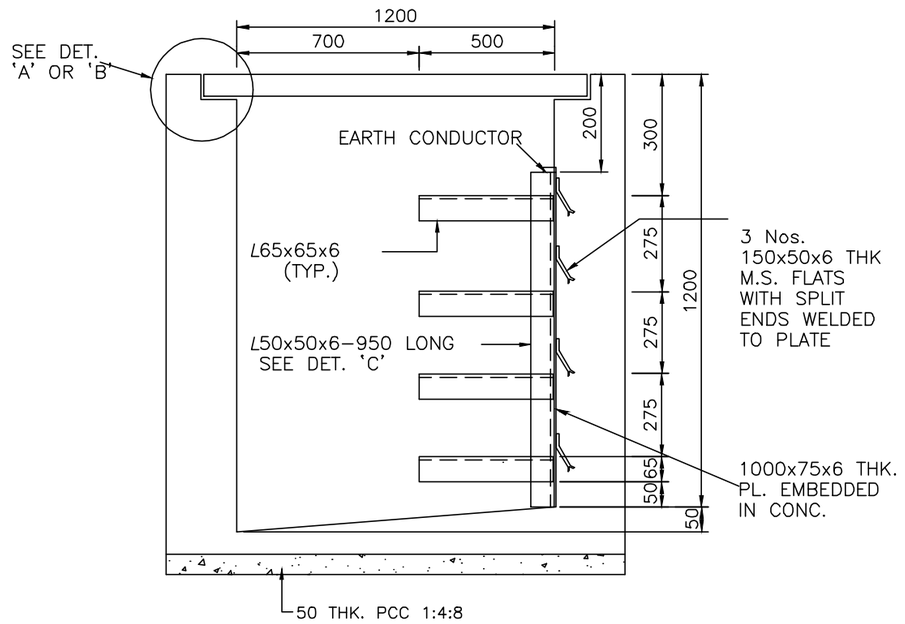
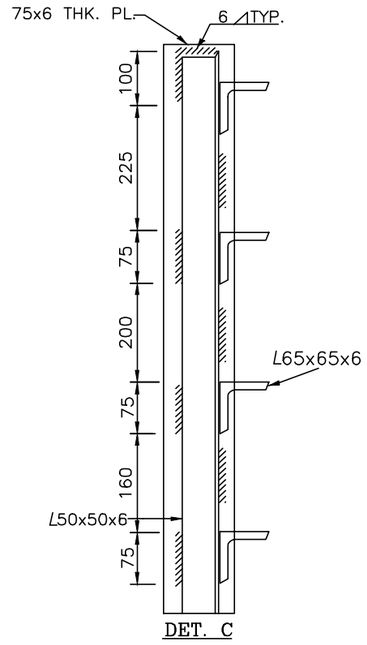
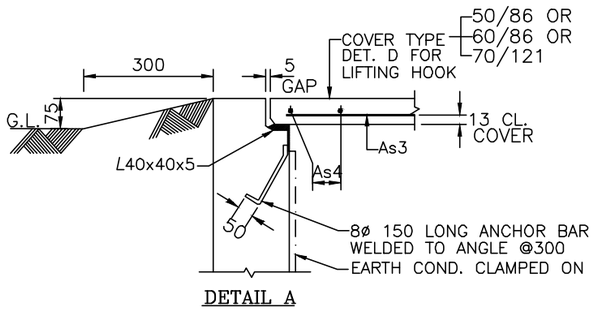
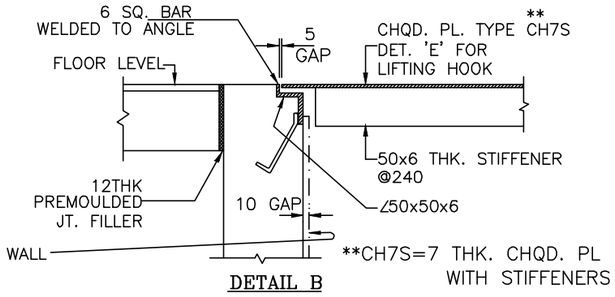




DET. C



DETAIL A



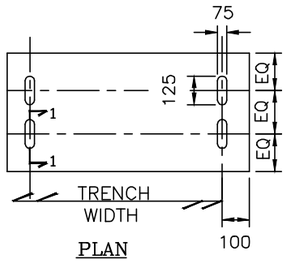
DETAIL B

**CH7S=7 THK. CHQD. PL WITH STIFFENERS

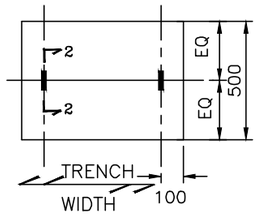
*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/86	50	7-6ø	9-6ø
60/104	60	6-8ø	7-8ø
70/121	70	5-8ø	7-8ø

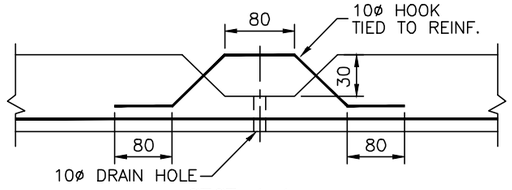
60x104 MEANS 60mm. THK.x104 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



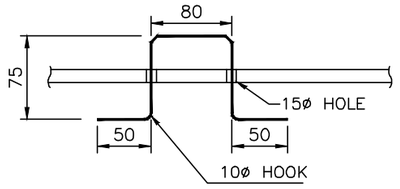
PLAN



PLAN



SECT. 1-1
DETAIL D



SECT. 2-2
DETAIL E

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRENCH TYPE

Size A3 | Scale NTS | Sheet 06 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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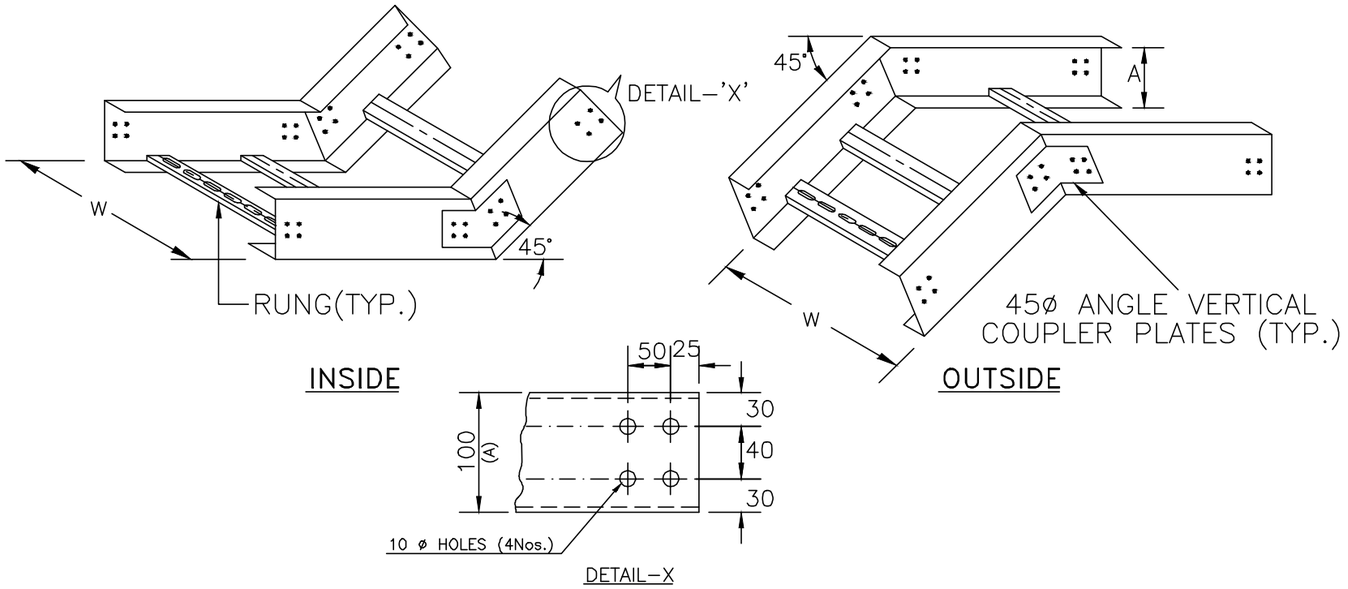
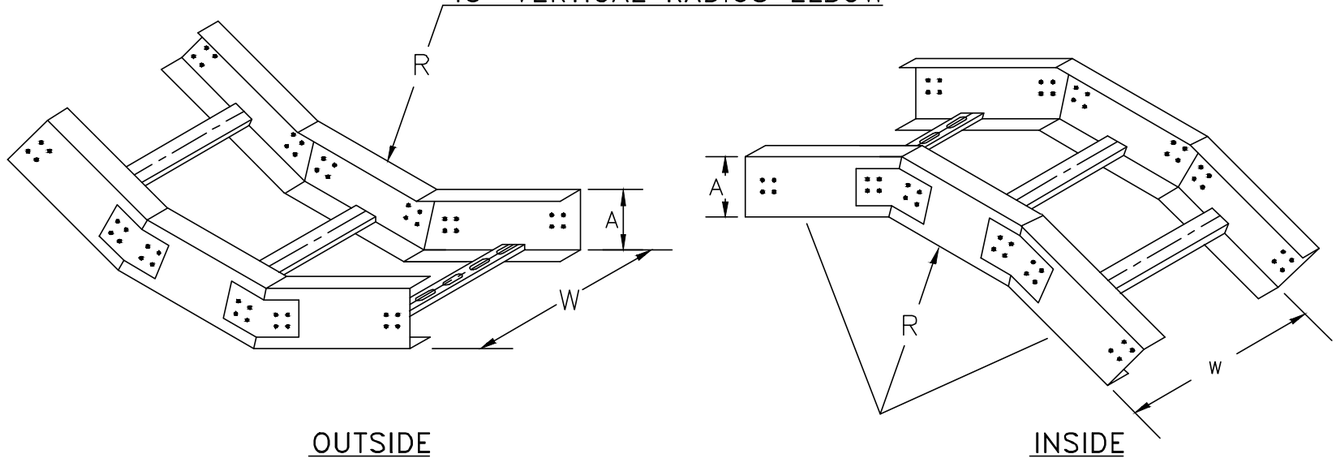
45° DIRECT VERTICAL ELBOW



45° VERTICAL RADIUS ELBOW



(W) INSIDE WIDTH OF TRAY – 150,300,450,600,800MM (AS PER BOQ)

(A) DEPTH OF TRAY – 100MM UNLESS NOTED

(R) BENDING RADIUS (AS PER BOQ)

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL – 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER BOQ)
3. M.S. SHEET SHALL CONFORM TO IS2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. CABLE TRAY SUPPLIED WITH OTHER MATERIALS SHALL CONFIRMED TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRED HARDWARE.
5. ALL TRAY FITTINGS SHALL BE SUPPLIED COMPLETE WITH MATCHING ANGLE HORIZONTAL COUPLER PLATES & HARDWARE. ALTERNATIVELY WELDED ASSEMBLY MAY BE SUPPLIED FOR G.S. CABLE TRAY FITTINGS.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY ACCESSORIES

Size	Scale	Sheet	Rev.
A3	NTS	07 of 62	0

Drawing No. GGNG-E-20714-3010

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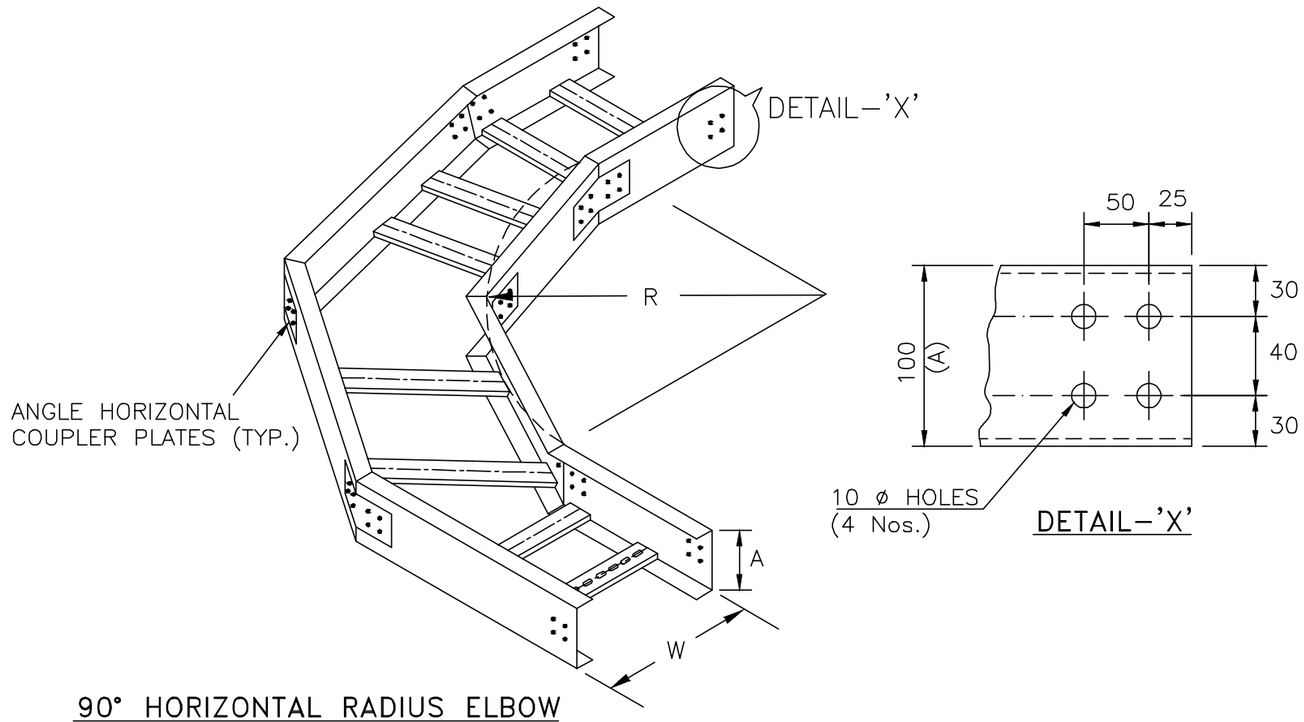
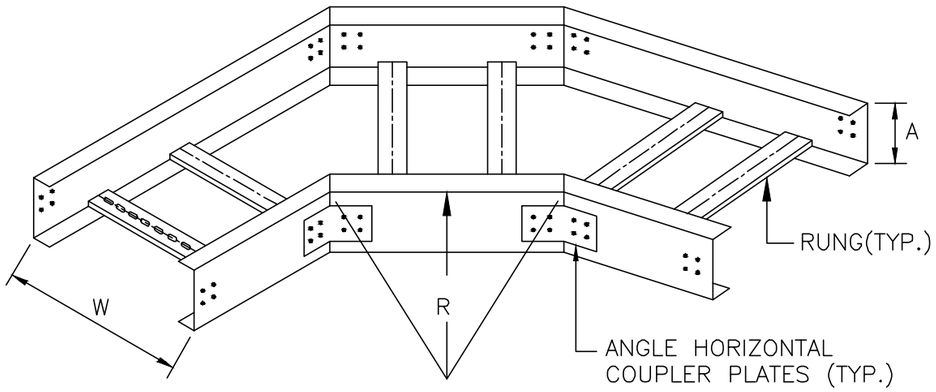


90° HORIZONTAL RADIUS ELBOW

DETAIL–'X'



45° HORIZONTAL RADIUS ELBOW

(W) INSIDE WIDTH OF TRAY – 150,300,450,600,800MM (AS PER BOQ)

(A) DEPTH OF TRAY – 100MM UNLESS NOTED

(R) BENDING RADIUS (AS PER BOQ)

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL – 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER BOQ)
3. M.S. SHEET SHALL CONFORM TO IS2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. CABLE TRAY SUPPLIED WITH OTHER MATERIALS SHALL CONFIRMED TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRED HARDWARE.
5. ALL TRAY FITTINGS SHALL BE SUPPLIED COMPLETE WITH MATCHING ANGLE HORIZONTAL COUPLER PLATES & HARDWARE. ALTERNATIVELY WELDED ASSEMBLY MAY BE SUPPLIED FOR G.S. CABLE TRAY FITTINGS.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY ACCESSORIES

Size	Scale	Sheet
A3	NTS	08 of 62

Drawing No.	Rev.
GGNG-E-20714-3010	0

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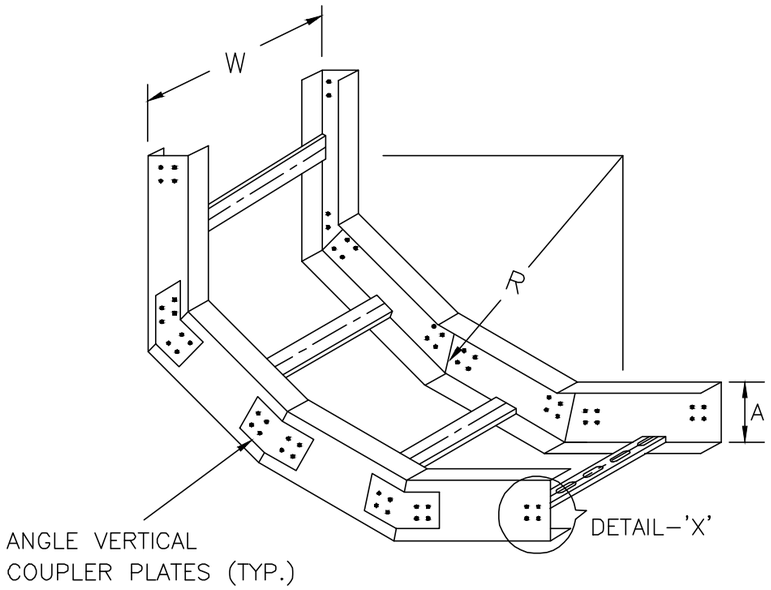
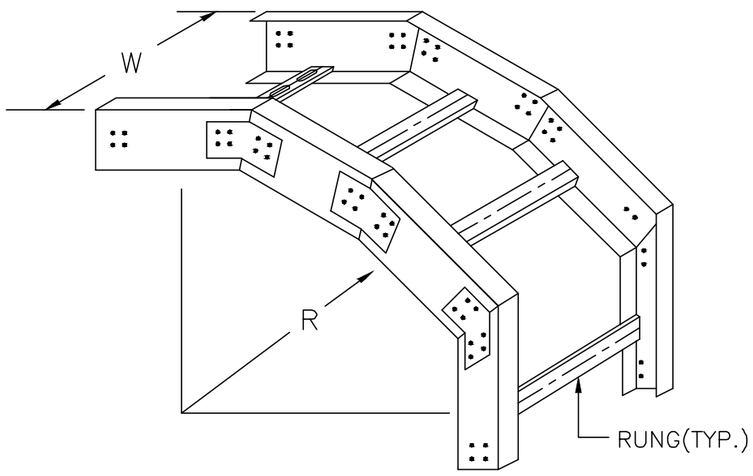
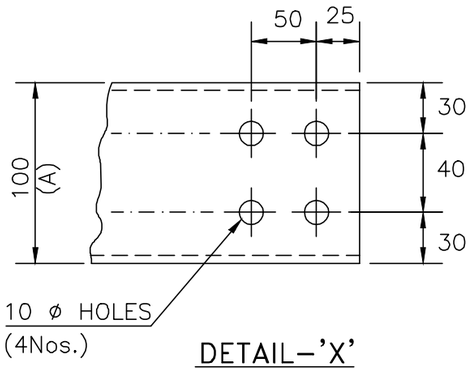
90° VERTICAL RADIUS ELBOW



INSIDE



OUTSIDE



DETAIL–'X'

(W) INSIDE WIDTH OF TRAY – 150,300,450,600,800MM (AS PER BOQ).
(A) DEPTH OF TRAY – 100MM UNLESS NOTED.
(R) BENDING RADIUS (AS PER BOQ).

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL – 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER BOQ)
3. M.S. SHEET SHALL CONFORM TO IS2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. CABLE TRAY SUPPLIED WITH OTHER MATERIALS SHALL CONFIRMED TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRED HARDWARE.
5. ALL TRAY FITTINGS SHALL BE SUPPLIED COMPLETE WITH MATCHING ANGLE HORIZONTAL COUPLER PLATES & HARDWARE. ALTERNATIVELY WELDED ASSEMBLY MAY BE SUPPLIED FOR G.S. CABLE TRAY FITTINGS.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY ACCESSORIES

Size	Scale	Sheet	Drawing No.	Rev.
A3	NTS	09 of 62	GGNG-E-20714-3010	0

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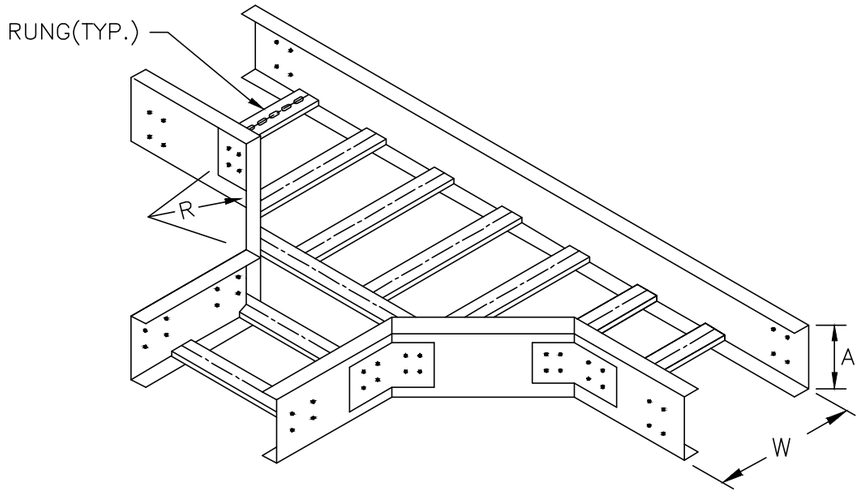
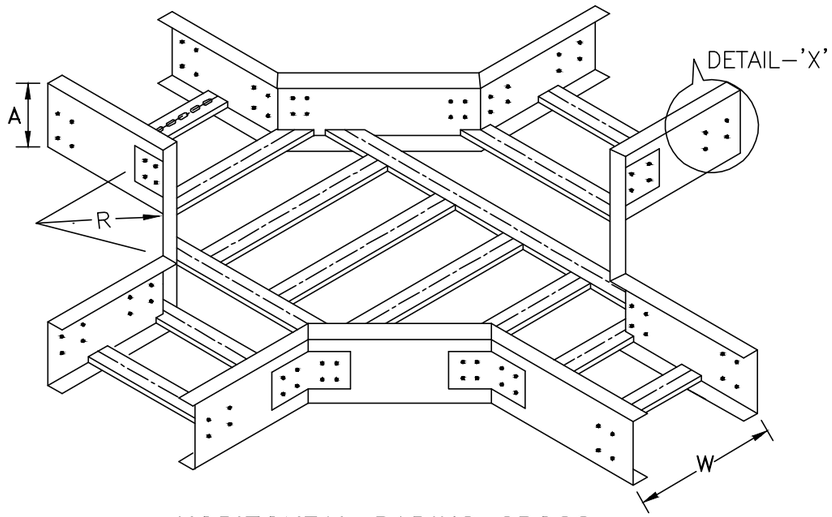
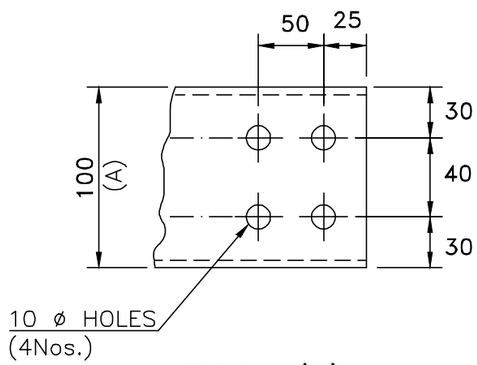


HORIZONTAL RADIUS TEE





DETAIL–'X'

HORIZONTAL RADIUS CROSS

(W) INSIDE WIDTH OF TRAY – 150,300,450,600,800MM (AS PER BOQ)

(A) DEPTH OF TRAY – 100MM UNLESS NOTED

(R) BENDING RADIUS (AS PER BOQ)

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL – 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER BOQ)
3. M.S. SHEET SHALL CONFORM TO IS2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. CABLE TRAY SUPPLIED WITH OTHER MATERIALS SHALL CONFIRMED TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRED HARDWARE.
5. ALL TRAY FITTINGS SHALL BE SUPPLIED COMPLETE WITH MATCHING ANGLE HORIZONTAL COUPLER PLATES & HARDWARE. ALTERNATIVELY WELDED ASSEMBLY MAY BE SUPPLIED FOR G.S. CABLE TRAY FITTINGS.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY ACCESSORIES

Size	Scale	Sheet	Rev.
A3	NTS	10 of 62	0

Drawing No. GGNG-E-20714-3010

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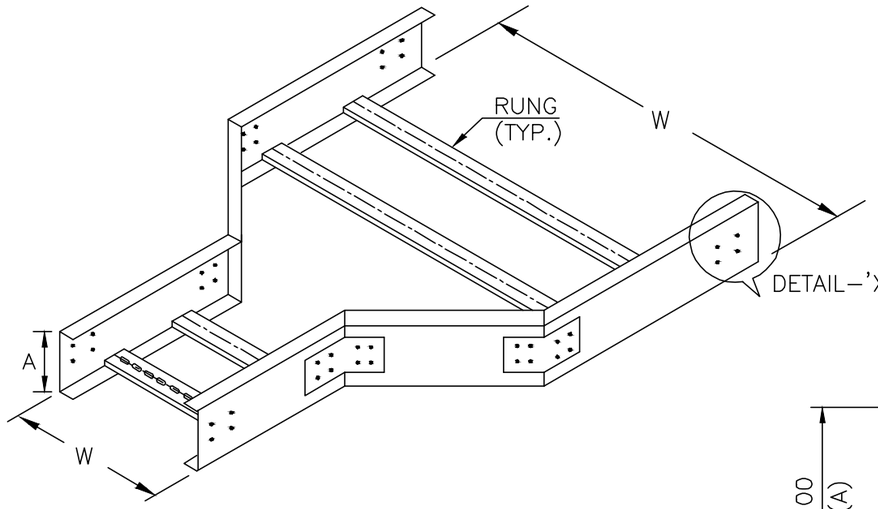
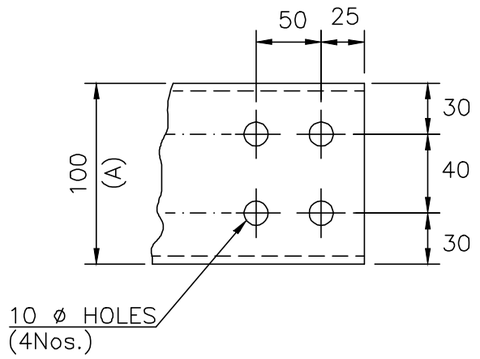
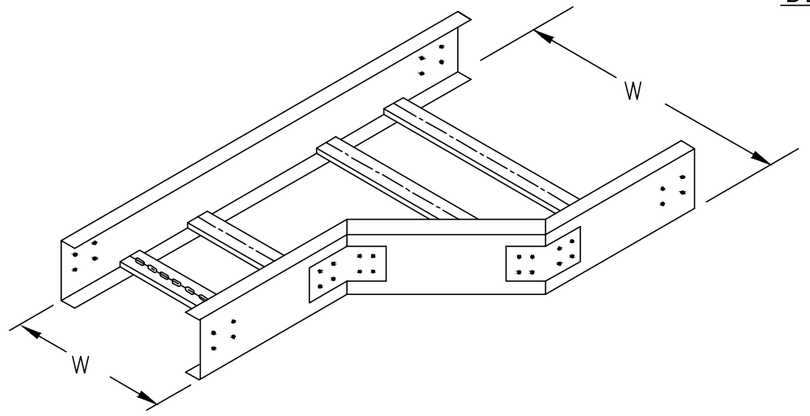


STRAIGHT REDUCER



DETAIL–'X'



RIGHT TO LEFT HAND REDUCER

(W) INSIDE WIDTH OF TRAY – 150,300,450,600,800MM (AS PER BOQ)

(A) DEPTH OF TRAY – 100MM UNLESS NOTED

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL – 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER BOQ)
3. M.S. SHEET SHALL CONFORM TO IS2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. CABLE TRAY SUPPLIED WITH OTHER MATERIALS SHALL CONFIRMED TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRED HARDWARE.
5. ALL TRAY FITTINGS SHALL BE SUPPLIED COMPLETE WITH MATCHING ANGLE HORIZONTAL COUPLER PLATES & HARDWARE. ALTERNATIVELY WELDED ASSEMBLY MAY BE SUPPLIED FOR G.S. CABLE TRAY FITTINGS.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY ACCESSORIES

Size	Scale	Sheet
A3	NTS	11 of 62

Drawing No. GGNG-E-20714-3010 Rev. 0

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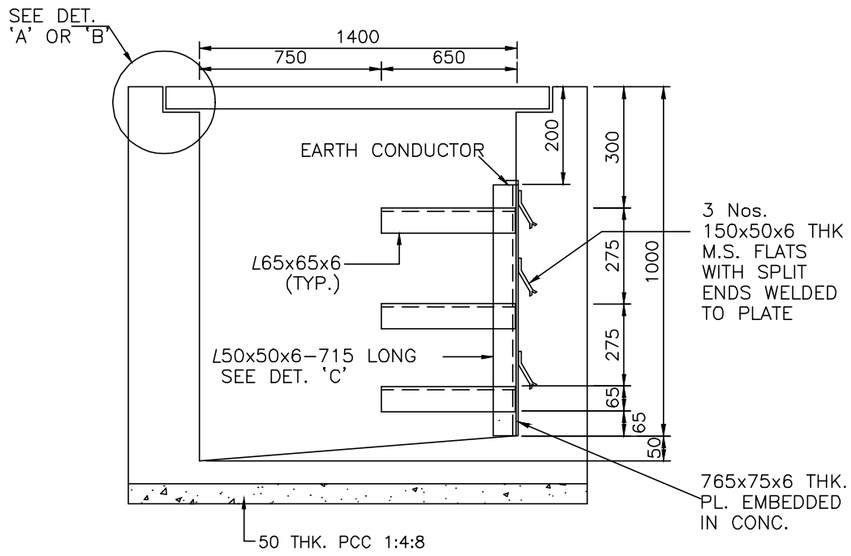
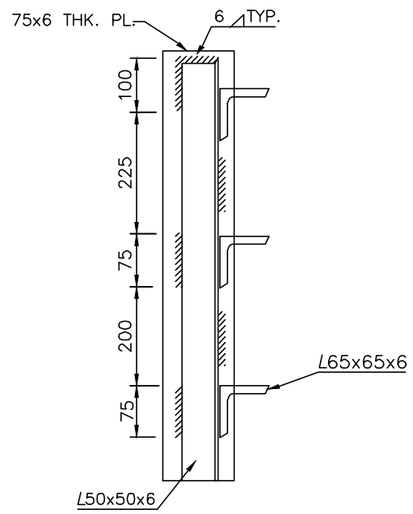
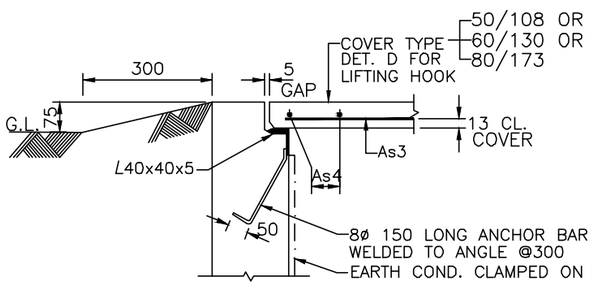
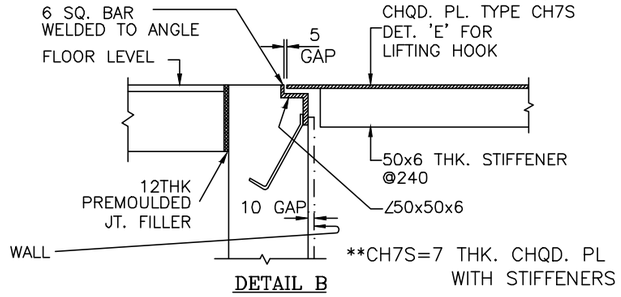




DETAIL C

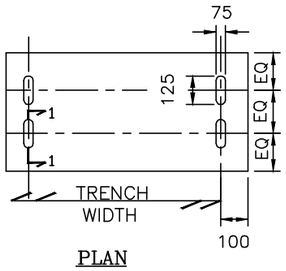


DETAIL A



DETAIL B

**CH7S=7 THK. CHQD. PL WITH STIFFENERS

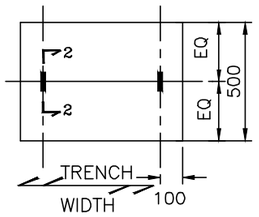


PLAN

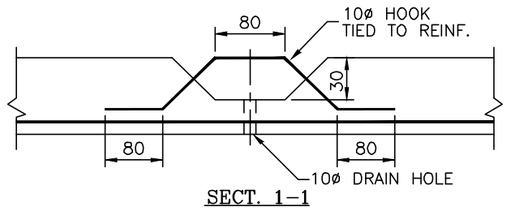
*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/108	50	7–6ø	9–6ø
60/130	60	6–8ø	7–8ø
80/173	80	5–8ø	7–8ø

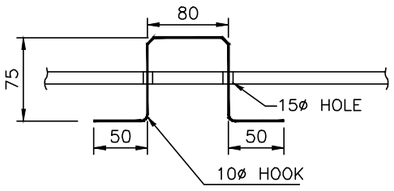
60x130 MEANS 60mm. THK.x130 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



PLAN



SECT. 1–1
DETAIL D



SECT. 2–2
DETAIL E

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRENCH TYPE

Size A3 | Scale NTS | Sheet 12 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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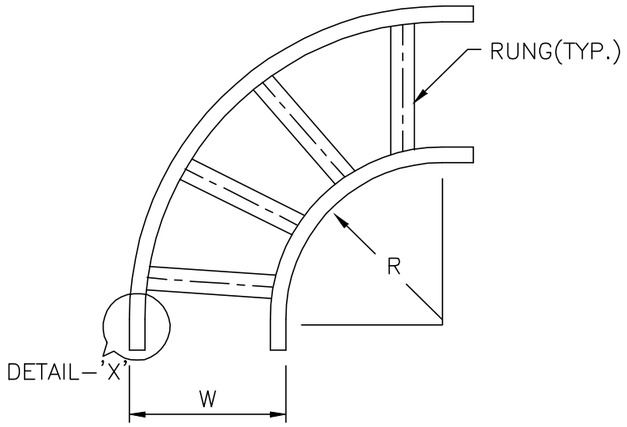
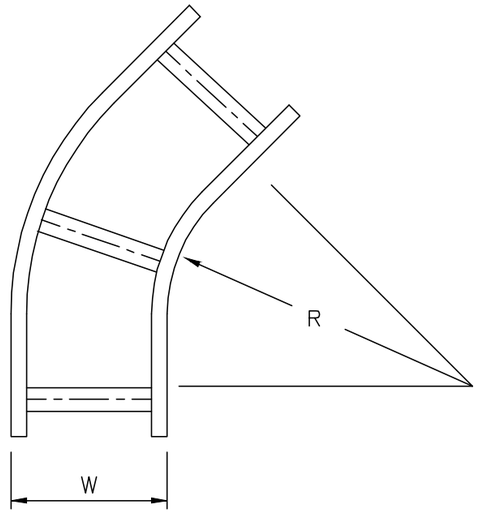
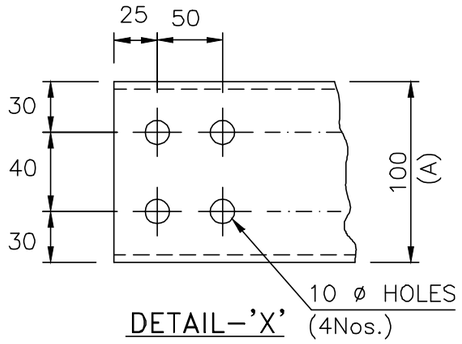


90° HORIZONTAL RADIUS ELBOW



45° HORIZONTAL RADIUS ELBOW



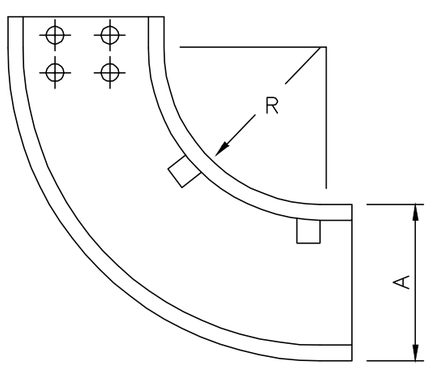
DETAIL–'X'

(W) INSIDE WIDTH OF TRAY – 150,300,450,600,800MM (AS PER BOQ)

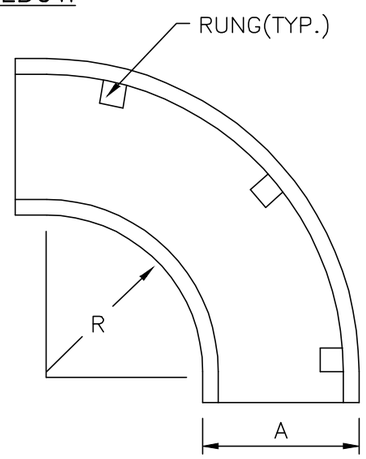
(A) DEPTH OF TRAY – 100MM UNLESS NOTED

(R) BENDING RADIUS (AS PER BOQ)

90° VERTICAL MOULDED RADIUS ELBOW



INSIDE



OUTSIDE

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL – 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER BOQ)
3. M.S. SHEET SHALL CONFORM TO IS2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. CABLE TRAY SUPPLIED WITH OTHER MATERIALS SHALL CONFIRMED TO RELEVANT IS/INTERNATIONAL STANDARDS.
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Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY ACCESSORIES (FRP)

Size	Scale	Sheet	Rev.
A3	NTS	13 of 62	0

Drawing No. GGNG-E-20714-3010

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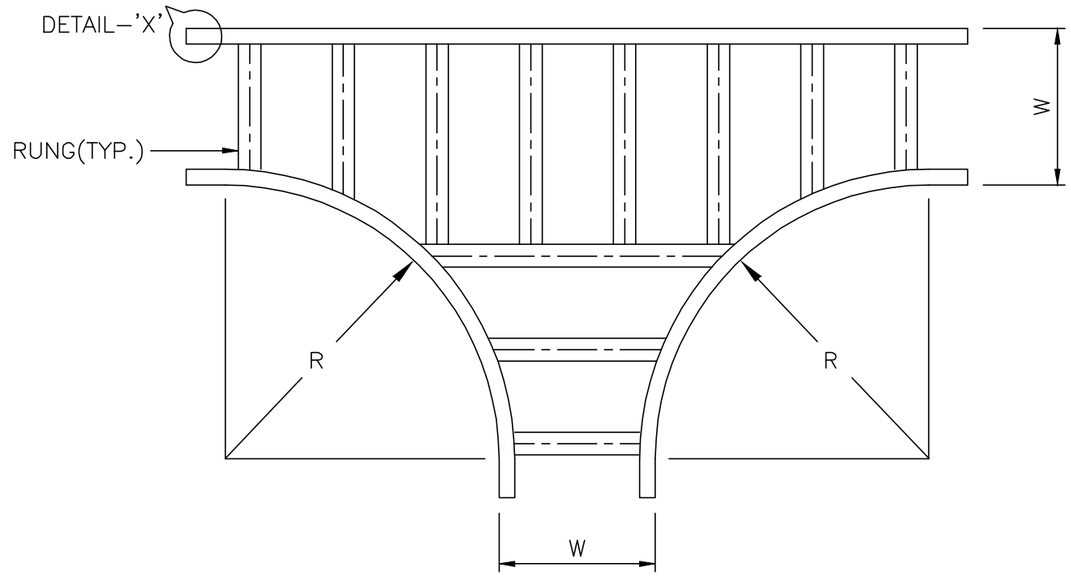
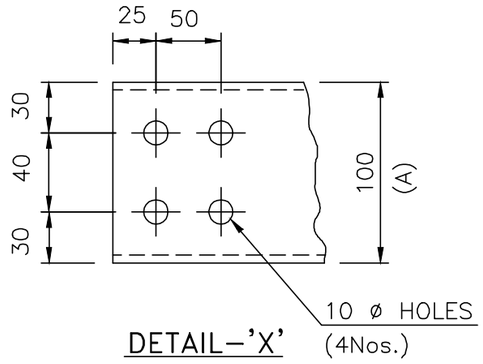


HORIZONTAL RADIUS TEE

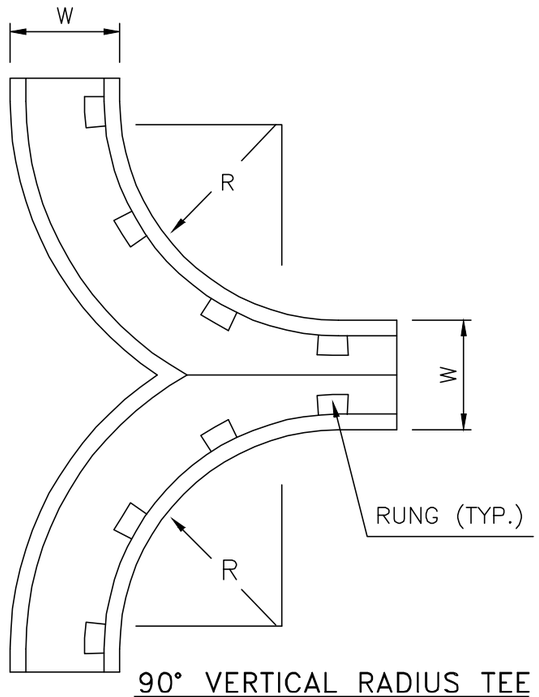


DETAIL–'X'

(W) – INSIDE WIDTH OF TRAY–150,300,450,600,800MM (AS PER BOQ)

(A) – DEPTH OF TRAY–100MM UNLESS NOTED

(R) – BENDING RADIUS (AS PER BOQ)



90° VERTICAL RADIUS TEE

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL – 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER BOQ)
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Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY ACCESSORIES

Size	Scale	Sheet
A3	NTS	14 of 62

Drawing No. GGNG-E-20714-3010 | Rev. 0

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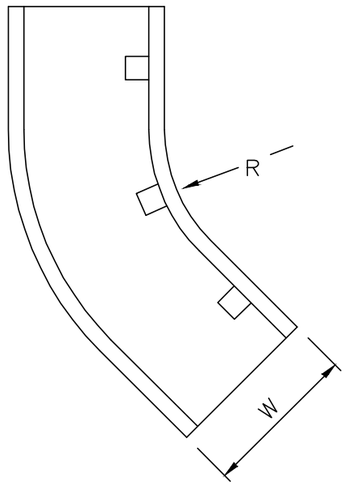
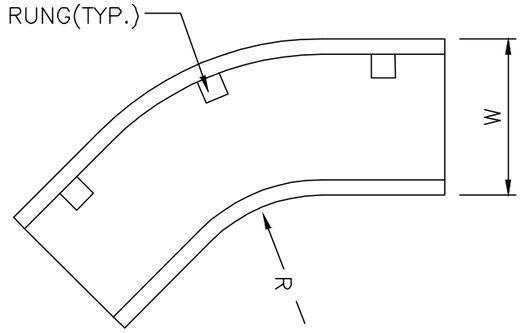
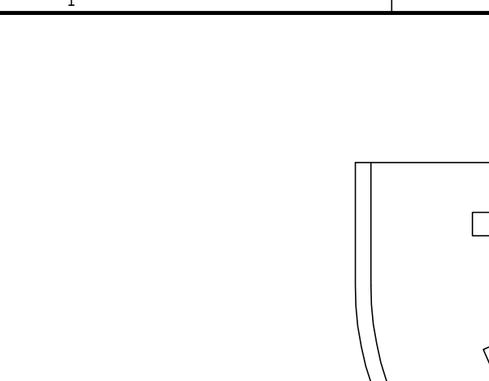
45° VERTICAL RADIUS ELBOW



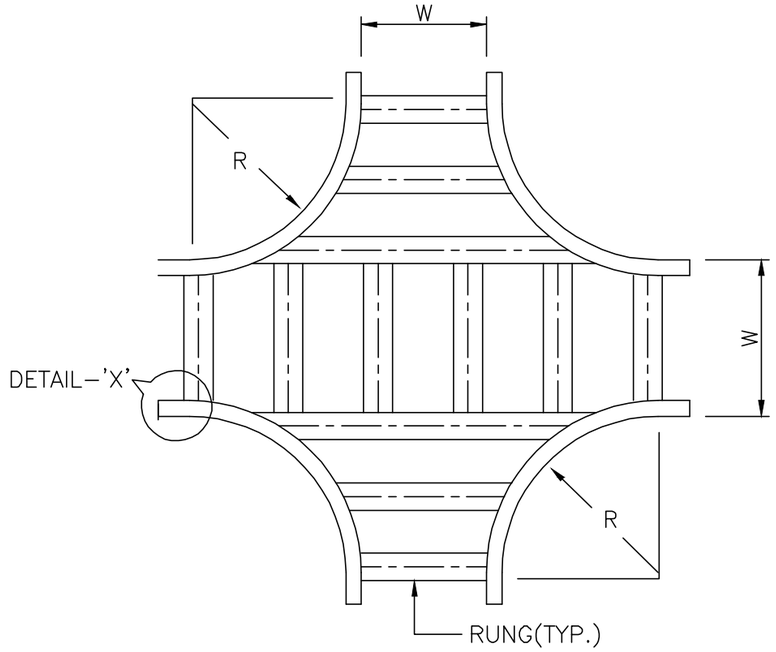
INSIDE



OUTSIDE



DETAIL–'X'



HORIZONTAL RADIUS CROSS

(W) INSIDE WIDTH OF TRAY – 150,300,450,600,800MM (AS PER BOQ)
(A) DEPTH OF TRAY – 100MM UNLESS NOTED
(R) BENDING RADIUS (AS PER BOQ)

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL – 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER BOQ)
3. M.S. SHEET SHALL CONFORM TO IS2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. CABLE TRAY SUPPLIED WITH OTHER MATERIALS SHALL CONFIRMED TO RELEVANT IS/INTERNATIONAL STANDARDS.
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Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY ACCESSORIES

Size	Scale	Sheet
A3	NTS	15 of 62

Drawing No.	Rev.
GGNG-E-20714-3010	0

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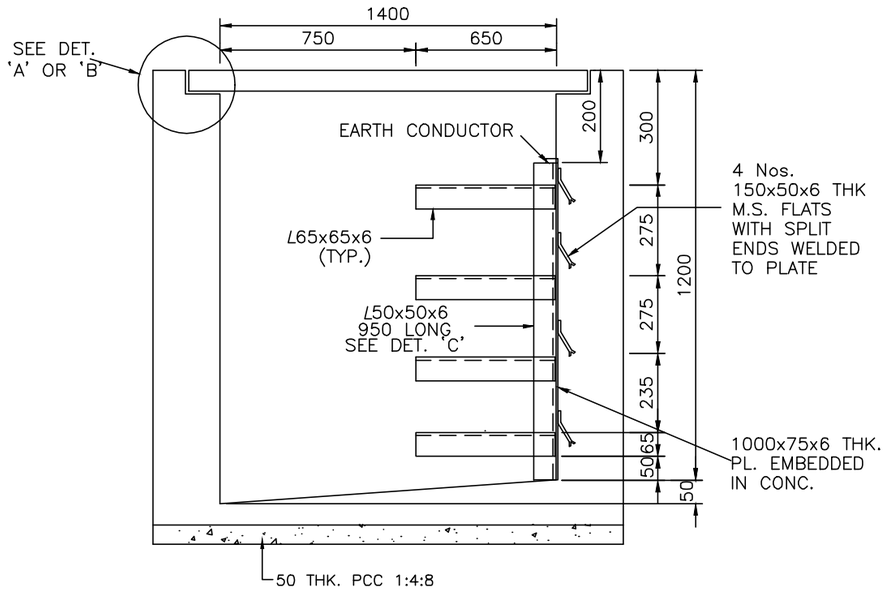
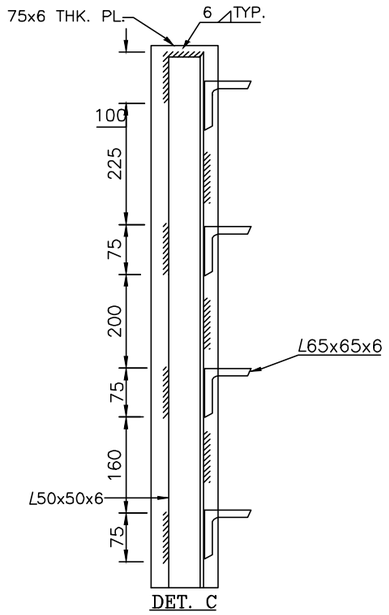
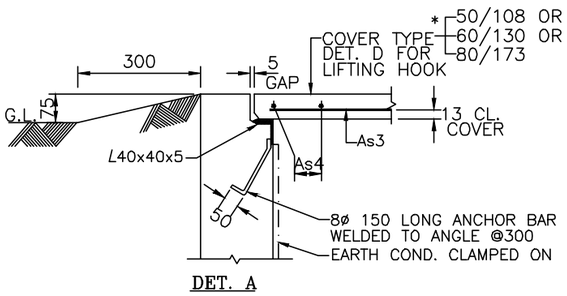
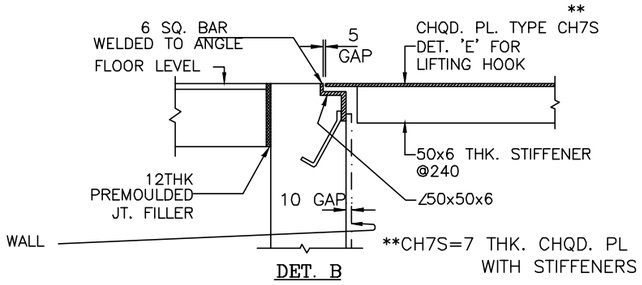




DET. C

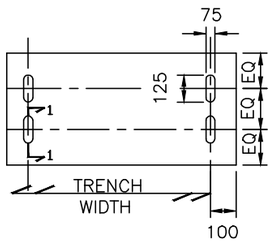


DET. A



DET. B

**CH7S=7 THK. CHQD. PL WITH STIFFENERS

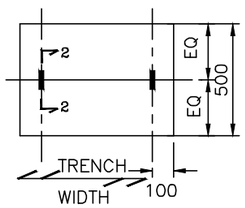


PLAN

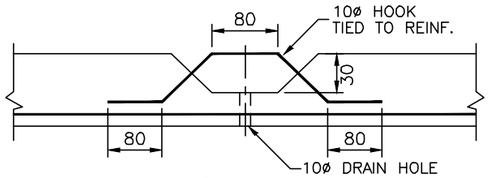
*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/108	50	7–6ø	9–6ø
60/130	60	6–8ø	8–8ø
80/173	80	5–8ø	8–8ø

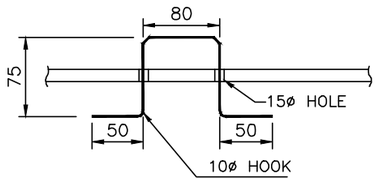
60x130 MEANS 60mm. THK.x130 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



PLAN



SECT. 1–1
DET. D



SECT. 2–2
DET. E

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRENCH TYPE

Size A3 | Scale NTS | Sheet 16 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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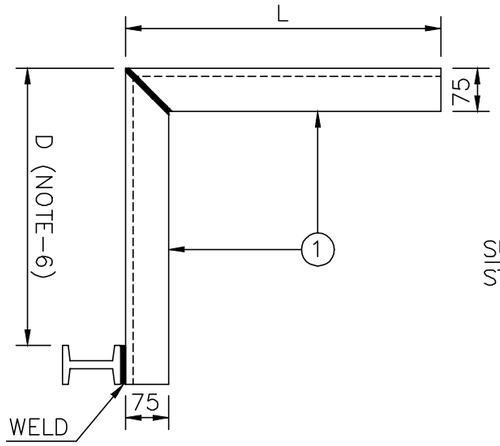
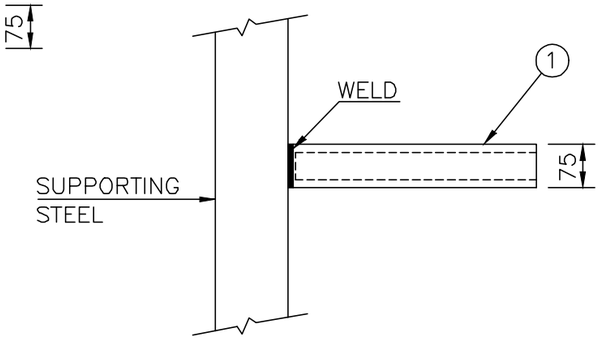
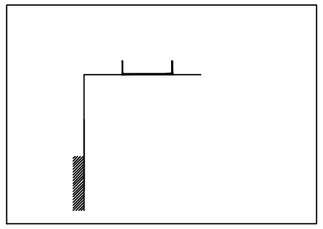


ELEVATION



PLAN



TYPE-2A

TABLE-1

TRAY WIDTH	L	REMARKS
100	250	
150	300	

TABLE-2

ITEM NO	DESCRIPTION	LENGTH	QTY No.	REMARKS
(1)	ISMC 75	D + L	1	FOR 'L' REF.TABLE-1

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. FULL LENGTH FILLET WELD WITH RETURNED ENDS TO BE MINIMUM 4MM.
3. ISMC 75 SHALL BE AS PER IS 2062: 1992.
4. WELDING SHALL BE DONE AS PER IS 816: 1969.
5. DIMENSION 'D' TO SUIT ELEVATION OF TRAY AS GIVEN ON CABLE TRAY LAYOUT DRAWING.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY CEILING MOUNTED SINGLE SUPPORT

Size A3 | Scale NTS | Sheet 17 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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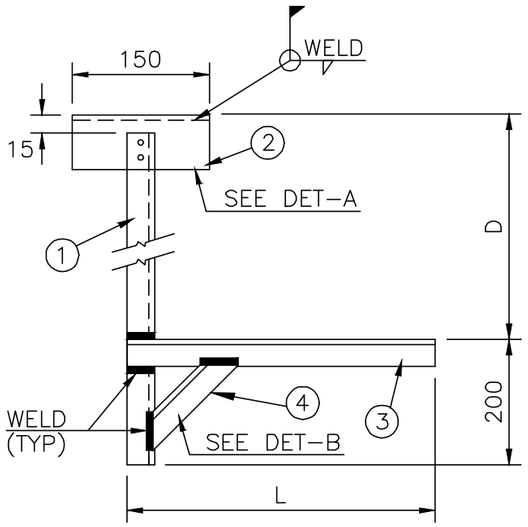
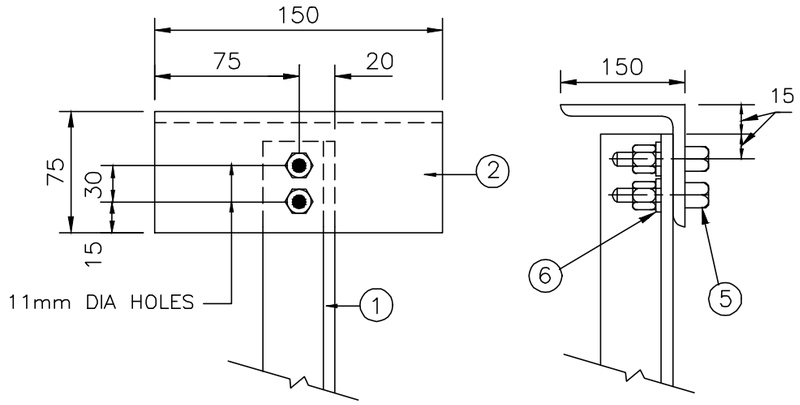
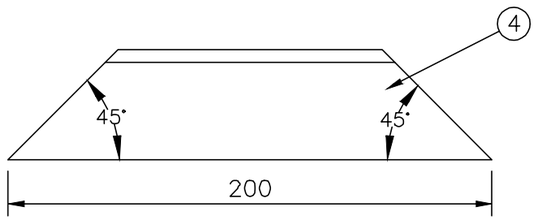


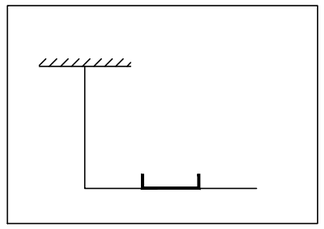
ELEVATION



DETAIL-A



DETAIL-B



TYPE-2B

TABLE-1

TRAY WIDTH	L	REMARKS
100	200	
150	250	
300	400	
450	550	
600	700	

TABLE-2

ITEM NO	DESCRIPTION	LENGTH MM	QTY No.	REMARKS
①	ISA 50x50x6	D+200	1	FOR 'D' REF.NOTE.4
②	ISA 75x50x6	150	1	
③	ISA 50x50x6	L	1	FOR 'L' REF.TABLE-1
④	ISA 50x50x6	200	1	ONLY FOR 600MM TRAY
⑤	BOLT/NUT(M10)	30	2	
⑥	SPRING WASHER (M10)	–	2	

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. FULL LENGTH FILLET WELD WITH RETURNED ENDS TO BE MINIMUM 4MM.
3. DIMENSION 'D' TO SUIT ELEVATION OF THE TRAY AS GIVEN ON CABLE TRAY LAYOUT DRAWING.
4. STRUCTURAL STEEL SHALL BE AS PER IS 2062: 1992.
5. NUTS AND BOLTS SHALL BE AS PER IS 1363 (PART-1,2,3): 1992/IS 1367(PART-5): 1980.
6. WASHERS SHALL BE AS PER IS 2016: 1967.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY CEILING MOUNTED SINGLE SUPPORT

Size A3 | Scale NTS | Sheet 18 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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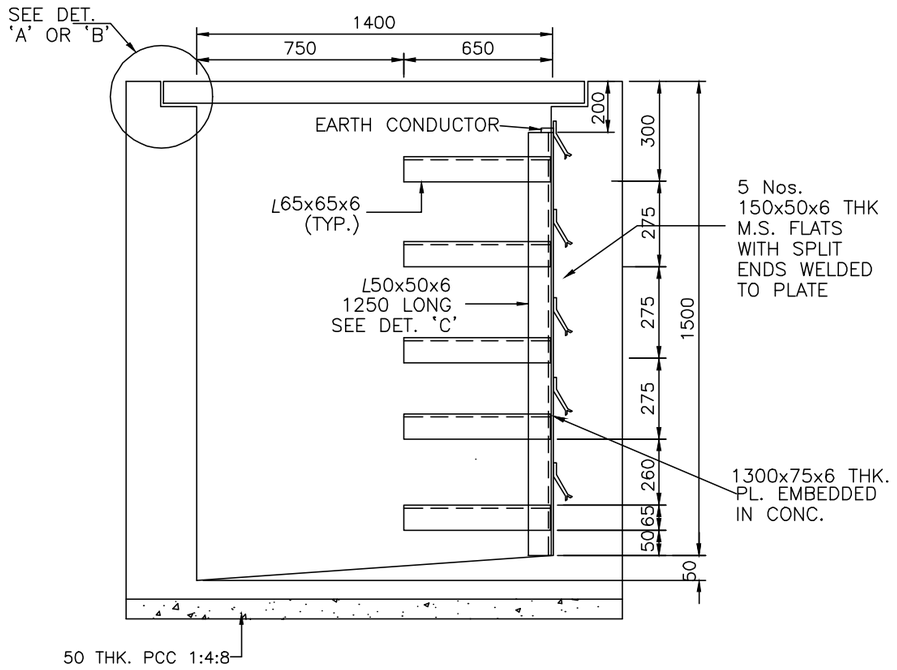
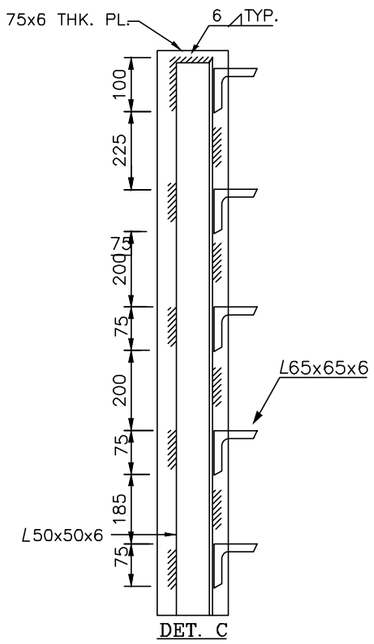
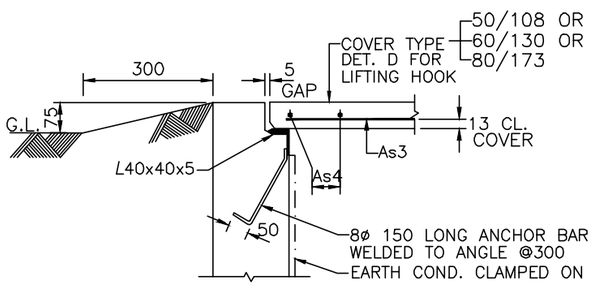
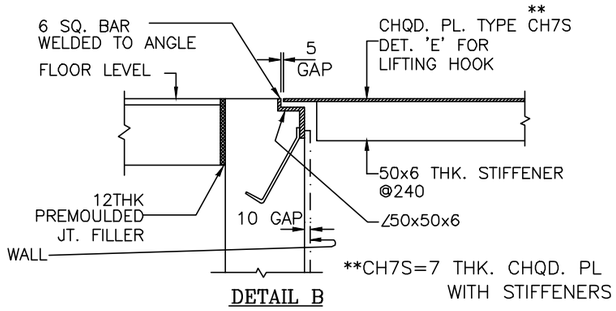




DET. C



DETAIL A



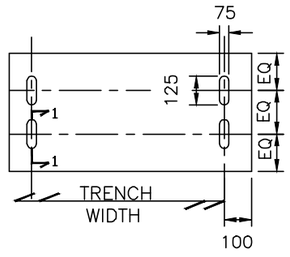
DETAIL B

**CH7S=7 THK. CHQD. PL WITH STIFFENERS

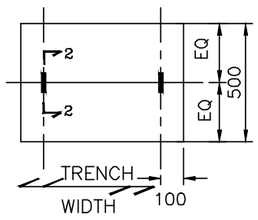
*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/108	50	7–6ø	10–6ø
60/130	60	6–8ø	8–8ø
80/173	80	5–8ø	8–8ø

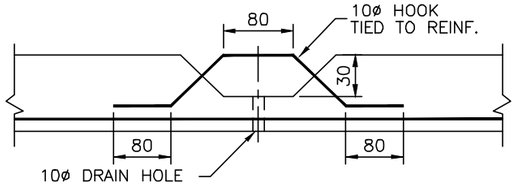
60x130 MEANS 60mm. THK.x130 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



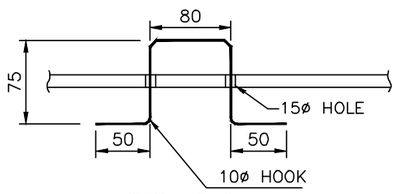
PLAN



PLAN



SECT. 1–1
DETAIL D



SECT. 2–2
DETAIL E

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRENCH TYPE - 1415

Size	Scale	Sheet
A3	NTS	19 of 62

Drawing No. GGNG-E-20714-3010 | Rev. 0

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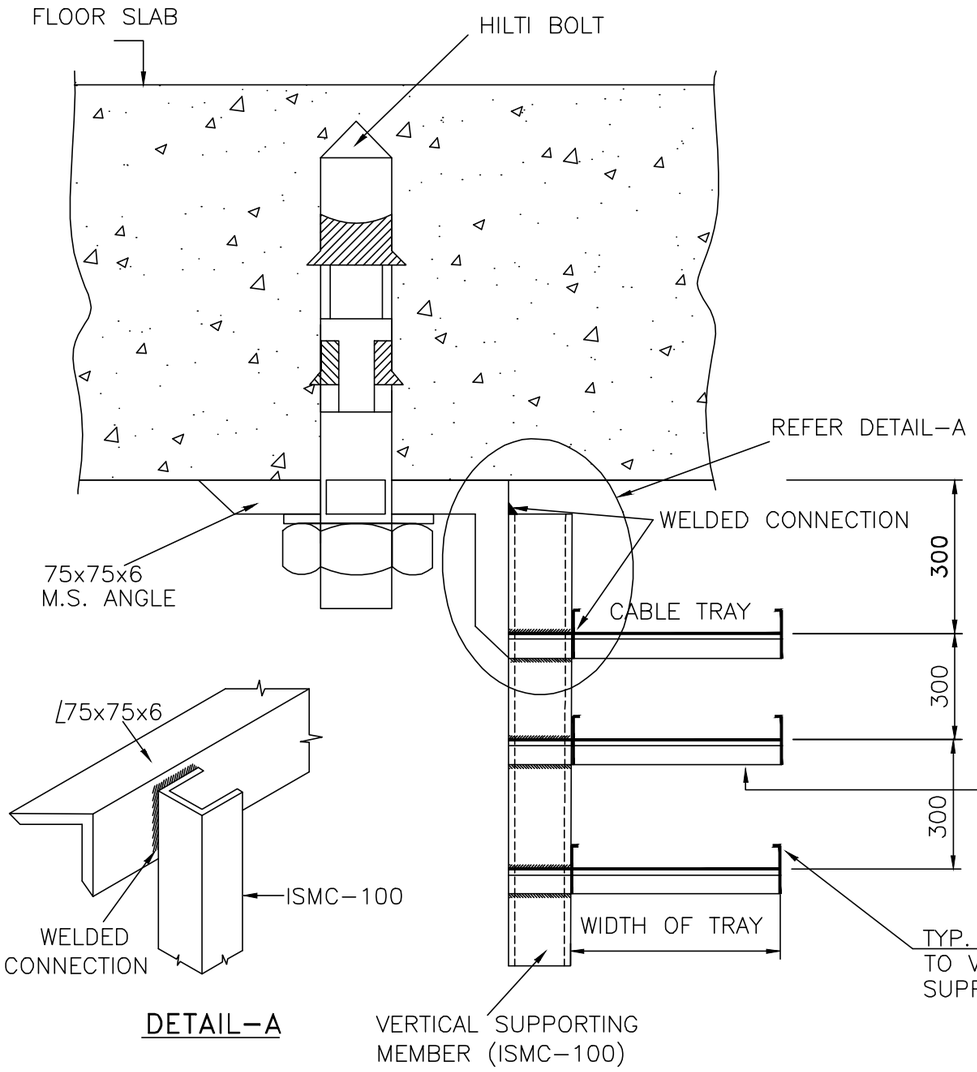
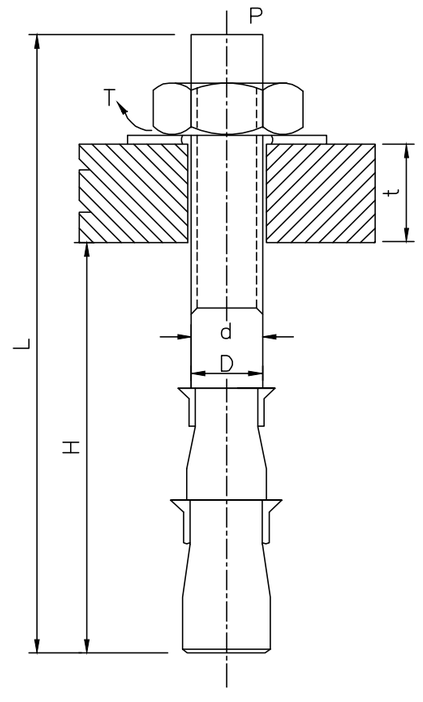


DETAIL–A



HILTI BOLT

HILTI BOLT DETAILS

SIZE	BOLT DIA (D) mm	BOLT LENGTH (L) mm)	DRILL DIA (d) mm	DEPTH OF HOLE (H) mm	FIXING HEIGHT (t) mm	MAXIMUM PULLOUT LOAD (P) Kg	TORQUE AT SF–4 (T) Kg.f.m.
M10x90	10(3/8")	90	10	45	25	1620	0.81
M10x150	12(1/2")	150	13	80	40	2700	1.62

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. BOLT SIZE M10x90 SHALL BE USED FOR TOTAL WEIGHT (INCLUDING CABLES, CABLE TRAY ACCESSORIES) UP TO 200 Kgs/METER AND M10x150 SHALL BE USED FOR TOTAL WEIGHT ABOVE 200 Kgs/METER AND UP TO 500 Kgs/METER.
3. STRUCTURAL STEEL SHALL BE AS PER IS 2062: 1992.
4. WELDING SHALL BE DONE AS PER IS 816: 1969.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY MOUNTING ARRANGEMENT CTMH (TYPE-A2)

Size: A3 | Scale: NTS | Sheet: 20 of 62
Drawing No.: GGNG-E-20714-3010 | Rev.: 0

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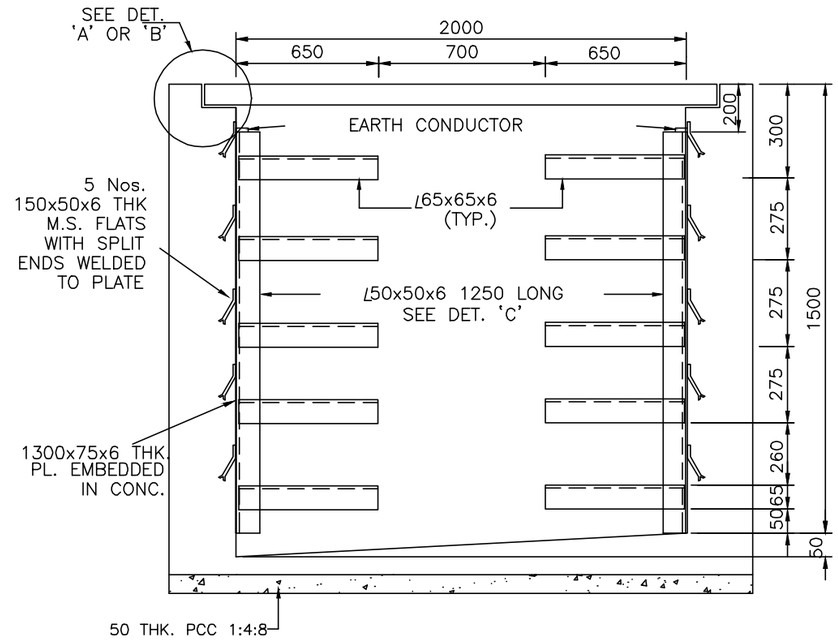
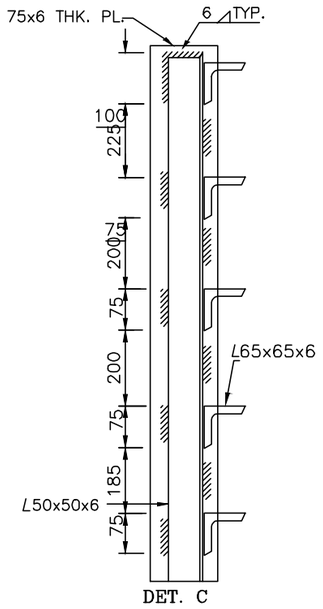
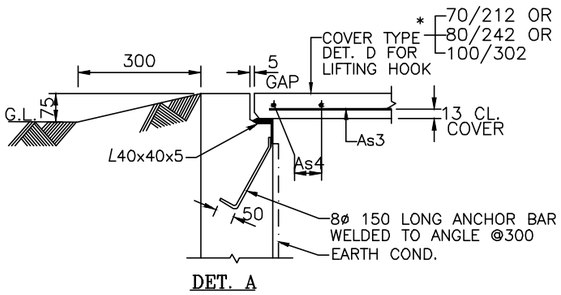
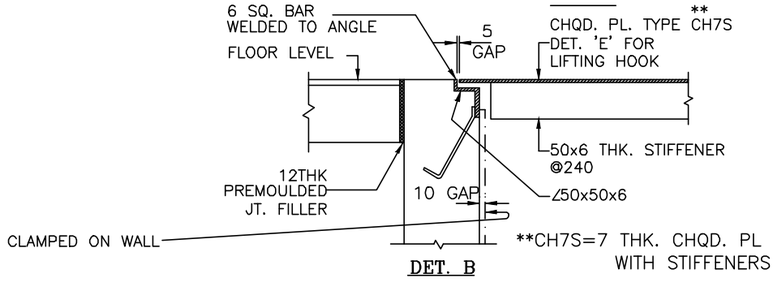




DET. C

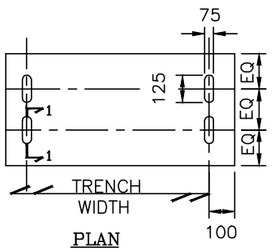


DET. A



DET. B

**CH7S=7 THK. CHQD. PL WITH STIFFENERS

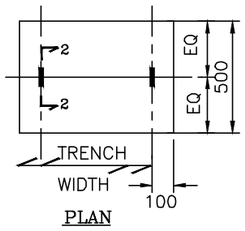


PLAN

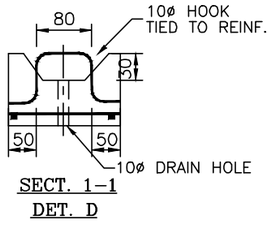
*

R C COVER TYPE	THICKNESS mm.	As3	As4
70/212	70	5–8ø	11–8ø
80/242	80	5–8ø	11–8ø
100/302	100	6–8ø	11–8ø

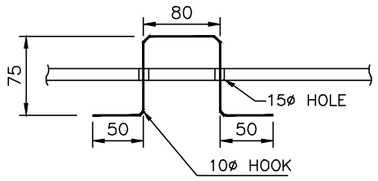
70x130 MEANS 70mm. THK.x212 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10.0m LENGTH OF TRENCH.



PLAN



SECT. 1–1
DET. D



SECT. 2–2
DET. E

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRENCH TYPE - 2015

Size A3 | Scale NTS | Sheet 21 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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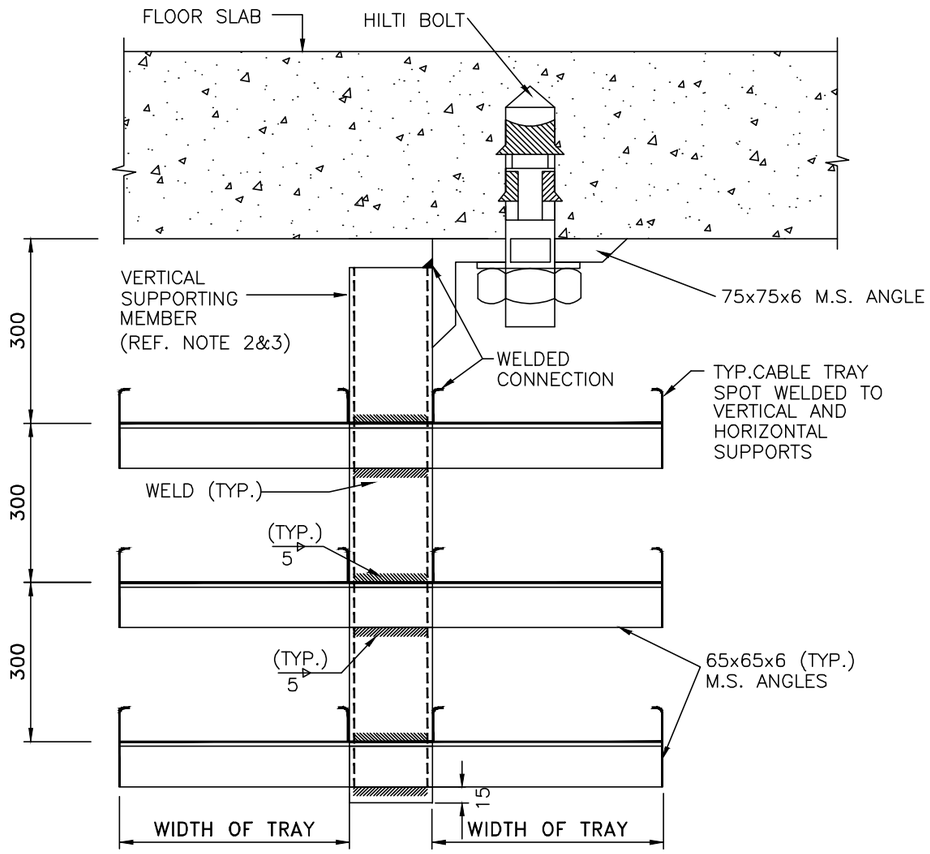

DRAWING TYPICAL FOR CTMH–T3

HILTI BOLT DETAILS

SIZE	BOLT DIA (D) mm	BOLT LENGTH (L) mm)	DRILL DIA (d) mm	DEPTH OF HOLE (H) mm	FIXING HEIGHT (t) mm	MAXIMUM PULLOUT LOAD (P) Kg	TORQUE AT SF–4 (T) Kg.f.m.
M10x90	10(3/8")	90	10	45	25	1620	0.81
M10x150	12(1/2")	150	13	80	40	2700	1.62

SL.NO.	TYPE OF MOUNTING	NO. OF TIERS
1	CTMH–T1	1
2	CTMH–T2	2
3	CTMH–T3	3
4	CTMH–T4	4

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. ISMC 75 UP TO TWO TIERS.
3. ISMC 100 FOR MORE THAN TWO TIERS.
4. BOLT SIZE M10x90 SHALL BE USED FOR TOTAL WEIGHT (INCLUDING CABLES, CABLE TRAY ACCESSORIES) UP TO 200 Kgs/METER AND M10x150 SHALL BE USED FOR TOTAL WEIGHT ABOVE 200 Kgs/METER AND UP TO 500 Kgs/METER.
5. STRUCTURAL STEEL SHALL BE AS PER IS 2062: 1992.
6. WELDING SHALL BE DONE AS PER IS 816: 1969.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY MOUNTING ARRANGEMENT CTMH (TYPE-B2)

Size	Scale	Sheet
A3	NTS	22 of 62

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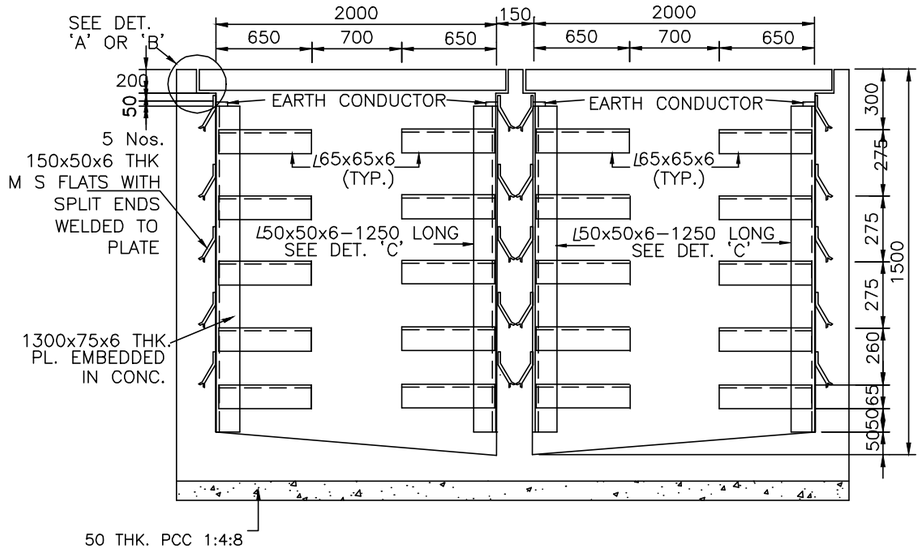
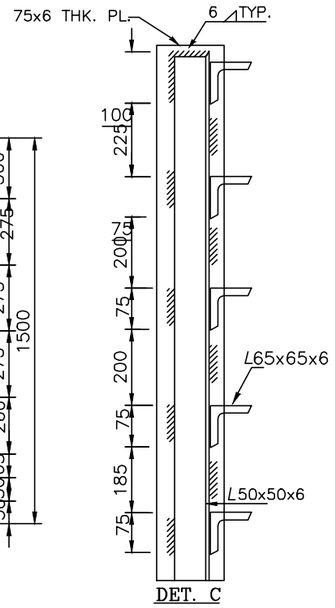
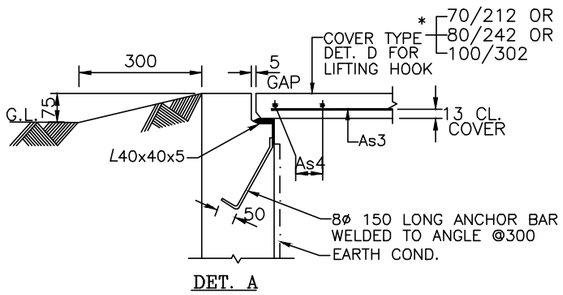
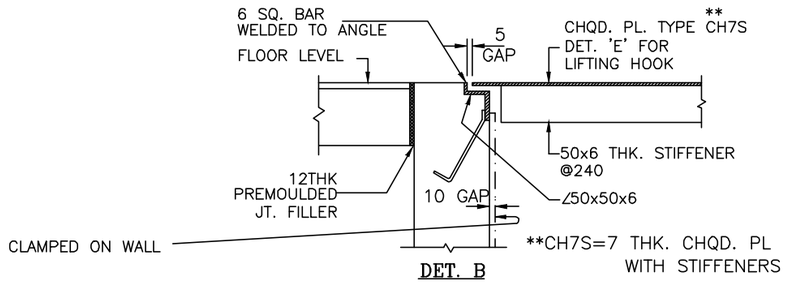




DET. C

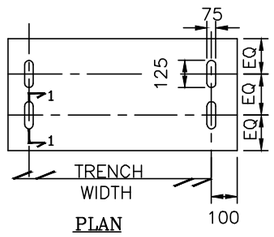


DET. A



DET. B

**CH7S=7 THK. CHQD. PL WITH STIFFENERS

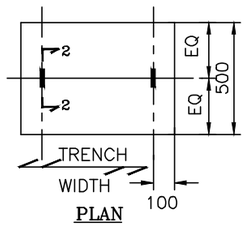


PLAN

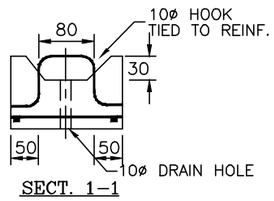
*

R C COVER TYPE	THICKNESS mm.	As3	As4
70/212	70	5–8ø	11–8ø
80/242	80	5–8ø	11–8ø
100/302	100	6–8ø	11–8ø

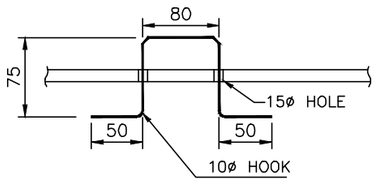
70x212 MEANS 70mm. THK.x212 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



PLAN



SECT. 1–1
DET. D



SECT. 2–2
DET. E

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRENCH TYPE 2/2013

Size	Scale	Sheet
A3	NTS	23 of 62

Drawing No. GGNG-E-20714-3010 Rev. 0

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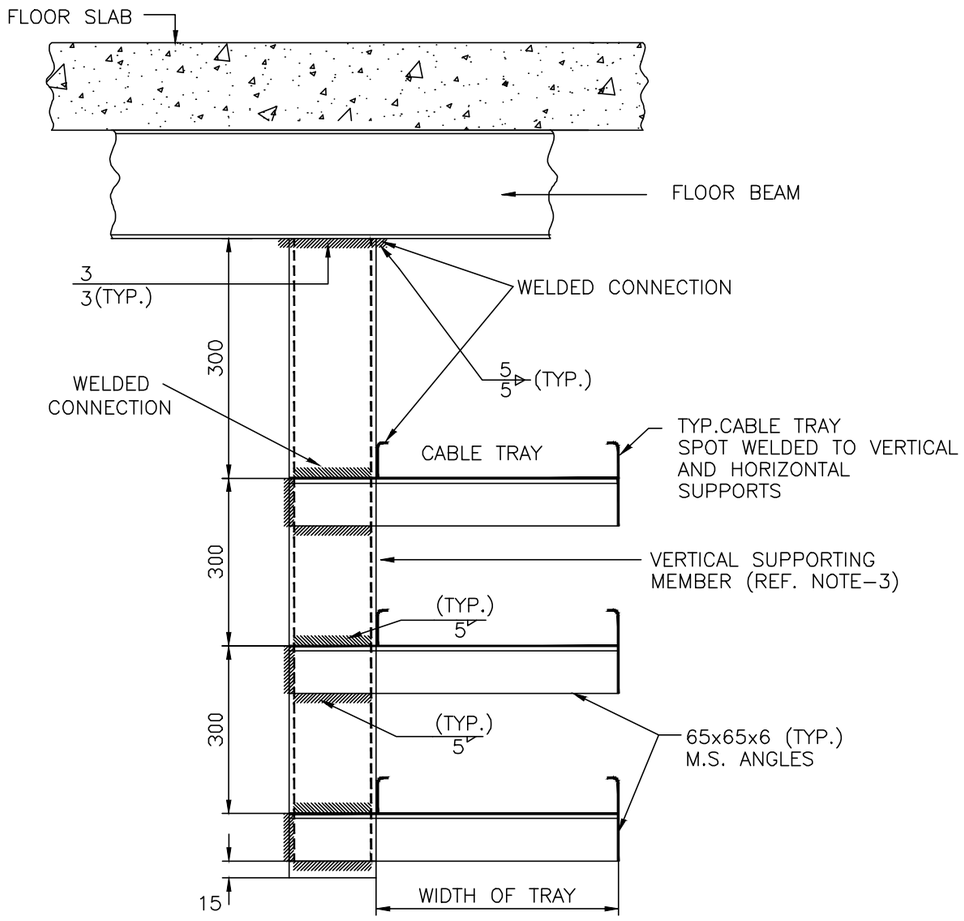

DRAWING TYPICAL FOR CTMH–T3

SL.NO.	TYPE OF MOUNTING	NO. OF TIERS
1	CTMH–T1	1
2	CTMH–T2	2
3	CTMH–T3	3
4	CTMH–T4	4

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. 75x75x6 M.S. ANGLE FOR ONE TIER.
3. ISMC 100 FOR MORE THAN ONE TIER.
4. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992.
5. WELDING SHALL BE DONE AS PER IS 816: 1969.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY MOUNTING ARRANGEMENT CTMH (TYPE-C)

Size	Scale	Sheet	Rev.
A3	NTS	24 of 62	0

Drawing No. GGNG-E-20714-3010

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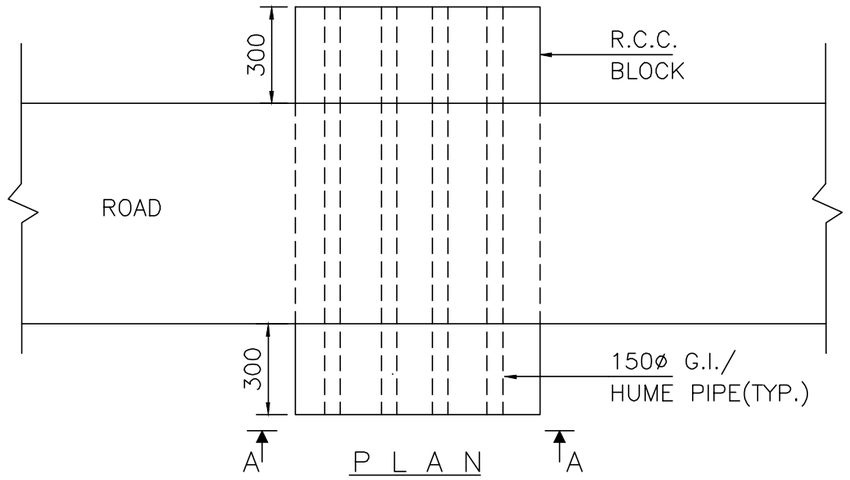

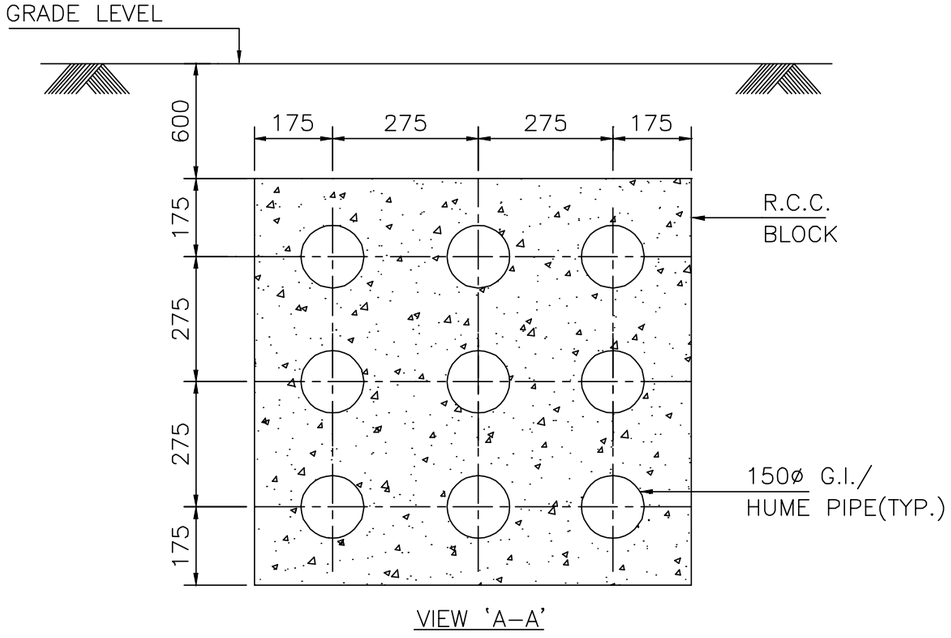

VIEW 'A–A'

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. R.C.C. BLOCK SHALL BE PROVIDED AT A MINIMUM DEPTH OF 600mm FROM THE GRADE LEVEL AND SHALL BE EXTENDED BY 300mm ON EITHER SIDES OF THE ROAD UNLESS OTHERWISE SPECIFIED.
3. G.I./HUME PIPE SIZES INDICATED ARE FOR INFORMATION ONLY AND EXACT SIZE AS PER PROJECT REQUIREMENT SHALL BE ADOPTED.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE INSTALLATION PRACTICE BELOW/CROSSING ROAD

Size	Scale	Sheet
A3	NTS	25 of 62

Drawing No. GGNG-E-20714-3010 | Rev. 0

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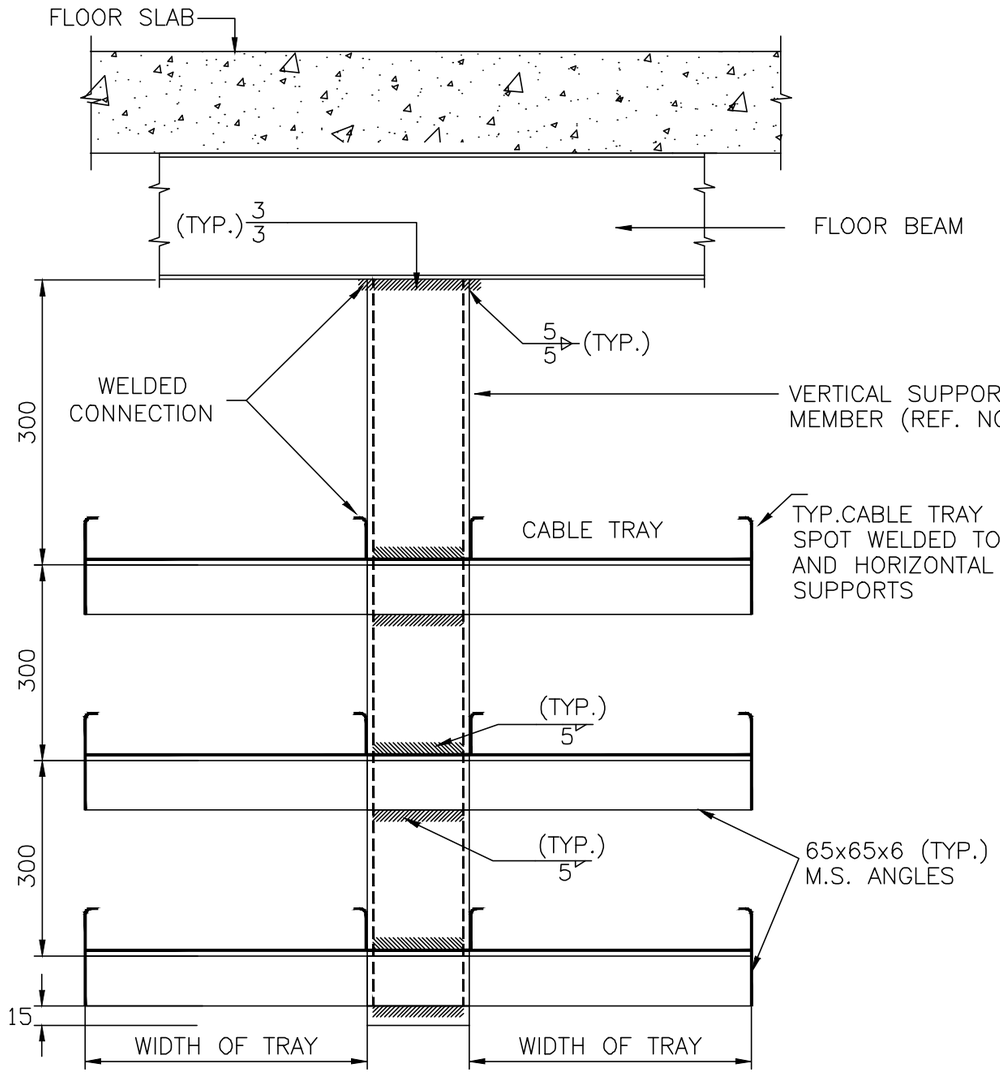

DRAWING TYPICAL FOR CTMH–T3

SR.NO.	TYPE OF MOUNTING	NO. OF TIERS
1	CTMH–T1	1
2	CTMH–T2	2
3	CTMH–T3	3
4	CTMH–T4	4

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. 75x75x6 M.S. ANGLE FOR ONE TIER.
3. ISMC 100 FOR MORE THAN TWO TIERS.
4. STRUCTURAL STEEL SHALL BE AS PER IS 2062: 1992.
5. WELDING SHALL BE DONE AS PER IS 816: 1969.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY MOUNTING ARRANGEMENT CTMH (TYPE-D)

Size	Scale	Sheet
A3	NTS	26 of 62

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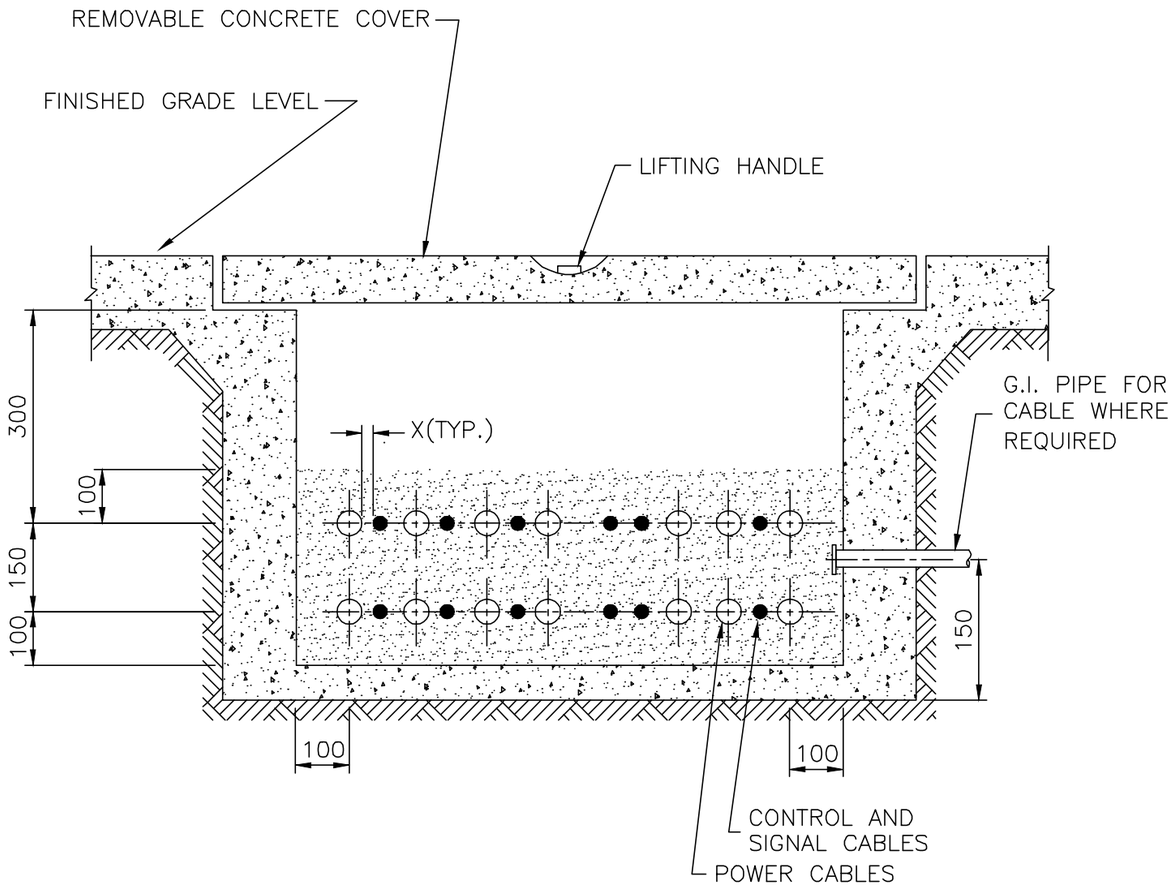

X – OVERAL DIAMETER OF THE BIGGER OF THE TWO CABLES

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. LEAVE SPACE FOR LATER ADDITION OF AT LEAST 2 CABLES AND 15% AVERAGE SPARE SPACE REGARDLESS OF FUTURE EXTENSION.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLES DIRECTLY BURRIED IN TRENCH (IN PAVED AREA)

Size	Scale	Sheet
A3	NTS	27 of 62

Drawing No. GGNG-E-20714-3010 | Rev. 0

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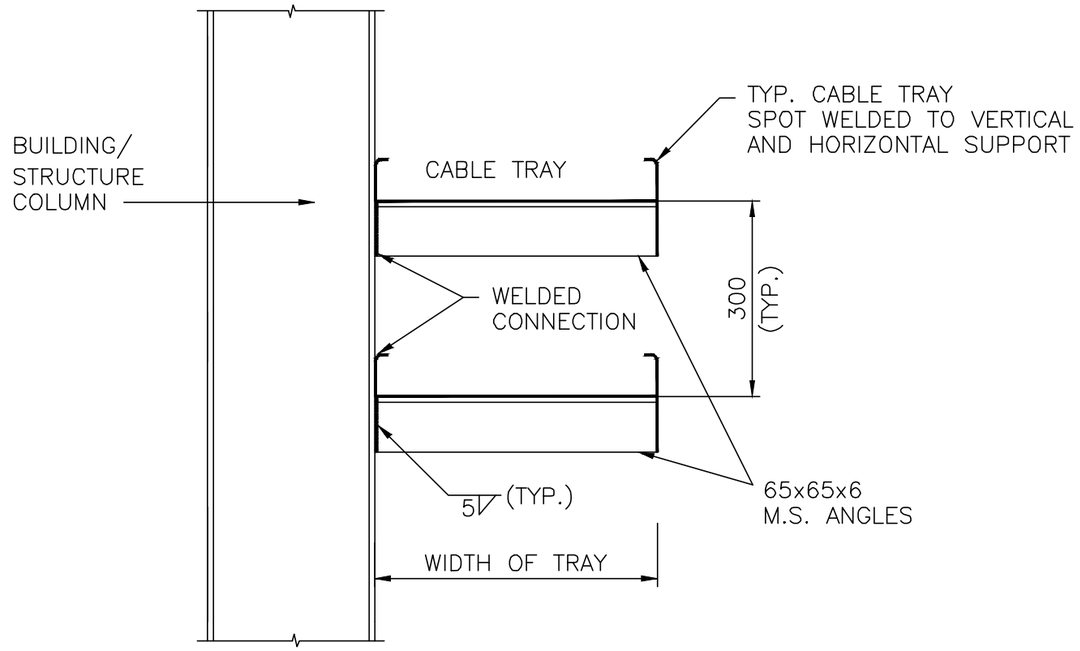

DRAWING TYPICAL FOR CTMH–T2

SR.NO.	TYPE OF MOUNTING	NO. OF TIERS
1	CTMH–T1	1
2	CTMH–T2	2
3	CTMH–T3	3
4	CTMH–T4	4

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062: 1992.
3. WELDING SHALL BE DONE AS PER IS 816: 1969.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY MOUNTING ARRANGEMENT CTMH (TYPE-E)

Size A3 | Scale NTS | Sheet 28 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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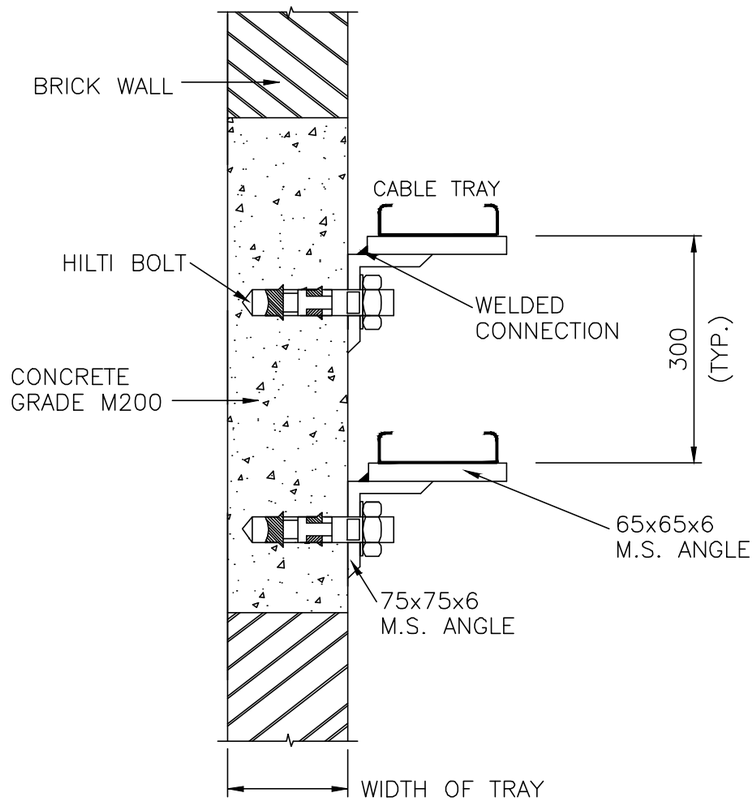

DRAWING TYPICAL FOR CTMH–T2

HILTI BOLT DETAILS

SIZE	BOLT DIA (D) mm	BOLT LENGTH (L) mm)	DRILL DIA (d) mm	DEPTH OF HOLE (H) mm	FIXING HEIGHT (t) mm	MAXIMUM PULLOUT LOAD (P) Kg	TORQUE AT SF–4 (T) Kg.f.m.
M10x90	10(3/8")	90	10	45	25	1620	0.81
M10x150	12(1/2")	150	13	80	40	2700	1.62

SL. NO.	TYPE OF MOUNTING	NO. OF TIERS
1	CTMH–T1	1
2	CTMH–T2	2

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. BOLT SIZE M10x90 SHALL BE USED FOR TOTAL WEIGHT (INCLUDING CABLES, CABLE TRAY ACCESSORIES) UP TO 200 Kgs/METER AND M10x150 SHALL BE USED FOR TOTAL WEIGHT ABOVE 100 Kgs/METER AND UP TO 500 Kgs/METER.
3. STRUCTURAL STEEL SHALL BE AS PER IS 2062: 1992.
4. WELDING SHALL BE DONE AS PER IS 816: 1969.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY MOUNTING ARRANGEMENT CTMH (TYPE-F2)

Size	Scale	Sheet
A3	NTS	29 of 62

Drawing No. GGNG-E-20714-3010 | Rev. 0

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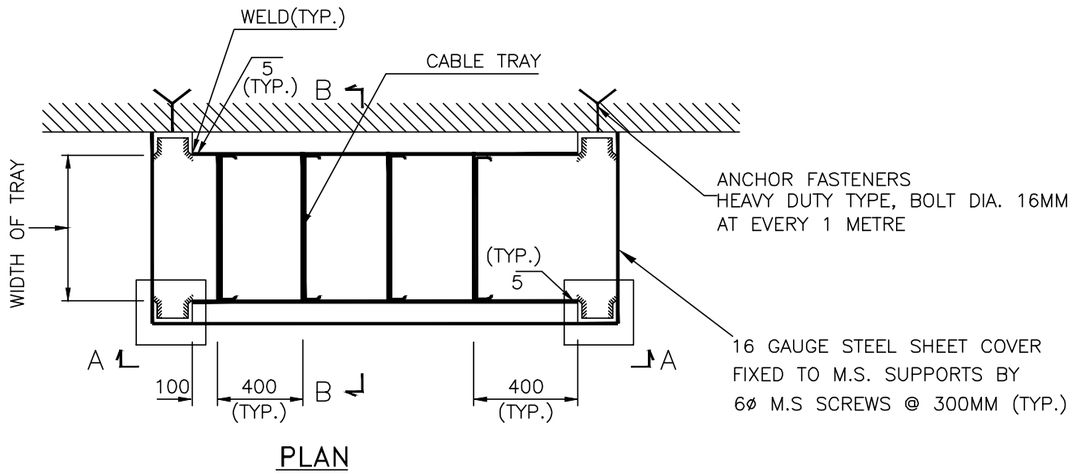
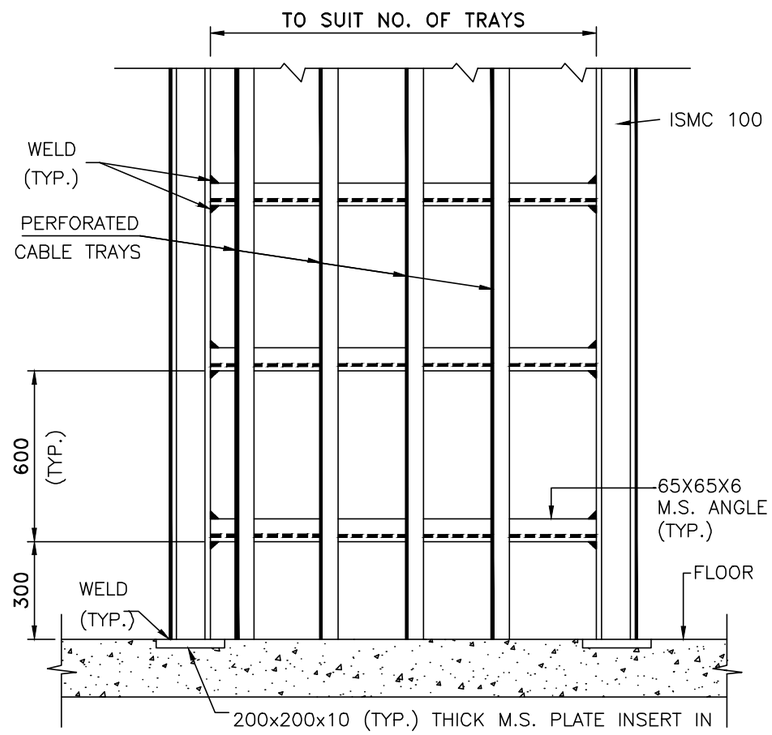
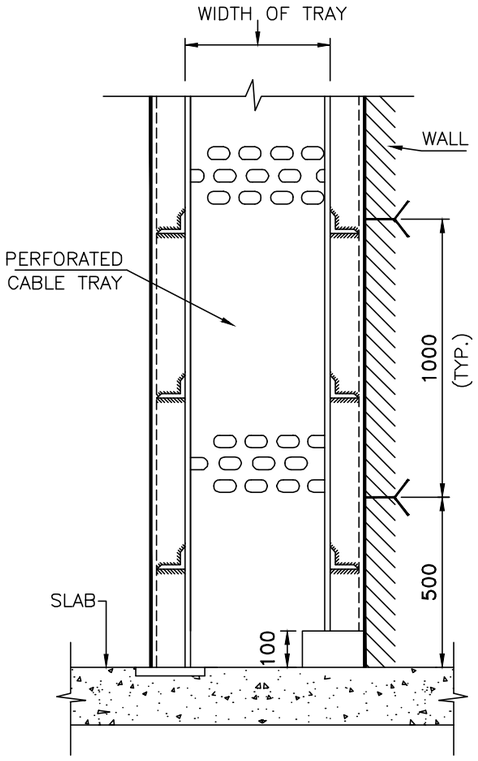


PLAN



SECTION A–A



SECTION B–B

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. NUMBER OF TRAYS WILL BE AS PER REQUIREMENT.
3. FOR OUTDOOR USE, THE VERTICAL SUPPORTS TO BE SUITABLY GROUTED IN CONCRETE FOUNDATION OR WELDED TO AVAILABLE STEEL STRUCTURES.
4. STRUCTURAL STEEL SHALL BE AS PER IS 2062: 1992.
5. WELDING SHALL BE DONE AS PER IS 816: 1969.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY MOUNTING ARRANGEMENT CTMV (TYPE-A)

Size	Scale	Sheet
A3	NTS	30 of 62

Drawing No. GGNG-E-20714-3010 Rev. 0

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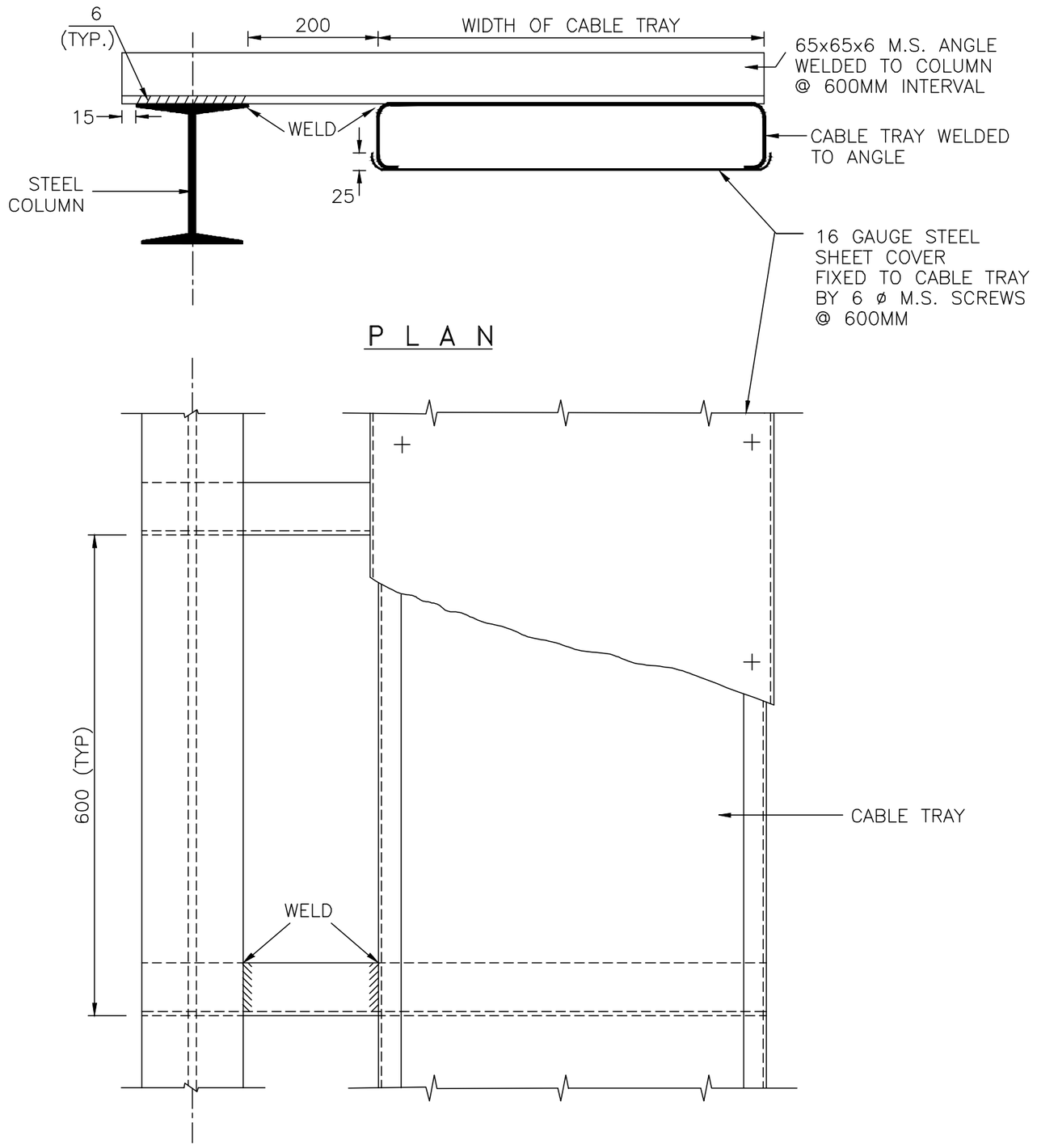

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062: 1992.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY MOUNTING ARRANGEMENT CTMV (TYPE-B)

Size	Scale	Sheet	Drawing No.	Rev.
A3	NTS	31 of 62	GGNG-E-20714-3010	0

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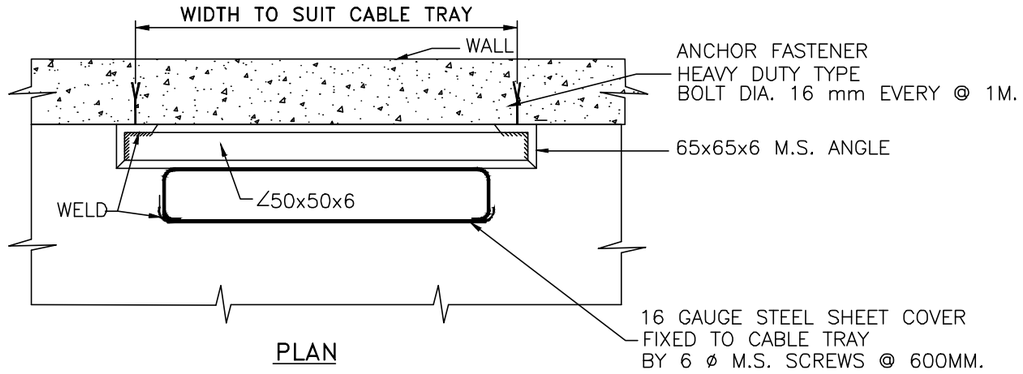
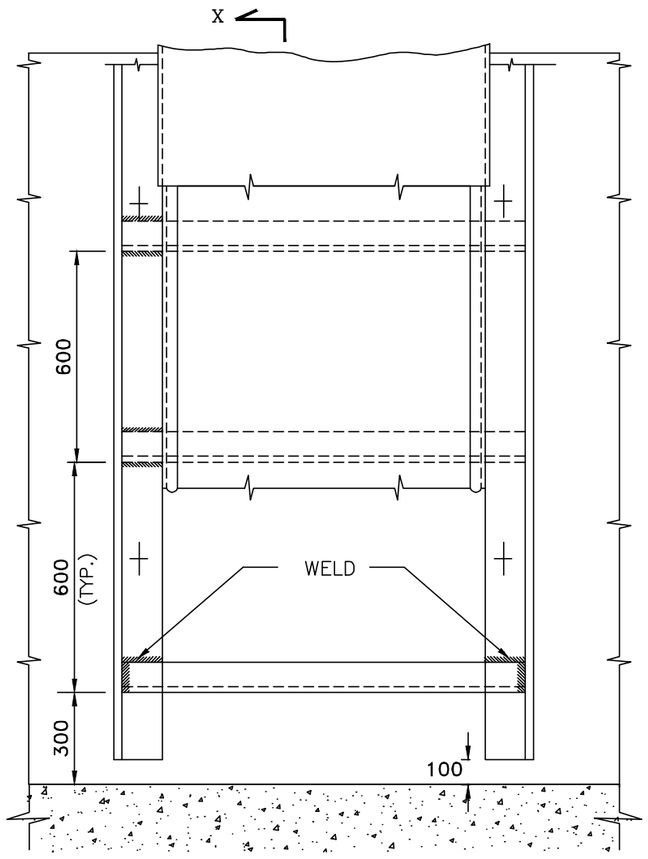
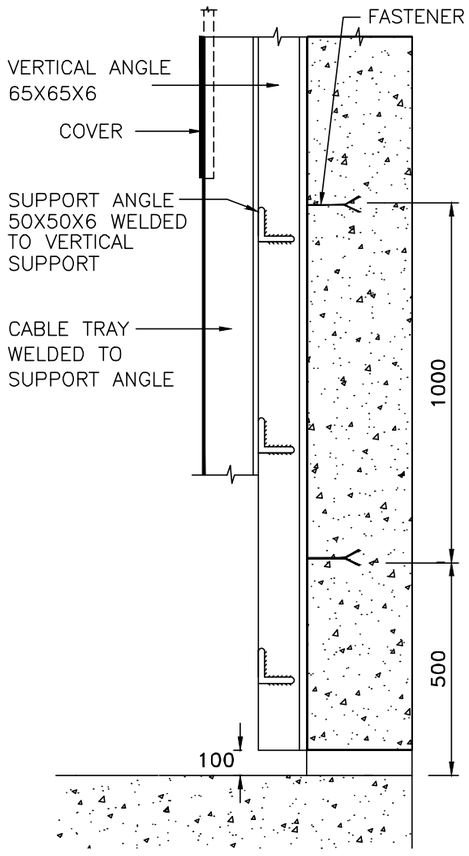


PLAN



X ELEVATION



SECTION X–X

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. NUMBER OF TRAYS WILL BE AS PER REQUIREMENT.
3. FOR OUTDOOR USE, THE VERTICAL SUPPORTS TO BE SUITABLY GROUTED IN CONCRETE FOUNDATION OR WELDED TO AVAILABLE STEEL STRUCTURES.
4. STRUCTURAL STEEL SHALL BE AS PER IS 2062: 1992.
5. WELDING SHALL BE DONE AS PER IS 816: 1969.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY MOUNTING ARRANGEMENT CTMV (TYPE-C)

Size	Scale	Sheet
A3	NTS	32 of 62

Drawing No. GGNG-E-20714-3010 Rev. 0

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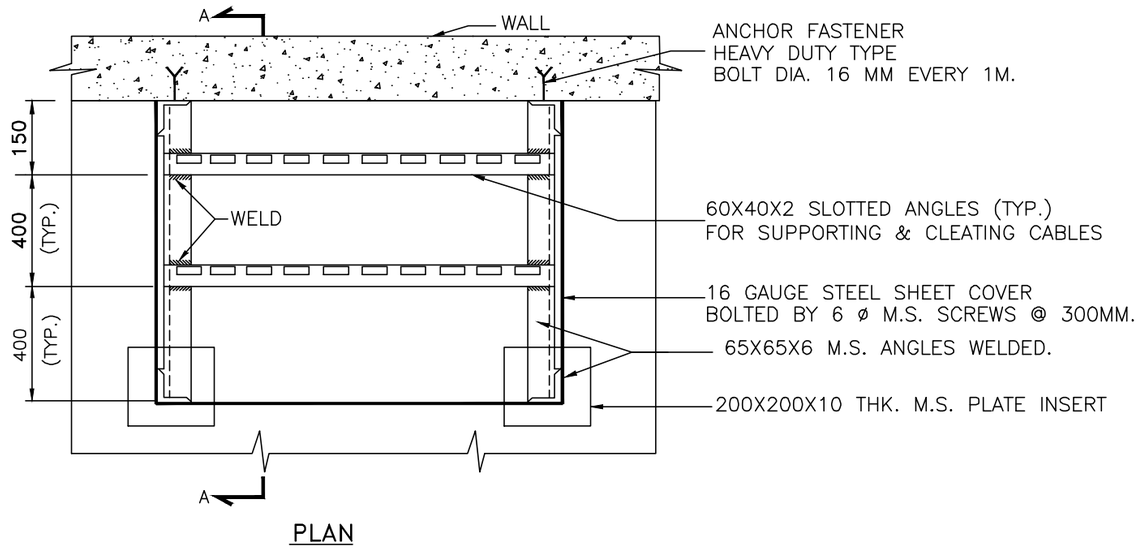
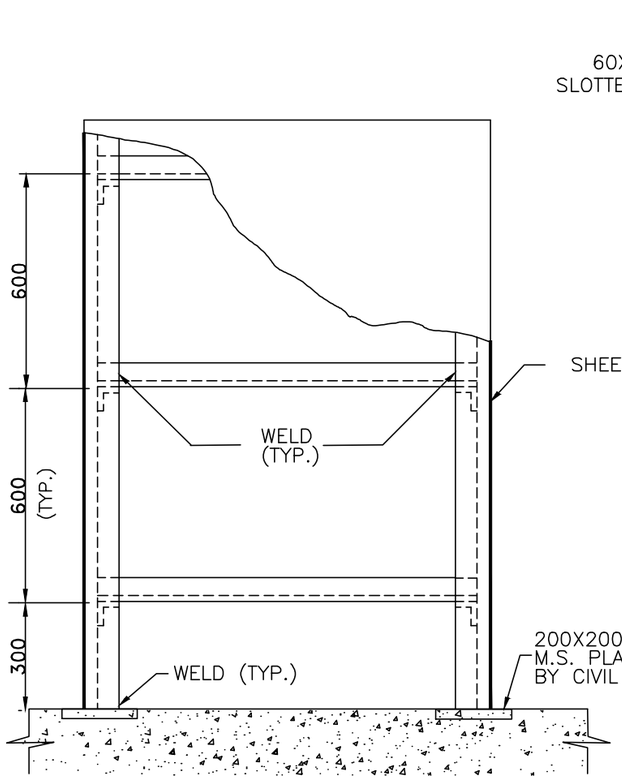
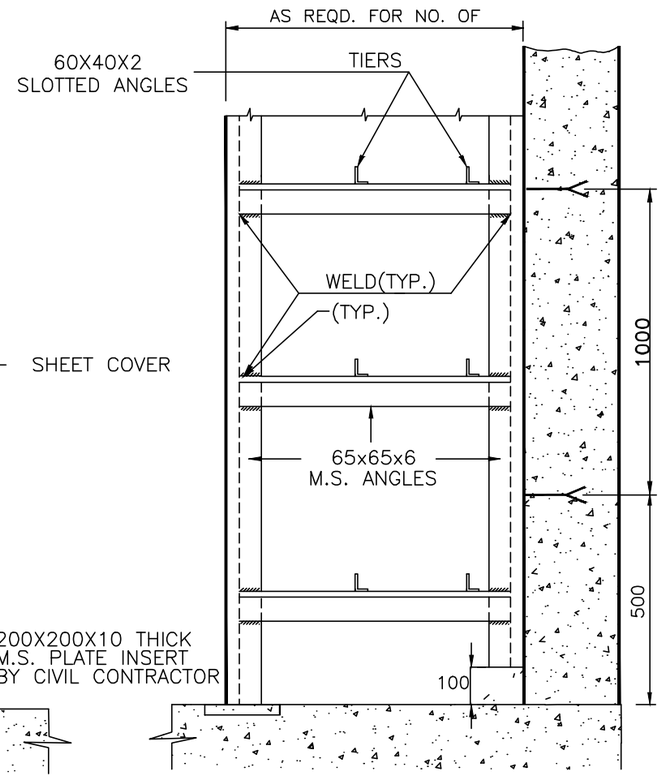


PLAN



ELEVATION



SECTION A–A

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. NUMBER OF TRAYS WILL BE AS PER REQUIREMENT.
3. FOR OUTDOOR USE, THE VERTICAL SUPPORTS TO BE SUITABLY GROUTED IN CONCRETE FOUNDATION OR WELDED TO AVAILABLE STEEL STRUCTURES.
4. STRUCTURAL STEEL SHALL BE AS PER IS 2062: 1992.
5. WELDING SHALL BE DONE AS PER IS 816: 1969.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAY MOUNTING ARRANGEMENT CTMV (TYPE-D)

Size	Scale	Sheet
A3	NTS	33 of 62

Drawing No. GGNG-E-20714-3010 | Rev. 0

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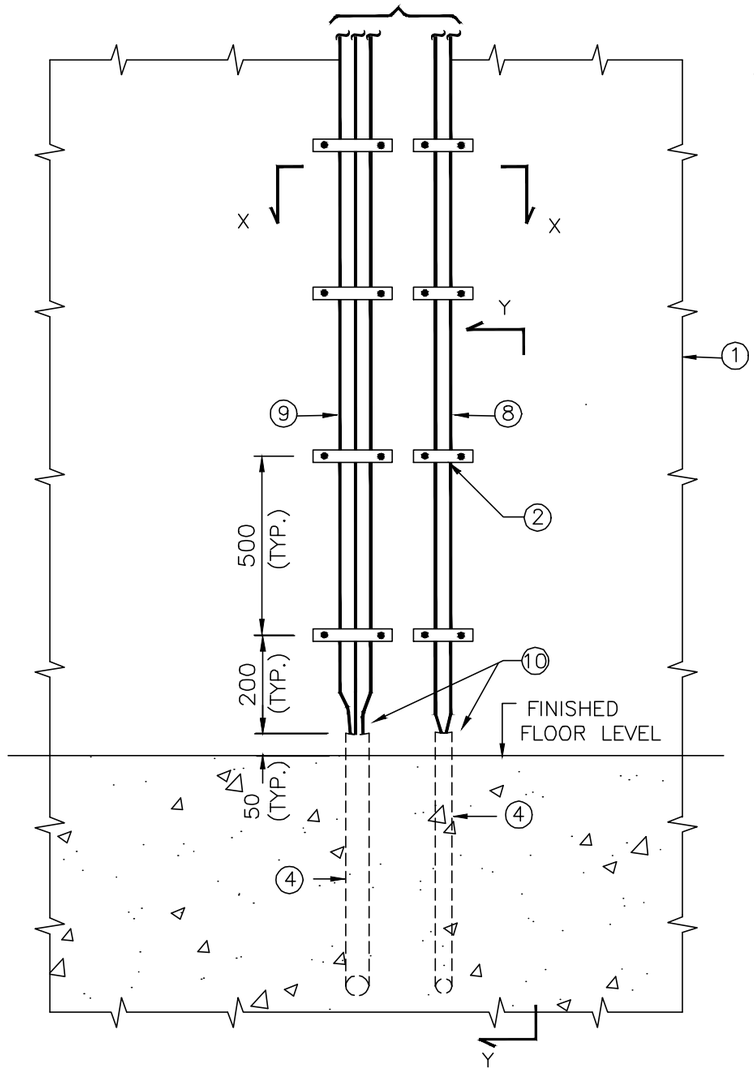
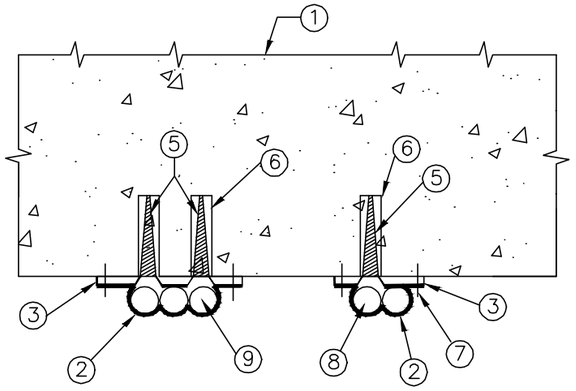
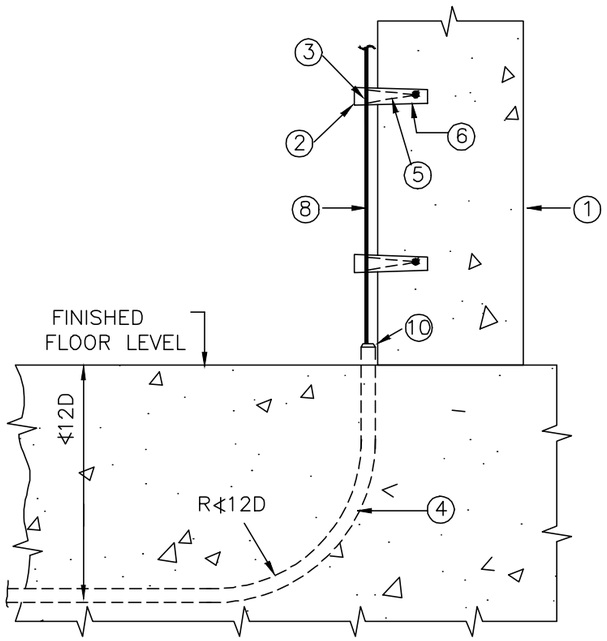




SECTION X–X



SECTION Y–Y

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. MAXIMUM 3 No. CABLES SHALL BE CLAMPED WITH ONE SADDLE. SEPARATE SADDLE SHALL BE USED FOR MORE THAN 3 CABLES.
3. POWER AND CONTROL CABLES SHALL BE CLAMPED SEPARATELY.
4. THE CONDUIT SHALL BE EXTENDED UP TO 2500 ABOVE THE FLOOR LEVEL IN CASE OF UNARMORED CABLES.

LEGEND

1. WALL/RCC STRUCTURE
2. G.I. SADDLE
3. G.I. SPACER
4. G.I. CONDUIT
5. 6ø, 35 LONG G.I. SCREW
6. RAWL PLUG
7. 3ø, 5 LONG G.I. M/C SCREW
8. CONTROL CABLE
9. POWER CABLE (LESS THAN 3Cx70MM²)
10. WATER PROOF SEALING

D – NORMAL DIAMETER OF CONDUIT

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE INSTALLATION PRACTICE ALONG WALL/RCC STRUCTURE (CABLE SIZE <3CX70mm)

Size: A3 | Scale: NTS | Sheet: 34 of 62
Drawing No.: GGNG-E-20714-3010 | Rev.: 0

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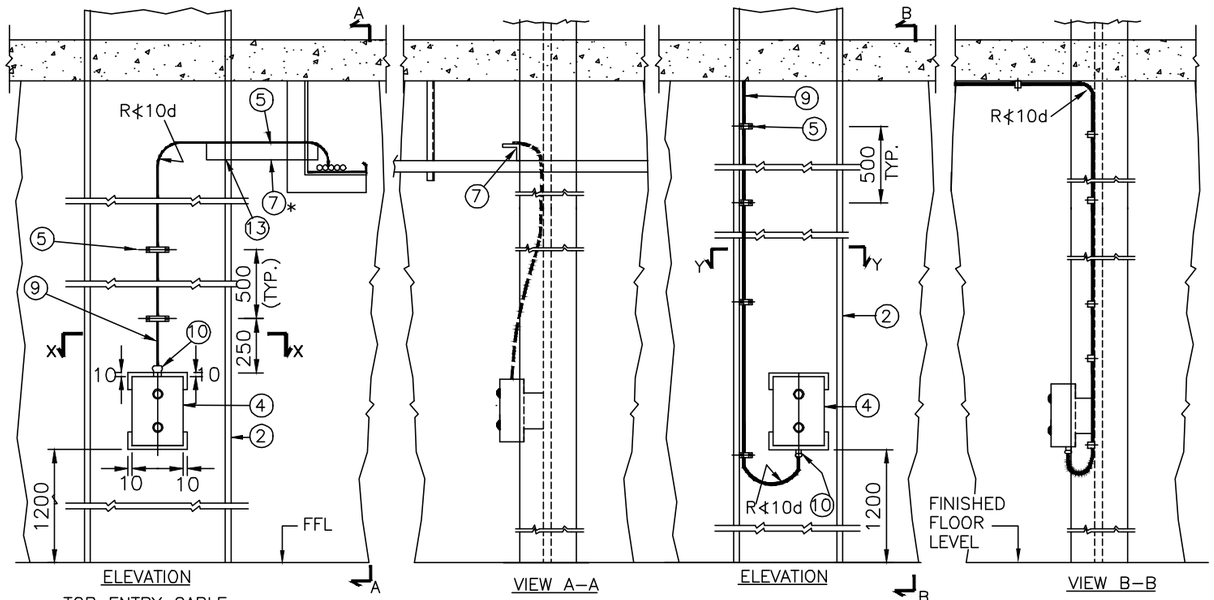
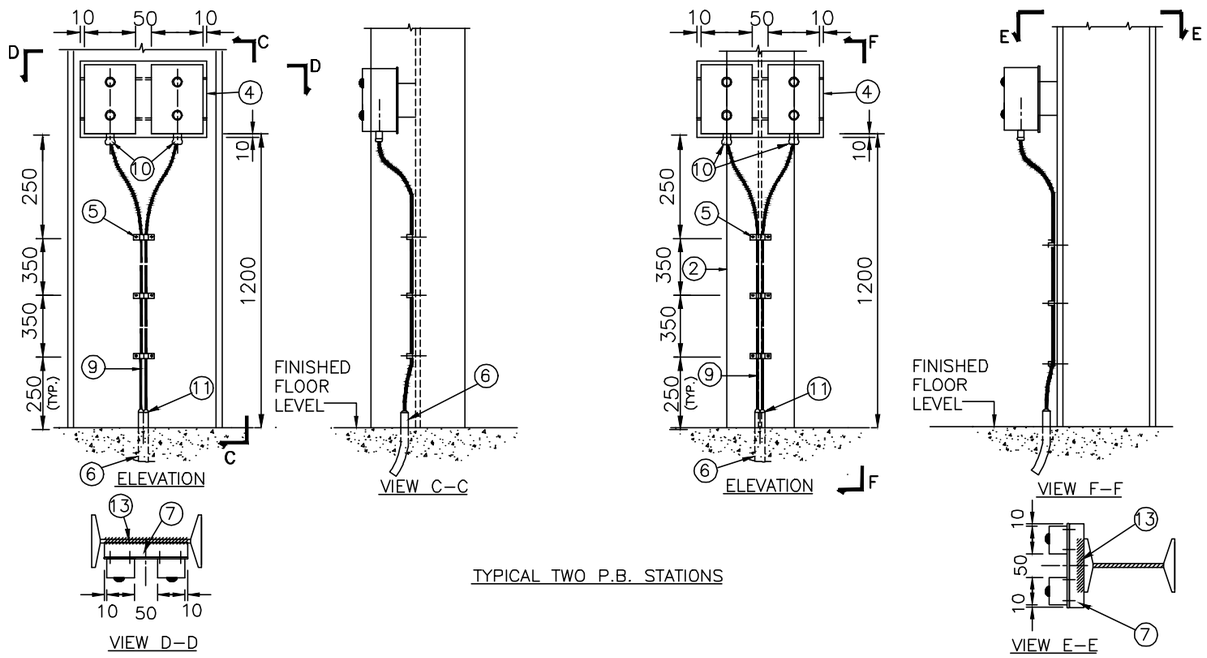


(ONLY FOR INDOOR & WHEN THERE IS NO LIKELIHOOD OF ANY LIQUID SPILLAGE)

* ITEM 7 TO BE WELDED TO COLUMN AND CABLE TRAY



TYPICAL TWO P.B. STATIONS

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
INSTALLATION OF P.B. STATION AND CABLE
(MOUNTED OF STEEL COLUMAN)

Size	Scale	Sheet	Drawing No.	Rev.
A3	NTS	35 of 62	GGNG-E-20714-3010	0

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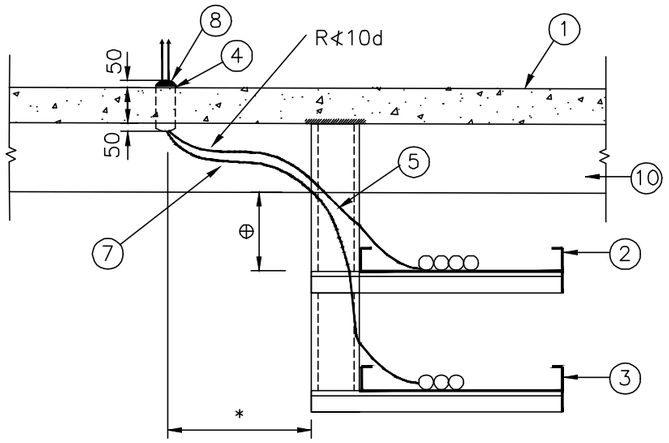
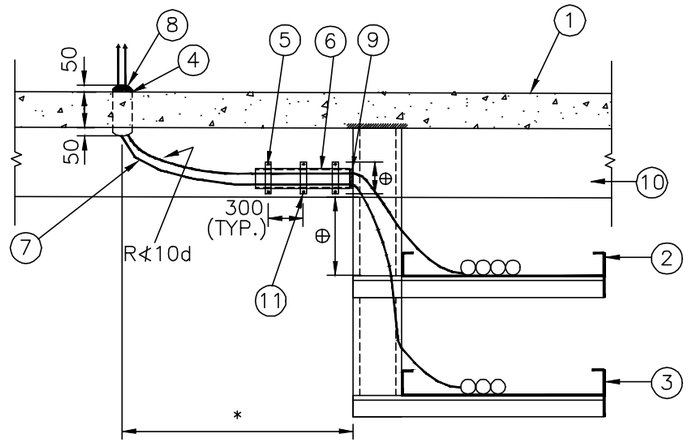


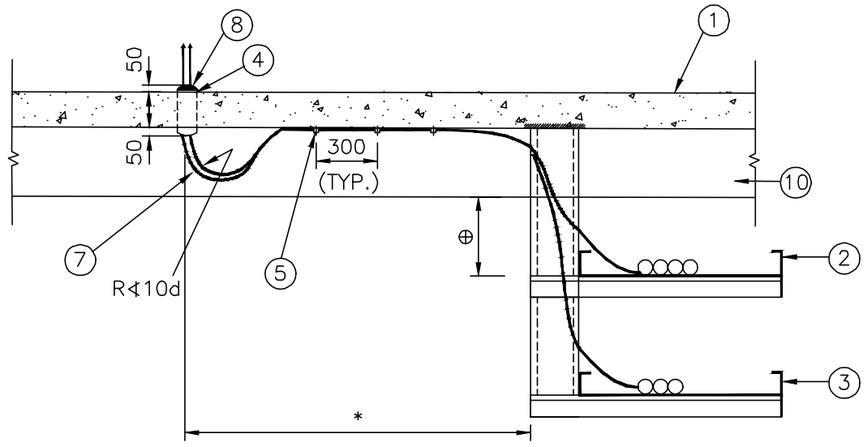
CABLE TRAY NEAR PIPE INSERT

(* = APPROX. 500)



CABLE TRAY AWAY FROM PIPE INSERT

(* ≯ 1200)



CABLE TRAY FAR AWAY FROM PIPE INSERT

(* > 1200)

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. POWER AND CONTROL CABLES SHALL BE CLAMPED SEPERATELY.
3. G.I. PIPE INSERT SHALL BE INSTALLED NEAR THE EQUIPMENT SUCH THAT THE CABLE COULD BE RAISED STRAIGHT TO THE EQUIPMENT CABLE GLAND /BOX WITHOUT ANT OFFSET.
4. ALL EMBEDDED PIPE INSERTS SHALL HAVE MINIMUM 50 LONG THREADED PROJECTION BEYOND THE EMBEDDED PART.
5. THE DIMENSION MARKED THUS ⊕SHALL BE DECIDED AT SITE. (PREFERABLY
6. THIS SHALL NOT EXCEED 500mm).
7. CABLE SHALL BE CLAMPED SUBJECT TO MINIMUM BENDING RADIUS.
8. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992.
9. WELDING SHALL BE DONE AS PER IS 816:1969.

LEGEND

(1) FLOOR SLAB
(2) POWER CABLE TRAY
(3) CONTROL CABLE TRAY
(4) G.I. PIPE INSERT
(5) SADDLE AND SPACER
(6) 50x50x6 M.S. ANGLE
(7) CABLE
(8) FIRE PROOF/WATER PROOF SEALING
(9) WELD
(10) BEAM
(11) 25 WIDE x 3 THICK M.S. FLAT WELDED TO ITEM-6

d – OVERALL DIA. OF CABLE

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE INSTALLATION PRACTICE TO
EQUIPMENTS INSTALLED ON UPPER FLOOR

Size	Scale	Sheet	Drawing No.	Rev.
A3	NTS	36 of 62	GGNG-E-20714-3010	0

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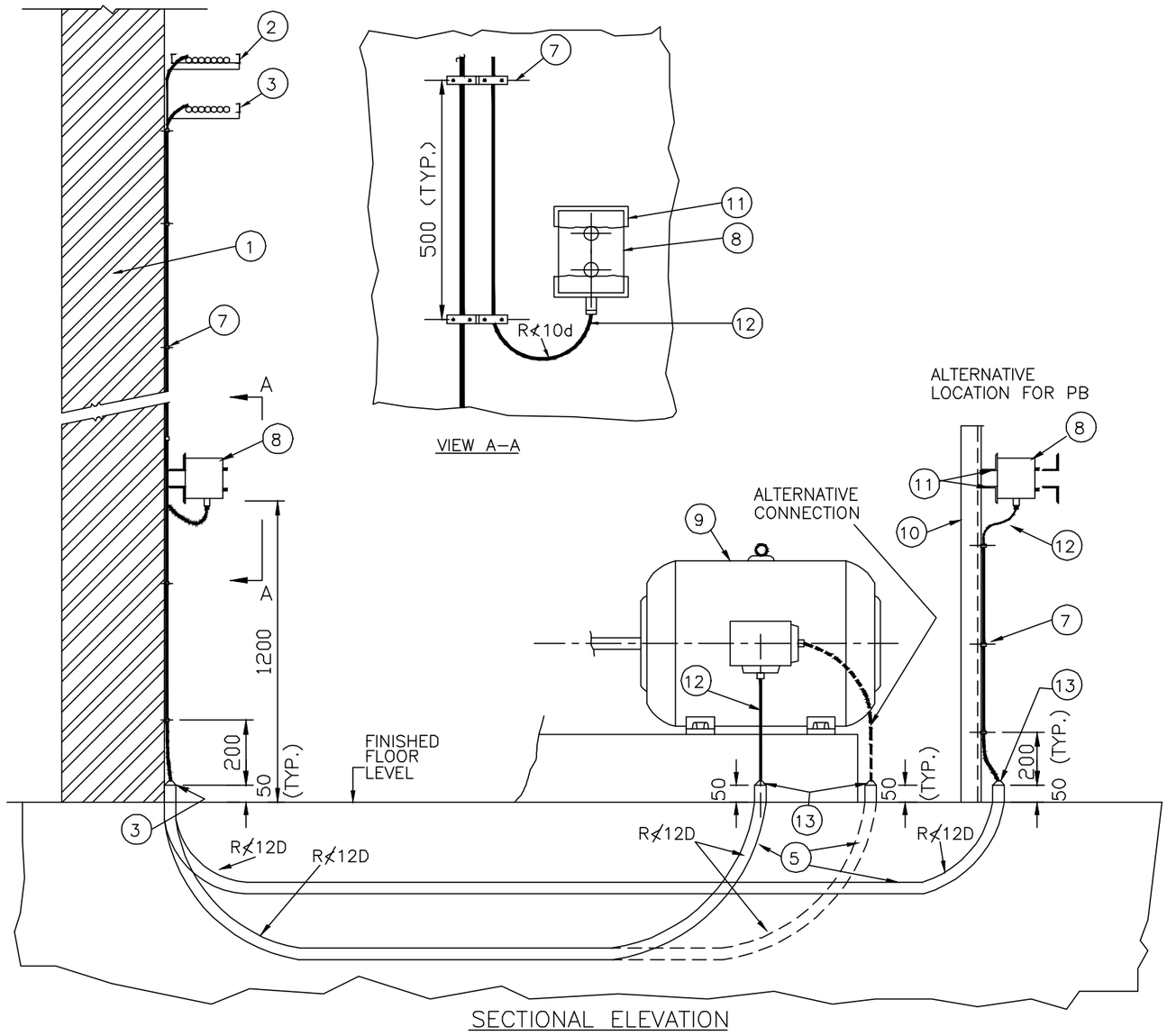

SECTIONAL ELEVATION

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. POWER AND CONTROL CABLES SHALL BE CLAMPED SEPARATELY.
3. THE CONDUIT/PIPE INSERT SHALL BE INSTALLED SUCH THAT CABLE CAN BE RAISED STRAIGHT TO THE EQUIPMENT CABLE GLAND/BOX WITHOUT ANY OFFSET.
4. CABLE SHALL BE CLAMPED/BENT SUBJECT TO MINIMUM BENDING RADIUS.
5. SEPARATE SPACE HEATER CABLE WHERE REQUIRED, SHALL BE LAID ALONG WITH THE POWER CABLE IN THE SAME CONDUIT, IF THE VOLTAGE GRADES OF THE TWO CABLES ARE SAME. OTHERWISE SEPARATE CONDUIT SHALL BE PROVIDED.
6. UNARMOURED CABLES SHALL HAVE MECHANICAL PROTECTION UPTO 2500 ABOVE FLOOR LEVEL.
7. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992.
8. CONDUITS AND ACCESSORIES SHALL CONFORM TO IS 1653:1972/IS 3837:1976.

LEGEND

(1) WALL/STEEL COLUMN
(2) POWER CABLE TRAY/RACK
(3) CONTROL CABLE TRAY/RACK
(4) CABLE TRENCH
(5) G.I. CONDUIT
(6) G.I. PIPE INSERT
(7) SADDLE AND SPACER
(8) P.B. STATION
(9) MOTOR
(10) ISMC-100
(11) 50x50x6 M.S. ANGLE
(12) CABLE IDENTIFICATION TAG
(13) WATER PROOF/FIRE PROOF SEALING
d OVERALL DIA. OF CABLE
D NOMINAL DIA. OF CONDUIT

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE INSTALLATION PRACTICE TO MOTOR AND P.B.

Size	Scale	Sheet
A3	NTS	37 of 62

Drawing No. GGNG-E-20714-3010 Rev. 0

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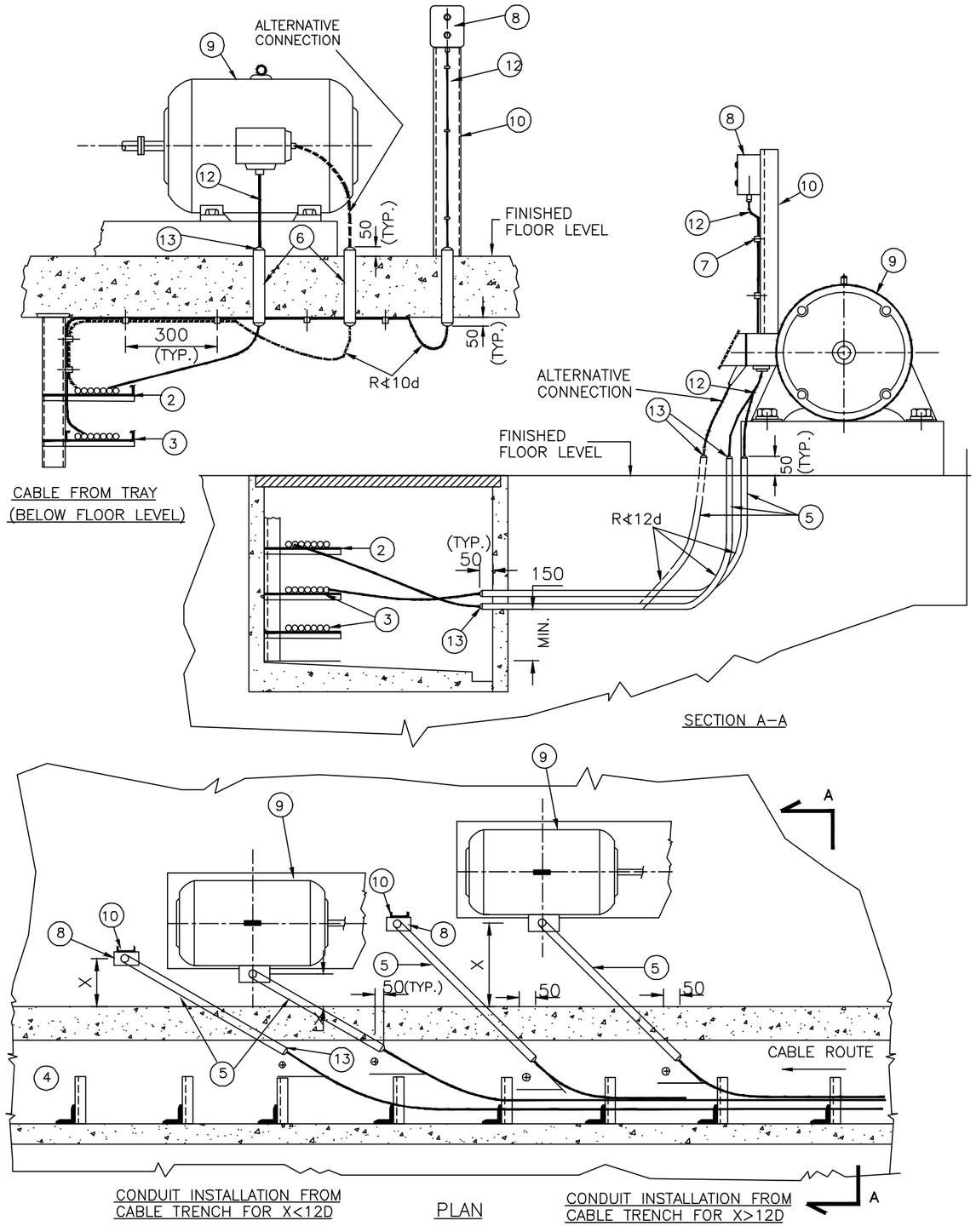

NOTES

1. FOR NOTES AND LEGEND REFER SHEET 37 OF 62.
2. THE ANGLE MARKED THUS ⊕ SHALL BE DECIDED BY SITE ENGINEER/INSTALLATION CONTRACTOR TO SUIT SITE CONDITION.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE INSTALLATION PRACTICE TO MOTOR AND P.B.

Size	Scale	Sheet
A3	NTS	38 of 62

Drawing No. GGNG-E-20714-3010 | Rev. 0

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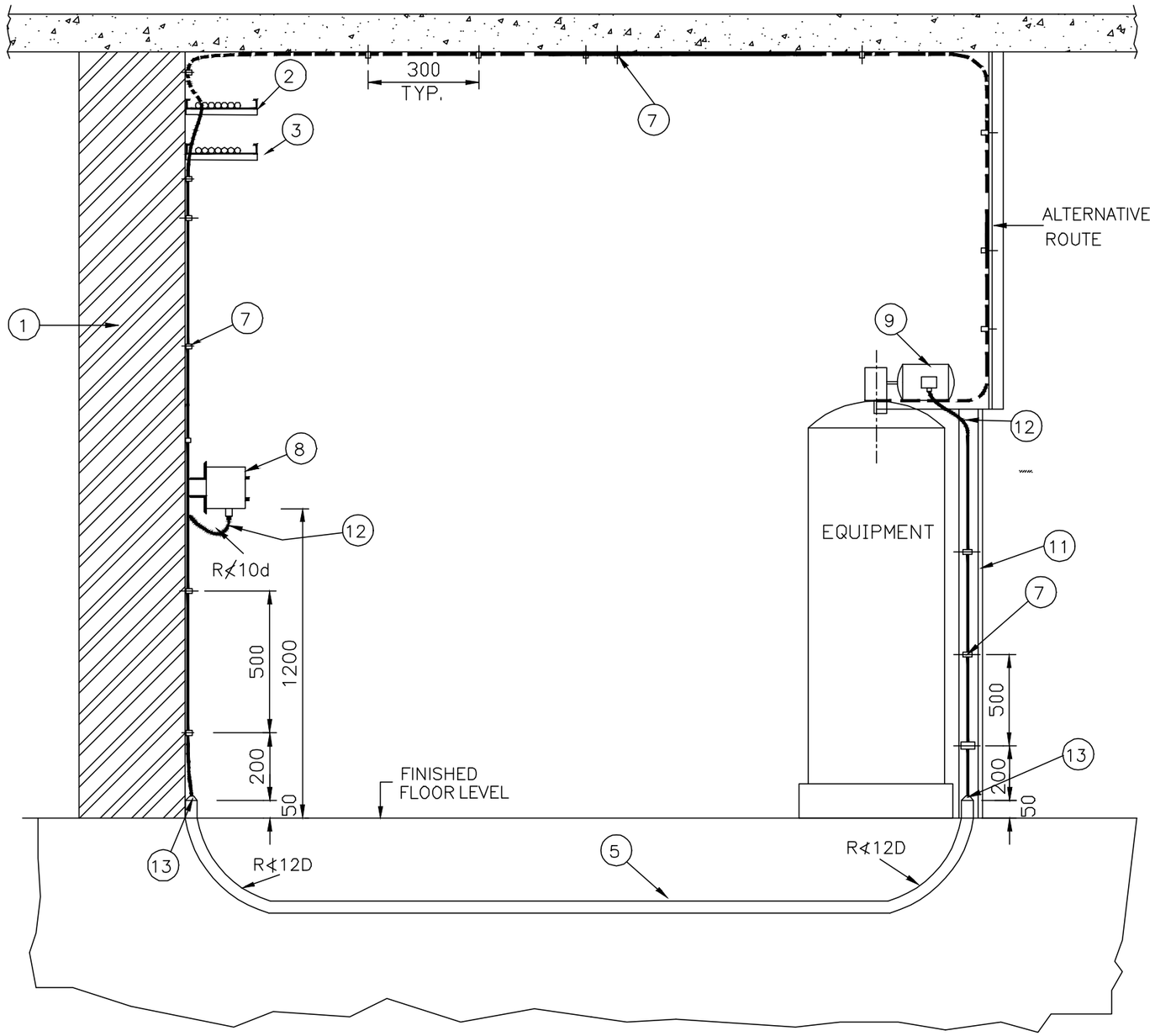

TYPICAL MOTOR MOUNTED ON EQUIPMENT

NOTES

1. FOR NOTES AND LEGEND REFER SHEET 37 OF 62.
2. 50x50x6 M.S. ANGLE SUPPORT FOR CABLE CLAMPING SHALL BE INSTALLED WITHOUT OBSTRUCTING THE PASSAGE AND ACCESSIBILITY, FOR MAINTENANCE OF EQUIPMENT. PREFERABLY THE SUPPORT SHALL BE REMOVABLE TYPE.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE INSTALLATION PRACTICE TO MOTOR AND P.B.

Size	Scale	Sheet
A3	NTS	39 of 62

Drawing No. GGNG-E-20714-3010 | Rev. 0

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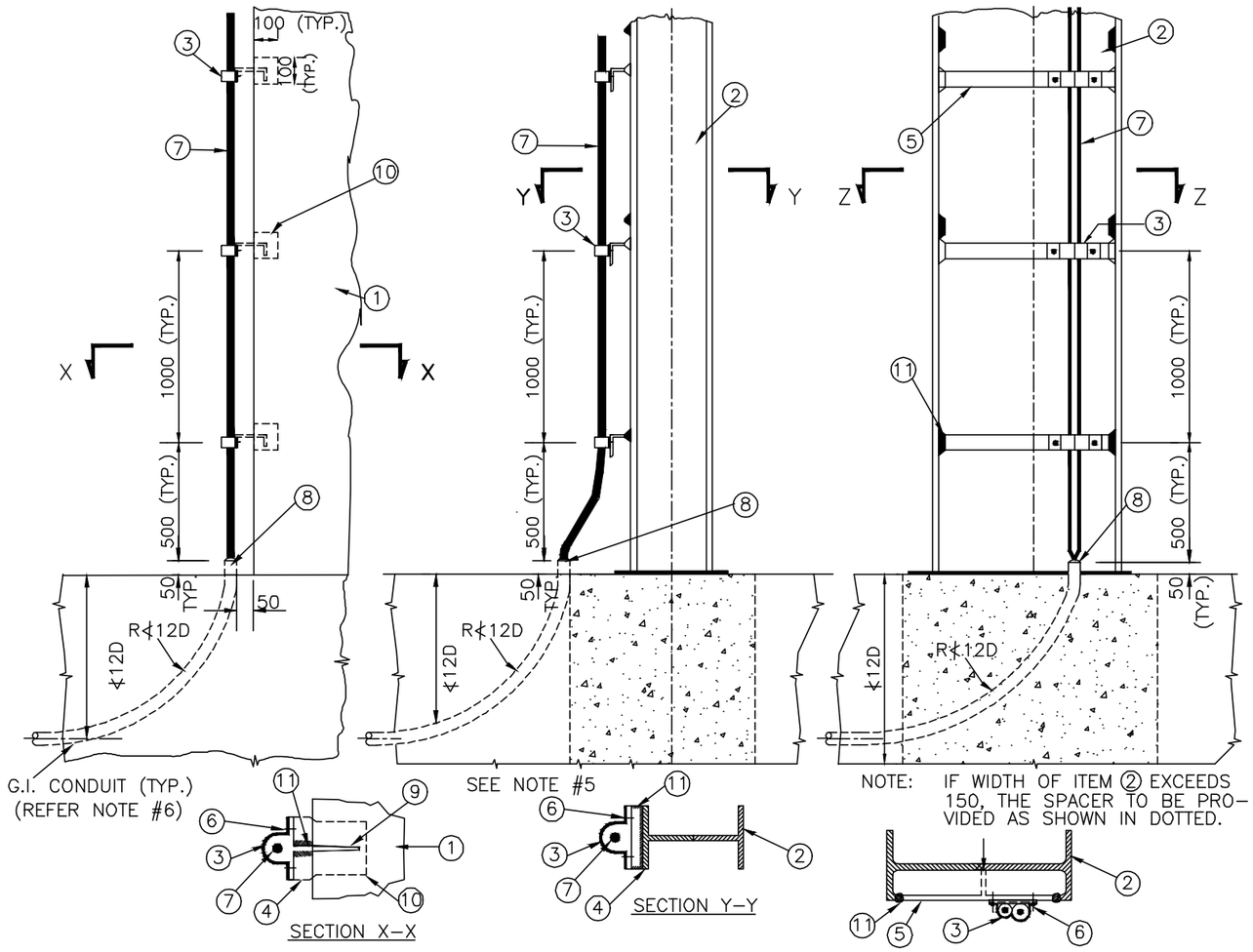

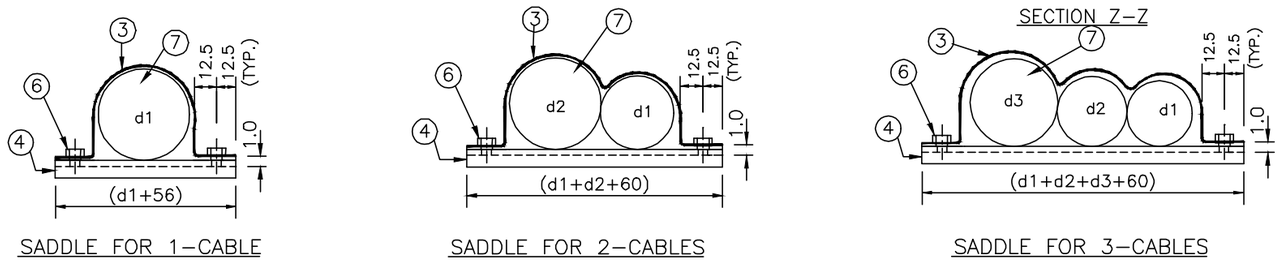

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. MAXIMUM 3NO. POWER CABLES SHALL BE CLAMPED TOGETHER.
3. CABLES OF DIFFERENT VOLTAGES SHALL BE CLAMPED SEPARATELY.
4. SINGLE CORE POWER CABLES SHALL BE CLAMPED IN TREFOIL FORMATION.
5. 2Nos.ANCHOR BARS SHALL BE USED FOR EACH ANGLE SPACER HAVING LENGTH MORE THAN 100.
6. THE CONDUIT SHALL BE EXTENDED UPTO 2500 ABOVE THE FLOOR LEVEL IN CASE OF UNARMOURED CABLES.
7. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992.
8. NUTS AND BOLTS SHALL BE AS PER IS 1363(PART–1,2,3):1992/ IS 1367(PART–5):1980.
9. WASHERS SHALL BE AS PER IS 2016:1967.
10. WELDING SHALL BE DONE AS PER IS 816:1969.

LEGEND

① WALL
② STEEL COLUMN
③ SADDLE FABRICATED FROM 25x3 G.I. FLAT
④ (50x50x6 M.S. ANGLE) SPACER
⑤ SPACER (25x6 M.S. FLAT)
⑥ 8ø,25LONG G.I. BOLT, NUT AND WASHER.
⑦ POWER CABLE (3Cx70mm AND ABOVE)
⑧ WATER PROOF SEALING
⑨ 8ø,150 LONG M.S. ANCHOR BAR
⑩ M 150 CONCRETE
⑪ WELD

d1, d2... OVERALL DIAMETER OF CABLES.
D–NOMINAL DIAMETER OF CONDUIT.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE INSTALLATION PRACTICE FOR POWER CABLES (3CX70mm AND ABOVE)

Size	Scale	Sheet	Drawing No.	Rev.
A3	NTS	40 of 62	GGNG-E-20714-3010	0

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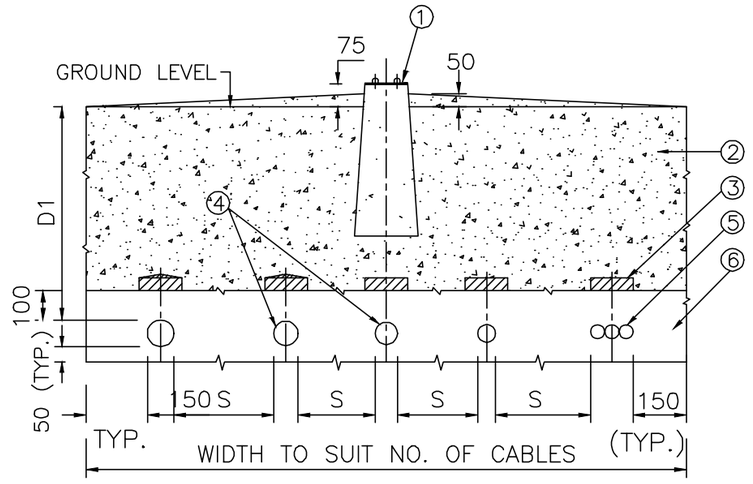
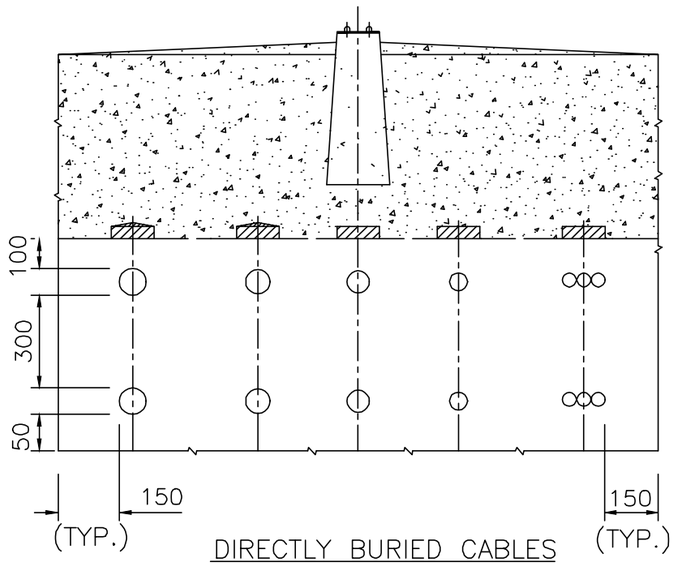


DIRECTLY BURIED CABLES
IN SINGLE LAYER



DIRECTLY BURIED CABLES
IN TWO LAYERS

DIMENSIONS (MIN.)	1100V GRADE CABLES	FOR 3.3KV TO 11KV	22KV & 33KV
D1	750	900	1050
S	⊗d —— BETWEEN CABLES OF SAME CLASS *300mm — BETWEEN CABLES OF DIFFERENT CLASS *400mm — BETWEEN 1/C POWER CABLE AND COMMUNICATION CABLE *300mm — BETWEEN MULTICORE POWER CABLE AND COMMUNICATION CABLE		

⊗d — OVERALL DIAMETER OF THE BIGGER OF THE TWO CABLES

* — SPACING SHALL BE KEPT BOTH HORIZONTALLY & VERTICALLY

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. SINGLE CORE CABLES SHALL BE RUN IN TREFOIL FORMATION AND SHALL BE BOUND BY PLASTIC TAPES OR 3 DIA NYLON CORD EVERY 750MM.
3. CABLE IDENTIFICATION TAG SHALL BE TIED AT BOTH ENDS OF THE CABLE AND ALSO AT AN INTERVAL OF 15 METRES.
4. IF THE MINIMUM CLEARANCE AS INDICATED IN THE ABOVE TABLE FOR CABLES OF DIFFERENT CLASSES ARE NOT FEASIBLE, BRICK BARRIERS SHALL BE USED BETWEEN ADJACENT CABLES.
5. G.I./HUME PIPE SHALL BE PROVIDED FOR ROAD CROSSING AT A MINIMUM DEPTH OF 600 FROM THE GRADE LEVEL UNLESS OTHERWISE SPECIFIED.

LEGEND

① CABLE ROUTE MARKER
② EARTH BACK FILLED & RAMMED
③ PROTECTIVE COVERS, AS PER APPENDIX–C OF IS:1255
   a) EARTHENWARE FOR LOW VOLTAGE CABLES.
   b) RCC FOR HIGH VOLTAGE CABLES, WITH HOLE AT EACH END TO TIE THEM TO EACH OTHER WITH G.I. WIRE.
④ POWER CABLE
⑤ CONTROL CABLE
⑥ FINE SAND/RIDDLED SOIL COMPACTED.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
INSTALLATION PRACTICE FOR DIRECTLY BURRIED CABLES

Size	Scale	Sheet
A3	NTS	41 of 62

Drawing No. GGNG-E-20714-3010 | Rev. 0

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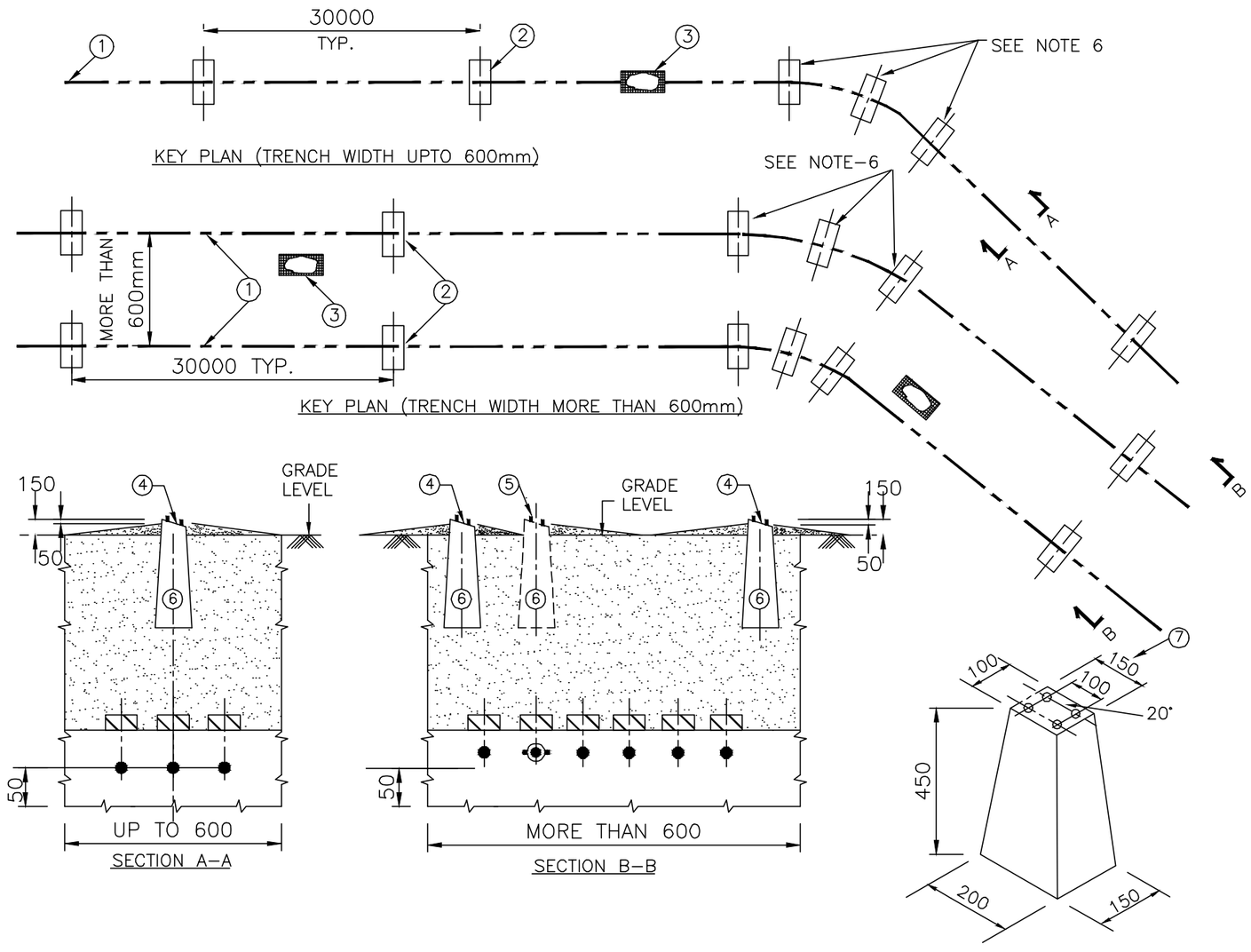

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. FOR NOTES AND OTHER DETAILS REFER SHEET 41 OF 62.
3. a) VOLTAGE OF HIGHEST GRADE CABLE SHALL BE CAST ON THE CABLE ROUTE MARKER PLATE.
   b) VOLTAGE, NUMBER OF CORES, SIZE AND IDENTIFICATION NUMBER OF THE CABLE SHALL BE CAST ON THE CABLE JOINT MARKER PLATE.
4. RAISED LETTERS AND ARROWS SHALL BE CAST ON 10 THICK CAST IRON PLATE (ARROW INDICATES THE ROUTE OF CABLES).
5. CABLE MARKER AS ABOVE SHALL BE AVOIDED ON ROADS. ONLY A TILE SHOWING DETAILS, SHALL BE USED AS MARKER.
6. TYPICAL CABLE ROUTE MARKER AS ABOVE IS SHOWN FOR BEND. ACTUAL PLACEMENT OF ROUTE MARKER SHALL BE DECIDED AT SITE BY SITE ENGINEER/CABLE INSTALLATION CONTRACTOR.
7. THE CABLE MARKER PLATE SHALL BE FIXED BY 4NO. SUITABLE G.I. NUTS.

LEGEND

(1)	CABLE ROUTE
(2)	CABLE ROUTE MARKER
(3)	CABLE JOINT MARKER
(4)	CABLE ROUTE MARKER PLATE (C.I.)
(5)	CABLE JOINT MARKER PLATE (C.I.)
(6)	M-150 CONCRETE BLOCK
(7)	10ø, 25 PROJ. G.I. STUD
(8)	12ø HOLE

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
INSTALLATION PRACTICE FOR DIRECTLY BURRIED CABLES

Size	Scale	Sheet
A3	NTS	42 of 62

Drawing No. GGNG-E-20714-3010 | Rev. 0

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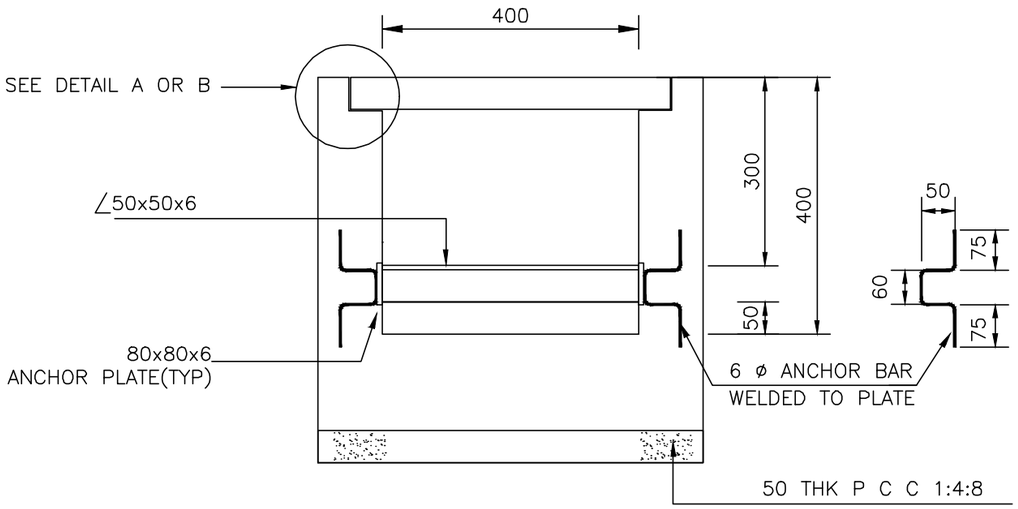
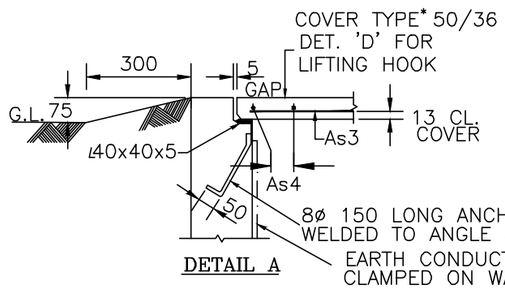
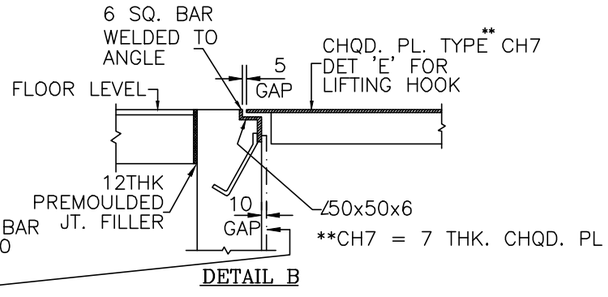
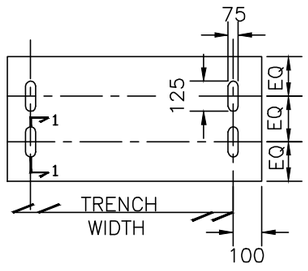




DETAIL A



DETAIL B

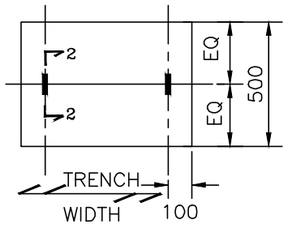


PLAN

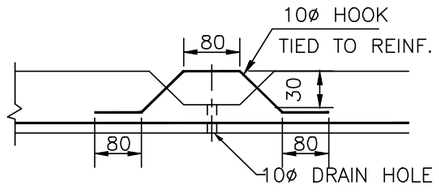
*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/36	50	7–6ø	4–6ø

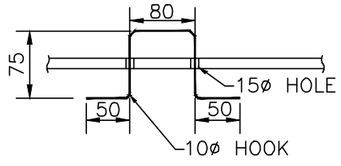
50/36 MEANS 50mm. THK.x36 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



PLAN



SECT. 1–1
DETAIL D



SECT. 2–2
DETAIL E

NOTES

1. ALL DIMENSIONS ARE IN MM
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRENCH TYPE - 0404

Size A3 | Scale NTS | Sheet 43 of 62
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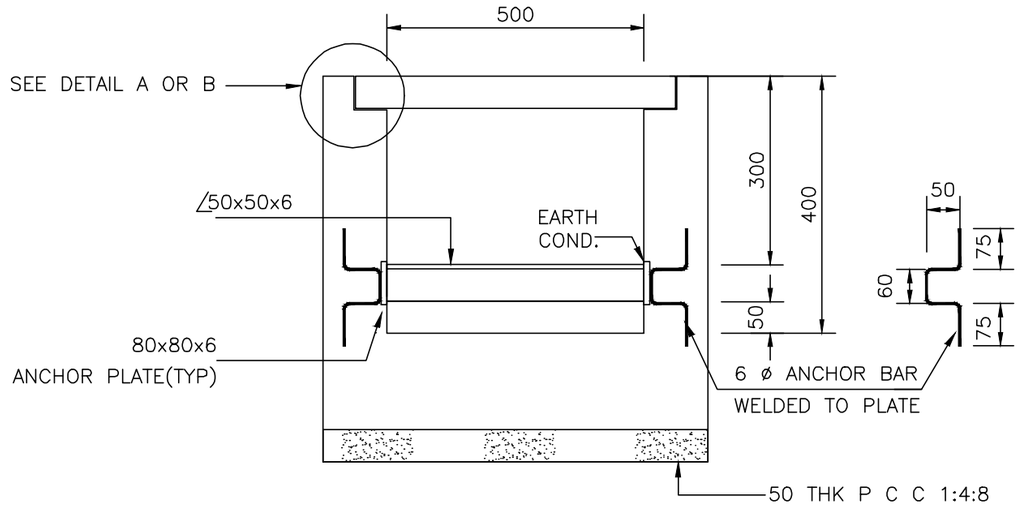
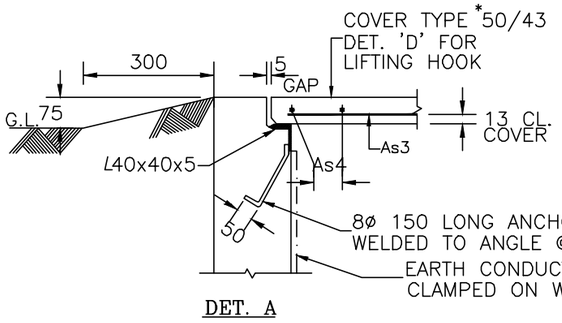
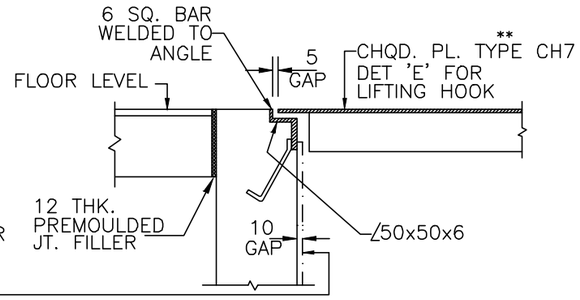


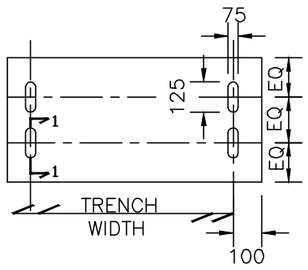


DET. A



DET. B

**CH7 = 7 THK. CHQD. PL

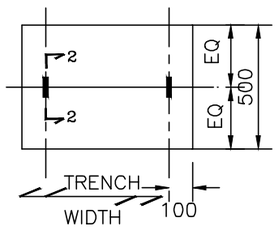


PLAN

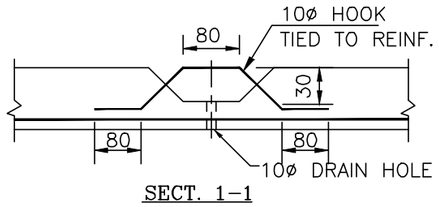
*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/72	50	7–6ø	7–6ø
50/36	50	7–6ø	4–6ø

50/36 MEANS 50mm. THK.x36 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.

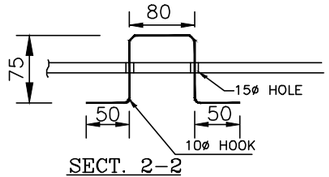


PLAN



SECT. 1–1

DET. D



SECT. 2–2

DET. E

NOTES

1. ALL DIMENSIONS ARE IN MM
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRENCH TYPE - 0504

Size A3 | Scale NTS | Sheet 44 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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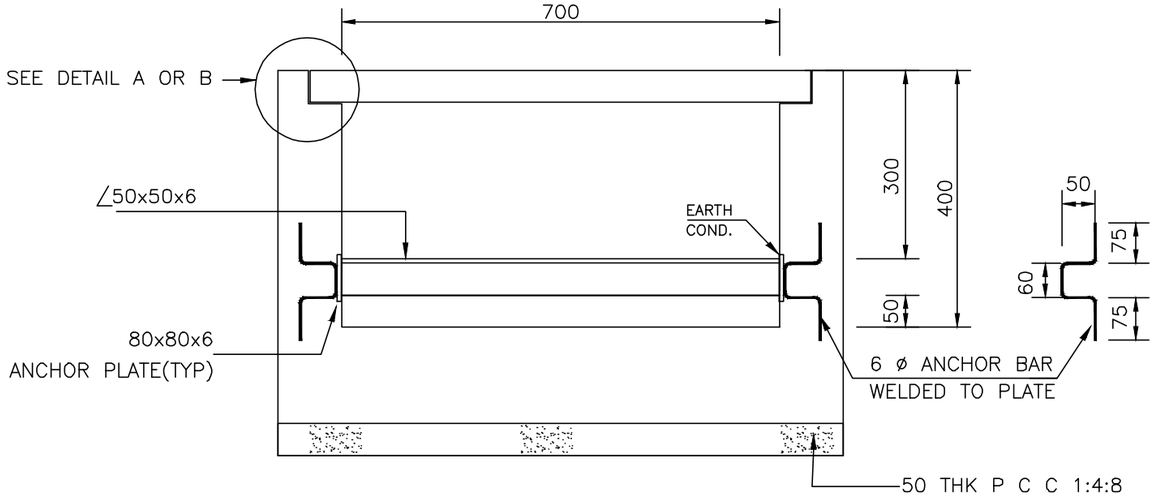
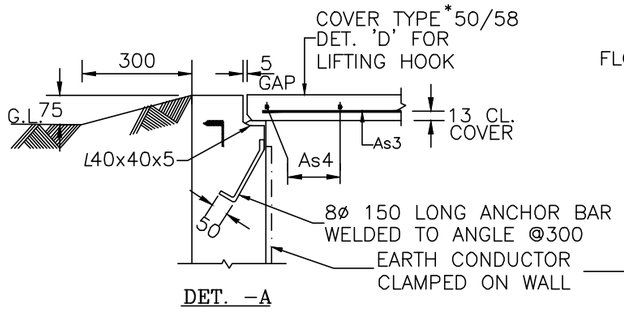
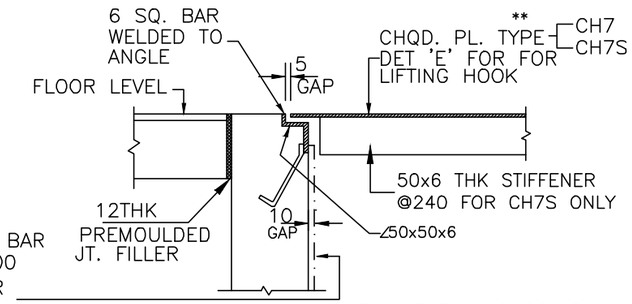


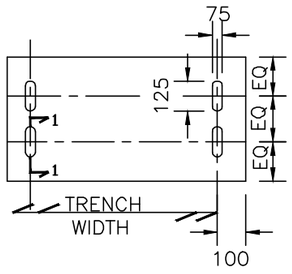


DET. –A



DET. B

**CH7 = 7 THK. CHQD. PL
CH7S = 7 THK CHQD PL. WITH STIFFNER

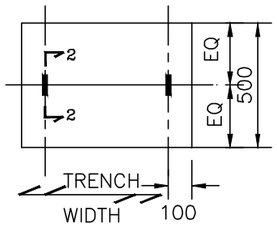


PLAN

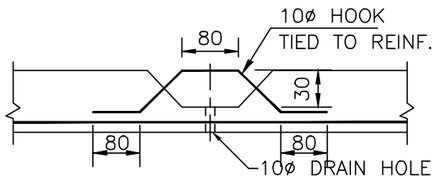
*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/58	50	7–6ø	7–6ø

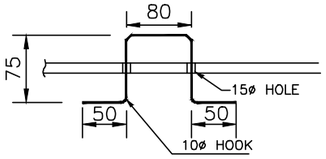
50/58 MEANS 50mm. THK.x58 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



PLAN



SECT. 1–1
DET. D



SECT. 2–2
DET. E

NOTES

1. ALL DIMENSIONS ARE IN MM
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRENCH TYPE - 0704

Size A3 | Scale NTS | Sheet 45 of 62
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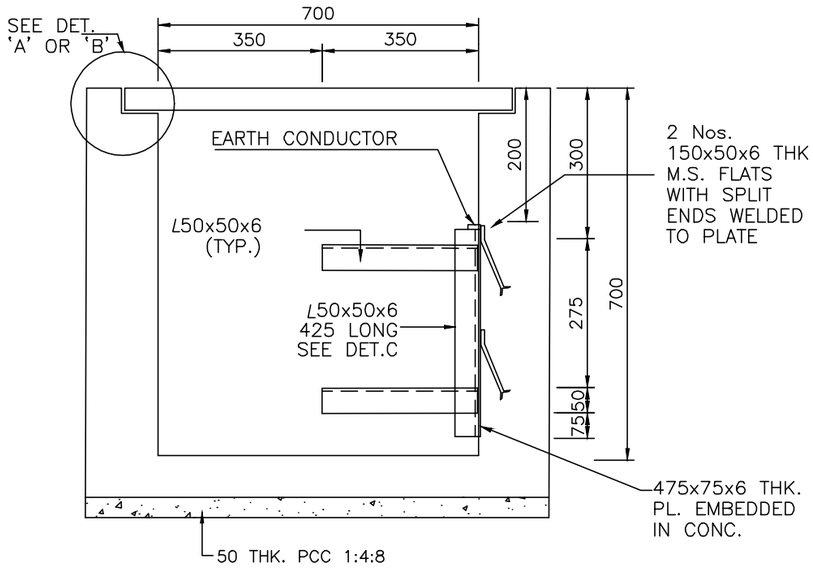
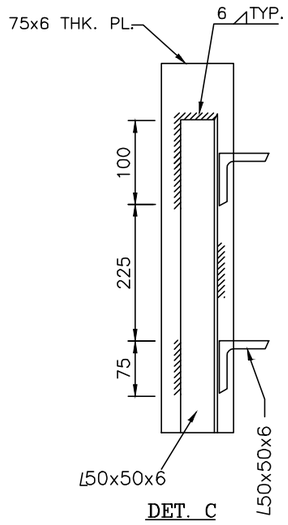
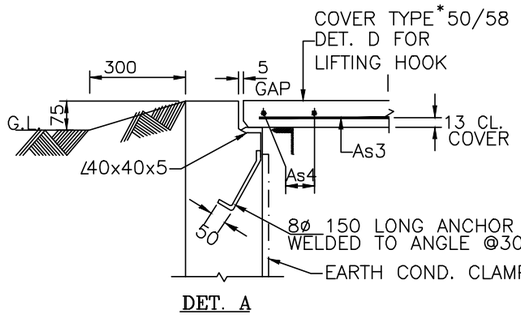
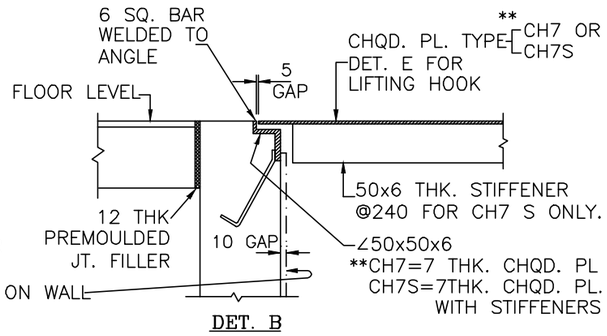




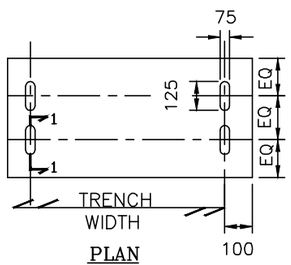
DET. C



DET. A



DET. B

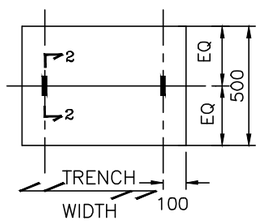


PLAN

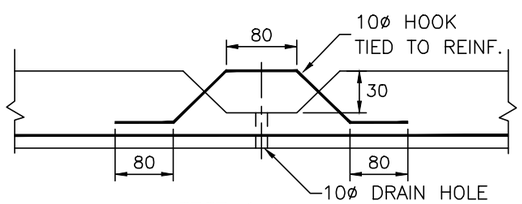
*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/58	50	7–6ø	6–6ø

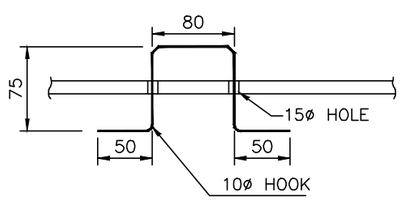
50x58 MEANS 50mm. THK.x58 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



PLAN



SECT. 1–1
DET. D



SECT. 2–2
DET. E

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRENCH TYPE - 0707

Size A3 | Scale NTS | Sheet 46 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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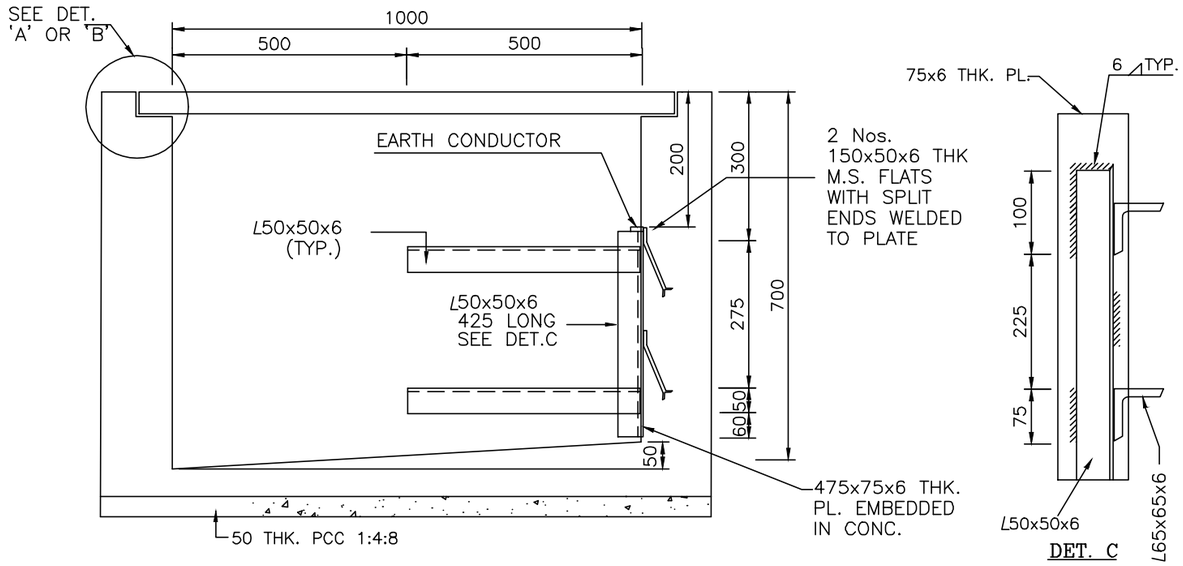
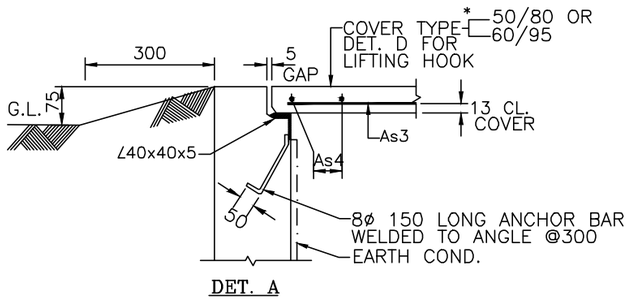
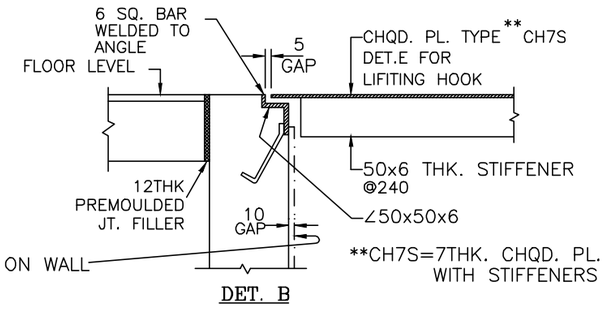


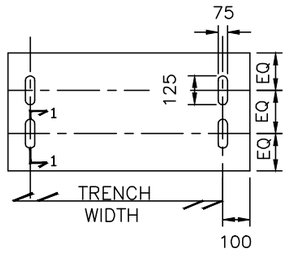
DET. C



DET. A



DET. B

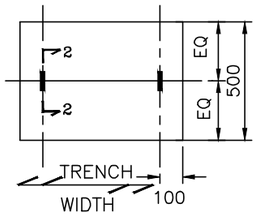


PLAN

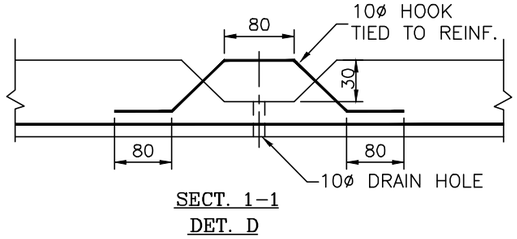
*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/80	50	7–6ø	6–6ø
60/95	60	7–8ø	6–8ø

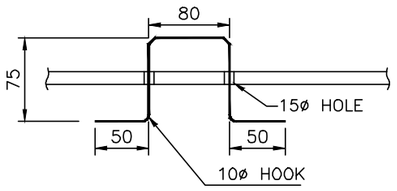
60x95 MEANS 60mm. THK.x95 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



PLAN



SECT. 1–1
DET. D



SECT. 2–2
DET. E

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRENCH TYPE - 1007

Size A3 | Scale NTS | Sheet 47 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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THE FOLLOWING TIGHTENING TORQUES SHALL BE USED FOR NUTS AND BOLTS USED FOR SUPPORTS, CABLE TRAY OR ACCESSORIES ASSEMBLY.

Metric size (mm)	Recommended Torque (Nm)
M8	12 Nm.
M10	25 Nm.
M12	45 Nm.
M16	100 Nm.

AS THE ABOVE VALUES CAN SLIGHTLY CHANGE FROM ONE CABLE TRAY MANUFACTURER TO ANOTHER, CABLE TRAY INSTALLATION CONTRACTOR TO CHECK THESE VALUES WITH MANUFACTURER DATA.

TIGHTENING TORQUES

NOTES

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0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
TIGHTENING TORQUES

Size	Scale	Sheet
A3	NTS	48 of 62

Drawing No. GGNG-E-20714-3010 Rev. 0

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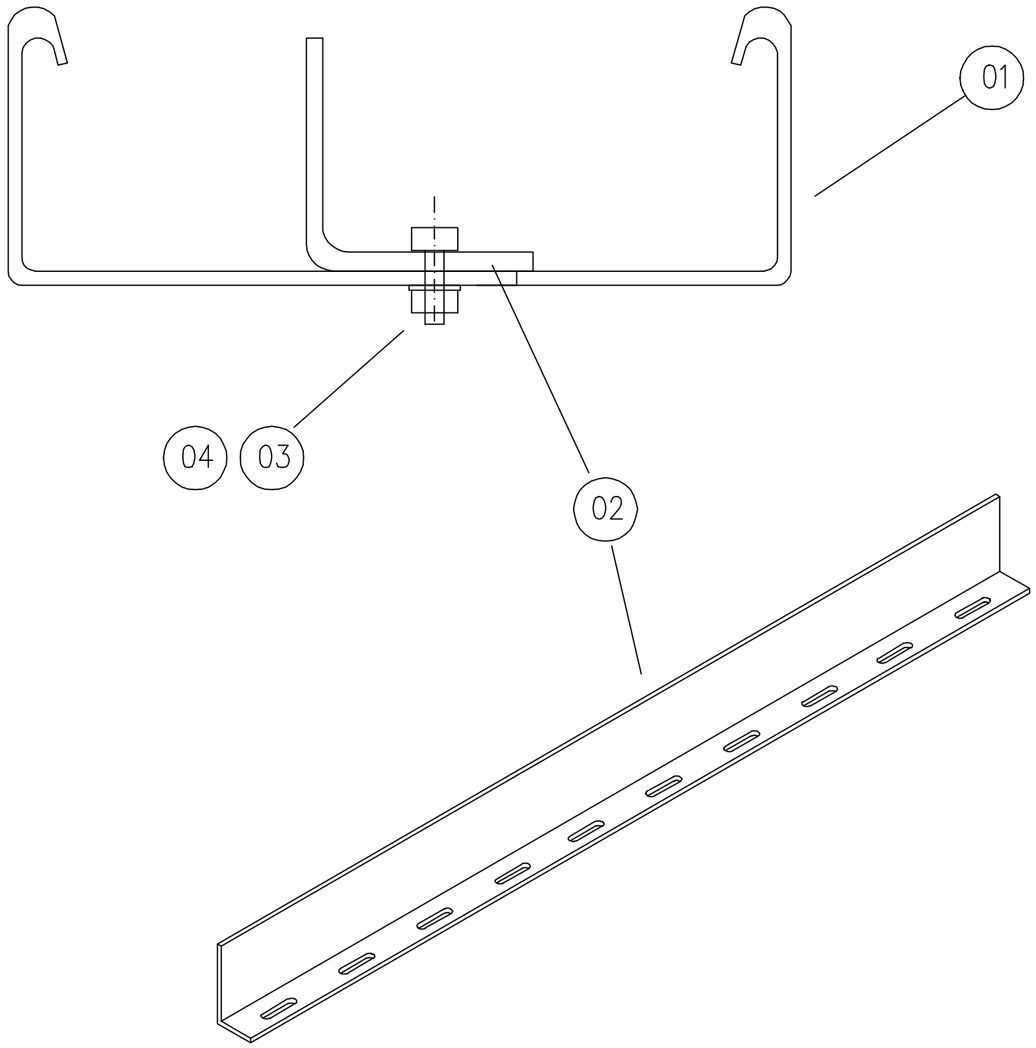

CABLE TRAY	W=100mm / H=50mm

04	NUT M6 WITH STOP BASE
03	SCREW M6x16
02	SEPARATOR
01	CABLE LADDER
	DESIGNATION

SEPARATOR FOR CABLE TRAY

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS
SEPARATOR FOR CABLE TRAY

Size A3 | Scale NTS | Sheet 49 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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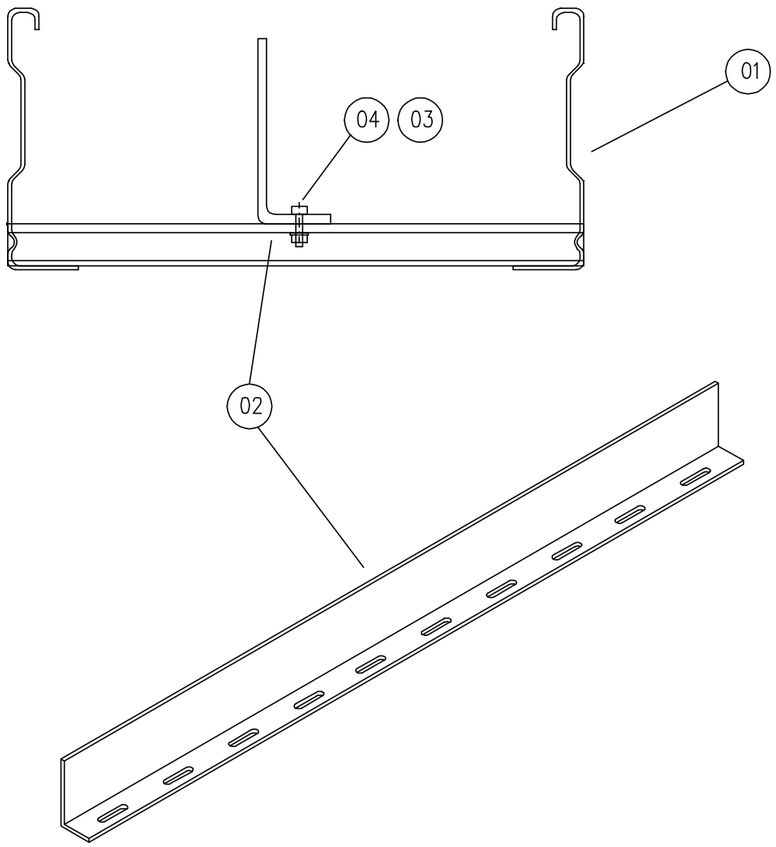

CABLES LADDER	W=300mm / H=100mm
CABLES LADDER	W=600mm / H=100mm

04	NUT M6 WITH STOP BASE
03	SCREW M6x16
02	SEPARATOR H 68mm
01	CABLE LADDER H 100mm
DESIGNATION	

CABLES LADDER SEPARATOR

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLES LADDER SEPARATOR

Size A3 | Scale NTS | Sheet 50 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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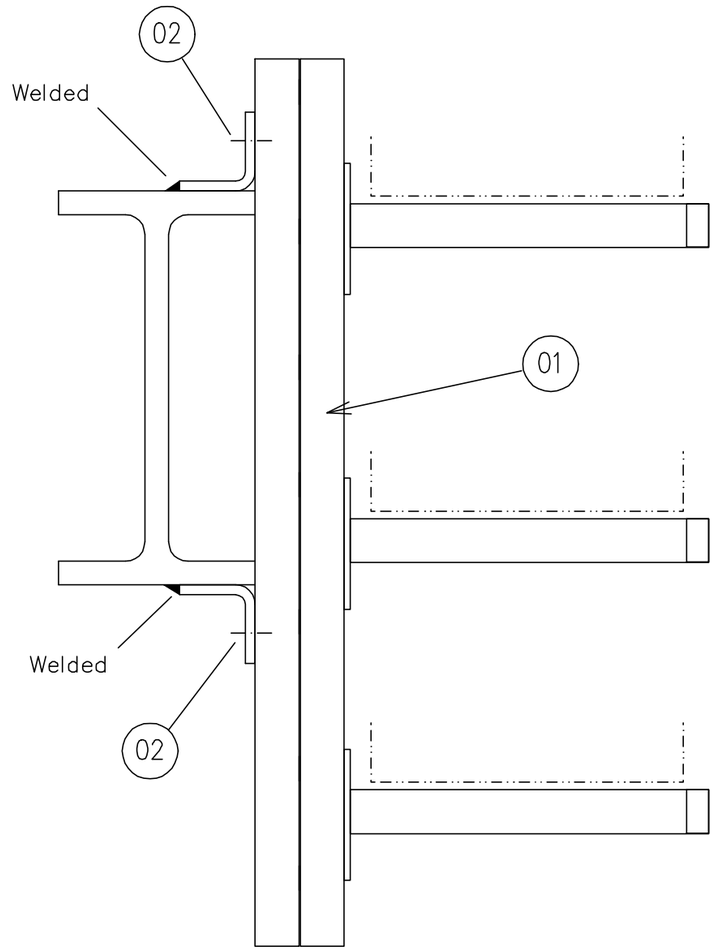

02	BOLT M10x30
01	DOUBLE CHANNEL 82x41
	DESIGNATION

SUPPORT TYPE FIXING ON GROUND AND CEILING

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS
SUPPORT TYPE FIXING ON GROUND AND CEILING

Size	Scale	Sheet
A3	NTS	51 of 62

Drawing No.	Rev.
GGNG-E-20714-3010	0

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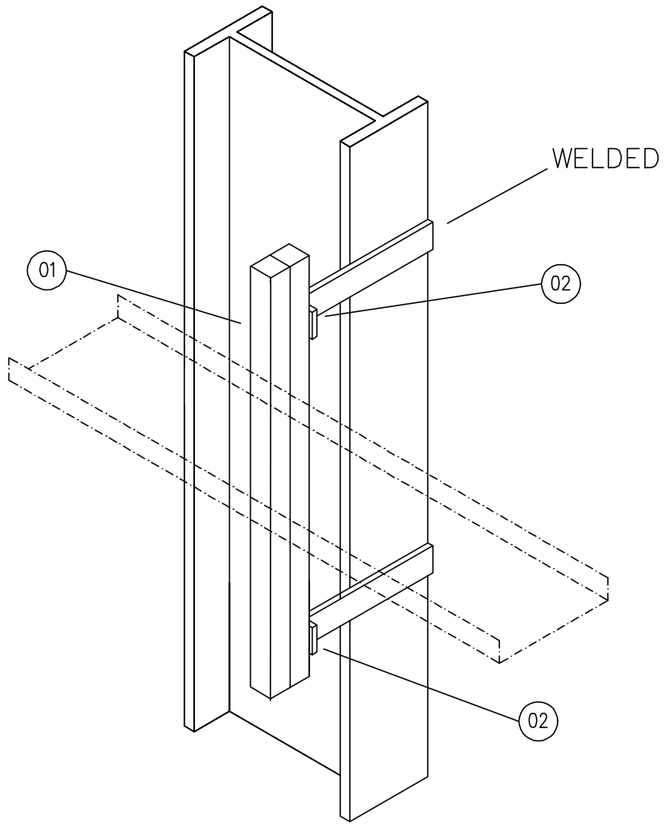

VERTICAL OR HORIZONTAL MOUNTING
ACCORDING TO DRAWING.

02	BOLT M10x30
01	DOUBLE CHANEL 82x41
	DESIGNATION

SUPPORT TYPE FIXING ON GROUND AND CEILING

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
SUPPORT TYPE FIXING ON GROUND AND CEILING

Size	Scale	Sheet	Rev.
A3	NTS	52 of 62	0

Drawing No. GGNG-E-20714-3010

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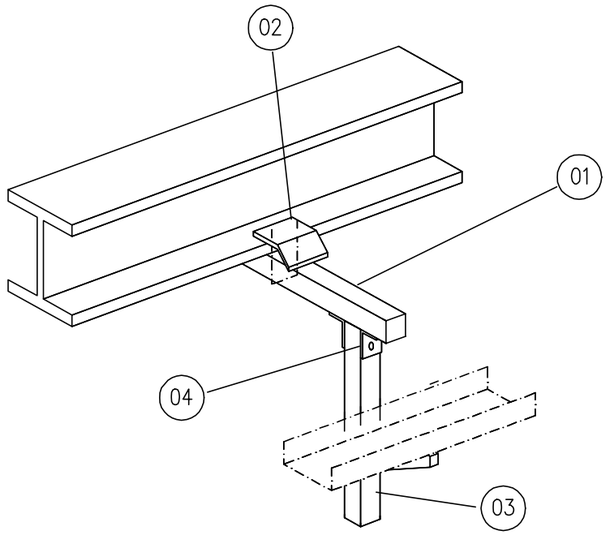

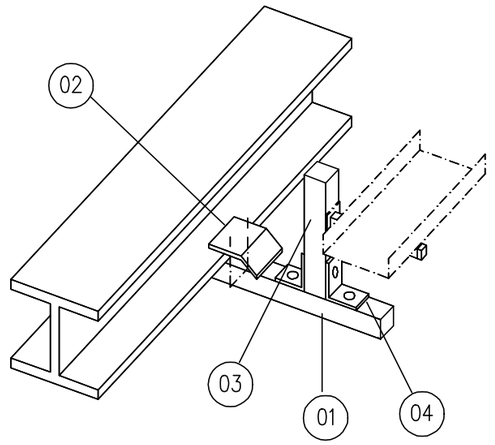

04	TWO HOLE CORNER ANGLE	
03	SIMPLE CHANNEL U 41x41	
02	BEAM CLAMPS FOR U 41x41	SUPPLIED WITH 1 U BOLT
01	SIMPLE CHANNEL U 41x41	
	DESIGNATION	REMARKS

SUPPORT TYPE MOUNTING UNDER BEAM

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
SUPPORT TYPE MOUNTING UNDER BEAM

Size	Scale	Sheet
A3	NTS	53 of 62

Drawing No. GGNG-E-20714-3010 Rev. 0

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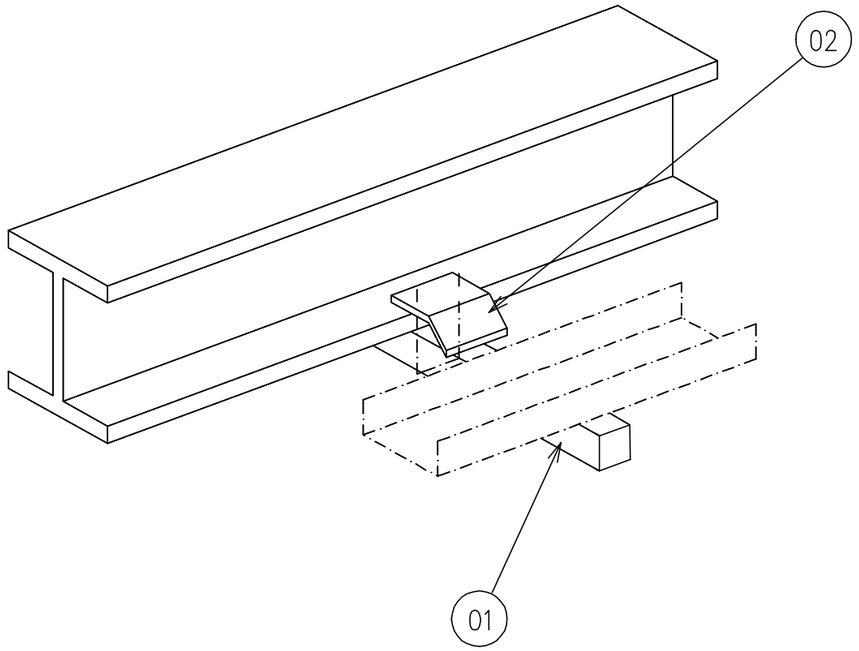

VERTICAL OR HORIZONTAL MOUNTING
ACCORDING TO DRAWING.

02	BEAM CLAMPS FOR U 41x41	SUPPLIED WITH 1 U BOLT
01	SIMPLE CHANNEL U 41x41	
	DESIGNATION	REMARKS

SUPPORT TYPE MOUNTING ON BEAM

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS
SUPPORT TYPE MOUNTING ON BEAM

Size A3 | Scale NTS | Sheet 54 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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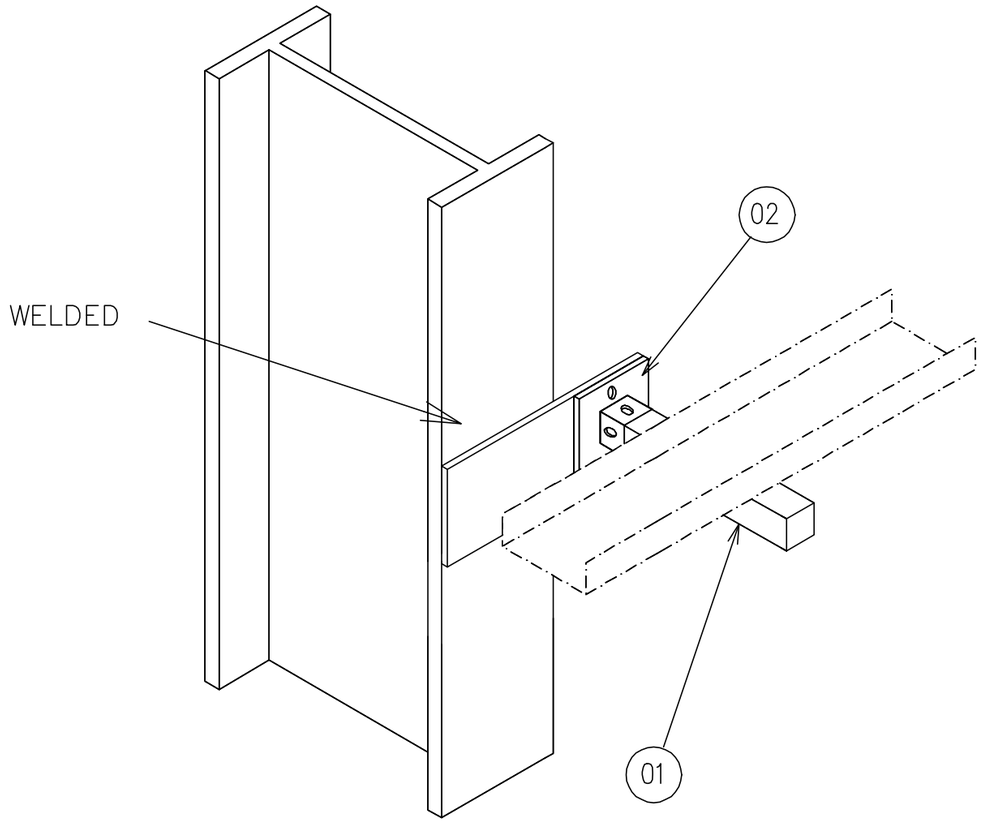

VERTICAL OR HORIZONTAL MOUNTING
ACCORDING TO DRAWING.

02	HEAD POST BASE	WELDED
01	SINGLE CHANNEL U 41x41	
	DESIGNATION	

SUPPORT TYPE MOUNTING ON BEAM

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS
SUPPORT TYPE MOUNTING ON BEAM

Size A3 | Scale NTS | Sheet 55 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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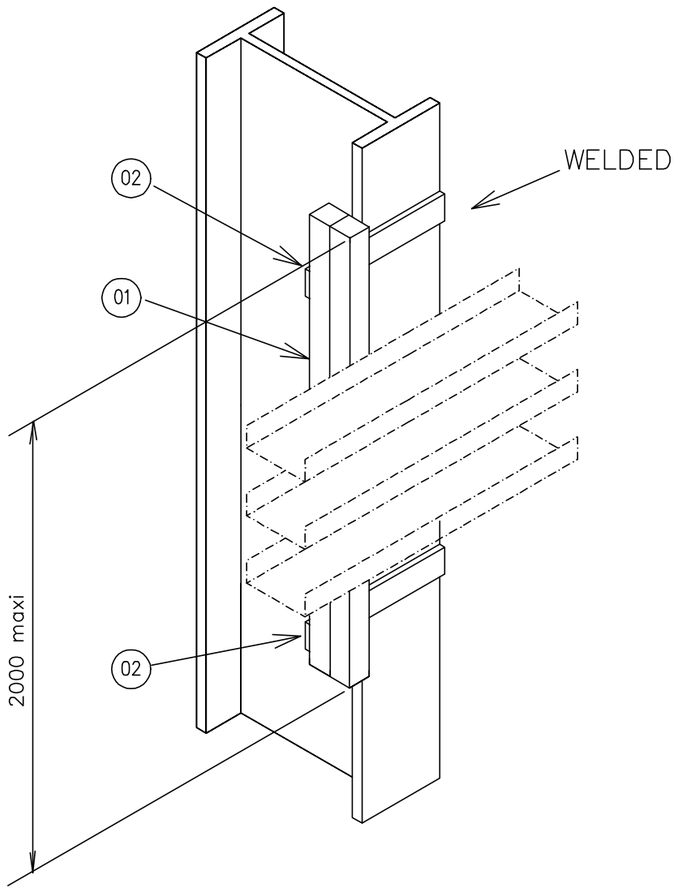

VERTICAL OR HORIZONTAL MOUNTING
ACCORDING TO DRAWING.

02	BOLT M10x30
01	DOUBLE CHANEL 82x41
	DESIGNATION

SUPPORT TYPE FIXING ON GROUND AND CEILING

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS
SUPPORT TYPE FIXING ON GROUND AND CEILING

Size A3 | Scale NTS | Sheet 56 of 62
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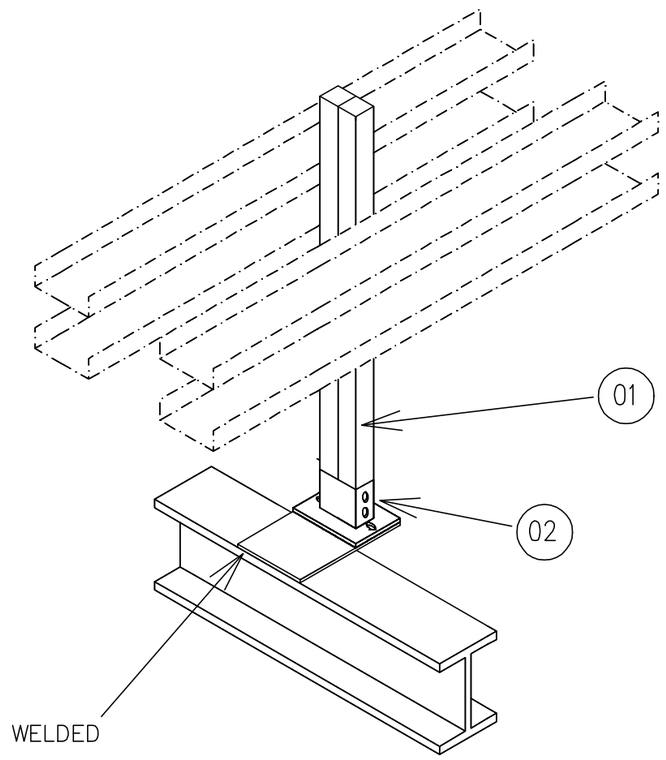

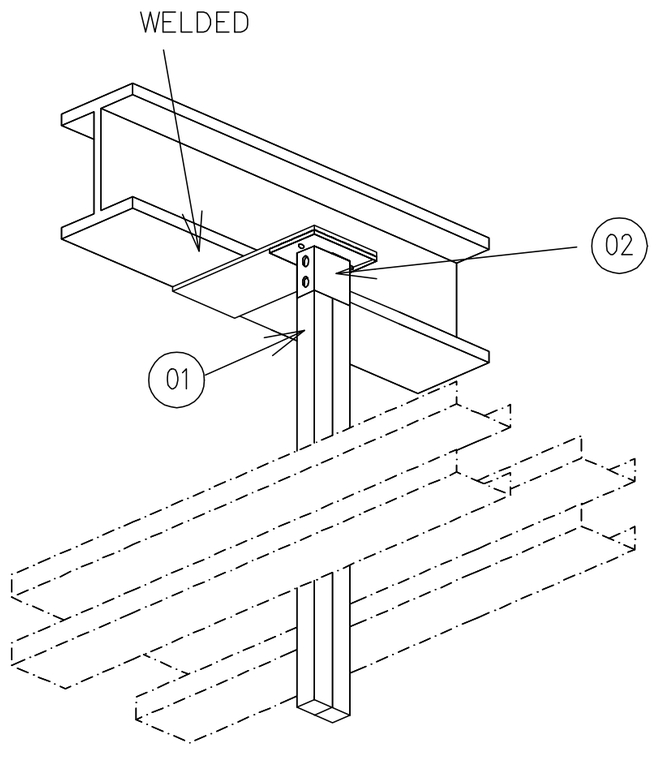

02	DOUBLE HEAD POST BASE	BOLTED
01	DOUBLE CHANNEL U 82x41	
	DESIGNATION	

SUPPORT TYPE FIXING ON GROUND AND CEILING

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
SUPPORT TYPE FIXING ON GROUND AND CEILING

Size A3 | Scale NTS | Sheet 57 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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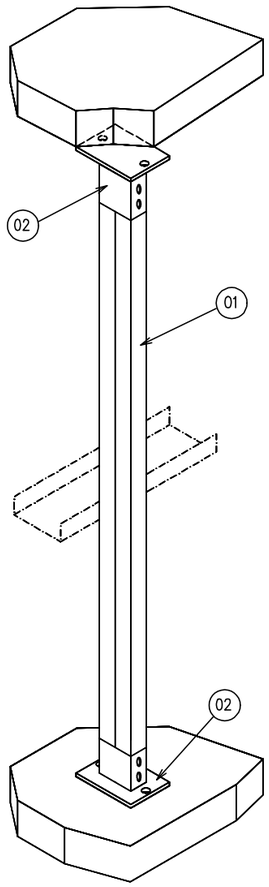

02	DOUBLE HEAD POST BASE	BOLTED
01	DOUBLE CHANNEL U 82x41	
	DESIGNATION	

SUPPORT TYPE 65 FIXING ON GROUND AND CEILING

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
SUPPORT TYPE 65 FIXING ON GROUND AND CEILING

Size A3 | Scale NTS | Sheet 58 of 62
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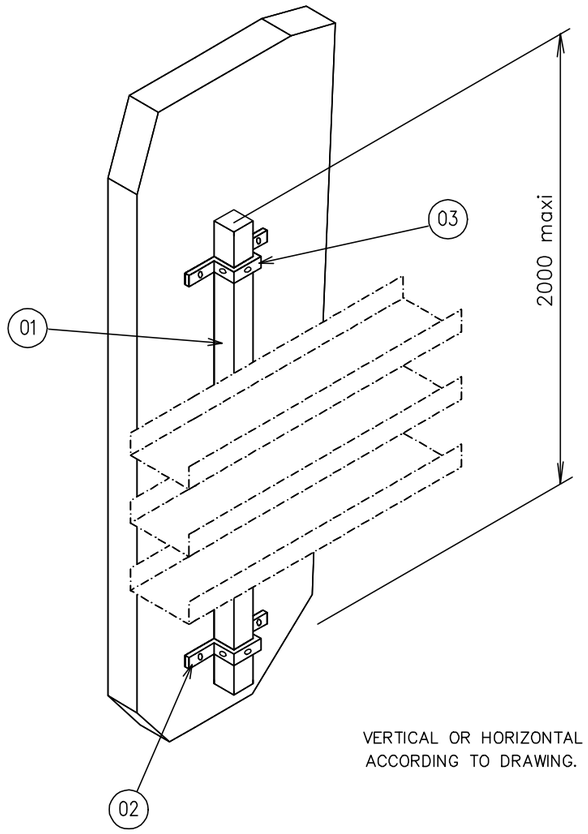

VERTICAL OR HORIZONTAL MOUNTING
ACCORDING TO DRAWING.

03	OMEGA SHAPE FITTING FOR U 42 x41
02	EXPANSION STUD ANCHOR
01	SINGLE CHANNEL U 41x41
	DESIGNATION

SUPPORT TYPE FIXING ON SINGLE CHANNEL U 41x41 ON CONCRETE

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL CABLE TRAY INSTALLATION DETAILS
SUPPORT TYPE FIXING ON SINGLE CHANNEL
U41x41 ON CONCRETE

Size: A3 | Scale: NTS | Sheet: 59 of 62
Drawing No.: GGNG-E-20714-3010 | Rev.: 0

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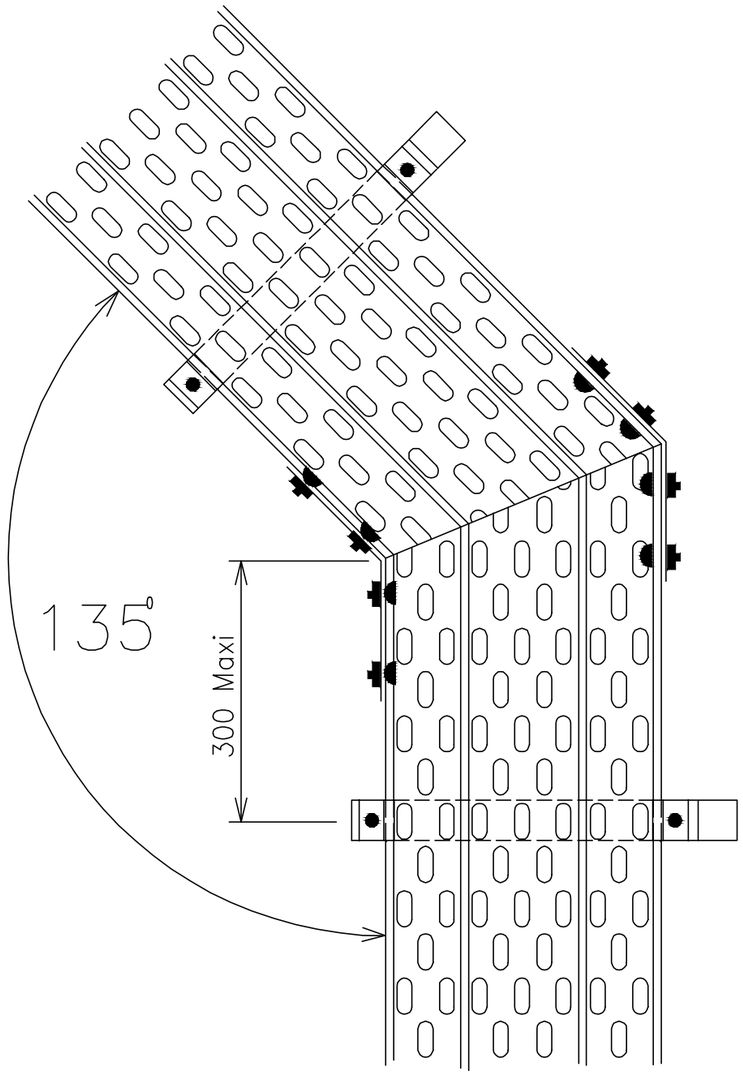

CABLE TRAYS 135° ANGLE

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAYS 135 ANGLE

Size	Scale	Sheet
A3	NTS	60 of 62

Drawing No. GGNG-E-20714-3010 Rev. 0

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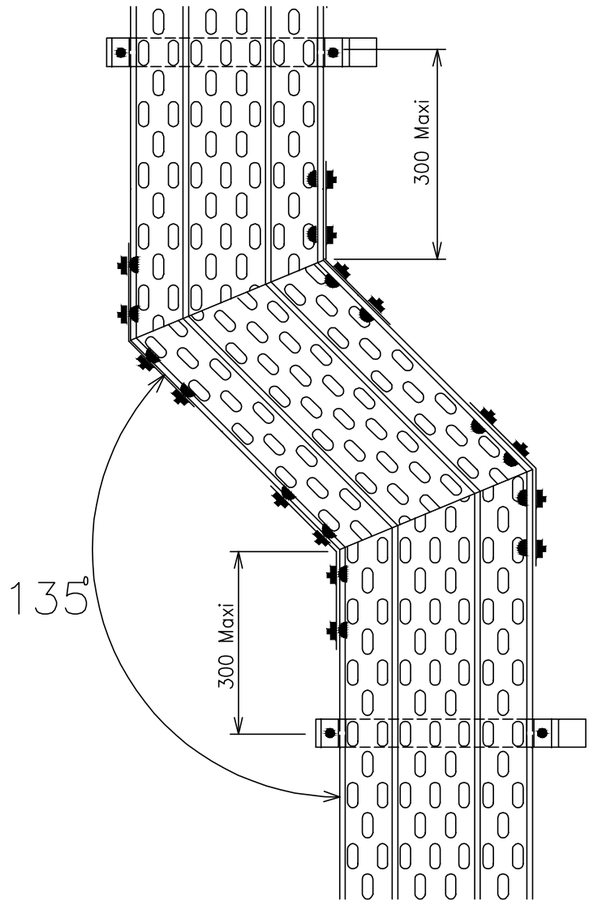

CABLE TRAYS 135° ANGLE

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE TRAYS 135 ANGLE

Size A3 | Scale NTS | Sheet 61 of 62
Drawing No. GGNG-E-20714-3010 | Rev. 0

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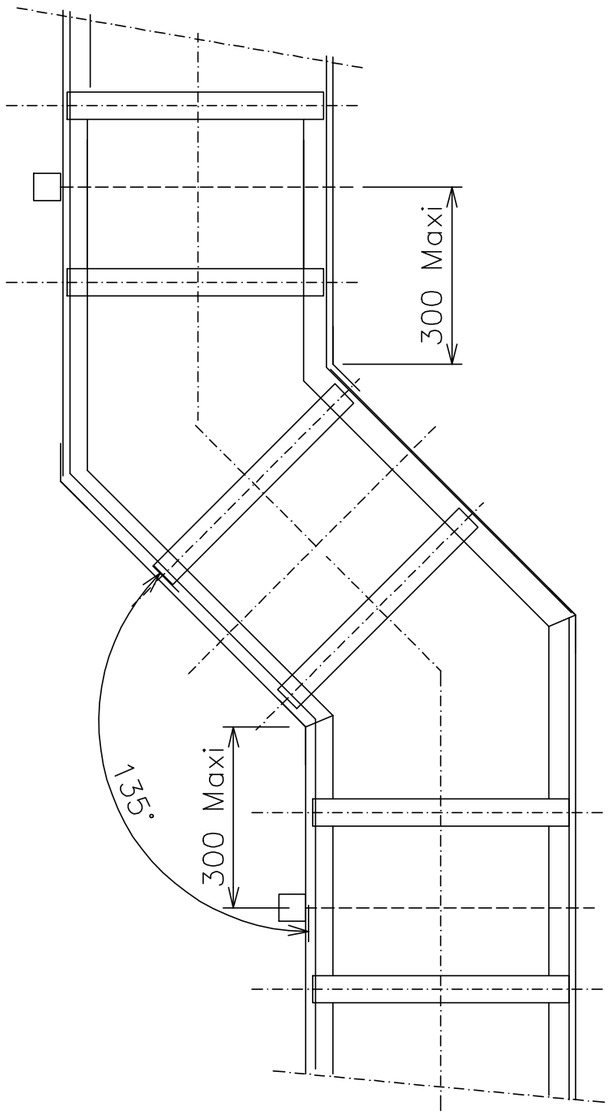

CABLE LADDER 135° ANGLE

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	07.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL CABLE TRAY INSTALLATION DETAILS
CABLE LADDER 135 ANGLE

Size	Scale	Sheet
A3	NTS	62 of 62

Drawing No. GGNG-E-20714-3010 Rev. 0

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TYPICAL EARTHING INSTALLATION DETAILS

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	13.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL EARTHING INSTALLATION DETAILS

Size	Scale	Sheet
A3	NTS	01 of 23

Drawing No. GGNG-E-20715-0812 Rev. 0

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GENERAL NOTES

1. ALL DIMENSIONS ARE GIVEN IN MM.(UNLESS OTHERWISE SPECIFIED).
2. ALL GROUNDING CONDUCTORS SURROUNDING THE BUILDINGS SHALL BE LOCATED ABOUT 1.5M(1500MM) FROM WALLS, COLUMN PEDESTALS AND FENCES.
3. ALL JOINTS UNDERGROUND SHALL BE PROTECTED AGAINST CORROSION BY DENSO TAPE(OR EQUIVALENT).
4. TIGHTENING TORQUES ARE GIVEN IN THE FOLLOWING TABLE:

Tightening torques (in m.kg)	
Diameter of screw	Class 5.8 steel screw
M 10	2.86
M 12	4.94
M 14	7.8
M 16	11.83
M 20	26

5. METALLIC FENCES AROUND TRANSFORMER AREA AND LONG METALLIC OBJECTS SHALL BE CONNECTED TO THE GROUNDING SYSTEM IN AT LEAST TWO INTERVALS NOT EXCEEDING 50 METERS.
   PLASTIC COVERED CHAIN LINK FENCES SHALL BE CONSIDERED IN THE SAME WAY AS BARE METALLIC FENCES, SO THAT SUPPORT POSTS, STAYS AND ANTI-CLIMBING FITTINGS SHALL BE BANDED ACCORDING TO ABOVE TWO METHODS.
6. PVC PIPES SHALL BE SET IN CONCRETE CASING UNLESS OTHERWISE SPECIFIED.
7. PVC PIPES ARE HEAVY DUTY TYPE.
8. ALL ARC WELDS SHALL BE PROTECTED AGAINST CORROSION.
9. ELECTRICAL EQUIPMENT LIKE MV/LV SWITCHGEAR, DB, CONTROL PANEL WILL BE EARTHED TO THE EARTHING CONDUCTOR RUNNING ALONG THE EDGE OF THE NEARBY CABLE TRAY, WHETHER AVAILABLE.
10. ALL NON CURRENT CARRYING METALLIC EQUIPMENT SUCH AS TANKS, METAL STRUCTURE SUCH HAS HAND RAIL, STRUCTURAL COLUMNS SHALL BE GROUNDED WITH MIN ON GROUND CONDUCTOR. AND TWO NUMBERS IN CASE LOCATED IN HAZARDOUS AREA.
11. A TEST LINK SHALL BE PROVIDED IN EACH EARTH PIT.
12. EARTH PIT FOR LIGHTNING PROTECTION DOWN CONDUCTOR SHALL BE SEPARATE DOWN CONDUCTORS FROM LIGHTNING ARRESTOR TO EARTH PIT SHALL BE RUN BY SHORTEST ROUTE LENGTH.
13. AL ELECTRICAL EQUIPMENT WITH 3-PHASE SUPPLY EG. SWITCHGEAR, POWER AND MOTOR CONTROL CENTERS, INVERTER PANEL, POWER LIGHTING DB, MOTOR WELDING RECEPTACLES. ETC SHALL BE GROUNDED BY TWO SEPARATE GROUND CONNECTIONS.
14. NEUTRAL POINT OF TRANSFORMER SECONDARY SHALL BE GROUNDED WITH TWO SEPARATE AND DISTINCT EARTH PIT. TRANSFORMER BODY SHALL BE GROUNDED BY TWO SEPARATE AND DIAGONALLY OPPOSITE CONNECTIONS TO MAIN GROUND GRID.
15. STATIC GROUND CONNECTIONS SHALL BE MADE ACROSS FLANGED JOINTS OF PIPELINES IDENTIFIED FOR STATIC CHARGE IN ALL AREAS.
16. DCS/PLC GROUND BUS BAR SHALL BE CONNECTED TO DCS GROUNDING ELECTRODE BY TWO SEPARATE PVC INSULATED COPPER CONDUCTORS.
17. ALL FLAME PROOF ELECTRICAL EQUIPMENT INCLUDING LIGHTING FIXTURES AND PUSH BUTTON STATION SHALL BE GROUNDED AT TWO POINTS.

NOTES

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0	13.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL EARTHING INSTALLATION DETAILS

Size	Scale	Sheet
A3	NTS	02 of 23

Drawing No. GGNG-E-20715-0812 Rev. 0

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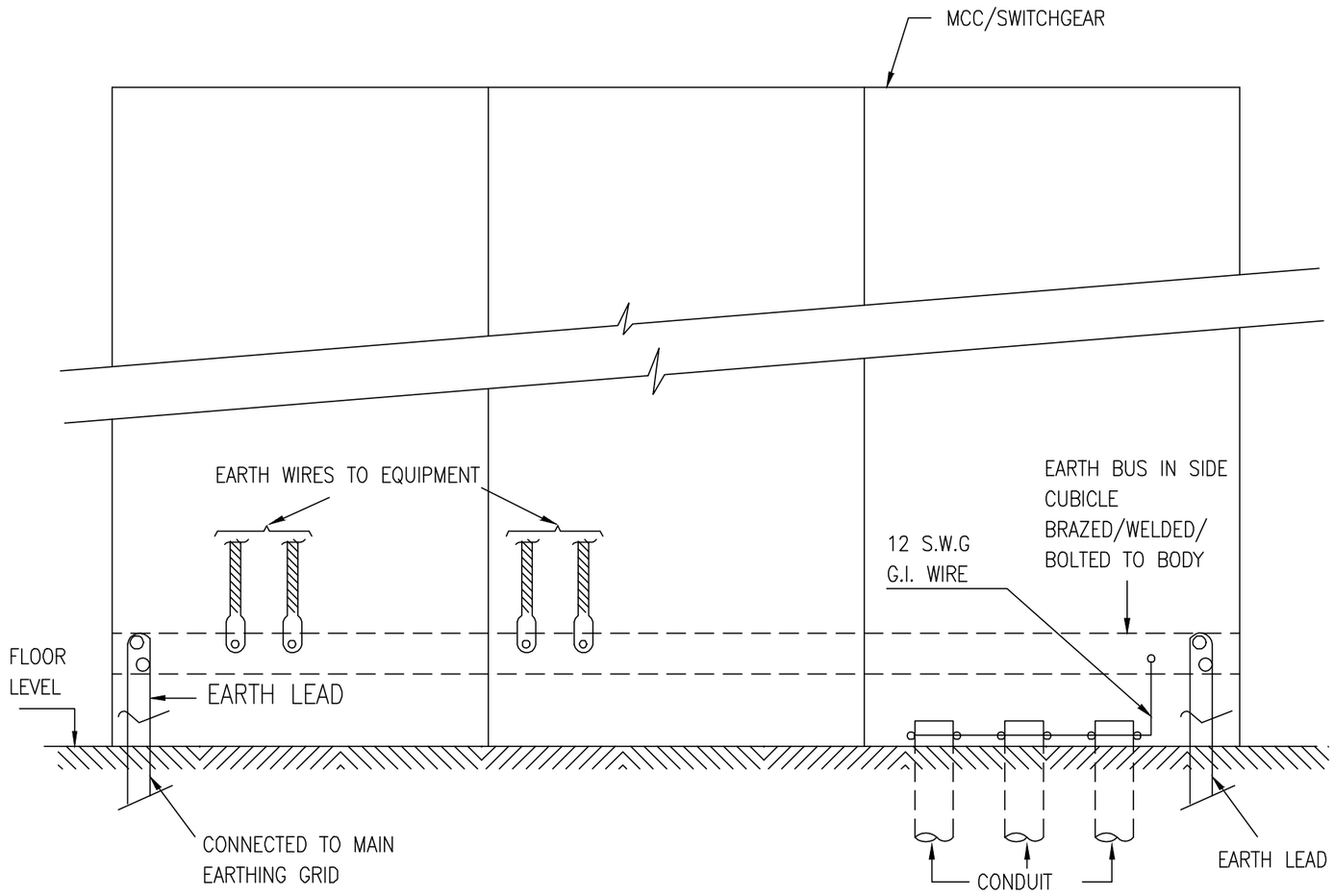

ELEVATION

NOTES

NOTES

1. CONNECTION BETWEEN EARTH BUS IN MCC/SWITCHGEAR AND EARTH LEAD SHALL BE WITH MINIMUM TWO BOLTS.

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SUBJECT
TYPICAL EARTHING INSTALLATION DETAILS
M.C.C. & METAL CLAD SWITCHGEAR

Size	Scale	Sheet
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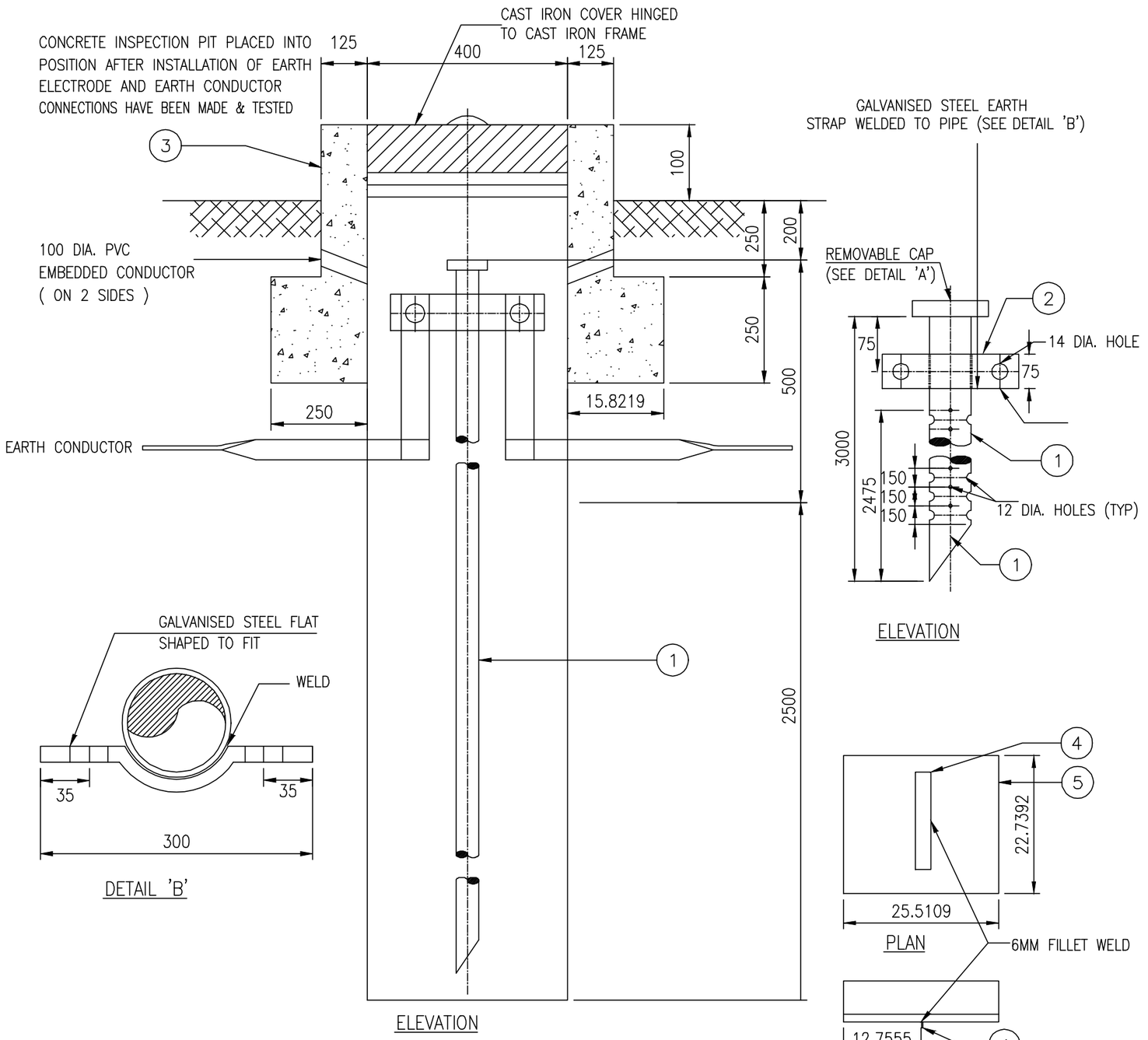

TYPICAL ARRANGEMENT OF PIPE ELECTRODE

NOTES

1. ALL DIMENSION AREA IN MILLIMETER (mm).
2. ALL STEEL WORK SHALL BE HOT DIP GALVANISED.
3. INSPECTION PITS SHALL BE INSTALLED FLASH WITH SURROUNDING GRADE WITHIN PAVED AREAS.
4. UNLESS OTHERWISE SPECIFIED, ALL THE MATERIALS ARE IN CONTRACTORS SCOPE OF SUPPLY.

LEGEND

1. 100mm DIAMETER MEDIUM DUTY GALVANISED STEEL PIPE (CLASS 'B')
2. GALVANISED MS FLAT (DETAIL 'B')
3. CONCRETE INSPECTION COVER
4. 90x50x6 GALVANISED MS ANGLE (DETAIL 'A')
5. 130x130x6 GALVANISED MS PLATE (DETAIL 'A'

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SUBJECT: TYPICAL EARTHING INSTALLATION DETAILS
PIPE/ROD ELECTRODE

Size	Scale	Sheet
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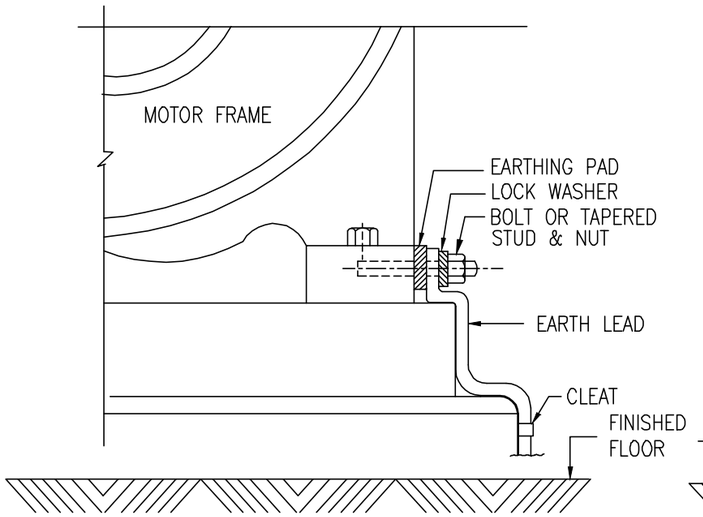
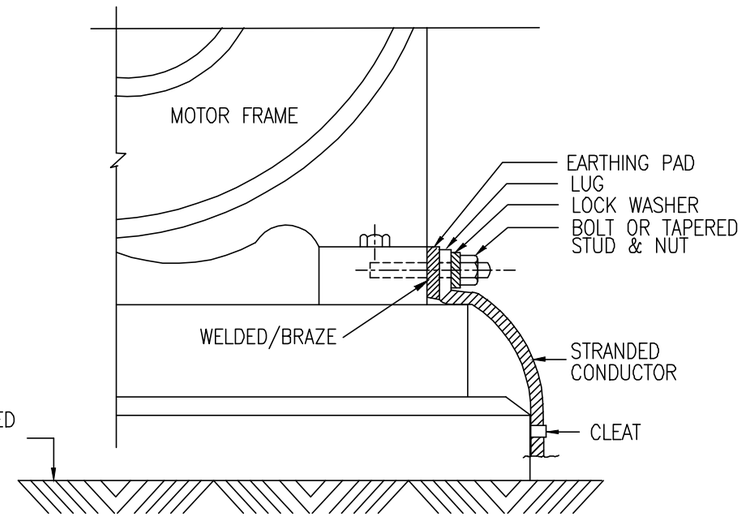
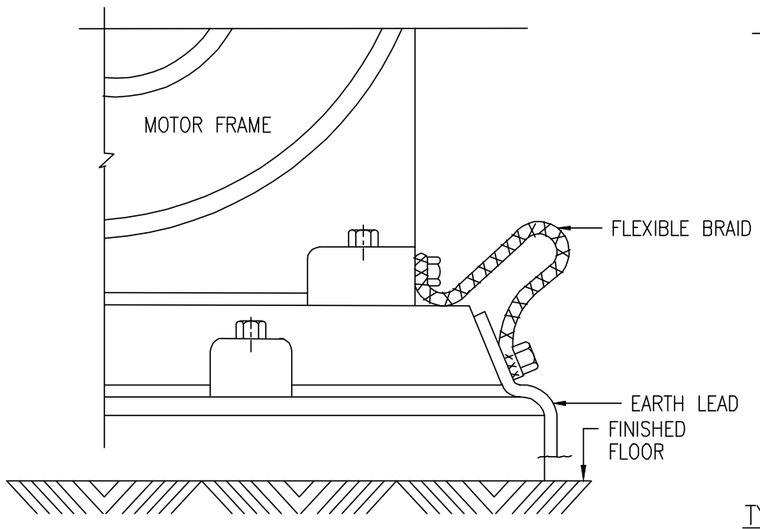


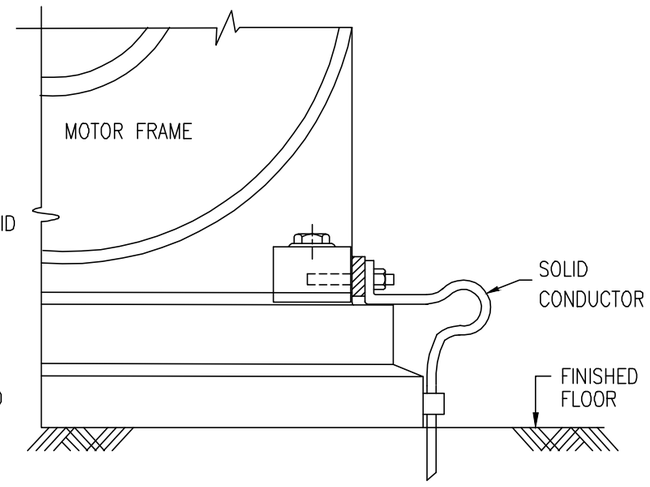
TYPE I CONNECTION FOR FLAT CONDUCTOR



TYPE II CONNECTION FOR STRANDED CONDUCTOR



TYPE III CONNECTION FOR FLAT/STRANDED CONDUCTOR FOR MOTORS IN SLIDING BASE



TYPE IV CONNECTION FOR SMALL MOTORS WHEN STRANDED CONDUCTORS IS NOT AVAILABLE

NOTES

1. NUTS AND BOLTS SHALL BE AS PER IS: 1363(PART–1,2,3):1992/ IS 1367(PART–5):1980.
2. WASHERS SHALL BE AS PER IS 2016:1967.

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SUBJECT
TYPICAL EARTHING INSTALLATION DETAILS
MOTOR FRAME EARTHING

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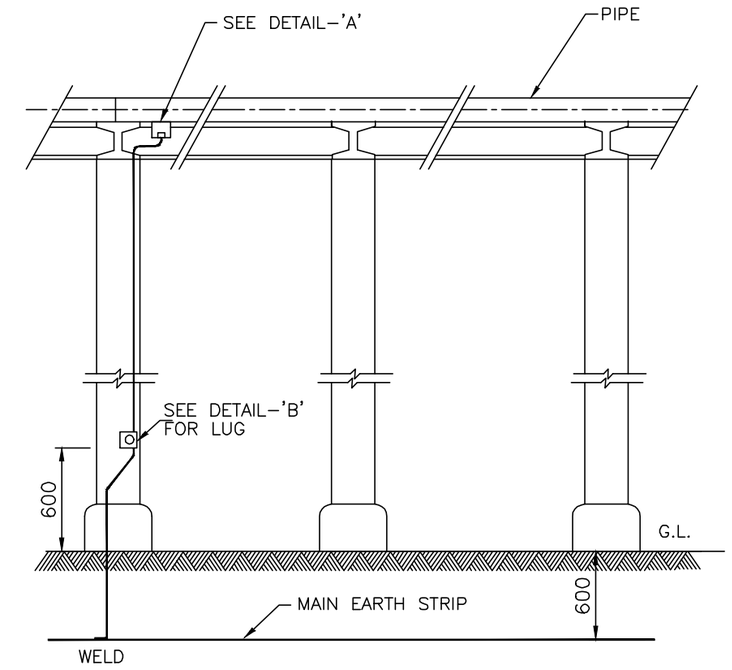
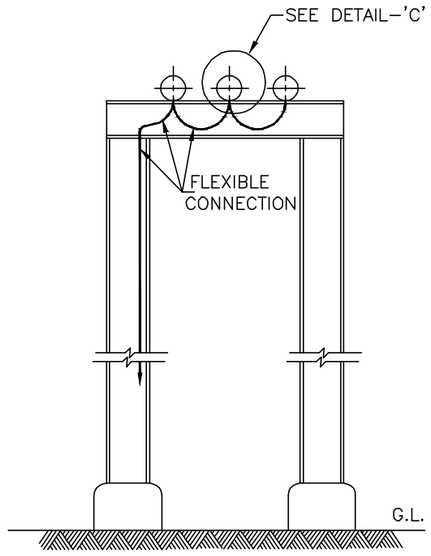
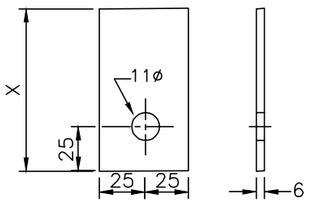


FRONT VIEW

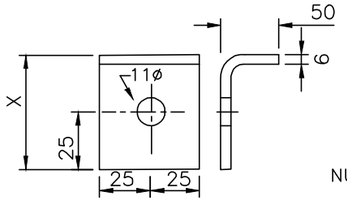


SIDE VIEW

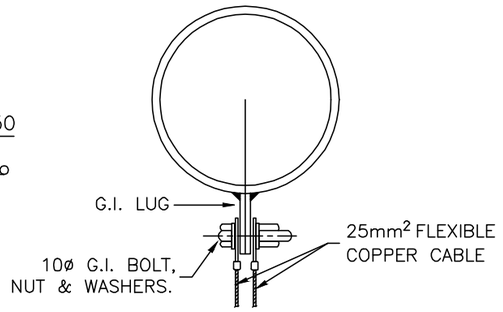
X – VARIES WITH INSULATION OF PIPE.



DETAIL – 'A'



DETAIL – 'B'



DETAIL – 'C'

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. THE PIPE LINES SHALL BE BONDED AND EARTHED AT THE ENTRY AND EXIT POINTS OF BATTERY LIMIT UNLESS OTHERWISE SPECIFIED.
3. NUTS/BOLTS SHALL BE AS PER IS 1363(PART–1,2,3):1992/ IS 1367(PART5):1980.
4. WASHERS SHALL BE AS PER IS 2016:1967.

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SUBJECT
TYPICAL EARTHING INSTALLATION DETAILS
EARTHING OF PIPES ON RACK

Size	Scale	Sheet	Rev.
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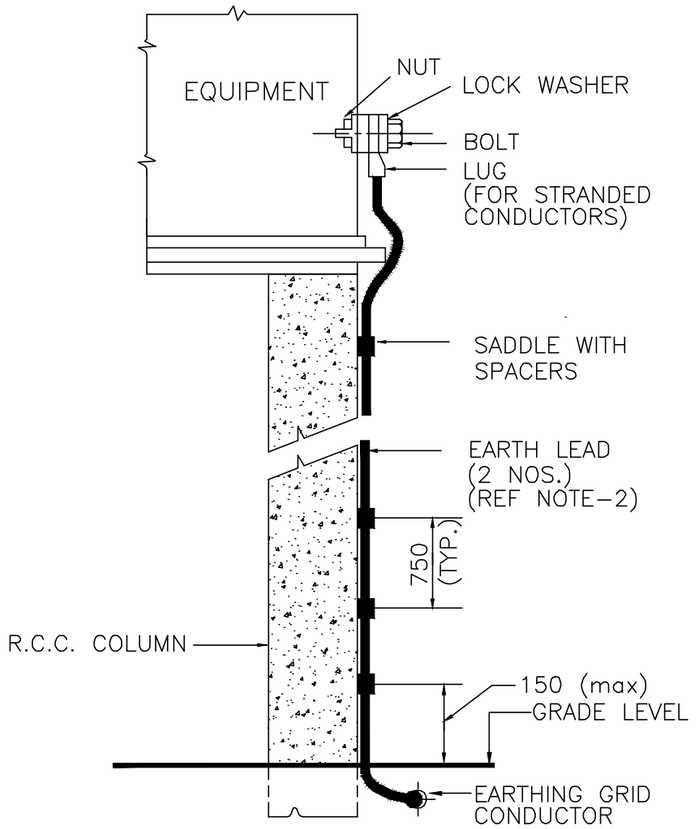
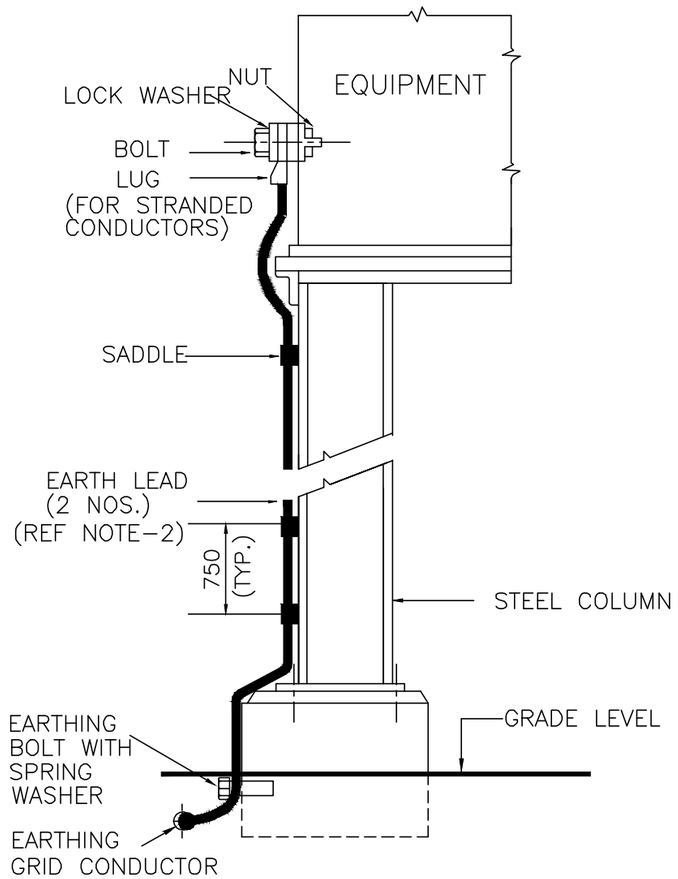


ELEVATION



ELEVATION

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. THE EARTH LEADS FOR THE SAME EQUIPMENT SHALL BE LAID ON TWO DIFFERENT COLUMNS, HOWEVER, IF THE EQUIPMENT IS SUPPORTED ON ONLY ONE COLUMN THE LEADS TO BE RUN ON OPPOSITE FACES OF THE SAME.
3. IF FLAT CONDUCTOR IS USED THE SAME TO BE SUITABLY DRILLED FOR CONNECTION TO THE EQUIPMENT EARTHING TERMINAL STUD.
4. THE CONDUCTOR CAN ALTERNATIVELY BE WELDED TO STEEL STRUCTURE AT 1000MM INTERVAL.
5. THE CONNECTION BETWEEN CONDUCTOR AND LUG SHALL BE CRIMPED TYPE.
6. NUTS AND BOLTS SHALL BE AS PER IS: 1363(PART-1,2,3):1992/ IS 1367(PART-5):1980.
7. WASHERS SHALL BE AS PER IS 2016:1967.

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SUBJECT
TYPICAL EARTHING INSTALLATION DETAILS
EQUIPMENT ON R C C / STEEL COLUMN

Size	Scale	Sheet
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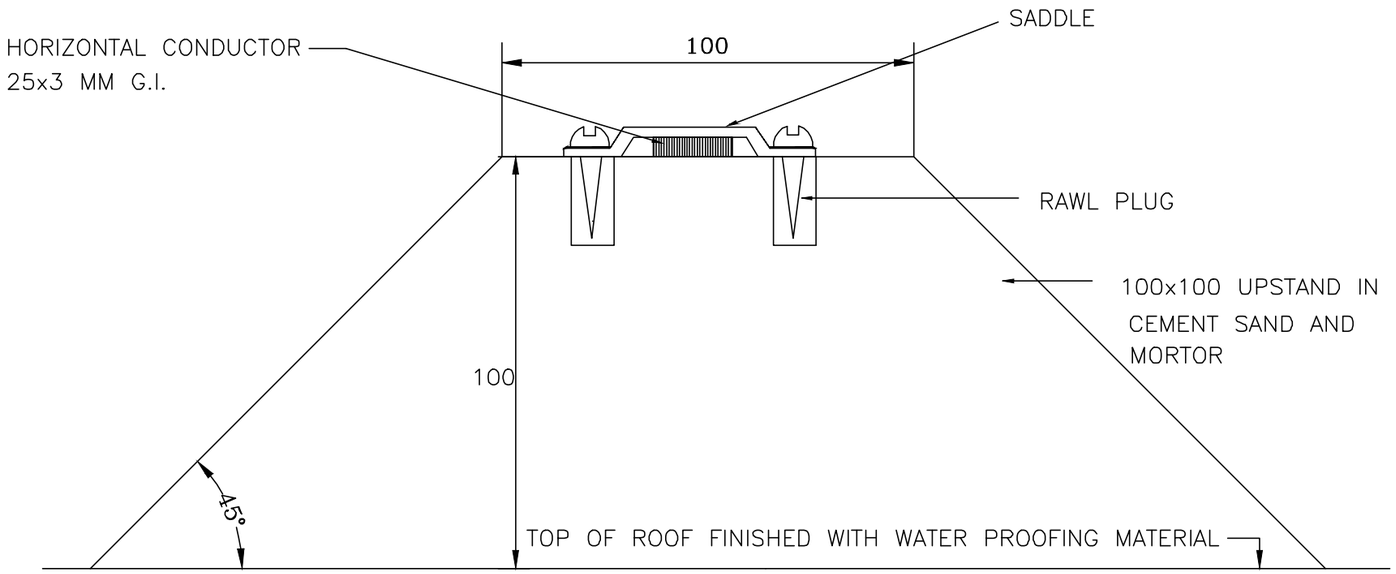

TYPICAL DETAILS OF CLEATING HORIZONTAL CONDUCTOR

OVER WATER PROOFING

NOTES

1. ALL DIMENSIONS ARE IN MM.

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SUBJECT: TYPICAL EARTHING INSTALLATION DETAILS
CLEATING EARTHING / LIGHTNING CONDUCTOR

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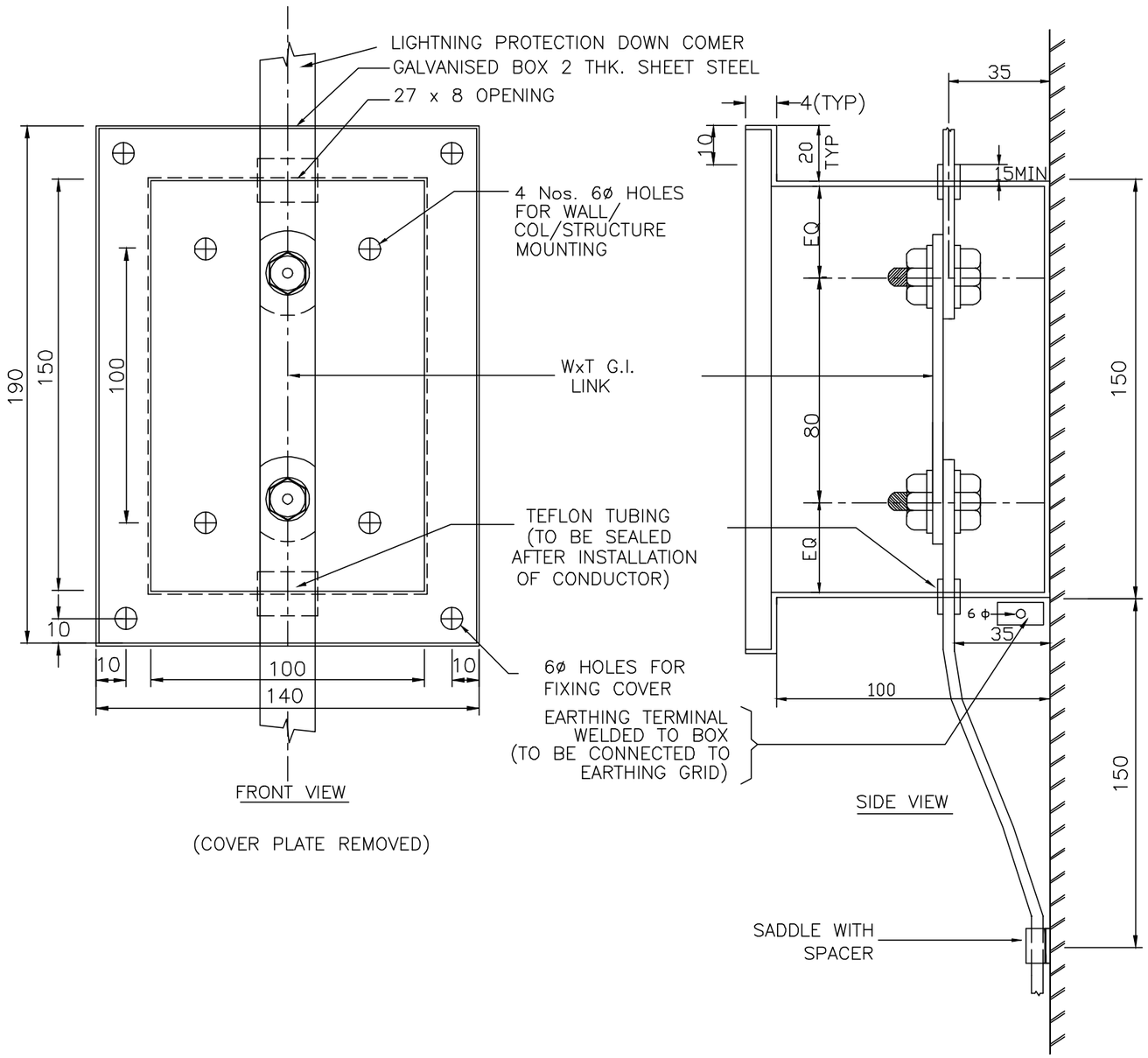

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. THE DOWN COMER ENTRY AND EXIT POINTS IN THE BOX TO BE MADE WATER TIGHT AFTER LAYING OF CONDUCTOR.
3. THE TEST LINK SHALL BE OF SAME WIDTH AND THICKNESS AS THE DOWN COMER. THE NUTS BOLTS AND WASHERS TO BE OF G.I.
4. NUTS AND BOLTS SHALL BE AS PER IS: 1363(PART-1,2,3):1992/ IS 1367(PART-5):1980.
5. WASHERS SHALL BE AS PER IS 2016:1967.

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SUBJECT: TYPICAL EARTHING INSTALLATION DETAILS
LIGHTNING PROTECTION DOWN COMER TEST LINK

Size	Scale	Sheet
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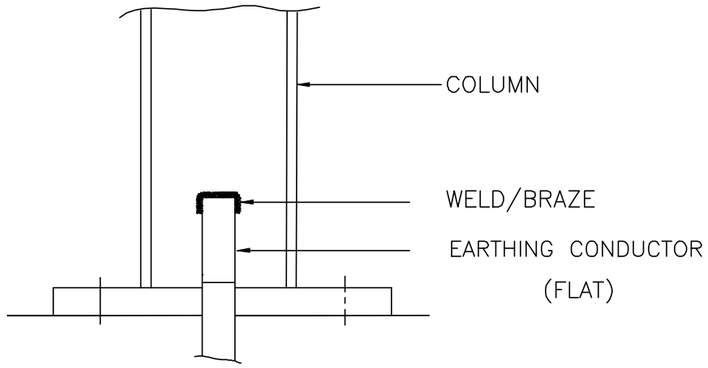
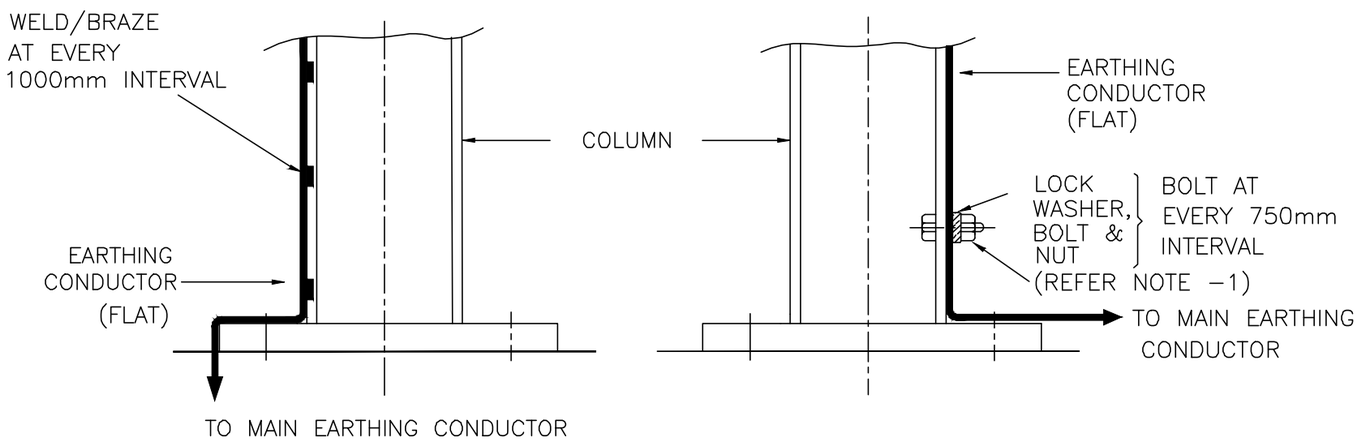


(i) STEEL COLUMN EARTHING



(ii) FLAT EARTHING CONDUCTOR RUNNINGALONG STEEL COLUMN

NOTES

1. IT IS PREFERABLE TO HAVE A RUN ON WEB SO THAT PROJECTIONS OF NUT/BOLTS ARE AVOIDED.
2. NUTS AND BOLTS SHALL BE AS PER IS: 1363(PART-1,2,3):1992/ IS 1367(PART-5):1980.
3. WASHERS SHALL BE AS PER IS 2016:1967.

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SUBJECT
TYPICAL EARTHING INSTALLATION DETAILS
EARTHING DETAILS STEEL COLUMNS

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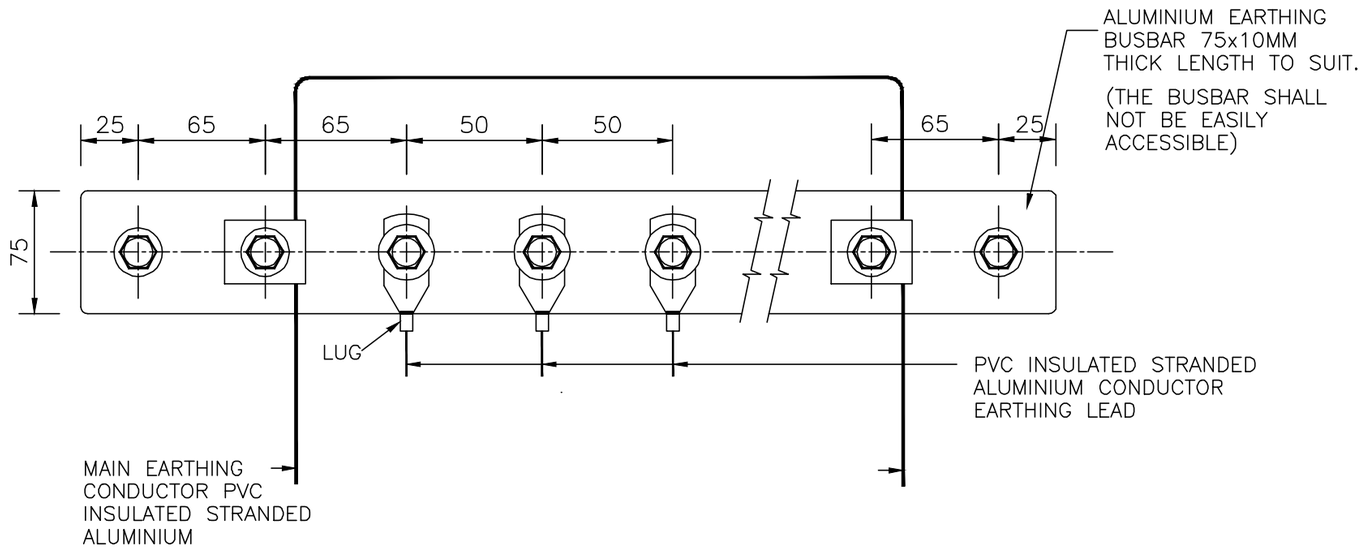

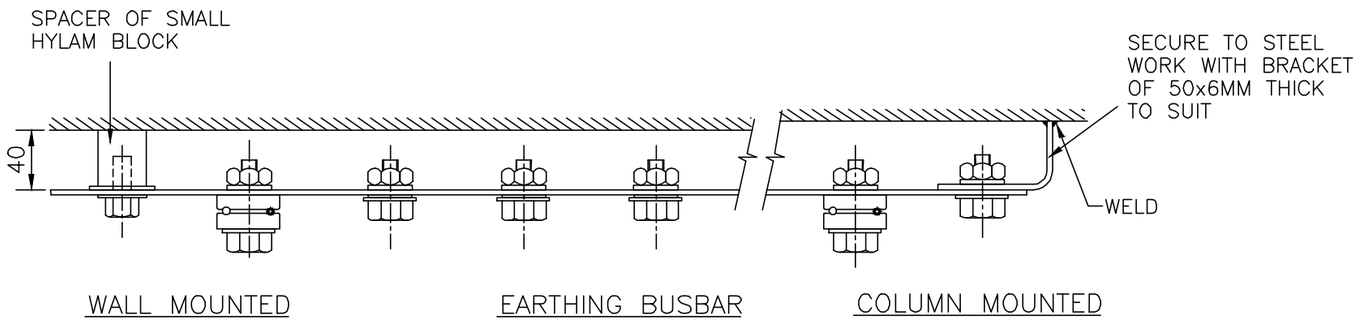

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. LUG DIMENSIONS TO SUIT VARIOUS CONDUCTOR SIZES USED.
3. FIELD TO ENCASE BUS IN BOX WHEN IN CORROSIVE ATMOSPHERE.
4. NUTS AND BOLTS SHALL BE AS PER IS: 1363(PART-1,2,3):1992/ IS 1367(PART-5):1980.
5. WASHERS SHALL BE AS PER IS 2016:1967.

MATERIALS

1. LUGS. . . . . ALUMINIUM (REFER NOTE # 2)
2. NUTS, BOLTS & WASHERS ..... G.I.

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SUBJECT: TYPICAL EARTHING INSTALLATION DETAILS
BUSBARS WALL/COLUMN MOUNTED

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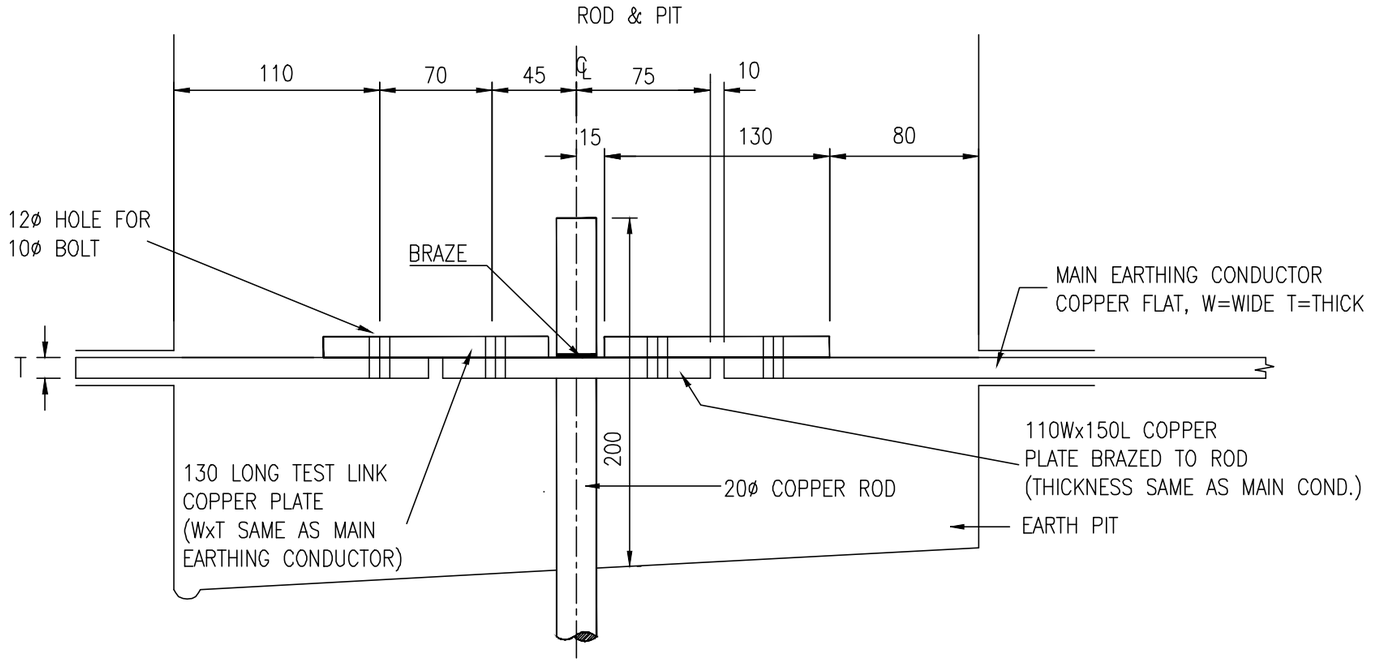

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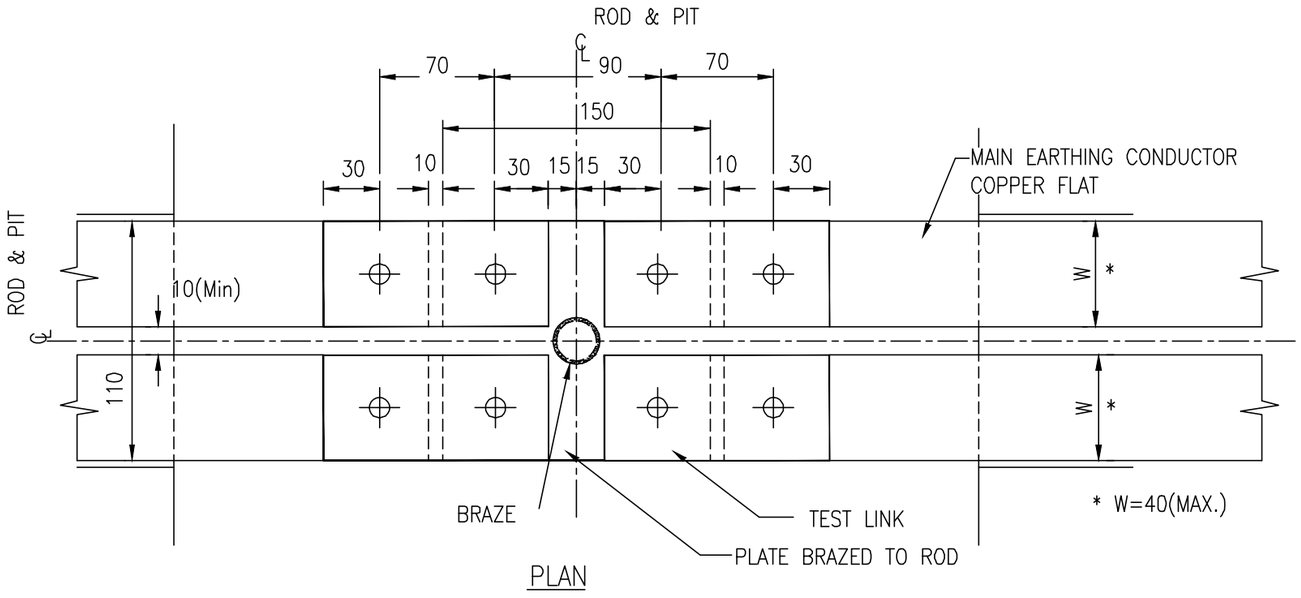

PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. ALL NUTS, BOLTS & WASHERS SHALL BE OF HIGH SILICON BRONZE ALLOY.
3. EXCEPT DIMENSIONS OF MAIN EARTHING CONDUCTOR, ALL OTHER DIMENSIONS SHALL REMAIN FIRM.
4. THE ARRANGEMENT IS TYPICAL FOR CONNECTING FOUR CONDUCTORS ON COPPER ROD ELECTRODE. ACTUAL NO. OF CONNECTIONS TO BE DECIDED AT SITE.
5. NUTS AND BOLTS SHALL BE AS PER IS: 1363(PART-1,2,3):1992/ IS 1367(PART-5):1980.
6. WASHERS SHALL BE AS PER IS 2016:1967.

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SUBJECT
TYPICAL EARTHING INSTALLATION DETAILS
ROD ELECTRODE CONNECTION DETAILS (FLAT CONDUCTOR)

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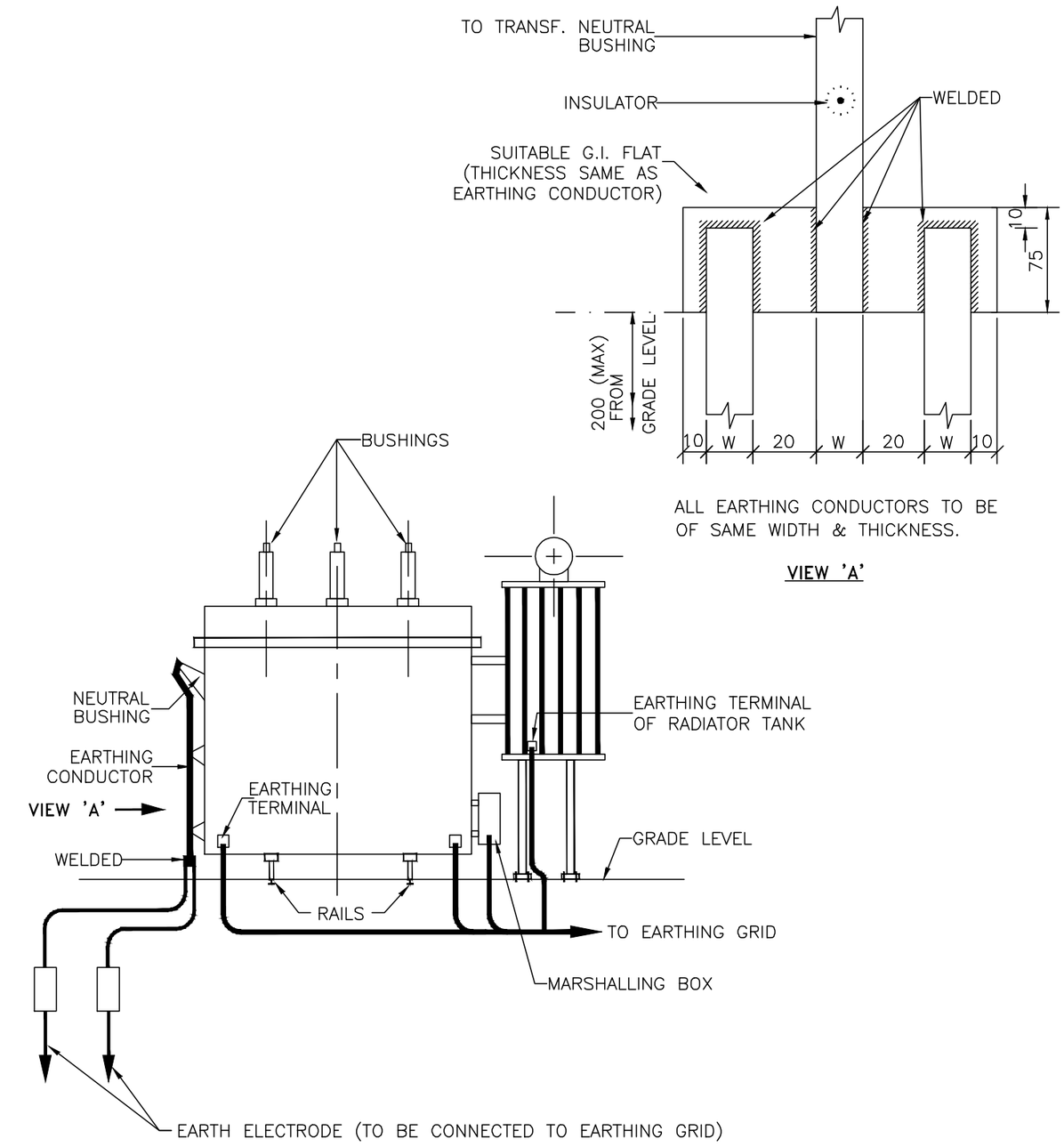

NOTES

1. ALL DIMENSIONS ARE IN MM.
2. WELDING SHALL BE DONE AS PER IS 816:1969.
3. THE TRANSFORMER NEUTRAL SHALL BE CONNECTED TO TWO ELECTRODES LOCATED APPROX 6M APART IN EARTH TEST PIT. THE CONNECTION BETWEEN TRANSFORMER NEUTRAL AND EACH ELECTRODE SHALL BE MADE BY SEPARATE CONDUCTORS.

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SUBJECT
TYPICAL EARTHING INSTALLATION DETAILS
TRANSFORMER EARTHING

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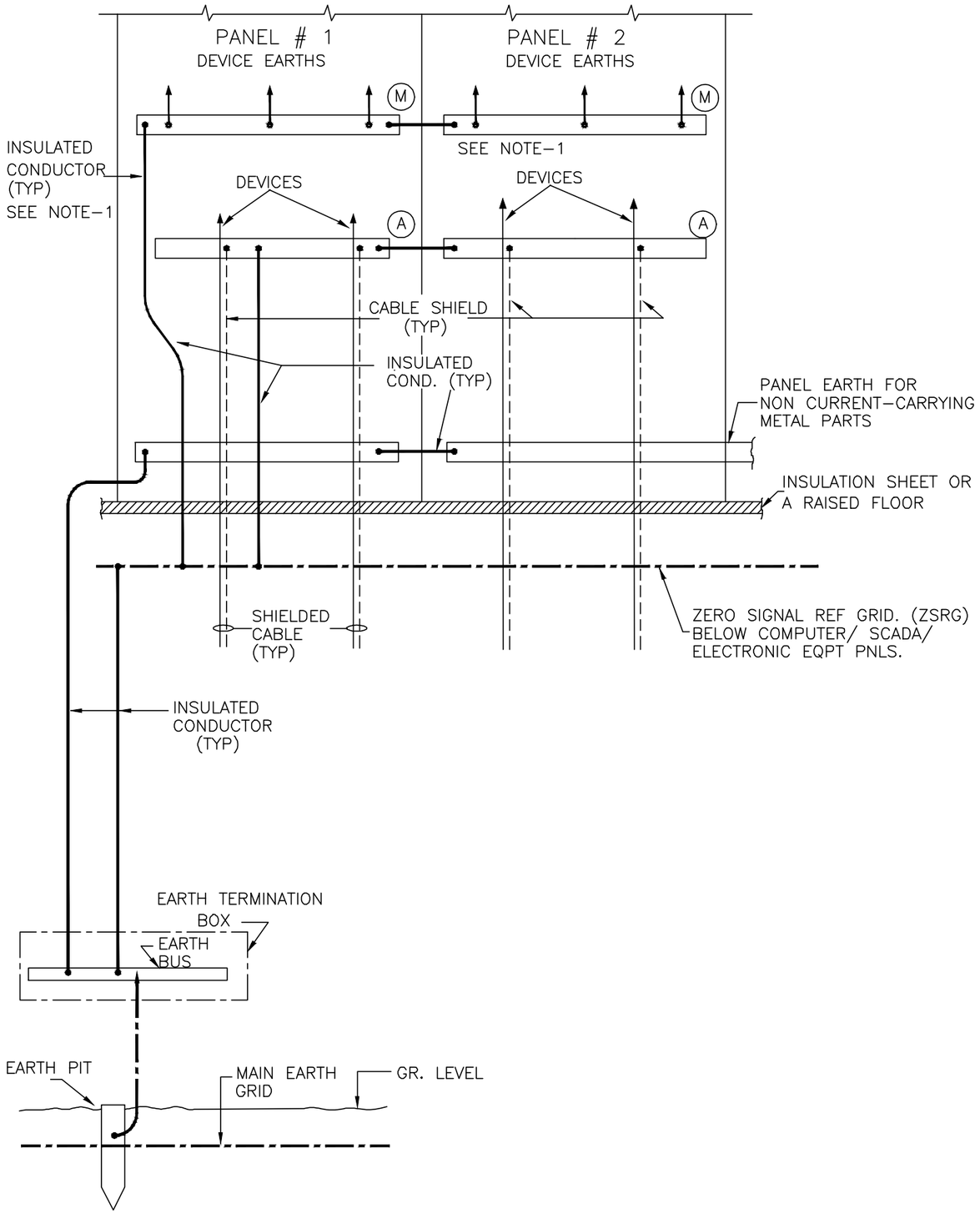

NOTES

1 EARTH BUSES Ⓐ & Ⓜ MAY BE COMBINED INTO ONE BUS IF TWO SEPARATE BUSES ARE NOT SPECIFIED BY VENDORS

2 IF ZSRG IS NOT PROVIDED THE Ⓐ & Ⓜ BUSES ARE BROUGHT BY INSULATED CONDUCTORS TO THE EARTHBUS IN THE EARTH TERMINATION BOX. ONLY ONE EARTHING CONNECTION SHOULD BE PROVIDED FROM THIS EARTH BUS TO EARTH PIT PROVIDED IN THE MAIN EARTHING GRID.

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SUBJECT
TYPICAL EARTHING INSTALLATION DETAILS
COMPUTER/INSTRUMENTATION EQUIPMENT

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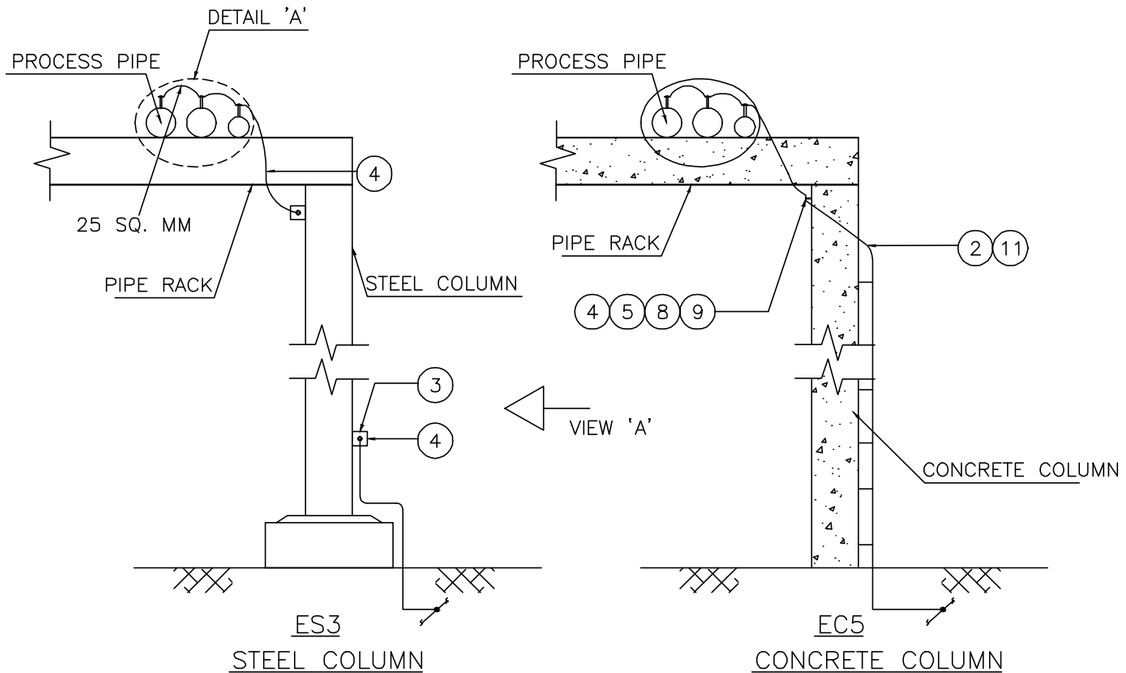


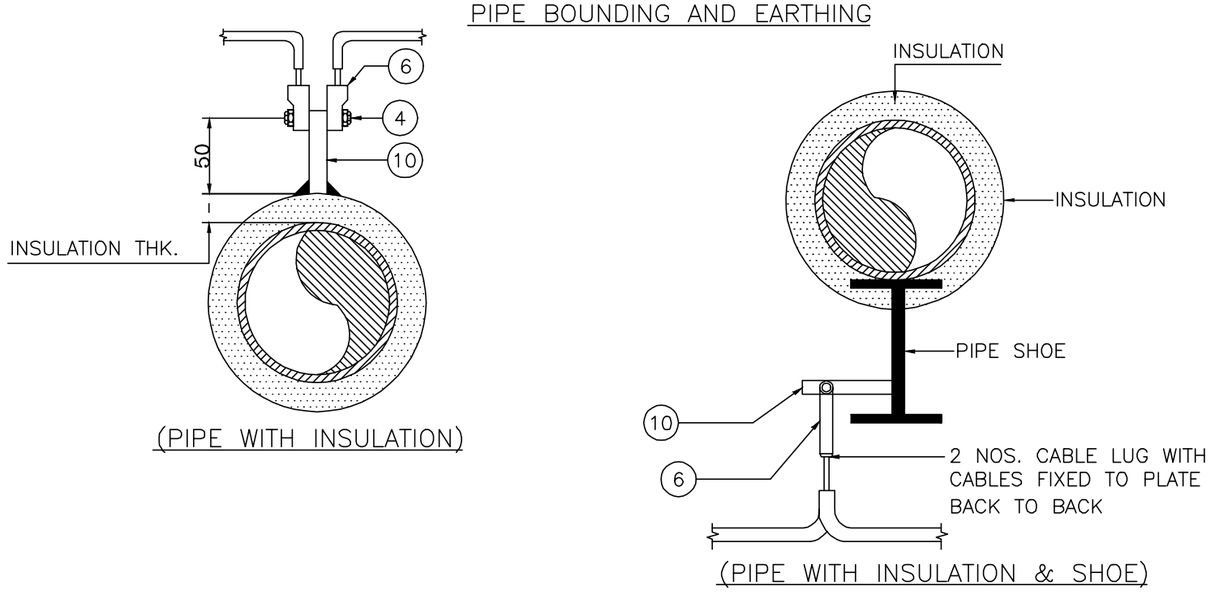
ES3

STEEL COLUMN

EC5

CONCRETE COLUMN

PIPE BOUNDING AND EARTHING



(PIPE WITH INSULATION)

(PIPE WITH INSULATION & SHOE)

NOTES

1. ALL DIMENSION INDICATED ARE IN MM UNLESS OTHERWISE SPECIFIED

LEGEND

1. EARTHING STRIP GI
2. SADDLE WITH CLAMP (HOT DIP GALV.)
3. EARTHING LUG (100x75x5mm THK.)
4. NUT, BOLT & SPRING WASHER
5. EARTH BUS 75x10mm, 400mm LONG
6. TERMINAL LUG (25 SQ.MM)
7. EARTHING CONDUCTOR (25AQ.MM)
8. 12mm DIA. SPACING PIPE(50mm LONG)
9. ANCHOR BOLT M8x100mm LONG WITH NUT WASHER & SPRING WASHER
10. 50 X 8 G.I STRIP WITH 1 NO. 10 DIA HOLE, LENGHT TO SUIT INSULATION
11. EXPANSION ANCHOR BOLT WITH FLATE WASHER (M6x40mm)

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	13.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT

TYPICAL EARTHING INSTALLATION DETAILS
EQUIPMENT ON R C C / STEEL COLUMN

Size	Scale	Sheet
A3	NTS	15 of 23

Drawing No. GGNG-E-20715-0812 | Rev. 0

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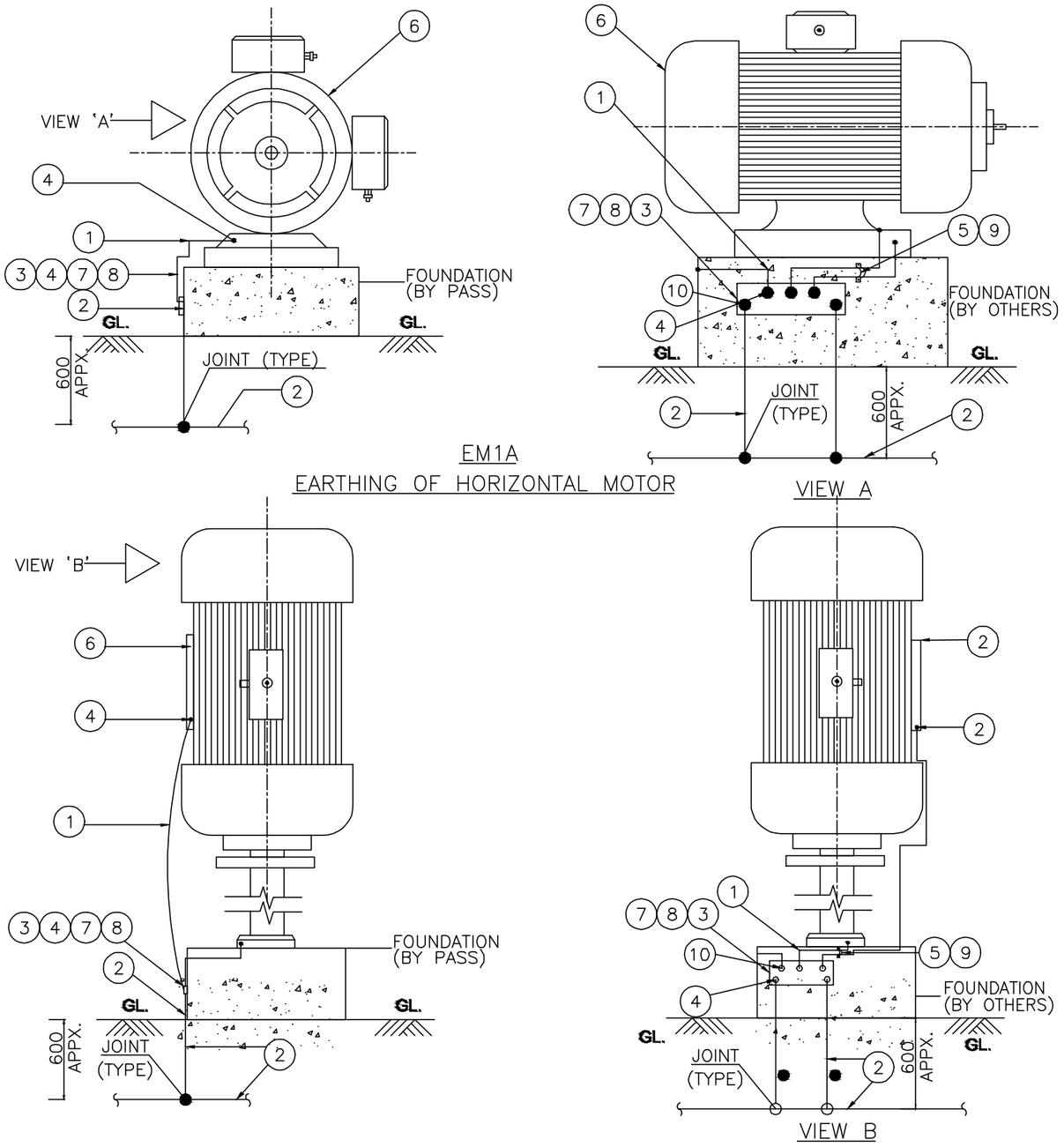

EM1A

EARTHING OF HORIZONTAL MOTOR

NOTES

1. ALL DIMENSION INDICATED ARE IN MM UNLESS OTHERWISE SPECIFIED.

LEGEND

1. EARTHING CONDUCTOR
2. EARTHING STRIP
3. EARTH BUS
4. TERMINAL LUG WITH NUT , BOLT & SPRING WASHER
5. SADDLE WITH CLAMP
6. MOTOR
7. 12mm DIA. SPACING PIPE (50mm LONG)
8. ANCHOR BOLT DIA 8mm, 100mm LONG WITH NUT,SPRING WASHER & PLAIN WASHER
9. EXPANSION ANCHOR NBOLT WITH FLATWASHER (M6x40mm)
10. NUT, BOLT & SPRING WASHER (M8)

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	13.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT

TYPICAL EARTHING INSTALLATION DETAILS

EARTHING OF HORIZONTAL MOTOR

Size	Scale	Sheet
A3	NTS	16 of 23

Drawing No. GGNG-E-20715-0812 | Rev. 0

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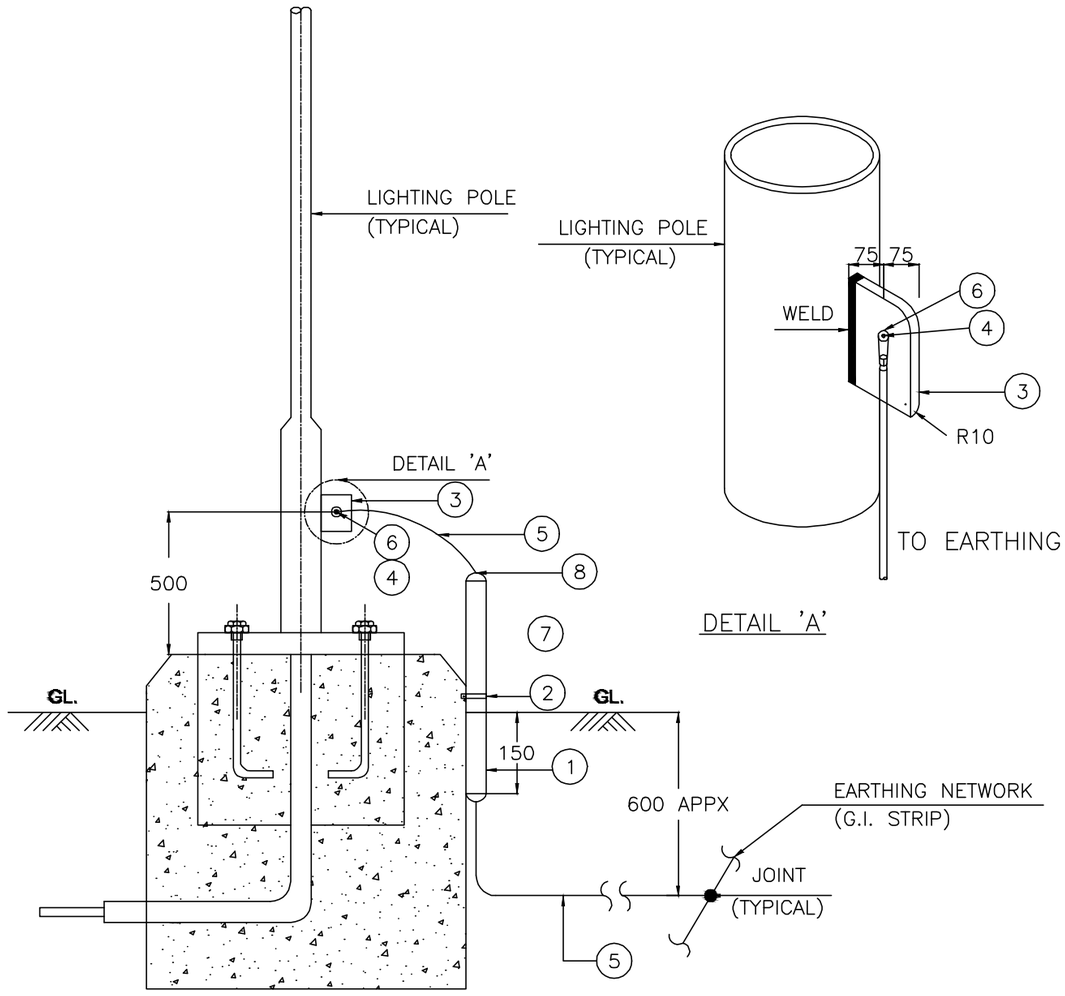
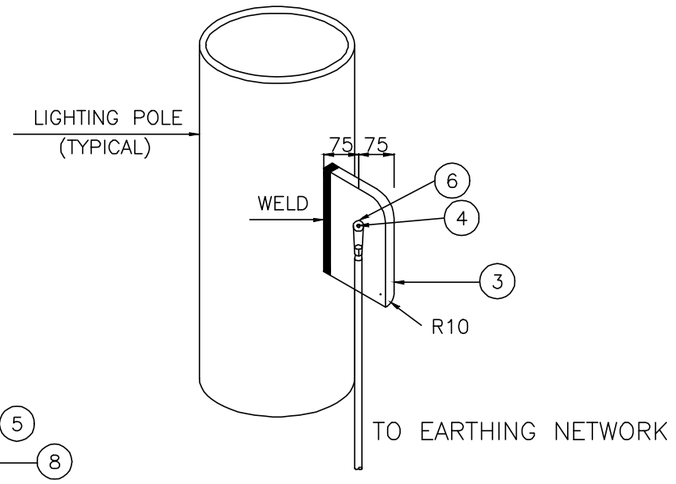


EARTHING OF LIGHTING POLE



DETAIL 'A'

NOTES

1. ALL DIMENSION INDICATED ARE IN MM UNLESS OTHERWISE SPECIFIED.

LEGEND

1. CONDUIT (GI)
2. CONDUIT CLAMP (HOT DIP GALV)
3. EARTHING LUG (100x75x5mm THK)
4. NUT, BOLT & SPRING WASHER (M8)
5. EARTHING CONDUCTOR (25 sq.mm)
6. TERMINAL LUG (25 sq.mm)
7. EXPANSION ANCHOR BOLT WITH FLATEWASHER (M6x400mm)
8. SEALING MATERIAL

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0	13.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL EARTHING INSTALLATION DETAILS
STANDARD EARTHING DETAILS FOR LIGHING POLE

Size A3 | Scale NTS | Sheet 17 of 23
Drawing No. GGNG-E-20715-0812 | Rev. 0

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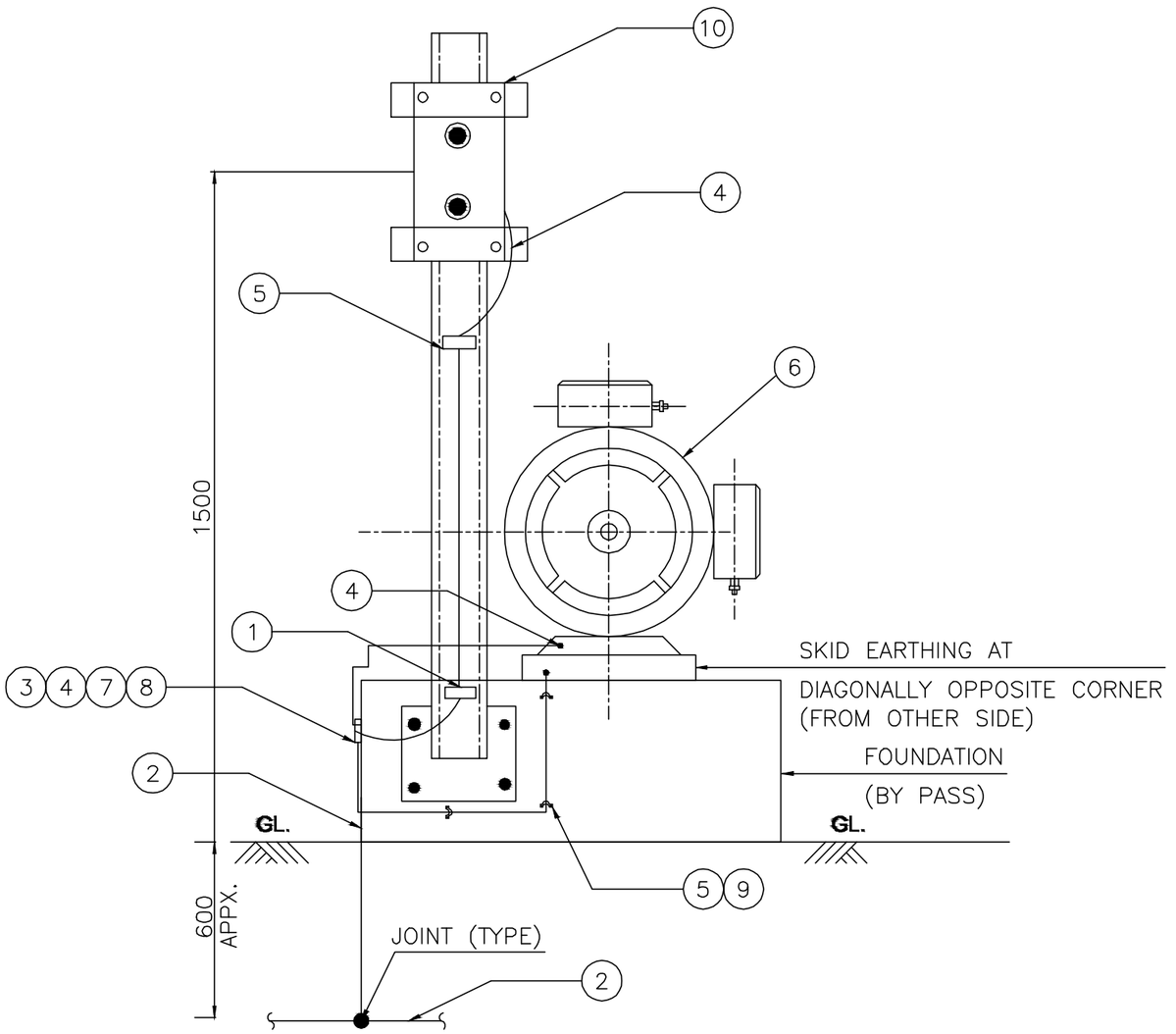

EM2

EARTHING OF MOTOR

WITH MOTOR FOUNDATION MOUMTED LCS

NOTES

1. ALL DIMENSION INDICATED ARE IN MM UNLESS OTHERWISE SPECIFIED.

LEGEND

1. EARTHING CONDUCTOR
2. EARTHING STRIP GI
3. EARTH BUS GI
4. TERMINAL LUG WITH NUT , BOLT & SPRING WASHER
5. SADDLE WITH CLAMP
6. MOTOR
7. 12mm DIA. SPACING PIPE (50mm LONG)
8. ANCHOR BOLT DIA 8mm, 100mm LONG WITH NUT,SPRING WASHER & PLAIN WASHER
9. EXPANSION ANCHOR NBOLT WITH FLATWASHER (M6x40mm)
10. LOCAL CONTROL STATION

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0	13.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL EARTHING INSTALLATION DETAILS
EARTHING OF MOTOR WITH MOTOR FOUNDATION MOUNTED LCS

Size: A3 | Scale: NTS | Sheet: 18 of 23

Drawing No.: GGNG-E-20715-0812 | Rev.: 0

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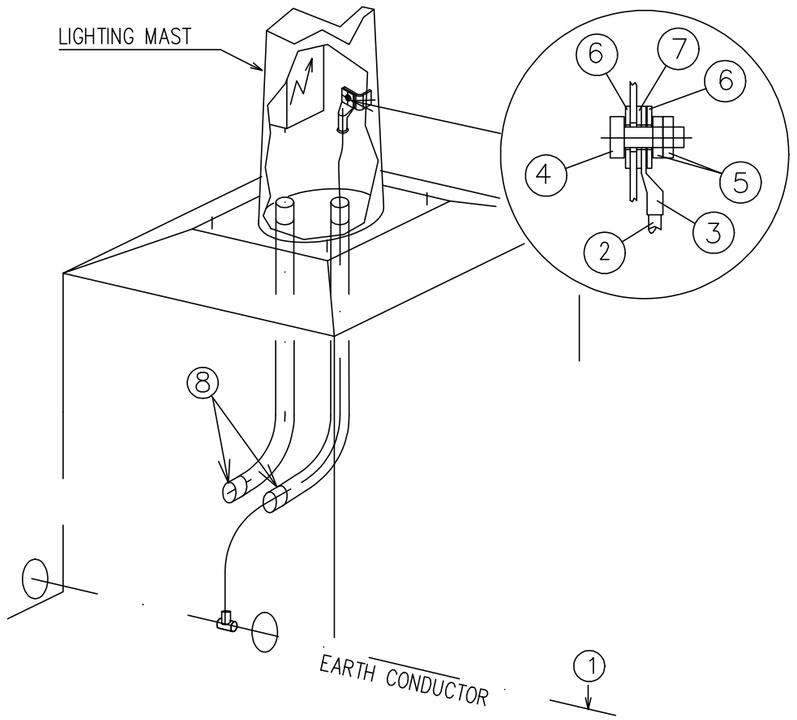

8	PIPE ø80mm	PVC		SUPPLY BY CIVIL WORK
7	BIMETALLIC WASHER M12	CU/AL		SUPPLY BY LIGHTING SUB-CONTRACTOR
6	CONTACT WASHER	STEEL	Zn8/B/Fe	SUPPLY BY LIGHTING SUB-CONTRACTOR
5	NUT	STEEL	Zn8/B/Fe	SUPPLY BY LIGHTING SUB-CONTRACTOR
4	SCREW	STEEL	Zn8/B/Fe	SUPPLY BY LIGHTING SUB-CONTRACTOR
3	TERMINAL	COPPER	Tinned	SUPPLY BY LIGHTING SUB-CONTRACTOR
2	PROTECTIVE CONDUCTOR	COPPER	Annealed	1x25 Sq.mm
1	EARTHING CONDUCTOR	G.I. FLAT	Annealed	65x8mm
N°	DESIGNATION	MATTER	SURF. TREAT.	OBSERVATION

TYPICAL DETAIL OF LIGHTING MAST EARTHING

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	13.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL EARTHING INSTALLATION DETAILS
LIGHTING MAST EARTHING

Size A3 | Scale NTS | Sheet 19 of 23
Drawing No. GGNG-E-20715-0812 | Rev. 0

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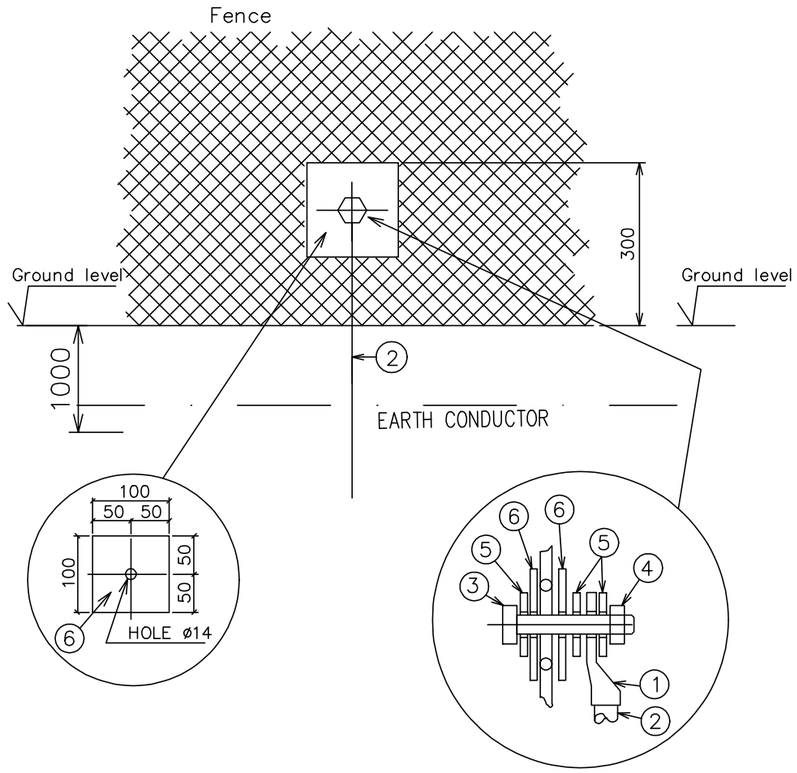

For metallic fence for inside facility like transformer yard the earthing conductor wil be bonded to the main buried earthing network.

⑥	ALUMINIUM FLAT 100x5	ALUMINIUM		Manufactur. on site
⑤	BIMETALLIC WASHER M12	CU /AL		
④	NUT H M12	STEEL	Zn8/B/Fe	
③	SCREW H M12 x 40	STEEL	Zn8/B/Fe	
②	PROTECTIVE CONDUCTOR	COPPER	Annealed	S= 50 Sqmm/ L=3m
①	CRIMPING LUG 70–12.5	COPPER	Tinned	
N°	DESIGNATION	MATTER	SURF. TREAT.	OBSERVATION

DETAIL OF FENCE EARTHING

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	13.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL EARTHING INSTALLATION DETAILS
OF FENCE EARTHING

Size A3 | Scale NTS | Sheet 20 of 23
Drawing No. GGNG-E-20715-0812 | Rev. 0

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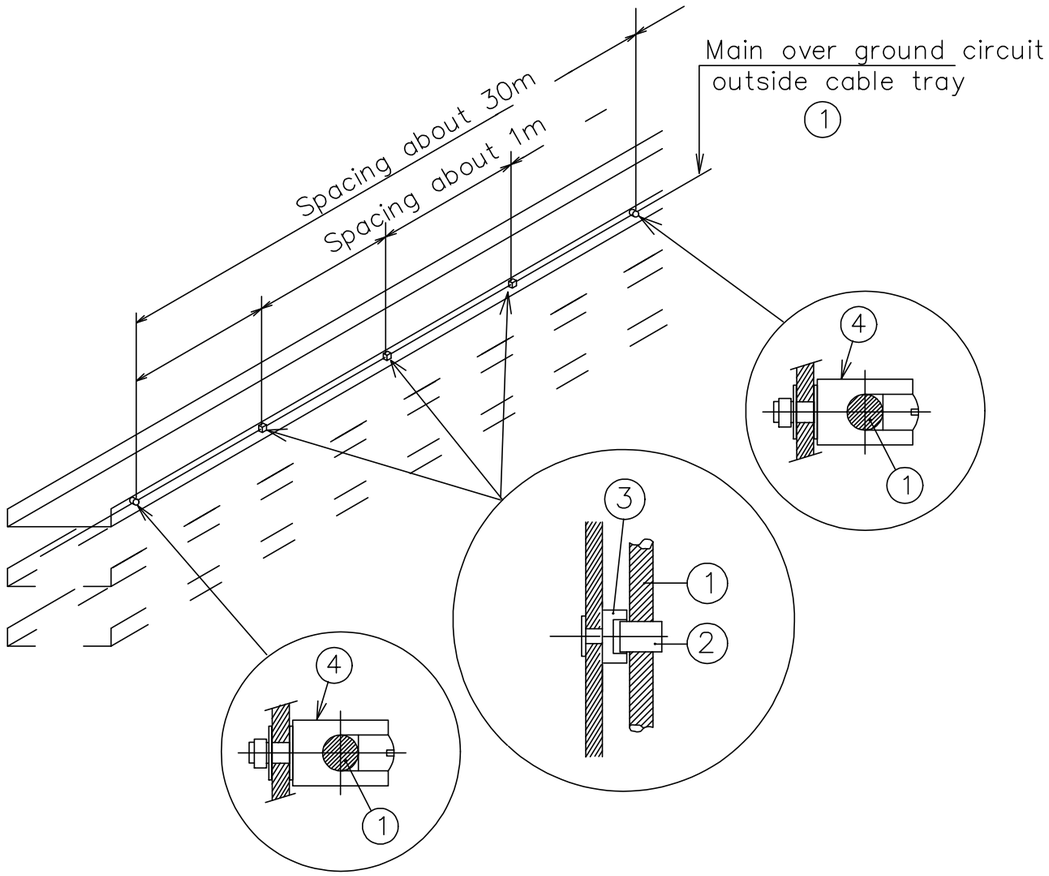

4	EARTHING CLIP	Brass		
3	BASE FOR CABLE TIE	Polyamide		
2	CABLE TIE	Polyamide		
1	PROTECTIVE CONDUCTOR	GI	Annealed	
N°	DESIGNATION	MATTER	SURF. TREAT.	OBSERVATION

TYPICAL DETAIL OF SINGLE ROW CABLE TRAY EARTHING

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	13.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT: TYPICAL EARTHING INSTALLATION DETAILS OF CABLE TRAY EARTHING

Size A3 | Scale NTS | Sheet 21 of 23

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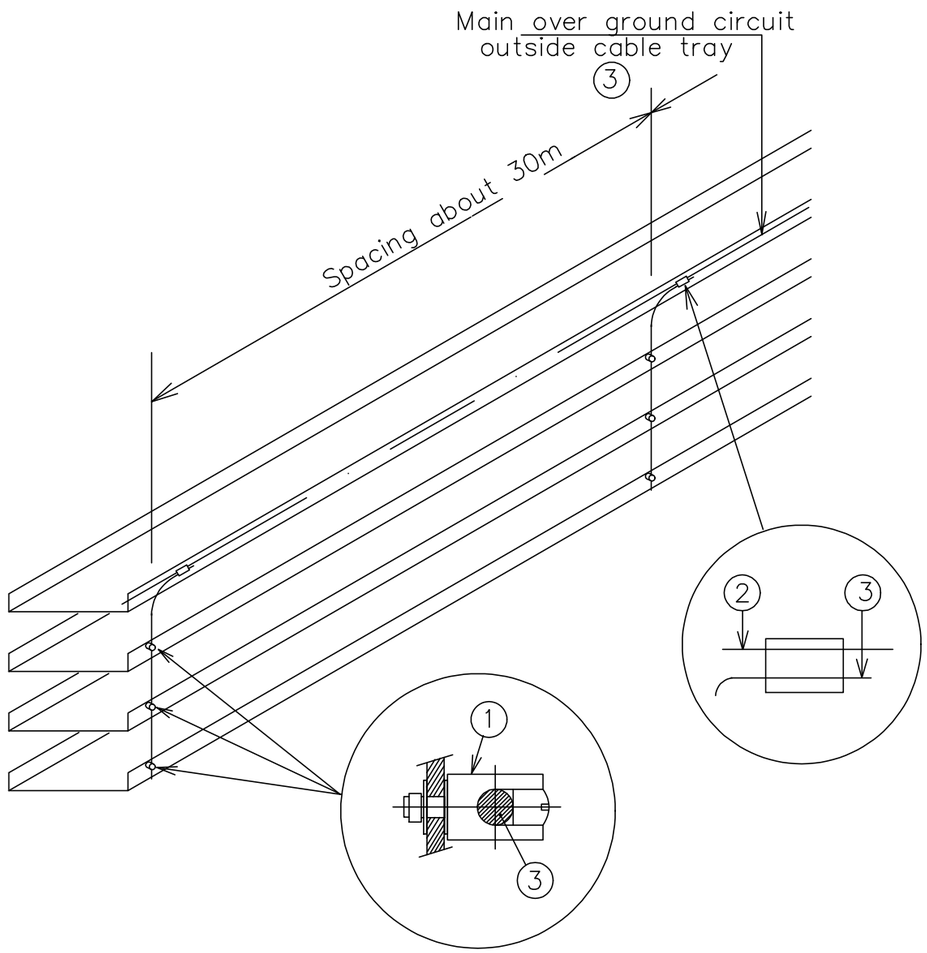

3	PROTECTIVE CONDUCTOR	GI	Annealed	65x8
2	PROTECTIVE CONDUCTOR	GI	Annealed	65x8
1	EARTHING CLIP	BRASS		According to number of cable trays
N°	DESIGNATION	MATTER	SURF. TREAT.	OBSERVATION

TYPICAL DETAIL OF MULTIPLE ROW CABLE TRAY EARTHING

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	13.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL EARTHING INSTALLATION DETAILS
OF MULTIPLE ROW CABLE TRAY EARTHING

Size	Scale	Sheet
A3	NTS	22 of 23

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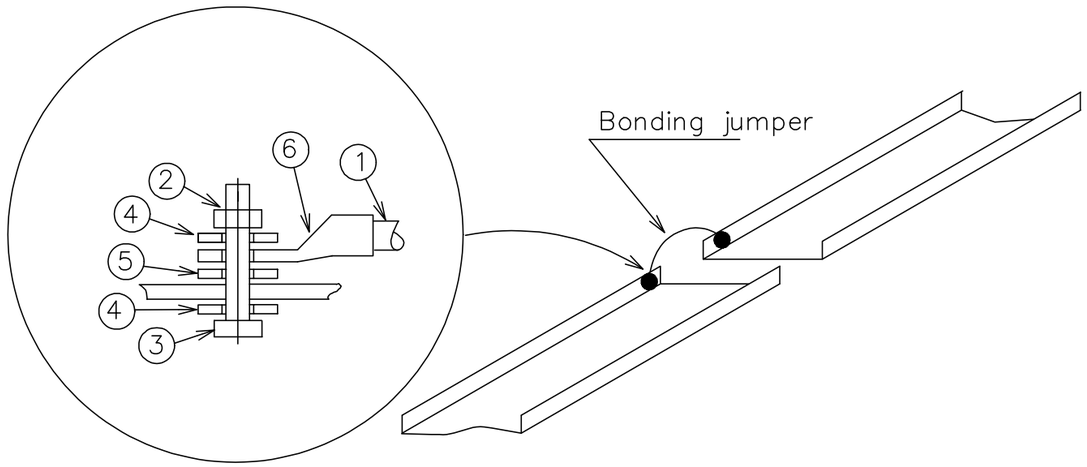

N°	DESIGNATION	MATTER	SURF. TREAT.	OBSERVATION
6	CRIMPING LUG 50–12	COPPER	Tinned	S= 50 Sqmm
5	BIMETALLIC PLATE	CU/AL		
4	BIMETALLIC WASHER M12	CU/AL		
3	SCREW H M12–40	STEEL	Zn8/ B/ Fe	
2	NUT H M12	STEEL	Zn8/ B/ Fe	
1	PROTECTIVE CONDUCTOR	COPPER	Annealed	S=50 Sqmm

TYPICAL DETAIL OF EXPANSION JOINT OF MAIN CABLE TRAY EARTHING

NOTES

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	13.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL EARTHING INSTALLATION DETAILS
OF EXPANSION JOINT OF MAIN CABLE TRAY EARTHING

Size	Scale	Sheet
A3	NTS	23 of 23

Drawing No. GGNG-E-20715-0812 Rev. 0

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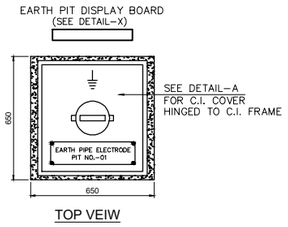
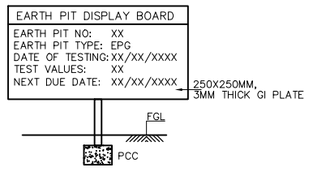
Annexure-I

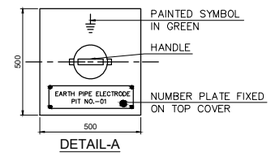
EARTH PIT DETAILS WITH G.I. PIPE ELECTRODE



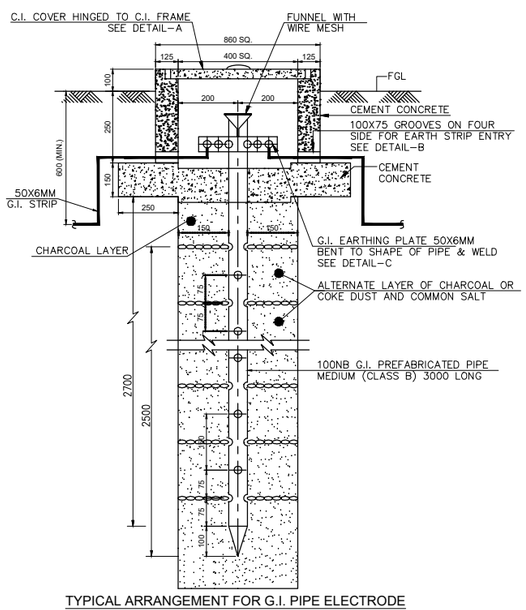
TOP VEIW



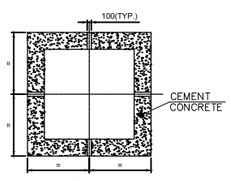
DETAIL-X



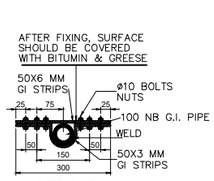
DETAIL-A



TYPICAL ARRANGEMENT FOR G.I. PIPE ELECTRODE

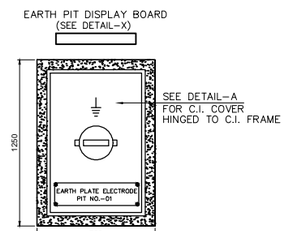


DETAIL-B

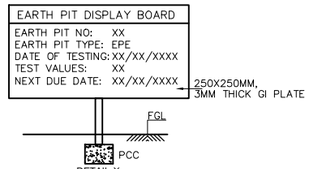


DETAIL-C

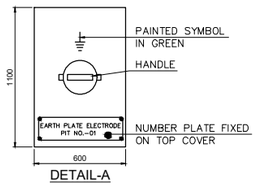
EARTH PIT DETAILS WITH COPPER PLATE ELECTRODE



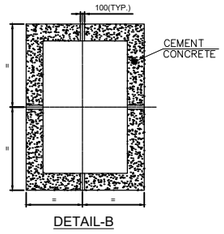
TOP VEIW



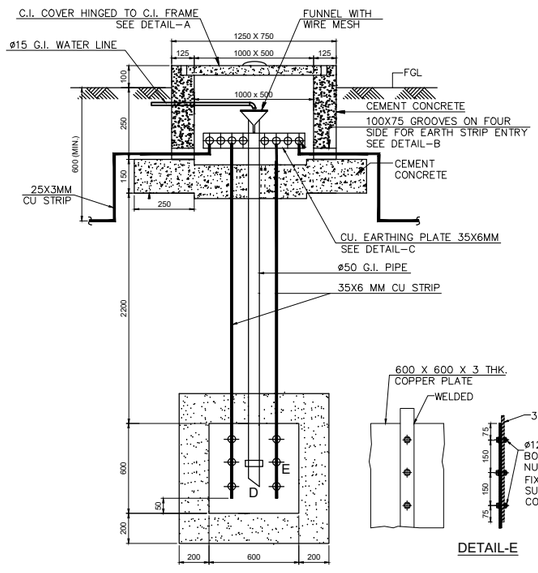
DETAIL-X



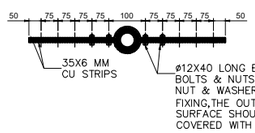
DETAIL-A



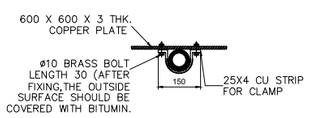
DETAIL-B



TYPICAL ARRANGEMENT FOR COPPER PLATE ELECTRODE



DETAIL-C



DETAIL-D

NOTES

1 ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2 FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE.
3. THE PIPE ASSEMBLY SHALL BE HOT DIP GALVANISED AFTER FABRICATION.

0	22.01.24	APPROVED	RKA	KB	DMY	VG

SUBJECT

TYPICAL EARTH PIT DETAILS

Size A3 | Scale NTS | Sheet 01 of 01

Drawing No. GGNG-E-20713-3001 | Rev. 0

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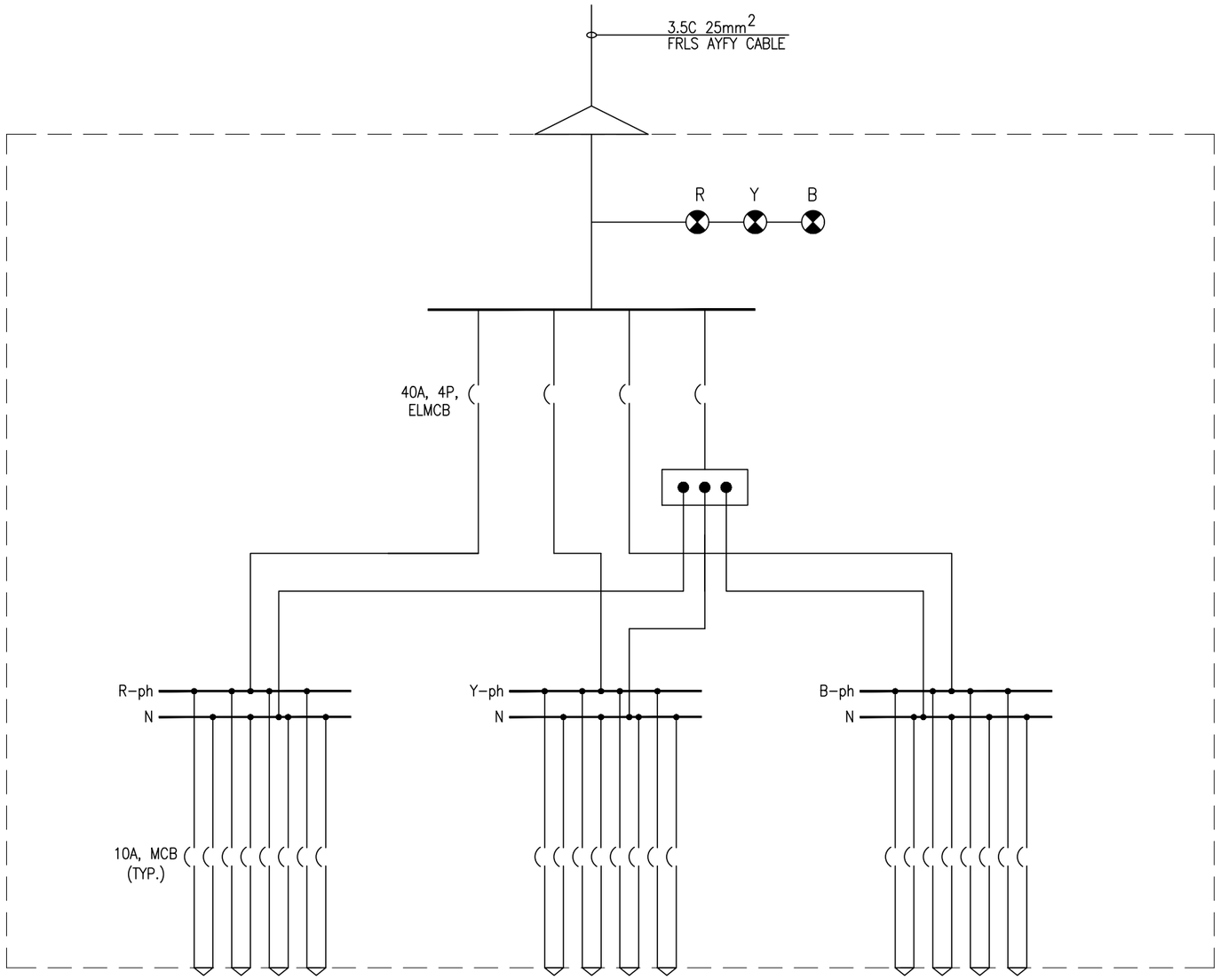

LEGEND:

	MCB
	INDICATION LAMP

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	06.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT

WIRING DIAGRAM FOR INDOOR LIGHTING
SUB DISTRIBUTION BOARD

Size	Scale	Sheet
A3	NTS	01 of 01

Drawing No. GGNG-E-20713-3002 | Rev. 0

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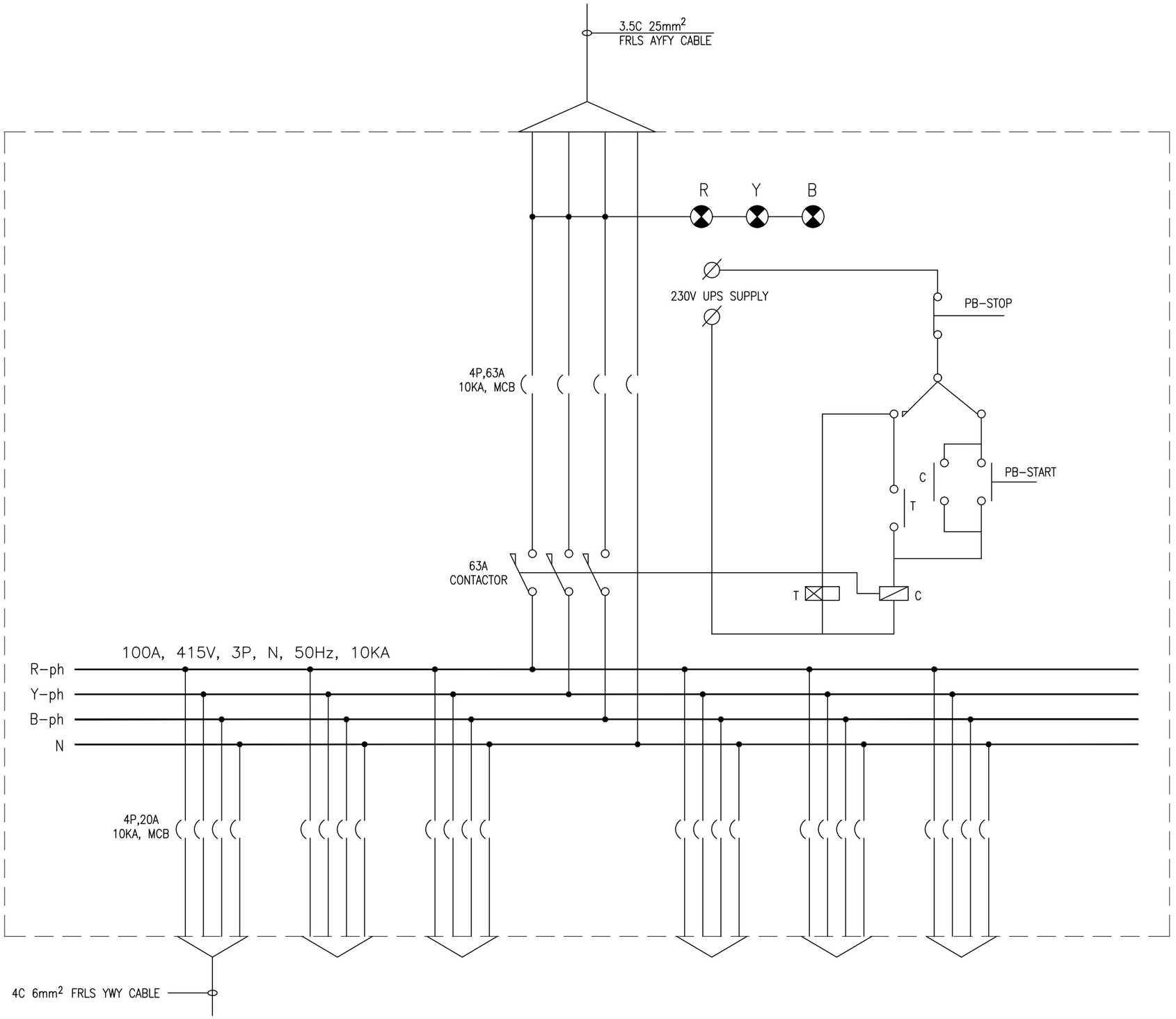

LEGEND:

	MCB
	INDICATION LAMP
	CONTACTOR
C	CONTACTOR
T	TIMER

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	06.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
WIRING DIAGRAM FOR OUTDOOR LIGHTING
SUB DISTRIBUTION BOARD

Size	Scale	Sheet
A3	NTS	01 of 01

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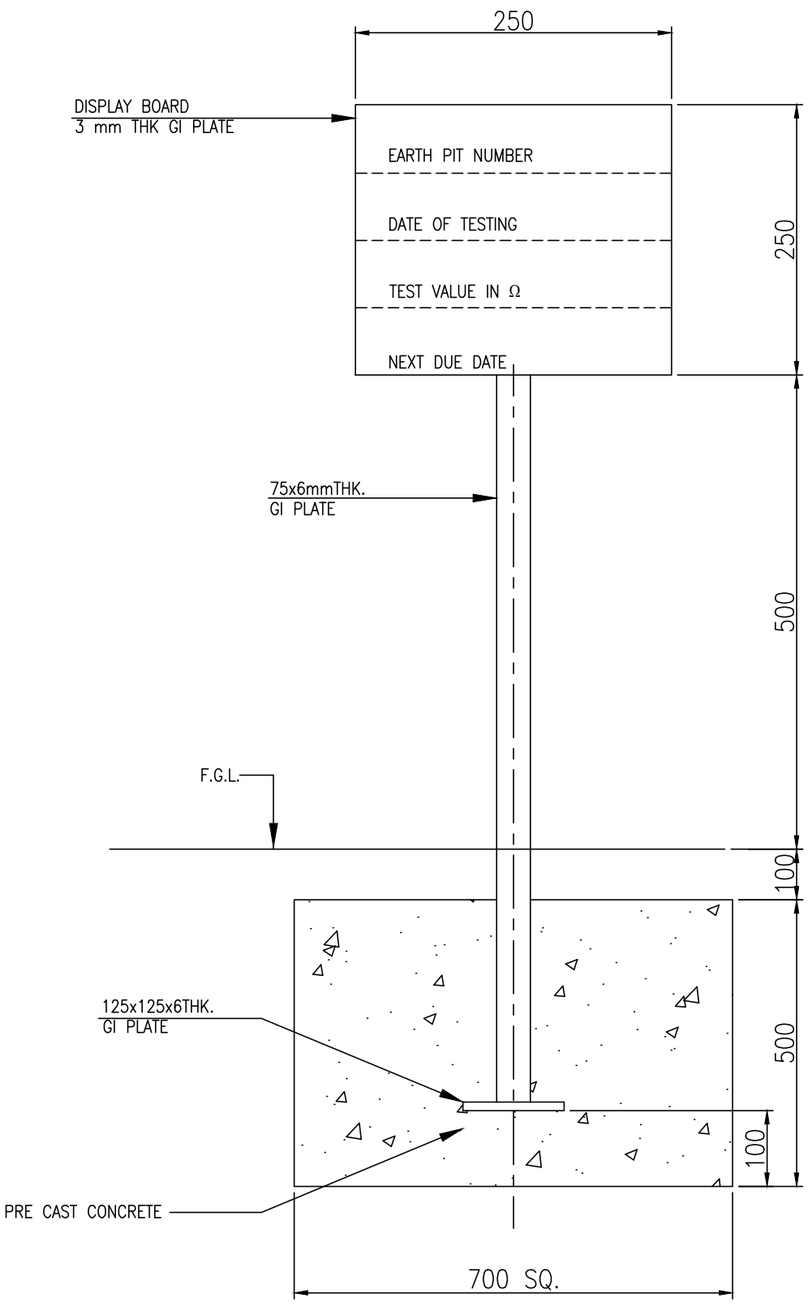

NOTES

1 ALL DIMENSIONS ARE IN MM. UNLESS OTHERWISE SPECIFIED.
2 FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE.
3 TEXT TO BE WRITTEN ON THE BOARD WITH BLACK ENAMEL PAINT AND FIGURE TO BE WRITTEN WITH RED ENAMEL PAINT.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	06.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT

DISPLAY BOARD FOR EARTH PIT

Size	Scale	Sheet
A3	NTS	01 of 01

Drawing No. GGNG-E-20713-3004 Rev. 0

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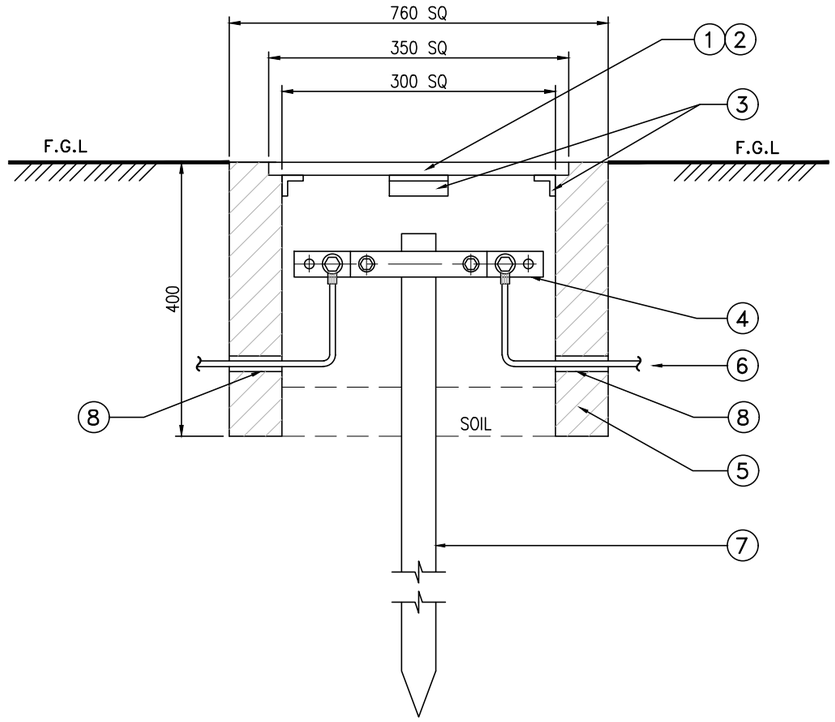

(TOP VIEW)

CLAMP TYPE EARTH BAR

NOTES

1 ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2 FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE.
3 EARTH RODS TO BE PROVIDED WITH A CLAMP TYPE EARTH BAR, WITCH ENSURES CONTINUITY OF MAIN EARTH RING EVEN WHEN REMOVED FROM EARTH ROD.

TAG	MATERIAL DESCRIPTION	CODMAT	QTY.	UNIT
1	STEEL COVER (6 THICK WITH 12 DIA LIFTING HOLE)		1	U
2	MARKED BY WELDING WITH EARTH SYMBOL		–	–
3	SECURING ANGLE IRON WELDED TO COVER		+	M
4	CLAMP TYPE EARTH BAR WITH HARDWARE & ACCESSORIES (NOTE1)		1	U
5	BRICK WORK		+	U
6	PLANT EARTH RING		*	M
7	20mm DIA. EARTH ROD (COPPER CLAD STEEL ROD)		3	M
8	PIPE CONDUIT 1 1/4" PVC HEAVY DUTY		1	M

\+ DECIDED AS PER REQUIREMENT
* QUANTITY AS REQUIRED

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	06.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT

TYPICAL EARTHING PIT DETAIL

Size A3 | Scale NTS | Sheet 01 of 0

Drawing No. GGNG-E-20713-3005 | Rev. 0

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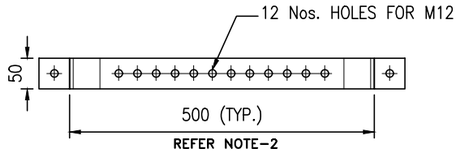
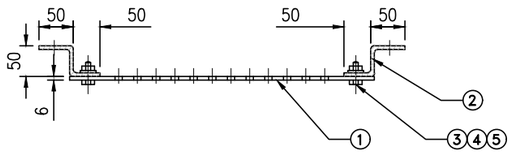
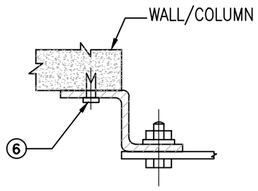
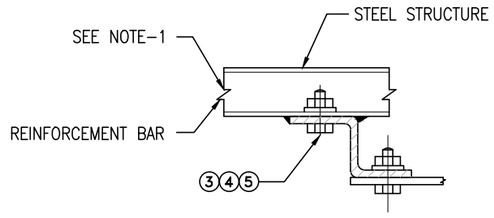






MOUNTING TYPE-1



MOUNTING TYPE-2

NOTES

1 ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2 FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE.
3 EARTH BUS SHALL BE INSTALLED AT CONVENIENT LOCATION NEAR GROUP OF EQUIPMENT PRECISE LOCATION OF GROUND BUS SHALL BE DECIDED BY AS PER SITE CONDITION.
4 LENGHT OF BUS TO SUIT AT SITE CONDITION.

TAG	MATERIAL DESCRIPTION	CODMAT	QTY.	UNIT
1	EARTH BUS 50x6 mm THK. COPPER		*	U
2	MOUNTING BRACKET		1	U
3	BOLT M12 – MS GALVANISED		2	U
4	NUTS (HEXAGONAL HEAD) – GALVANISED		2	U
5	PLAIN WASHER – GALVANISED		1	U
6	ANCHOR BOLT		4	U

* QUANTITY AS REQUIRED

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	06.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYPICAL EARTHING BUS DETAILS

Size	Scale	Sheet
A3	NTS	01 of 01

Drawing No. GGNG-E-20713-3006 Rev. 0

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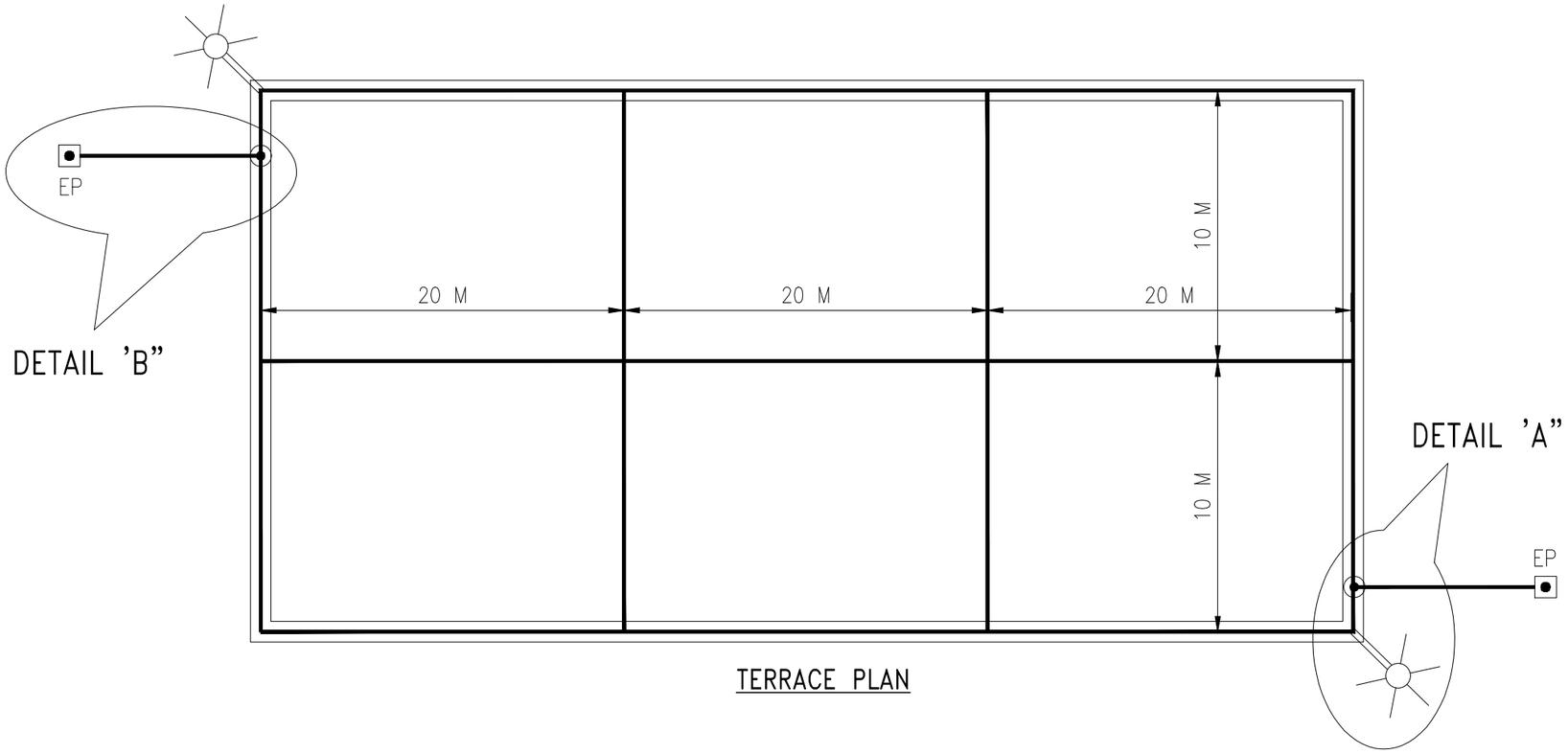


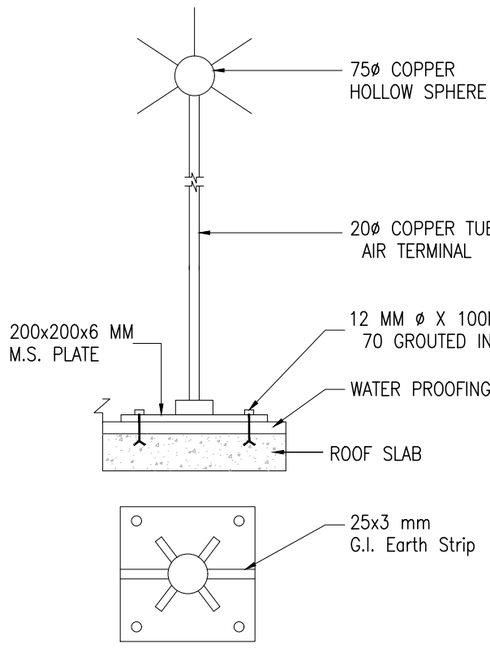
TERRACE PLAN

NOTES

1 ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2 FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE.
3 G.I. SADDLE TO BE FIXED FOR HORIZONTAL DOWN CONDUCTOR A THE INTERVAL OF 750mm.

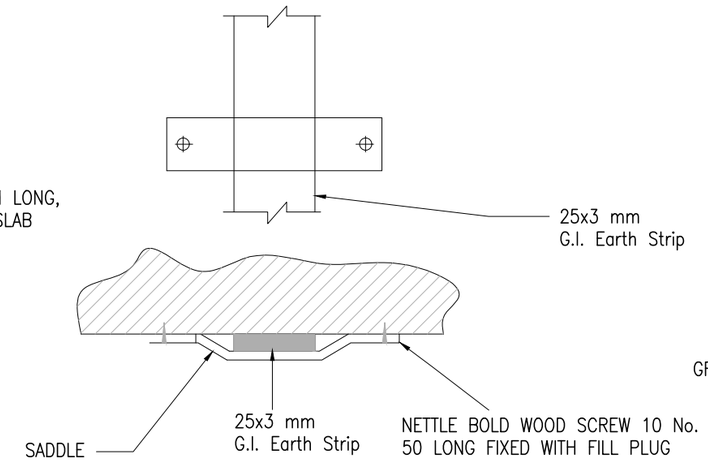
LEGEND

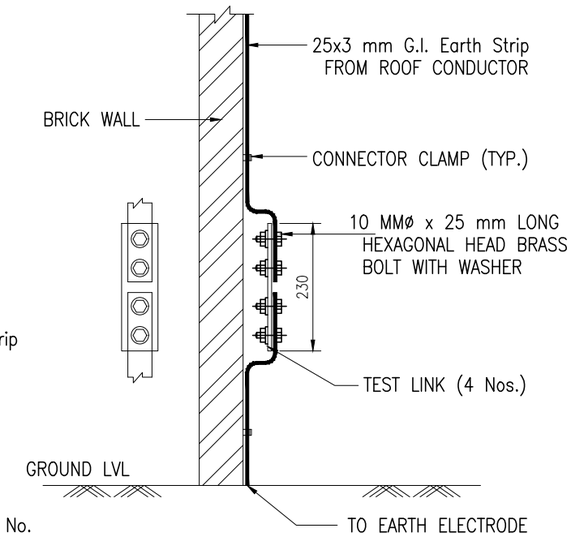
S.No.	SYMBOL DESCRIPTION	SYMBOL
1	25x3 mm G.I. EARTH STRIP	
2	25x3 mm DOWN CONDUCTOR	
3	LIGHTNING ARRESTOR (VERTICAL AIR TERMINAL)	
4	EARTH PIT	EP



FIXING ARRANGEMENT FOR HORIZONTAL DOWN CONDUCTORS

DETAIL 'A"





TEST LINK FOR LIGHTINING PROTECTION

DETAIL 'B"

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0	06.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT
TYP. LIGHTNING PROTECTION DETAIL
FOR CONTROL ROOM BUILDING

Size	Scale	Sheet
A3	NTS	01 of 01

Drawing No. GGNG-E-20713-3007 | Rev. 0

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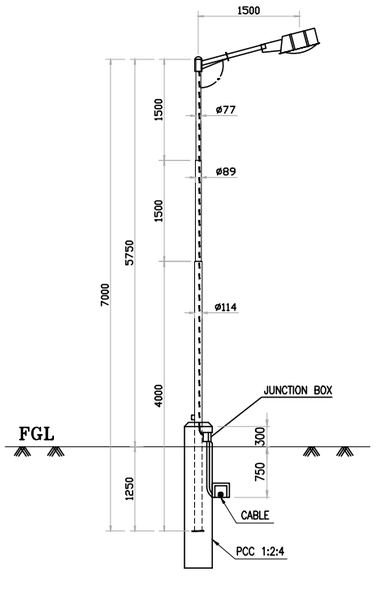
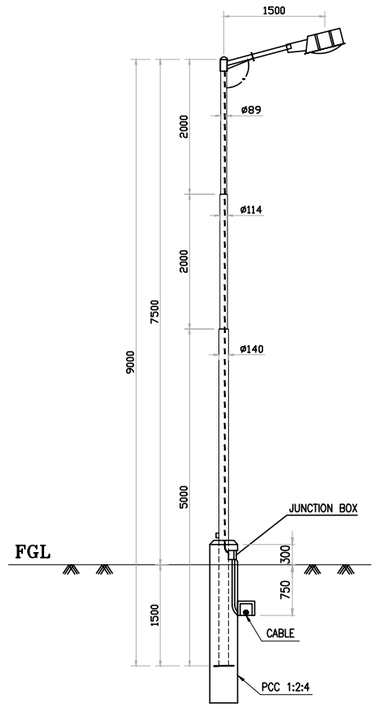
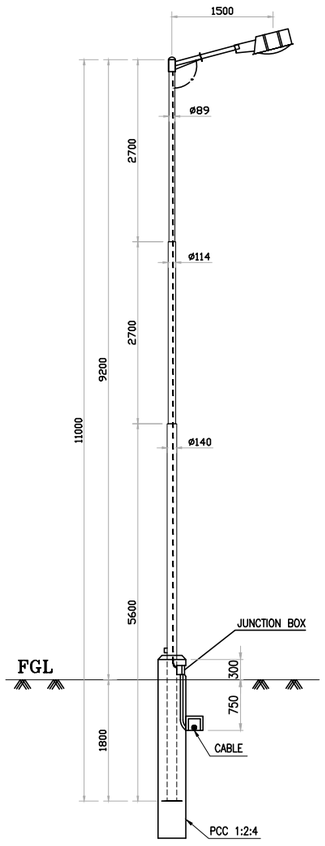


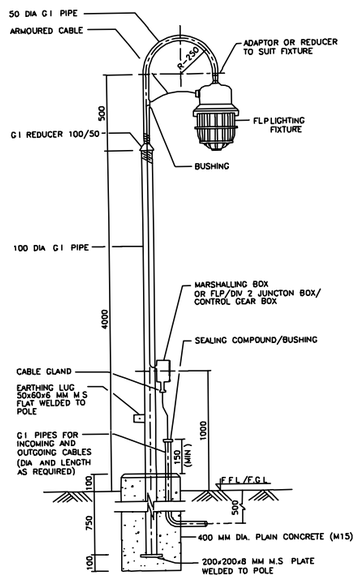
7M HEIGH POLE TYPE-(410 SP-3)



9M HEIGH POLE TYPE-(410 SP-30)



11M HEIGH POLE TYPE-(410 SP-50)



4.5M HEIGH FLP WELL GLASS LIGHTING FIXTURE SUITABLE FOR HAZARDOUS AREA (ZONE 1/ZONE 2)

NOTES

1 ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.

2 FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE.

3 THE LIGHTING POLE SHALL BE ACCORDING TO IS:2713.

Rev.	D M Y	Modifications	Drawn	Checked	Approved	Validated
0	06.10.16	APPROVED	RKS	PR	KJ	SKH

SUBJECT

LIGHTING POLES DETAILS

Size	Scale	Sheet
A3	NTS	01 of 01

Drawing No. GGNG-E-20713-3009 Rev. 0

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STANDARD DRAWINGS

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SPECTACLE BLIND FLANGE	DRAWING NO.
	SD-PI-001
	SHEET NO. 1 OF 1

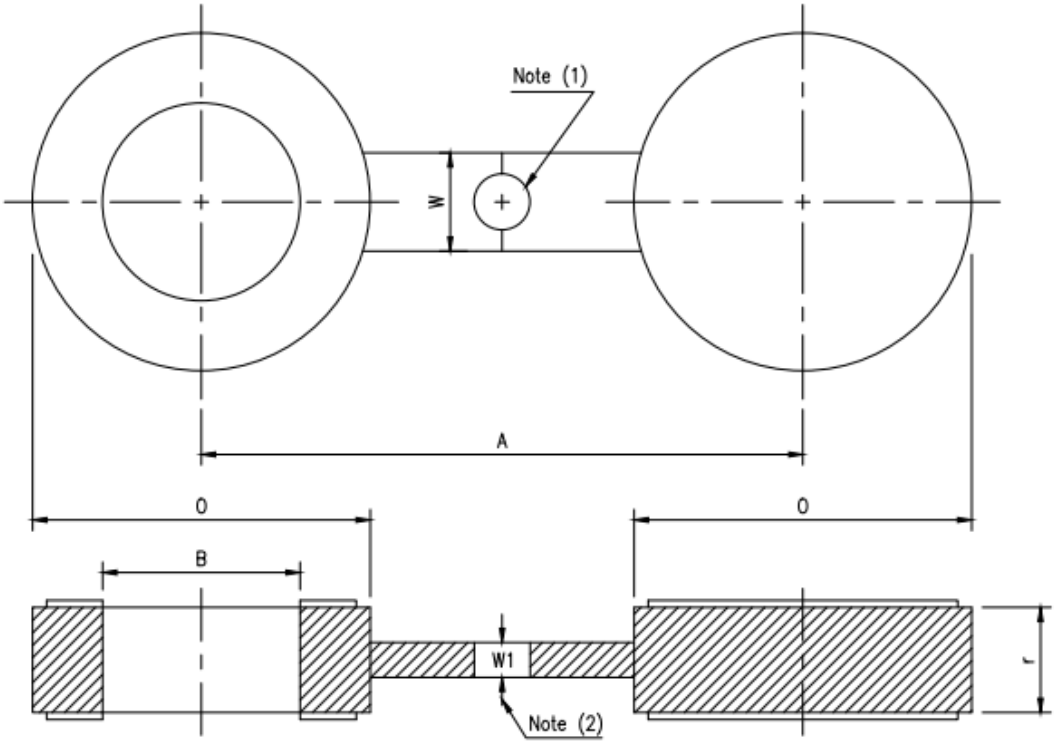

TABLE-4 DIMENSIONS OF CLASS 600 RAISED FACE FIGURE 8 BLANKS

NPS	INSIDE DIAMETER B, in.	OUTSIDE DIAMETER O, in.	CENTERLINE DIMENSION A, In.	THICKNESS r, in.	WEB WIDTH W, In.
1/2	0.62	2.00	2.62	0.25	1.50
3/4	0.82	2.50	3.25	0.25	1.50
1	1.05	2.75	3.50	0.25	2.25
1¼	1.44	3.12	3.98	0.38	2.25
1½	1.68	3.62	4.50	0.38	2.62
2	2.16	4.25	5.00	0.38	2.25
2½	2.64	5.00	5.88	0.50	2.62
3	3.26	5.75	6.62	0.50	2.62
3½	3.76	6.25	7.25	0.62	3.00
4	4.26	7.50	8.50	0.62	3.00
5	5.30	9.38	10.50	0.75	3.38
6	6.36	10.38	11.50	0.88	3.38
8	8.33	12.50	13.75	1.12	3.75
10	10.42	15.62	17.00	1.38	4.12
12	12.39	17.88	19.25	1.62	4.12
14	13.62	19.25	20.75	1.75	4.50
16	16.62	22.12	23.75	2.00	4.88
18	17.62	24.00	25.75	2.12	5.25
20	19.58	26.75	28.50	2.50	5.25
24	23.50	31.00	33.00	2.88	6.00

NOTES:
(1) Hole size (where required due to bolt spacing) shall be the same as the flange bolt hole. and located such that it will not interfere with bolting between two flanges.
(2) The thickness of the web (or tie bar) dimension W1 shall be 0.25 in. minimum.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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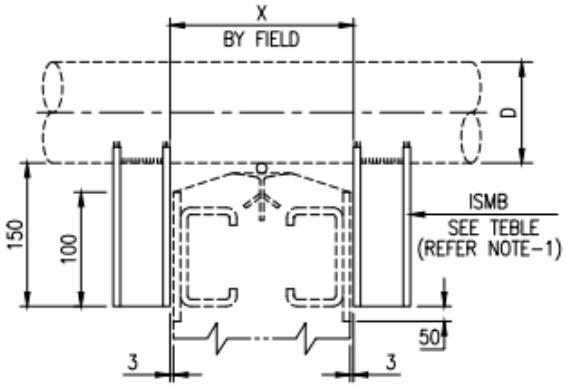
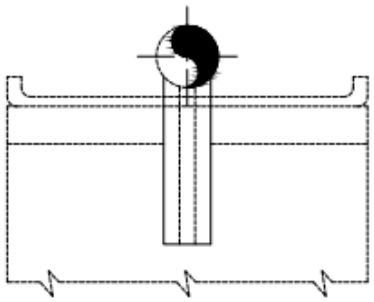
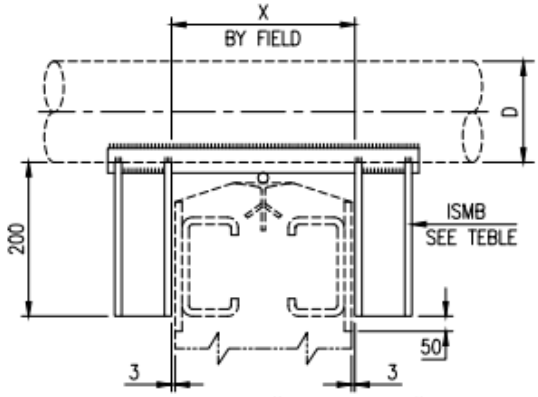
	ANCHOR FOR BARE PIPE SIZE 2" THRU 24" TYPE–G5 (FOR OFFSITE)	DRAWING NO. SD–PI–002 SHEET NO. 1 OF 1

D	8	10	12	14	16	18	20	24
I BEAM	150				200		250	

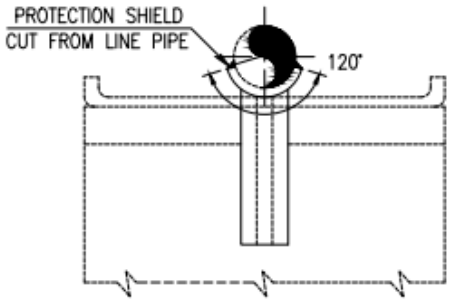


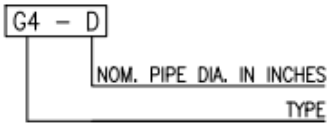
FOR PIPE 2" THRU 12"





FOR PIPE 14" THRU 24"





SYMBOL

NOTE:–

1. FOR SUPPORTING DETAILS FOR PIPE SIZE 2" THRU 6", REFER STD. 00004–PL–PI–STD–009

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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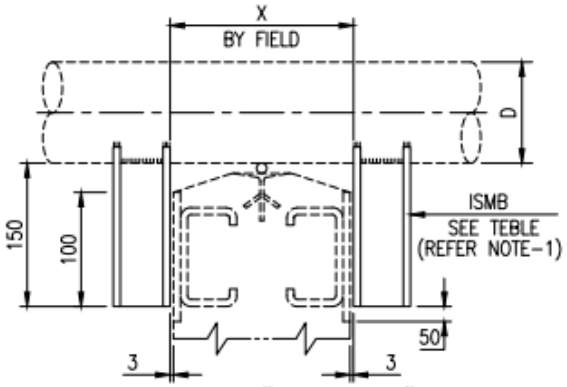
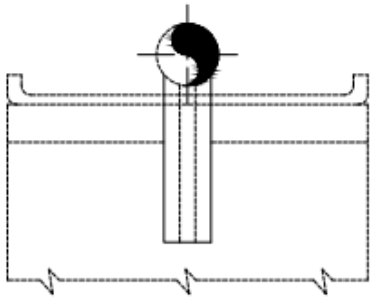
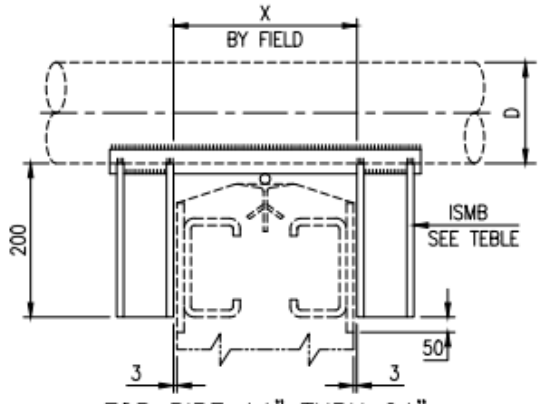
CROSS GUIDE FOR BARE PIPE SIZE 2" THRU 24" TYPE–G4 (OFFSITE)	DRAWING NO.
	SD–PI–003
	SHEET NO. 1 OF 1

D	8	10	12	14	16	18	20	24
I BEAM	150				200		250	

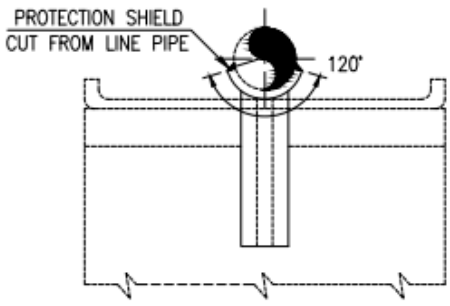


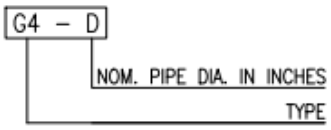
FOR PIPE 2" THRU 12"





FOR PIPE 14" THRU 24"





SYMBOL

NOTE:–

1. FOR SUPPORTING DETAILS FOR PIPE SIZE 2" THRU 6", REFER STD. STD.00004–PL–PI–STD–009

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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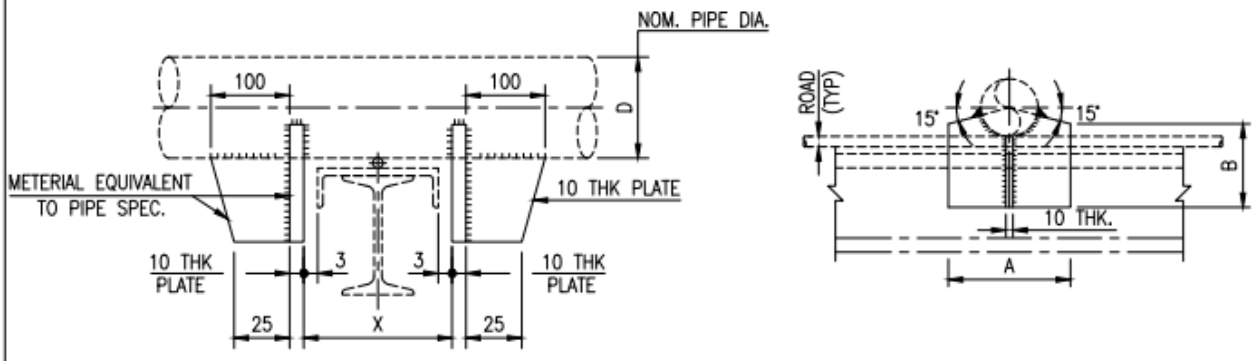
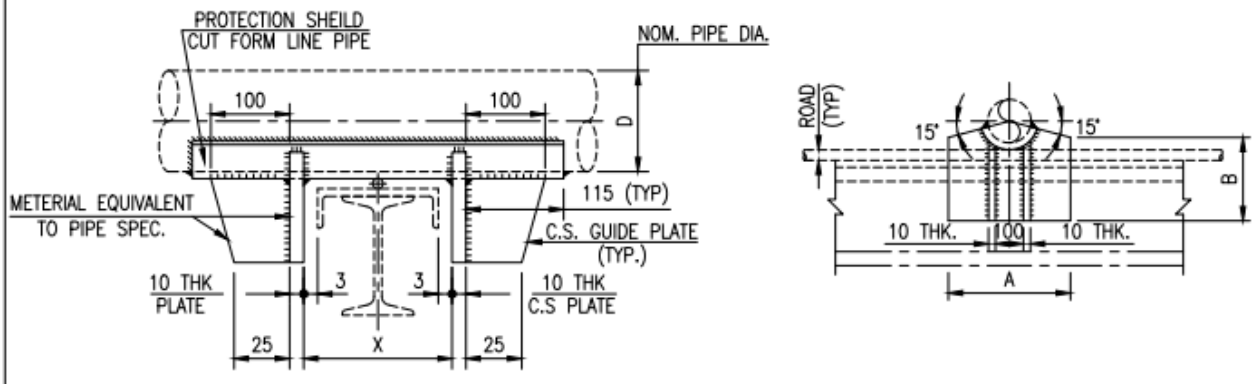
CROSS GUIDE FOR BARE PIPE SIZE 2" THRU 24" TYPE-G3	DRAWING NO.
	SD-PI-004
	SHEET NO. 1 OF 1

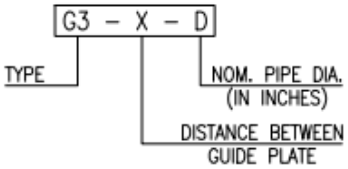
CROSS GUIDE													
D	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"
A	100	130	154	208	280	314	364	396	446	498	548	598	650
B	67	78	86	106	131	145	163	175	193	212	231	248	268



CROSS GUIDE 2" THRU 12"



CROSS GUIDE 14" THRU 24"



SYMBOL

NOTE:-

1. PROTECTION SHIELD SHALL BE CUT FROM LINE PIPE.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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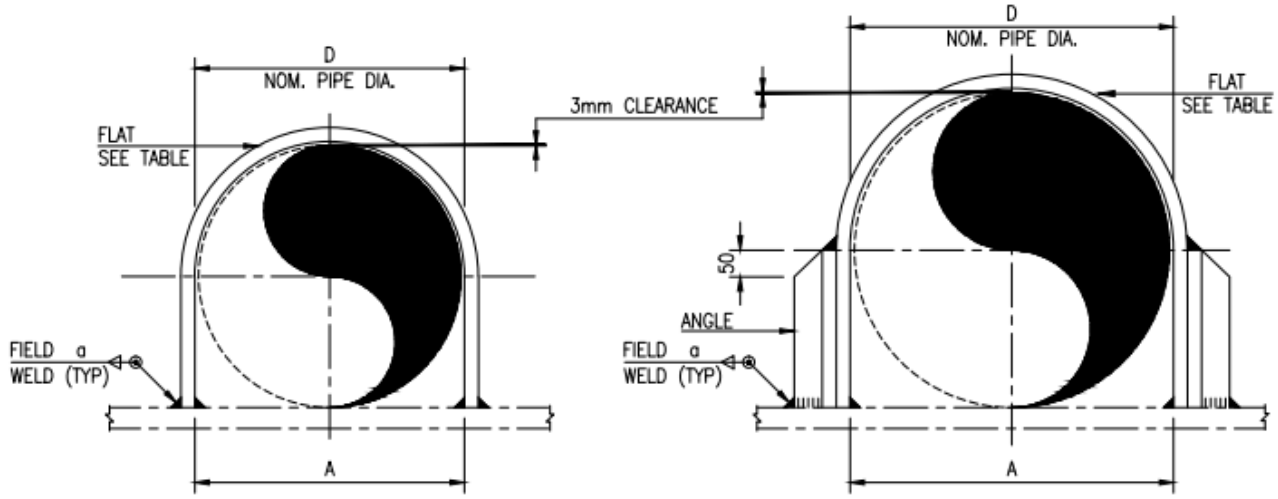
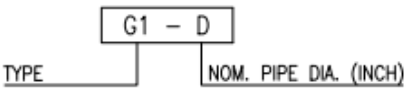
GUIDE SUPPORT FOR BARE PIPE SIZE 1/2" THRU 24" TYPE-G1	DRAWING NO.
	SD-PI-005
	SHEET NO. 1 OF 1



FOR SIZE UPTO 10"

FOR SIZE 12" THRU 24"

D	A	a	FLAT SIZE	ANGLE SIZE
1/2"	26	6	40 x 6	–
3/4"	33			
1"	40			
1 1/4"	48			
1 1/2"	55			
2"	65			
2 1/2"	80			
3"	95			
3 1/2"	107	10	50 x 10	–
4"	120			
5"	146			
6"	174			
8"	225			
10"	278			
12"	328	10	65 x 12	75x75x10
14"	362			
16"	412			
18"	463	10	75 x 12	90x90x10
20"	515			
24"	616			



SYMBOL

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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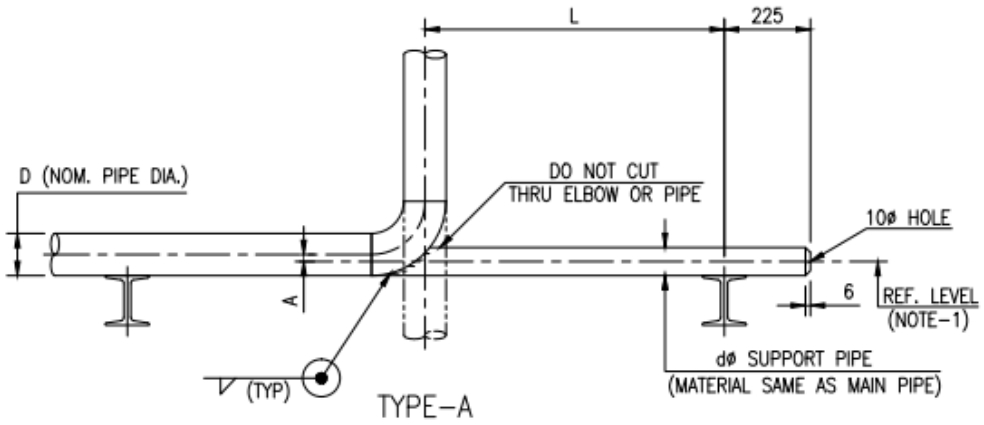
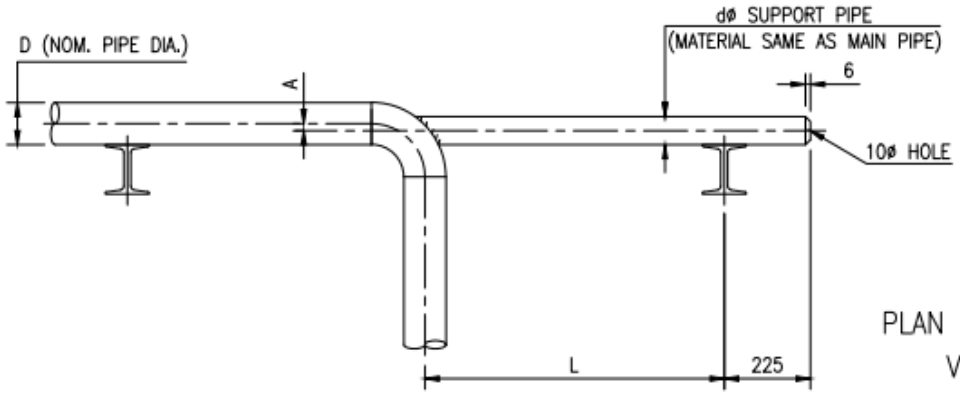
Date: 2026.02.13 19:41:32

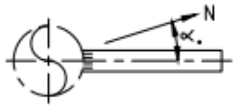
DUMMY PIPE SUPPORT FOR BARE PIPE SIZE 2" THRU 24" TYPE-B-39	DRAWING NO.
	SD-PI-006
	SHEET NO. 1 OF 1



TYPE-A



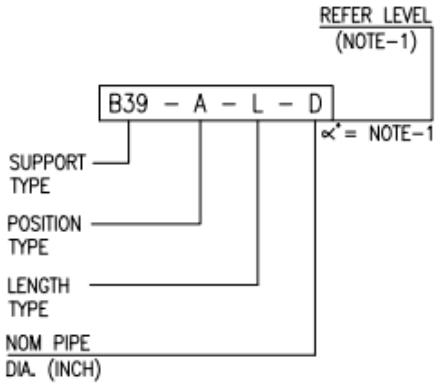
TYPE-B



PLAN FOR SUPPORT ON VERTICAL PIPE

FOR L, 1500 OR LESS		
D	d (NOTE 2)	A
2"	2"-SCH.40	-
3"	2"-SCH.40	15
4"	3"-SCH.40	13
6"	3"-SCH.40	40
8"	4"-SCH.40	52
10"	6"-SCH.40	52
12"	6"-SCH.40	78
14"	8"-SCH.40	68
16"	8"-SCH.40	94
18"	8"-SCH.40	119
20"	10"-SCH.40	118
24"	10"-SCH.40	168

FOR L, OVER 1500		
D	d (NOTE 2)	A
2"	2"-SCH.40	-
3"	2"-SCH.40	15
4"	3"-SCH.40	13
6"	4"-SCH.40	27
8"	6"-SCH.40	25
10"	8"-SCH.40	27
12"	8"-SCH.40	52
14"	10"-SCH.40	41
16"	10"-SCH.40	67
18"	10"-SCH.40	92
20"	12"-SCH.40	92
24"	12"-SCH.40	143



SYMBOL

NOTES:-

1. REF. LEVEL & ∝ TO BE GIVEN IN CASE SUPPORT IS WELDED TO VERTICAL PIPE.
2. IN CASE SIZE AND/OR SCH. OF SUPPORT PIPE (d) LISTED IN THE TABLE IS NOT AVAILABLE USE NEXT HIGHER SIZE AND/OR NEAREST EQUIVALENT THICKNESS AVAILABLE.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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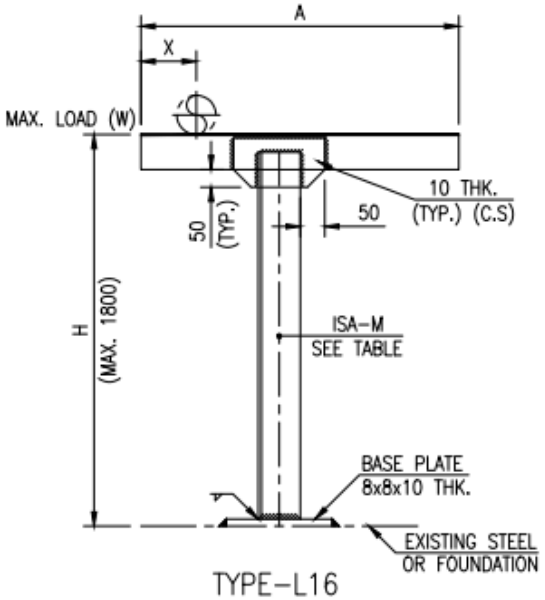
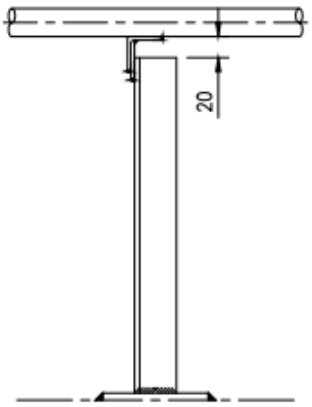
Date: 2026.02.13 19:41:32

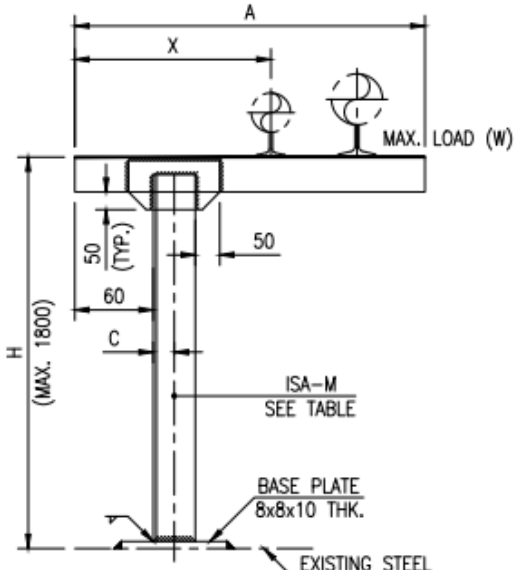
LOW SUPPORT STANCHION TYPE–L16 AND L–16A	DRAWING NO. SD–PI–007
	SHEET NO. 1 OF 1



TYPE–L16



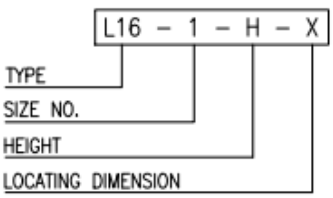
SIDE VIEW



TYPE–L16A

NOTE:–

1. DO NOT USE FOR ANCHORING THE PIPE.



SYMBOL

SIZE NO.	MAX. LOAD (W) Kg.	M	A	B	C
1	500	ISA 80x80x8	600	150	45
2	800	ISA 100x100x10	700	150	60
3	1500	ISA 130x130x12	800	150	80

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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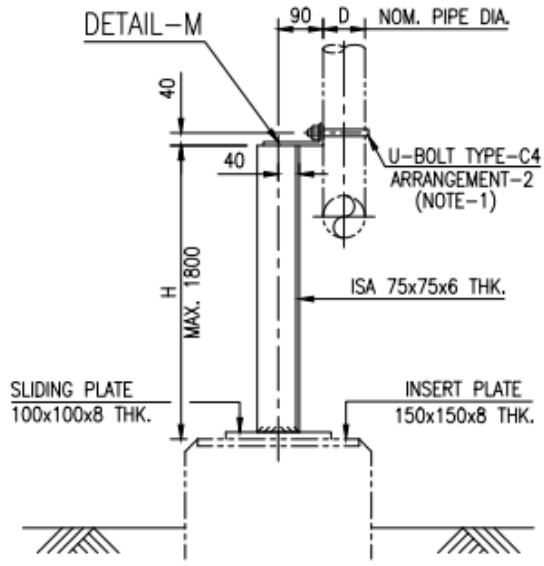
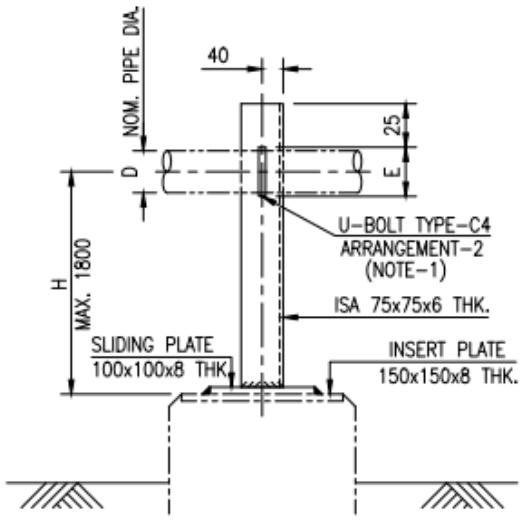
Date: 2026.02.13 19:41:32

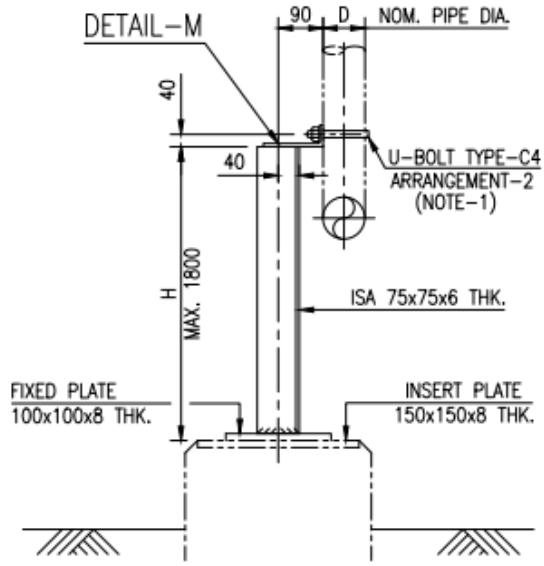
LOW SUPPORT SLIDING AND FIXED FOR PIPE SIZE 3/4" THRU 1.1/2"TYPE L-15	DRAWING NO. SD-PI-008
	SHEET NO. 1 OF 1



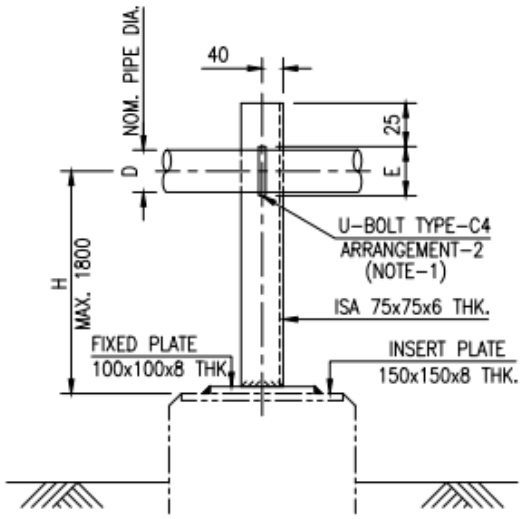
ARRANGEMENT TYPE-1
(SLIDING)



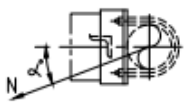
ARRANGEMENT TYPE-2
(SLIDING)



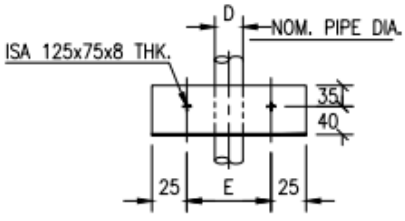
ARRANGEMENT TYPE-3
(FIXED)



ARRANGEMENT TYPE-4
(FIXED)



(FIXED)
(FOR TYPE-1 & 3)



DETAIL-M

D	E
3/4"	36
1"	45
1 1/2"	60

∝= (FOR TYPE 1 & 3) L15 - 1 - H - D

TYPE
ARRANGEMENT TYPE
HEIGHT
NOM. PIPE DIA. (INCH)

SYMBOL

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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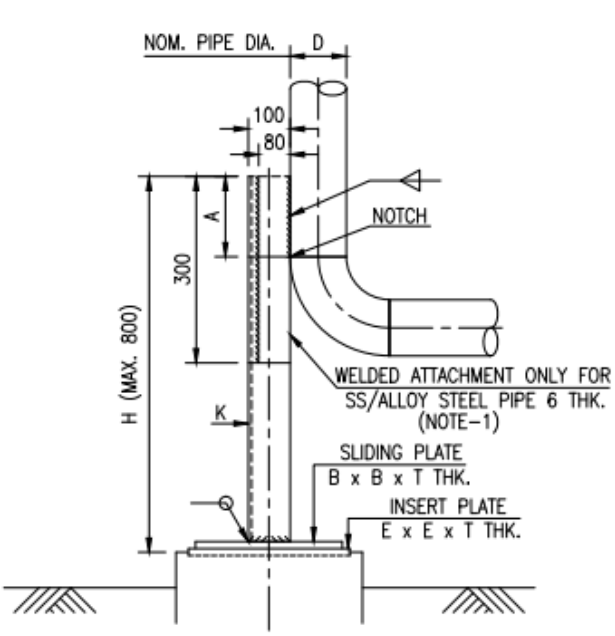
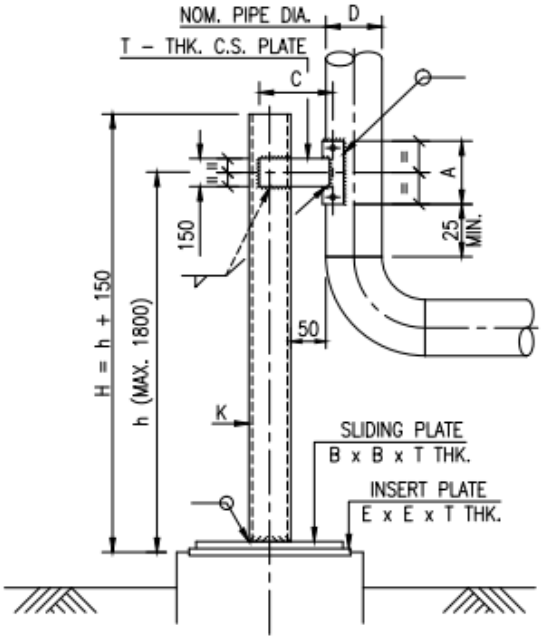
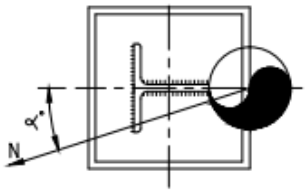
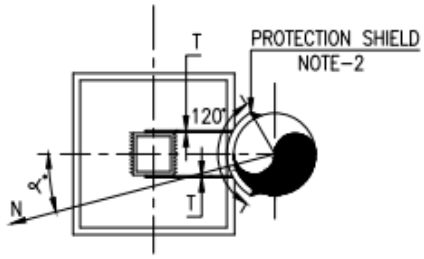
LOW SUPPORT SLIDING FOR BARE & INSULATED PIPE SIZE 2" THRU 24" TYPE-L6	DRAWING NO. SD-PI-009
	SHEET NO. 1 OF 1



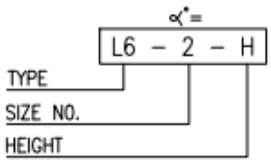




FOR PIPE SIZES 2" THRU 4"



FOR PIPE SIZES 6" THRU 24"



SYMBOL

NOTES:-

1. MATERIAL FOR WELDED ATTACHMENT SHALL BE EQUIVALENT TO PIPE MATERIAL.
2. PROTECTION SHIELD IS TO BE CUT FROM LINE PIPE.

SIZE NO.	D	K	A	T	C	E	B
1	2" TO 4"	CUT FROM ISMB 200	200	10	-	250	150
2	6" TO 10"	ISMC-125 2 NOS.	200	12	150	300	200
3	12" TO 24"	ISMC-225 2 NOS.	300	12	230	400	300

FOR TEMP. UP TO 400 °C ONLY

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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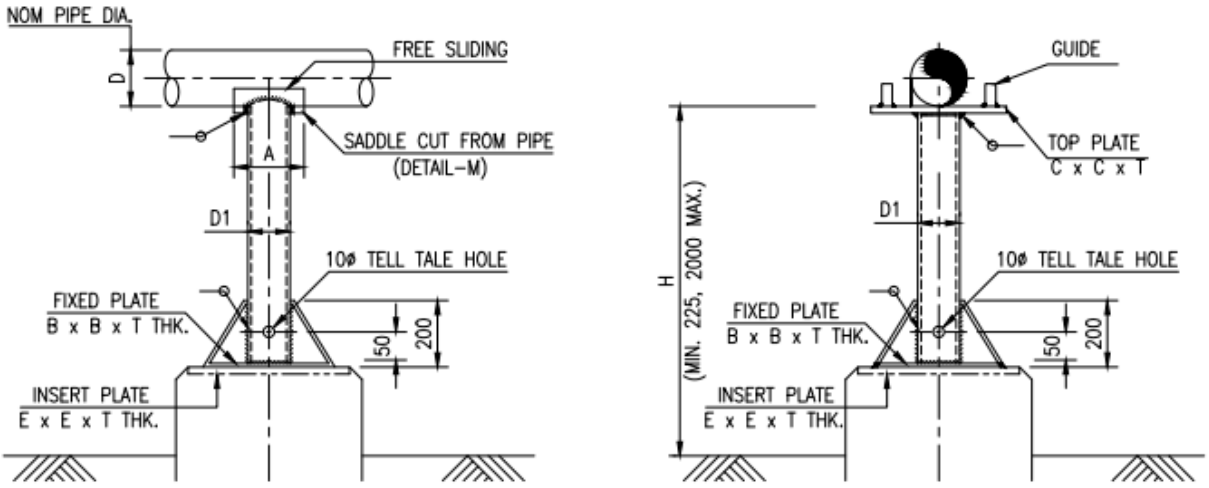
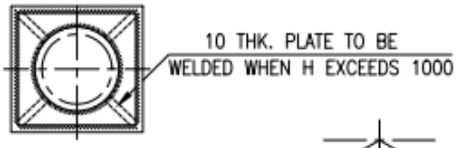
Date: 2026.02.13 19:41:32

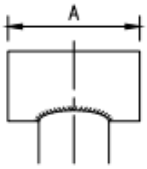
LOW SUPPORT SLIDING FOR BARE PIPE SIZE 3/4" THRU 36" TYPE-L5 & L5A

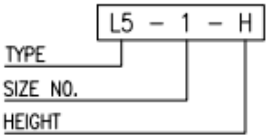
DRAWING NO.
SD-PI-010
SHEET NO. 1 OF 1



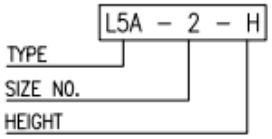


DETAIL-M





SYMBOL



SYMBOL

SIZE NO.	D	A	D1 (NOTE-1)	C	B	E	T
1	3/4"	2" NB x 100 Lg.	2" HEAVY IS :1239	150	150	200	12
	1"						
	1.1/2"	3" NB x 100 Lg.		200			
	2"						
2	3"	6" NB x 150 Lg.	2" HEAVY IS :1239	200	150	200	12
	4"						
3	6"	10" NB x 250 Lg.	3" HEAVY IS :1239	300	200	250	16
	8"						
4	10"	14" NB x 350 Lg.	4" HEAVY IS :1239	350	200	250	16
	12"						
5	14"	18" NB x 350 Lg.	6" HEAVY IS :1239	400	250	300	20
	16"						
6	18"	20" NB x 350 Lg.	8" SCH. 40	400	300	350	20
7	20"	24" NB x 350 Lg.	10" SCH. 40	450	350	400	20
	24"						
	26"	30" NB x 350 Lg.	12" SCH. 40				
	30"						
8	36"	36" NB x 400 Lg.		550	400	500	20

NOTES:-

1. IN CASE SIZE AND/OR SCH. OF SUPPORT PIPE (D) LISTED IN THE TABLE IS NOT AVAILABLE, USE NEXT HIGHER SIZE AND/OR NEAREST EQUIVALENT THICKNESS AVAILABLE.
2. MATERIAL FOR SUPPORT PIPE & PLATE SHALL BE CARBON STEEL.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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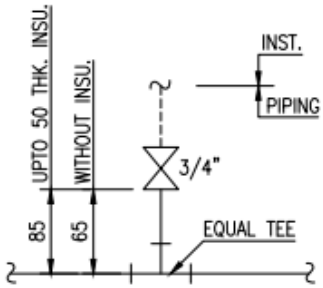
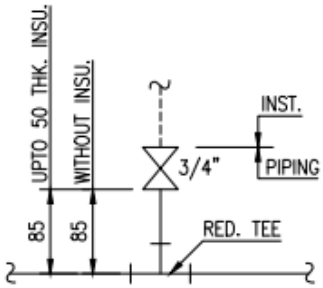
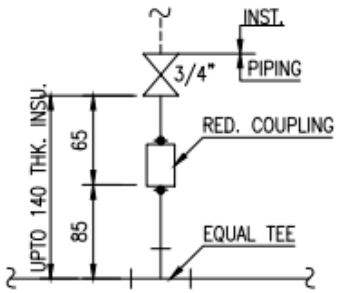
PRESSURE TAPPINGS (PA, PG, PC, PT, PIC ETC.)	DRAWING NO.
	SD-PI-011
	SHEET NO. 1 OF 1



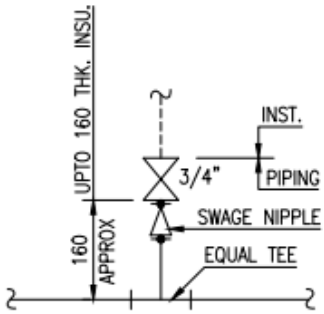
PC-1 ON LINE 3/4"



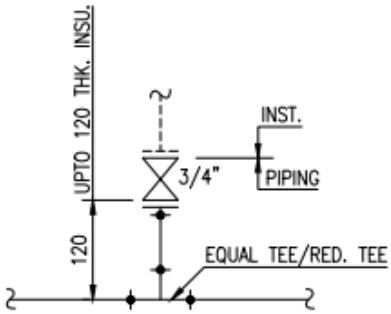
PC-2 ON LINE 1"-1 1/2"



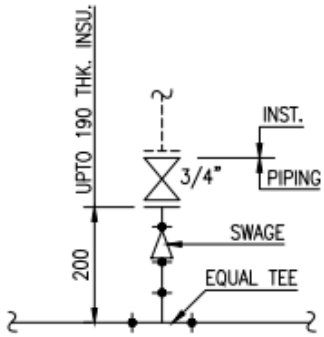
PC-3 ON LINE 1"-1 1/2"



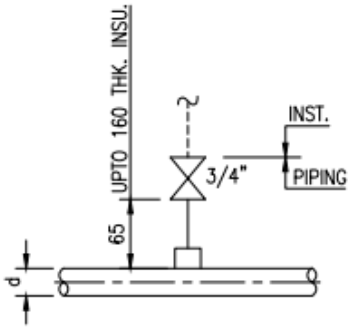
PC-4 ON LINE 1"-1 1/2"



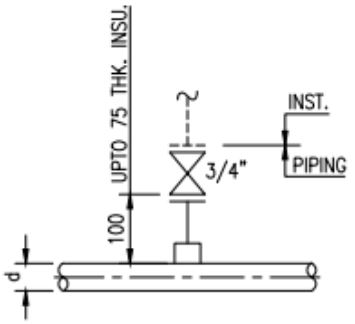
PC-5 ON LINE 3/4"-1 1/2"



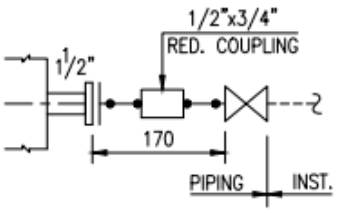
PC-6 ON LINE 1"-1 1/2"



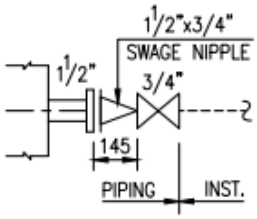
PC-10 ON LINE 2" & ABOVE



PC-11 ON LINE 2" & ABOVE

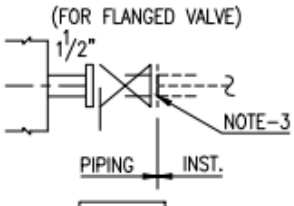


PC-12



PC-13

ON VESSELS / COLUMNS



PC-14
PC-15
WITH 2" NO 220 E & 2" VALVE

NOTES:-

1. THE INDICATED DIMENSIONS ARE MINIMUM WHICH ALSO COVER INSULATION TO THE EXTENT SHOWN ABOVE IN HIGHER THICKNESS OF INSULATION THAN INDICATED, THE DIFFERENCE SHALL BE ADDED IN THE DIMENSIONS SHOWN ABOVE ACCORDINGLY.
2. PRESSURE TAPPING SHALL BE PROVIDED WITH GATE, GLOBE OR PLUG VALVE (FLGD. SW. OR SCR'D) WITH TEE (EQ. OR RED.) HALF COUPLING (.W. OR SCR'D) OR STUB-IN AS PER PIPING SPECIFICATION.
3. IN CASE OF FLGD. VALVES BOLTING & GASKET ON BOTH SIDES OF VALVE SHALL BE IN PIPING SCOPE.
4. IN CASE OF TAPPING PROVIDED OTHER THAN INDICATED IN THIS STD FOR LAYOUT REASONS DETAILED DIMENSIONS WILL BE CALLED FOR OR CARRIED OUT.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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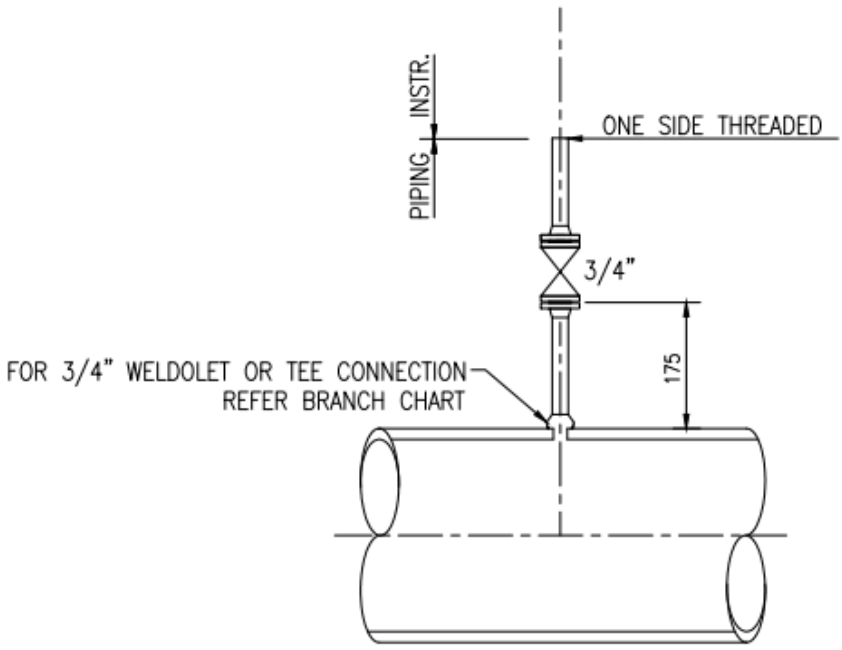
Date: 2026.02.13 19:41:32

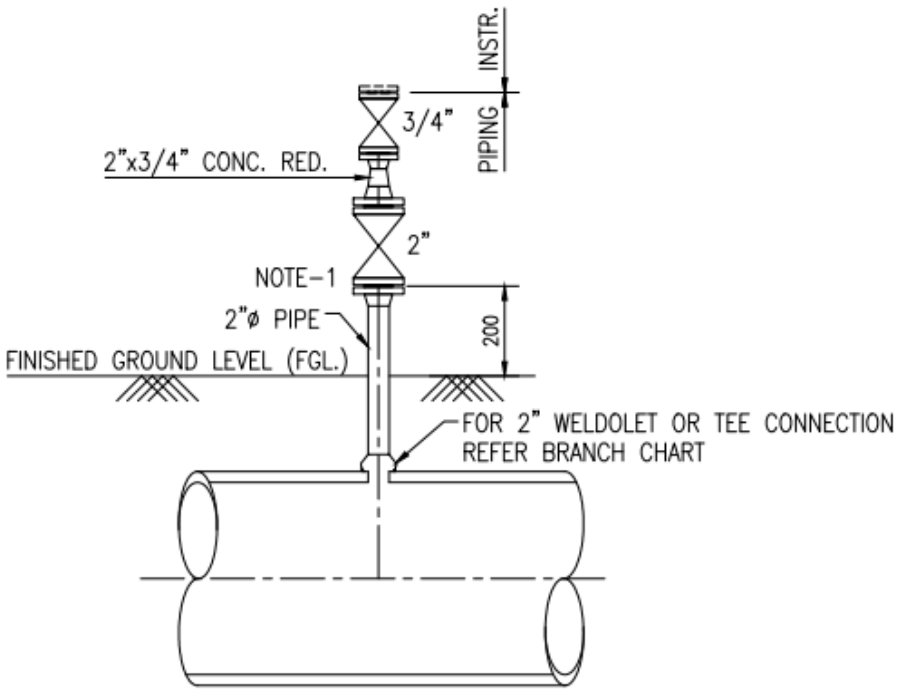
	DETAIL OF PRESSURE CONNECTIONS ABOVE GROUND PIPE	DRAWING NO. SD-PI-012
		SHEET NO. 1 OF 1



REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

DETAIL OF PRESSURE CONNECTIONS UNDER GROUND PIPE	DRAWING NO.
	SD-PI-013
	SHEET NO. 1 OF 1



NOTE:

1 INSULATION GASKET SHALL BE INSTALLED.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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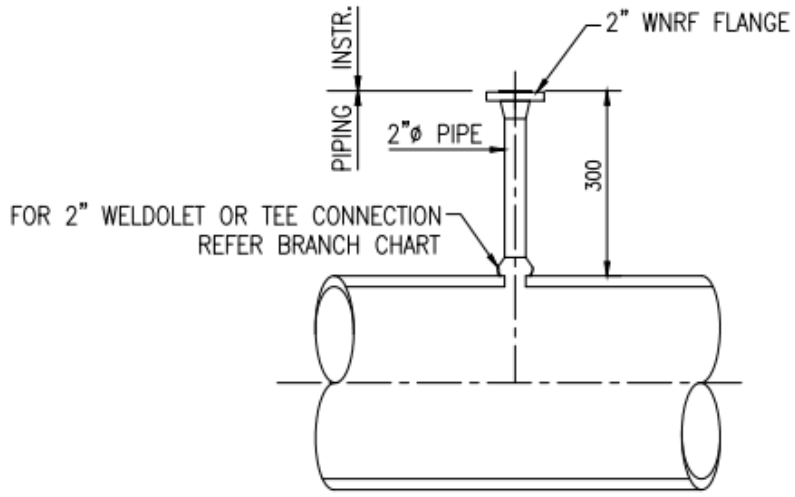
Date: 2026.02.13 19:41:32

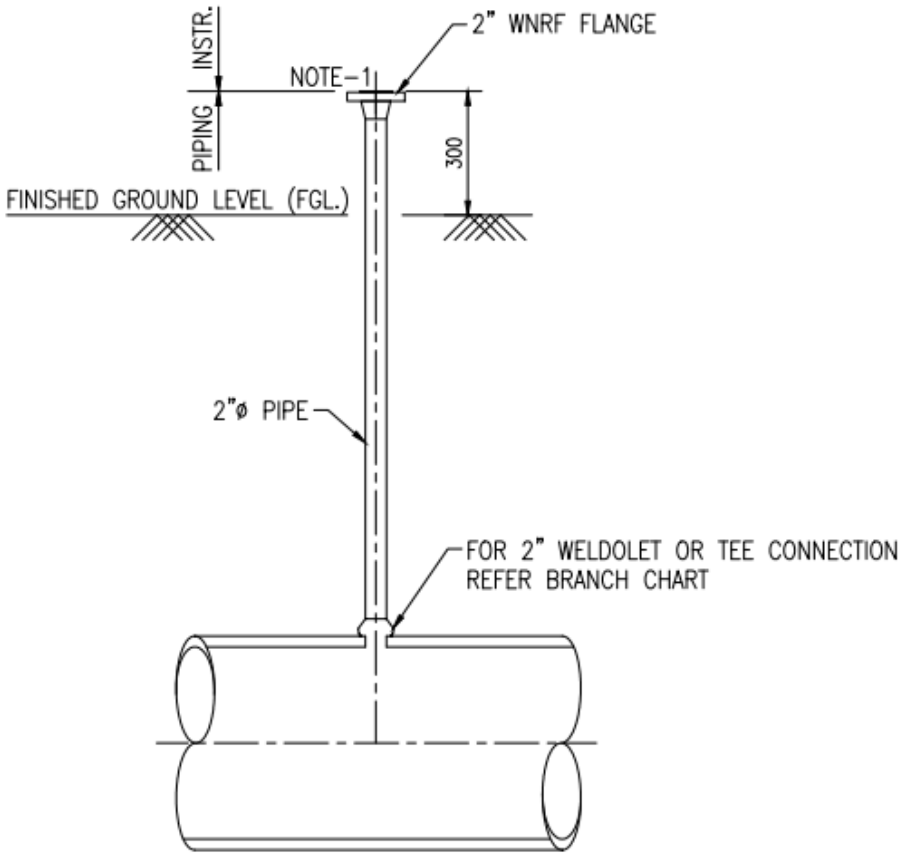
DETAIL OF TEMPERATURE CONNECTIONS ABOVE GROUND PIPE	DRAWING NO.	
	SD-PI-014	
	SHEET NO.	1 OF 1



REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

DETAIL OF TEMPERATURE CONNECTIONS UNDER GROUND PIPE	DRAWING NO.
	SD–PI–015
	SHEET NO. 1 OF 1



NOTE:

1 INSULATION GASKET SHALL BE INSTALLED.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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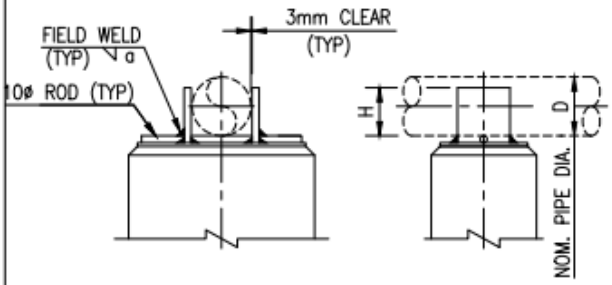
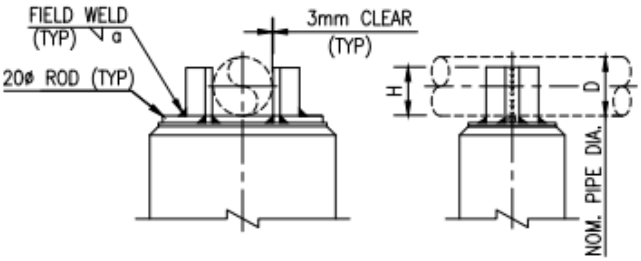
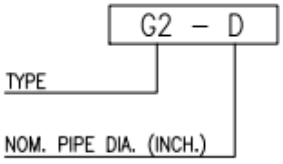
GUIDE SUPPORT FOR BARE PIPE (SIZE 1/2" TO 24") TYPE G2	DRAWING NO.
	SD-PI-016
	SHEET NO. 1 OF 1



FOR SIZES UPTO 4"



FOR SIZES 6" THRU 24"



SYMBOL

D	H	a	METERIAL
2" & SMALLER	40	6	FLAT 60 x 10
3" TO 4"	70	6	FLAT 75 x 10
6" TO 8"	130	6	2 NOS. ISA 50 x 50 x 6
10" TO 18"	230	10	2 NOS. ISA 75 x 75 x 10
20" TO 24"	350	10	2 NOS. ISA 90 x 90 x 10

NOTES:–

GUIDE ANGLES SHOULD BE SUITABLY TRIMMED WHEREVER THESE OBSTRUCT ADJOINING GUIDE ANGLES.

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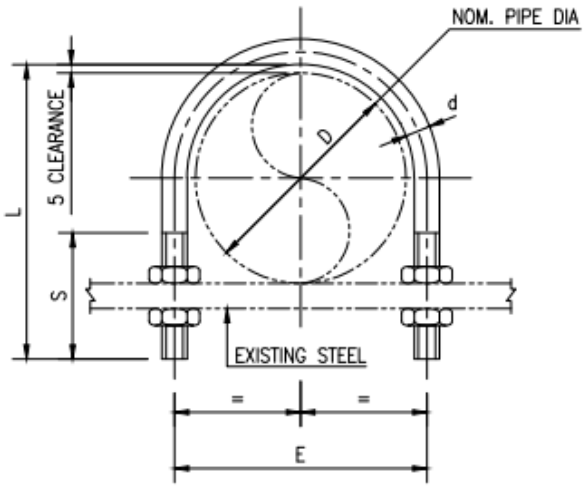
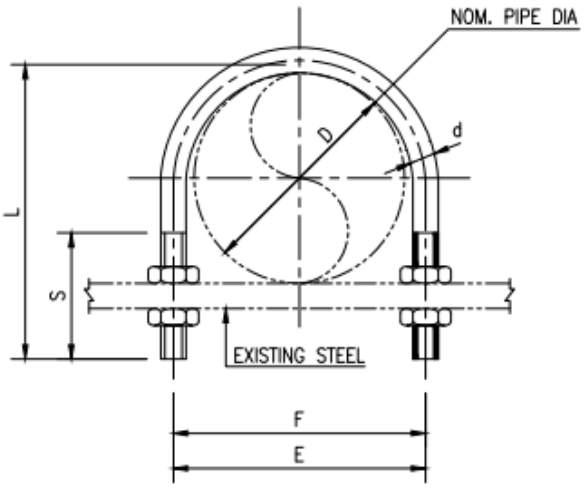
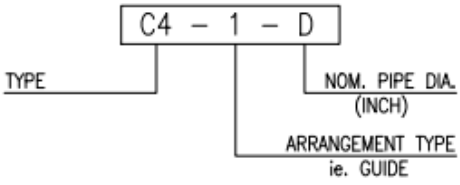
U-BOLT FOR BARE PIPE (SIZE 1/2" TO 24")	DRAWING NO. SD-PI-017
	SHEET NO. 1 OF 1



GUIDE
ARRANGEMENT TYPE-1
(1/2" TO 24")



FIXED
ARRANGEMENT TYPE-2
(1/2" TO 1 1/2")



SYMBOL

D	O.D. (mm)	'U' CLAMP				
		L	E	S	d	F
1/2"	21	65	30	50	6	24
3/4"	27	70	36	50	6	30
1"	33	75	45	55	8	37
1 1/2"	48	90	60	55	8	52
2"	60	105	72	60	8	64
3"	89	145	106	80	12	94
4"	114	170	130	80	12	119
6"	168	240	190	100	16	173
8"	219	290	242	100	16	226
10"	273	345	296	100	16	280
12"	324	420	351	130	20	331
14"	356	450	382	130	20	362
16"	408	500	435	130	20	414
18"	457	565	490	140	24	465
20"	508	620	540	140	24	515
24"	610	720	645	140	24	620

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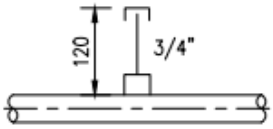
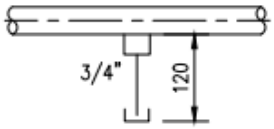
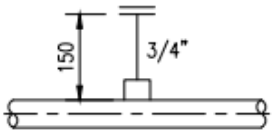
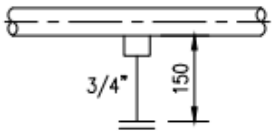
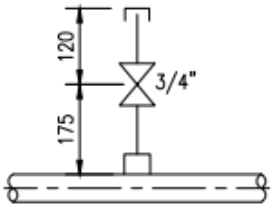
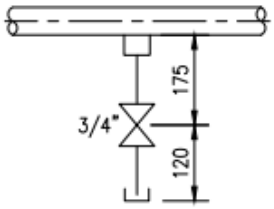
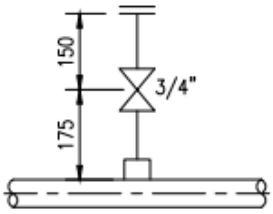
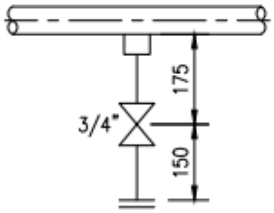
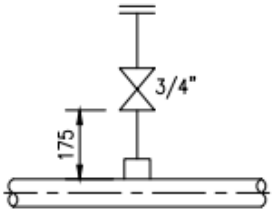
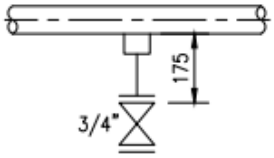
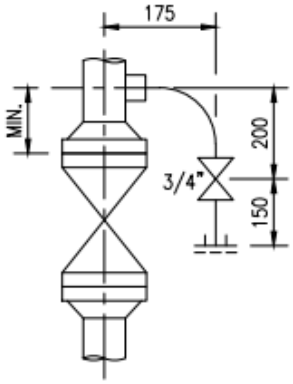
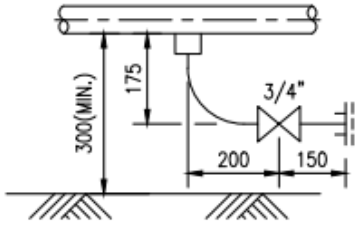
VENTS AND DRAINS (ON LINES 2" AND ABOVE)

DRAWING NO.
SD-PI-018
SHEET NO. 1 OF 1

TYPE	VENT	DRAIN	TYPE
VP1, V1C			D1, D1C
V2F			D2F
V3, V3C			D3, D3C
V4F			D4F
V5F			D5F
DC9, DF9			
DC10, DF10			

NOTES:-

1. DELETED.
2. VENTS & DRAINS SHALL BE PROVIDED WITH GATE, GLOBE OR PLUG VALVE (FLG'D.) WITH HALF COUPLING. OR STUB IN, WITH CAP OR FLANGE & BLIND FLANGE AS PER PIPING SPECIFICATIONS.
3. DELETED.
4. LEGEND : V = VENT; D = DRAIN; C = CAP; F = FLANGE; P = PLUG.

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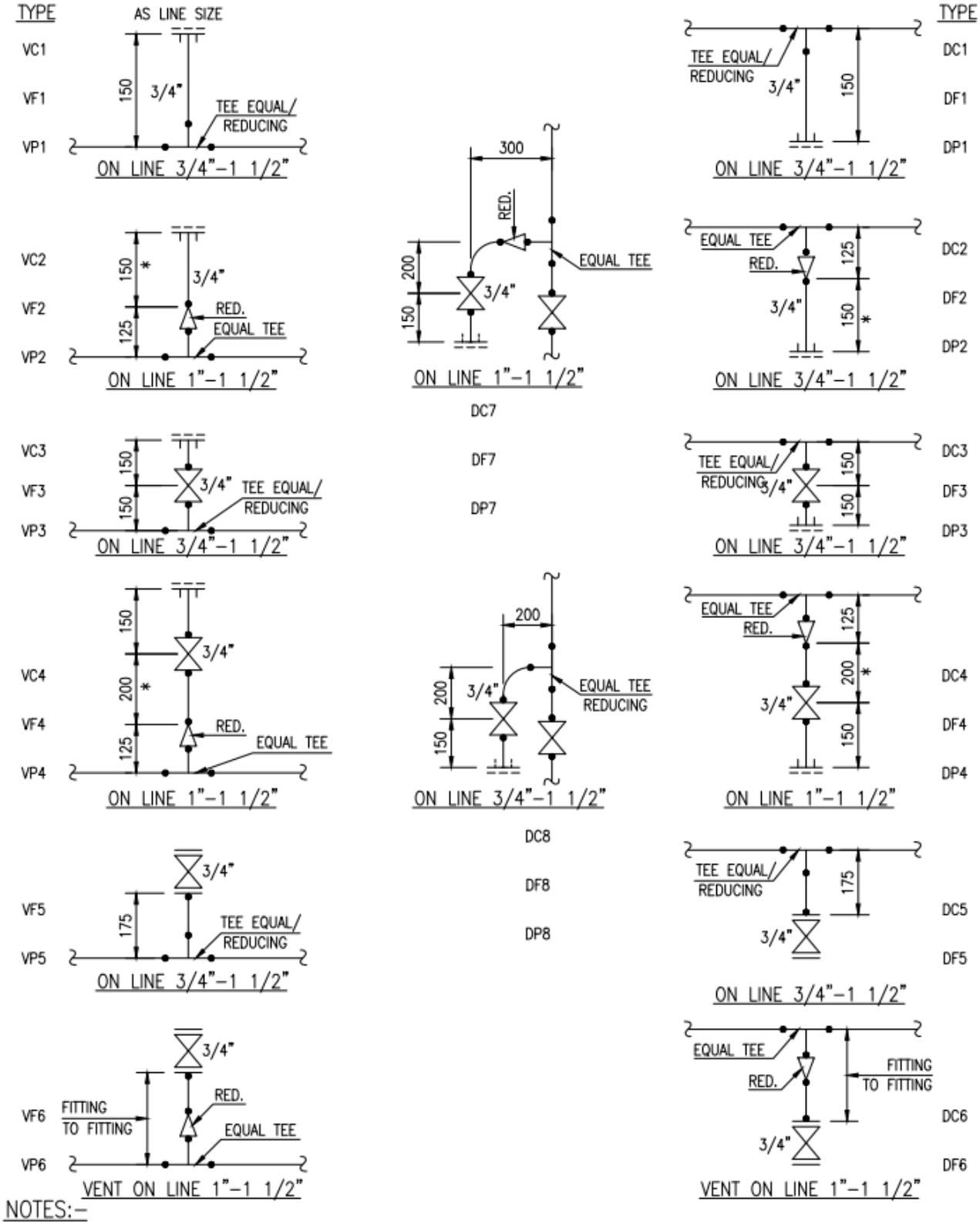
VENTS AND DRAINS (ON LINES 1 1/2" AND BELOW)

DRAWING NO. SD-PI-019

SHEET NO. 1 OF 1



NOTES:-

1. DIMENSIONS ARE VALID FOR 50mm(MAX) INSULATION THICKNESS, INCREASE DIMENSIONS AS REQUIRED, DIMENSIONS MARKED '*' ARE MAXIMUM AND MAY BE REDUCED TO SUIT.
2. VENTS & DRAINS SHALL BE PROVIDED WITH GATE, GLOBE OR PLUG VALVE (FLGD.) WITH TEE (EQUAL OR REDUCING), HALF COUPLING OR STUB IN, CAP OR PLUG FLANGE AND BLIND FLANGE AS PER PIPING SPECIFICATION.
   LEGEND : V = VENT; D = DRAIN; C = CAP; F = FLANGE; RED. = REDUCER, COUPLING OR SOCKET; P = PLUG.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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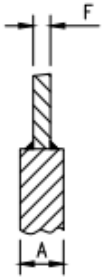
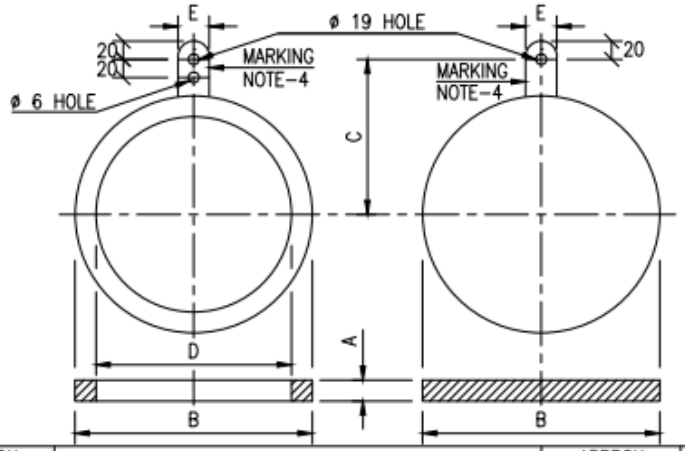
Date: 2026.02.13 19:41:32





NOTES:-

1. PROVIDE CONCENTRIC SERRATED FINISH ON BOTH SIDES WITH GROOVES 0.8 mm APART AND DEPTH APPROX 0.4 mm.
2. DIMENSIONS ARE FOR FLANGES TO ANSI B16.5 FOR SIZE UP TO 24" & MSS-SP-44 FOR SIZE ABOVE 24" FOR FLANGES TO API 605 CALCULATE DIMN.
3. THE DIA METER RATING AND MATERIAL SPECIFICATION SHALL BE MARKED ON WELDED FIXED PLATE.
4. MATERIAL AS PER PIPE CLASS.

PIPE SIZE INCH	150# FF							APPROX WT KGS		300# FF							APPROX WT KGS		600# FF							APPROX WT KGS		PIPE SIZE INCH
	A	B	C	D	E	F		BLIND	SPECER	A	B	C	D	E	F		BLIND	SPECER	A	B	C	D	E	F		BLIND	SPECER	
1"	5	62	105	29	25	4		0.2	0.1	5	70	115	29	25	4		0.2	0.1	5	70	125	29	25	4		0.28	0.15	1"
1½"	5	82	115	43	25	4		0.3	0.2	5	92	125	43	25	4		0.4	0.3	7	92	125	43	25	4		0.5	0.35	1½"
2"	7	102	125	55	25	4		0.4	0.3	7	108	130	55	25	4		0.6	0.4	10	108	130	55	25	4		0.75	0.5	2"
2½"	7	121	140	65	25	4		0.8	0.6	10	127	150	65	25	6		1.1	0.7	15	127	150	65	25	6		1.2	0.9	2½"
3"	7	134	150	80	40	4		0.9	0.7	10	146	155	80	40	6		1.7	1.0	15	146	155	80	40	6		2.0	1.2	3"
4"	8	170	165	106	40	6		1.8	1.0	13	178	180	106	40	6		2.1	1.2	18	190	180	106	40	6		3.7	2.4	4"
6"	11	218	190	157	40	6		3.7	1.5	18	248	210	157	40	6		7.2	3.8	24	263	225	157	40	8		11.0	6.2	6"
8"	15	275	220	207	40	6		7.5	2.7	21	305	240	207	40	8		13.5	6.3	30	314	260	207	40	10		19.5	10.0	8"
10"	18	335	250	260	40	8		13.0	4.3	26	358	270	260	40	10		22.5	8.8	37	397	300	260	40	10		37.0	19.0	10"
12"	19	405	290	312	40	8		22.0	8.0	30	418	310	312	40	10		35.0	13.8	43	454	325	312	40	15		57.0	27.5	12"
14"	22	445	320	342	40	10		28.0	12.5	34	480	340	342	40	15		52.0	23.5	48	448	350	342	40	15		71.0	33.0	14"
16"	26	510	350	393	40	10		42.0	15.0	38	536	375	393	40	15		70.0	30.0	54	560	390	393	40	20		110	55	16"
18"	29	545	370	445	40	10		53.0	17.0	43	592	400	445	40	20		100	42.0	62	608	415	445	40	20		140	65	18"
20"	30	600	400	496	40	15		70.0	20.0	48	650	440	496	40	20		128	49.0	67	678	450	496	40	20		190	83	20"
24"	37	710	450	597	50	15		120	52.0	57	772	510	597	50	20		210	74.0	81	785	515	597	50	25		307	125	24"
TOLERANCE	± 0.3	± 0.5		± 0.5	± 1.0					± 0.3	± 0.5		± 0.5	± 1.0					± 0.3	± 0.5		± 0.5	± 1.0					TOLERANCE

NO.	DATE	REVISION	DRN	CHKD	APPD
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SPACERS BLINDS
150#,300# & 600# FF

DRAWING NO. SD-PI-021

REV. 0

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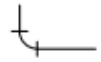
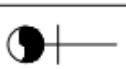
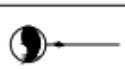
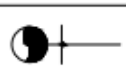
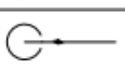
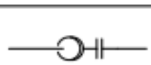
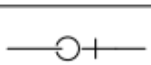
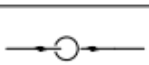
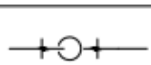
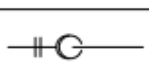
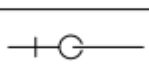
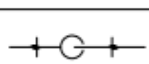
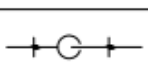
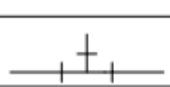
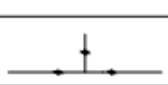
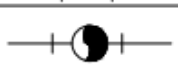
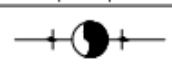
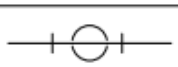
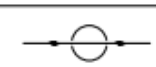
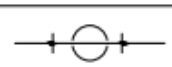
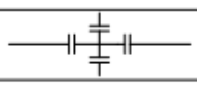
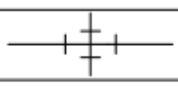
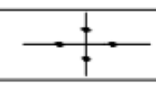
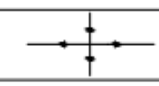
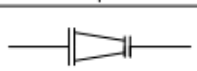
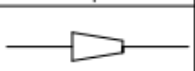
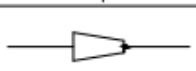
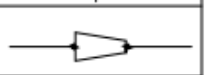
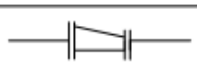
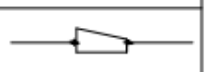
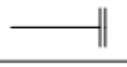
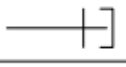
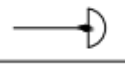
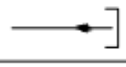
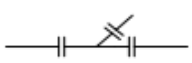
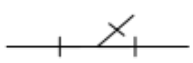
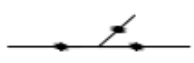
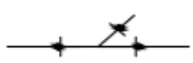
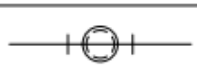
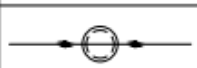
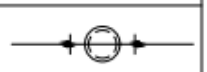
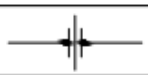
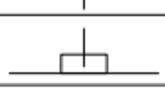
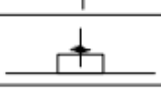
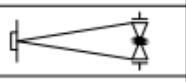
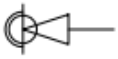
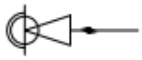
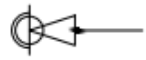
SYMBOLS OF PIPING ELEMENTS ON DRAWINGS	DRAWING NO.	
	SD-PI-023	
	SHEET NO.	1 OF 4

DESCRIPTION	FLANGED	SCREWED	WELDED (NOTE-1)	SOCKET WELD
90° ELBOW				
ELBOW (TURNED UP)				
ELBOW (TURNED DOWN)				
MITERED BEND 90°				
MITERED BEND 45°				
45° ELBOW				
45° ELBOW (TURNED UP)				
45° ELBOW (TURNED DOWN)				
TEE EQUAL/UNEQUAL				
TEE (OUTLET UP)				
TEE (OUTLET DOWN)				
CROSS				
CONCENTRIC REDUCER				
ECCENTRIC REDUCER				
DEAD END				
LATERAL				
SIGHT GLASS				
UNION				
HALF COUPLING				
FULL COUPLING				
HOSE COUPLING				

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

SYMBOLS OF PIPING ELEMENTS ON DRAWINGS	DRAWING NO. SD-PI-023
	SHEET NO. 2 OF 4

DESCRIPTION	FLANGED	SCREWED	WELDED (NOTE-1)	SOCKET WELD
GATE VALVE (PLAN)				
GATE VALVE (ELEVATION)				
GLOBE VALVE (PLAN)				
GLOBE VALVE (ELEVATION)				
ANGLE VALVE (PLAN)				
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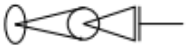
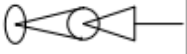
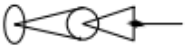
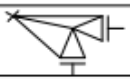
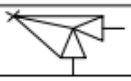
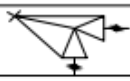
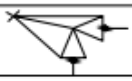
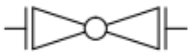
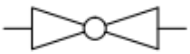
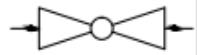
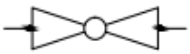
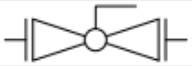
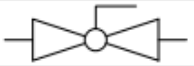
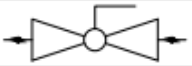
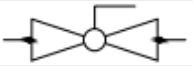
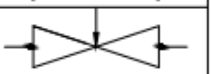
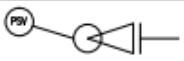
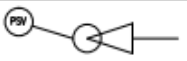
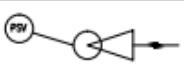
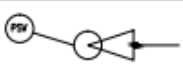
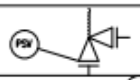
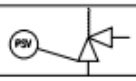
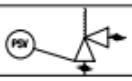
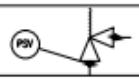
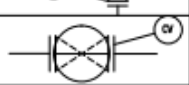
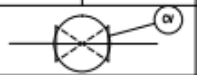
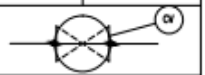
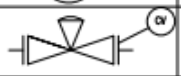
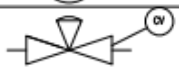
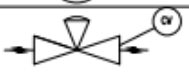
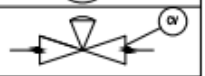
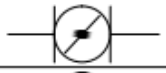
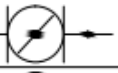
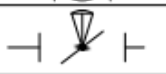
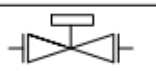
CHECK VALVE (PLAN OR ELEVATION)				
ANGLE STOP CHECK VALVE (PLAN)				
ANGLE STOP CHECK VALVE (ELEVATION)				
PLUG VALVE (PLAN)				
PLUG VALVE (ELEVATION)				
BALL VALVE (PLAN)				
BALL VALVE (ELEVATION)				
NEEDLE VALVE (PLAN OR ELEVATION)				
RELIEF VALVE (PLAN)				
RELIEF VALVE (ELEVATION)				
CONTROL VALVE GLOBE TYPE(PLAN)				
CONTROL VALVE GLOBE TYPE(ELEVATION)				
CONTROL VALVE BUTTERFLY TYPE(PLAN)				
CONTROL VALVE BUTTERFLY TYPE(ELEV.)				
SOLENOID OPERATED VALVE(PLAN OR ELEV.)				

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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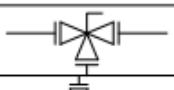
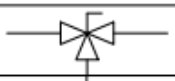
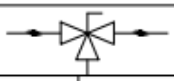
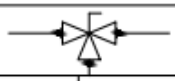
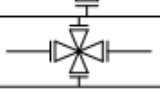
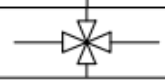
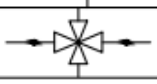
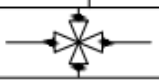
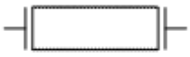
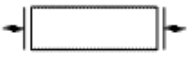
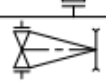
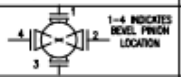
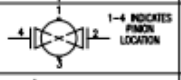
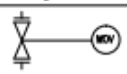
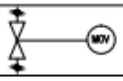
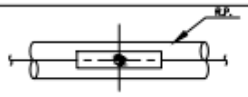
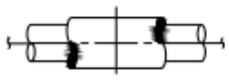
Date: 2026.02.13 19:41:32

SYMBOLS OF PIPING ELEMENTS ON DRAWINGS	DRAWING NO.
	SD-PI-023
	SHEET NO. 3 OF 4

DESCRIPTION	FLANGED	SCREWED	WELDED (NOTE-1)	SOCKET WELD
BUTTERFLY VALVE (PLAN OR ELEVATION)				
DIAPHRAGM VALVE (PLAN OR ELEVATION)				
3-WAY PLUG VALVE (PLAN OR ELEVATION)				
4-WAY PLUG VALVE (PLAN OR ELEVATION)				
EXPANSION JOINT				
ANGLE CONTROL VALVE				
CHAIN OPERATING VALVE				
GEAR OPERATED VALVE (BEVEL GEAR)PLAN				
GEAR OPERATED VALVE (SPUR GEAR)PLAN				
MOTOR OPERATING VALVE				
STEAM TRAP				
Y-STRAINER				

DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
SLIP ON FLANGE		STUB – IN (WITH OR WITHOUT RENIF)	
WELDNECK FLANGE			
SCREWED FLANGE		STUB – IN (SADDLE RENIF)	
SOCKET WELD FLANGE			
SPACER		STUB – IN WITH RENIF (IN PLAN)	
SPACER BLIND			
SPECTALE FIG. 8 (BLIND)		INSUALTED (LINES 12" AND BELOW)	
SPECTALE FIG. 8 (OPEN)			

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0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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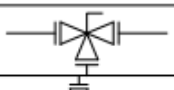
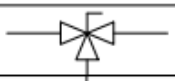
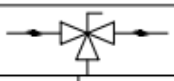
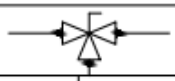
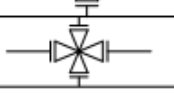
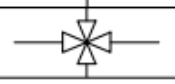
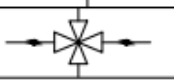
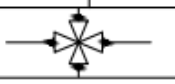
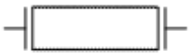
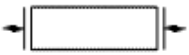
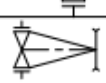
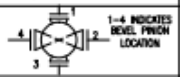
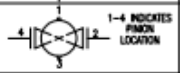
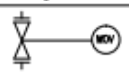
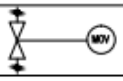
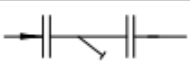
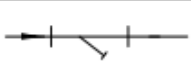
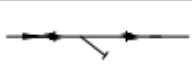
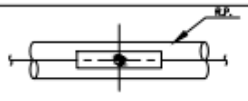
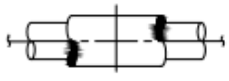
SYMBOLS OF PIPING ELEMENTS ON DRAWINGS

DRAWING NO.
SD-PI-023
SHEET NO. 3 OF 4

DESCRIPTION	FLANGED	SCREWED	WELDED (NOTE-1)	SOCKET WELD
BUTTERFLY VALVE (PLAN OR ELEVATION)				
DIAPHRAGM VALVE (PLAN OR ELEVATION)				
3-WAY PLUG VALVE (PLAN OR ELEVATION)				
4-WAY PLUG VALVE (PLAN OR ELEVATION)				
EXPANSION JOINT				
ANGLE CONTROL VALVE				
CHAIN OPERATING VALVE				
GEAR OPERATED VALVE (BEVEL GEAR)PLAN				
GEAR OPERATED VALVE (SPUR GEAR)PLAN				
MOTOR OPERATING VALVE				
STEAM TRAP				
Y-STRAINER				

DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
SLIP ON FLANGE		STUB - IN (WITH OR WITHOUT RENIF)	
WELDNECK FLANGE			
SCREWED FLANGE		STUB - IN (SADDLE RENIF)	
SOCKET WELD FLANGE			
SPACER		STUB - IN WITH RENIF (IN PLAN)	
SPACER BLIND			
SPECTALE FIG. 8 (BLIND)		INSULATED (LINES 12" AND BELOW)	
SPECTALE FIG. 8 (OPEN)			

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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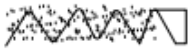
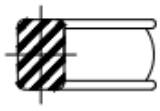
	GASKET THICKNESS	DRAWING NO.
		SD–PI–024
		SHEET NO. 1 OF 1

TYPICAL CROSS SECTION	DESCRIPTION		THICKNESS OF GASKET	COMPRESSED THICKNESS (NOTE –1)
	FLAT RING FOR RAISED FACE FLANGE	COMPRESSED ASBESTOS FOR SYNTHETIC RUBBER	2.0	2.0
	FULL FACE FOR FLAT FACE FLANGES			
	SPIRAL WOUND METAL FLAT RING GASKET, NON METALLIC FILTER, AND A STEEL SOLID RING TYPE CENTERING DEVICE– FOR RAISED FACE FLANGES.		4.4	3.0
	FLAT METAL JACKETED GASKET, NON METALLIC FILTER COMPLETELY ENCLOSED WITHIN A FULLY ANNEALED DOUBLE METAL JACKET–FORRAISED FACE FLANGES		3.0	2.0
	CORRUGATED METAL JACKETED GASKET, NON METALLIC FILTER, COMPLETELY ENCLOSED WITHIN A FULLY ANNEALED DOUBLE METAL CORRUGATED JACKET– FOR RAISED FACE FLANGES.		3.2	1.0
	CORRUGATED METAL GASKET–FULLY ANNEALED CORRUGATED METAL WITH FILTER MATERIAL CEMENTED TO THE CORRUGATIONS ON BOTH FACES –FOR RAISED FACE FLANGES		3.2	1.0
	SOLID METAL FLAT RING FOR SMALL TONGUE AND GROOVE FLANGES.		AS SPECIFIED	
	SOLID METAL FLAT RING FOR LARGE TONGUE AND GROOVE FLANGES.		AS SPECIFIED	
	SOLID METAL OCTAGONAL RING FOR R.T.J FLANGES		DIMENSIONS SHALL BE AS PER ASME B 16.20(NOTE–2)	
	SOLID METAL OVAL RING FOR R.T.J FLANGES		DIMENSIONS SHALL BE AS PER ASME B 16.20(NOTE–2)	
	FULLY ANEALED CORRUGATED METAL FOR RAISED FACE FLANGES.		3.2	1.0

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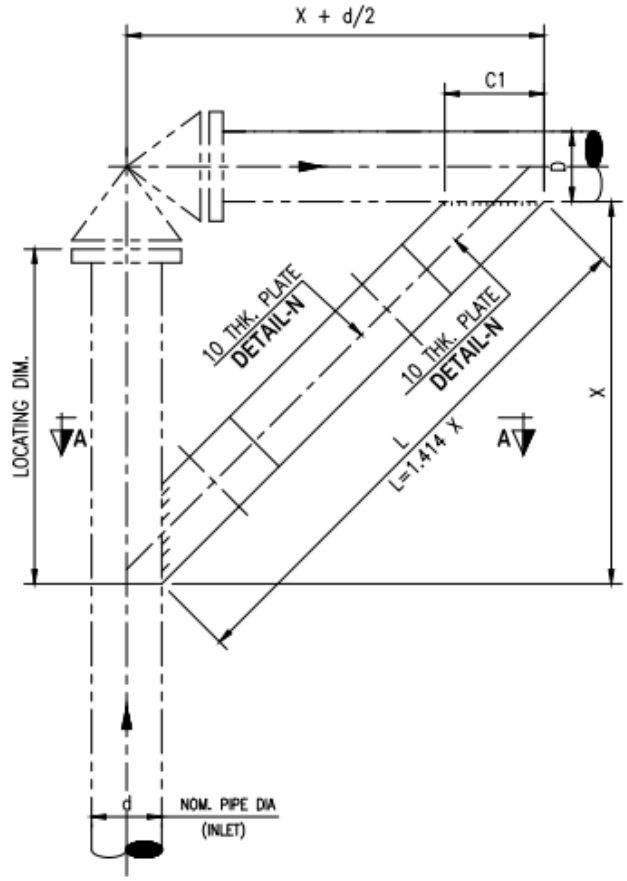
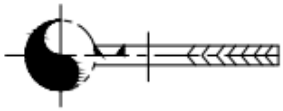
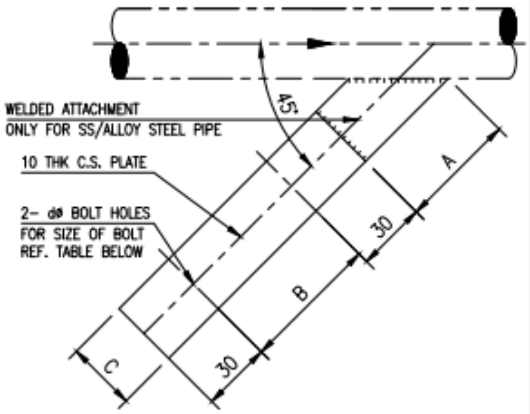
SUPPORTING ARRANGEMENT FOR ANGLE AND RELIEF VALVES TYPE–SP2	DRAWING NO.
	SD–PI–025
	SHEET NO. 1 OF 1

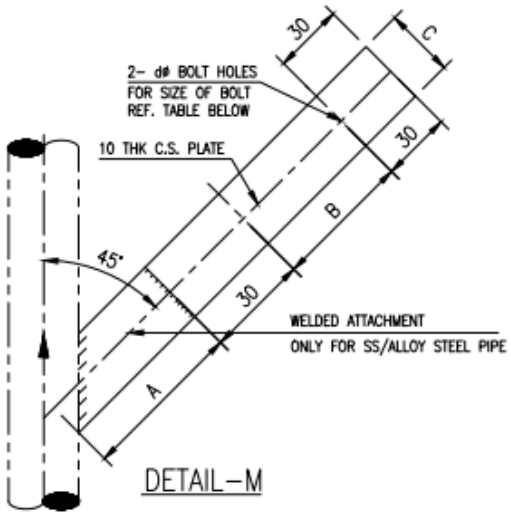




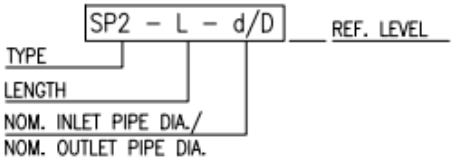
SECTION A–A



DETAIL–N



DETAIL–M



SYMBOL

NOTES:–

1. MATERIAL FOR WELDED ATTACHMENT SHALL BE EQUIVALENT TO PIPE MATERIAL.

D	BOLT SIZE dø	A	C	B MIN.	C1	D1
1" TO 4"	M12 X 50	75	50	150	71	14
6" TO 12"	M16 X 50	100	75	200	106	18

FOR TEMP. UP TO 400 °C ONLY

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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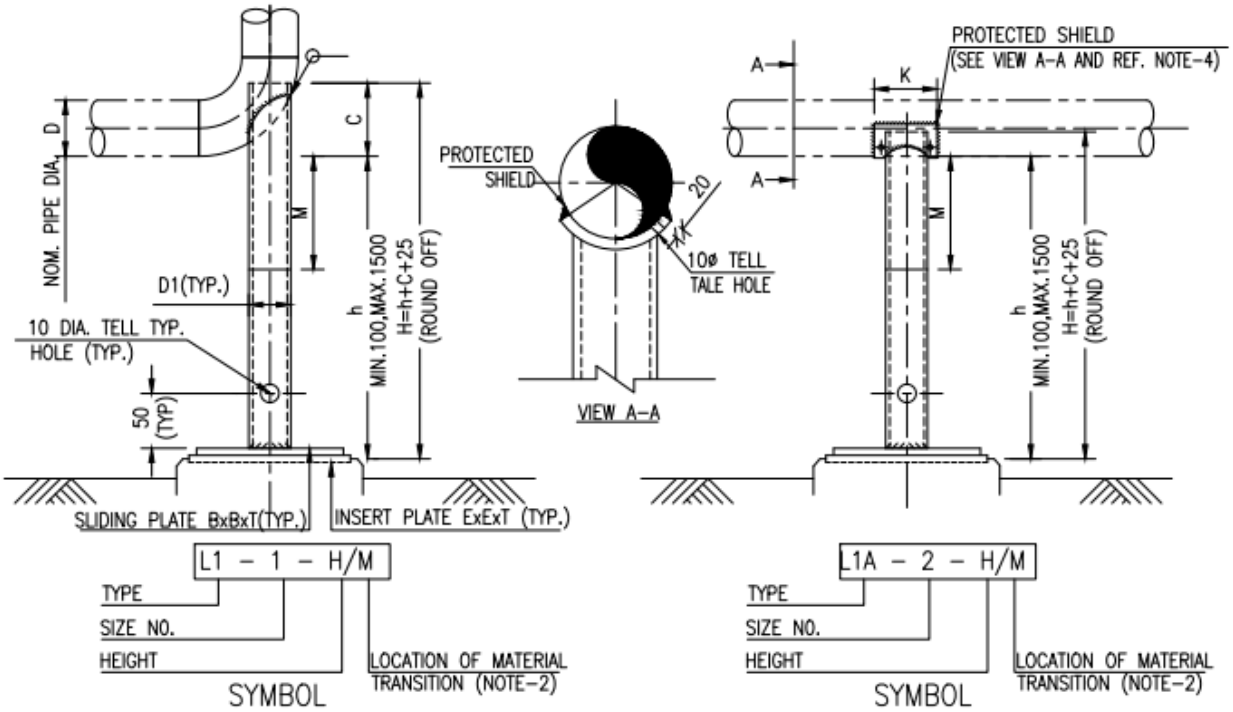
LOW SUPPORT SLIDING FOR BARE & INSULATED PIPE SIZE 2" THRU 36" TYPE-L1 AND L1A	DRAWING NO.
	SD-PI-026
	SHEET NO. 1 OF 1



L1 – 1 – H/M

TYPE
SIZE NO.
HEIGHT
LOCATION OF MATERIAL TRANSITION (NOTE-2)

SYMBOL

L1A – 2 – H/M

TYPE
SIZE NO.
HEIGHT
LOCATION OF MATERIAL TRANSITION (NOTE-2)

SYMBOL

SIZE NO.	D	D1 (NOTE-3)	B	T	C (NOTE-5)	E	K (NOTE-4)
1	2"	2" S40/10S	150	10	70	250	160
	3"				115		
2	4"	3" S40/10S	200	10	137	300	190
	6"				174		
3	8"	4" S40/10S	200	12	205	300	215
	10"				262		
	12"				287		
4	14"	6" S40/10S	250	12	388	350	270
	16"				418		
5	18"	8" S40/10S	300	12	454	400	320
6	20"	10" S40/10S	350	12	554	450	375
	24"				615		
7	26"	12" S40/10S	400	16	675	500	425
	30"				800		
	36"				950		

NOTES:-

1. INSERT AND SLIDING PLATE MATERIAL SHALL BE CARBON STEEL WHERE DESIGN TEMP. IS >345°C WITH h < 200MM, SLIDING PLATE MATERIAL SHALL BE EUIVALENT TO PIPE MATERIAL.
2. DIMENSION "M" LOCATES THE POINT OF MATERIAL TRANSITION ON THE SUPPORT. THE STUB MATERIAL SHALL BE EQUIVALENT TO THAT OF LINE PIPE AND THE LOWER SUPPORT PIPE SHALL BE CARBON STEEL. MINIMUM VALUE OF M SHALL BE "INSULATION THICKNESS+25MM".
   A. FOR CARBON STEEL(CS) LINE PIPE, THE ENTIRE SUPPORT PIPE SHALL BE CS, THAT IS M=0.
   B. FOR ALLOY STEEL(AS) OR STAINLESS STEEL(SS) LINE -PIPE, SUPPORT PIPE SHALL CONSIST OF THE FOLLOWING-
   -FOR h LESS THAN OR EQUAL TO 500MM, ENTIRE SUPPORT PIPE MATERIAL SHALL BE EQUIVALENT TIO THAT OF LINE PIPE, THAT IS M=h.
   -FOR h GREATER THAN 500MM,SUPPORT PIPE SHALL BE COMPOSITE WITH M=INSULATION THK.+25MM OR 100MM, WHICHEVER IS GREATER.
3. IN CASE SIZE AND/OR SCH. OF SUPPORT PIPE (D1) LISTED IN THE TABLE IS NOT AVAILABE USE NEXT HIGHER SIZE AND/OR NEAREST HIGHER THICKNESS AVAILABLE.
4. PROTECTION SHIELD (LENGTH=KMM) CUT FROM LINE-PIPE OR EQUIVALANT PLATE SHALL BE PROVIDED ON HORIZONTAL LINE AS FOLLOWS-
   A. FOR 150# AND 300# CLASS PIPEING
   CS AND AS LINES - 10" AND ABOVE
   SS LINES - 2" AND ABOVE
   B. FOR 600# AND HIGHER CLASS PIPING
   CS, AS AND SS LINES - 10" AND ABOVE
5. DIMENSION "C" IS TO BE MODIFIED IF OTHER THAN 1.5 D RADIUS ELBOWS ARE USED.
6. IN CASE CALCULATED h EXCEEDS THE MAX. VALUE, PEDESTAL SHALL BE RAISED ACCORDINGLY.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
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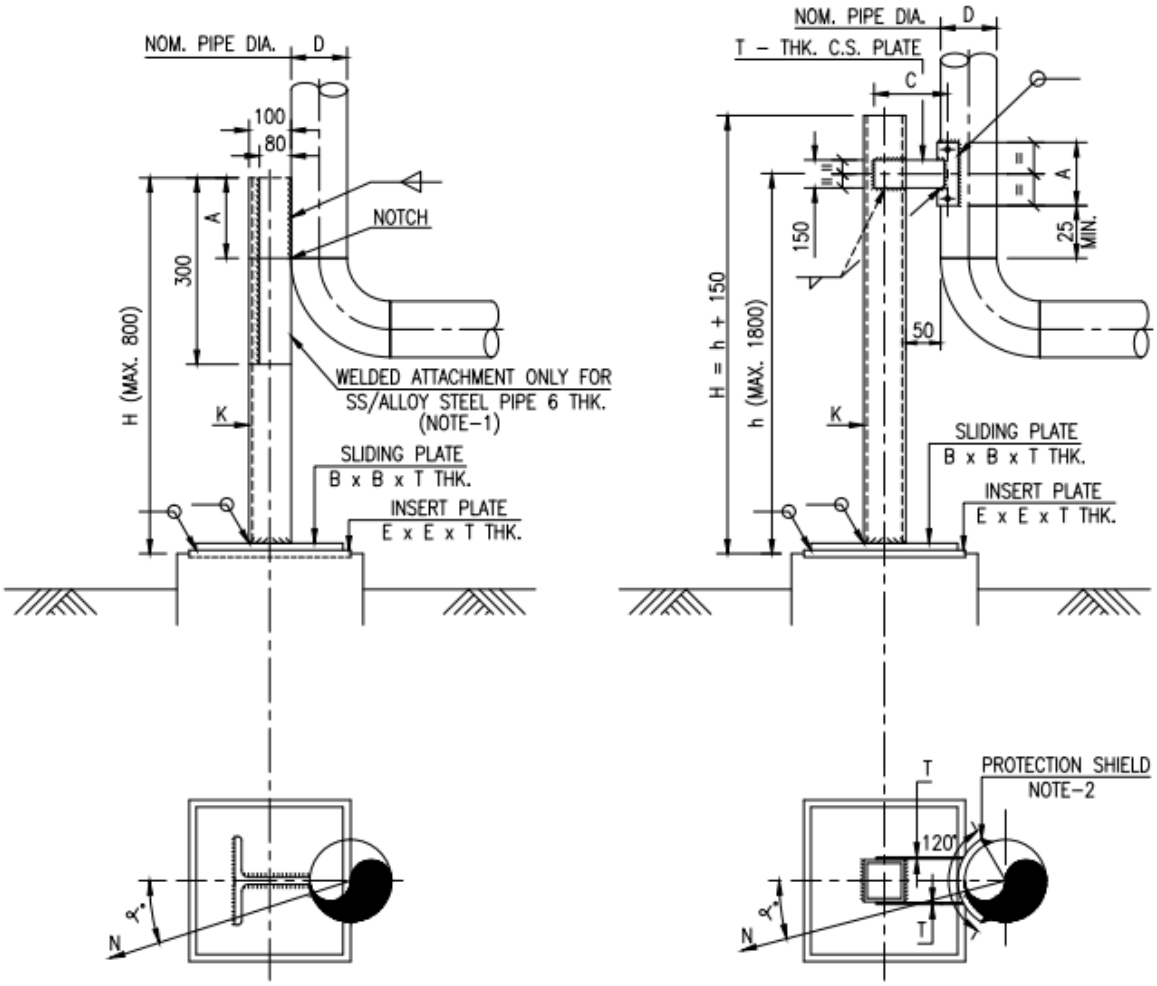
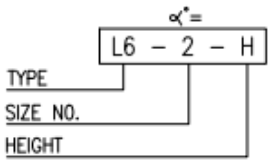
LOW SUPPORT FIXED FOR BARE & INSULATED PIPE SIZE 2" THRU 24"TYPE–L6	DRAWING NO.
	SD–PI–027
	SHEET NO. 1 OF 1



FOR PIPE SIZES 2" THRU 4"

FOR PIPE SIZES 6" THRU 24"



SYMBOL

NOTES:–

1. MATERIAL FOR WELDED ATTACHMENT SHALL BE EQUIVALENT TO PIPE MATERIAL.
2. PROTECTION SHIELD IS TO BE CUT FROM LINE PIPE.

SIZE NO.	D	K	A	T	C	E	B
1	2" TO 4"	CUT FROM ISMB 200	200	10	–	250	150
2	6" TO 10"	ISMC–125 2 NOS.	200	12	150	300	200
3	12" TO 24"	ISMC–225 2 NOS.	300	12	230	400	300

FOR TEMP. UP TO 400 °C ONLY

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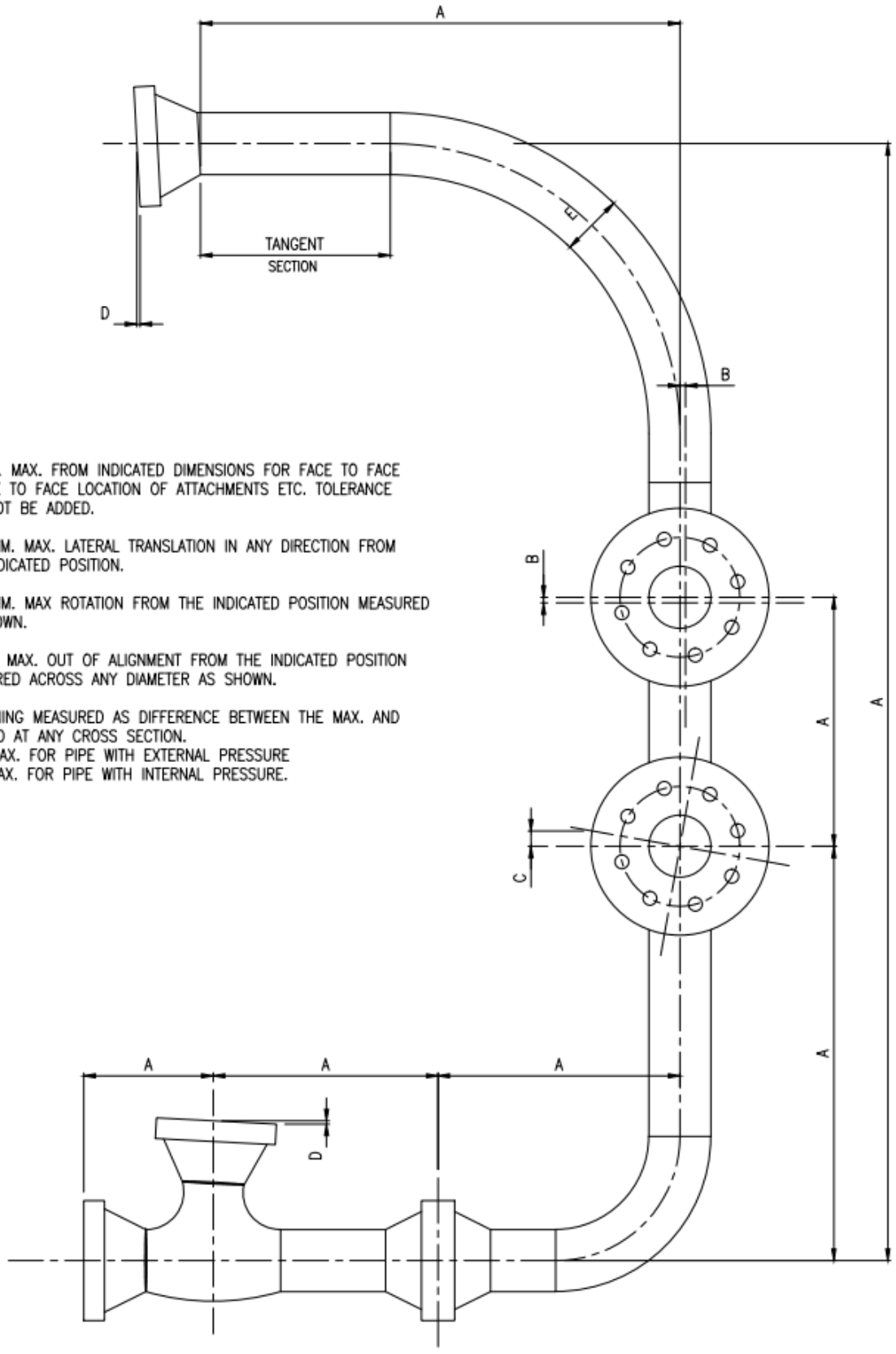
TOLERANCES FOR FABRICATION	DRAWING NO.
	SD-PI-028
	SHEET NO. 1 OF 1



A ±3 MM. MAX. FROM INDICATED DIMENSIONS FOR FACE TO FACE CENTRE TO FACE LOCATION OF ATTACHMENTS ETC. TOLERANCE CAN NOT BE ADDED.

B ±1.5 MM. MAX. LATERAL TRANSLATION IN ANY DIRECTION FROM THE INDICATED POSITION.

C ±1.5 MM. MAX ROTATION FROM THE INDICATED POSITION MEASURED AS SHOWN.

D ±1 MM MAX. OUT OF ALIGNMENT FROM THE INDICATED POSITION MEASURED ACROSS ANY DIAMETER AS SHOWN.

E FLATTENING MEASURED AS DIFFERENCE BETWEEN THE MAX. AND MIN. OD AT ANY CROSS SECTION.
-3% MAX. FOR PIPE WITH EXTERNAL PRESSURE
8% MAX. FOR PIPE WITH INTERNAL PRESSURE.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED FOR STANDARD	US	DK	AD

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ABBREVIATIONS

DRAWING NO.	
SD-PI-029	
SHEET NO.	1 OF 1

M&F	MALE & FEMALE
MI	MALLEABLE IRON
MOLY OR MO	MOLYBDENUM
MR	MATERIAL REQUISITION
MTO	MATERIAL TAKE OFF
MS	MILD STEEL
MSS	MANUFACTURER'S STANDARD SOCIETY
MH	MAN HLOE
NPT	NATIONAL PIPE THREAD
NPSH	NET POSITIVE SUCTION HEAD
NIP	NIPPLE
OD	OUTSIDE DIAMETER
PC.MK	PIECE MARK
PE	PLAIN END
PL	PLATE
PLTF	PLATFORM
P.S	PIPE SUPPORT
PSE	PLAIN SMALL END
PRESS.	PRESSURE
PSI	POUNDS PER SQUARE INCH
POE	PLAIN ONE END
PSIG	POUNDS PER SQUARE INCH GAUGE
RAD OR R	RADIUS
RED.	REDUCER
RF	RAISED FACE
R/L	RANDOM LENGTH
REF.	REFERENCE
RPM	REVOLUTIONS PER MINUTE
RTJ	RING TYPE JOINT
SH	SPRING HANGER
SHT	SHEET
SCH	SCHEDULE
SCRD	SCREWED
S	SAMPLE CONNECTION
SG	SIGHT GLASS
SC	SAMPLE COOLER
SMLS	SEAMLESS
SO	SLIP ON
SOL	SOCKOLET
SP. GR	SPECIFIC GRAVITY
SR	SHORT RADIUS
SS	STAINLESS STEEL
ST	STEAM TRAP
STN	STATION
STM	STEAM
STD	STANDARD
SW	SOCKET WELD
SWG	SWAGE NIPPLE / STD WIRE GAGE
STA	STEAM TRAP ASSEMBLY
TOG	TOP OF GRATING
TEMP.	TEMPERATURE
TOL	THREADOLET
T&C	THREADED & COUPLED
THRD	THREADED
T&G	TONGUE & GROOVE
TBE	THREADED BOTH ENDS
TLE	THREADED LARGE END
TSE	THREADED SMALL END
TOS	TOP OF STEEL
TOE	THREADED ONE END
TYP	TYPICAL
VC	VENT CONNECTION
VERT.	VERTICAL
WP	WORKING PRESSURE, WORKING POINT
	INVERT LEVEL OF PIPE
▽	BOTTOM LEVEL OF THE PIPE
▼	CENTRELINE ELEVATION OF PIPE
WN	WELD NECK
WT	WEIGHT
WOL	WELDOLET
WLD	WELD
XS	EXTRA STRONG
XXS	DOUBLE EXTRA STRONG

NOTE:

1. FOR ABBREVIATIONS RELATED TO CIVIL ENGINEERING/UNDERGROUND PIPING WORK, REFER CIVIL ENGINEERING STANDARD.

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0	10.05.17	ISSUED WITH TENDER	US	DK	AD

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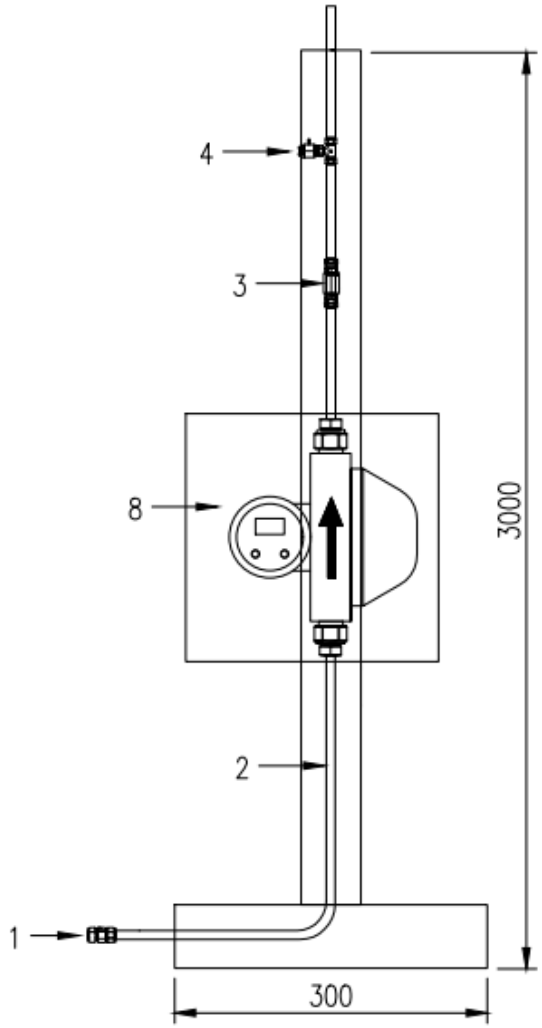
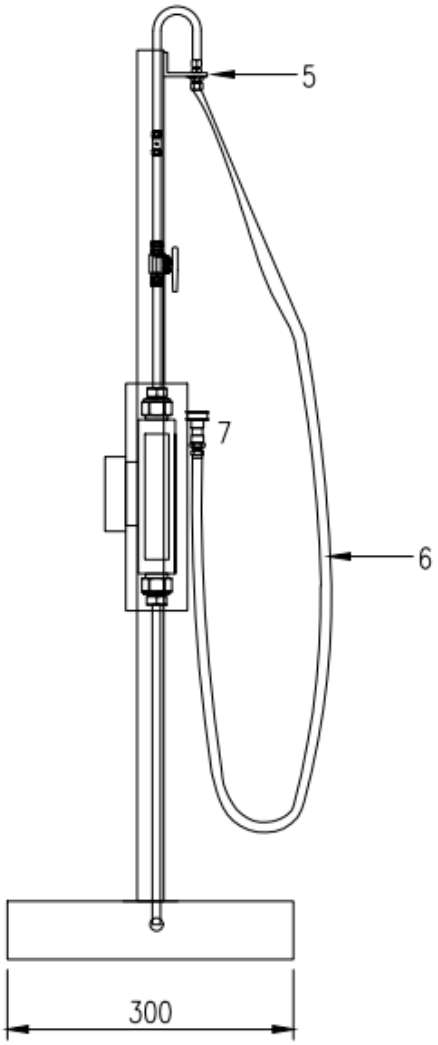
	LCV LOADING POST WITH FLOW METER	DRAWING NO. SD-ME-001
		SHEET NO. 1 OF 1



FRONT VIEW



SIDE VIEW

S.NO.	PART NAME	MATERIAL	MAKE/MODEL
1	UNION 3/4" OD	SS 316	SWAGELOK/PARKER/ DK LOK
2	TUBE 3/4" OD	A 269/213 TP316	SANDVIK/TUBACEX
3	TWO WAY BALL VALVE 3/4" OD	SS 316	SWAGELOK/PARKER/ DK LOK
4	BLEED VALVE 1/4" NPTM	SS 316	SWAGELOK/PARKER/ DK LOK
5	BULKHEAD UNION 3/4" OD	SS 316	SWAGELOK/PARKER/ DK LOK
6	FILL HOSE 1/2" ID, LENGTH-4Mtr. (SS BRAIDED STAINLESS STEEL)	5000 PSIG	SWAGELOK/TUBACEX/ETON
7	QRC 1/2" NPTF	SS 316	SWAGELOK/PARKER/ DK LOK
8	FLOW METER WITH INTEGRATED DISPLAY (COROLIS TYPE) 0-100 Kg/min.	-	MICRO MOTION / E&H

NOTES :

1. ALL DIMENSIONS IN MM.
2. THIS DWG. IS INDICATIVE ONLY, VENDOR TO FURNISH FINAL DWG. BASED ON ARRANGEMENT FOR CNG FILLING FOR APPROVAL POST ORDER.
3. HOSE SHOULD CONFIRM TO NFPA52/CSA NGV 4.2-2014/CSA12.52-2014.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	24.09.19	ISSUED FOR REVIEW	DK	RR	AD

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LIST OF ATTACHMENT
CIVIL-STRUCTURAL AND ARCHITECTURAL

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Date: 2026.02.13 19:41:32

CONTENTS

1.0 LIST OF ATTACHMENTS.....3
2.0 STANDARD DRAWINGS 3
3.0 SPECIFICATIONS.....6
4.0 PROJECT SPECIFIC DRAWINGS.....4

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1.0 LIST OF ATTACHMENTS

Contractor shall carry out all works strictly in accordance with the drawings/documents/specifications indicated in subsequent paragraphs.

2.0 STANDARD DRAWINGS

Sr. No	Standard Drawings Number	Description	Sheet	Rev No
1		Detail of Road Curves and Crossing	1	3
2		Chain Link Fencing	2	3
3		Detail Of Soak Pit	1	3
4		Detail Of Septic Tank	1	3
5		Standard section of storm water drains	1	3
6		Trench Sand Bedding	1	3
7		Concrete Bedding & Encasement for Pipes	1	3
8		Pipe Culvert for Storm Water Drainage	1	3
9		Rain Water Harvesting Pit	1	3
10		Cross Section of Road	3	3
11		Sand trap (for tank farm)	1	3
12		Man Holes (SWS) type-1 for depth < 1M(ø<300)	1	3
13		Man Holes type-2 sanitary waste system for depth <2M(ø≤500)	1	3
14		Details of masonry dyke and fire wall (tank farm)	1	3
15		Brick masonry compound wall	1	3
16		Tank pad details with stone ring wall (for tank height up to 10.0m)	1	3
17		Brick footpath	1	3
18		RCC pavement details	1	3
19		Concrete trapezoidal storm water drain (height (h)<3.0m)	1	3
20		Steps on earthen dykes and road	1	3

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Sr. No	Standard Drawings Number	Description	Sheet	Rev No
		embankments		
21		Area plan for Topo survey	1	3
22		Standard Typ. Details of Cable Trench	1	3
23		R.C.C Flooring Details(Type I & II)	2	3
24		Handrail On Steel Platform	1	3
25		Sliding T- Support	2	3
26		Small operating platforms on grade/ RCC elevation structure	3	3
27		Standard Grating Details	3	3
28		Pipe sleeper Crossover	3	3
29		Miscellaneous Details	1	3
30		Details of Steel Ladder	3	3
31		Metal Insert Plates	7	3
32		Cantilever Pipe Support	1	3
33		Standard for Ring wall foundation for storage tanks (liquid temp. up to 190° c)	4	3
34		Standard for detail of Pedestal for stair / ladder	1	3
35		Details of Block foundation for transformers (up to 2000 KVA rating)	1	3
36		Details for M.S. rungs for conc. structures	1	3
37		Steel stairs	6	3
38		Reinforcement details at circular cut-out in slab	1	3
39		Reinforcement details at sq. / rect. cut-out in slab	1	3
40		Standard lugs	1	3
41		Box culvert Type I,II,III & IV	1	3
42		Typical grating support.	1	3
43		Typical Chequered Plate Support	1	3

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Sr. No	Standard Drawings Number	Description	Sheet	Rev No
44		M.S. anchor bolt assemblies	4	3
45		RCC pipe support	1	3
46		Standard for Detail of False Flooring	3	3
47		Wash Basin Fixing Detail	1	3
48		European Type W.C. Fixing Detail	1	3
49		Urinal Fixing Detail	1	3
50		Standard for Detail of Glazed Aluminum Doors	2	3
51		Wooden Flush Door	1	3
52		Glazed Aluminum Window	1	3
53		False Ceiling	1	3
54		Standard for Detail of Hung Gate	4	3
55		Standard for Detail of Steel Door (Pressed Steel Single Shutter)	2	3
56		Typ. Plinth protection	1	3
57		Aluminum sliding window	1	3
58		Aluminum ventilator	1	3
59		Standard for Detail of Barbed wire fencing(With angle Iron post)	1	3

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3.0 SPECIFICATIONS

Sr. No	Specification Number	Description	Sheet	Rev no
1		Topographic survey of stations	09	3
2		Earthwork in site grading	09	3
3		Earthwork for underground piping	08	3
4		Roads and flexible pavements (up to WBM layer)	12	3
5		Concrete pavement	11	3
6		Flexible pavement with bitumen premix carpet	09	3
7		RCC pipe culverts & ERC crossing etc.	06	3
8		Tank pads	08	3
9		Gravel filling	06	3
10		Misc. civil & structural works for underground services	07	3
11		Plumbing & drainage	09	3
12		Chain link fencing	08	3
13		General scope	05	3
14		Materials	17	3
15		Earth work in foundations	13	3
16		Plain and reinforced cement concrete	35	3
17		Structural steel works	26	3
18		Steel works (tubular hollow sections)	14	3
19		Miscellaneous steel works	13	3
20		Brick masonry	09	3
21		Stone masonry	10	3
22		Demolition & dismantling	08	3
23		Miscellaneous items	09	3

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Sr. No	Specification Number	Description	Sheet	Rev no
24		Soil investigations	35	3
25		Driven cast-in-situ piles	09	3
26		Construction and installation of RCC bored cast-in-suit piles	09	3
27		Testing of concrete piles	13	3
28		Floor finishing	19	3
29		Wood work	08	3
30		Steel aluminum doors, windows and ventilators	09	3
31		Plastering & Pointing	10	3
32		Roof Treatment	05	3
33		White washing, Colour washing, distempering, painting and polishing	15	3
34		Roofing	10	3
35		False ceiling, false flooring, under deck insulation & partitioning	12	3
36		Acid proof tile lining	06	3
37		Inspection and Test Plan (ITP) for Civil Structural & Architectural Works	31	3

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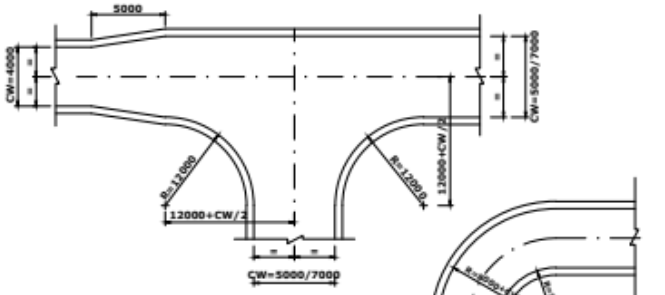
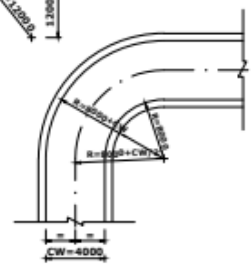
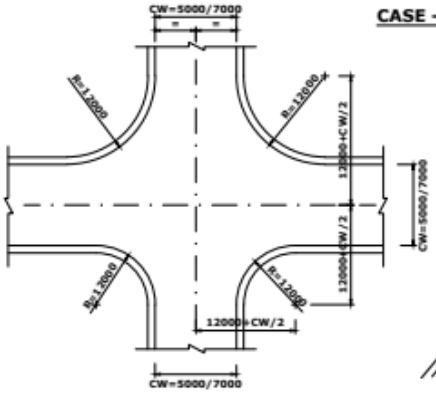
STANDARD DRAWING FOR OF ROAD CURVES AND CROSSINGS	STANDARD DRAWING NO.	REV.	SIZE
		03	A4
	SHEET NO. 1 OF 1		



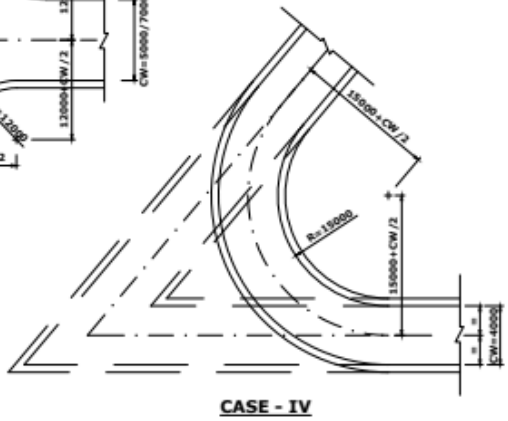
CASE - I



CASE - III



CASE - II



CASE - IV

NOTES:-

1. ALL DIMENSIONS ARE IN MM. UNLESS OTHERWISE MENTIONED.
2. MINIMUM RADIUS OF CURVES FOR ROADS WITH CW=4.0m
3. MINIMUM RADIUS OF CURVES FOR ROADS WITH CW>4.0m SHALL BE 12m.
4. RADIUS OF CURVES FOR APPROACH ROADS TO BUILDINGS AND OTHERS AREAS MAY BE REDUCED AS PER SERVICES REQUIRMENTS.
5. FOR ROAD CURVES WITH ACUTE ANGLE TURNING. THE MINIMUM RADIUS SHALL BE 15m AND ANGLE NOT LESS THAN 50°.
6. RADIUS OF CURVES AND CROSSING WHEN DIFFERENT FROM THOSE GIVEN IN THIS STANDARD TO MEET ANY SPECIAL REQUIRMENT SHALL BE SO MARKED IN THE AREA DRAWINGS.

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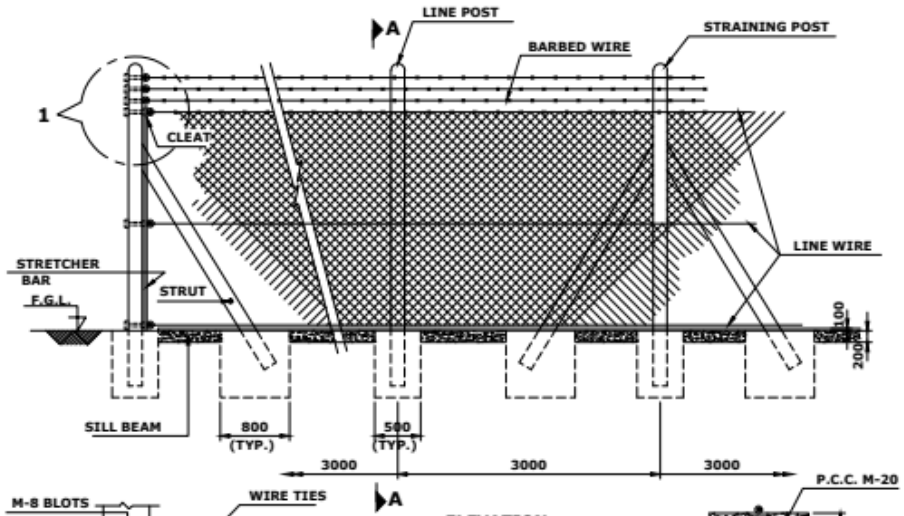
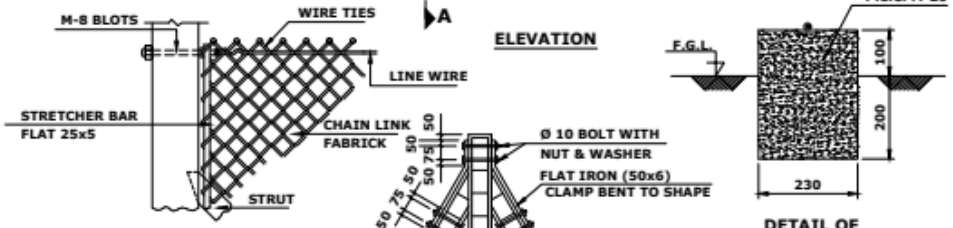
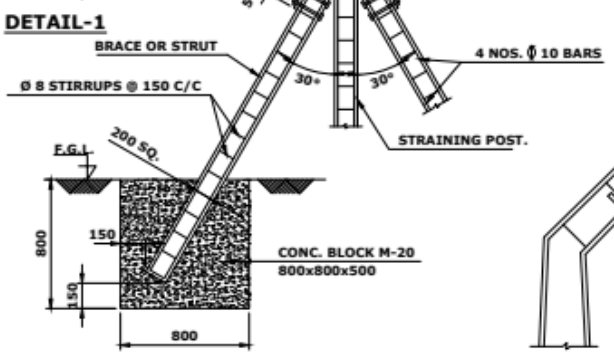


ELEVATION

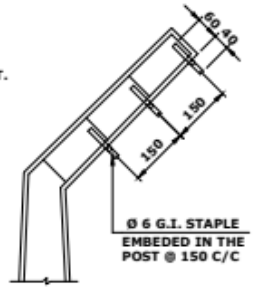


DETAIL-1

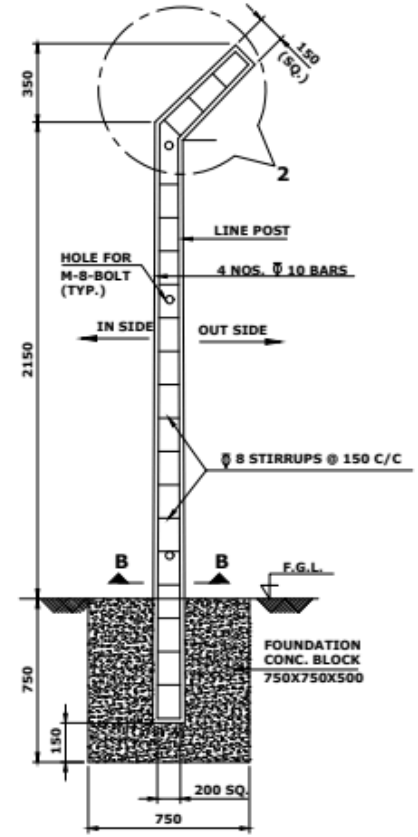
DETAIL OF SILL BEAM



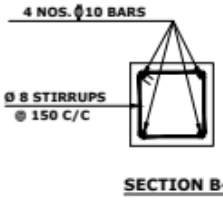
DETAIL OF STRAINING POST AND BRACE OR STRUT



DETAIL-2



SECTION A-A



SECTION B-B

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.

TYPE-I

DETAIL OF CHAIN LINK FENCING (WITH CONC. POST)

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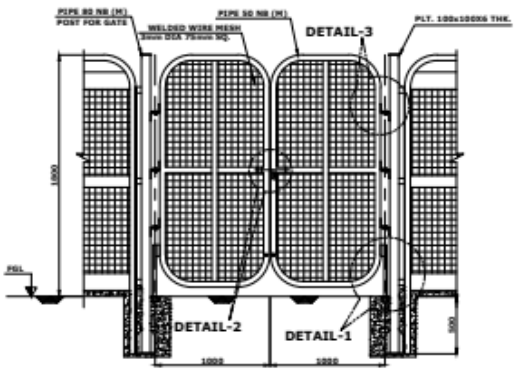
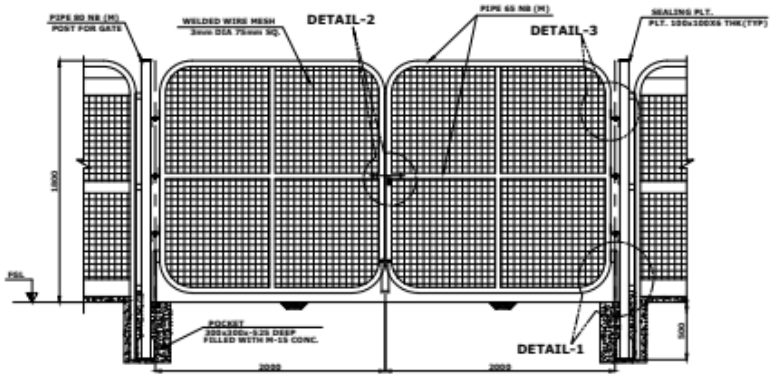


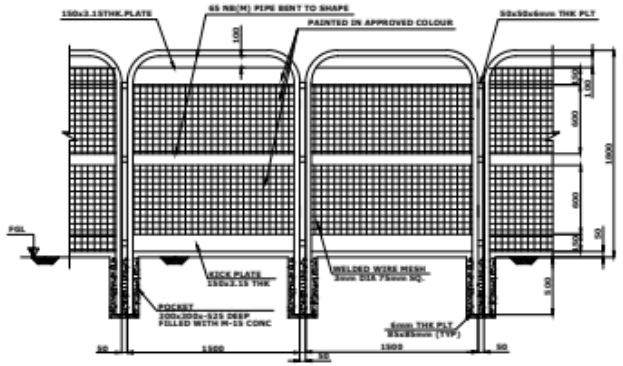
2.0 WIDE GATE DETAIL
2100 HIGH



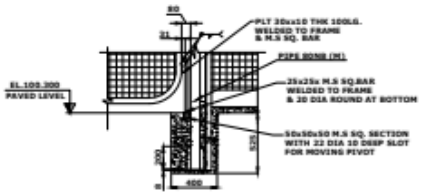
4.0 WIDE GATE DETAIL

NOTES:-

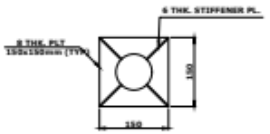
1. ALL DIMENSIONS AND LEVELS ARE IN mm. (UNLESS MENTIONED OTHERWISE)
2. ONLY FIGURED DIMENSIONS ARE TO BE FOLLOWED.
3. ALL STRUCTURAL STEEL SHALL CONFORM TO I.S :2062-2011 GRADE-A.
4. FABRICATION SHALL BE DONE IN ACCORDANCE TO I.S :800-2007
5. ALL WELD SHALL BE 6MM FILLET WELD UNLESS OTHERWISE STATED.
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.



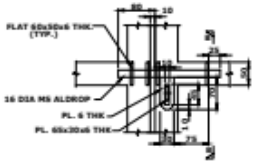
TYPICAL FENCING DETAIL



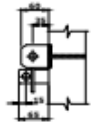
DETAIL - 1



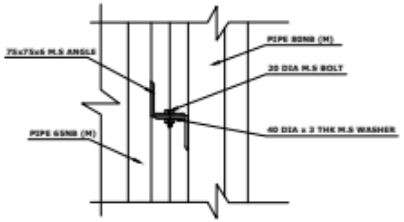
SECTION A-A



DETAIL - 2



SECTION B-B



DETAIL - 3

TYPE-II

DETAIL OF CHAIN LINK
NCING & GATE (WITH STEEL POST)

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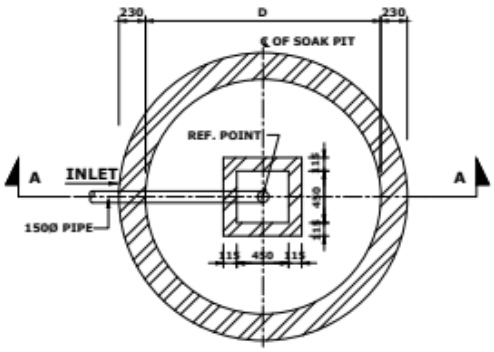
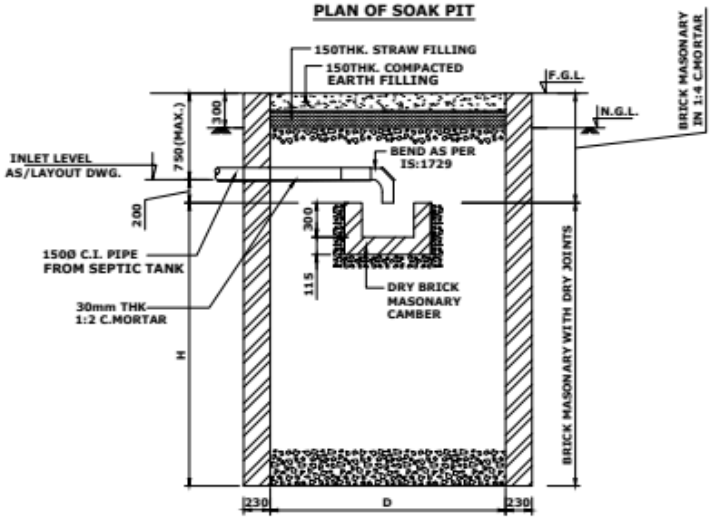
STANDARD DRAWING FOR DETAIL OF SOAKPIT	STANDARD DRAWING NO.		REV.	SIZE
			03	A4
	SHEET NO.	1 OF 1		



PLAN OF SOAK PIT



SECTION A-A

TABLE

TYPE	NO. OF USERS	DEPTH IN METERS	DIA IN METERS	AREA OF ABSORPTION
1	10	2.5	2.5	24.53
2	25	5.0	3.25	59.35
3	50	7.0	3.6	89.30
4	100	10.0	5.0	196.25

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETERS EXCEPT LEVELS AND CO-ORDINATES WHICH ARE IN METERS.
2. THE FILLING OF BRICK BATS IN SOAKPIT SHALL BE DONE SIMULTANEOUSLY WITH CONST. OF BRICK WALLS AS WORK PROGRESS.
3. C.I. PIPE SHALL CONFORM TO IS: 3486.
4. DEPTH AND DIA CAN BE SUITABLY ADJUSTED TO GIVE THE ABSORPTIVE AREA DEPENDING UPON THE SUB SOIL WATER TABLE.
5. BOTTOM OF THE SOAKPIT SHOULD NOT BE LESS THAN 600mm ABOVE THE SUB SOIL WATER.

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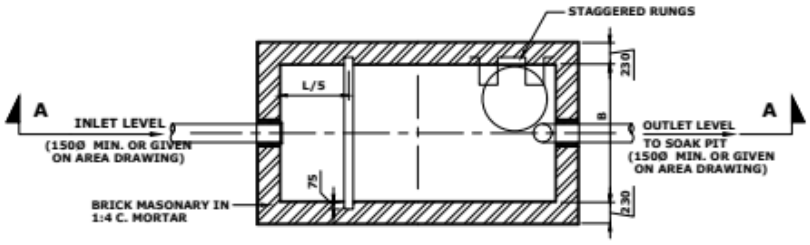
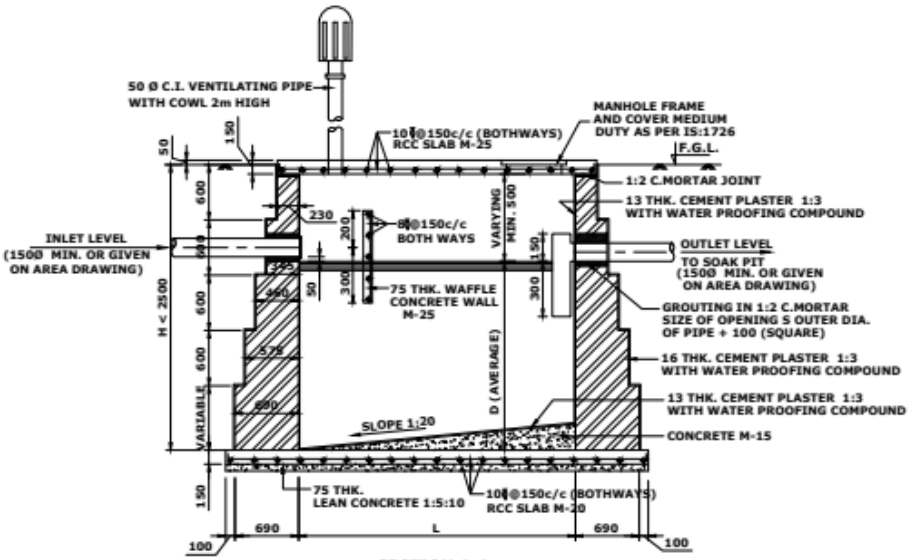
STANDARD DRAWING FOR DETAIL OF SEPTIC TANK	STANDARD DRAWING NO.		REV.	SIZE
			03	A4
	SHEET NO.	1 OF 1		



PLAN OF SEPTIC TANK



SECTION A-A

RECOMMENDED DIMENSIONS OF SEPTIC TANK

TYPE	NO. OF USERS	LENGTH (L)	BREADTH (B)	LIQUID DEPTH (D)
1	10	2000	900	1000
2	20	2300	1100	1300
3	30	4000	1400	1300
4	50	4750	1700	1500

NOTES:-

1. ALL DIMENSIONS ARE IN MM. & LEVEL IN METRES.
2. FOLLOW WRITTEN DIMENSIONS ONLY. DO NOT SCALE.
3. CLEAR COVER TO MAIN REINF. SHALL BE: (a) SLAB = 30 mm
4. Ø DENOTES HIGH YIELD STRENGTH DEFORMED BARS OF GRADE Fe 415 (MIN.) CONFORMING TO IS -1786 .
5. DESLUDGING SHALL BE DONE PERIODICALLY EVERY YEAR PREFERABLY BY A PORTABLE NON CLDG. PUMP.

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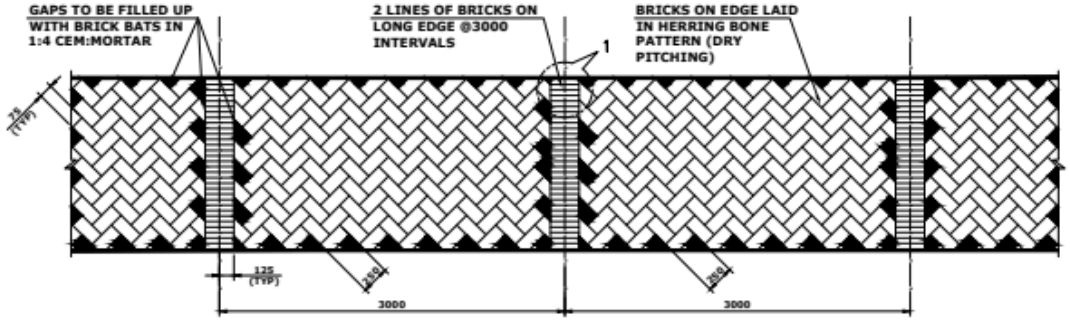
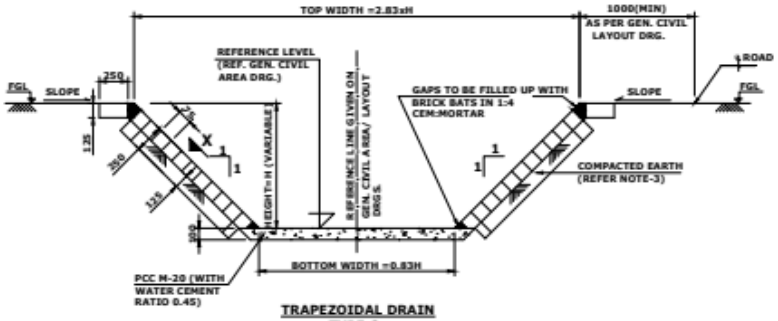
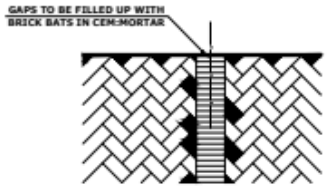


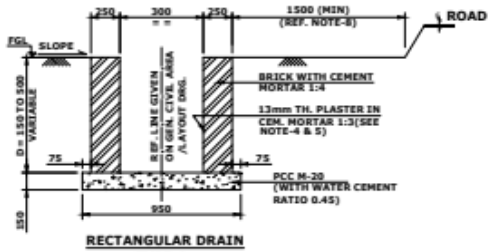
VIEW-X



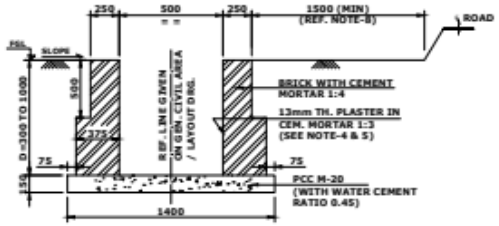
TRAPEZOIDAL DRAIN
TYPE-3
(FOR H 300 TO 2000)



DETAIL-1
(TYP)



RECTANGULAR DRAIN
TYPE-1
(DEPTH ABOVE 300 TO 1000)



RECTANGULAR DRAIN
TYPE-2
(DEPTH ABOVE 300 TO 1000)

NOTES:-

1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.
2. (a) THIS STD. IS APPLICABLE FOR OFFSITE AREAS ONLY.
   (b) WHEREVER TYPE 1 & 2 DRAINS ARE LAID IN EXPANSIVE SOIL. A LAYER OF MINIMUM 250mm THICK SAND SHALL BE PROVIDED BELOW AND AROUND THE SIDES OF DRAIN.
   (C) TRAPEZOIDAL DRAIN (TYPE-3) IS NOT SUITABLE FOR AREAS WITH EXPANSIVE SOIL AND SANDY SOIL.
3. BRICK PITCHING SHALL BE DONE ONLY AFTER THE SIDES OF DRAIN ARE CUT, COMPACTED TO 90% OF MAX. LABORATORY DRY DENSITY AND DRESSED TO THE REQUIRED SLOPE.
4. 13mm THK. PLASTER IN CEM. MORTAR 1:3 SHALL BE PROVIDED ON BENDS UP TO A DISTANCE OF 1.5M ON EITHER SIDE OF THE BEND FOR ALL DRAINS. FLUSH CEMENT POINTING IN CEMENT MORTAR 1:3 SHALL BE DONE AT OTHER PLACES.
5. INTERNAL PLASTER OF SAME SPECIFICATION AS SHOWN IN NOTE-4 IN RECTANGULAR DRAIN TYPE-1 & 2 SHALL BE DONE ONLY FOR THE PORTION OF DRAIN LOCATED NEAR BUILDING.
6. EXACT THICKNESS OF BRICK MASONRY WORK SHALL BE ACCORDING TO THE SIZE OF LOCALLY AVAILABLE BRICK HERE BRICK SIZE IS CONSIDERED AS 250x125x75.
7. THIS STANDARD DRG. SHALL BE VALID WHERE WATER TABLE IS UP TO FGL.
8. 1500 mm (MIN) HAS BEEN KEPT TO AVOID THE IMPACT OF SURCHARGE PRESSURE OF ROAD EMBANKMENT OF THE WALL OF THE DRAIN.

STANDARD SECTION OF STORM WATER DRAINS

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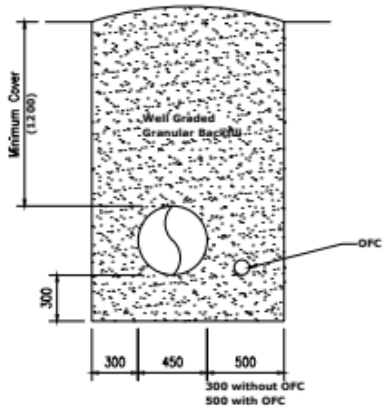
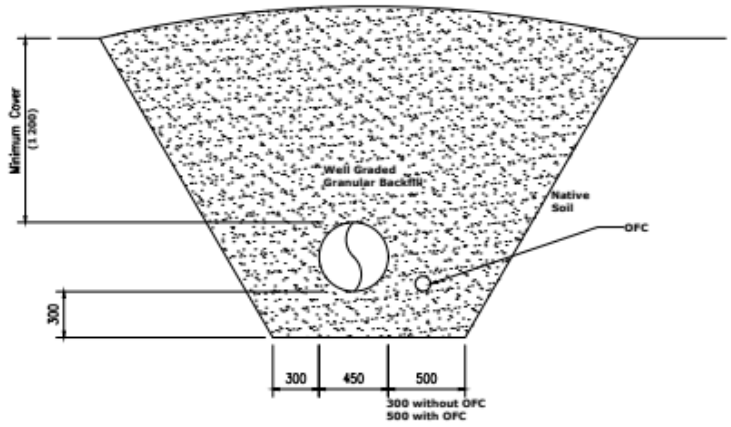
STANDARD FOR TRENCH SAND BEDDING	STANDARD DRAWING NO.		REV.	SIZE
	[illegible]		03	A4
	SHEET NO.	1 OF 1		

For Rocky Strata / Gravel Area :



For Clay Soil :



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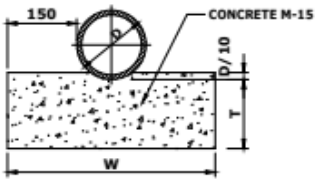
STANDARD DRAWING FOR CONCRETE BEDDING AND ENCASEMENT FOR PIPES	STANDARD DRAWING NO.	REV.	SIZE
		03	A4
	SHEET NO. 1 OF 1		

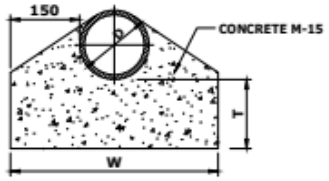
TYPE-I



SECTION ELEVATION OF BEDDING

(FOR C.S PIPE SEWER WHERE SUPPORT IS REQUIRED)

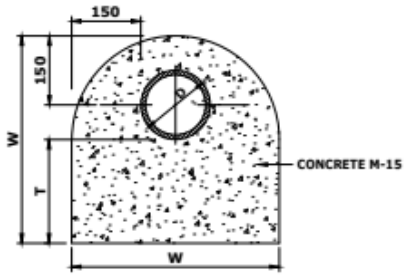
TYPE-II



SECTION ELEVATION OF HAUNCHING

(FOR HDPE, SW PIPE SEWERS)

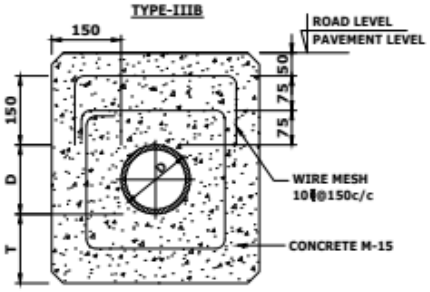
TYPE-IIIA



SECTION ELEVATION SURROUND OR ENCASING

(FOR SEWERS UNDER ROADS COVER>600mm)

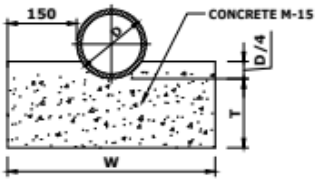
TYPE-IIIB



SECTION ELEVATION SURROUND OR ENCASING

(FOR SLEEVES/PIPES CULVERTS UNDER ROADS FOR COVER<600mm)

TYPE-IV



SECTION ELEVATION CONCRETE GRADE BEDDING

(FOR SEWERS - CONCRETE PIPE)

LEGEND

D = EXTERNAL DIA OF PIPE
W = D+300
T = 100 FOR PIPES UNDER 150 NOMINAL DIA.
T = 150 FOR PIPES OF 150 NOMINAL DIA AND ABOVE.

NOTES:-

1. BEDDING:- WHERE BEDDING IS USED, THE CONCRETE SHALL BE BROUGHT UP TO ATLEAST TO THE INVERT LEVEL OF THE PIPE TO FORM A CRADLE & TO AVOID LINE CONTACT BETWEEN THE PIPE AND BED.
2. HAUNCHING:- THE FULL WIDTH OF THE BED SHALL BE CARRIED TO THE LEVEL OF THE HORIZONTAL DIAMETER OF THE PIPE AND SPLAYS FROM THIS LEVEL CARRIED ON BOTH SIDES OF THE PIPE TO MEET THE PIPE BARREL TANGENTIALLY.
3. SURROUNDED OR ENCASING TYPE-IIIA:- THE SURROUND OR ENCASING SHALL BE SIMILAR TO HAUNCHING UP TO THE HORIZONTAL , DIA OF THE PIPE & THE PORTION OVER THIS SHALL BE FINISHED IN A SEMI-CIRCULAR FORM TO GIVE A UNIFORM ENCASING FOR THE TOP HALF OF THE PIPE.
   TYPE-IIIB:- IT IS SIMILAR TO TYPE-IIIA ABOVE EXCEPT THAT THE TOP PORTION OVER THIS SHALL BE FINISHED RECTANGULAR AS SHOWN AND THE SECTION PROVIDED WITH REINFORCEMENT AS PER REQUIRMENTS.
4. CONCRETE CRADLE BEDDING:- IS THE METHOD OF BEDDING PIPES IN WHICH THE LOWER PART OF THE PIPE EXTERIOR IS BEDDED IN CRADLE CONSTRUCTION OF CONCRETE WITH DIMENSION AS SHOWN.
5. CONCRETE WORK SHALL BE CONFORM TO IS: 456.

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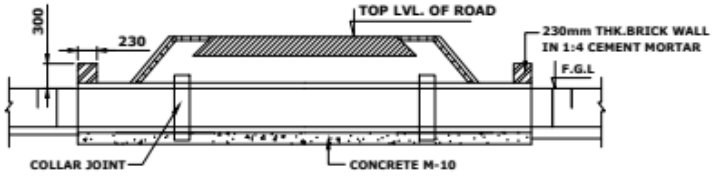
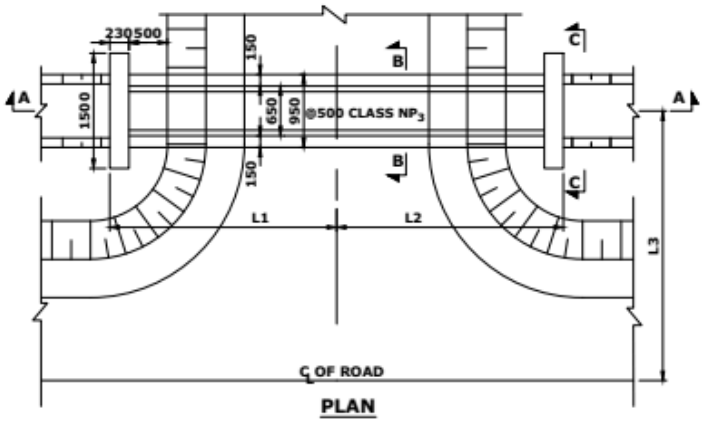
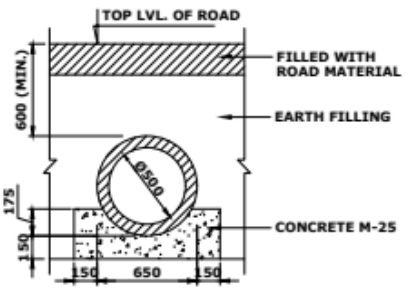
	STANDARD DRAWING FOR PIPE CULVERT FOR STORM WATER DRAINAGE	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 2		



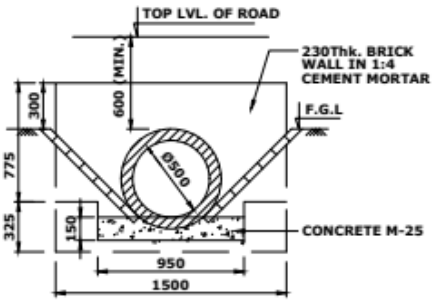
SECTION A-A



PLAN



SECTION B-B



SECTION C-C

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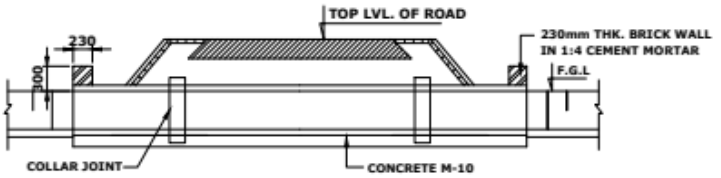
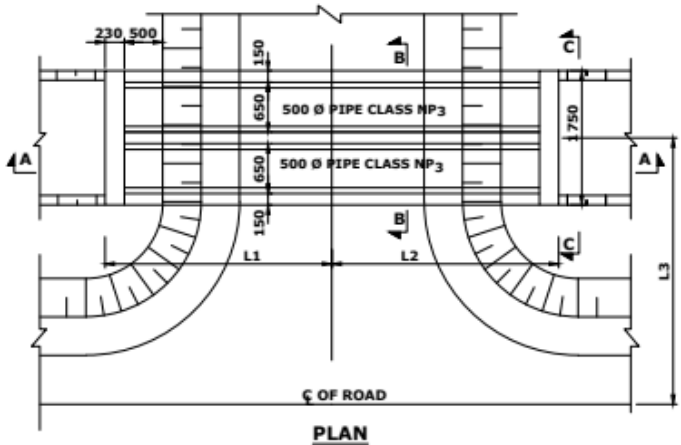
Date: 2026.02.13 19:41:32

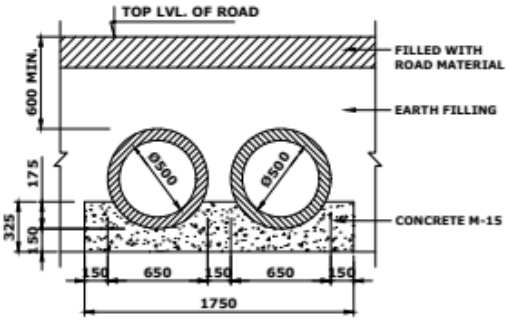
	STANDARD DRAWING FOR PIPE CULVERT FOR STORM WATER DRAINAGE	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 2 OF 2		



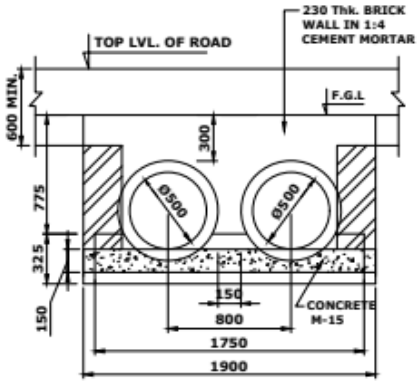
SECTION A-A



PLAN



SECTION B-B



SECTION C-C

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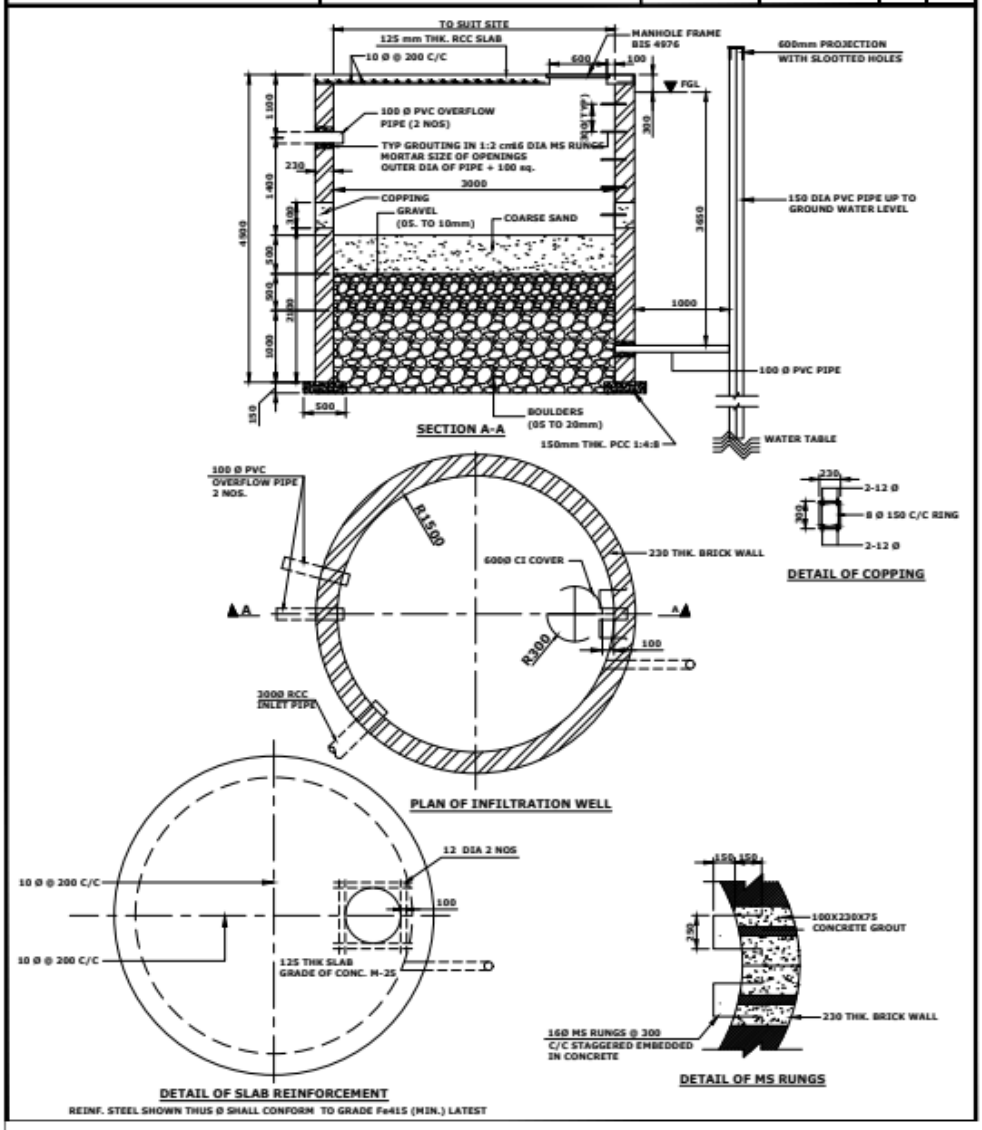
Date: 2026.02.13 19:41:32

	STANDARD DRAWING FOR RAIN WATER HARVESTING PIT	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 1		



REINF. STEEL SHOWN THUS Ø SHALL CONFORM TO GRADE Fe415 (MIN.) LATEST

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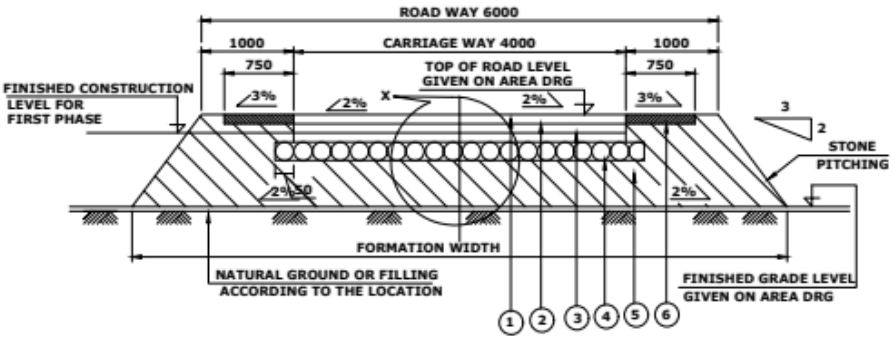
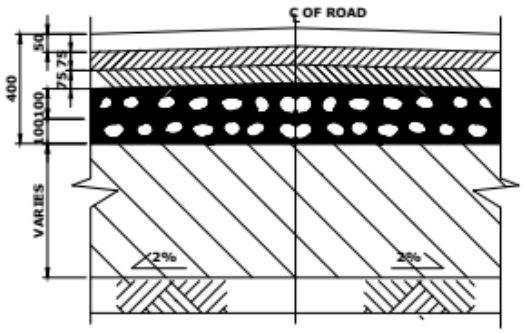
	STANDARD DRAWING FOR CROSS SECTION OF ROAD (6.0 M WIDE)	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 3		





DETAIL - X

LEGEND

1. PREMIX BITUMENOUS CARPET WITH SEAL COAT.
2. SECOND LAYER WATER BOUND MACADAM COURSE WITH GRADE-II AGGREGATE.
3. FIRST LAYER WATER BOUND MACADAM COURSE WITH GRADE-II AGGREGATE.
4. SUB BASE COURSE TWO LAYERS OF WBM WITH GRADE-I AGGREGATE.
5. APPROVED MATERIAL FROM SITE COMPACTED TO 90% OF MAXIMUM LAB. DRY DENSITY AS IS 2720 PART VIII.
6. 75mm THK. WATER BOUND MACADAM COURSE WITH GRADE-II AGGREGATE.

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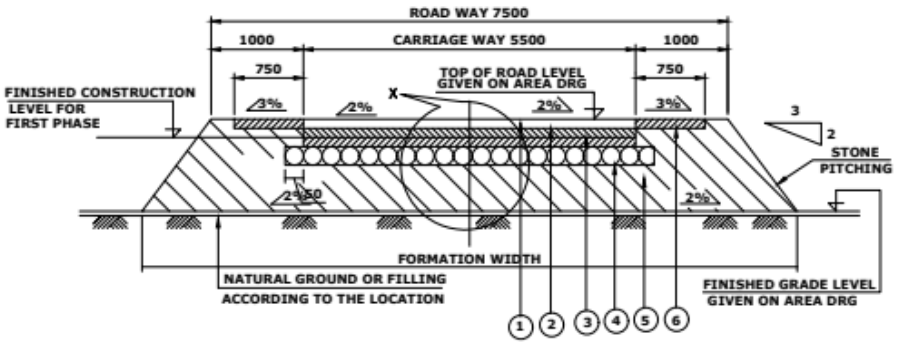
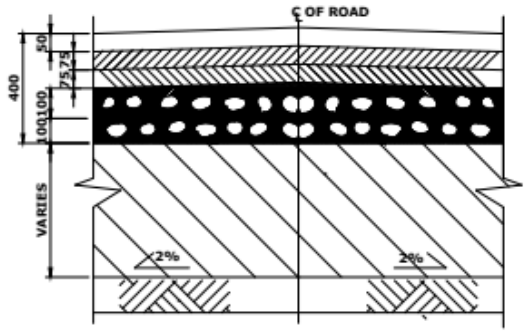
	STANDARD DRAWING FOR CROSS SECTION OF ROAD (7.5 M WIDE)	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	2 OF 3		





DETAIL - X

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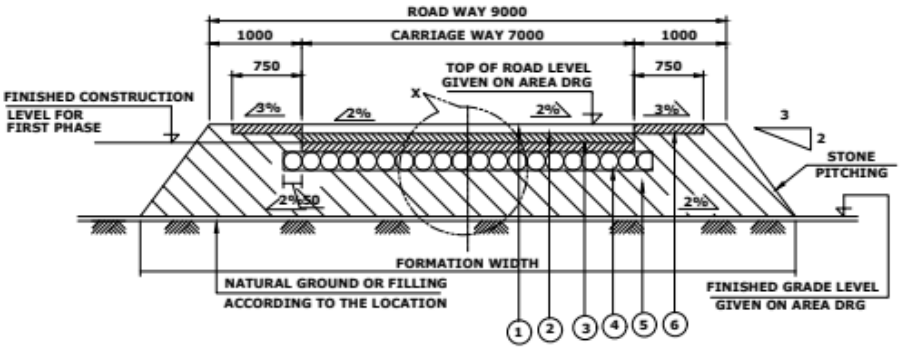
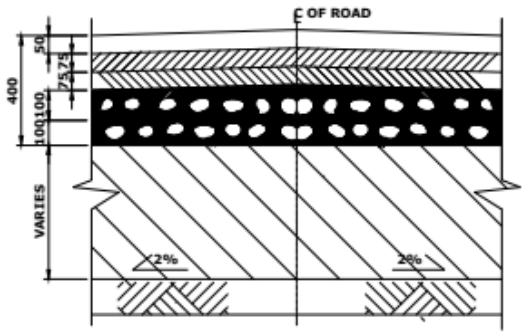
Date: 2026.02.13 19:41:32

	STANDARD DRAWING FOR CROSS SECTION OF ROAD (9.0 M WIDE)	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 3 OF 3		





DETAIL - X

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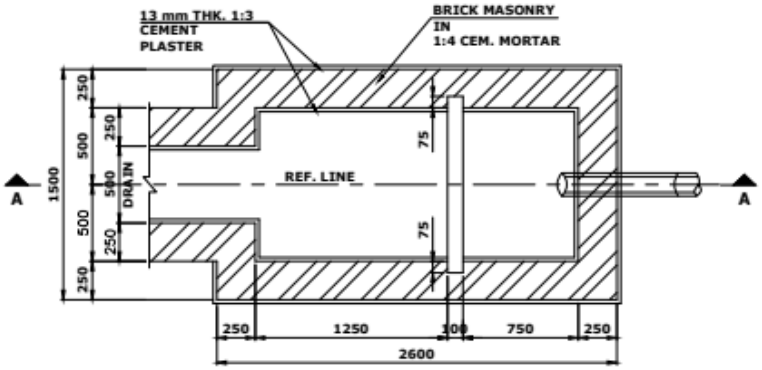
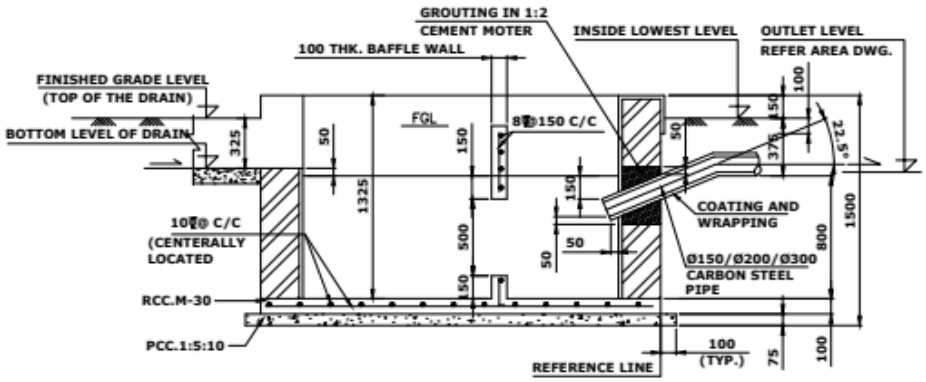
STANDARD DRAWING FOR SAND TRAP (FOR TANK FARM)	STANDARD DRAWING NO.	REV.	SIZE
		03	A4
	SHEET NO. 1 OF 1		



PLAN



SECTION A-A

REPRESENTATION IN AREA DRG.

NOTES :-

1. ALL DIMENSION ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. EXACT THICKNESS OF BRICK MASONRY SHALL BE ACCORDING TO THE SIZE OF LOCALLY AVAILABLE BRICK. HERE BRICK SIZE IS CONSIDERED AS 250x125X75.

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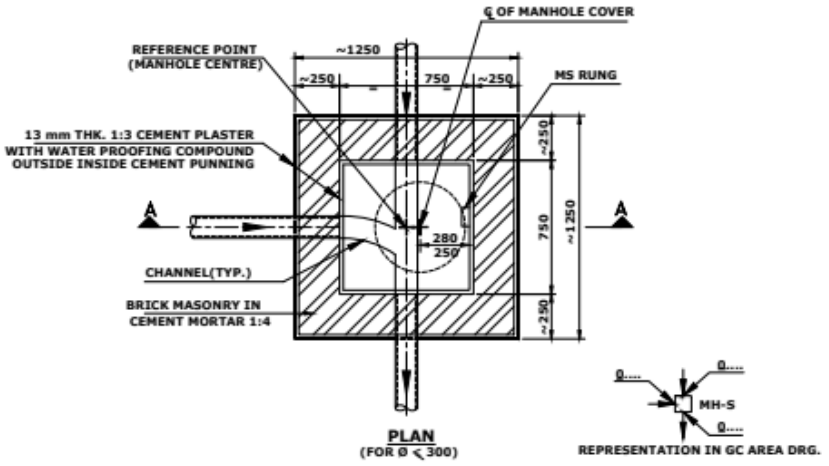
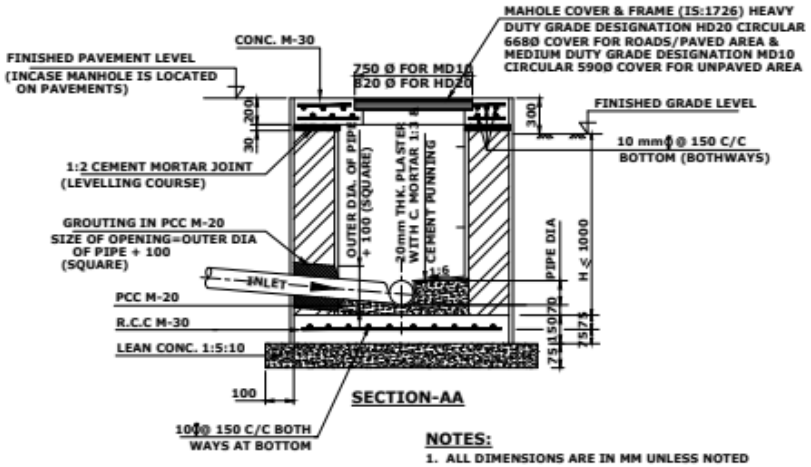
	STANDARD DRAWING FOR MANHOLE(SWS) TYPE-1 FOR DEPTH <1M.(Ø<300)	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 1		



PLAN
(FOR Ø ≤ 300)

REPRESENTATION IN GC AREA DRG.



SECTION-AA

NOTES:

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. ALL REINFORCEMENT SHALL BE OF GRADE Fe415 CONFORMING TO IS:1786.
3. EXACT THICKNESS OF BRICK MASONARY SHALL BE ACCORDING TO SIZE OF LOCALLY AVAILABLE BRICKS.
4. FOR AGGRESSIVE SOIL CONCRETE GRADE M-35 SHALL BE PROVIDED

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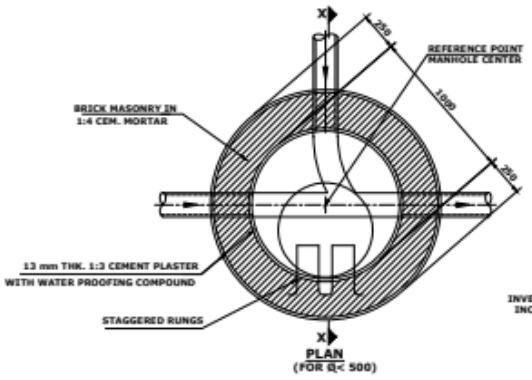
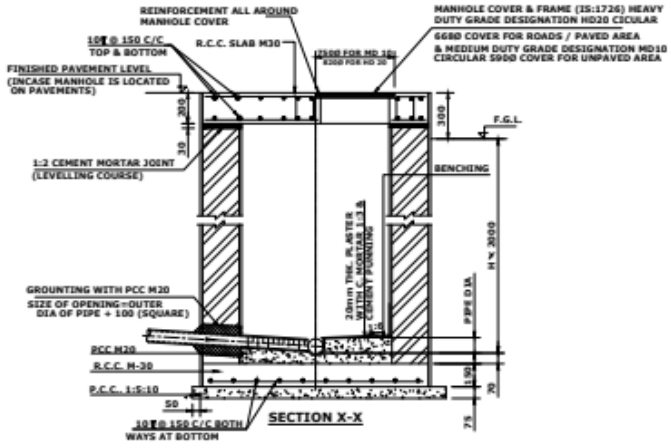
	STANDARD DRAWING FOR MANHOLE TYPE-2 (SANITARY WASTE SYSTEM) FOR DEPTH<2(Ø<500)	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 1		



PLAN
(FOR Ø< 500)

REPRESENTATION
ON AREA DRG.



SECTION X-X

NOTE:

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE
2. ALL REINFORCEMENT SHALL BE OF GRADE Fe 415 (MIN.) CONFORMING TO IS:1786
3. BAR BENDING SHALL CONFORM TO IS:2502.
4. TOP SLAN SHALL BE CAST-IN-SITU AND REINFORCEMENT ON WALL SIDE OF MANHOLE OPENING SHALL BE ADJUSTED AT SITE.
5. THE BRICKS SHALL CONFORM TO IS:1077 (CLASS 5.0 MENIMUM).
6. EXACT THICKNESS OF BRICK MASONRY WALL SHALL BE AS PER LOCATION AVAILABLE BRICK (HERE WALL THICKNESS HAS BEEN GIVEN AS PER BRICKS SIZE 250x125x75).
7. FOR AGRESSIVE SOIL CONCRETE GRADE M-35 SHALL BE PROVIDE.

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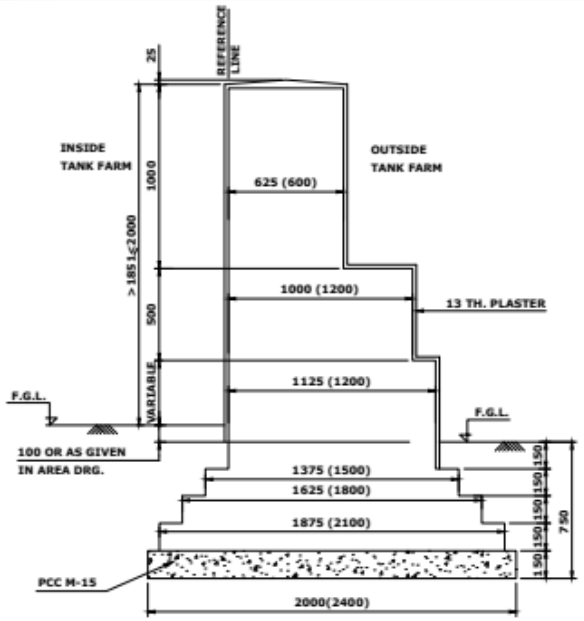
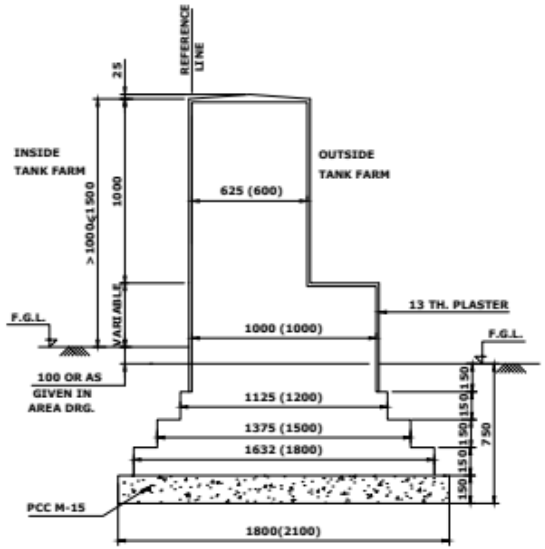


STONE / BRICK MASONRY DYKE WALL TYPE-I

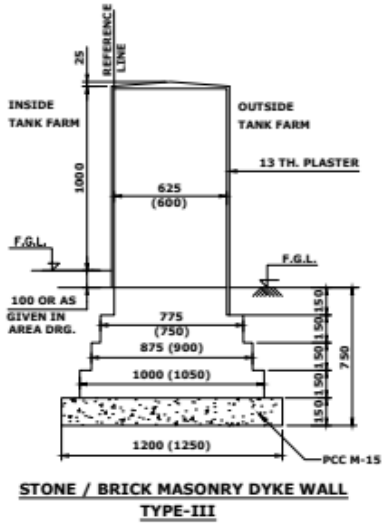


STONE / BRICK MASONRY DYKE WALL TYPE-II

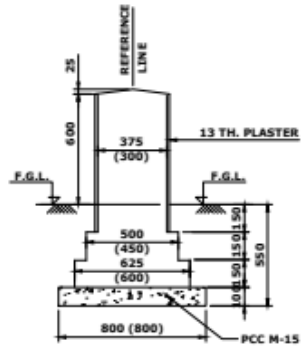
NOTES :-

DESIGN CONDITIONS:

1. ALL DIMENSIONS ARE IN MILLIMETER.
2. DYKE AND FIRE WALL IS DESIGNED TO RETAIN LIQUID ON ONE SIDE OF WALL, IT SHALL BE ENSURED THAT EARTH IS TO BE RETAINED ON EITHER SIDE OF WALL BELOW F.G.L FOR STABILITY.
3. WALL FOOTINGS ARE DESIGNED FOR A MINIMUM SAFE BEARING CAPICITY OF 7.5T/m2 (NET) FOR DYKE WALLS AND 5.0 T/m2 (NET) FOR FIRE WALLS.
4. DIMENSIONS GIVEN WITHIN BRACKETS ARE FOR STONE MASONRY DYKE WALLS AND FIRE WALLS
5. BRICK MASONRY WALLS SHALL BE PLASTERED WITH 13MM THICK 1:3 CEMENT MORTAR ON SIDES & TOP AND STONE MASONRY WALLS SHALL BE FLUSH POINTED IN 1:3 CEMENT MORTAR.
6. BRICK MASONRY AND STONE MASONRY SHALL BE DONE IN 1:4 CEMENT MORTAR
7. EXACT THICKNESS OF BRICK MASONRY WALL SHALL BE AS PER LOCALLY AVAILABLE BRICKS. (HERE WALL THICKNESS HAS BEEN GIVEN AS PER BRICK SIZE OF 250X125X75).
8. THE BRICKS OF CLASS 5.0 (MINIMUM) SHALL BE USED.



STONE / BRICK MASONRY DYKE WALL TYPE-III



STONE / BRICK MASONRY FIRE WALL

DETAILS OF MASONRY DYKE AND FIRE WALL (TANK FARM)

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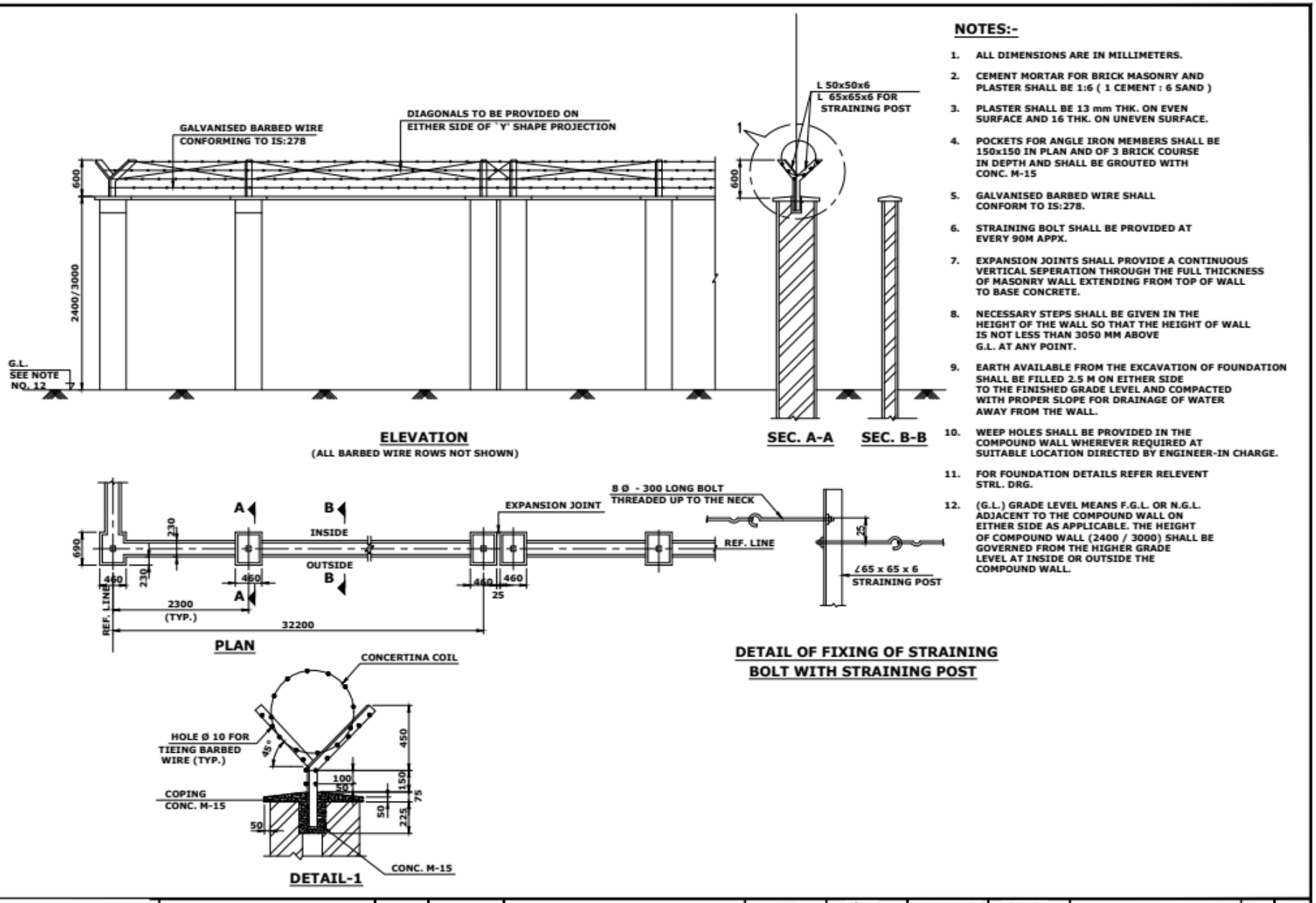
Date: 2026.02.13 19:41:32 IST



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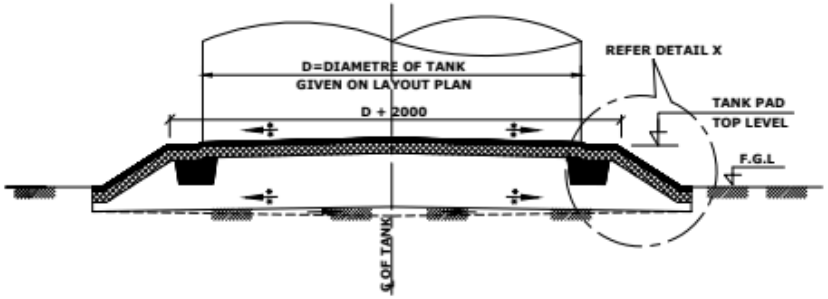
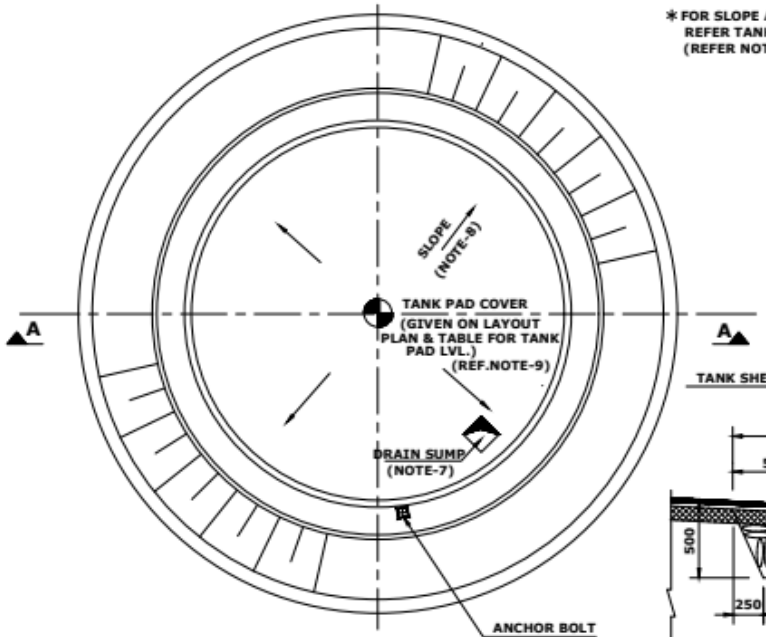
Date: 2026.02.13 19:41:32

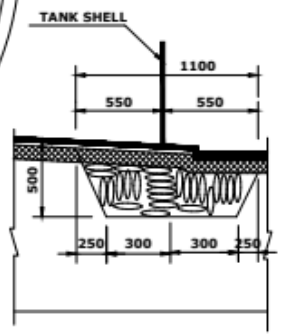


SECTION A-A

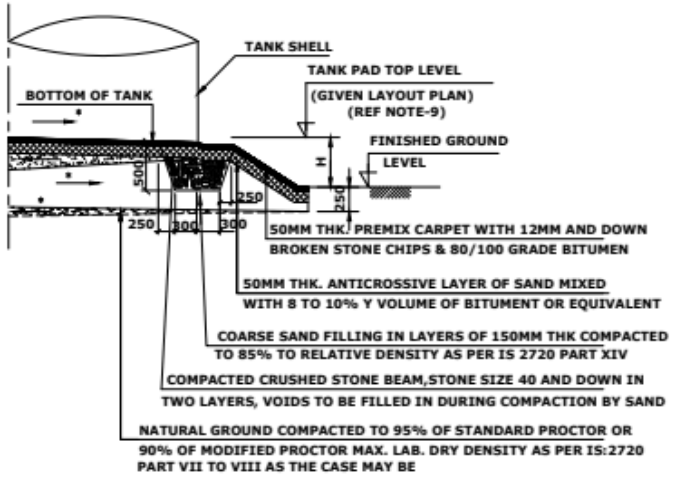


PLAN

✱ FOR SLOPE AND DIRECTION
REFER TANK DATA SHEET
(REFER NOTE NO.8)



PART ENLARGED DETAIL -X



NOTES:-

1. ALL DIMENSIONS ARE IN MM & ALL LEVELS ARE IN METRES UNLESS OTHERWISE SPECIFIED
2. THIS FOUNDATION IS VALID FOR TANK HEIGHT UPTO 10.0M
3. SOIL STRATUM AT EXCAVATION LEVELS FOR TANKS PADS SHALL BE THROUGHLY EXAMINED BEFORE STARTING THE FILLING FOR TANK PADS. INCASE LOOSE SOILS ARE MET WITH OR DRY DENSITY OF SOIL POOR, IT SHALL BE COMPACTED TO 95% OF STANDARD PROCTOR OR 90% OF MODIFIED PROCTOR DENSITY AS PER IS:2720 PART VII OR VIII AS THE CASE MAY BE & TESTED TO THE SATISFACTION OF ENGINEER IN CHARGE
4. SAND USED FOR FILLING SHALL BE APPROVED BY ENGINEER IN CHARGE. USE OF DUST LIKE SAND IS PROHIBITED. SAND FILLING SHALL BE IN 150 THK. LAYERS. EACH SHALL BE THOROUGHLY COMPACTED TO 85% RELATIVE DENSITY AS PER IS:2720 PART XIV
5. ANTICORROSIVE LAYER OVER SAND FILLING CONSISTS OF SIFTED DRY SAND HAVING 1.5 EFFECTIVE SIZE MIXED WITH BINDING MATERIAL 8 TO 10% BY VOLUME OF BITUMEN OR EQUIVALENT
6. PREMIX CARPET SHALL BE LAID AFTER INSULLATION OF TANK AND AS PER INSTRUCTIONS OF THE ENGINEER IN CHARGE
7. FOR SIZE AND LOCATION OF ANCHOR BOLTS AND DRAIN SUMP REFER RELEVANT TANK DATA SHEET
8. INWARD/OUTWARD SLOPE OF TANK PAD TOP SHALL BE VARIFIED WITH RELEVANT TANK DATA SHEET.
9. THE TANK PAD LEVEL SHALL BE GIVEN AS "TO BE CONSTRUCTED" AND ALSO AS " FINAL TANK PAD LEVEL AFTER SETTLEMENT DURING HYDROTEST. THE DIFFERENCE BETWEEN TWO LEVELS BEING THE EXPECTED SETTLEMENT

**TANK PAD DETAILS WITH
STONE RING WALL
(FOR TANK HEIGHT UPTO 10.0M)**

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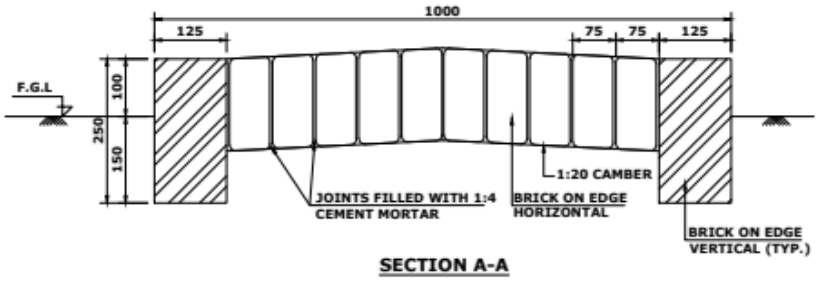
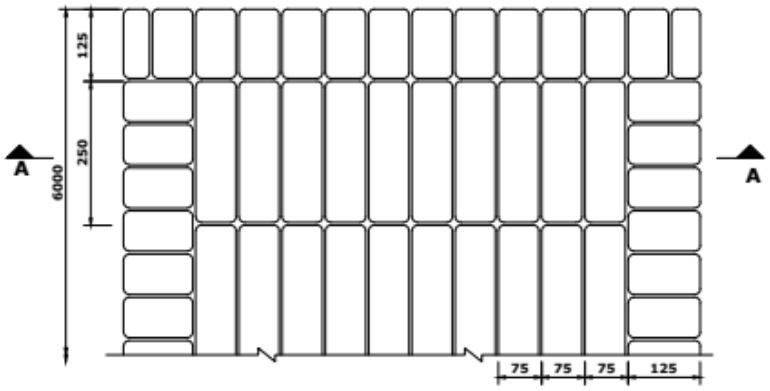
Date: 2026.02.13 19:41:32 IST

	STANDARD DRAWING FOR BRICK FOOTPATH	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 1		



SECTION A-A



PLAN

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. AFTER EVERY 6000 LENGTH OF FOOTPATH A BREAK OF 100 mm WIDTH SHALL BE LEFT UNPAVED TO ALLOW THE SURFACE DRAINAGE.

LEGEND:-

F.G.L = FINISH GRADE LEVEL

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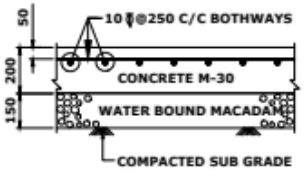
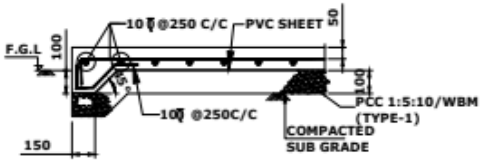
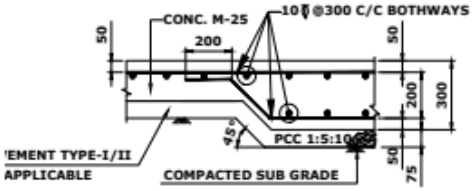
Date: 2026.02.13 19:41:32



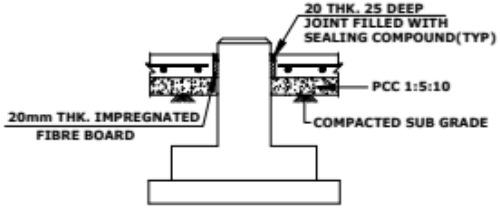
TYPE - I
(FOR VEHICULAR MOVEMENT AREA)



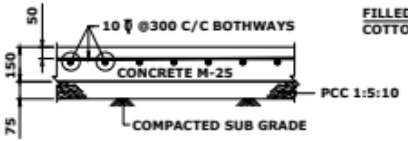
TYPICAL EDGE DETAIL
(WITHOUT KERB WALL)



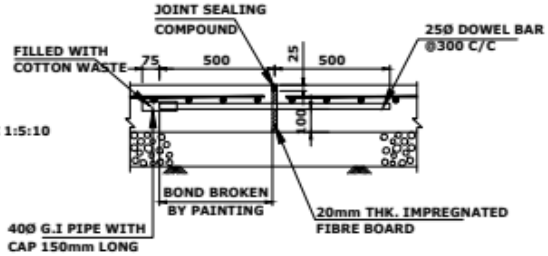
X-SECTION OF THICKENED PAVEMENT
(SEE NOTE 14)



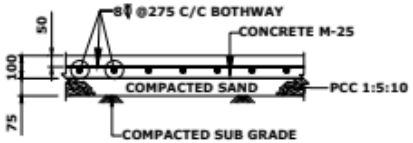
TYPICAL DETAIL OF JOINT SEALING
AROUND FOUNDATION



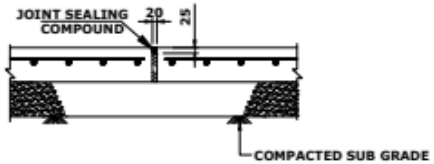
TYPE - II
(FOR UNIT PAVEMENT)



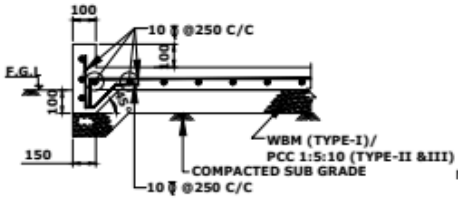
DETAIL OF EXPANSION JOINT
(FOR TYPE -I PAVEMENT)



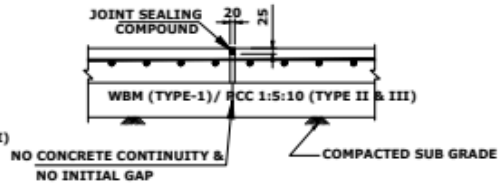
TYPE - III
(FOR OFFSITE PUMP STATION)



DETAIL OF EXPANSION JOINT
(FOR TYPE -II & III PAVEMENT)



TYPICAL EDGE DETAIL
(WITH KERB WALL)



DETAIL OF CONSTRUCTION JOINT
(SEE NOTE 13)

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.

GEOTECHNICAL RECOMMENDATION SHALL BE FOLLOWED FOR SUBGRADE TREATMENT FOR PAVEMENTS IN BLACK COTTON SOIL AREAS/JOB SPECIFIC REQUIREMENT

RCC PAVEMENT DETAILS

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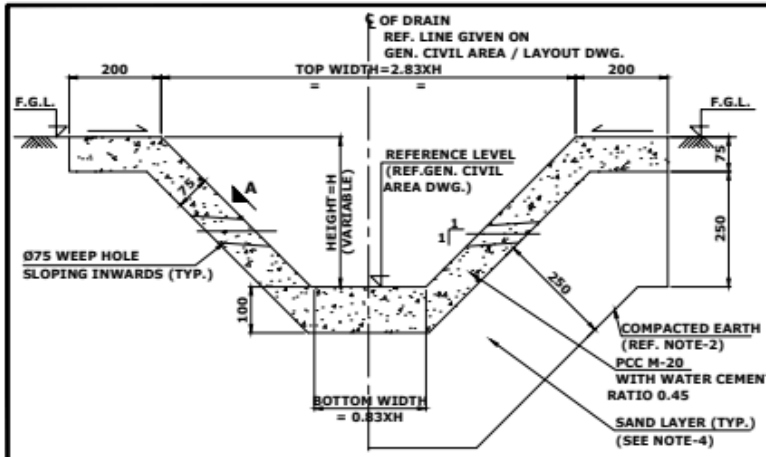
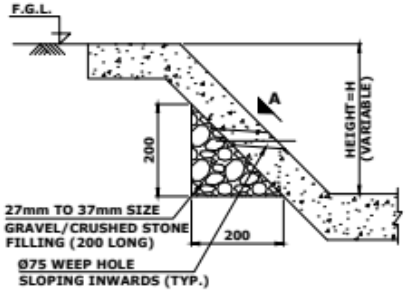


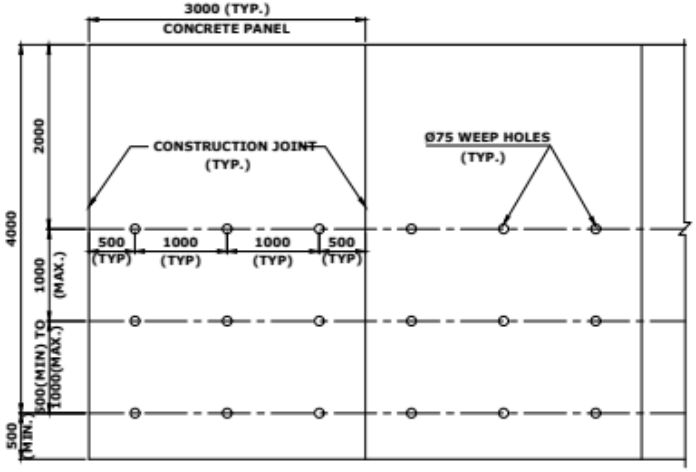
TRAPEZOIDAL DRAIN



DETAIL OF WEEP HOLE

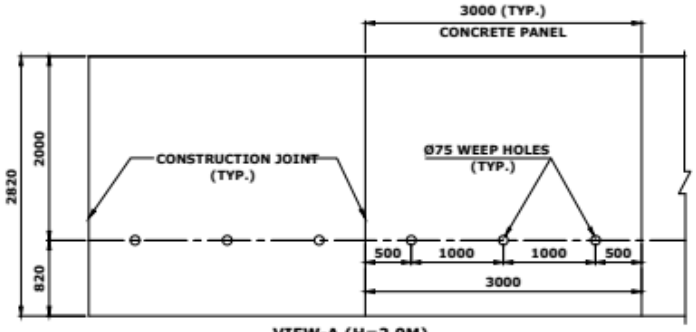
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. CONCRETE. LINING SHALL BE DONE AFTER THE SIDES OF DRAIN ARE CUT, COMPACTED TO 90% OF MAX. LABORATORY DRY DENSITY AND DRESSED TO THE REQUIRED SLOPE.
3. CONCRETING ON THE SIDE SLOPES SHALL BE DONE IN PANELS OF 3.0 METER LENGTH.
4. WHEREVER CONCRETE TRAPEZOIDAL DRAIN IS LAID IN EXPANSIVE/ BLACK COTTON SOIL, A LAYER OF 250 mm THICK SAND SHALL BE PROVIDED BELOW AND AROUND THE SIDE OF DRAIN.
5. NO WEEP HOLES SHALL BE PROVIDED UPTO 1.5M HEIGHT (H) i.e. 2.0 (APPROX.) INCLINED PART OF THE DRAIN FROM FGL TO ELIMINATE POLLUTION IN THE DRAIN DUE TO CONTAMINATED SUB-SURFACE FLOW.
6. THE VIEW OF INCLINED PART OF DRAIN ARE SHOWN HERE AS A GUIDELINE FOR THE LOCATION OF WEEP HOLES AND FOR THE PANELS OF CONCRETING. HOWEVER, FOR DEPTHS OTHER THAN SHOWN HERE, THE GUIDELINE SHALL REMAIN SAME.



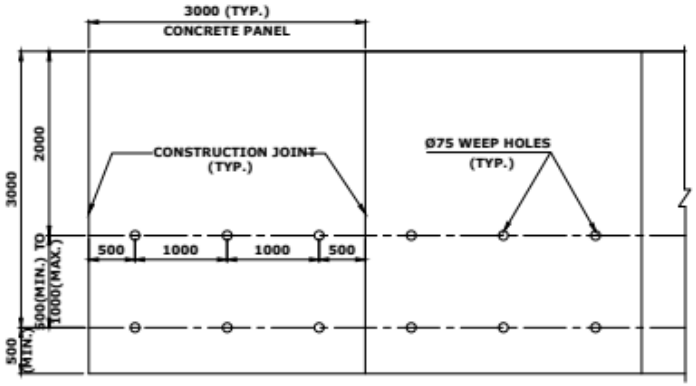
VIEW-A (H=>2.5M TO 3.0M)

(INCLINED PART OF THE DRAIN)



VIEW-A (H=2.0M)

(INCLINED PART OF THE DRAIN)



VIEW-A (H=>2.0M TO 2.50M)

(INCLINED PART OF THE DRAIN)

CONCRETE TRAPEZOIDAL STORM WATER DRAIN (HEIGHT (H)<3.0M)

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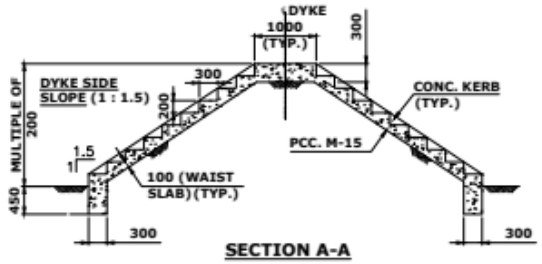
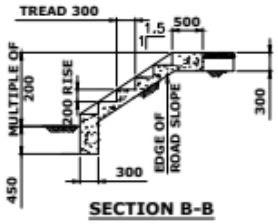
Date: 2026.02.13 19:41:32 IST

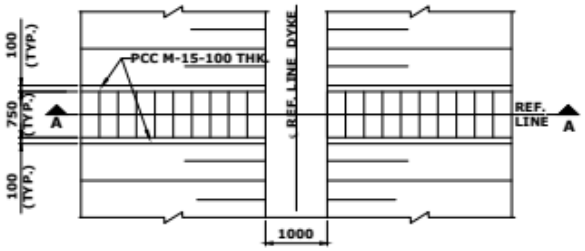
	STEPS ON EARTHEN DYKES AND ROAD EMBANKMENTS	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 1		



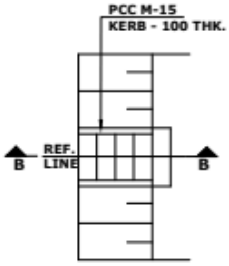
SECTION A-A



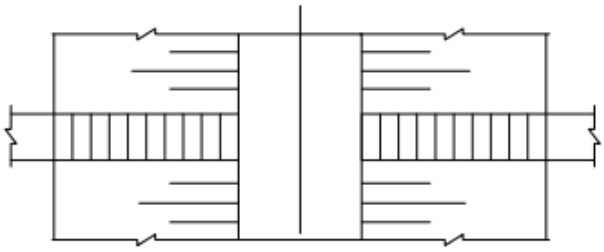
SECTION B-B



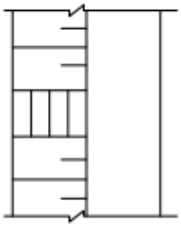
PLAN
(FOR EARTHEN DYKES)



PLAN
(FOR ROAD EMBANKMENT)



REPRESENTATION ON AREA DRG.
(FOR EARTHEN DYKES)



REPRESENTATION ON AREA DRG. (FOR ROADS)

NOTES :-

1. ALL HANDRAIL AND UPRIGHT SHALL BE AS PER RESPECTIVE TYPE.

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Date: 2026.02.13 19:41:32

AREA PLAN FOR TOPO SURVEY

TOPO SURVEY AREA

20000

20000

PLOT AREA

20000

20000

AREA PLAN FOR TOPO SURVEY

NOTES:-

1. ALL DIMENSION ARE IN MM AND CO-ORDINATES AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

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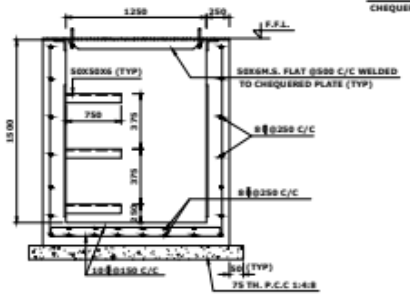
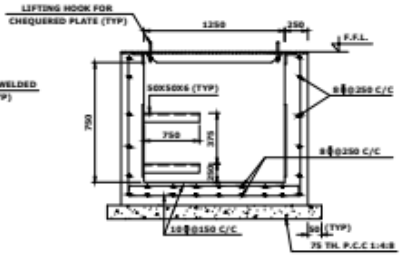
Date: 2026.02.13 19:41:32

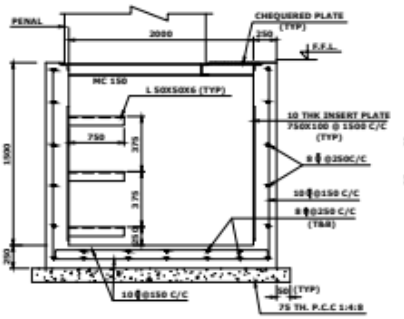
	STANDARD TYP.DETAILS OF CABLE TRENCH	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 1		



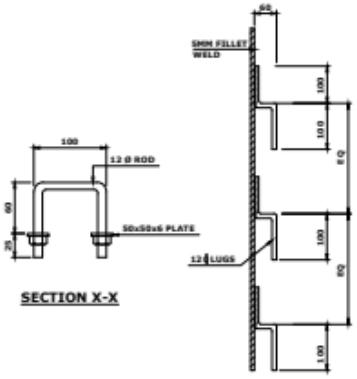
R/F DETAIL OF CABLE TRENCH SECTION



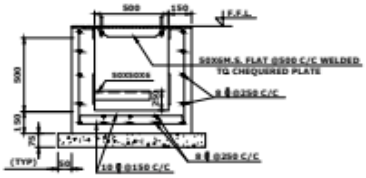
R/F DETAIL OF CABLE TRENCH SECTION



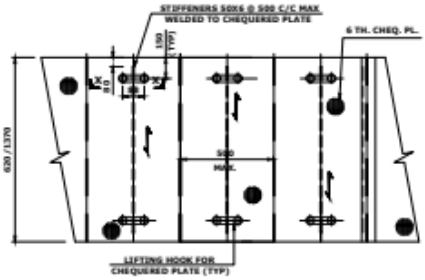
SUPPORTING PANELS



TYP. DETAIL OF INSERT PLATE



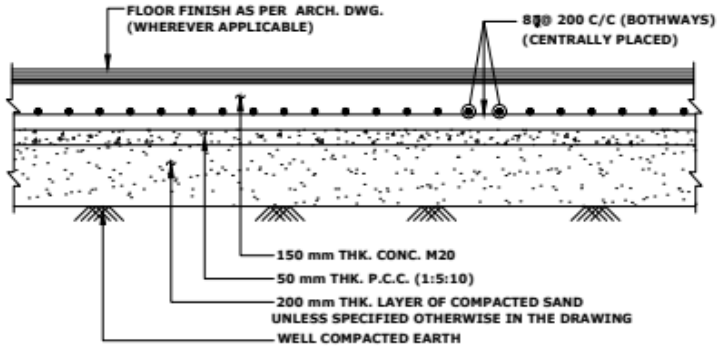
R/F DETAIL OF CABLE TRENCH SECTION



DETAIL OF CHEQUERED PLATE

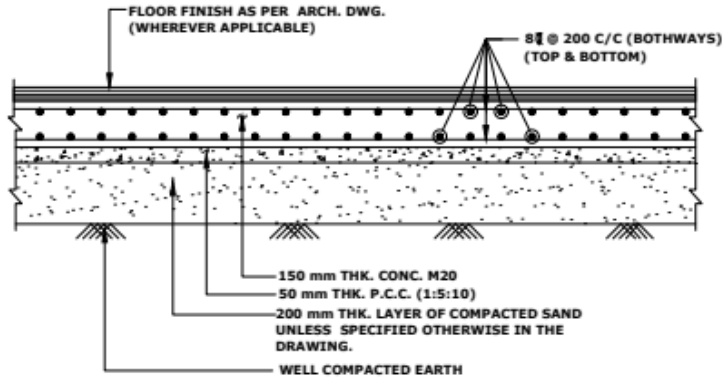
Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

	R.C.C FLOORING DETAILS	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 2		



TYPE-I

(FOR PLANT BUILDINGS, SUB-STATION, CONTROL ROOM, PUMP HOUSE, UTILITY COMPRESSOR HOUSE, PARKING AREA, STORE & PORCH)



TYPE-II

(FOR WAREHOUSE, WORKSHOP, CEMENT GODOWN, FIRE STATION & PROCESS COMPRESSOR HOUSE)

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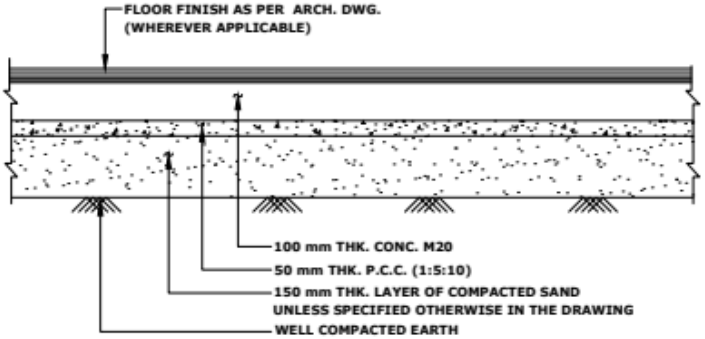
	R.C.C FLOORING DETAILS	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	2 OF 2		



TYPE-III

(FOR NON-PLANT BUILDINGS, ADMINISTRATION, LABORATORY, CANTEEN, TIME OFFICE, SITE OFFICE ETC.,)

NOTES:-

1. ALL DIMENSIONS ARE IN mm
2. STRUCTURAL CONCRETE SLAB SHALL BE CAST IN ALTERNATE PANELS AND NO DIMENSION OF THE PANEL SHALL EXCEED 4.5 m

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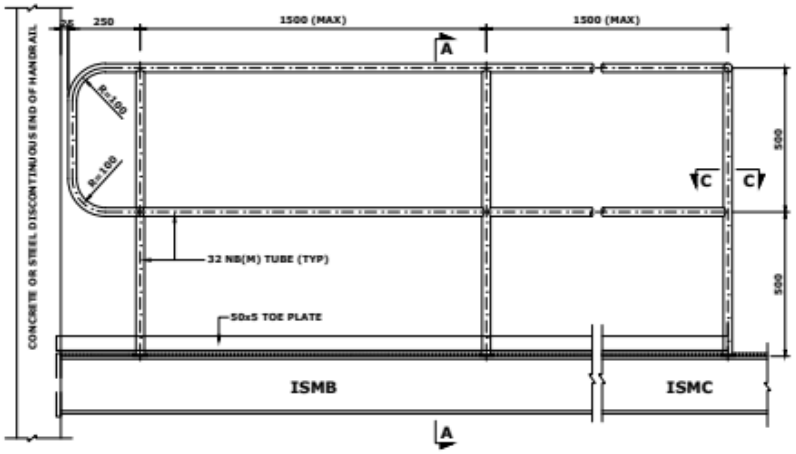
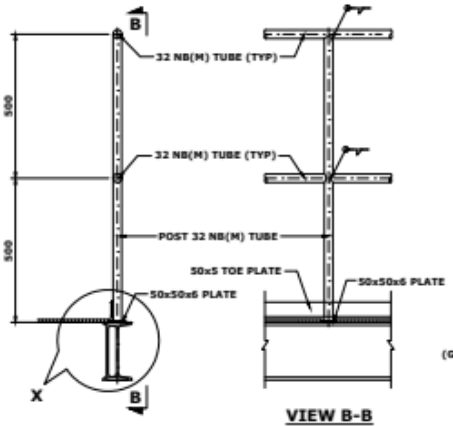
	STANDARD FOR HANDRAIL ON STEEL PLATFORM	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 1		



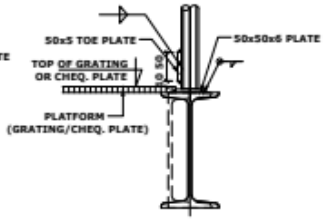
HORIZONTAL HANDRAIL ON STEEL PLATFORM



SECTION A-A

VIEW B-B

VIEW C-C
(AT CORNER)



DETAIL X

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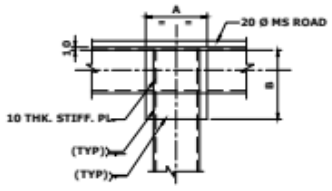
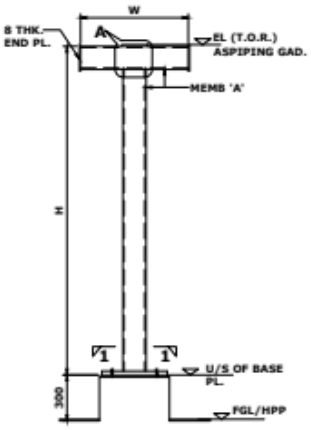
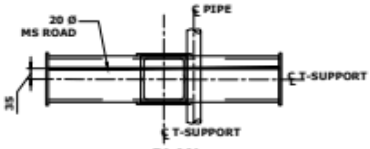
	STANDARD FOR SLIDING T- SUPPORT	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 2		



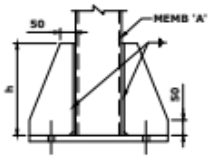
DETAIL -A



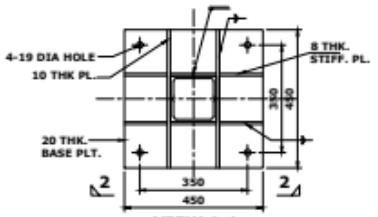
ELEVATION



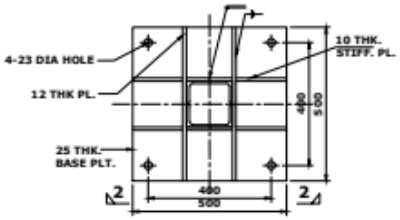
PLAN



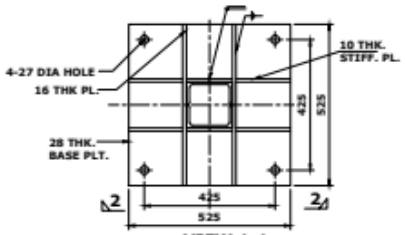
VIEW 2-2



VIEW 1-1
(BASE PLATE TYPE I)



VIEW 1-1
(BASE PLATE TYPE II)



VIEW 1-1
(BASE PLATE TYPE III)

S. NO.	T-SUPPT. MKD.	WIDTH 'W'	HEIGHT 'H'	MEMB 'A'	BASE PLATE TYPE	h	CONN. PLATE A	CONN. PLATE B	APPX. TY IN KG
1	TS1	UP TO 750	UP TO 2000	ISMC 150 ☐	I	200	200	225	150
2	TS2	UP TO 750	2000≤H<3000	ISMC 200 ☐	II	275	250	300	260
3	TS3	UP TO 750	3000≤H<4000	ISMC 250 ☐	III	325	300	350	410
4	TS4	750<W<1500	UP TO 1500	ISMC 150 ☐	I	200	200	225	160
5	TS5	750<W<1500	1500≤H<2300	ISMC 200 ☐	II	275	250	300	260
6	TS6	750<W<1500	2300≤H<3000	ISMC 250 ☐	III	325	300	350	400

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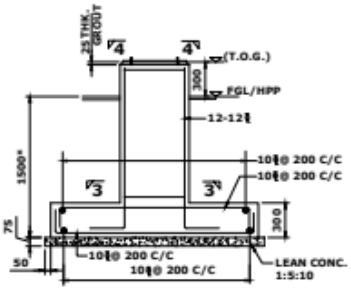
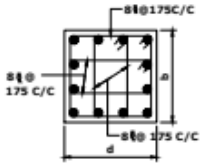
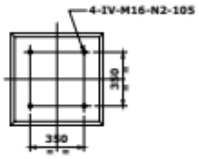
	STANDARD FOR SLIDING T- SUPPORT	STANDARD DRAWING NO.	REV.	SIZE
		SHEET NO. 2 OF 2	03	A4



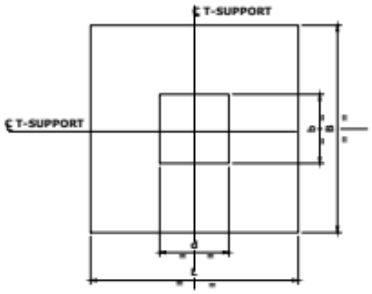
ELEVATION



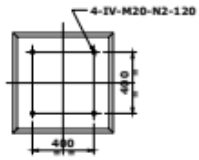
SECTION 3-3



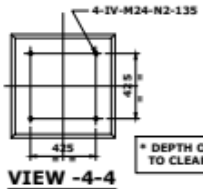
VIEW -4-4
(FOR SUPPORT TS1 & TS4)



FDN. PLAN



VIEW -4-4
(FOR SUPPORT TS2 & TS5)



VIEW -4-4
(FOR SUPPORT TS3 & TS6)

* DEPTH OF FDN. CAN BE INCREASED TO CLEAR U/G PIPING IF ANY.

NOTES :-

1. FOLLOWING LOADS HAVE BEEN CONSIDERED IN DESIGEN:
   a) VERTICAL LOAD =1.0 MT FOR 750 WIDTH
   =2.0 MT FOR 1500 WIDTH
   b) WIND INTENSITY =150 Kg/sqm
   c) WIND ON 18" PIPE HAS BEEN CONSIDERED
   d) PIPE FRICTION COEFFICENT IN BOTH DIRECTION = 0.30

S. NO.	T-SUPPT. MKD.	PED SIZE		5.0<S.B.C<10.0 T/sqm			10.0<S.B.C<15.0 T/sqm			S.B.C>15.0 T/sqm		
				FDN SIZE		QTY IN m^3	FDN. SIZE		QTY IN m^3	FDN. SIZE		QTY IN m^3
		d	b	L	B		L	B		L	B	
1	TS1	600	600	1800	1800	1.51	1600	1600	1.31	1500	1500	1.22
2	TS2	650	650	2000	2000	1.83	1750	1750	1.55	1600	1600	1.40
3	TS3	675	675	2250	2250	2.20	1800	1800	1.66	1800	1800	1.66
4	TS4	600	600	2000	2000	1.74	1750	1750	1.46	1600	1600	1.31
5	TS5	650	650	2250	2250	2.15	1800	1800	1.60	1700	1700	1.50
6	TS6	675	675	2250	2250	2.20	1900	1900	1.77	1900	1900	1.77

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	SMALL OPERATING PLATFORMS ON GRADE/RCC ELEVATION STRUCTURE	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 3		

NOTES:-

1. THIS STANDARD COVERS DETAILS OF OPERATING PLATFORM ON GRADE, OR ON ELEVATED R.C.C. STRUCTURE FOR A MAXIMUM HEIGHT OF 2300mm ABOVE FGL AND/OR 2150mm ABOVE FFL.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. STRUCTURAL STEEL SHALL CONFORM TO IS:2062 GRADE-A.
4. GRADE OF CONCRETE SHALL BE AS MENTIONED IN GENERAL NOTES FOR CONCRETE WORKS FOR THE PROJECT.
5. R/F BARS SHALL BE COLD WORKED STEEL HIGH STRENGTH DEFORMED BARS OF GRADE Fe415 CONFORMING TO IS:1786.
6. CONCRETE & STEEL WORKS SHALL BE AS PER GENERAL NOTES OF THE PROJECT.
7. THE LOCATION AND ORIENTATION OF PLATFORMS SHALL BE AS PER PIPING GAD.
8. IF NOT GALVANIZED GRATING SHALL BE WELDED ALONG THE LINE OF SUPPORT. GALVANIZED GRATING SHALL BE CLAMPED.
9. UP TO H> 2000 HANDRAIL SHALL BE TYPE-IV HANDRAIL FOR OTHER PLATFORMS SHALL BE TYPE-VII. TOP RAIL OF HANDRAIL SHALL BE 32 NB (M) PIPE.
10. ALL GUSSET PLATES SHALL BE 8mm THICK, UNLESS NOTED OTHERWISE.
11. ALL CONNECTIONS SHALL BE WELDED USING 6mm THICK FILLET WELDS. CONNECTIONS AT CORNER LOCATIONS SHALL BE WITH SUITABLE CLEAT ANGLE.
12. FOUNDATIONS SHOWN IN THIS STANDARD ARE VALID UP TO S.B.C. OF 5.00 T/M^2 AT FOUNDATION LEVEL.
13. CONSTRUCTION JOINTS IN PAVEMENT SHALL BE SUITABLY LOCATED AT SITE IN CASE THICKNESS PAVEMENT IS ADOPTED FOR PLATFORM FOUNDATIONS.
14. GROUT SHALL BE 1:2 CEMENT SAND MORTAR TYPE.

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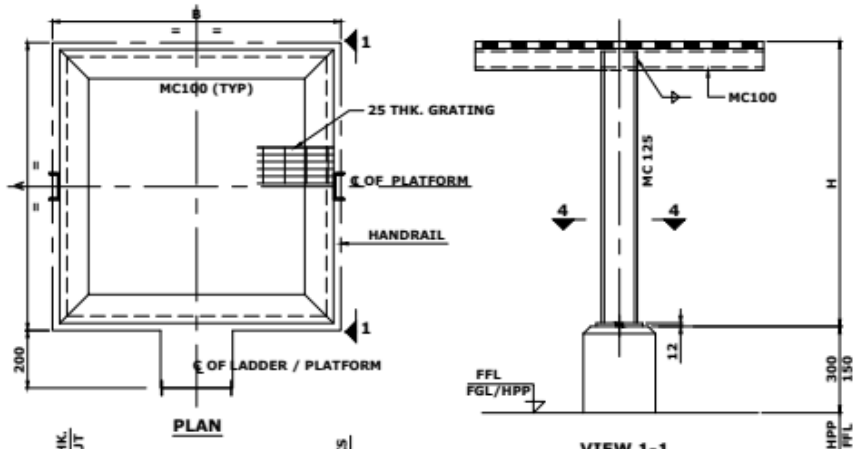
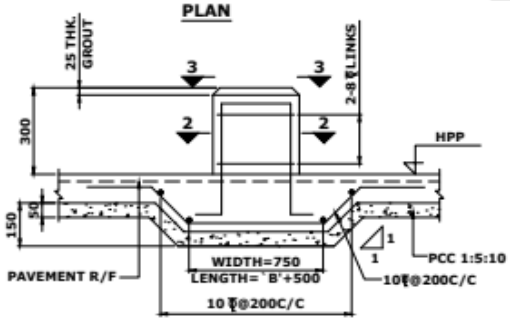
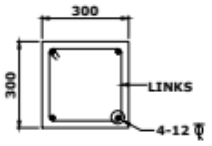
SMALL OPERATING PLATFORMS ON GRADE/RCC ELEVATION STRUCTURE	STANDARD DRAWING NO.	REV.	SIZE
		03	A4
	SHEET NO. 2 OF 3		

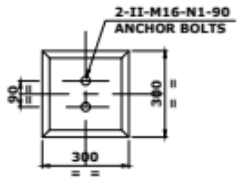




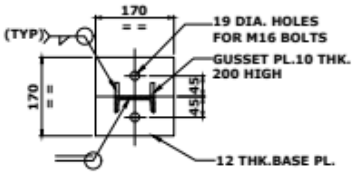
DETAIL OF FOUNDATION
(W.R.T. VIEW 1-1)



SECTION 2-2



VIEW 3-3



VIEW 4-4

750 ≤A ≤1000
750 ≤B ≤1000
750 ≤H ≤1000

TYP.DETAILS OF PLATFORMS

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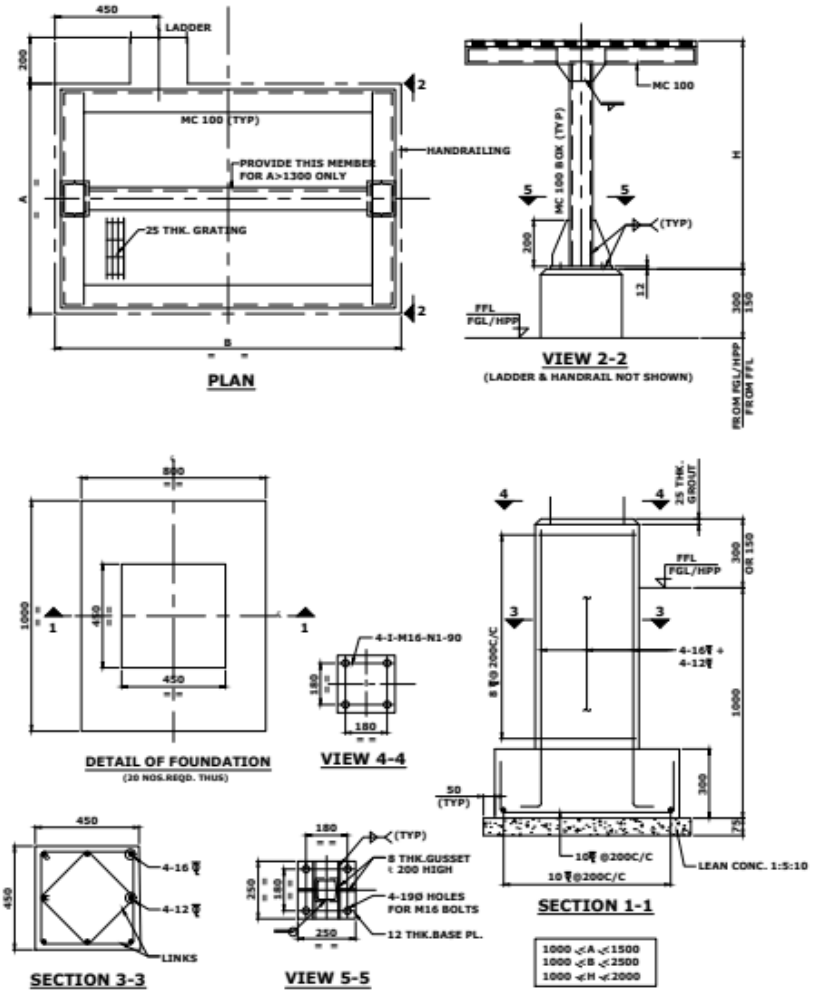
	SMALL OPERATING PLATFORMS ON GRADE/RCC ELEVATION STRUCTURE	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 3 OF 3		



TYP.DETAILS OF PLATFORMS FOR

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	STANDARD GRATING DETAILS	STANDARD DRAWING NO.		REV.	SIZE
		[illegible]		03	A4
		SHEET NO.	1 OF 3		

NOTES:-

1. THIS STANDARD No VPC-STD-CS-6036 GIVES DESIGN AND DETAILS OF GRATING.
2. THE TYPE OF GRATING TO BE USED SHALL BE CALLED OUT ON THE DESIGN DRAWING.
3. THE TYPE OF GRATING TO BE USED SHALL BE CALLED OUT ON THE DESIGN DRAWING.
4. MATERIAL FOR THE GRATING (M.S. ROUNDS / M.S. FLATS) SHALL CONFORM TO IS:2026 GR-A. COMMERCIAL QUALITY MATERIAL WILL BE ALLOWED ONLY AFTER ASCERTAINING ITS WELDABILITY / STRENGTH.
5. THE NET WORKING LOADS ARE BASED ON A LIMITING VERTICAL DEFLECTION OF SPAN/200 OR 6mm WHICHEVER IS LESS.
6. THE PANEL WIDTH OF 1056 SHOWN ON THE SUBSEQUENT SHEETS IS INDICATIVE. IT MAY BE INCREASED OR DECREASED AS REQUIRED TO SUIT THE GEOMETRY OF THE PLATFORM AND CONVENIENCE OF HANDLING.
7. MAIN / SECONDARY MEMBERS OF THE GRATING SHALL BE PLACED AS PER THE SPACINGS. HOWEVER IF THE SIZE OF THE GRATING IS NOT IN MULTIPLES OF THE SPACING. ADJUSTMENT SHALL BE MADE AT THE ENDS ONLY.
8. THE GRATING WEIGHTS ARE COMPUTED FOR A PANEL SIZE OF 1056 X 1000.
9. REMOVABLE GRATING PANEL SHALL BE FIXED WTH THE SUPPORTING MEMBERS BY CLAMPS ONLY.
10. UNSUPPORTED EDGES OF ADJACENT GRATING PANELS SHALL BE CONNECTED BY TACK WELD OR U-CLAMPS MADE OUT OF 25X3 THK. M.S. FLATS WITH M-6 BOLTS AT BOTTOM. MINIMUM TWO TACK WELDS OR TWO CLAMPS PER PANEL SHALL BE PROVIDED.
11. GRATINGS SHALL NOT BE USED FOR SUPPORTING THE PIPES DIRECTLY. ADDITIONAL MEMBER MC100 SHALL BE PROVIDED UNDER THE GRATING FOR SUPPORTING THE PIPE HAVING A MAXIMUM LOAD OF 500kg. THIS MEMBER SHALL SPAN IN SAME DIRECTION AS GRATING.
12. FOR GRATING PANELS WITH CUTOUTS / OPENINGS; STRENGTHENING SHALL BE CARRIED OUT AS PER THE DETAILS GIVEN ON SHEET 3 OF 3.

NET SAFE WORKING LOADS FOR GRATING

L	500	600	700	800	900	1000	1100	1250	1400
d	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	
w	> 2000				1515	1105	830	540	345
p	1475	1225	1050	915	810	670	550	400	275

SYMBOLS :-

L = EFFECTIVE SPAN IN mm
b = BEARING WIDTH IN mm
d = VERTICAL DEFLECTION IN mm
w = UDL IN kg/m2
p = UNIFORMLY DISTRIBUTED LINEAR LOAD IN kg/m AT MID SPAN ALONG PANEL WIDTH.
⟷ = GRATING SPAN

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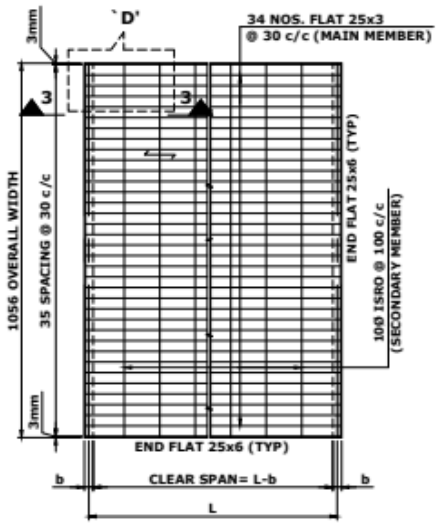
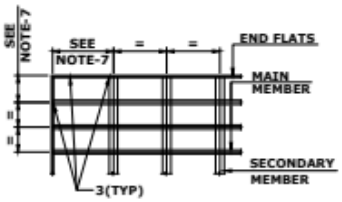
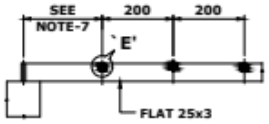
	STANDARD GRATING DETAILS	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	2 OF 3		



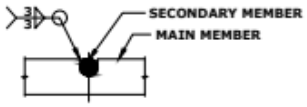
PLAN



DETAIL - `D'



SECTION 3-3



DETAIL - `E'

GRATING

WEIGHT OF GRATING IN kg/m2				PROPERTIES WIDTH - 1056			APPLICATION	NOTES
25X6	25X3	10Ø ISRO	TOTAL	Lxx cm4	Zxx cm3	MR kgm		
4.6	18.8	5.4	28.8	14.84	11.87	195.94	EQUIPMENT PLATFORM STAIRCASE PUMP HOUSE CROSS OVER	REFER SHT. 1 OF 3

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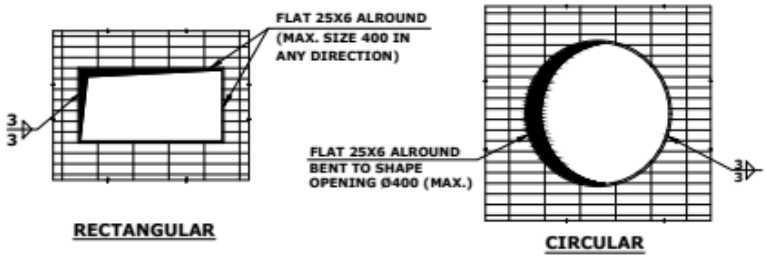
Date: 2026.02.13 19:41:32

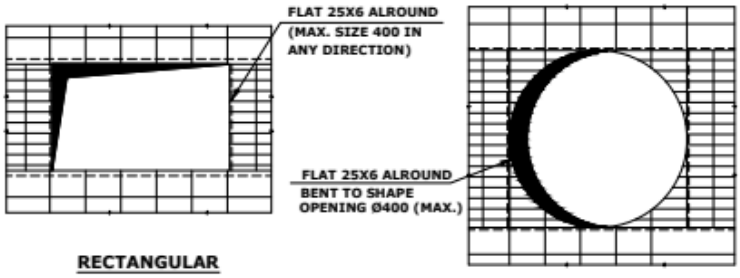
	STANDARD GRATING DETAILS	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	3 OF 3		



RECTANGULAR

CIRCULAR

(MAXIMUM SIZE OF OPENING 400 mm)

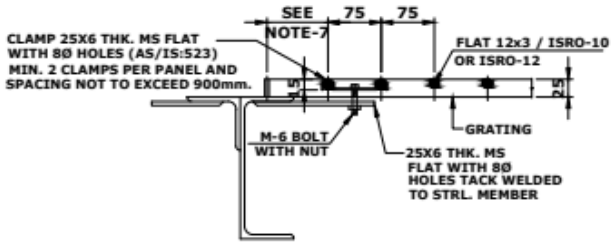


RECTANGULAR

CIRCULAR

(SIZE OF OPENING GREATER THAN 400 mm)

TYPICAL DETAIL OF GRATING STRENGTHENING AT OPENINGS



FIXING DETAIL FOR REMOVABLE GRATING PANELS WITH CLAMPS

(SEE NOTE - 9)

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	PIPE SLEEPER CROSSOVER	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 3		

NOTES :-

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. THE LOADING CONSIDER ARE :-
   a) LIVE LOAD = 2.0 KN/m^2 ON CROSSOVER
   b) SELF WEIGHT OF MEMBER INCLUDING GRATINGS
3. ALL STRUCTURE STEEL SHALL CONFORM TO IS: 2062 GRADE-A
4. GRADE OF CONCRETE SHELL BE AS MENTIONED IN GENERAL NOTES FOR CONCRETE WORKS, FOR THE PROJECT
5. R/F BARS SHELL BE COLD WORKED STEEL HIGH STRENGTH DEFORMED BARS OF GRADE Fe 415 (MIN.) CONFORMING TO IS: 1786
6. CONCRETE AND STEEL WORK SHALL BE AS PER GENERAL NOTES FOR THE PROJECT.
7. LOCATION AND ORIENTATION OF PLATFORMS SHALL BE AS PER PIPING GAD.
8. STAIRCASE DETAIL AS PER VPC-STD-CS-6047.
9. STAIRCASE ON EACH SIDE OF CROSSOVER SHALL HAVE INCLINATION OF 41° TO HORIZONTAL, WITH RISERS NOT EXCEEDING 200mm.
10. GRATING SHALL BE AS PER VPC-STD-CS-6036.
11. UPTO> 2000 HANDRAIL SHALL BE AS PER VPC-STD-CS-6033.
12. GUSSET PLATES SHALL BE 8mm. THICK UNLESS NOTED OTHERWISE.
13. ANCHOR BOLTS SHALL BE AS PER VPC-STD-CS-6054.
14. PIPE SLEEPERS HAVE BEEN ASSUMED TO BE 500mm. (MAXIMUM) ABOVE GRADE AND WITH A MAXIMUM LENGTH OF 5000mm SYMMETRICALLY LOCATED WITH RESPECT TO CENTRE LINE THUS REQUIRING SINGLE SPAN CROSSOVERS.

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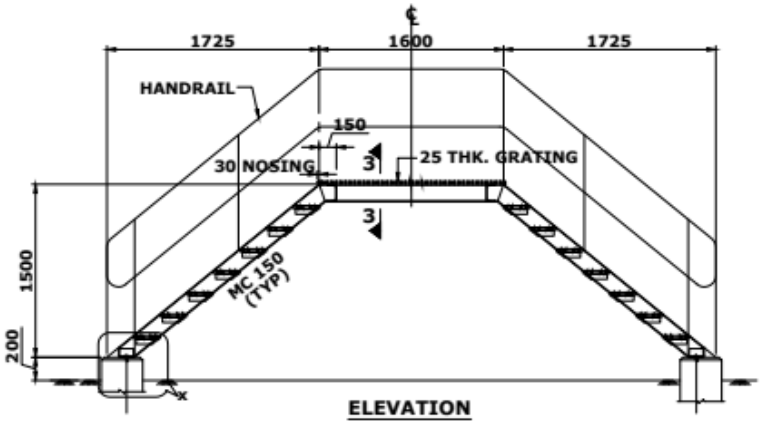
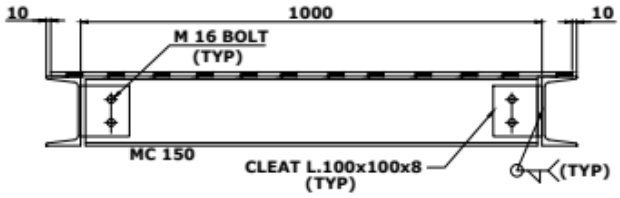
Date: 2026.02.13 19:41:32

	PIPE SLEEPER CROSSOVER	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 2 OF 3		

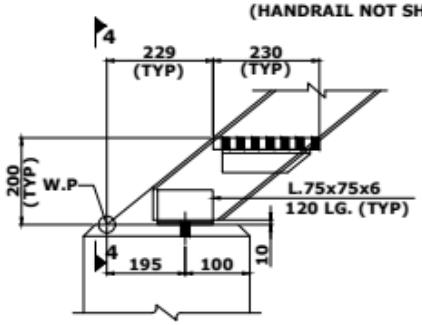


ELEVATION

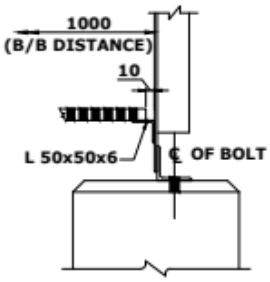


SEC. 3-3

(HANDRAIL NOT SHOWN)



DETAIL X FOR
MC 150 STRINGER



VIEW 4-4

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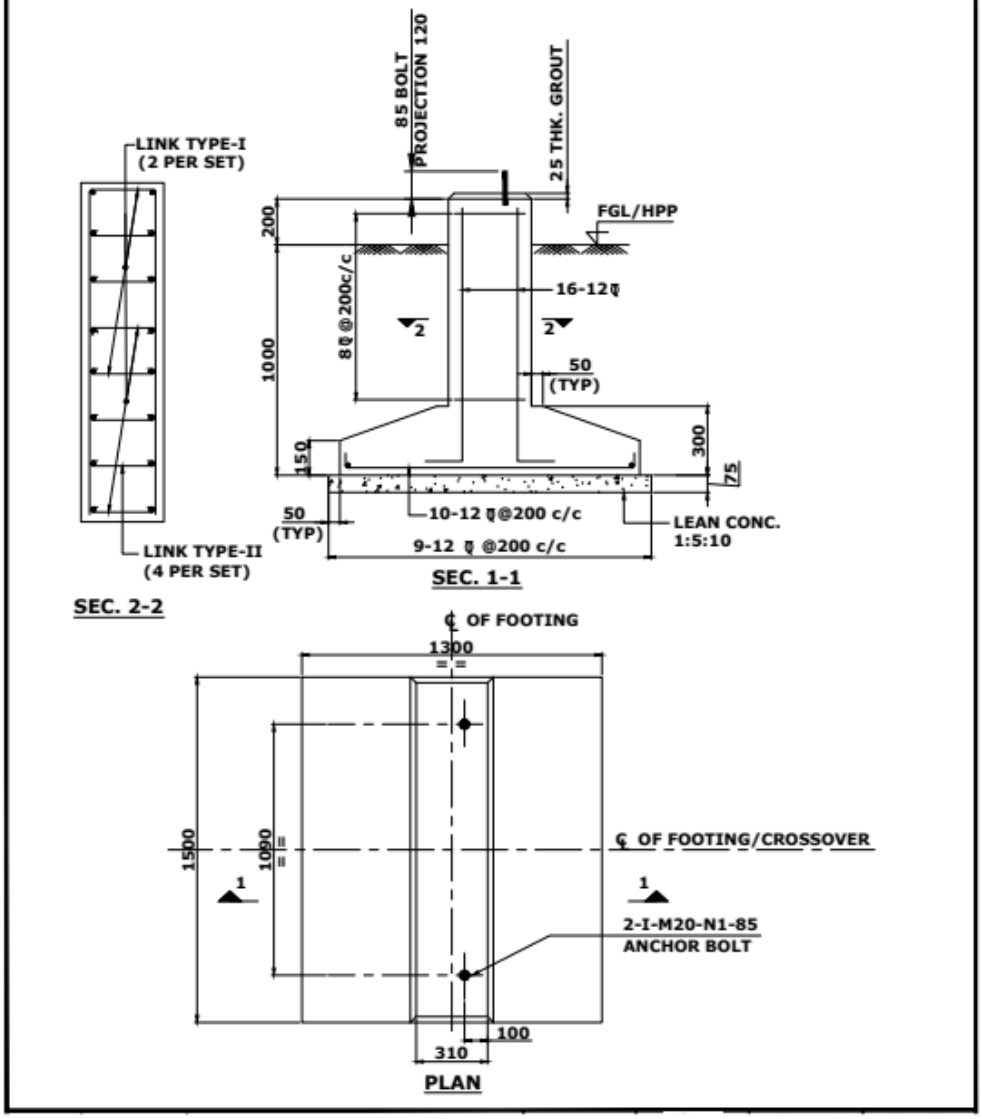
Date: 2026.02.13 19:41:32

	PIPE SLEEPER CROSSOVER	STANDARD DRAWING NO.	REV.	SIZE
		\	03	A4
		SHEET NO. 3 OF 3		



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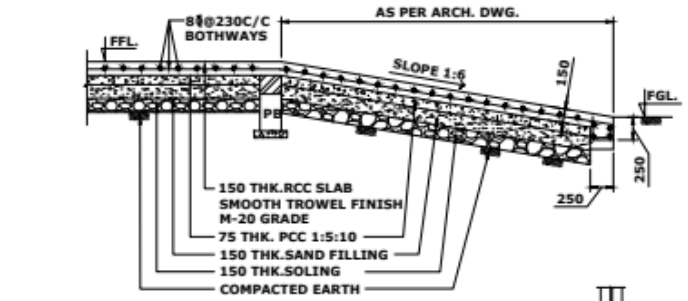
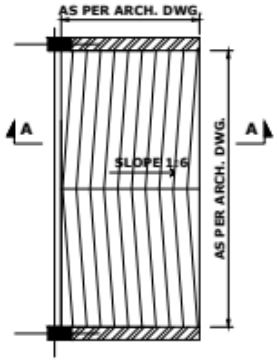
Date: 2026.02.13 19:41:32

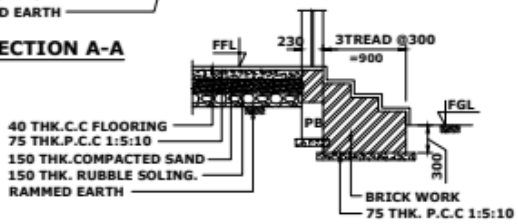
	STANDARD FOR MISCELLANEOUS DETAILS	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 1		



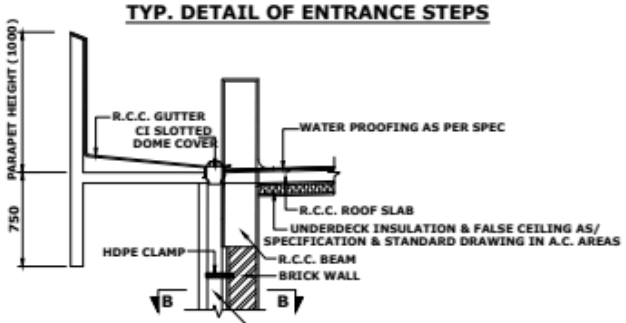


PLAN OF RAMP

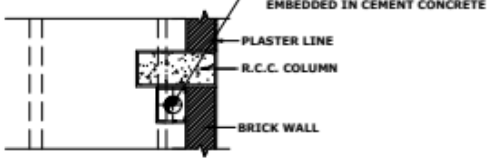
SECTION A-A



TYP. DETAIL OF ENTRANCE STEPS



DETAIL A



SECTION B-B

TYP.DETAIL OF RAIN DOWNTAKE

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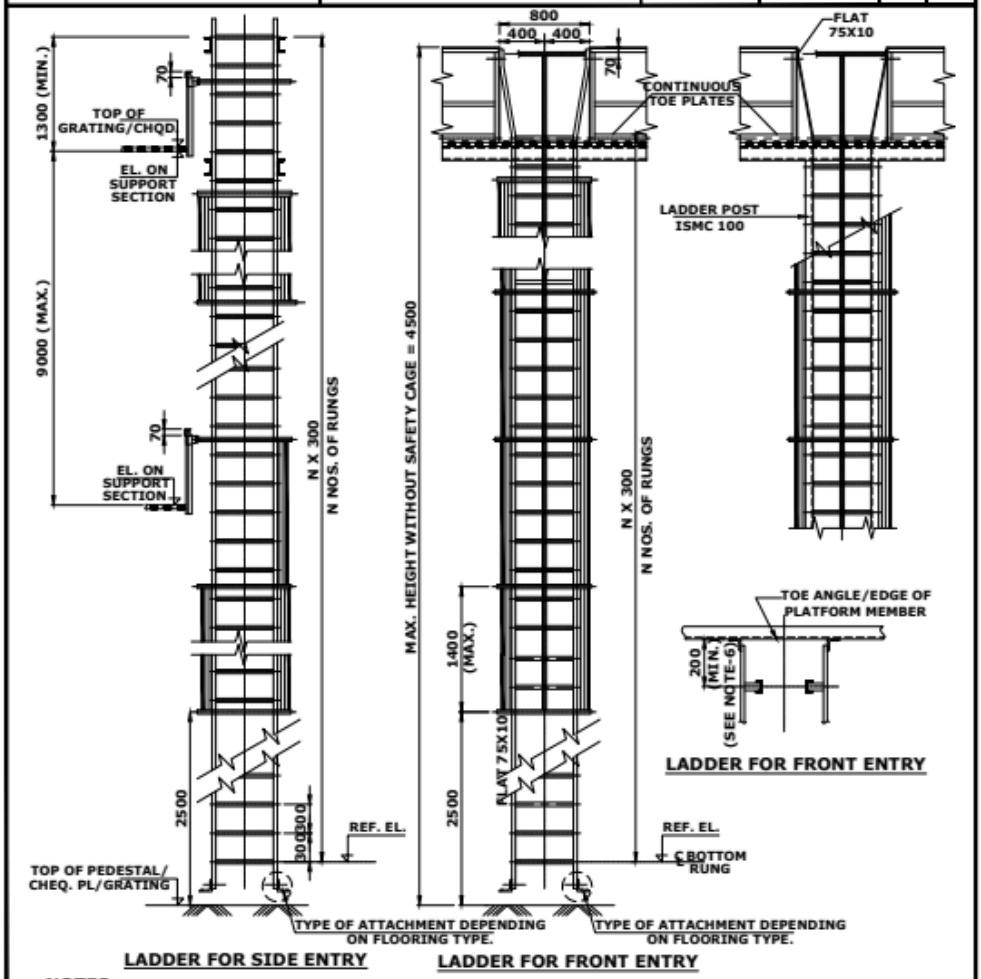
Date: 2026.02.13 19:41:32

	DETAILS OF STEEL LADDER	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 3		



NOTES :-

1. LADDER POSTS SHALL BE OF FLAT (75X10) UPTO 3.50m. (MAX.) BETWEEN SUPPORTS AND ISMC 100 UPTO 7.0m. (MAX.) BETWEEN SUPPORTS.
2. RUNGS SHALL BE 20 Ø.
3. SUPPORT TYPE `X1' CORRESPONDS TO FIXED SUPPORT AND `X2' CORRESPONDS TO SLIDING SUPPORT.
4. SUPPORT ELEVATION X1,X2 CORRESPONDS TO C OF BOLT HOLES.
5. SUPPORT `X1' IS CAPABLE TO SUSTAIN A LOAD FOR 9000mm LONG LADDER ONLY.
6. LADDER SHALL BE GIVEN A SUITABLE SLOPE, IF NECESSARY, TO AVOID FOULING WITH ANCHOR CHAIRS.

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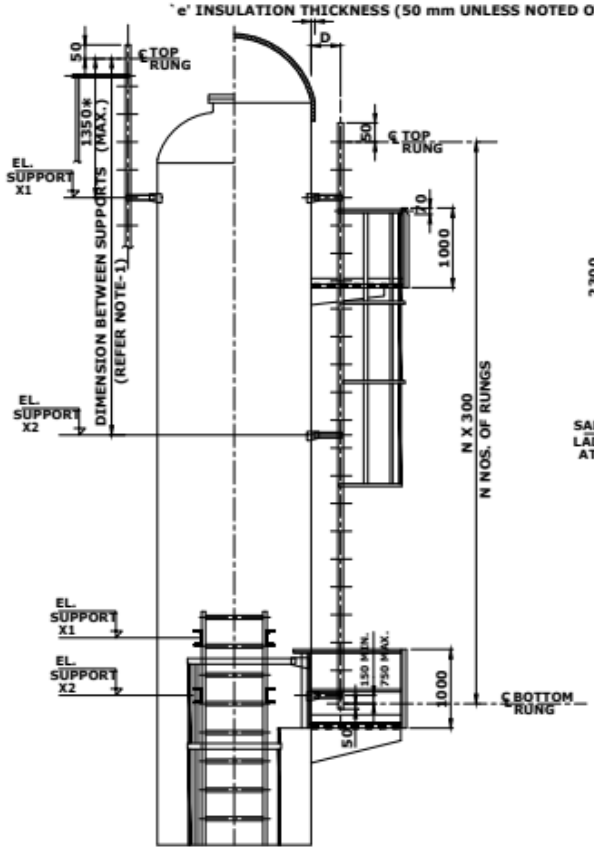
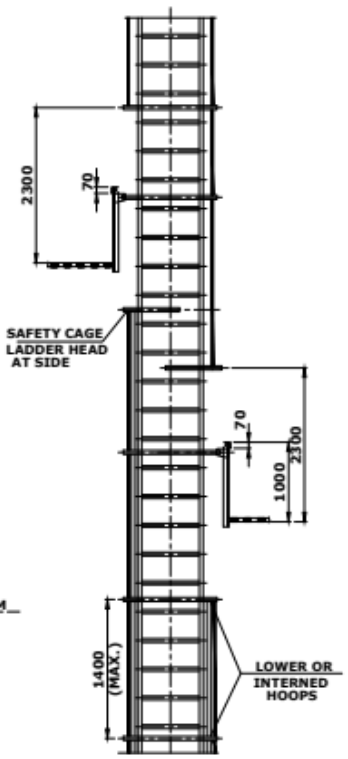
	DETAILS OF STEEL LADDER	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 2 OF 3		

`e' INSULATION THICKNESS (50 mm UNLESS NOTED OTHERWISE)



LADDER FOR SIDE ENTRY



LADDER FOR SIDE ENTRY

VESSEL DIA (mm)	DISTANCE `D' (mm)
UPTO 800	200 + e
> 800 < 3200	260 + e
> 3200 < 8000	275 + e

*MC100 SHALL BE ADOPTED FOR DISTANCE MORE THAN 1350 UPTO 2000

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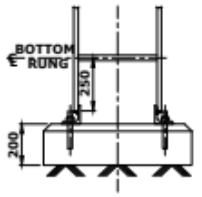
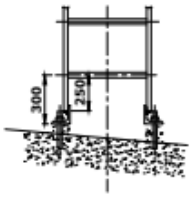
	DETAILS OF STEEL LADDER	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	3 OF 3		

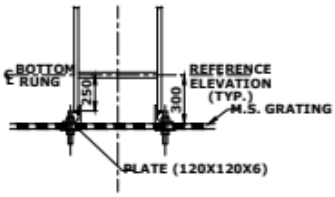
TYPE OF ATTACHMENT	NATURE OF SUPPORT SECTION	REMARKS
A1, A2	SITE WITHOUT PAVING	
B1, B2	CONCRETE FLOOR	A1, B1, C1, D1 : FIXED TYPE
C1, C2, D1, D2	CHEQUERED PLATE / GRATING FLOORING	A2, B2, C2, D2 : SLIDING TYPE



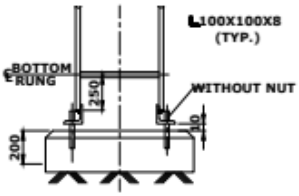
TYPE - A1



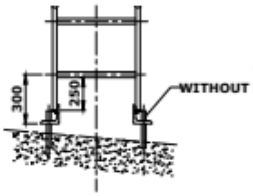
TYPE - B1



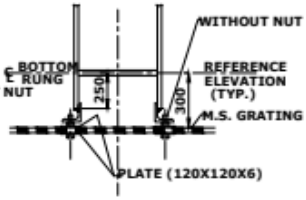
TYPE - C1



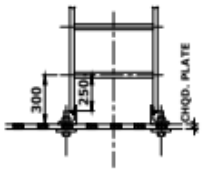
TYPE - A2



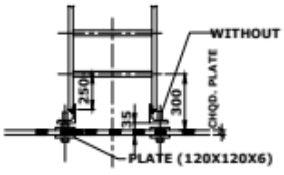
TYPE - B2



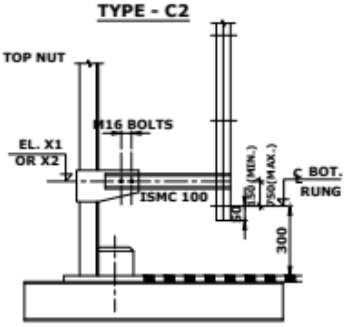
TYPE - C2



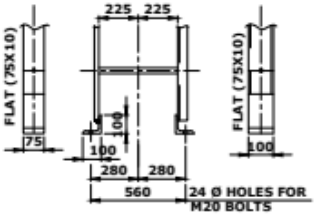
TYPE - D1



TYPE - D2



TYPE - E
(FREE)



LADDER BOTTOM DETAILS

NOTE :-

IN CASE OF TOWERS BOTTOM RUNG SHALL BE 300 mm FROM FGL /HPP

TYPE OF ATTACHMENT AT BASE

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Date: 2026.02.13 19:41:32

	METAL INSERT PLATES	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 7		

GENERAL NOTES:-

1. ALL LUGS SHALL BE OF HIGH STRENGTH DEFORMED BARS OF GRADE Fe415 CONFORMING TO IS:1786 (WITH GUARANTEED WELDABILITY) AND SHALL BE CONNECTED TO METAL INSERT PLATES BY 6 mm FILLET WELDS AS SHOWN IN SKETCHES.
2. METAL INSERT PLATES SHALL BE CONFORMING TO IS:2062 (GR-A).
3. METAL INSERT PLATES MARKED ON DRAWING REFER AS UNDER

   IP -(A) @ (C)

   IP = INSERT PLATE

   A = TYPE OF INSERT PLATE

   C = ELEVATION OF INSERT PLATE (TOP EDGE)

   e.g IP-R9a @ EL.110.300 MEANS INSERT TYPE R9a AT EL.110.300.
4. METAL INSERT PLATES SHALL BE KEPT FLUSH WITH CONCRETE SURFACE.
5. THE LONGER SIDE OF METAL INSERT PLATE SHALL BE KEPT VERTICAL UNLESS SHOWN OTHERWISE.
6. METAL INSERT PLATE ON COLUMN OR BEAM SHALL BE KEPT SYMMETRICAL ABOUT ℄ OF COLUMN OR BEAM, UNLESS SHOWN OTHERWISE.

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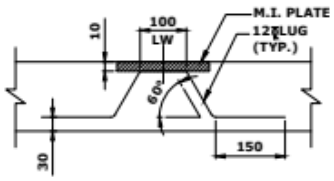
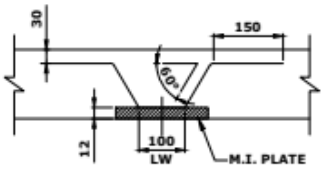
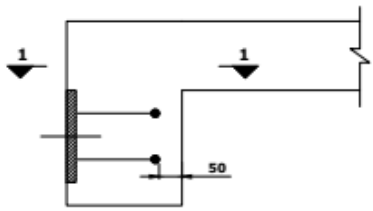
	METAL INSERT PLATES (LUG BENDING DETAILS)	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 2 OF 7		



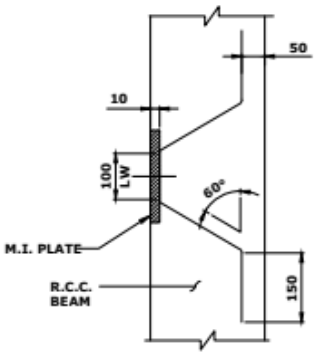
METAL INSERT DETAIL
ON TOP OF SLAB



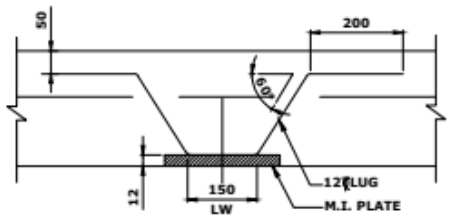
METAL INSERT DETAIL
ON BOTTOM OF SLAB



METAL INSERT DETAIL
ON SIDE OF BEAM

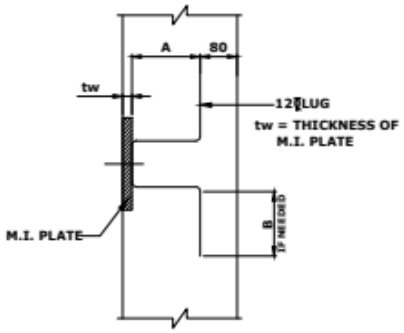


VIEW 1-1



METAL INSERT DETAIL
ON BOTTOM OF BEAM

(FOR ALTERNATE DETAIL REF. SHT. 7 OF 7)



METAL INSERT DETAIL
ON COLUMNS

A+B = LUG EMBEDMENT REQUIRED
AS PER SHT. 4,5,6 OF 7

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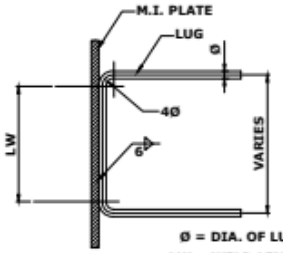
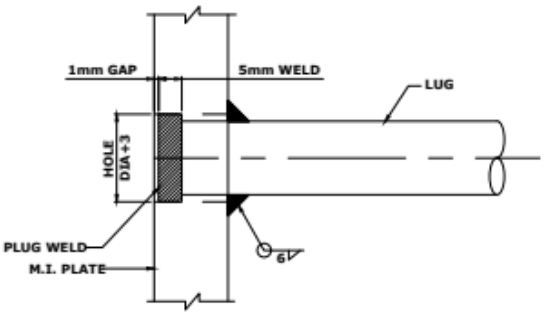
Date: 2026.02.13 19:41:32

	METAL INSERT PLATES	STANDARD DRAWING NO.	REV.	SIZE
		[illegible]	03	A4
		SHEET NO. 3 OF 7		

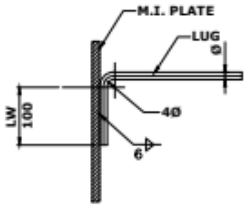


Ø = DIA. OF LUG
LW = WELD LENGTH AVAILABLE

BENDING DIMENSIONS FOR 12Ø & 16Ø LUGS
(FOR SPACING OF LUGS ≥ 190)
(NOT APPLICABLE FOR S1, S2 & R1)



WELD DETAIL OF 12Ø & 16Ø LUGS WITH M.I. PLATE
(FOR SPACING OF LUGS < 190)
(VALID FOR S1, S2 & R1)



BENDING DIMENSIONS FOR 12Ø & 16Ø LUGS
(VALID FOR R9, R10, R12, R13, R14, PS11 & PS12)

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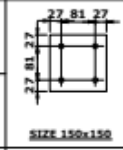
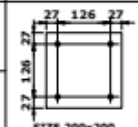
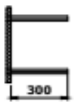
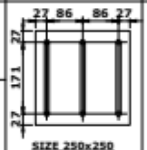
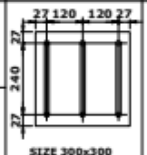
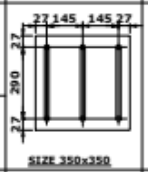
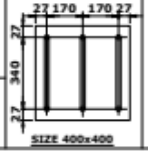
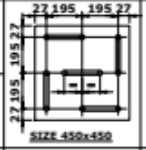
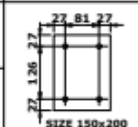
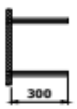
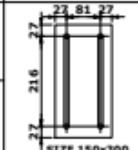
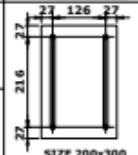
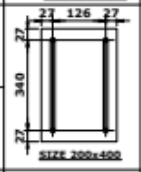
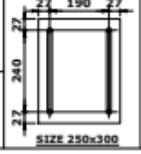
Date: 2026.02.13 19:41:32

	METAL INSERT PLATES (S/R DESIGNATES)	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 4 OF 7		

S. NO.	TYPE OF INSERT	DIA OF LUGS	THK. OF INSERT	DETAILS OF INSERT PLATE	
				PLAN	CROSS SECTION
1.	S1a	12	12		
	S1b	16	16		
2.	S2a	12	12		
	S2b	16	16		
3.	S3a	12	12		
	S3b	16	16		
4.	S4a	12	12		
	S4b	16	16		
5.	S5a	12	12		
	S5b	16	16		
6.	S6a	12	12		
	S6b	16	16		

S. NO.	TYPE OF INSERT	DIA OF LUGS	THK. OF INSERT	DETAILS OF INSERT PLATE	
				PLAN	CROSS SECTION
7.	S7a	12	12		
	S7b	16	16		
8.	R1a	12	12		
	R1b	16	16		
9.	R2a	12	12		
	R2b	16	16		
10.	R3a	12	12		
	R3b	16	16		
11.	R4a	12	12		
	R4b	16	16		
12.	R5a	12	12		
	R5b	16	16		

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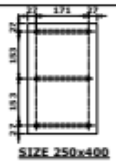
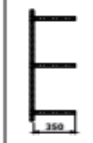
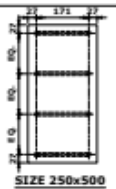
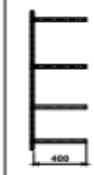
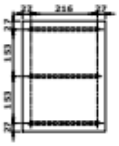
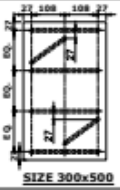
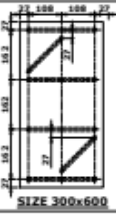
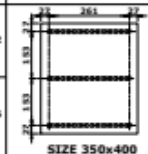
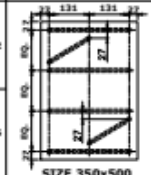
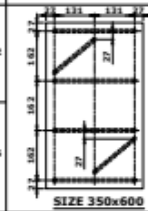
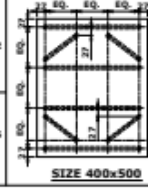
Date: 2026.02.13 19:41:32

	METAL INSERT PLATES (R DESIGNATES)	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 5 OF 7		

S. NO.	TYPE OF INSERT	DIA OF LUGS	THK. OF INSERT	DETAILS OF INSERT PLATE	
				PLAN	CROSS SECTION
13.	R6a	12	12	 SIZE 250x400	
	R6b	16	16		
14.	R7a	12	12	 SIZE 250x500	
	R7b	16	16		
15.	R8a	12	12	 SIZE 300x400	
	R8b	16	16		
16.	R9a	12	12	 SIZE 300x500	
	R9b	16	16		
17.	R10a	12	12	 SIZE 300x600	
	R10b	16	16		
18.	R11a	12	12	 SIZE 350x400	
	R11b	16	16		
19.	R12a	12	12	 SIZE 350x500	
	R12b	16	16		
20.	R13a	12	12	 SIZE 350x600	
	R13b	16	16		
21.	R14a	12	12	 SIZE 400x500	
	R14b	16	16		

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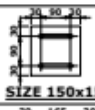
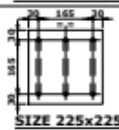
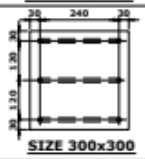
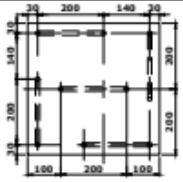
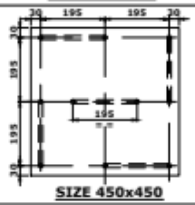
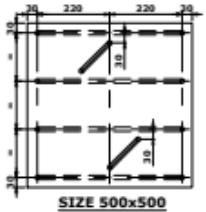
	METAL INSERT PLATES (PS DESIGNATES)	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 6 OF 7		

S. NO.	TYPE OF INSERT	DIA OF LUGS	THK. OF INSERT	DETAILS OF INSERT PLATE	
				PLAN	CROSS SECTION
1.	PS1	12	12	 SIZE 150x150	250(TYP.) FOR 12ϕ LUGS 300(TYP.) FOR 16ϕ LUGS
	PS2	16	16		
2.	PS3	12	12	 SIZE 225x225	
	PS4	16	16		
3.	PS5	12	12	 SIZE 300x300	
	PS6	16	16		
4.	PS7	12	12	 SIZE 400x400	
	PS8	16	16		
5.	PS9	12	12	 SIZE 450x450	
	PS10	16	16		
6.	PS11	12	12	 SIZE 500x500	
	PS12	16	16		

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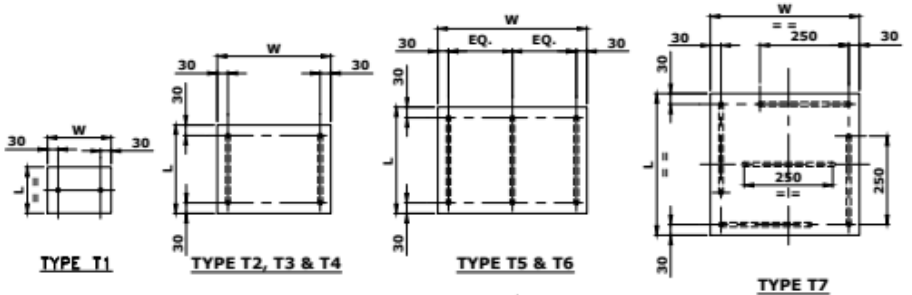
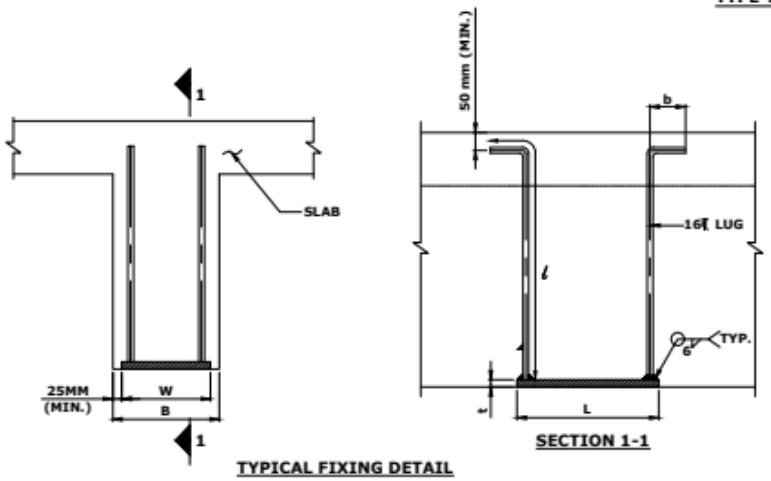
	STANDARD FOR DETAIL OF METAL INSERT PLATES (PS DESIGNATES)	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 7 OF 7		





TYPICAL FIXING DETAIL

S.NO.	TYPE OF INSERT	WIDTH OF BEAM 'B' (mm)	MAXIMUM WIDTH OF PLATE 'W' (mm)	LENGTH OF PLATE 'L' (mm)	MAXIMUM 'b' (mm)	THICKNESS OF PLATE 't' (mm)	TOTAL ANCHORAGE LENGTH 'l' (mm)
1.	T1	230	180	180	110	16	350
2.	T2	300	220	250	110	20	350
3.	T3	350	270	250	110	20	350
4.	T4	400	320	250	110	20	350
5.	T5	450	370	300	110	32	350
6.	T6	500	420	300	110	32	350
7.	T7	500	420	400	110	32	350

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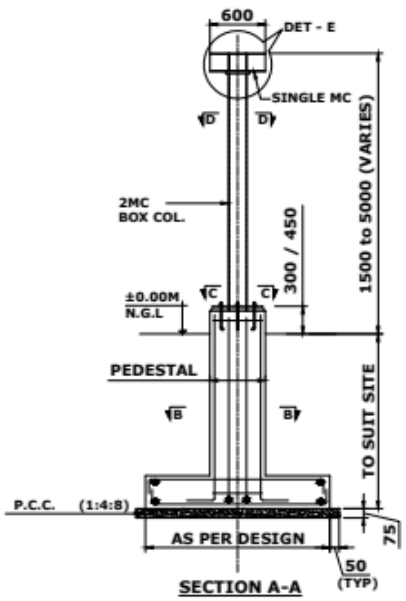
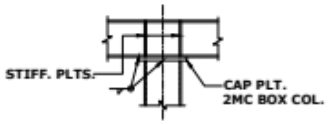
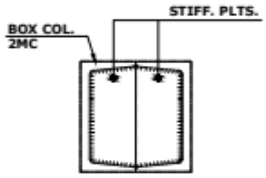
	STANDARD FOR DETAIL OF CANTILEVER PIPE SUPPORT	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 1		



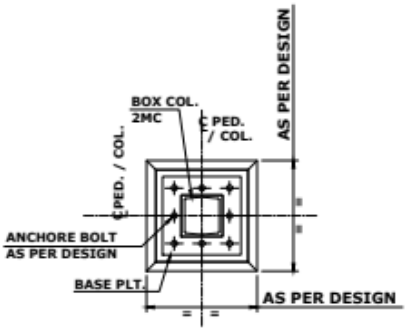
SECTION A-A



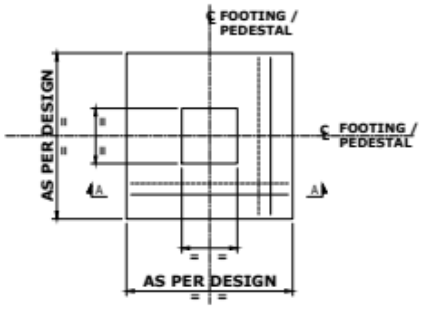
DETAIL - E



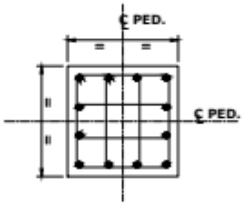
SECTION D-D



VIEW C-C



FOUNDATION PLAN



SECTION B-B

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Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL OF RING WALL FOUNDATION FOR STORAGE TANKS (LIQUID TEMP. UPTO 190° C)	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 4		

NOTES:-

1. ALL DIMENSIONS ARE IN mm.

2. JOB SPECIFIC DRAWING SHALL BE REFERRED FOR THE FOLLOWING :-
   - RING BEAM DETAILS INCLUDING TOP & BOTTOM LEVEL.
   - ANCHOR BOLT LOCATION AND DETAILS.
   - DRAIN LOCATION AND OTHER DETAILS.
   - SPECIFIC REQUIREMENT ON GROUND TREATMENT.

3. SLOPE OF TOP OF SAND FILL AND ANTI-CORROSIVE LAYER SHALL MATCH WITH TANK BOTTOM.

THIS STANDARD IS NOT APPLICABLE FOR ACID / CAUSTIC / PRESSURISED TANKS AS WELL AS FOR TANKS WHERE STRESS RELIEVING IN POSITION IS ENVISAGED.

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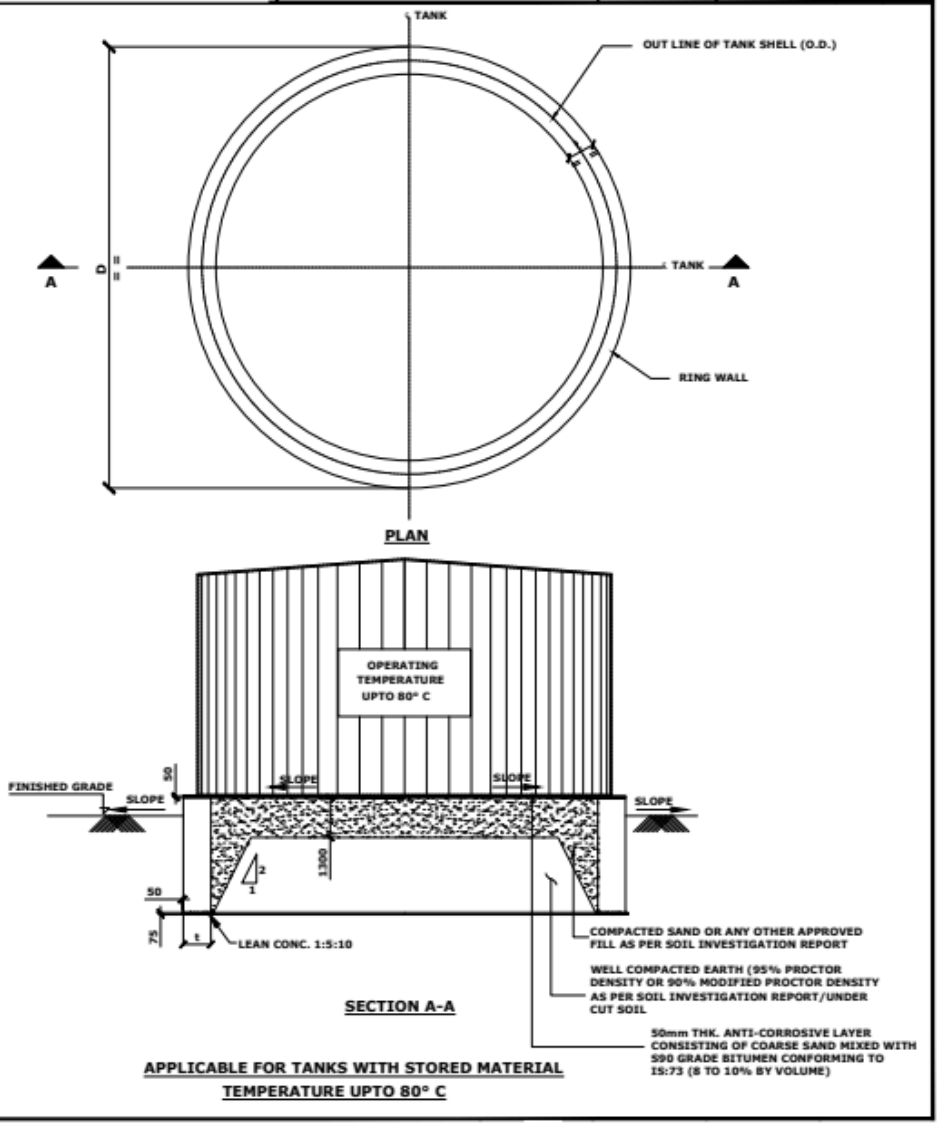
Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL OF RING WALL FOUNDATION FOR STORAGE TANKS (LIQUID TEMP. UPTO 190° C)	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	2 OF 4		



APPLICABLE FOR TANKS WITH STORED MATERIAL TEMPERATURE UPTO 80° C

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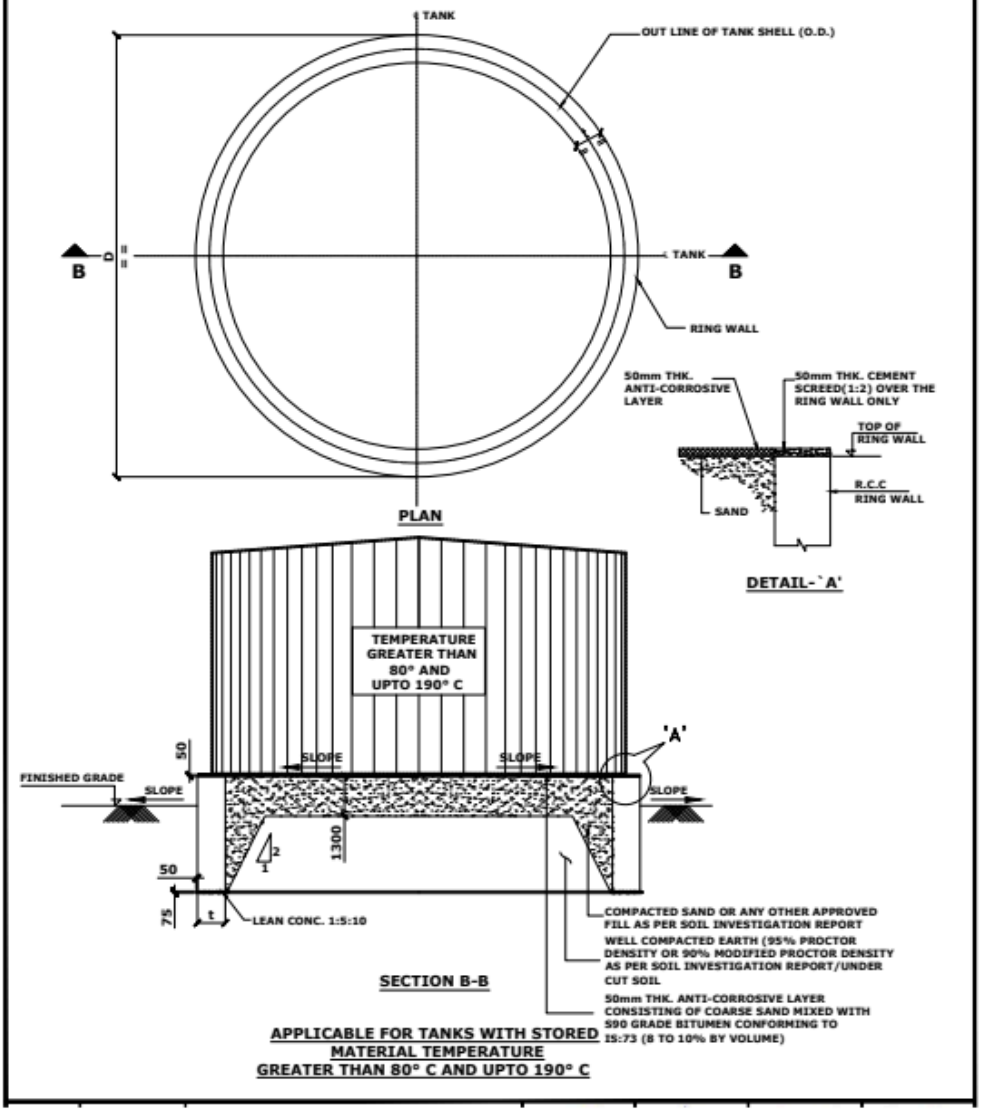
Date: 2026.02.13 19:41:32

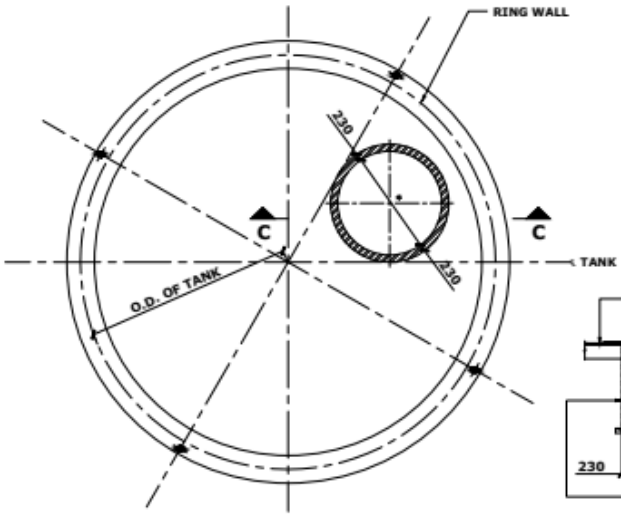
	STANDARD FOR DETAIL OF RING WALL FOUNDATION FOR STORAGE TANKS (LIQUID TEMP. UPTO 190° C)	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 3 OF 4		



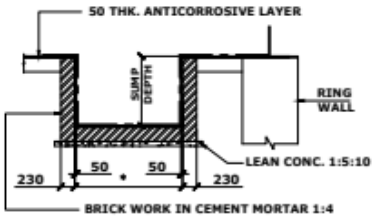
APPLICABLE FOR TANKS WITH STORED MATERIAL TEMPERATURE GREATER THAN 80° C AND UPTO 190° C

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

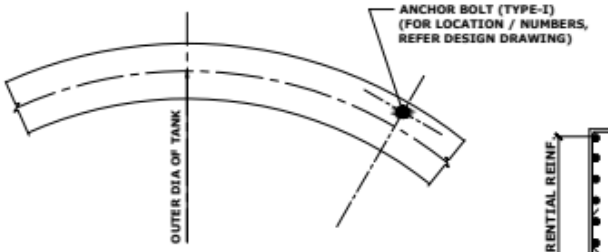
	STANDARD FOR DETAIL OF RING WALL FOUNDATION FOR STORAGE TANKS (LIQUID TEMP. UPTO 190° C)	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	4 OF 4		



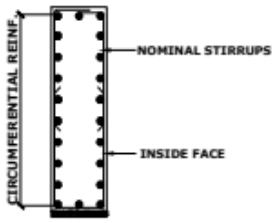
TYPICAL DETAIL FOR DRAIN PIT
(FOR ORIENTATION AND LOCATION REFER TANK DATA)



SECTION C-C
* = DIMENSION AS PER TANK DATA SHEET



TYP. DET. OF RING WALL AT ANCHOR BOLT LOCATION



TYP. DETAIL OF REINF.

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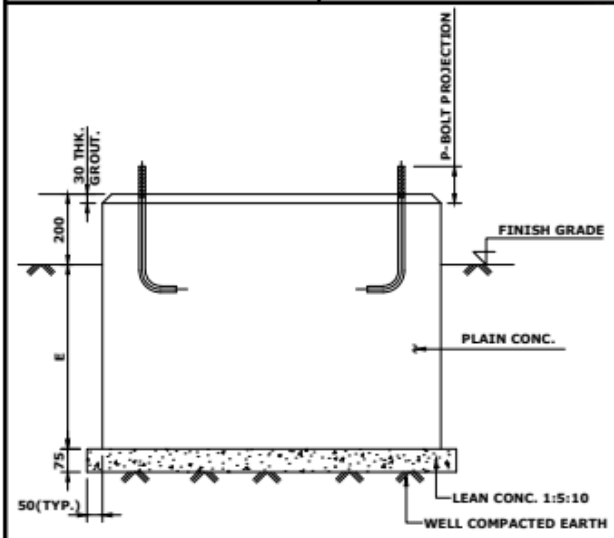
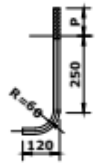
Date: 2026.02.13 19:41:32

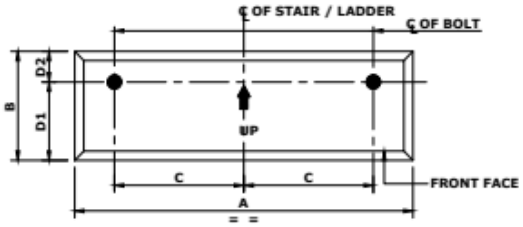
	STANDARD FOR DETAIL OF PEDESTAL FOR STAIR / LADDER	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 1		



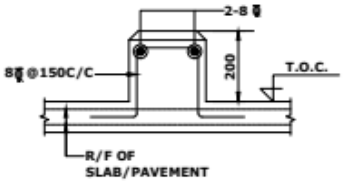
PEDESTAL FOR UNPAVED AREA



DETAIL OF L-BOLT



PLAN



PEDESTAL ON CONC. PAVEMENT/R.C.C.SLAB

S.NO.	ITEM	WIDTH	A	B	C	D1	D2	P	E	NUT	REMARKS
1	LADDER	450	750	300	280	200	100	90	500	SINGLE	
2	STAIR	750	1100	310	421	160	150	90	600	SINGLE	FOR STRINGER BEAM MC150
3	STAIR	750	1100	355	421	255	100	90	600	SINGLE	FOR STRINGER BEAM MC200

NOTES :–

1. IN CASE OF PEDESTAL OVER PILE CAP/RCC FOUNDATION, DIMENSION E TO SUIT ACCORDINGLY BUT NOT TO EXCEED VALUES GIVEN IN ABOVE TABLE.
2. CONCRETE GRADE SHALL BE AS PER GENERAL NOTES OF THE PROJECT BUT NOT LOWER THEN M25.
3. M20 L-BOLT AS PER DETAIL GIVEN ABOVE SHALL BE PROVIDED.
4. BOLTS SHALL BE TURNED FROM MILD STEEL BARS CONFORMING TO IS:2062 GRADE-A.
5. HEXAGONAL NUTS AND WASHERS SHALL CONFORM TO IS:1363 AND IS:3138.
6. THREADING SHALL BE COARSE AND CONFORM TO IS:1367 AND IS 4218.

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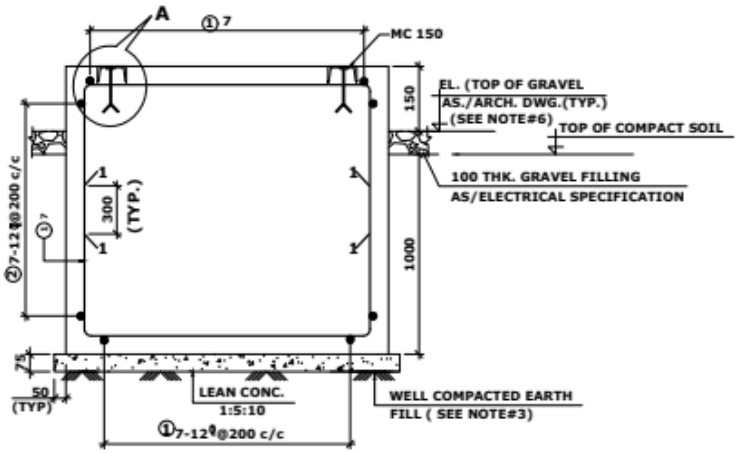
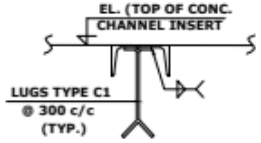
Date: 2026.02.13 19:41:32

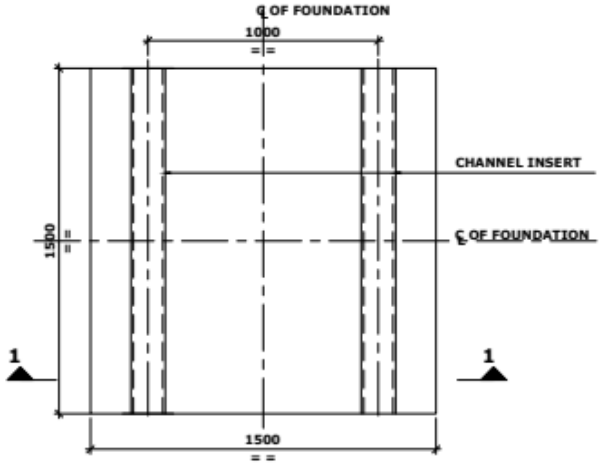


SECTION 1-1

FOR LOCATION & LAYOUT OF TRANSFORMER FDN. REFER RELEVANT ELECTRICAL DRGS.



DETAIL A



PLAN

NOTES:

1. CONCRETE GRADE SHALL BE AS PER GENERAL NOTES OF THE PROJECT BUT NOT LOWER THAN M25.
2. R/F SHALL BE HIGH YIELD STRENGTH DEFORMED BARS CONFORMING TO IS:1786 GRADE Fe 415 (MIN.)
3. FOUNDATION SHALL REST ON WELL COMPACTED EARTH FILL AS/ SPECIFICATIONS.
4. SUITABLE END STOPPERS SHALL BE PROVIDED (BY OTHERS) AT CHANNEL ENDS AFTER THE INSTALLATION OF TRANSFORMER.
5. SBC OF SOIL CONSIDERED IS 5 MT/m^2 AND A MAXIMUM EQUIPMENT WEIGHT OF 6.5 MT.
6. TOP OF COMPACTED SOIL FILL SHALL BE 50mm ABOVE THE TOP OF APPROACH ROAD LEVEL.

TYPE	BAR MARK	ϕ	A	B	C	CUT LENGTH (mm)	NOS. REQD.	TOTAL LENGTH (mm)	UNIT WT. IN kg./m	QUANTITIES FOR ONE SET				REMARKS
										HYD. BARS (kg.)	CONC. 1:5:10 $(m)^3$	STRL. CONC. $(m)^3$	STRL. STEEL (kg.)	
A, C, B	①	12	1400	750	750	2825	28	79100	0.89	108.00	0.34	3.00	50.00	
	②	12	1400	850	850	3025	14	42350	0.89					

STANDARD FOR DETAIL
OF BLOCK FOUNDATION FOR
TRANSFORMERS (UPTO 2000kVA RATING)

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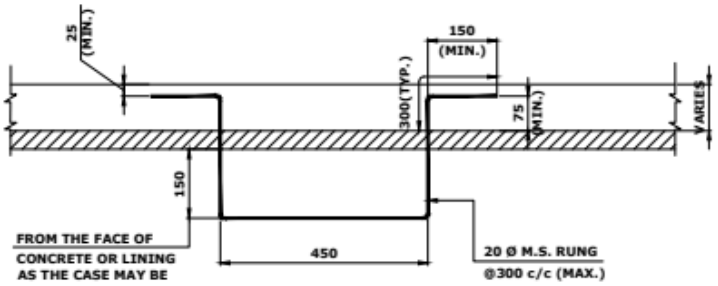
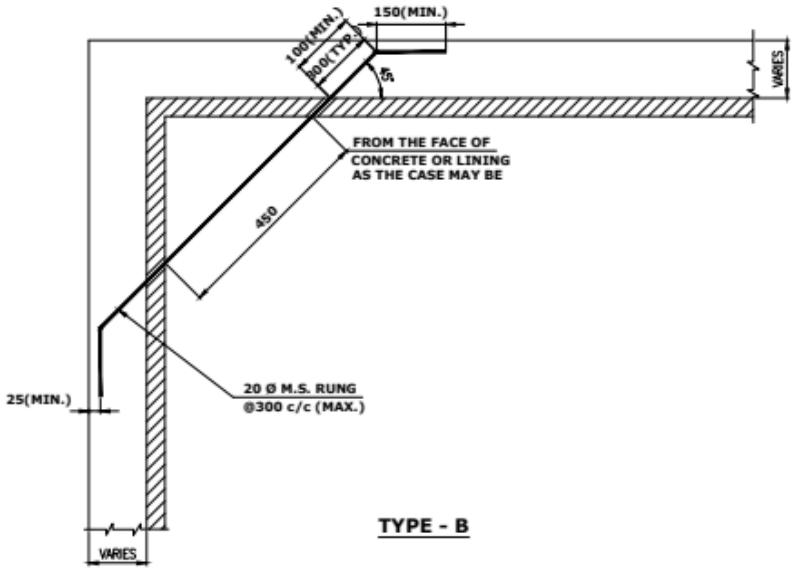
Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL OF M.S. RUNGS FOR CONC. STRUCTURES	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 1		



TYPE - A



TYPE - B

NOTES :–

1. ALL DIMENSIONS ARE IN mm.
2. FIRST RUNG SHALL BE AT 300mm FROM TOP.

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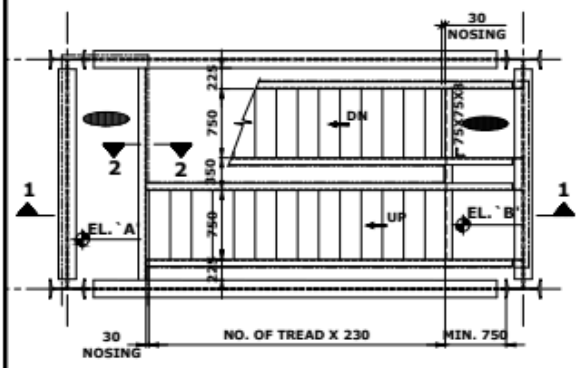
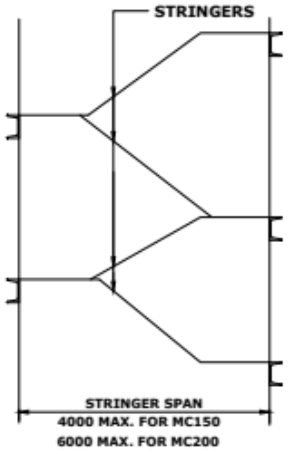
Date: 2026.02.13 19:41:32

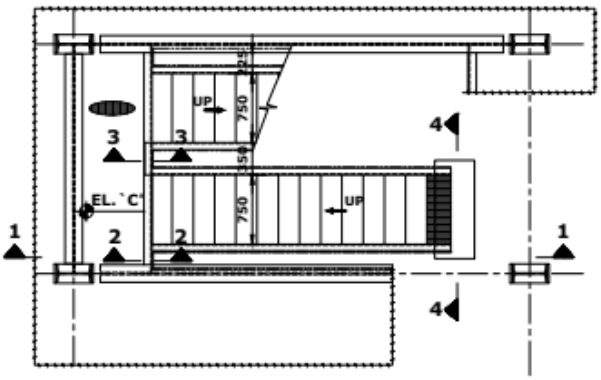
	STANDARD FOR DETAIL OF STEEL STAIRS	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 1		



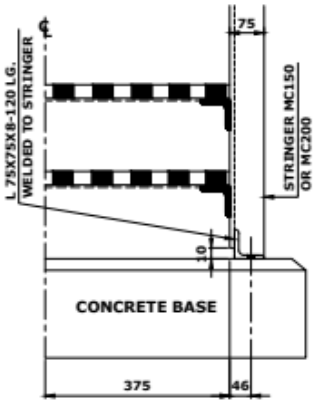
PLAN AT EL.-`A'



MAX. STRINGER SPAN BETWEEN SUPPORTS



PLAN AT EL.-`C'



SECTION 4-4

NOTES:

1. FOR STAIRWAY USE GRATING TYPE III OR CHEQUERED PLATE IN TREADS WITH NOSING AS SPECIFIED.
2. FOR CONNECTION DETAILS REFER SHEETS 3, 4, AND 6.
3. STRUCTURAL FLOORING : CHEQ. PLATE OR GRATING.
4. STRINGER TO BE MC150 FOR RISES UPTO 4.0 m EXCEPT IN OFFICE BUILDING,WARE HOUSES AND WORKSHOPS, WHERE IT WILL BE AS PER DESIGN.

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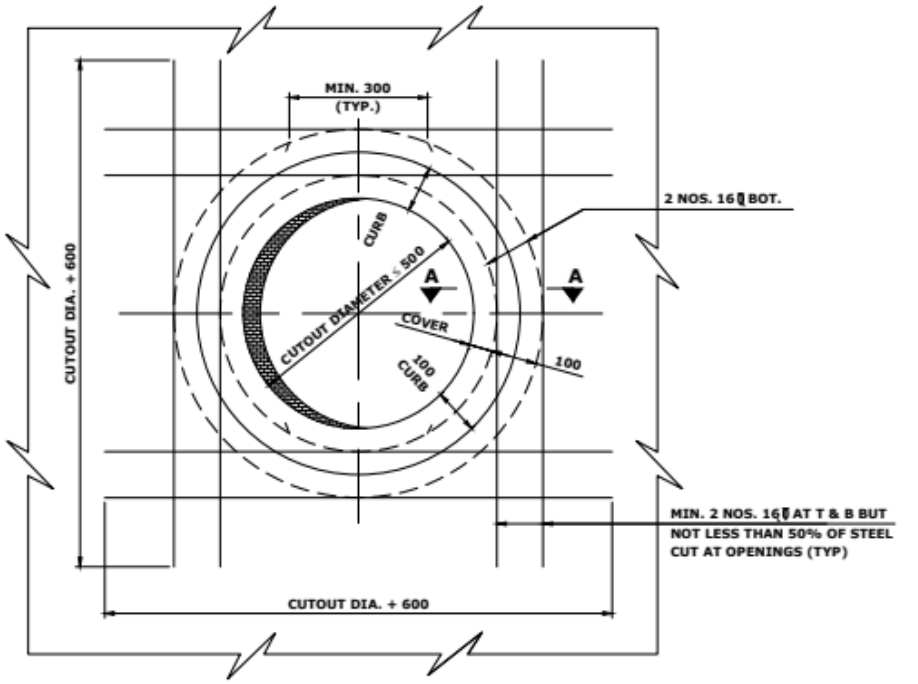
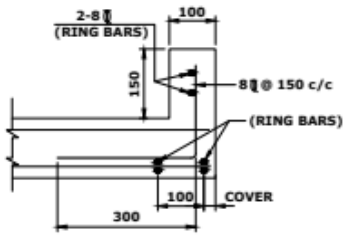
Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL OF REINFORCEMENT AT CIRCULAR CUT-OUT IN SLAB	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 1		





SECTION: A-A

NOTES :–

1. ALL DIMENSIONS ARE IN mm.
2. ALL THE BARS SHALL BE EFFECTIVELY TIED WITH THE MAIN REINFORCEMENT BARS CUT OR SPLAYED NEAR THE OPENING AS PER THE DIRECTION OF THE ENGINEER-IN-CHARGE.
3. THIS DETAIL APPLIES TO SLABS UPTO 200 THK.
4. OMIT CURB WHERE SPECIFICALLY STATED ON DRAWINGS.

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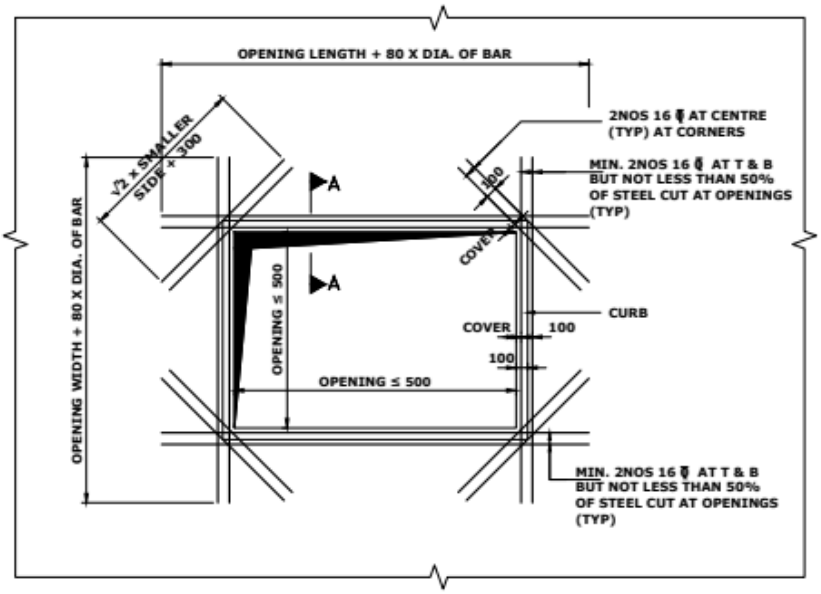
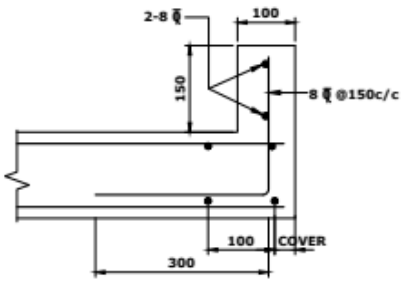
Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL OF REINFORCEMENT AT SQ. / RECT. CUT-OUT IN SLAB	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 1		





SECTION: A-A

NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. EXTRA BARS MAY BE OMITTED IF A BEAM IS PROVIDED AT THE RELEVANT EDGE.
3. CORNER BAR MAY BE OMITTED IF TWO BEAMS MEET AT THE RELEVANT CORNER.
4. ALL THE BARS MENTIONED ABOVE SHALL BE EFFECTIVELY TIED WITH THE MAIN REINFORCEMENT BARS CUT OR SPLAYED NEAR OPENING AS DIRECTED BY ENGINEER-IN-CHARGE.
5. OMIT CURB WHERE SPECIFICALLY STATED ON DRAWING.
6. THIS DETAIL APPLIES TO SLABS UPTO 200 THK.

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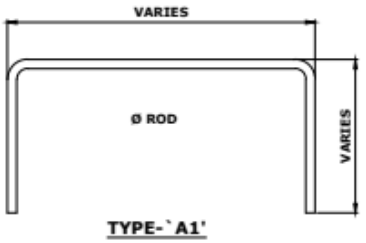
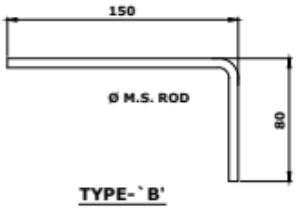
Date: 2026.02.13 19:41:32

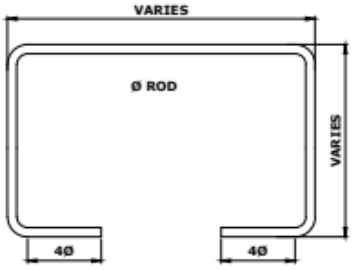
	STANDARD FOR DETAIL OF LUGS	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 1		



TYPE-`A1'



TYPE-`B'



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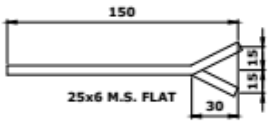
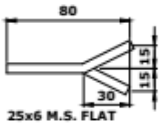


TYPE-`C1'



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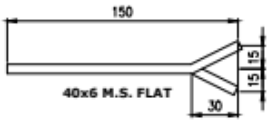

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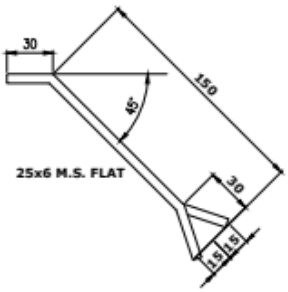

TYPE-`C4'

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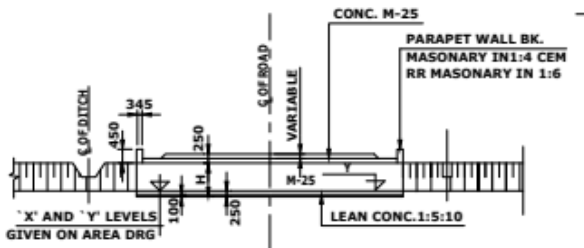
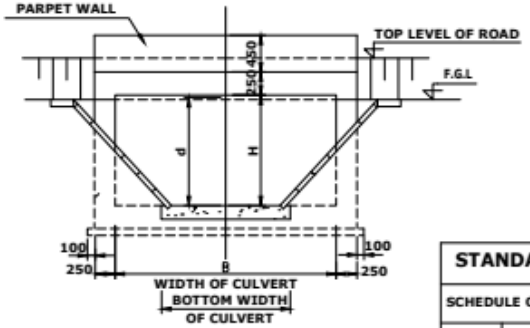
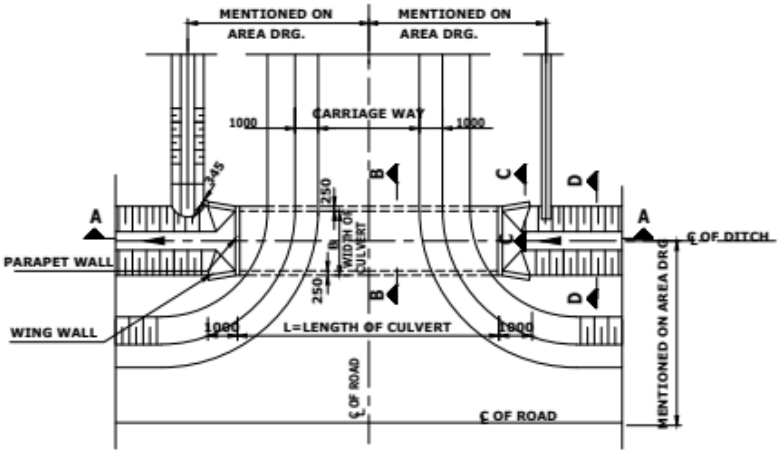


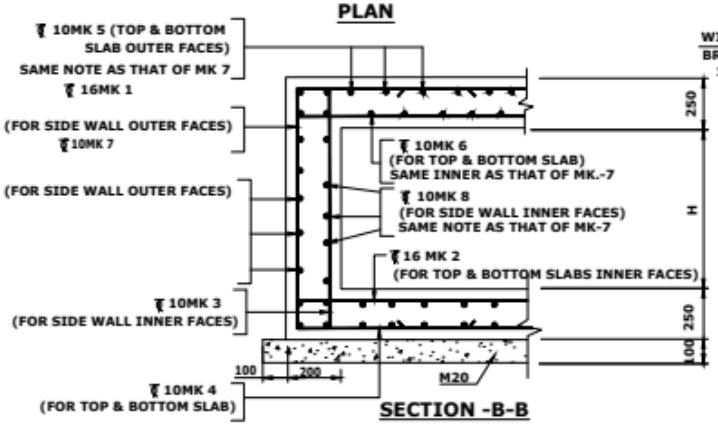
SECTION A-A



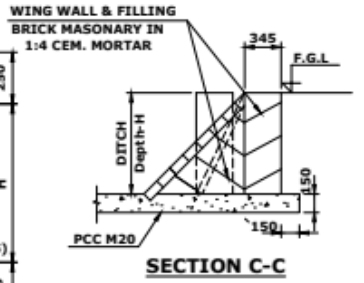
SECTION D-D



PLAN



SECTION -B-B



SECTION C-C

NOTES:-

BARS OF VARYING DIMENSIONS FOR DIFFERENT CULVERTS DEPENDING UPON THE LENGTH OF CULVERT.

NOTES:-

1. ALL DIMENSIONS ARE IN MM EXCEPT LEVELS WHICH ARE IN METRES.
2. BOX CULVERT ARE DESIGNED FOR I.R.C CLASS `A' & CLASS `AA' LOADING.
3. ALL REINFORCEMENT SHOWN THUS SHALL BE OF COLD TWISTED. DEFORMED BARS CONFORMING TO IS 1786-LATEST.
4. BARS BENDING SHALL CONOIRM TO IS:2502
5. REINFORCEMENT CONCRETE SHALL BE M:25 CONFORMING TO IS : 456 LATEST
6. ALL BRICK WORK SHALL BE IN 1:4 CEMENT MORTAR AS PER IS : 2212
7. OVERLAP FOR BARS SHALL BE 50D AND SHALL BE STAGGERED.
8. FOR AGGRESSIVE SOIL PCC M20 AND RCC M35 SHALL BE USED.

STANDARD DIMENSIONS OF BOX CULVERT WITH BILLS OF MATERIAL

SCHEDULE OF CULVERT		PER METRE LENGTH OF CULVERT			WING WALL & PARAPET PER CULVERT		
TYPE	WIDTH DEPTH (BXH)	WEIGHT OF REINFORCEMENT	CONC. 1:5:10	CONC. M-25	CONC. 1:4:8	BK.WALL IN 1:4 MORTAR	1:3 CEM PLASTER -TER 13mm THK.
I	1700X850	℄ 16 0.1T ℄ 10 0.066T	0.21M^3	1.53M^3	0.25M^3	2.44M^3	10.70M^3
II	2000X1000	℄ 16 0.16T ℄ 15 0.071T	0.27M^3	1.75M^3	0.25M^3	2.77M^3	14.22M^3
III	2200X1100	℄ 16 0.129T ℄ 10 0.078T	0.291M^3	1.90M^3	0.25M^3	3.0M^3	15.18M^3
IV	2600X1300	℄ 16 0.144T ℄ 10 0.089T	0.33M^3	2.20M^3	0.25M^3	3.44M^3	17.10M^3

REINFORCEMENT BENDING SCHEDULE

MK 1 ℄ B, A, MARK 2 3 4, (L-100), MK.5,6,7&8

MARK	TYPE OF CULVERT	STEEL DIA & SPACING	BENDING SCHEDULE A	BENDING SCHEDULE B	CUT LENGTH
MK-1	I	Ø16 150C/C	1250	725	2704
	II	Ø16 125C/C	1400	850	3004
	III	Ø16 100C/C	1500	930	3264
	IV	Ø16 100C/C	1700	1070	3744
MK-2	I	Ø16 150C/C	2100		2100
	II	Ø16 125C/C	2400		2400
	III	Ø16 100C/C	2600		2600
	IV	Ø16 100C/C	3000		3000
MK-3	I	Ø10 200C/C	1250		1250
	II	Ø10 200C/C	1400		1400
	III	Ø10 200C/C	1500		1500
	IV	Ø10 200C/C	1700		1700
MK-4	I	Ø10 200C/C	2100		2100
	II	Ø10 200C/C	2400		2400
	III	Ø10 200C/C	2600		2600
	IV	Ø10 200C/C	3000		3000
MK-5	I	Ø10 200C/C	BARS OF VARYING LENGTH		
MK-6	II	Ø10 100C/C			
MK-7	III	Ø10 100C/C			
MK-8	IV	Ø10 200C/C			

STANDARD FOR DETAIL OF BOX CULVERT TYPE- I,II,III & IV

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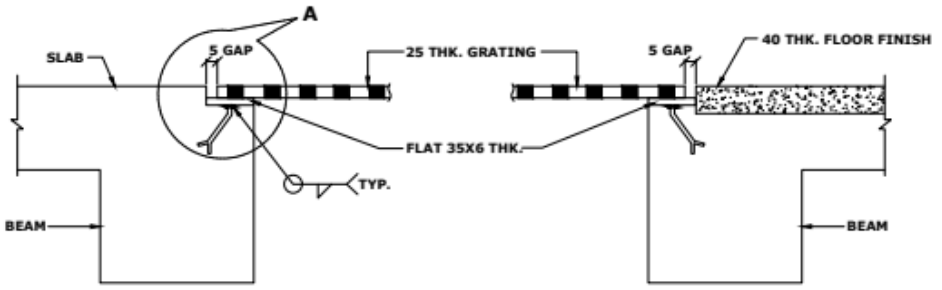
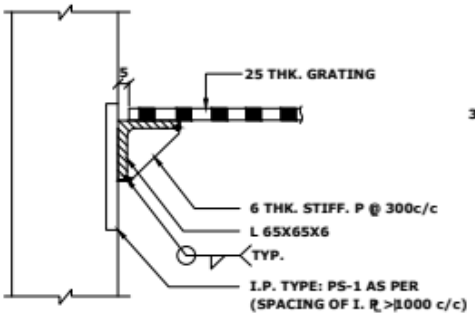
Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL OF TYPICAL GRATING SPORT.	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 1		

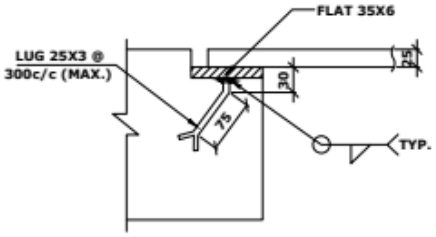


GRATING SUPPORT OVER BEAM WITHOUT FLOOR FINISH

GRATING SUPPORT OVER BEAM WITH FLOOR FINISH



GRATING SUPPORT ON WALL/COLUMN



DETAIL `A'

NOTES:

1. M.S. LUGS SHALL BE SUITABLY BENT IF CONCRETE THICKNESS IS LESS THAN THE LENGTH OF LUGS OR LUGS INTERFERE WITH R/F BARS.
2. ALL DIMENSIONS ARE IN mm.

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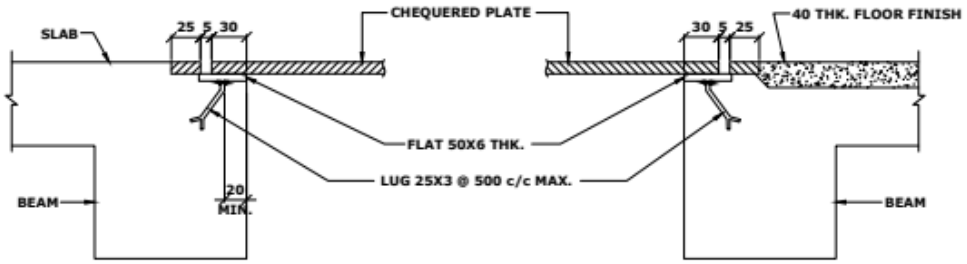
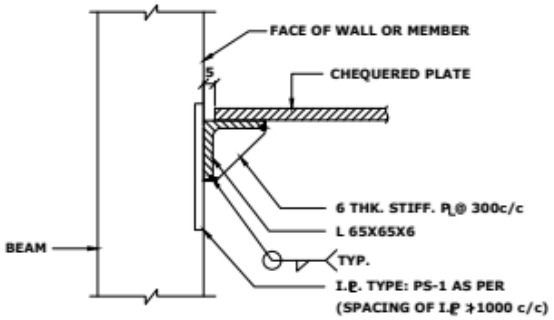
Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL TYPICAL CHEQUERED PLATE SUPPORT.	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 1		



CHQD. PL SUPPORT OVER BEAM WITHOUT FLOOR FINISH

CHQD. PL SUPPORT OVER BEAM WITH FLOOR FINISH



GRATING SUPPORT ON WALL/COLUMN

NOTES:

1. M.S. LUGS SHALL BE SUITABLY BENT IF CONCRETE THICKNESS IS LESS THAN THE LENGTH OF LUGS OR LUGS INTERFERE WITH R/F BARS.
2. ALL DIMENSIONS ARE IN mm.

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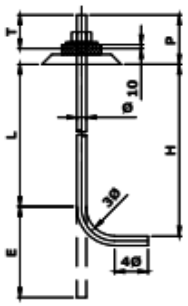
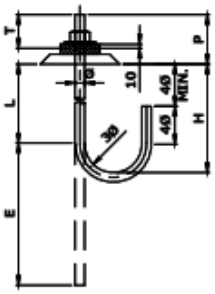
Date: 2026.02.13 19:41:32

	M.S. ANCHOR BOLT ASSEMBLIES	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 4		

GRADE OF CONC.	BOLT TYPE	DIMENSIONS MM		BOLT DIA (Ø) IN MM											
				10	12	16	18	20	22	24	27	30	33	36	39
M25	I & III		L	200	250	400	400	450	550	550	650	700	800	850	950
			E	95	115	155	170	190	210	230	255	285	315	345	370
		H	TYPE-I	230	286	448	454	510	616	622	731	790	899	958	1067
			TYPE-III	380	436	598	604	810	916	922	1181	1240	1349	1408	1517
	II & IV		L	150	150	250	250	300	350	350	450	500	550	600	650
			E	150	180	240	270	300	330	360	405	450	495	540	585
		H	TYPE-II	180	186	298	304	360	416	422	531	590	649	708	767
			TYPE-IV	330	336	440	454	660	716	722	981	1040	1099	1158	1217
M30	I & III		L	180	220	315	335	390	445	470	550	600	680	735	815
			E	95	115	155	170	190	210	230	255	285	315	345	370
		H	TYPE-I	210	260	365	390	450	515	545	635	690	780	845	935
			TYPE-III	360	410	515	540	750	815	845	1085	1140	1230	1295	1385
	II & IV		L	150	150	200	200	250	275	300	350	375	425	450	500
			E	150	180	240	270	300	330	360	405	450	495	540	585
		H	TYPE-II	180	190	250	255	310	345	375	435	465	525	560	620
			TYPE-IV	330	340	400	405	610	645	675	885	915	975	1010	1070



TYPE-I



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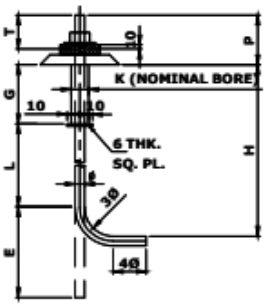
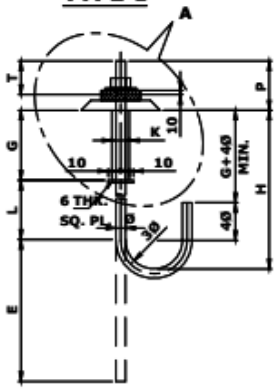
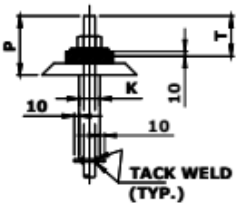


TYPE-III



TYPE-IV



DETAIL-A
(TYP.)

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	M.S. ANCHOR BOLT ASSEMBLIES	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 2 OF 4		

| GRADE OF CONC. | BOLT TYPE | DIMENSIONS MM | | | BOLT DIA (Ø) IN MM | | |

	M.S. ANCHOR BOLT ASSEMBLIES	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	3 OF 4		

GRADE OF CONC.	BOLT TYPE	DIMENSIONS MM		BOLT DIA (Ø) IN MM																											
				10	12	16	18	20	22	24	27	30	33	36	39	42	45	48	52	56	60	64	68	72							
M25&M30	V & VI	E		50	60	70	75	80	90	95	105	110	120	130	140	150	155	165	180	190	200	215	225	240							
	V, VI,	K		50	50	50	50	50	80	80	80	80	80	80	100	100	100	100	125	125	125	150	150	150							
		THREADED (T)	SINGLE NUT	40	45	55	60	60	65	70	75	80	90	95	100	105	110	120	125	135	140	150	160	165							
	VII & VIII	LENGTH	DOUBLE NUT	50	60	70	75	80	90	95	105	110	120	130	140	150	155	165	180	190	200	215	225	240							
	VII	G						16	16	16	16	16	16	16	16	16	16	20	20	20	20	20	20	20							
	VIII	G												16	20	20	20	25	25	25	28	32	32	32							
	VII & VIII	G		150	150	150	150	300	300	300	300	450	450	450	450	450	450	450	450	450	450	600	600	600							
	IX	L		80	100	150	170	200																							
	M25	L		185	220	310	335	385	435	466	535	590	660	720																	
	M30	L		150	150	200	225	250	275	306	350	375	435	450																	

NOTES :-

1. BOLTS SHALL BE MARKED ON THE DRAWING AS UNDER :

   A B C D P
   | | | | |
   | | | | PROJECTION ABOVE CONCRETE
   | | | SINGLE NUT (N1) OR DOUBLE NUT (N2)
   | | DIAMETER OF BOLT
   | TYPE OF BOLT
   NO OF BOLTS

   e.g. 6-IV-M27-N1-200

2. BOLTS SHALL BE TURNED FROM M.S. ROUNDS CONFORMING TO IS:2062 GR-A.
3. NUTS AND WASHERS SHALL CONFORM TO IS:1363 AND IS 3138.
4. THREADED SHALL BE COARSE CONFORMING TO IS:1367 AND IS:4218
5. ANCHOR BOLTS SHALL BE SET ACCURATELY AND HELD IN POSITION BEFORE THE CONCRETING.
6. 6 THK. SQ. PLATE AT THE BOTTOM OF SLEEVE SHALL BE TACK WELDED WITH BOLTS AND SLEEVE FOR BOLT TYPE III, IV, VII AND VIII.
7. SLEEVE SHALL BE M.S. TUBES (MEDIUM) AS PER IS:1239.
8. REFFER DESIGN DRAWINGS FOR PROJECTION (P) OF BOLT ABOVE TOP OF ROUGH CONCRETE AND NUMBER (A) OF BOLTS.
9. ANCHOR BOLTS SHALL BE TEMPERED BEFORE MACHINING IF MADE BY ROLLING. THE TEMPERING TEMPERATURE SHALL BE ABOVE 900° C BUT LOWER THAN SUPER HEATING TEMPERATURE.

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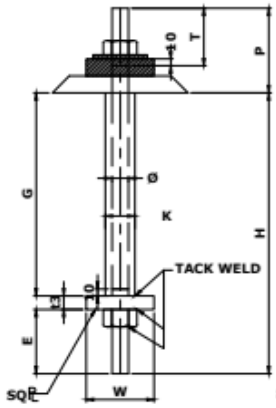
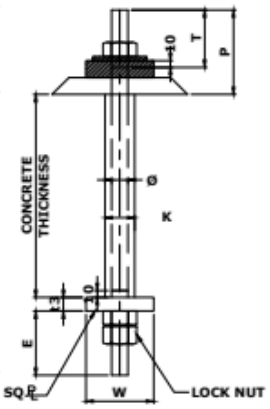
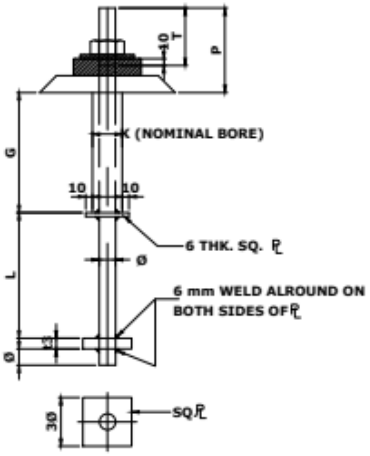
	M.S. ANCHOR BOLT ASSEMBLIES	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 4 OF 4		



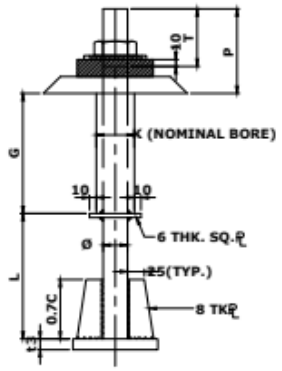
TYPE-V

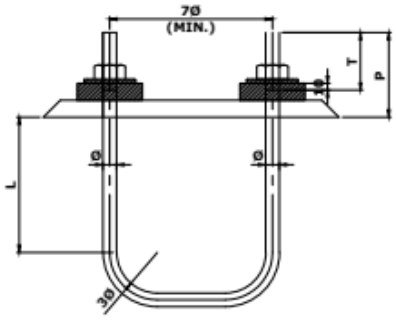


TYPE-VI

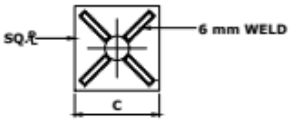


TYPE-VII





TYPE-IX



TYPE-VIII

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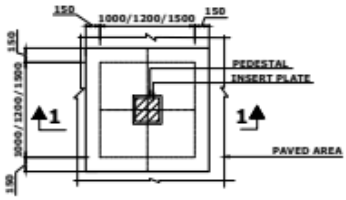
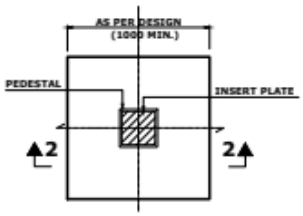
Date: 2026.02.13 19:41:32

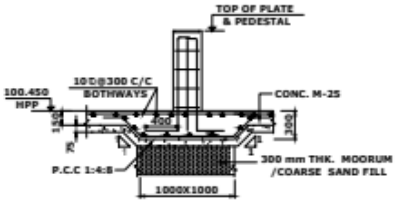
	STANDARD FOR DETAIL OF RCC PIPE SUPPORT	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 1		



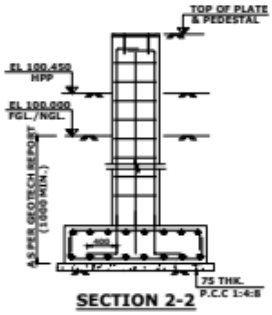
FOUNDATION PLAN
(FOUNDATION LOAD LESS THAN 8 KN)



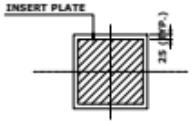
FOUNDATION PLAN
(FOUNDATION LOAD > 8 KN AND < 15 KN)



SECTION 1-1



SECTION 2-2



PEDESTAL PLAN

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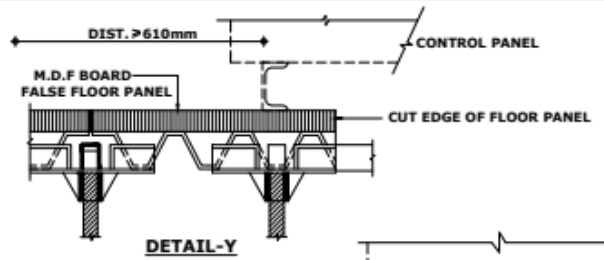
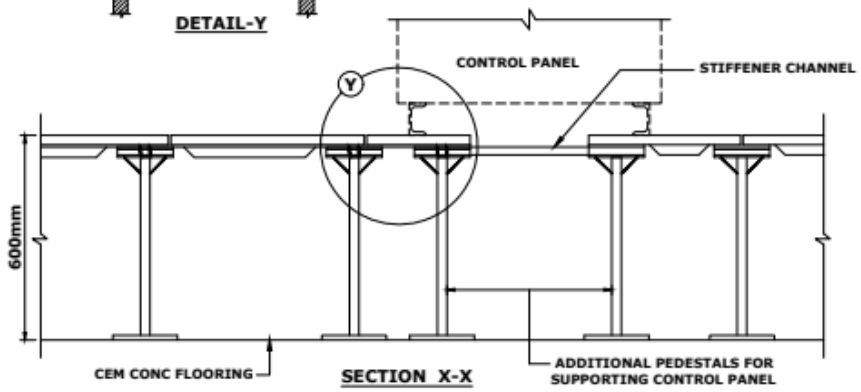
Date: 2026.02.13 19:41:32

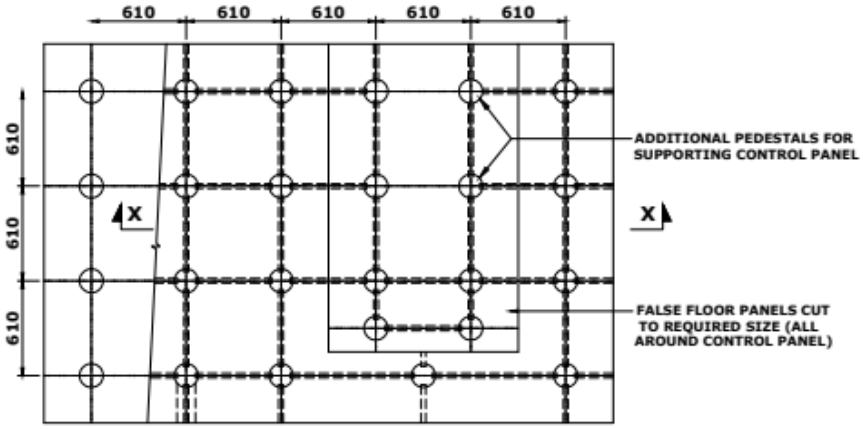
	STANDARD FOR DETAIL OF FALSE FLOORING	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 3		



DETAIL-Y



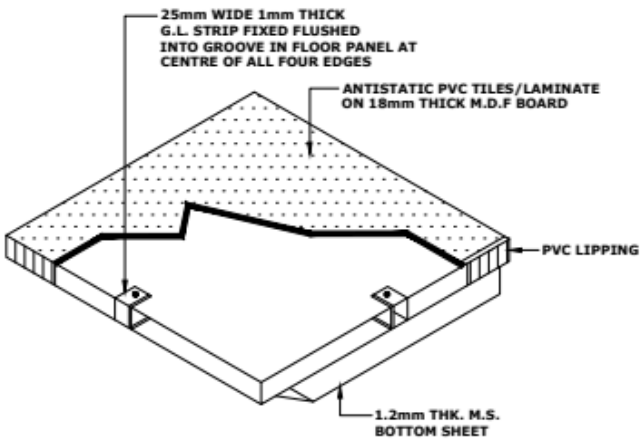
SECTION X-X



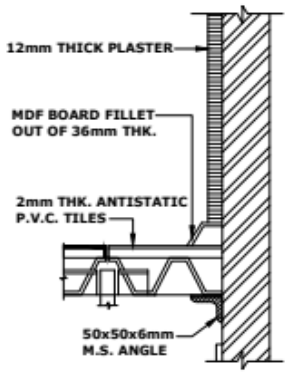
PART PLAN OF FALSE FLOORING

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

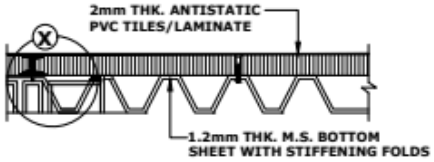
	STANDARD FOR DETAIL OF FALSE FLOORING	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	2 OF 3		



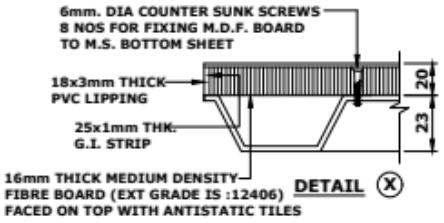
ISOMETRIC VIEW OF A PANEL



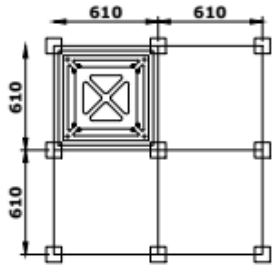
DET. OF JUNCTION WITH THE WALL



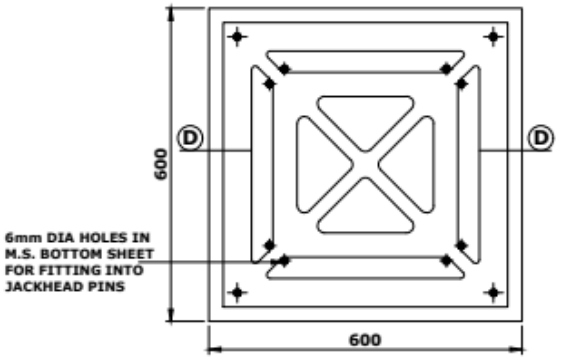
SECTION D-D



DETAIL X



PART OF GRID PLAN



PLAN OF FLOOR PANEL

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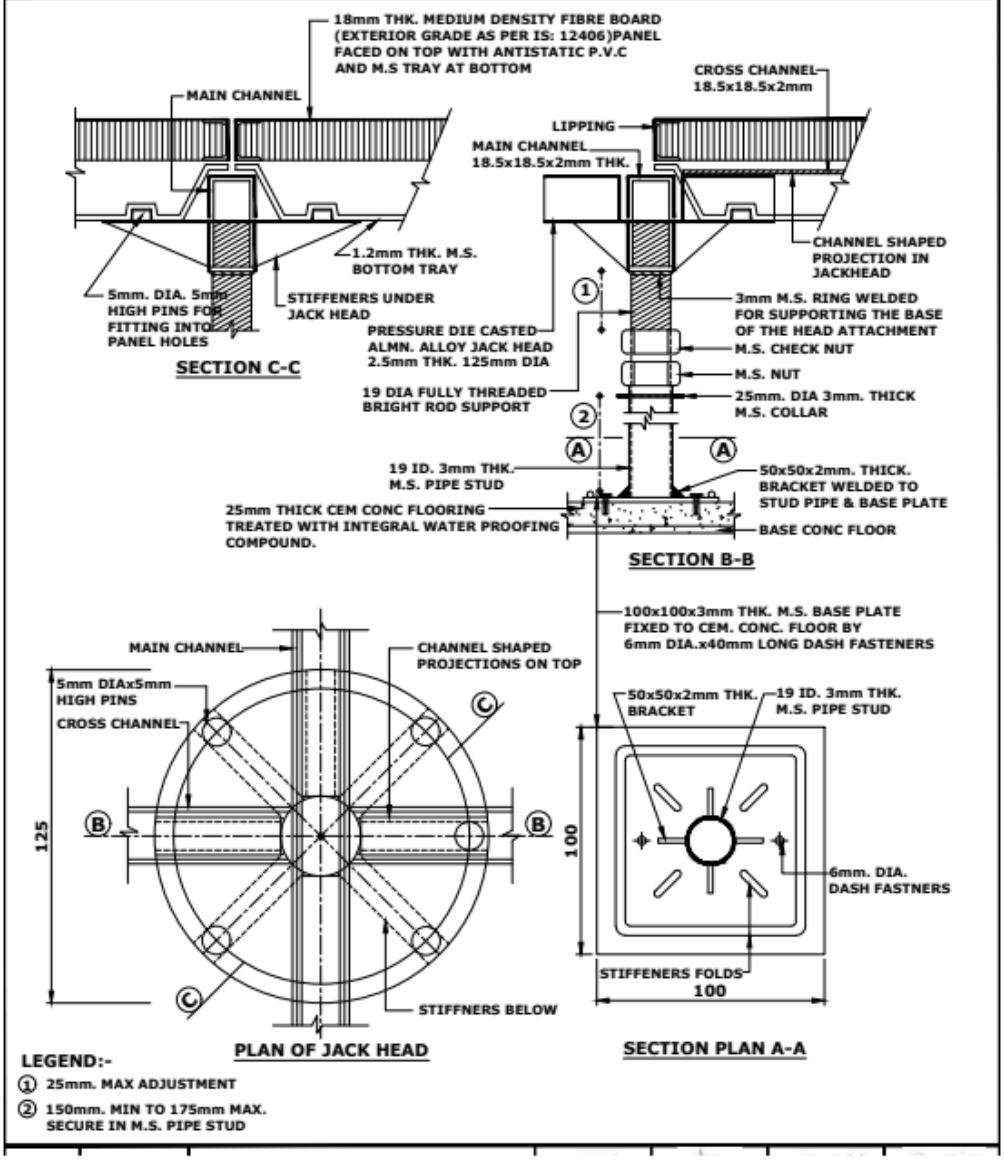
Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL OF FALSE FLOORING	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	3 OF 3		



LEGEND:-

① 25mm. MAX ADJUSTMENT

② 150mm. MIN TO 175mm MAX. SECURE IN M.S. PIPE STUD

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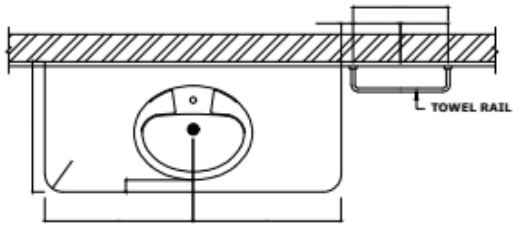
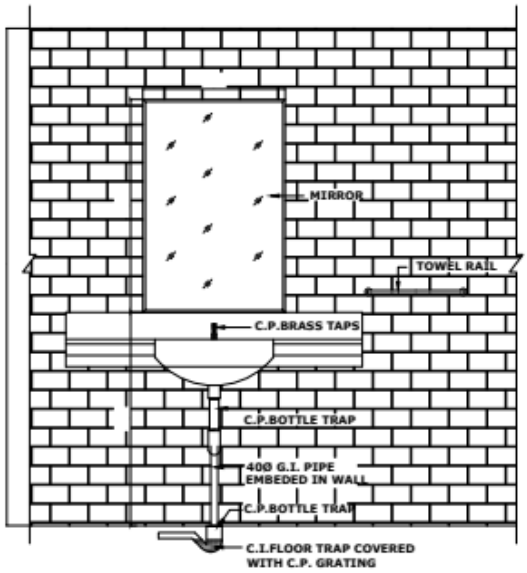
Date: 2026.02.13 19:41:32

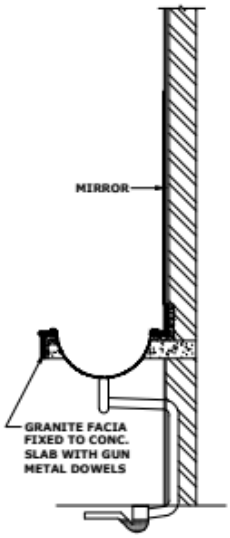
	STANDARD FOR DETAIL OF WASH BASIN FIXING DETAIL	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 1		



PLAN



ELEVATION



SECTION

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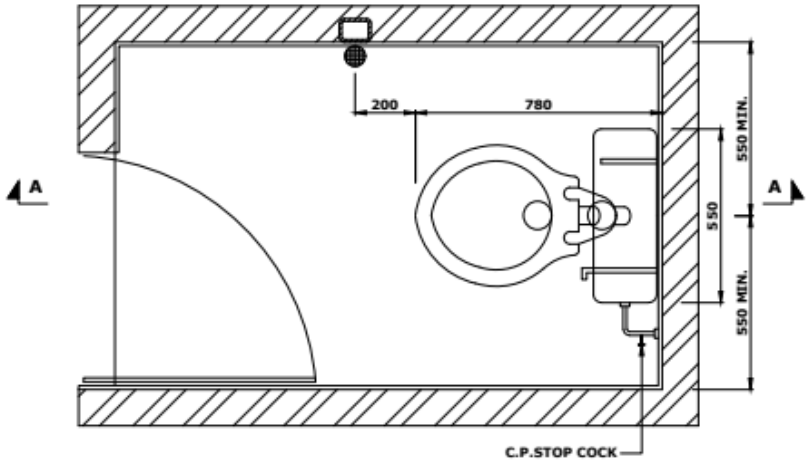
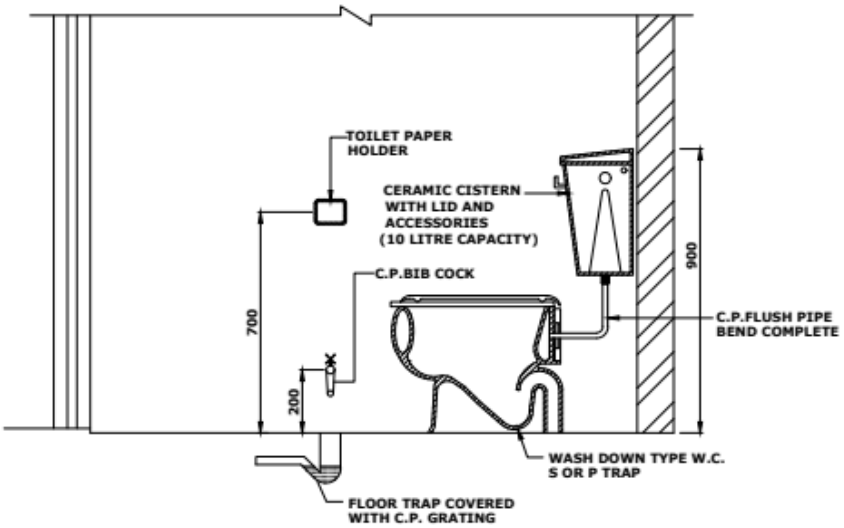
Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL OF EUROPEAN TYPE W.C. FIXING DETAIL	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 1		



PLAN



SECTION A-A

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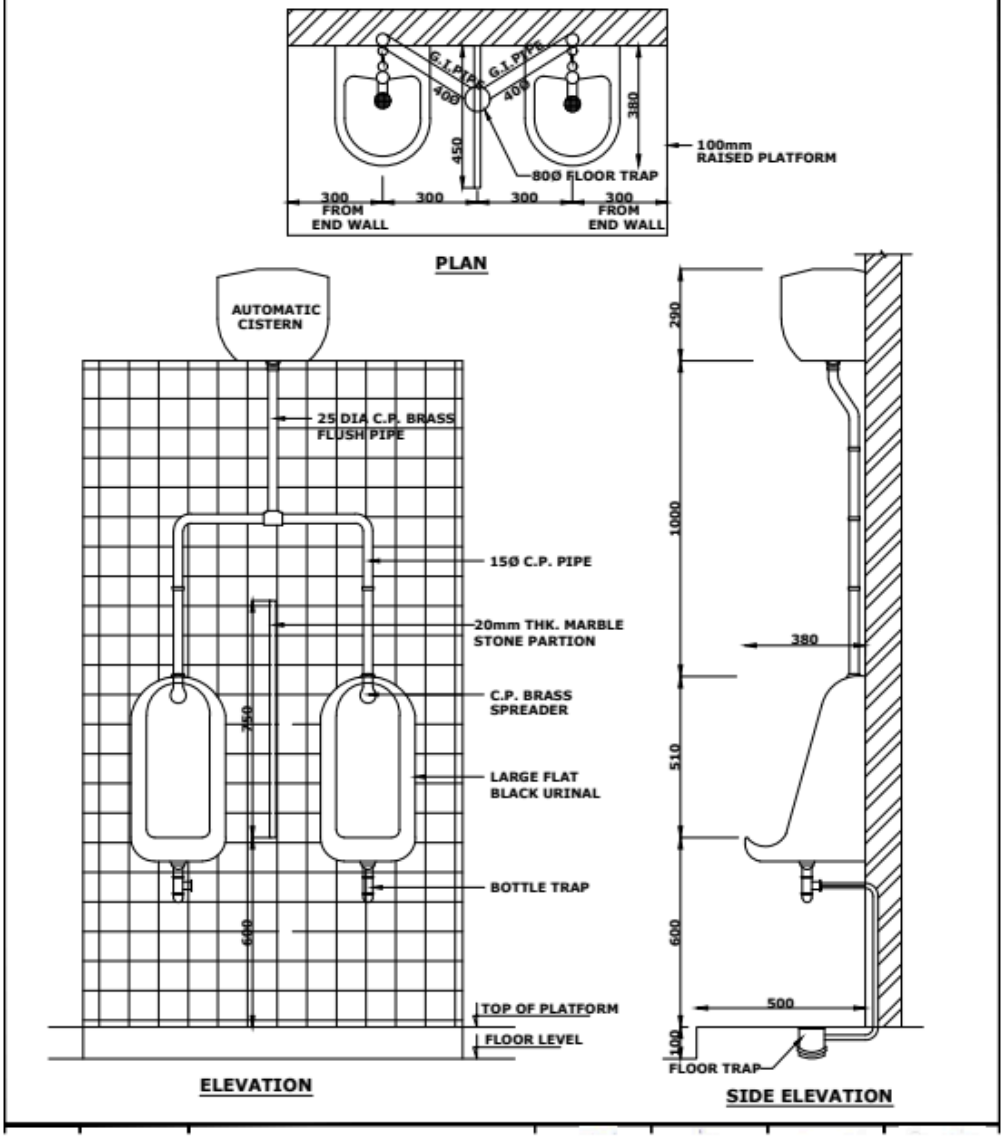
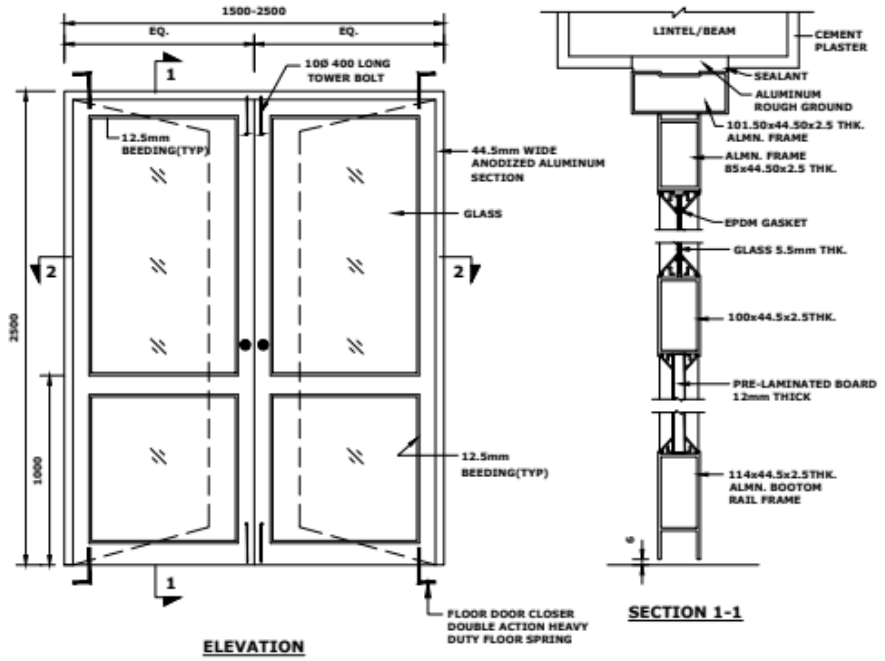
Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL OF URINAL FIXING DETAIL	STANDARD DRAWING NO.	REV.	SIZE
		\	03	A4
		SHEET NO. 1 OF 1		



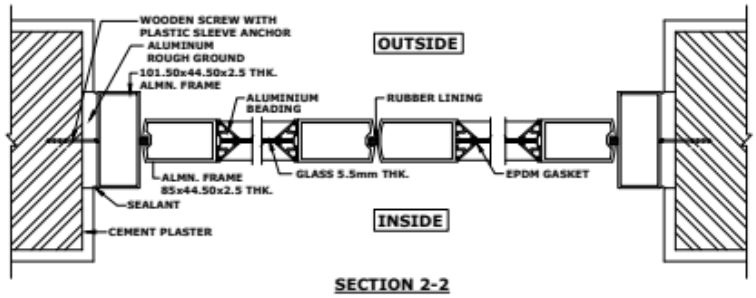
Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL OF GLAZED ALUMINUM DOOR	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 2		



ELEVATION

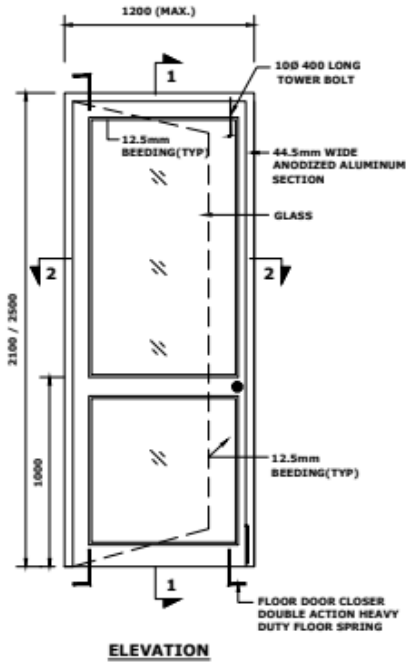
SECTION 1-1



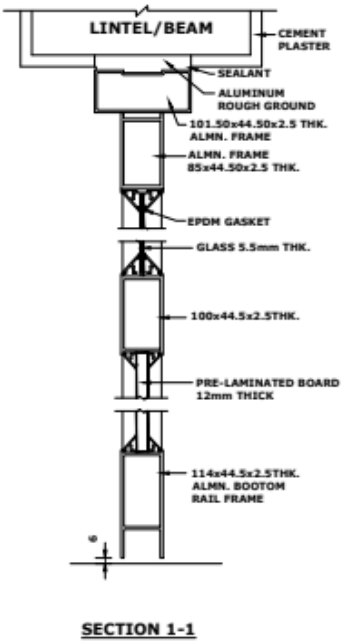
SECTION 2-2

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

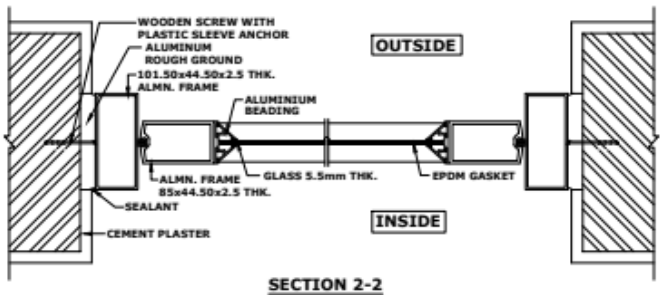
	STANDARD FOR DETAIL OF GLAZED ALUMINUM DOOR	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 2 OF 2		



ELEVATION



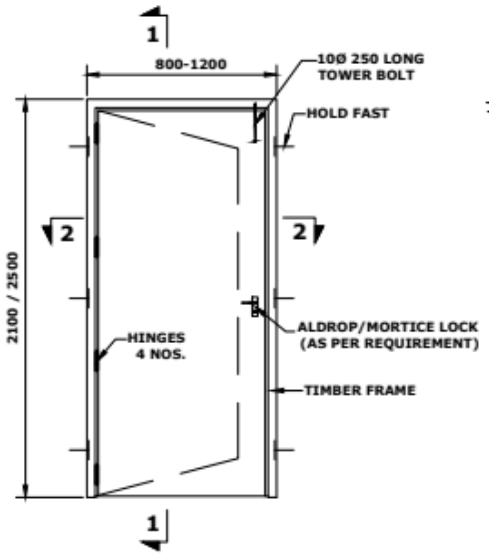
SECTION 1-1



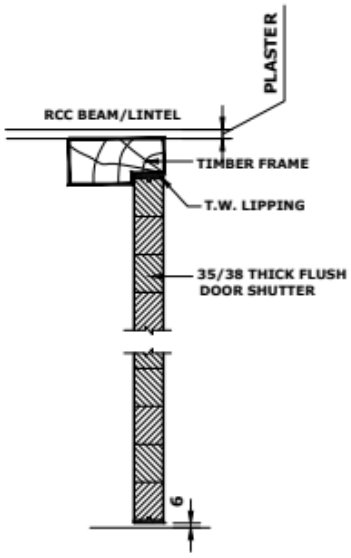
SECTION 2-2

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

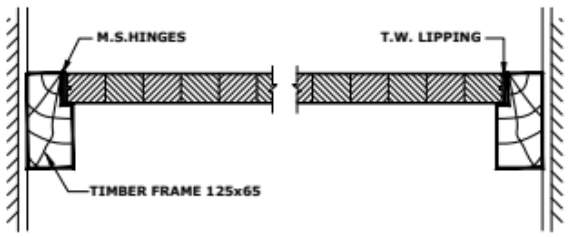
	STANDARD FOR DETAIL OF WOODEN FLUSH DOOR	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 1		



ELEVATION



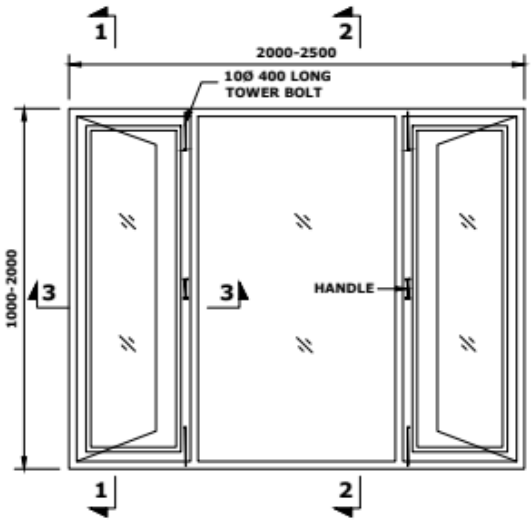
SECTION 1-1



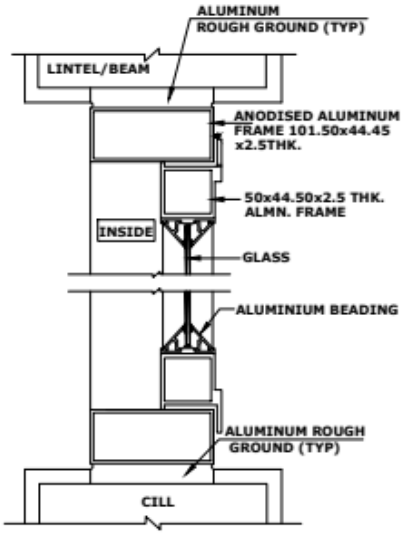
SECTION 2-2

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

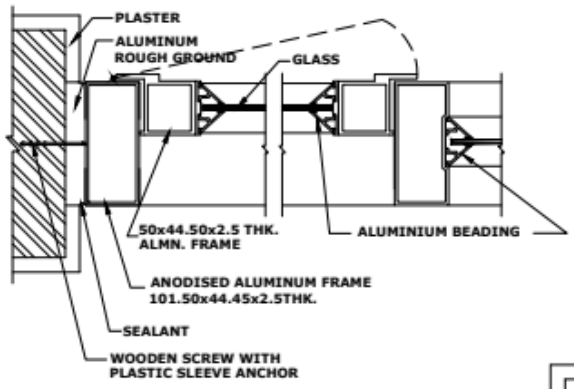
	STANDARD FOR DETAIL OF GLAZED ALUMINUM WINDOW	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 1		



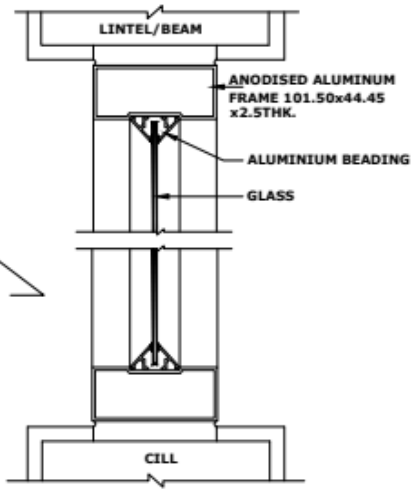
ELEVATION



SECTION 1-1



SECTION 3-3



SECTION 2-2

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

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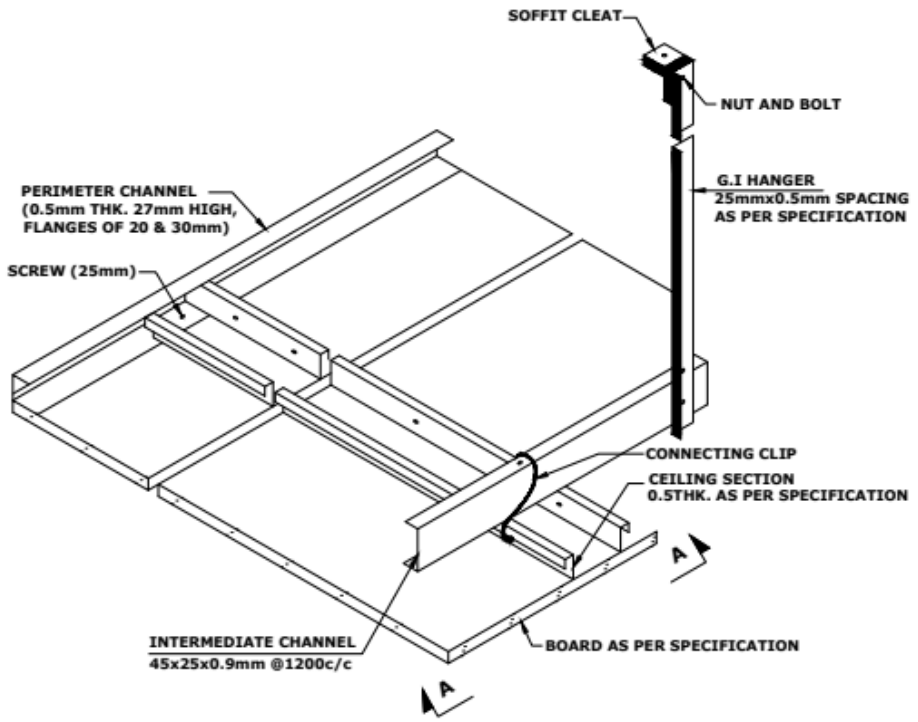
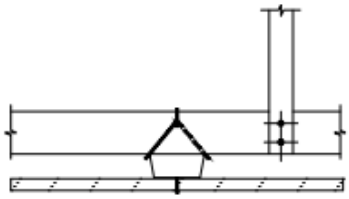
				03	A4
		SHEET NO.	1 OF 1		

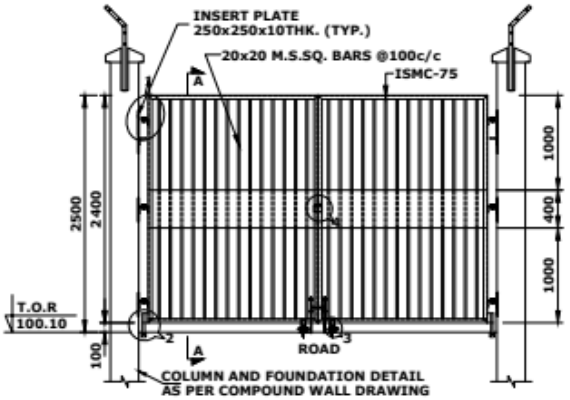




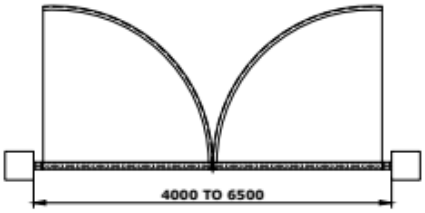
VIEW A-A

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

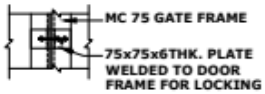
	STANDARD FOR DETAIL OF HUNG GATE	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 1 OF 4		



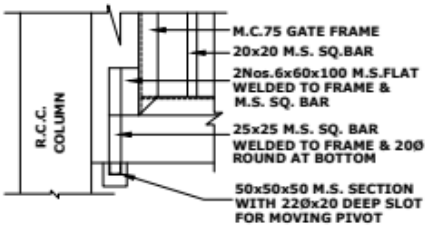
ELEVATION



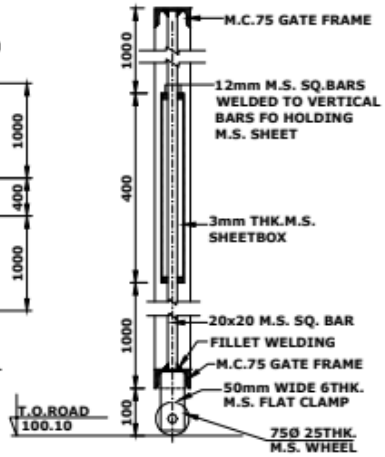
PLAN



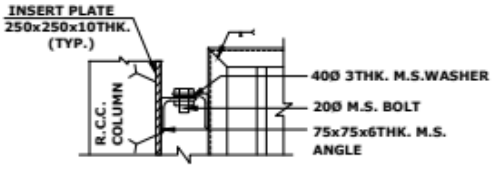
DETAIL AT 4



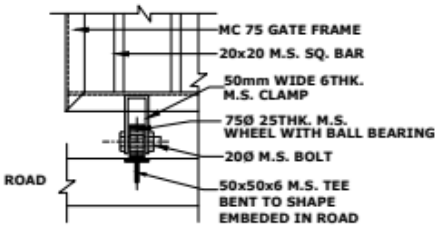
DETAIL AT 2



SECTION A-A



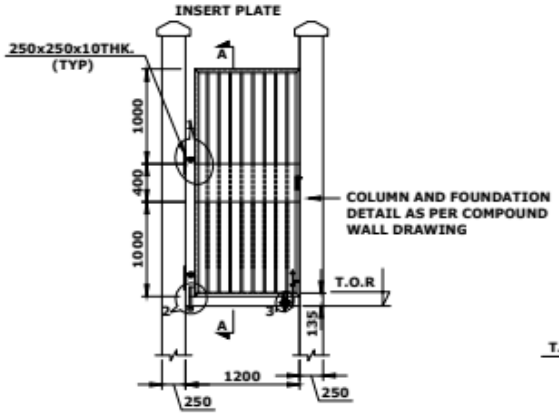
DETAIL AT 1



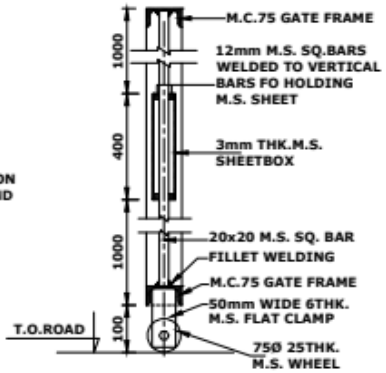
DETAIL AT 3

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

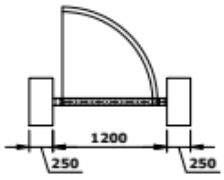
	STANDARD FOR DETAIL OF HUNG GATE	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	2 OF 4		



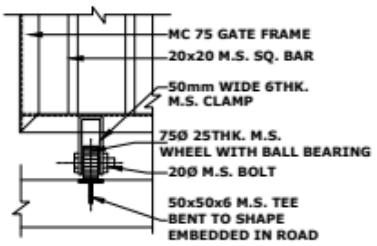
ELEVATION



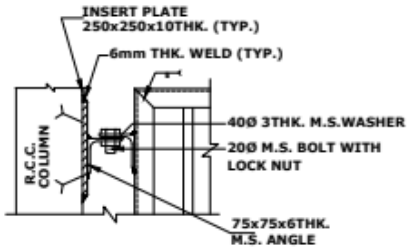
SECTION A-A



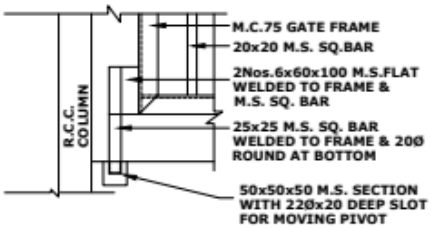
PLAN



DETAIL AT 3



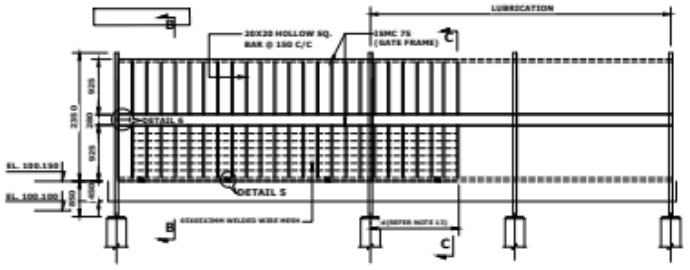
DETAIL AT 1



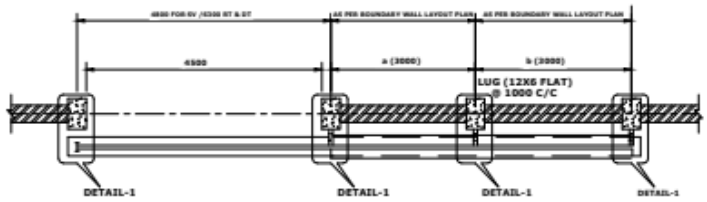
DETAIL AT 2

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

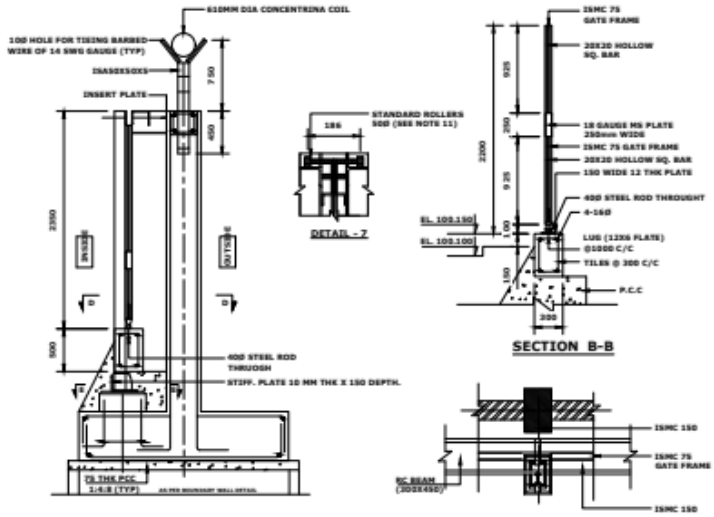
	STANDARD FOR DETAIL OF HUNG GATE	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 3 OF 4		



ELEVATION OF SLIDING GATE



PLAN OF SLIDING GATE



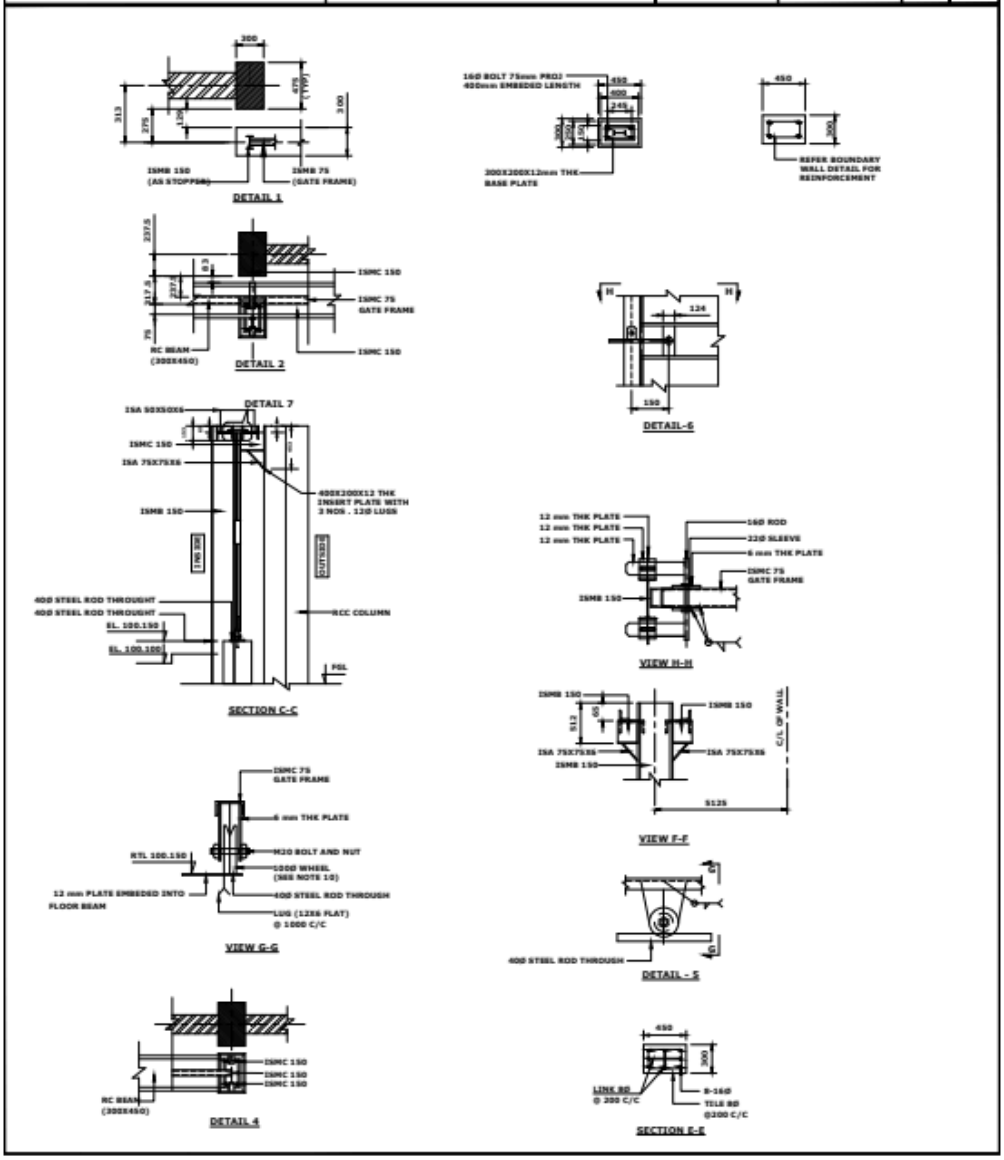
SECTION A-A

DETAIL 3

CONTINUED ON SHEET 4

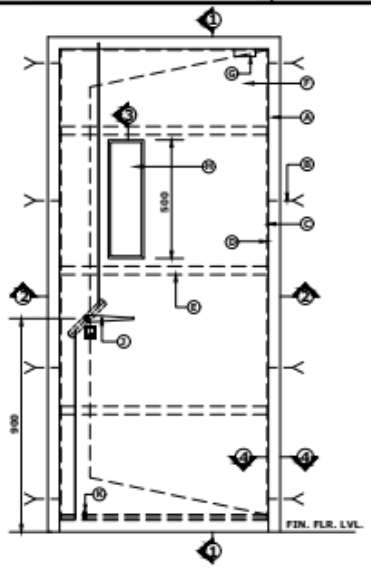
Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL OF HUNG GATE	STANDARD DRAWING NO.	REV.	SIZE
			03	A4
		SHEET NO. 4 OF 4		

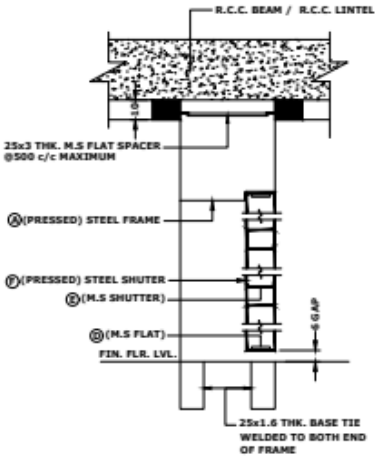


Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

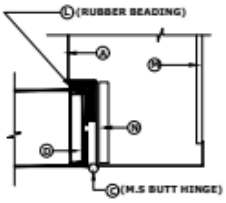
	STANDARD FOR DETAIL OF STEEL DOOR (PRESSED STEEL) SINGLE SHUTTER	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 2		



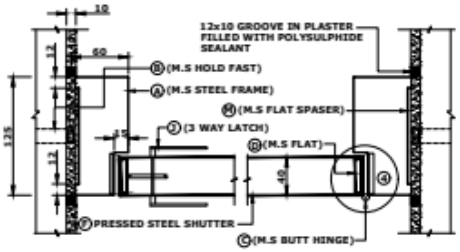
ELEVATION



SECTION 1-1



SECTION 4-4



SECTIONAL PLAN 2-2

LEGEND:-

(A) 18 GAUGE PRESSED STEEL FRAME FINISHED WITH SYNTHETIC ENAMEL PAINT / ELECTROSTATIC. POWER COATING OVER RED-OXIDE ZINC CHROMATE PRIMER AS PER TENDER ITEMS

(B) M.S. HOLDFAST 300x25x6 THK. @MAXIMUM 600 C/C WELDED TO FRAME SPACER (M.)

(C) 150 LONG M.S. BUTT HINGE @MAXIMUM 600C/C SCREWED TO FRAME AND SHUTTER.

(D) 6 THK. M.S. FLAT CONTINUOUS ALONG PERIMETER OF SHUTTER.

(E) 35 WIDE 16 GAUGE M.S. HORIZONTAL STIFFNER @500 C/C MAXIMUM.

(F) 22 GAUGE PRESSED STEEL SHUTTER (OVERALL 40 THK.)

(G) OVER HEAD HYDRAULIC DOOR CLOSER (HEAVY DUTY)

(H) VISION PANEL AS PER SPECIFICATION (OPTIONAL)

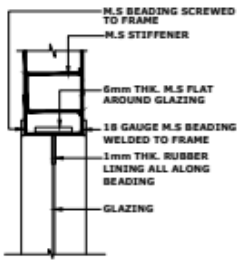
(J) 3 WAY SPRING LOADED LATCH AND LOCKING SYSTEM.

(K) SPRING LOADED PRESSURE DIE CAST ZINC ALLOY DOOR STOPPER.

(L) NEOPRENE RUBBER BEADING FIXED WITH NEOPRENE RUBBER ADHESIVE (DUNLOP S-758 OR EQUIVELENT ALONG FRAME REBATE.

(M) 50x5 THK. M.S. FLAT SPACER WELDED TO FRAME AT HOLD FAST LOCATION.

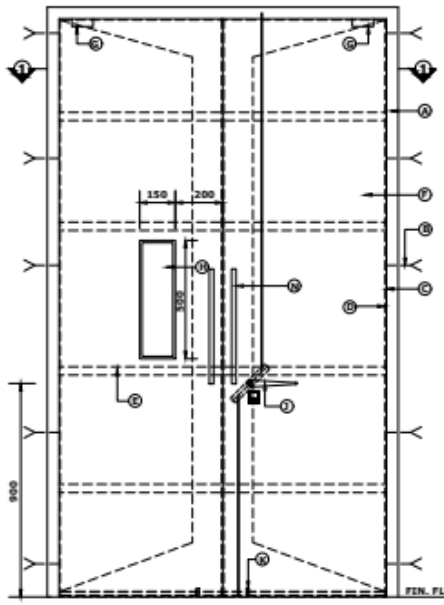
(N) 40x150x5 THK. M.S. PAD WELDED TO FRAME AT ALL HINGE & LOCK LOCATION.



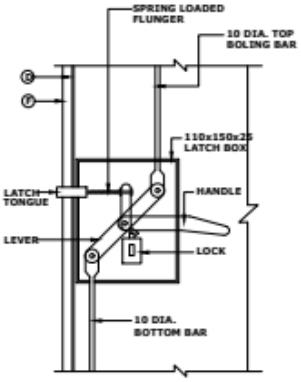
SECTION 3-3

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

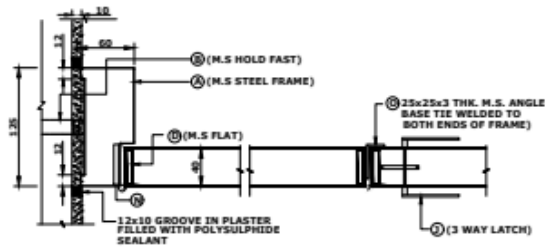
	STANDARD FOR DETAIL OF STEEL DOOR (PRESSED STEEL) SINGLE SHUTTER	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	2 OF 2		



ELEVATION



DETAIL OF 3 - WAY LATCH



SECTIONAL PLAN 1-1

LEGEND:-

(A) 18 GAUGE PRESSED STEEL FRAME FINISHED WITH SYNTHETIC ENAMEL PAINT / ELECTROSTATIC. POWER COATING OVER RED-OXIDE ZINC CHROMATE PRIMER AS PER TENDER ITEMS

(B) M.S. HOLDFAST 300x25x6 THK. @MAXIMUM 600 C/C WELDED TO FRAME SPACER (M.)

(C) 150 LONG M.S. BUTT HINGE @MAXIMUM 600C/C SCREWED TO FRAME AND SHUTTER.

(D) 6 THK. M.S. FLAT CONTINUOUS ALONG PERIMETER OF SHUTTER.

(E) 35 WIDE 16 GAUGE M.S. HORIZONTAL STIFFNER @500 C/C MAXIMUM.

(F) 22 GAUGE PRESSED STEEL SHUTTER (OVERALL 40 THK.)

(G) OVER HEAD HYDRAULIC DOOR CLOSER 9HEAVY DUTY)

(H) VISION PANEL AS PER SPECIFICATION (OPTIONAL)

(J) 3 WAY SPRING LOADED LATCH AND LOCKING SYSTEM.

(K) SPRING LOADED PRESSURE DIE CAST ZINC ALLOY DOOR STOPPER.

(L) NEOPRENE RUBBER BEADING FIXED WITH NEOPRENE RUBBER ADHESIVE (DUNLOP S-758 OR EQUIVELENT ALONG FRAME REBATE.

(M) 50x5 THK. M.S. FLAT SPACER WELDED TO FRAME AT HOLD FAST LOCATION.

(N) PRESSURE DIE CAST ZINC ALLOY DOOR HANDLE 12 DIA. 300mm LONG.

(O) 25x45x3 THK. M.S. ANGLE (VERTICAL) WELDED TO ONE SHUTTER FOR BEADING AT MEETING POINT.

(P) 40x150x5 THK. M.S. PAD PLATE WELDED AT ALL HINGES AND LOCK LOCATIONS.

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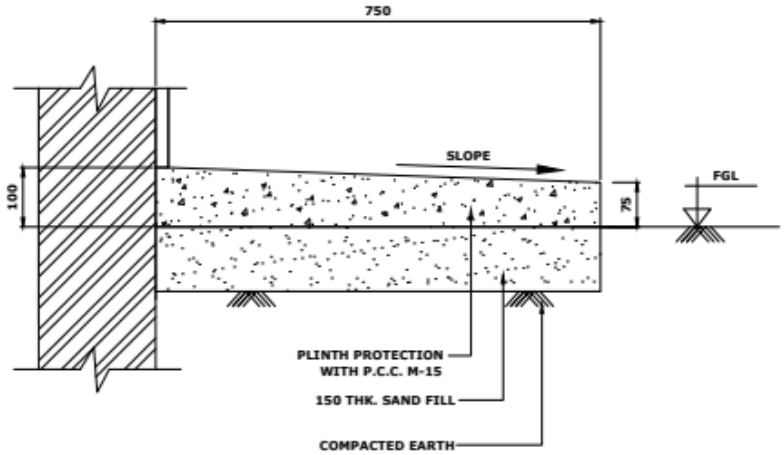
Date: 2026.02.13 19:41:32

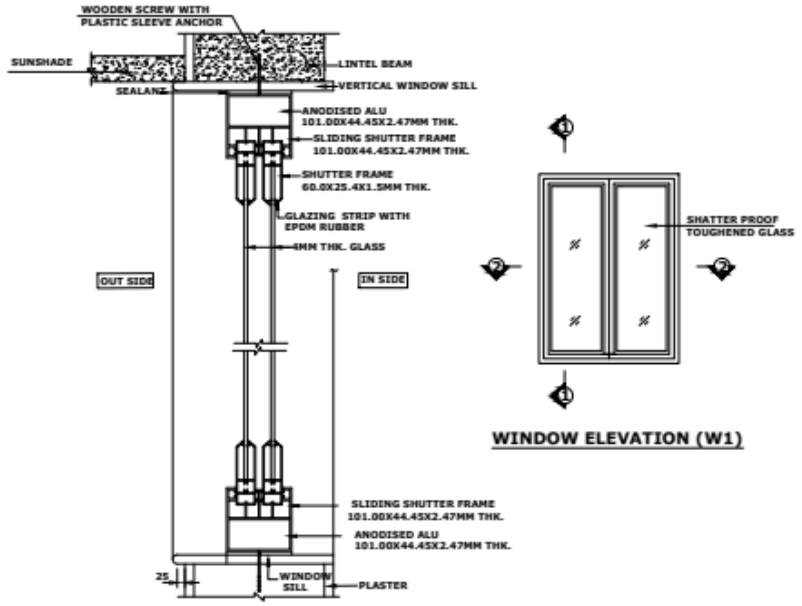
	STANDARD FOR DETAIL OF TYPICAL PLINTH PROTECTION DETAIL	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 1		



TYP. PLINTH PROTECTION DETAIL

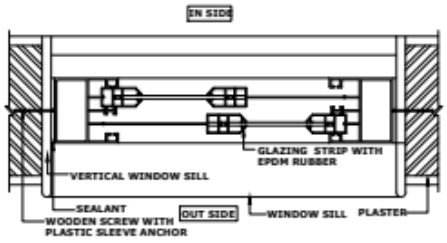
Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL OF ALUMINUM SLIDING WINDOW	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 1		



WINDOW ELEVATION (W1)

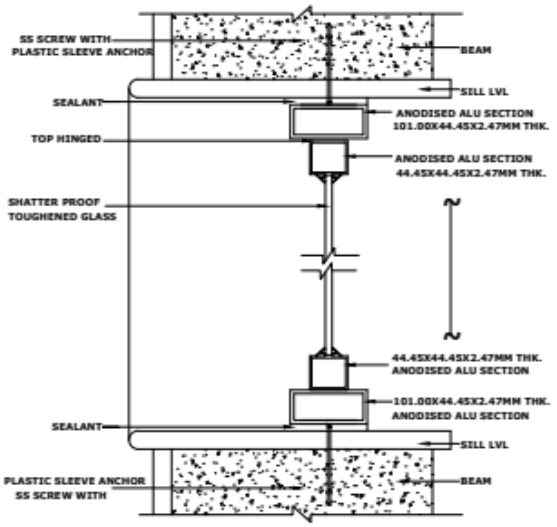
SECTION 1-1



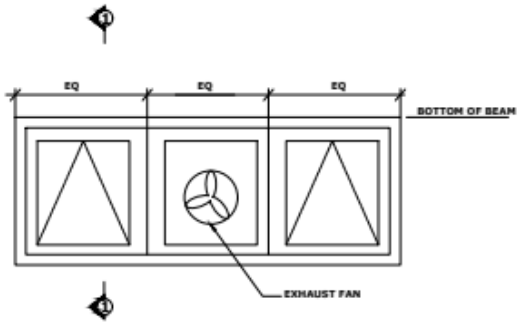
SECTION 2-2
DOUBLE PANEL ALUMINIUM WINDOW

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

	STANDARD FOR DETAIL OF ALUMINUM VENTILATOR	STANDARD DRAWING NO.		REV.	SIZE
				03	A4
		SHEET NO.	1 OF 1		

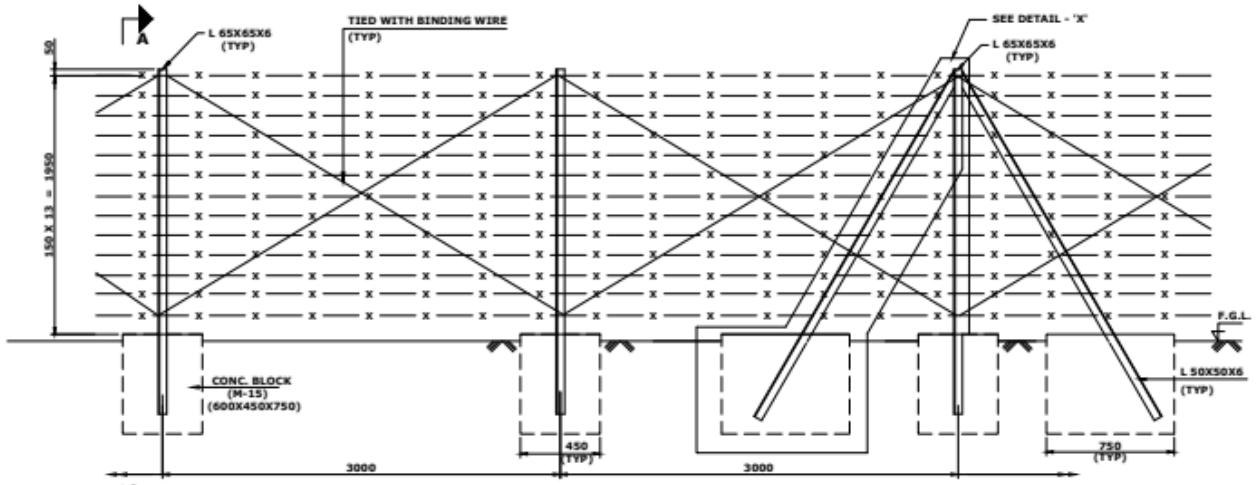


SECTION 1-1

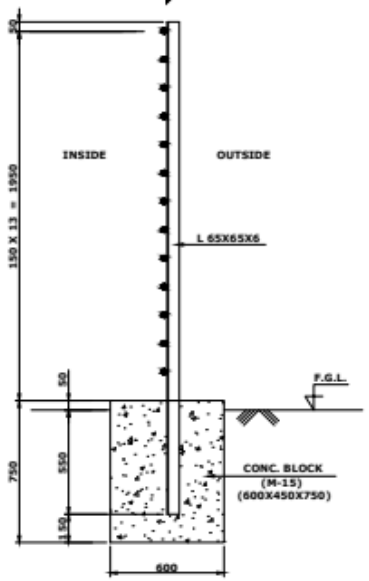


VENTILATOR ELEVATION

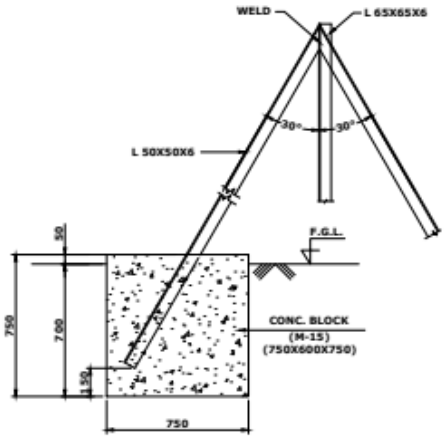
Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32



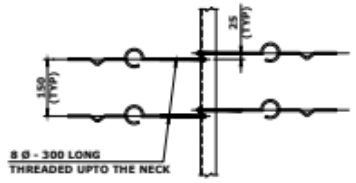
BARBED WIRE FENCE
(OUTSIDE)



SCETION ELEVATION A - A



DETAIL - X



FIXING DETAIL OF STRAINING BOLT WITH POST

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. THE GALVANIZED STEEL BARBED WIRE DESIGNATED AS STEEL BARBED WIRE A-1 TO IS:278 SHALL HAVE LINE WIRE OF Ø2.5MM,POINT WIRE OF Ø 20MM & MINIMUM WEIGHT OF COMPLETE BARBED WIRE SHALL BE 108gm/m WITH 75mm DISTANCE BETWEEN TWO BARBED WIRES.
3. LINE POST SHALL BE PLACED AT 3.0M C/C.
4. STRUT SHALL BE PROVIDED AT EVERY 15TH. POST OF BOTH SIDE & END POST ON ONE SIDE.
5. STRAINING BOLTS SHALL BE PROVIDED AT THE END POST & AT PLACES AS DIRECTED BE ENGINEER INCHARGE.
6. EXPOSED FOUNDATION BLOCK AT GROUT LEVEL SHALL BE FINISHED SMOOTH IN CEMENT MORTAR 1:6.
7. GALVANIZED BARBED WIRE SHALL BE TIED TO THE ANGLE IRON POST EITHER WITH WELDED M.S NIBS OR WITH G.I WIRE THROUGH HOLES IN THE POST.

STANDARD FOR DETAIL OF BARBED WIRE FENCING (WITH ANGLE IRON POST)

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32 IST

STANDARD DRAWINGS

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

	GENERAL NOTES-LIGHTING	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		

GENERAL NOTES:

1. ENTIRE ELECTRICAL INSTALLATION SHALL BE CARRIED OUT STRICTLY IN ACCORDANCE WITH THE ELECTRICALLY RULES, OISD REGULATION ISI CODES, FIRE INSURANCE AND OTHER APPLICABLE CODES AND REGULATIONS.
2. EXCEPT AS SPECIFICALLY APPROVED BY THE CLIENT/CONSULTANT AT SITE INSTALLATION OF LIGHTING FITTING SHALL BE TAKEN ONLY AFTER ALL MAJOR SERVICE SUCH AS EQUIPMENT ERECTION, PIPING ETC. IN THAT PARTICULAR AREA HAVE BEEN COMPLETED.
3. ALL CABLES FROM LIGHTING PANEL TO LIGHTING FITTING SHALL BE IDENTIFIED WITH STAINLESS STEEL STRIP TAGS GIVING CIRCUIT REFERENCE NUMBER.
4. WIRING TO LIGHTING FITTING INSIDE PLANT AREA SHALL BE CARRIED OUT BY NEANS OF 3c x 2.5 SQ. MM YWY CABLES. FOR EARTHING OF LIGHTING FITTING AND JUNCTION BOX THIRD CORE SHALL BE USED.
5. GENERALLY IN PLANT AREA, THE LIGHTING FITTING SHALL BE DIRECTLY CONTROLLED FROM NINIATURE CIRCUIT BREAKERS PROVIDED IN THE LIGHTING DISTRIBUTION BOARD. HOWEVER, LOCAL CONTROL SWITCHES SHALL BE PROVIDED WHEREVER NECESSARY. i.e. FOR CONTROLLING LIGHTING FITTINGS IN TOILET BLOCK/OFFICE/STORE ROOM/SUB-STATION/CABLE CELLAR ENTRANCE ETC.
6. EXCEPT AS NOTED, MOUNTING HEIGHT OF BOTTOM LINE OF VARIOUS EQUIPMENT FROM FINISHED FLOOR LEVEL SHALL BE AS FOLLOWS:
   - A) SUB-LIGHTING DISTRIBUTION BOARD : 1200mm
   - B) LIGHTING CONTROL SWITCHES : 1200mm
   - C) RECEPTACLE WITH SWITCH : 800mm
7. EXCEPT AS SPECIFIED, CABLES FOR STREET LIGHTING SHALL BE DIRECTLY BURIED IN GROUND OR ROUTED IN CABLE TRENCH/DUCTS AS THE CASE MAY BE.
8. LIGHTING CABLES SHALL BE TAKEN THROUGH HIME PIPE BURIED IN GROUND AT SUITABLE DEPTH AT ALL ROAD CROSSING.
9. SINGLE PHASE SWITCHED SOCKET OUTLETS INCLUDING 10A & ABOVE SHALL BE FED AND CONTROLLED FROM PANEL (PP).
10. LIGHTING WIRING IN CONDUIT SHALL BE CARRIED OUT BY USING 19/25mm DIA. HEAVY GAUGE STEEL RIGID CONDUIT AND COPPER CONDUCTOR PVC FLEXIBLE WIRE SHALL BE USED :
    - A) LIGHTING FITTING & 6/16 AMPS. COMMERCIAL TYPE SWITCHED : 2.5 SQ.MM
    - B) 16/32A METAL CLAD INDUSTRIAL SWITCH SOCKET OUTLETS : 4.0 SQ.MM
    - C) FOLLOWING COLOUR WIRE SHALL BE USED :
      1. FOR 'R' PHASE : RED COLOUR COPPER CONDUCTOR PVC FLEXIBLE WIRE
      2. FOR 'Y' PHASE : YELLOW COLOUR COPPER CONDUCTOR PVC FLEXIBLE WIRE
      3. FOR 'B' PHASE : BLUE COLOUR COPPER CONDUCTOR PVC FLEXIBLE WIRE
      4. FOR 'N' PHASE : BLACK COLOUR COPPER CONDUCTOR PVC FLEXIBLE WIRE
      5. FOR EARTH : GREEN COLOUR 1.5 SQ. MM COPPER CONDUCTOR PVC FLEXIBLE WIRE
12. ALL SITE FABRICATED STEEL ASSEMBLIES SHALL BE PAINTED WITH TWO COATS OF ANTI-CORROSIVE PAINT AND TWO COATS OF EPOXY PAINTS.
13. ALL HARDWARE SHALL BE OF STAINLESS STEEL.

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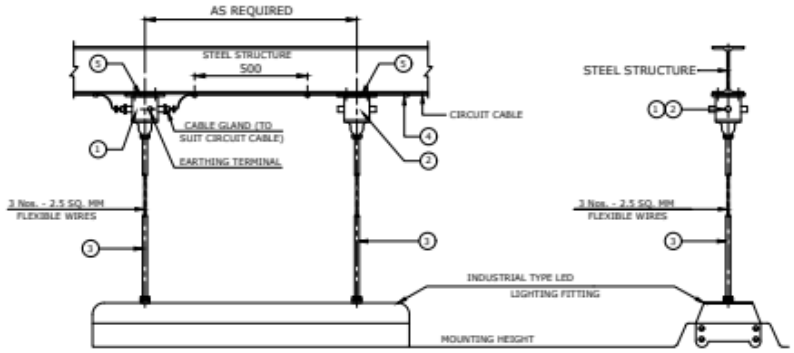
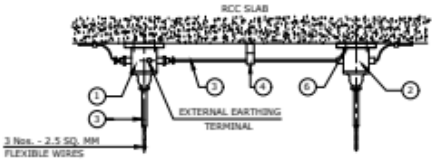
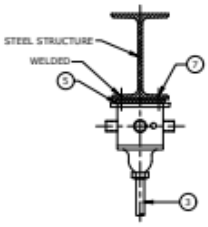
	TYPICAL SUSPENSIONMOUNTING DETAIL OF INDUSTRIAL LED LIGHTING FITTING	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



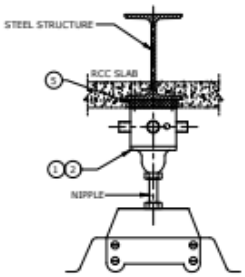
TYPICAL MOUNTING ARRANGEMENT OF LED LIGHTING FITTING ON STRUCTURE STEEL & WIRING WITH PVC INSULATED CABLE MOUNTING TYPE : SM1



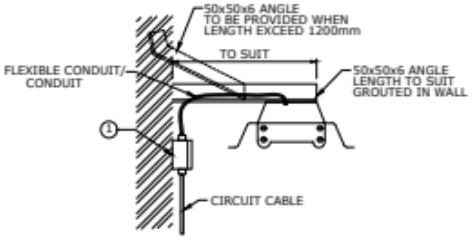
TYPICAL MOUNTING ARRANGEMENT OF LED LIGHTING FITTING ON R.C.C. SLAB & CONDUIT WIRING



TYPICAL MOUNTING DETAILS OF J.B. ON STRUCTURAL STEEL



MOUNTING TYPE : CM1



BRACKET MOUNTING ON WALL/COLUMN MTG. TYPE : BM1

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	JUNCTION BOX WITH COME COVEER, BALL & SOCKET WITH TERMINAL BLOCK.	1 NO.	
2	DUMMY JUCTION BOX WITH DOME COVER, BALL & SOCKET WITHOUT TERMINAL BLOCK.	1 NO.	
3	19mm Ø HEAVY GAUGE CONDUIT WITH BOTH END CHECK NUTS LENGTH TO SUIT MOUNTING HEIGHT (MAXIMUM LENGTH 2 Mtrs.)	2 NOS.	
4	G.I. SADDLE/CLEAT ALONG WITH SUITABLE SIZE OF FIXING SCREW TO SUIT FOR CIRCUIT CABLE/CONDUIT.	AS REQUIRED	
5	25 x 6 THK. M.S. FLAT 200mm LONG FOR JUNCTION BOX MOUNTING ON STEEL STRUCTURE.	2 NOS.	
6	COUNTER SUNK SCREW WITH RAWAL PLUG FOR RCC SLAB OR SELF TAPPING COUNTER SUNK SCREW FOR STEEL STRUCTURE.	4 NOS.	
7	SELF TAPPING SCREW WITH WASHER FOR FIXING OF JUNCTION BOX ON 25 x 6mm MS FLAT.	AS REQUIRED	

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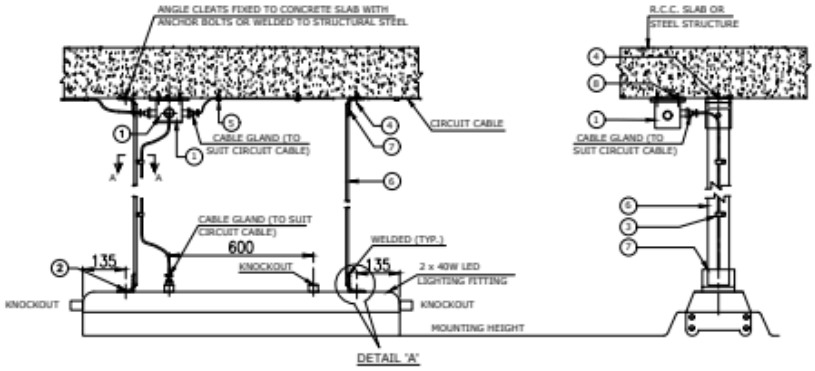
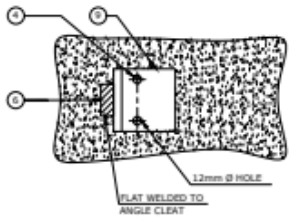
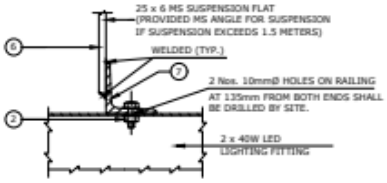
	TYPICAL SUSPENSION MOUNTING DETAILS OF INDUSTRIAL LED LIGHTING FITTING WITH SUSPENSION MORE THAN 2 Mtrs.	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



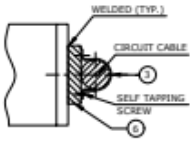
DETAIL 'A'



TYPICAL MOUNTING DETAILS



DETAIL 'A'



SECTION 'A-A'

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	4WAY-100mm DIA ROUND JUNCTION BOX WITH TERMINAL BLOCK.	1 NO.	
2	M8-40mm LONG BOLT WITH NUT AND PLAIN WASHER	2 NOS.	
3	G.I. SADDLE/CLEAT ALONG WITH SUITABLE SIZE OF FIXING SCREW & NUT TO SUET FOR CIRCUIT CABLE.	AS REQUIRED	
4	M10-68mm LONG ANCHOR STUD WITH BOLT & PLAIN WASHER	4 NOS.	
5	SADDLE/CLEAT WITH FIXING SCREW OR M8-68mm LONG STUD, NUTS & LOCK WASHERS FOR CIRCUIT CABLE	AS REQUIRED	
6	25 x 6mm THK. M.S. FLAT (LENGTH TO SUIT)	2 NOS.	
7	ISA 50 x 50 x 6 THK.-75mm LONG ANGLE CLEAT WITH 10 Ø HOLES	4 NOS.	
8	10mm Ø 35 LONG COUNTER SUNK SCREWS WITH RAWAL PLUG	2 NOS.	
9	ISA 50 x 50 x 6 THK.-150mm LONG ANGLE CLEAT WITH 2 NOS. 12 Ø HOLES	2 NOS.	

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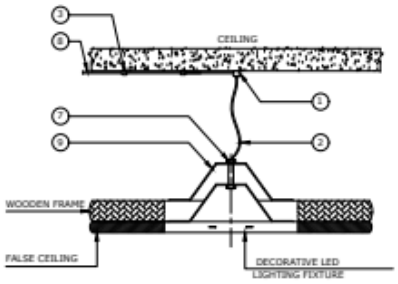
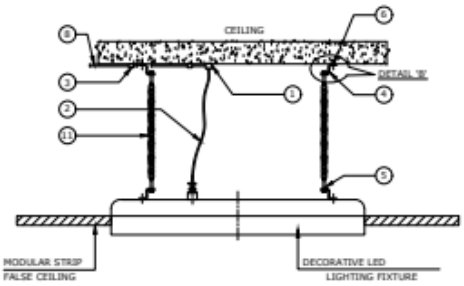
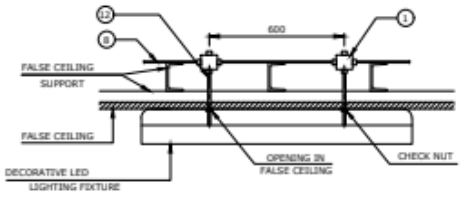
	TYPICAL DETAILS OF DECORATIVE LIGHTING FIXTURE MOUNTING RECESSED OR BELOW FALSE CEILING	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



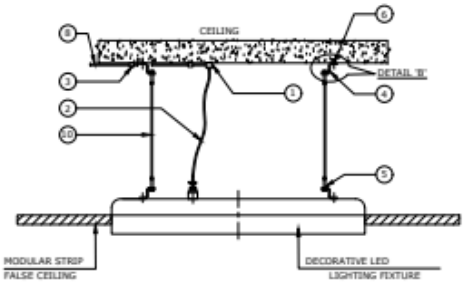
RECESSED MOUNTING FIXTURE
SUPPORTED ON WOODEN FRAME
TYPE : RM1



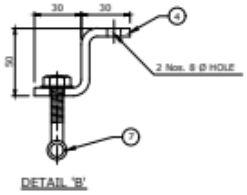
RECESSED MOUNTING FIXTURE
SUPPORTED ON CHAIN
TYPE : RM1



FIXTURE MOUNTED BELOW
FALSE CEILING
TYPE : RM2



RECESSED MOUNTING FIXTURE
SUPPORTED WITH G.I. WIRE
TYPE : RM1



DETAIL 'B'

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	JUNCTION BOX WITH DOME COVER	1 NO.	
2	19 mm DIA PVC FLEXIBLE PIPE WITH 2 Nos. PVC STRAIGHT ADAPTOR	AS REQUIRED	
3	G.I./PVC SADDLE CLEAT WITH SUITABLE SCREWS	AS REQUIRED	
4	32 x 6mm THK. 110 mm LONG M.S. FLAT BEND 'Z' SHAPE	4 NOS.	
5	M6-30mm LONG G.I. EYE BOLT & NUT WITH WASHER	4 NOS.	
6	M6-35mm LONG ANCHOR STUD WITH NUT AND WASHER	2 NOS.	
7	M6-30mm LONG BOLT WITH SWING NUT AND 2 Nos. PLAIN WASHER	2 NOS.	
8	19mm DIA CONDUIT (AS SPECIFIED)	AS REQUIRED	
9	BRACKET MADE OUT OF 25 x 3mm THK. M.S. FLAT	2 NOS.	
10	10 SWG. G.I. WIRE (LENGTH TO SUIT)	2 NOS.	
11	SUPPORTING CHAIN (LENGTH TO SUIT)	2 NOS.	
12	19mm Ø CONDUIT EITH THREAD AT BOTH END AND NUT	2 NOS.	

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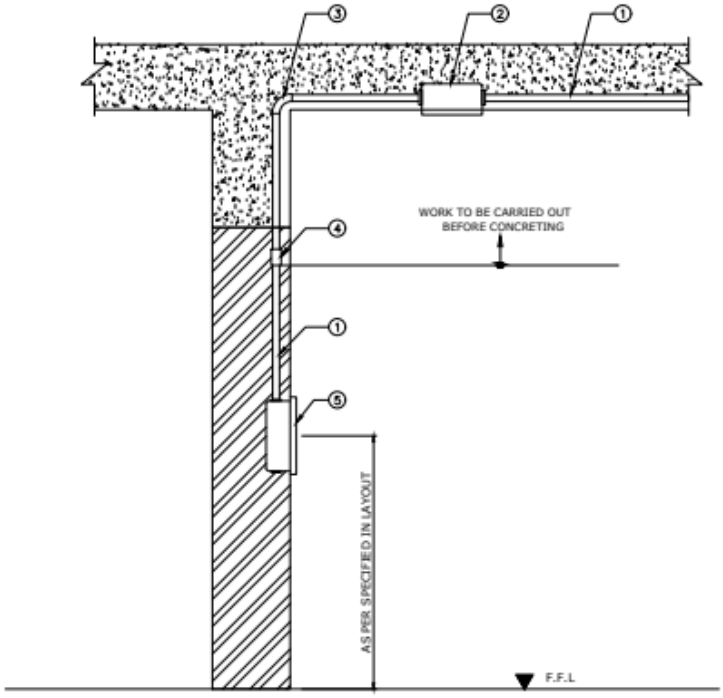
Date: 2026.02.13 19:41:32

	TYPICAL DETAIL OF CONCEALED CONDUIT WIRING	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



TYPICAL INSTALLATION DETAIL OF CONDUIT ENTERY
FROM R.C.C SLAB INTO THE BRICK WALL

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	PVC/G.I. CONDUIT SIZE AS REQUIRED	AS REQUIRED	
2	WIRE PULL BOX WITH FLAT COVER	AS REQUIRED	
3	PVC/G.I. 90° BEND SIZE AS REQUIRED	AS REQUIRED	
4	PVC/G.I. COUPLING SIZE AS REQUIRED	AS REQUIRED	
5	SWITCH BOARD, SOCKET OUTLET ETC.	AS REQUIRED	

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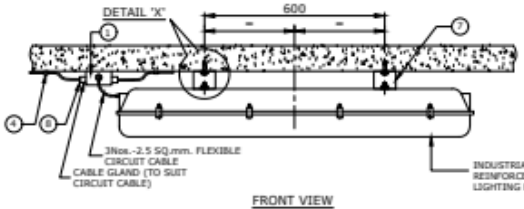
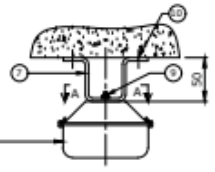
Date: 2026.02.13 19:41:32

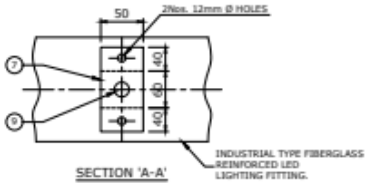
	TYPICAL CEILING MOUNTING DETAILS OF INDUSTRIAL TYPE FIBERGLASS REINFORCED LED LIGHTING FITTING	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



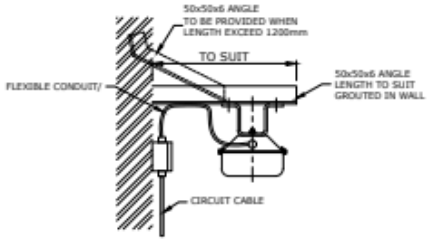
FRONT VIEW
MOUNTING TYPE : CM3



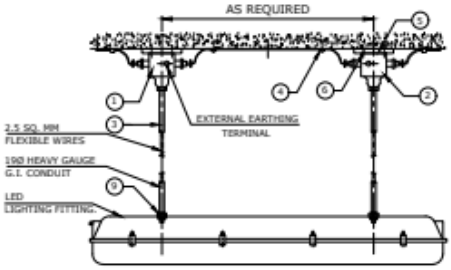
END VIEW



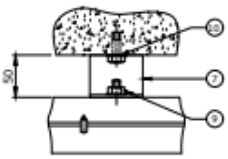
SECTION 'A-A'



BRACKET MOUNTING ON
WALL/COLUMN MTG. TYPE : BM3



FRONT VIEW
MOUNTING TYPE : SM3



DETAIL 'X'

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	4WAY-100mm DIA ROUND JUNCTION BOX WITH TERMINAL BLOCK.	1 NO.	
2	DUMMY JUCTION BOX WITH DOME COVER, BALL & SOCKET WITHOUT TERMINAL BLOCK.	1 NO.	
3	19mm Ø HEAVY GAUGE CONDUIT WITH BOTH END CHECK NUTS LENGTH TO SUIT MOUNTING HEIGHT (MAXIMUM LENGTH 2 Mtrs.)	2 NOS.	
4	G.I. SADDLE/CLEAT ALONG WITH SUITABLE SIZE OF FIXING SCREW TO SUIT FOR CIRCUIT CABLE/CONDUIT.	AS REQUIRED	
5	25 x 6 THK. M.S. FLAT 200mm LONG FOR JUNCTION BOX MOUNTING ON SLAB/STEEL STRUCTURE.	2 NOS.	
6	COUNTER SUNK SCREW WITH RAWAL PLUG FOR RCC SLAB OR SELF TAPPING COUNTER SUNK SCREW FOR STEEL STRUCTURE.	4 NOS.	
7	240 x 50 x 6 THK. M.S. BRACKET FOR MOUNTING OF LIGHTING FITTING	2 NOS.	
8	M10-40mm LONG SCREW WITH RAWAL PLUG FOR MOUNTING OF M.S. BRACKET TO CEILING	4 NOS.	
9	M6-40mm LONG BOLT WITH NUT & WASHER	2 NOS.	
10	M10-68mm ANCHOR BOLT FOR MOUNTING OF JUNCTION BOX TO CEILING	2 NOS.	
11	M8-25mm G.I. BOLT WITH 2 Nos. PLAIN AND 1 No. SPRING WASHER TO ANGLE	2 NOS.	

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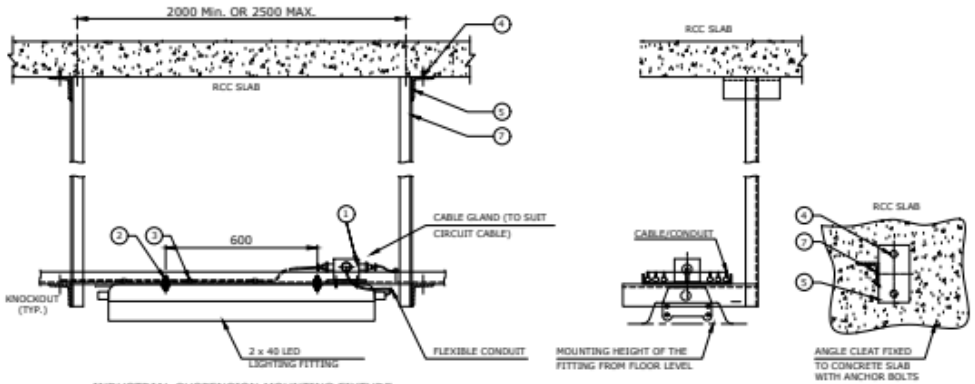
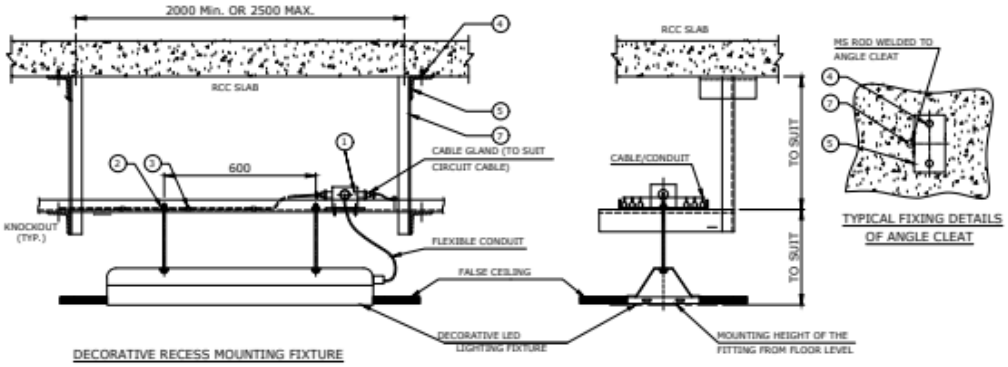
	TYPICAL MOUNTING DETAILS OF INDTL./ RECESS MTG. LED LIGHTING FITTING BELOW PERFORATED LIGHTING CABLE TRAY	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		

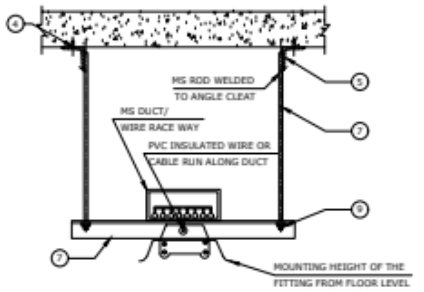


INDUSTRIAL SUSPENSION MOUNTING FIXTURE
MOUNTING TYPE : SM4



DECORATIVE RECESS MOUNTING FIXTURE
MOUNTING TYPE : RM4

TYPICAL FIXING DETAILS OF ANGLE CLEAT



NOTES:

1. ALL FABRICATED STEEL STRUCTURE SHALL BE PAINTED WITH TWO COATS OF ANTI CORROSIVE PAINT AND TWO COATS OF EPOXY PAINT OF APPROVED SHED.
2. ALL HARDWARE SHALL BE STAINLESS STEEL.

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	4WAY-100mm DIA ROUND JUNCTION BOX WITH TERMINAL BLOCK.	1 NO.	
2	19mm DIA CHECK NUT	4 NOS.	
3	G.I. SADDLE ALONG WITH SUITABLE SIZE OF FIXING SCREW & NUT TO SUIT FOR CIRCUIT CABLE/CONDUIT.	AS REQUIRED	
4	M10x68mm LONG ANCHOR STUD WITH BOLT & PLAIN WASHER	AS REQUIRED	
5	ISA 50x6mm THK. 100mm LONG ANGLE CLEAT.	AS REQUIRED	
6	150mm OR 300mm WIDE PERFORATED CABLE TRAY OR DUCT/ WIRE RACE WAY CHANNEL.	AS REQUIRED	
7	ISA 25 x 25 x 6mm THK. ANGLE WELDED TO ANGLE OR 8mm DIA MS ROD WITH THREAD AT BOTTOM END	AS REQUIRED	
8	19mm DIA G.I. PIPE/CONDUIT	AS REQUIRED	
9	NUT SUITABLE FOR M8 BOLT WITH PLAIN WASHER	AS REQUIRED	

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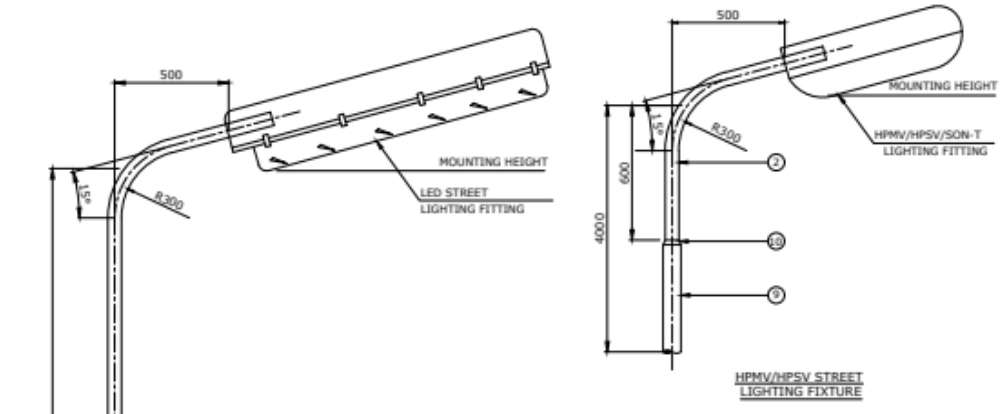
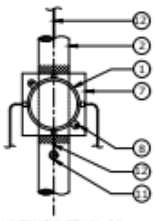
	TYPICAL HANDRAIL PIPE MOUNTING DETAILS OF LED HPMV/HPSV LIGHTING FITTING ON PLATEFORM	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		

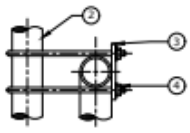


MOUNTING TYPE - PM1

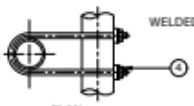
HPMV/HPSV STREET
LIGHTING FIXTURE



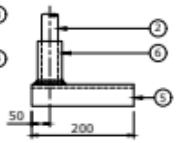
MOUNTING DETAIL OF
JUNCTION BOX
DETAIL 'Y'



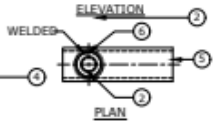
ELEVATION



PLAN
DETAIL-'X'



ELEVATION



PLAN
PIPE SUPPORT
BOTTOM BRACKET DETAILS
DETAIL-'Z'

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	4WAY-INDUSTRIAL JUNCTION BOX WITH TERMINAL BLOCK.	1 NO.	
2	40mm DIA G.I. PIPE (CLASS HEAVY) WITH ONE SIDE 300mm RADIUS 15° BEND & OTHER END THREADED	1 NO.	
3	25 x 6mm THK. M.S. FLAT 150mm LONG WITH 2Nos. 12 Ø HOLE	4 NOS.	
4	10mm Ø 'U' BOLT WITH BOTH END THREADED WITH NUTS & PLAIN WASHERS SUITABLE FOR 40 mm Ø GI PIPE	4 NOS.	
5	ISMC-100 x 50 x 300mm LONG FOR SUPPORT TO PIPE	1 NO.	
6	G.I. PIPE COUPLING TO SUIT 40mm Ø G.I. PIPE, COUPLING WELDED TO ISMC-100 x 50	1 NO.	
7	200x200x6mm THK. M.S. PLATE WITH SUITABLE SIZE OF HOLES FOR MOUNTING OF JUNCTION BOX	1 NO.	
8	40mm LONG BOLT WITH NUT & PLAIN WASHER FOR FIXING OF JUNCTION BOX TO MS PLATE	2 NOS.	
9	65mm Ø G.I. PIPE (CLASS HEAVY) LENGTH TO SUIT MOUNTING HEIGHT	1 NO.	
10	65 x 10mm G.I. REDUCER	1 NO.	
11	RURDER GROMMET	1 NO.	
12	2.5 Sq. mm PVC COPPER CONDUCTOR FLEXIBLE CABLE	AS REQUIRED	

NOTES:

1. MOUNTING HEIGHT SHALL NOT EXCEED 4 MTRS. FROM THE TOP OF PLATFORM.
2. LIGHT FITTING SHALL BE WITH ONE EXTERNAL EARTH CONNECTION AND USE THERD CORE OR PVC FLEXIBLE CABLE FOR INTERNAL EARTHING. EARTH JUNCTION BOX WITH TWO EXTERNAL EARTH CONDUCTORS.
3. CABLE GLANDS USED FOR TERMINATION OF FLEXIBLE CABLE SHALL BE DOUBLE SEAL WITH CONE GRIP TYPE.
4. PLUG ALL UNUSED ENTRIES OF LIGHTING FITTING AND JUNCTION BOX WITH THREADED STOPPING PLUGS.
5. WHEN MOUNTING HEIGHT IS MORE THEN 2.25M THEN 65 Ø G.I. PIPE WITH REDUCER SHALL BE USED.

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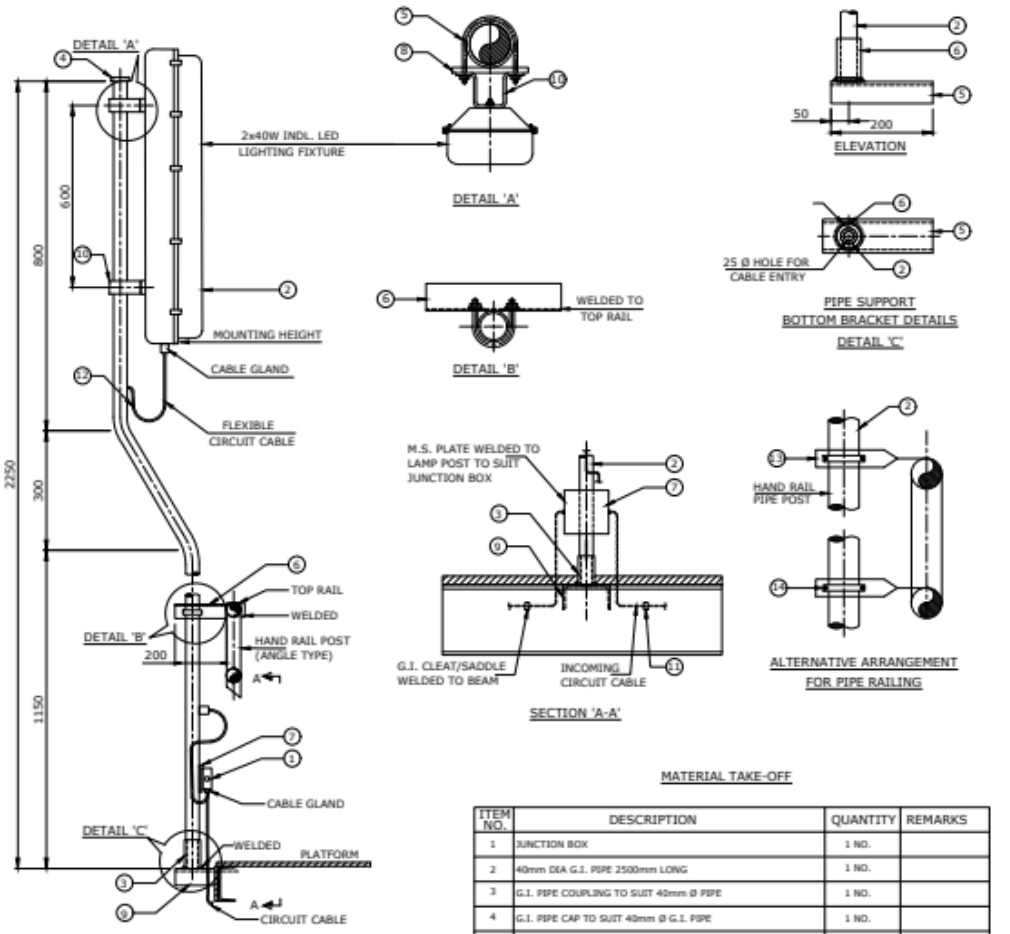
	TYPICAL MOUNTING DETAILS OF LED LIGHTING FITTING (WALL/COLUMN MOUNTED)	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



MOUNTING TYPE - PM2

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	JUNCTION BOX	1 NO.	
2	40mm DIA G.I. PIPE 2500mm LONG	1 NO.	
3	G.I. PIPE COUPLING TO SUIT 40mm Ø PIPE	1 NO.	
4	G.I. PIPE CAP TO SUIT 40mm Ø G.I. PIPE	1 NO.	
5	M10 'U' BOLT TO SUIT 40NB G.I. PIPE THREADED AT BOTH THE ENDS WITH NUTS AND WASHERS	2 EACH	
6	50 x 50 x 300mm GALVANIZED MILD STEEL ANGLE	1 NO.	
7	150 Sq. x 6mm THK. M.S. PLATE	1 EACH	
8	50 x 6mm M.S. FLAT - 100mm LONG	1 NO.	
9	ISMC-100 x 50 x 6mm THK. -200mm LONG	AS REQUIRED	
10	BRACKET TO BE MADE OUT OF 25 x 6mm M.S. FLAT	2 NOS.	
11	G.I. CLEAT, SADDLE WITH SUITABLE SIZE SCREW	AS REQUIRED	
12	RUBBER GROMMET	2 NOS.	
13	75 x 10mm THK. G.I. FLAT - 300mm LONG	2 NOS.	
14	G.I. SADDLE/CLEAT TO SUIT 40mm Ø G.I. PIPE WITH G.I. SCREWS AND WASHERS	AS REQUIRED	

NOTES:

1. ALL NUTS, BOLTS & WASHERS SHALL BE GALVANISED OR ZINK PASSIVATED.
2. ALL SHARP EDGES AND BURR SHALL BE REMOVED.
3. SITE FABRICATION STEEL SHALL BE PAINTED IN ACCORDANCE WITH THE CONTRACT SPECIFICATION.
4. ALL DUMMIES TO GALVANISED FINISHED SHALL BE CLEANED AND APPLIED WITH 2 COATS OF ANTI-CORROSIVE PAINT AND ZINC RICH PAINT.
5. WHERE POSSIBLE LOCATE LAMP POST ADJACENT TO HANDRAIL POST.

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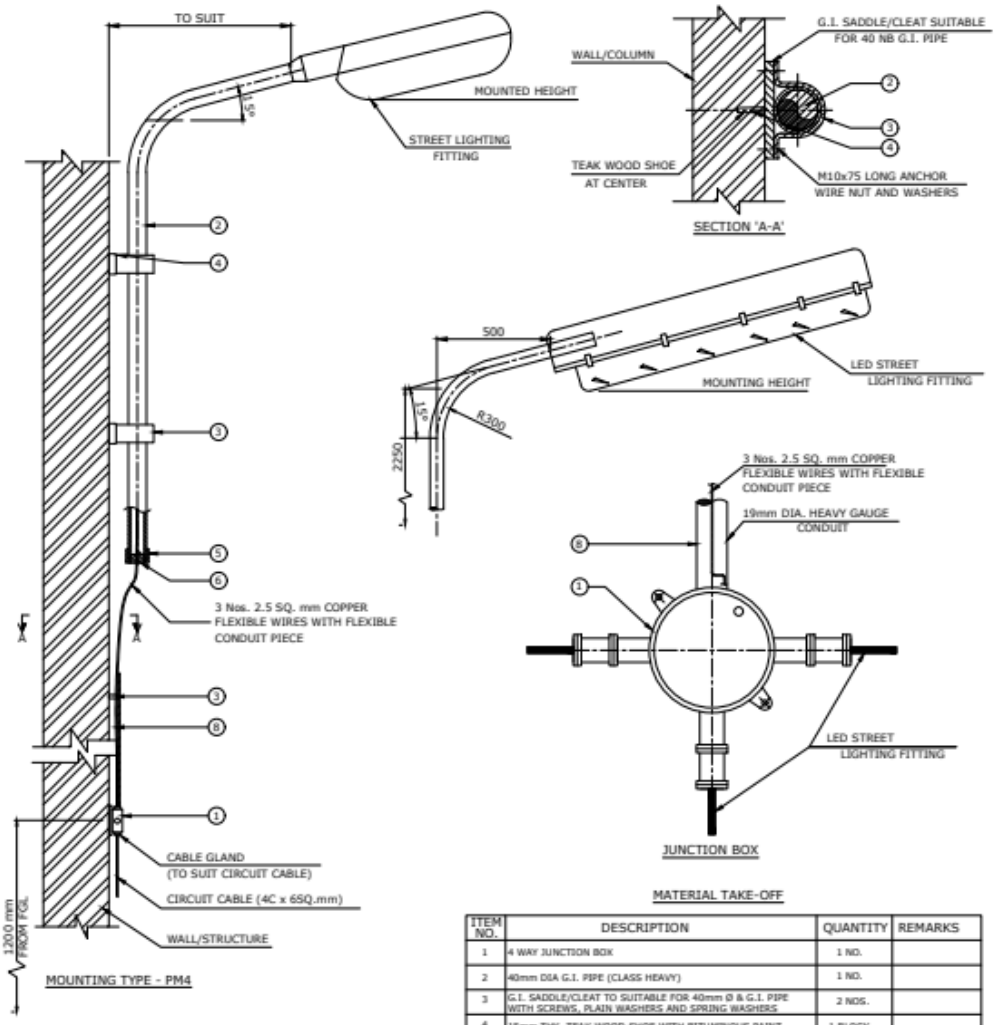
	TYPICAL MOUNTING DETAILS OF STREET LIGHTING FITTING (WALL/COLUMN MOUNTED)	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	4 WAY JUNCTION BOX	1 NO.	
2	40mm DIA G.I. PIPE (CLASS HEAVY)	1 NO.	
3	G.I. SADDLE/CLEAT TO SUITABLE FOR 40mm Ø & G.I. PIPE WITH SCREWS, PLAIN WASHERS AND SPRING WASHERS	2 NOS.	
4	15mm THK. TEAK WOOD SHOE WITH BITUMINOUS PAINT	1 BLOCK	
5	G.I. PIPE COUPLING (TO SUIT 40mm Ø G.I. PIPE)	1 NO.	
6	RUBBER GROMMET (TO SUIT 40mm Ø G.I. PIPE)	1 NO.	
7	50mm DIA G.I. PIPE SLEAVE	1 NO.	
8	19mm DIA G.I. HEAVY GAUGE CONDUIT	AS REQUIRED	
9	10A, 250V D.P WEATHER PROOF LIGHTING SWITCH WITH BOTTOM ENTRY	1 NO.	
10	SCREW WITH PLAIN WASHER AND RAWAL PLUG FOR FIXING JB & LIGHTING SWITCH	8 NOS.	

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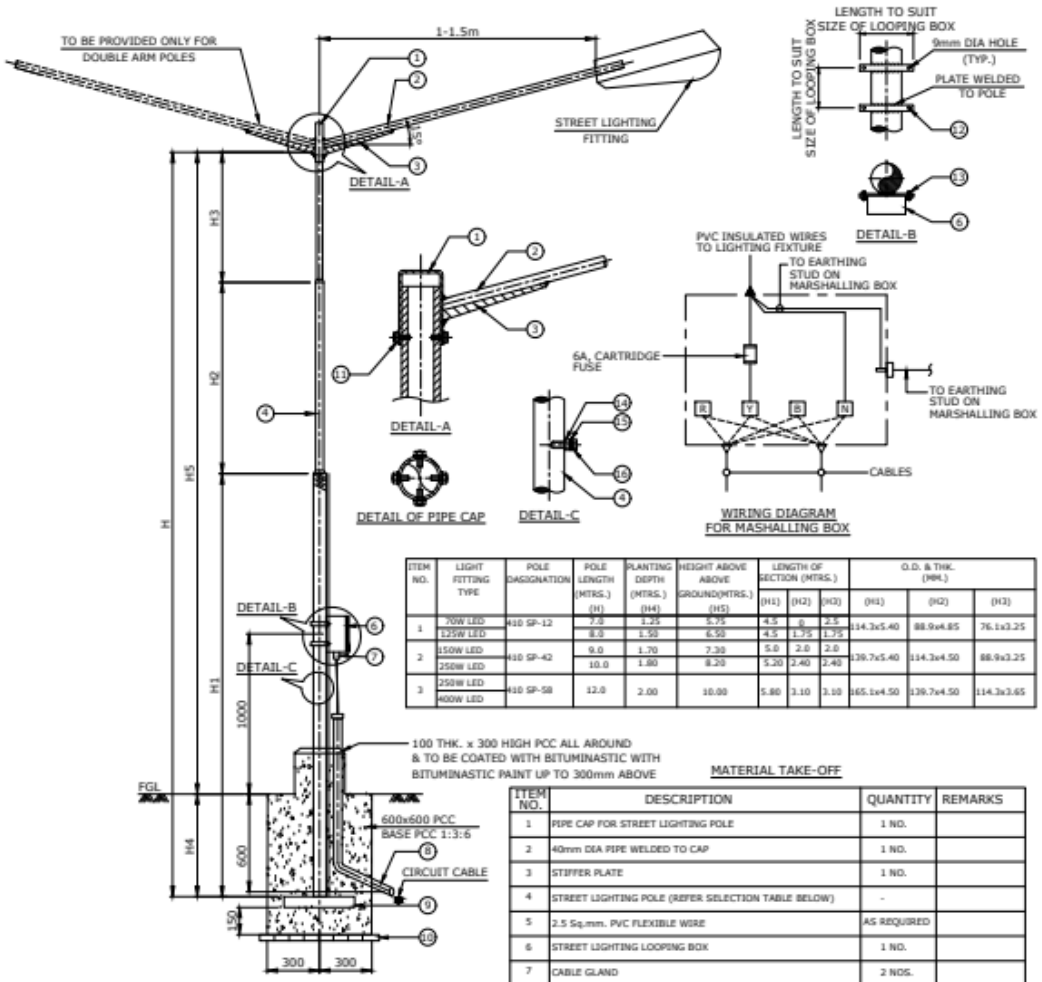
TYPICAL MOUNTING DETAILS OF STREET LIGHTING FITTING	STANDARD DRAWING NO.	REV.	SIZE
		02	A4
	SHEET NO. 1 OF 3		



ITEM NO.	LIGHT FITTING TYPE	POLE DASIGNATION	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-12	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	12.0	2.00	10.00	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	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 SUETABLE FOR M10 BOLT	2 NOS. EACH	
16	M10 FULL THREADED BOLT 40mm LONG	2 NOS.	

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.

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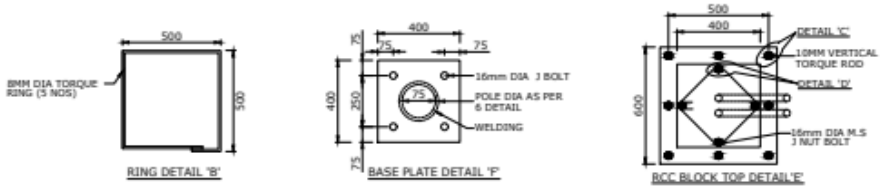
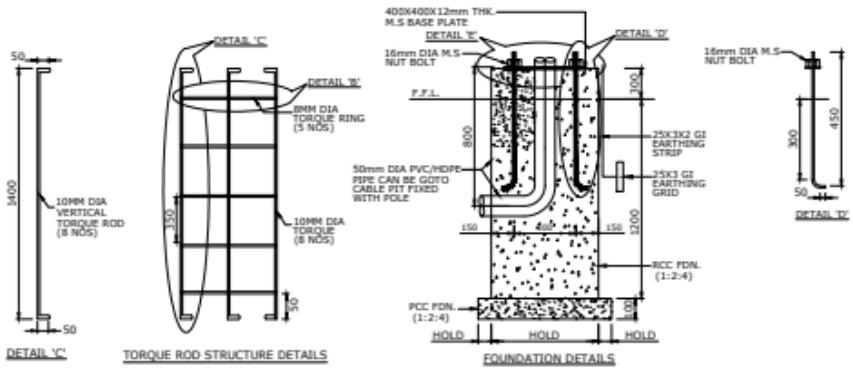
	TYPICAL MOUNTING DETAILS OF STREET LIGHTING FITTING	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 3 OF 3		





Standard Octagonal Poles (Technical Datasheet)						
	Base Plate			Anch Bolt		
Pole Height (M)	Length (mm)	Width (mm)	Thickness (mm)	Anch Bolt (No. x Dia)	PCD (mm)	Anch Bolt ℄ to ℄
3	200	200	12	4 X 16	200	100
4	200	200	12	4 X 16	200	100
5	200	200	12	4 X 16	200	100
6	200	200	12	4X 20	200	100
7	200	200	12	4X 20	200	100
8	200	200	12	4X 20	200	100
9	250	250	16	4X 24	250	125
9	200	200	16	4X 20	200	100
10	275	275	16	4X 24	275	117.5
10	250	250	16	4X 24	250	125
11	300	300	16	4X 24	300	150
12	320	320	16	4X 24	320	160
12	300	300	16	4X 24	300	150

Standard Conical Poles (Technical Datasheet)							
	Base Plate			Anch Bolt			
Pole Height (M)	Length (mm)	Width (mm)	Thickness (mm)	Anch Bolt (No. x Dia)	PCD (mm)	Anch Bolt ℄ to ℄	
3	200	200	12	4 X 16	200	100	
4	200	200	12	4 X 16	200	100	
5	200	200	12	4 X 16	200	100	
6	200	200	16	4X 20	210	105	
7	250	250	16	4X 20	235	117.5	
8	250	250	16	4X 20	235	117.5	
9	275	275	16	4X 24	270	135	
10	275	275	16	4X 24	270	135	
11	300	300	16	4X 24	300	150	
12	320	320	16	4X 24	320	160	
12	300	300	16	4X 24	320	160	

D = (sin 90/Z) * PCD

VERIFY BASE PLATE DIMENSION AND PCD BEFORE CASTING FOUNDATION

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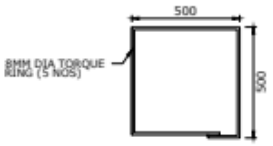
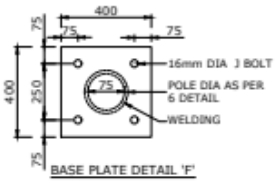
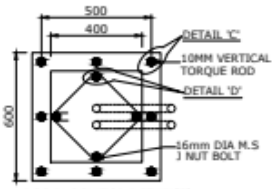
	TYPICAL MOUNTING DETAILS OF STREET LIGHTING FITTING	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	3 OF 3		



RING DETAIL 'B'

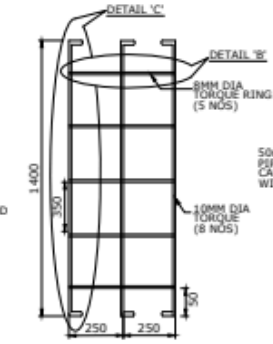


BASE PLATE DETAIL 'F'

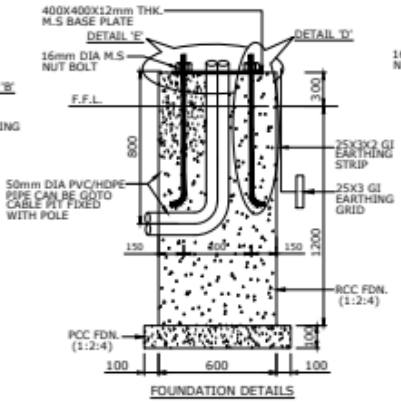


RCC BLOCK TOP DETAIL'E'

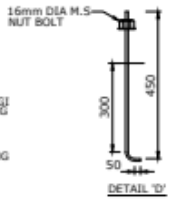
DETAIL 'C'



TORQUE ROD STRUCTURE DETAILS



FOUNDATION DETAILS



DETAIL 'D'

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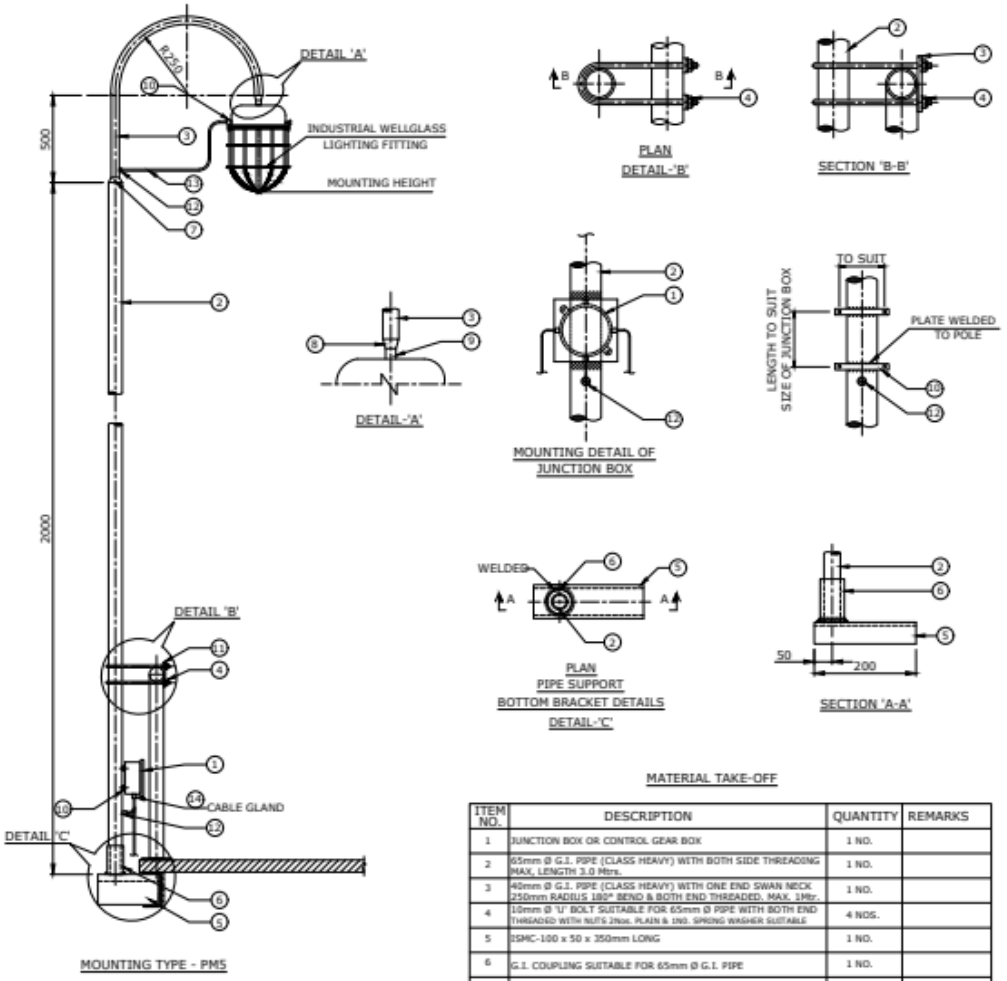
	TYPICAL FOUNDATION MOUNTED LIGHTING POLE DETAILS INDUSTRIAL TYPE/WITH BUILT-IN CONTROL GEAR TYPE LIGHTING FIXTURE	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 2		



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. MOUNTING HEIGHT SHALL NOT EXCEED 2.5M FROM THE PLATFORM.
3. CABLE GLAND USED FOR TERMINATION OF FLEXIBLE CABLE SHALL BE DOUBLE SEAL WITH CONE GRIP FOR BRADING.
4. PLUG ALL UNUSED ENTRIES OF LIGHTING FITTING AND JUNCTION BOX WITH THREADED STOPPING PLUGS.
5. ALL NUTS, BOLTS AND WASHERS SHALL BE GALVANISED.
6. ALL SHARP EDGES AND BURRS SHALL BE REMOVED. SITE FABRICATED STEEL SHALL BE PAINTED WITH TWO COATS OF ANTI-CORROSIVE PAINT AND TWO COATS OF EPOXY PAINTS.
7. ALL DAMAGE TO GALVANISED FINISHED SHALL BE MADE GOOD WITH ZINC RICH PAINT.
8. WHERE POSSIBLE LOCATE LAMP POST ADJACENT TO HANDRAIL POST.

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	JUNCTION BOX OR CONTROL GEAR BOX	1 NO.	
2	65mm Ø G.I. PIPE (CLASS HEAVY) WITH BOTH SIDE THREADING MAX. LENGTH 3.0 Mtrs.	1 NO.	
3	40mm Ø G.I. PIPE (CLASS HEAVY) WITH ONE END SWAN NECK 250mm RADIUS 180° BEND & BOTH END THREADED. MAX. 1Mtr.	1 NO.	
4	10mm Ø 'U' BOLT SUITABLE FOR 65mm Ø PIPE WITH BOTH END THREADED WITH NUTS 2Nos. PLAIN & 1NO. SPRING WASHER SUITABLE	4 NOS.	
5	ISMC-100 x 50 x 350mm LONG	1 NO.	
6	G.I. COUPLING SUITABLE FOR 65mm Ø G.I. PIPE	1 NO.	
7	G.I. REDUCER - 60 x 40	1 NO.	
8	G.I. REDUCER - 40 x 19	1 NO.	
9	G.I. NIPPLE THREADED AT BOTH END	1 NO.	
10	150x150x6mm THK. M.S. PLATE WITH 2 Nos. 12mm Ø HOLES OR 50x6x300 LONG G.I. FLATE WITH 2 Nos. 12mm Ø HOLES.	1 NO./2 Nos.	REFER VIEW -'A'
11	50 x 6 x 150mm LONG G.I. FLAT WITH 2 Nos. 12mm Ø HOLES.	4 NOS.	
12	RURDER GROMMET TO SUIT FLEXIBLE WIRE	2 NOS.	
13	2.5 Sq. mm SQ. FLEXIBLE CABLE	3.5Mtrs. MAX.	
14	CABLE GLAND SUITABLE FOR ITEM NO. 13	2 NOS.	

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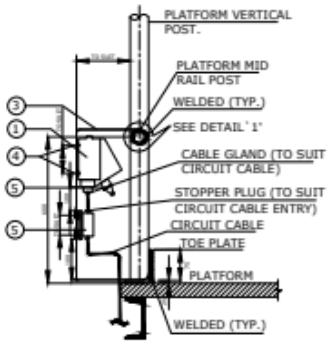
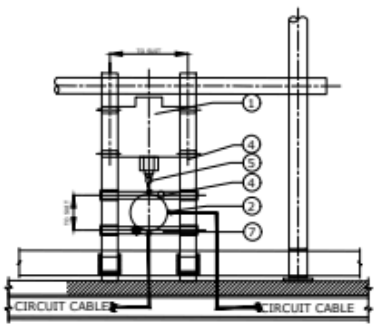
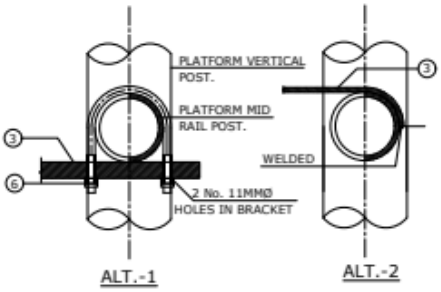
	TYPICAL MOUNTING DETAILS OF SINGLE PHASE SOCKET OUTLET ON HANDRAIL	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



SIDE VIEW

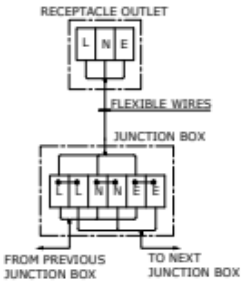


FRONT VIEW



ALT.-1 ALT.-2

ALTERNATE ARRANGEMENT FOR FIXING OF BRACKET TO MID RAIL POST DETAIL-`1'



WIRING DIAGRAM FOR JUNCTION BOX TO RECEPTACLE

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1.	SMALL POWER SOCKET OUTLET	AS REQUERED	
2.	JUNCTION BOX WITH TERMINAL BLOCK	AS REQUERED	
3.	50 x 6mm THK. (LENGTH AS REQUERED) MS FLAT FOR FIXING FOR POWER SOCKET OUTLET	3 MTRS.	
4.	M6 x 40mm LONG MS BOLT WITH NUT & WASHER FOR FIXING OF JUNCTION BOX ON BRACKET	8 NOS.	
5.	PLUG TO SUIT SMALL POWER SOCKET OUTLET	AS REQUERED	
6.	M10 'U' BOLT OF SUITABLE TO MD HANDRAIL POST WITH THREADED BOTH THE SIDE WITH NUT, LOCK NUT & WASHER	2 NOS.	
7.	50 x 6mm THK. (LENGTH AS REQUERED) MS FLAT FOR FIXING JUNCTION BOX	2 NOS.	

NOTES:

1. ALL DIMENSION ARE IN MM.
2. DRILLING OF ITEM 3 AND 7 TO BE DETERMINED BY FABRICATOR TO THE SOCKET OUTLET AND JUNCTION BOX.
3. JUNCTION BOX, RECEPTACLES ANS ACCESSORIES SHALLL BE CALLED UP ON THE RELEVANT LAYOUT DRAWING MATERIAL LIST AS REQUIRED.
4. ALL CABLE AND GLANDS SHALL CALLED UP ON DISTRIBUTION BOARD SCHEDULE.
5. AFTER FABRICATION THE ASSEMBLY IS TO BE PAINTED WITH TWO COATS OF ANTI-CORROSIVE PAINT AND TWO COATS OF EPOXY PAINT.
6. ALL NUTS, BOLTS, WASHERS SHALL BE GALVANISED OR ZINC PASSIVATED.
7. RECEPTACLES AND JUNCTION BOX SHALL BE CERTIFIED FOR THE HAZARDOUS AREA IN WHICH THEY ARE TO BE LOCATED.

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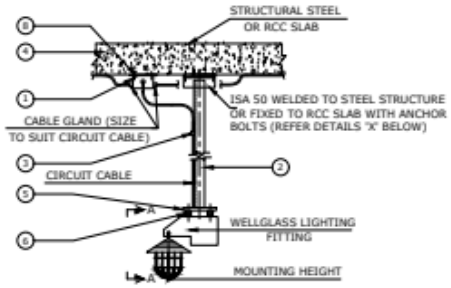
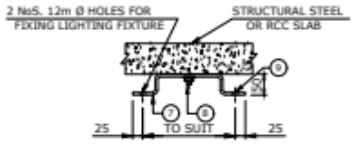
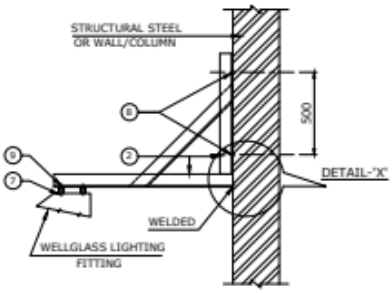
	TYPICAL MOUNTING DETAILS OF INDUSTRIAL WELLGLASS LIGHTING FITTING WITH BUILT-IN CONTROL GEAR BOX	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



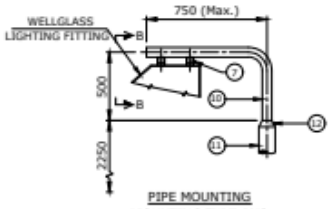
SUSPENSION MOUNTING
MOUNTING TYPE-SMS



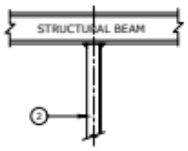
CEILING MOUNTING
MOUNTING TYPE-CMS



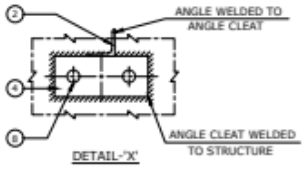
BRACKET MOUNTING
MOUNTING TYPE-BMS



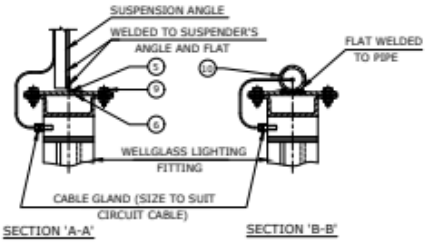
PIPE MOUNTING
MOUNTING TYPE-PM3



MOUNTING ON STRUCTURE OR BEAM
MOUNTING TYPE-SMS



DETAIL-'X'



SECTION 'A-A' SECTION 'B-B'

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	4WAY ROUND JUNCTION BOX	1 NO.	
2	ISA 50 x 50 x 6mm THK. -MAX. LENGTH 3500mm	1 NO.	
3	G.I. SADDLE/CLEAT LONG WITH SCREWS TO SUIT CIRCUIT CABLE	AS REQUIRED	
4	50 x 50 x 6 x 150 LONG ANGLE CLEAT WITH 2 Nos. 12 Ø HOLES (REFER DETAIL - 'X')	1 NO.	
5	25 x 25 x 6 x 300 LONG ANGLE CLEAT	1 NO.	
6	32 x 6 x 200 LONG G.I. FLAT WITH 3 Nos. 12 Ø HOLES	2 NOS.	
7	50 x 6 x 200 LONG G.I. FLAT WITH 2 Nos. 12 Ø HOLES	1 NO.	
8	M10 x 40mm LONG ANCHOR STUD WITH PLAIN AND SPRING WASHERS	1 NO.	
9	M10 x 30mm LONG G.I. BOLT WITH NUT, 2 PLAIN AND SPRING WASHERS	4 NOS.	
10	40mm Ø G.I. PIPE - CLASS HEAVY WITH MAX. LENGTH OF 1.5 Mtrs. WITH THREADED AT BOTH SIDES.	1 NO.	
11	65mm Ø G.I. PIPE - CLASS HEAVY WITH MAX. LENGTH OF 13.0 Mtrs. WITH THREADED AT BOTH SIDES.	1 NO.	

NOTES:

1. ALL WELDED POINT SHALL CLEANED AND APPLY TWO COAT OF ANTI-CORROSIVE PAINT AND TWO COATS OF ZINC RICH PAINT.

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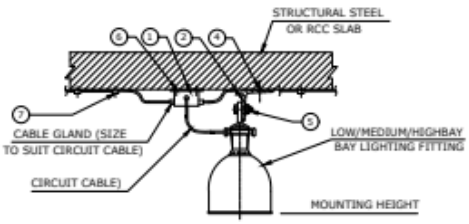
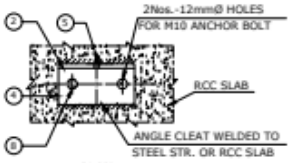
	TYPICAL DETAIL OF CEILING/SUSPENSION MOUNTED HIGHBAY LIGHTING FITTING	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		

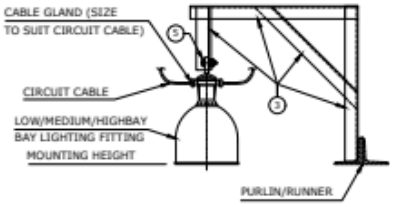


CEILING MOUNTED
LIGHTING FITTING - CM6

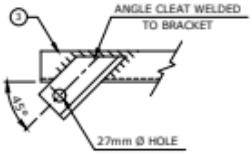
ELECATION



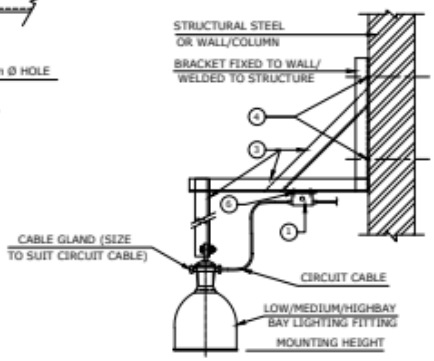
PLAN
MOUNTING DETAIL ON
R.C.C. SLAB



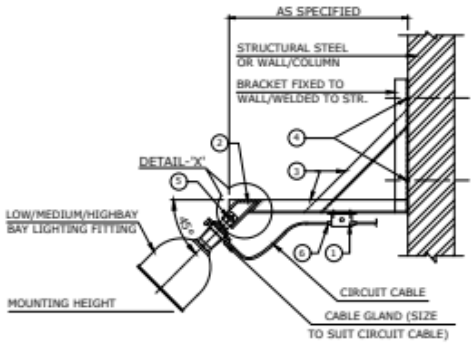
BRACKET MOUNTED ON PURLIN
MOUNTING TYPE-BM6



DETAIL-'X'



BRACKET MOUNTING
MOUNTING TYPE-BM6



BRACKET MOUNTED 30° OR 45°
MOUNTING TYPE-BM6

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	4WAY ROUND JUNCTION BOX	1 NO.	
2	ISA 50 x 50 x 6mm THK. 160mm LONG ANGLE CLEAT WITH 2 Nos. 12mm Ø HOLES	1 NO.	
3	ISA 50 x 50 x 6mm THK. LENGTH TO SUIT MTG. HEIGHT OR BRACKET SUSPENSION MOUNTING TYPE TO SUIT HEIGHT	1 NO.	
4	M10-68mm LONG ANCHOR STUD WITH LOCK WASHERS AND NUTS FOR FIXING OF ISA IN RCC SLAB	2 NOS.	
5	M25-40mm LONG BOLT WITH NUT AND PLAIN WASHERS	1 NO.	
6	M10-40mm LONG BOLT WITH NUT AND PLAIN WASHERS FOR MOUNTING OF LIGHTING FITTING	2 NOS.	
7	SADDLE/CLEAT ALONG WITH SUITTABLE SIZE OF ANCHORING FIXING SCREWS TO SUIT FOR CIRCUIT CABLE SADDLE.	AS REQUIRED	

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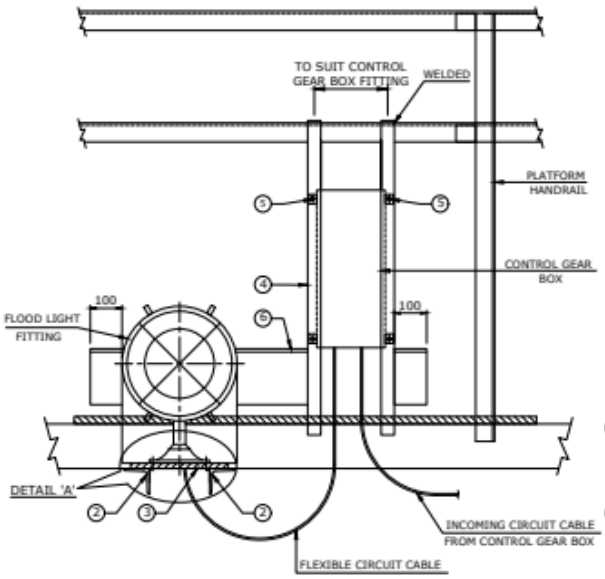
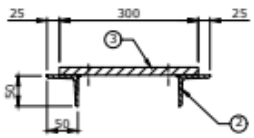
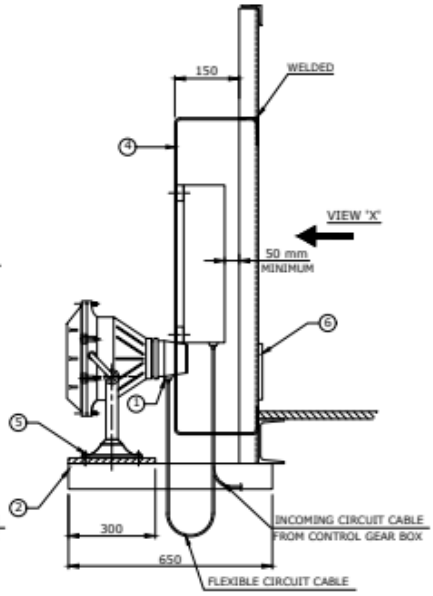
	TYPICAL DETAIL OF ARRANGEMENT OF FLOOD LIGHT MOUNTED ON PLATFORM/WALKWAY	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



VIEW 'X'



DETAIL 'A'



MOUNTING TYPE-BM10

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	CABLE GLAND (SIZE TO SUIT CIRCUIT CABLE)	AS REQUIRED	
2	50 x 50 x 6mm THK. 650mm LONG M.S. ANGLE	2 NOS.	
3	300 x 300 x 6mm THK. MILD STEEL FLAT	AS REQUIRED	
4	50 x 6mm THK. MILD STEEL FLAT (LENGTH TO SUIT)	AS REQUIRED	
5	M10 x 50 LONG M.S. BOLT WITH NUT & WASHER	AS REQUIRED	
6	3 mm THK. KICK PLATE (SIZE TO SUIT AT SITE)	AS REQUIRED	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. AFTER INSTALLATION THE ASSEMBLY IS TO BE PREPARED, PRIMED AND PAINTED.

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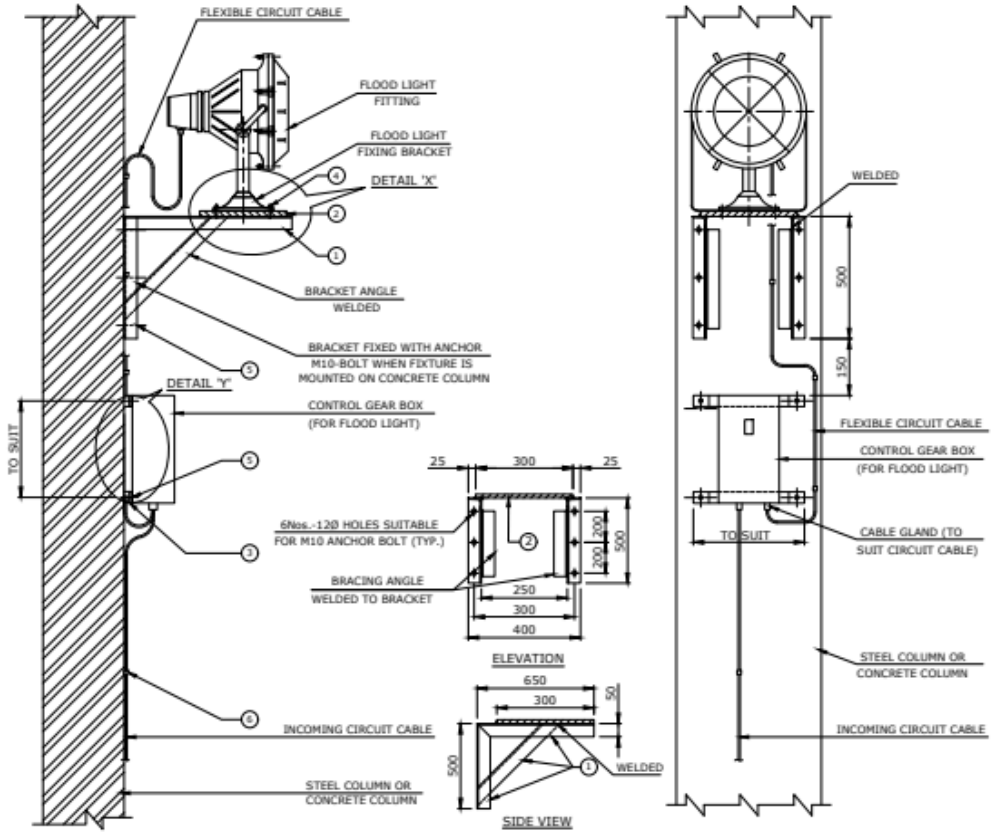
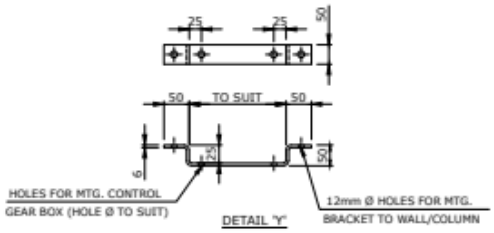
	TYPICAL MOUNTING ARRANGEMENT OF FLOOD LIGHT MOUNTED ON STEEL/CONCRETE COLUMN	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		





MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	50 x 50 x 6mm THK. M.S. ANGLE (AS PER DETAIL-'X'	AS REQUIRED	
2	300 x 300 x 6mm THK. MILD STEEL PLATE FOR FIXING FLOOD LIGHT FITTING	1 NO.	
3	50 x 6mm THK. MILD STEEL FLAT (AS PER DETAIL-'Y'	2 NOS.	
4	M10-50mm LONG BOLT WITH LOCK NUT & WASHER FOR FIXING FLOOD LIGHT FITTING	4 NOS.	
5	M10-68mm LONG STUD WITH NUT & LOCK WASHER FOR FIXING BRACKET	10 NOS.	
6	SADDLE/CLEAT (TO SUIT CABLE SIZE) WITH SUITABLE SIZE FIXING ANCHOR BOLTS LOCK WASHER 7 NUTS.	AS REQUIRED	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. AFTER INSTALLATION THE ASSEMBLY IS TO BE PAINTED WITH TWO COATS OF ANTI-CORROSIVE PAINT AND TWO COATS OF EPOXY PAINTS.

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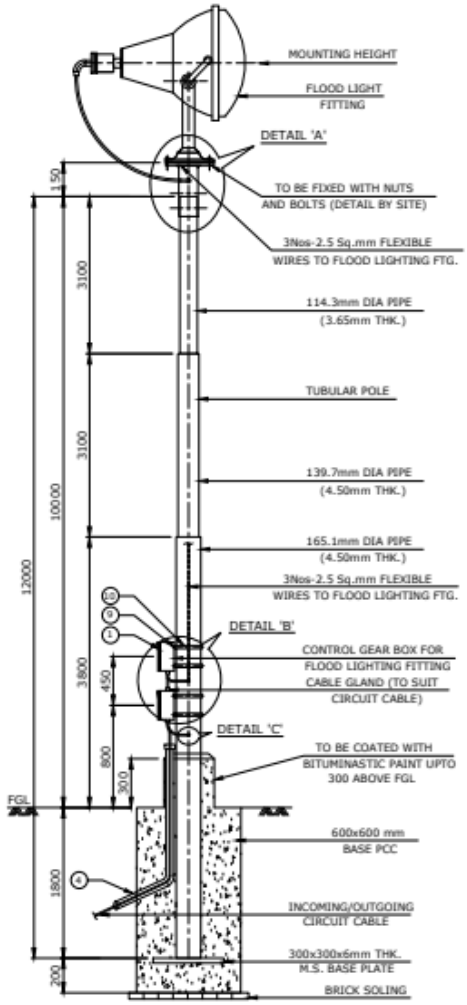
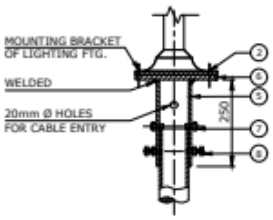
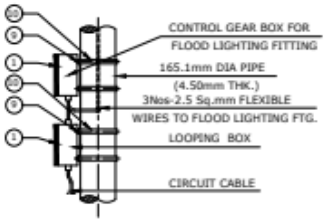
	TYPICAL MOUNTING DETAIL OF 1 NO. FLOOD LIGHT FITTING	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		

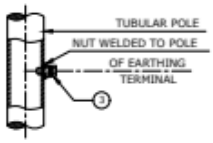




DETAIL 'A'



DETAIL 'B'



DETAIL-C

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	STREET LIGHTING LOOPING BOX	1 NO.	
2	M8 x 40mm LONG BOLT WITH NUTS & PLAIN WASHER FOR FIXING FLOOD LIGHT	AS REQUIRED	
3	EARTHING TERMINAL M10-40mm LONG BOLT WITH NUTS, 2Nos. SPRING WASHERS & 2Nos. PLAIN WASHERS	1 NO.	
4	75mm NB G.I. PIPE SLEAVE	2 NOS.	
5	M.S PIPE CAP TO SUIT 1114.30mm DIA PIPE	1 NO.	
6	300 x 300 x 10mm THICK M.S. PLATE	1 NO.	
7	M10-40mm LONG BOLT TO BE USED AS STOPPER	3 NOS.	
8	M10 x 40mm LONG BOLT WITH LOCK NUT TO BE USED AS HOLDER	3 NOS.	
9	M8-40mm LONG BOLT WITH NUTS & PLAIN WASHER FOR FIXING OF CONTROL GEAR BOX & LOOPING BOX	8 NOS.	
10	BRACKET/CLAMP MADE OUT FROM 25x6mm THK. M.S. FLAT FOR FIXING OF CONTROL GEAR BOX & LOOPING BOX	4 NOS.	

NOTES:

1. LIGHTING FITTING FIXING DETAILS TO BE FURNISHED BY SITE.
2. EARTHING TERMINALS ARE LOCATED DIAMETRICALLY OPPOSITE.
3. ALL NUTS, BOLTS AND WASHER SHALL BE GALVANISED OR ZINC PASSIVATED.
4. MOUNTING DETAILS OF CONTROL GEAR BOX & LOOPING BOX REFER INSTALLATION DETAILS.
5. ALL SHARP EDGES AND BURRS SHALL BE REMOVED.
6. POLE SHALL BE MADE FROM TUBULAR STEEL PIPES SWAGED AND WELDED CONFORMING TO DESIGNATION 410TP-60 AS PER IS-2713 (PART II) - 1980.

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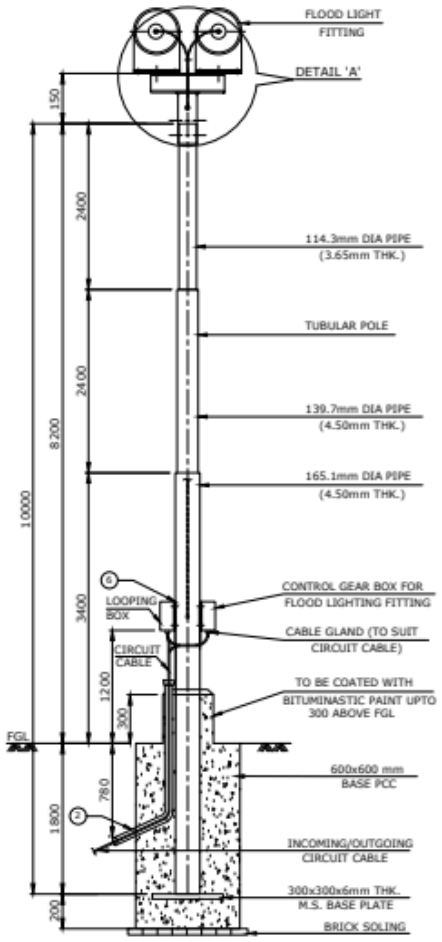
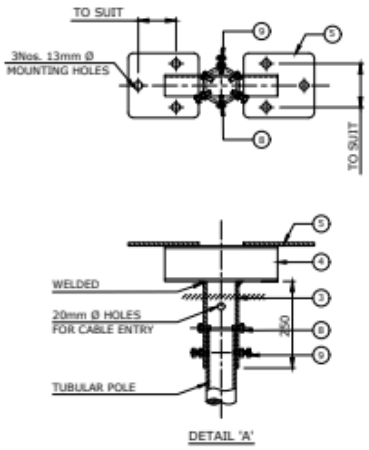
	TYPICAL MOUNTING DETAIL OF 2 NOS. INDUSTRIAL TYPE FLOOD LIGHTING FITTING	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		





NOTES:

1. FIXING DETAILS TO BE FURNISHED BY SITE.
2. EARTHING TERMINALS ARE LOCATED DIAMETRICALLY OPPOSITE.
3. 2 Nos. 20mm Ø HOLES LOCATED DIAMETRICALLY OPPOSITE.
4. MOUNTING DETAILS OF CONTROL GEAR BOX & LOOPING BOX TO BE FIXED BY SITE.
5. FOR INCANDESCENT LAMP, FLEXIBLE CABLE TO GO DIRECTLY TO FITTING.
6. ALL SHARP EDGES AND BURRS SHALL BE REMOVED.
7. ALL NUTS, BOLTS AND WASHER SHALL BE GALVANISED OR ZINC PASSIVATED.
8. POLE SHALL BE MADE FROM TUBULAR STEEL PIPES SWAGED AND WELDED CONFORMING TO DESIGNATION 410TP-60 AS PER IS-2713 (PART II) - 1980.

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	STREET LIGHTING LOOPING BOX	-	
2	75mm NB G.I. PIPE SLEAVE	2 NOS.	
3	M.S PIPE CAP (TO SUIT 1114.30mm DIA PIPE)	1 NO.	
4	100 x 50 x 6mm THK. M.S. CHANNEL (LENGTH TO SUIT)	AS REQUIRED	
5	300 x 300 x 6mm THICK M.S. PLATE	2 NOS.	
6	50 x 6mm THICK M.S. FLAT (LENGTH TO SUIT)	AS REQUIRED	
7	M10-30mm LONG BOLT WITH NUT, WASHER FOR FIXING FLOOD LIGHT	AS REQUIRED	
8	M10 BOLT (TO BE USED AS STOPPER)	3 NOS.	
9	M10 BOLT WITH LOCK NUT (TO BE USED AS HOLDER)	3 NOS.	

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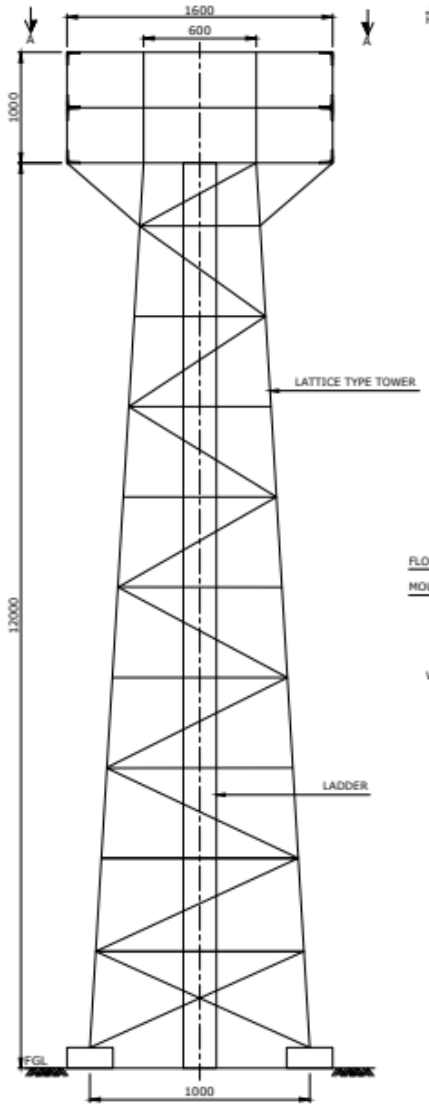
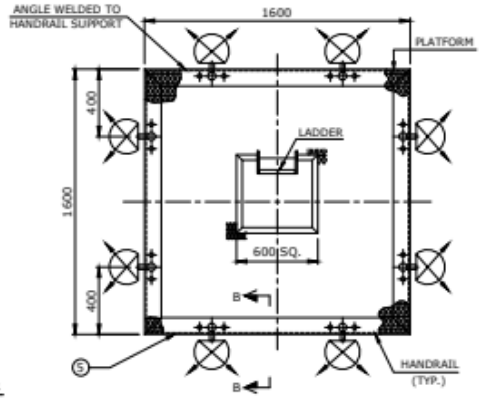
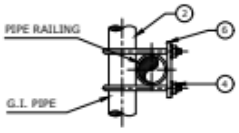
	TYPICAL MOUNTING DETAIL OF 8 NOS. FLOOD LIGHTING FITTING ON LATTICE TYPE TOWER	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		

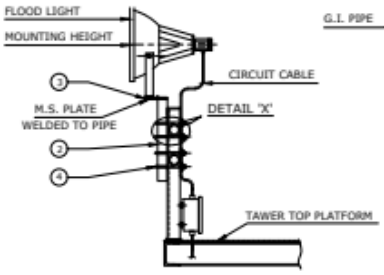




SECTION 'A-A'



DETAIL 'X'



SECTION 'B-B'

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	CONTROL GEAR BOX	AS REQUIRED	
2	40mm Ø G.I. PIPE (CLASS HEAVY) LENGTH TO SUIT	AS REQUIRED	
3	150 x 250 x 6mm THK. M.S. PLATE	AS REQUIRED	
4	M10 'U' BOLT OF SUITABLE SIZE (THREADED AT BOTH ENDS) WITH NUT AND WASHER	4 NOS.	
5	75 x 75 x 6mm THK. M.S. ANGLE (LENGTH TO SUIT)	AS REQUIRED	
6	25 x 6mm THICK M.S. FLAT (LENGTH TO SUIT)	AS REQUIRED	

NOTES:

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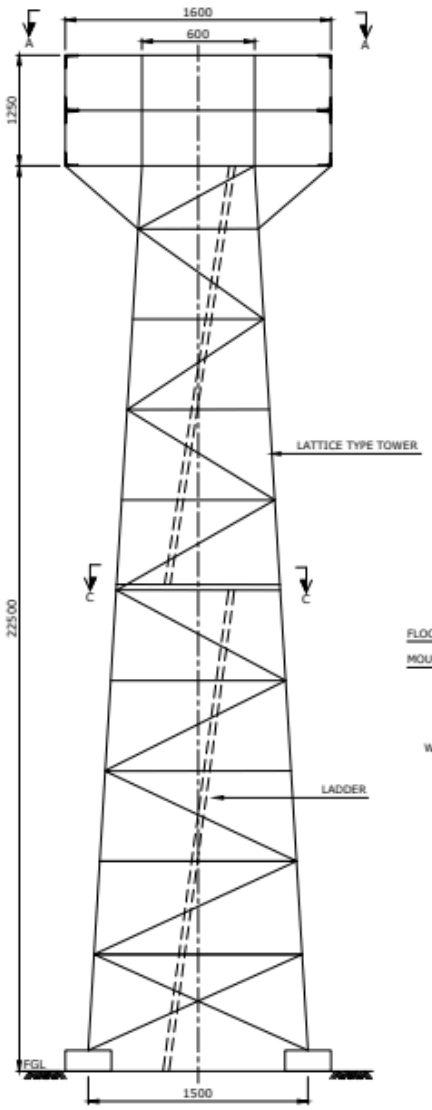
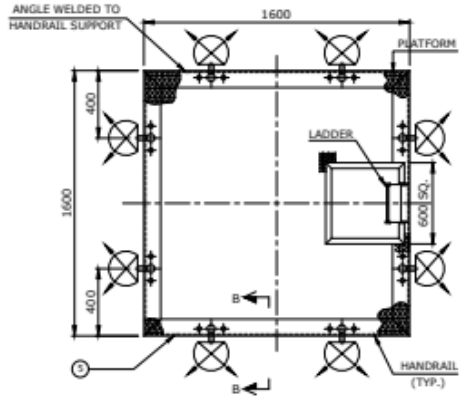
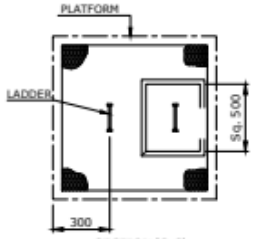
Date: 2026.02.13 19:41:32

	TYPICAL MOUNTING DETAIL OF 8 NOS. FLOOD LIGHTING FITTING ON LATTICE TYPE TOWER	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		

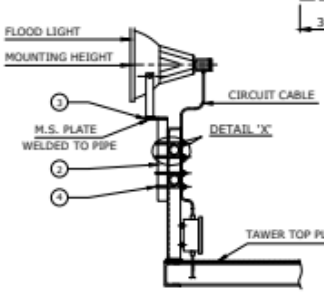




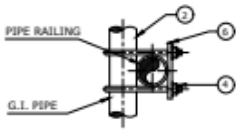
SECTION 'A-A'



SECTION 'C-C'



SECTION 'B-B'



DETAIL 'X'

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	CONTROL GEAR BOX	AS REQUIRED	
2	40mm Ø G.I. PIPE (CLASS HEAVY) LENGTH TO SUIT	AS REQUIRED	
3	150 x 250 x 6mm THK. M.S. PLATE	AS REQUIRED	
4	M10 'U' BOLT OF SUITABLE SIZE (THREADED AT BOTH ENDS) WITH NUT AND WASHER	2 NOS.	
5	75 x 75 x 6mm THK. M.S. ANGLE (LENGTH TO SUIT)	AS REQUIRED	
6	25 x 6mm THICK M.S. FLAT (LENGTH TO SUIT)	AS REQUIRED	

NOTES:

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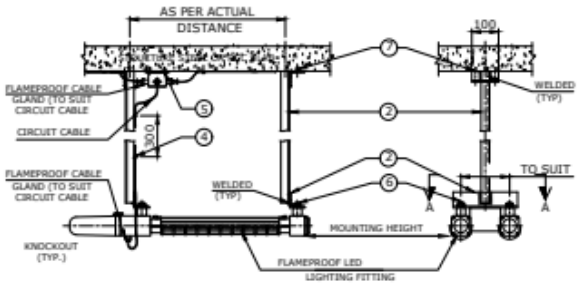
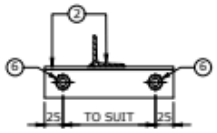
Date: 2026.02.13 19:41:32

	TYPICAL MOUNTING DETAILS OF FLAMEPROOF LED LIGHTING FITTING	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		

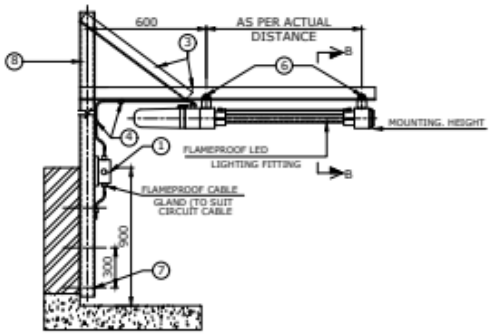


DETAIL FOR SUSPENSION MOUNTING
MOUNTING TYPE : SM9

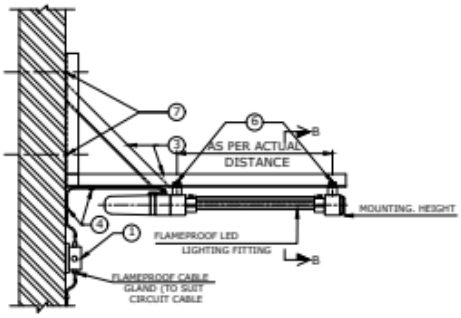


SECTION 'A-A'

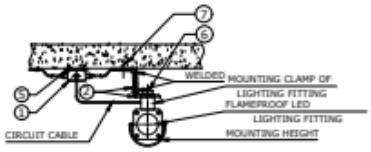
SECTION 'B-B'



DETAIL FOR ROOF/TERRACE MOUNTING
MOUNTING TYPE : BM9



DETAIL FOR BRACKET MOUNTING
MOUNTING TYPE : BM9



DETAIL FOR CEILING MOUNTING
MOUNTING TYPE : CM9

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY			REMARKS
		CM	SM	BM	
1	FLAMEPROOF JUNCTION BOX WITH TERMINAL BLOCK.	1 NO.	1 NO.	1 NO.	
2	ISA 50 x 50 x 6mm THK. (LENGTH TO SUIT)	AS REQD.	AS REQD.	-	
3	BRACKET MADE OUT FROM ISA 75 x 75 x 6mm THK. (LENGTH TO SUIT).	-	-	AS REQD.	
4	SADDLE/CLEAT ALONG WITH SUITABLE SIZE OF FIXING SCREWS TO SUIT FOR CIRCUIT CABLE.	AS REQD.	AS REQD.	AS REQD.	
5	M8-68mm LONG STUD ANCHOR WITH NUT & LOCK WASHER FOR JUNCTION BOX FIXING TO CEILING/WALL.	2 NOS.	2 NOS.	2 NOS.	
6	M10x40mm LONG BOLT NUT & PLAIN WASHER.	2 NOS.	4 NOS.	4 NOS.	
7	M10-68mm LONG STUD ANCHOR WITH NUT & LOCK WASHER FOR FIXING OF ISA TO CEILING/WALL.	2 NOS.	4 NOS.	4 NOS.	
8	ISMC -150 (LENGTH TO SUIT)	-	-	AS REQD.	

NOTES:

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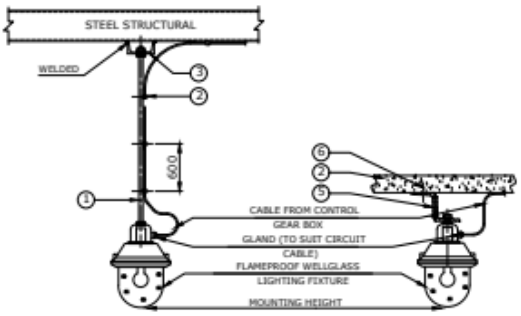
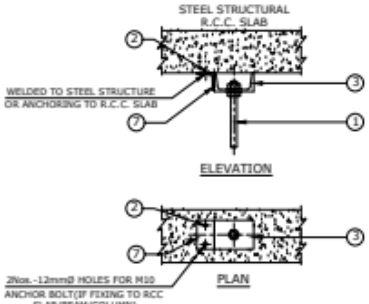
	TYPICAL SUSPENSION/CEILING/PIPE/BRACKET MOUNTING DETAILS OF FLAMEPROOF WELLGLASS LIGHTING FITTING	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		

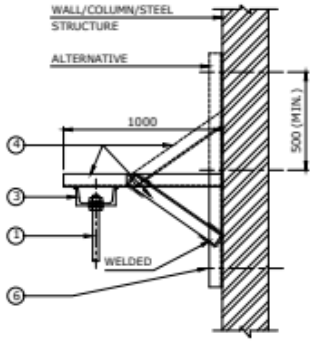


SUSPENSION MOUNTING
MOUNTING TYPE : SM8

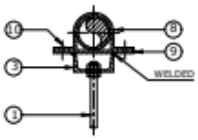
CEILING MOUNTING
MOUNTING TYPE : CM8



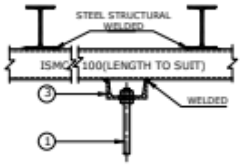
MOUNTING DETAIL ON
R.C.C. SLAB



WALL/COLUMN BRACKET
MOUNTING TYPE : BM8



TUBULAR TRUSS
MOUNTING TYPE : PM8



SUSPENSION FROM STEEL
STRUCTURE
MOUNTING TYPE-SM8

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	19mm Ø M.S. ROD (LONG AS REQUIRED) THREADED WITH BOTH ENDS WITH 2 Nos. NUTS, 2Nos. PLAIN/SPRING WASHERS	2 NOS.	
2	SADDLE/CLEAT ALONG WITH SUITABLE SIZE OF FIXING SCREWS. TO SUIT FOR CIRCUIT CABLE.	AS REQUIRED	
3	ISMC 100 x 50 - 75mm LONG (OR MORE LONG AS REQUIRED)	1 NO.	
4	BRACKET MADE OUT FROM ISA 50 x 50 x 6mm THK.	AS REQUIRED	
5	ISMC 75 x 40 - 50mm LONG (OR MORE LONG AS REQUIRED)	1 NO.	
6	M10-40mm LONG ANCHOR BOLT FOR MOUNTING OF PLATE/ BRACKET/ISMC TO WALL/COLUMN/CEILING	AS REQUIRED	
7	ISA 50 x 50 x 6mm THK. WITH 2 Nos.-Ø12mm HOLES	AS REQUIRED	
8	CLAMP/SADDLE (TO BE MADE OUT OF 50 x 6mm M.S. FLAT) WITH FIXING SCREWS. (CLAMP TO SUIT SIZE OF TRUSS/PIPE)	1 NO.	
9	50 x 6mm THK. M.S. FLAT (FOR SADDLE/CLAMP FIXING) LENGTH TO SUIT SIZE OF TRUSS/PIPE	1 NO.	
10	M10-40mm LONG BOLT WITH NUT & WASHER FOR CLAMP/ SADDLE BOLTED	2 NOS.	

NOTES:

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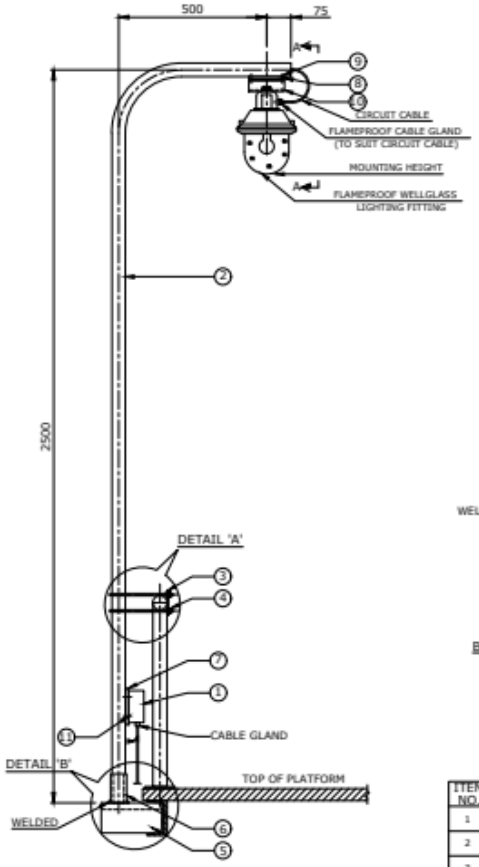
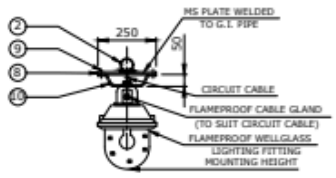
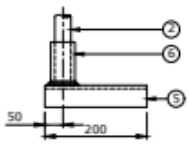
	TYPICAL HANDRAIL MOUNTED PIPE DETAILS OF FLAMEPROOF WELLGLASS LIGHTING FIXTURE	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		

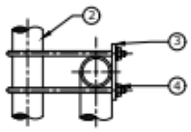




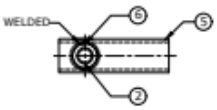
SECTION 'A-A'



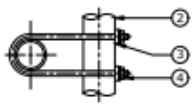
ELEVATION



ELEVATION



PLAN
PIPE SUPPORT
BOTTOM BRACKET DETAILS
DETAIL-'B'



PLAN
DETAIL-'A'

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	FLAMEPROOF CONTROL GEAR BOX	1 NO.	
2	40mm Ø G.I. PIPE (CLASS HEAVY) WITH ONE SIDE 300mm RADIUS 90° BEND & OTHER END THREADED	1 NO.	
3	CLAMP MADE OUT FROM 25x6mm THK. M.S. FLAT 150mm LONG FOR FIXING WITH 'U' BOLT	4 NOS.	
4	10mm Ø 'U' BOLT SUITABLE WITH BOTH END THREADED WITH NUTS & PLAIN WASHER SUETABLE FOR 40mm Ø G.I. PIPE	4 NOS.	
5	ISMC-100 x 50 x 200mm LONG FOR SUPPORT TO PIPE	1 NO.	
6	G.I. PIPE COUPLING TO SUIT 40mm Ø G.I. PIPE, COUPLING WELDED TO ISMC-100 x 50	1 NO.	
7	150 x 150 x 3mm THK. M.S. PLATE WITH SUITABLE SIZE OF HOLES FOR MOUNTING OF JUNCTION BOX	1 NO.	
8	25 x 6mm THK.-250 LONG M.S. FLAT WELDED TO G.I. PIPE	1 NO.	
9	M10-40mm LONG BOLT WITH NUT & PLAIN WASHER FOR FIXING OF BRACKET TO FLAT	2 NOS.	
10	BRACKET/CLAMP MADE OUT FROM 25 x 6mm THK. M.S. FLAT 325mm LONG FOR LIGHTING FITTING FIXING	1 NO.	
11	M6-40mm LONG BOLT WITH NUT & PLAIN WASHER FOR FIXING OF JUNCTION BOX TO MS PLATE.	2 NOS.	

NOTES:

1. MOUNTING HEIGHT SHALL NOT BE EXCEED 4M FROM THE PLATFORM.
2. CABLE GLAND USED FOR TERMINATION OF FLEXIBLE CABLE SHALL BE DOUBLE SEAL WITH CONE GRIP FOR BRADING.
3. PLUG ALL UNUSED ENTRIES OF LIGHTING FITTING AND JUNCTION BOX WITH THREADED STOPPING PLUGS.

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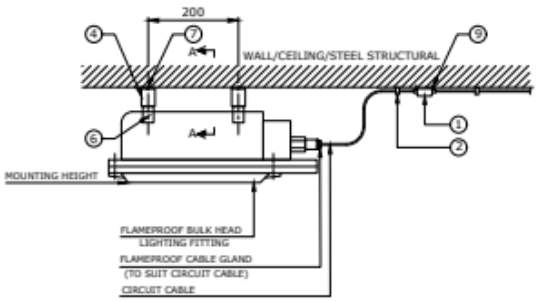
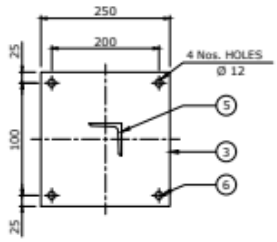
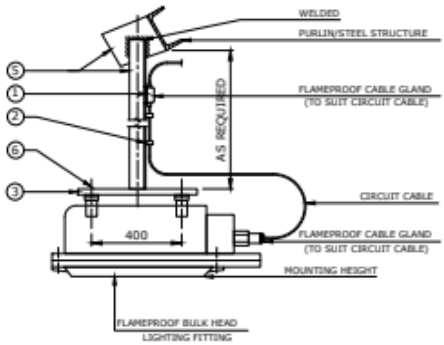
	TYPICAL CEILING/SUSPENSION MOUNTING DETAILS OF FLAMEPROOF BULK HEAD LIGHTING FITTING	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



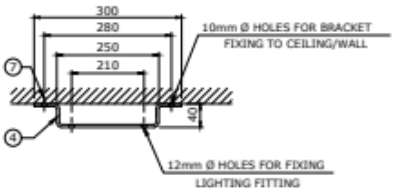
CEILING/WALL MOUNTED BULK HEAD LIGHTING FITTING MOUNTING TYPE : CM7



MOUNTING DETAILS OF PLATE



PENDENT (SUSPENSION) MOUNTING BULK HEAD LIGHTING FITTING (ON PURLIN) MOUNTING TYPE : SM7



SECTION 'A-A'

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY		REMARKS
		CM7	SM7	
1	FLAMEPROOF CONTROL GEAR BOX	1 NO.	1 NO.	
2	SADDLE/CLEAT WITH FIXING SCREWS/ANCHOR STUD, NUTS & LOCK WASHERS FOR CIRCUIT CABLE.	AS REQD.	AS REQD.	
3	250 x 250 x 8mm THK. M.S. PLATE	-	1 NO.	
4	MOUNTING BRACKET/CLAMP (TO MADE OUT FROM 25 x 6mm THK FLAT) FOR LIGHTING FITTING.	2 NOS.	-	
5	ISA 50 x 50 x 6mm THK. (LENGTH TO SUIT)	-	AS REQD.	
6	M10-40mm LONG BOLT WITH NUT & WASHER FOR BOLTING FITTING TO BRACKET	4 NOS.	4 NOS.	
7	M10-68mm LONG STUD WITH NUT & LOCK WASHER FOR BRACKET MOUNTING TO CEILING	4 NOS.	-	
8	M8-40mm LONG BOLT WITH NUT & WASHER FOR BOLTING JUNCTION BOX TO ANGLE	-	2 NOS.	
9	M8-68mm LONG ANCHOR STUD WITH NUT & LOCK WASHER FOR JUNCTION BOX MOUNTING TO CEILING	2 NOS.	-	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. ALL SHARP EDGES AND BURRS SHALL BE REMOVED.
3. ALL NUTS, BOLTS AND WASHERS SHALL BE GALVANISED OR ZINC PASSIVATED.

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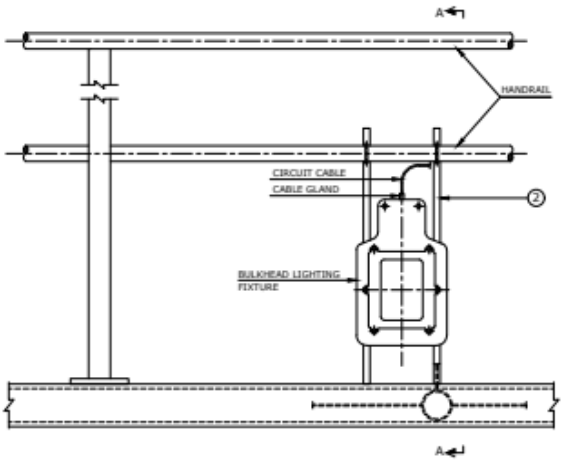
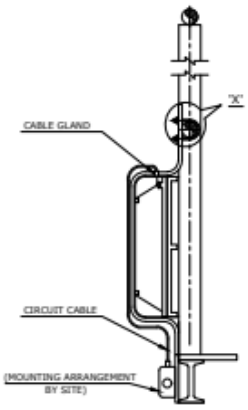
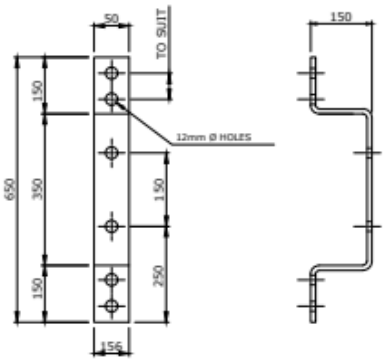
	TYPICAL DETAILS OF BULKHEAD LIGHTING FITTING MOUNTED ON HANDRAILS	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		

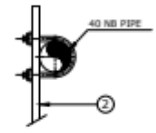




SECTION 'A-A'



DETAIL OF FIXING BRACKET



DETAIL 'X'

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	JUNCTION BOX	1 NO.	
2	FIXING BRACKET MADE OUT OF 32 x 6mm M.S. FLAT	2 NOS.	
3	10mm 'U' BOLT SUITABLE SIZE (BOTH END THREADED) WITH NUTS WASHERS.	AS REQUIRED	

NOTES:

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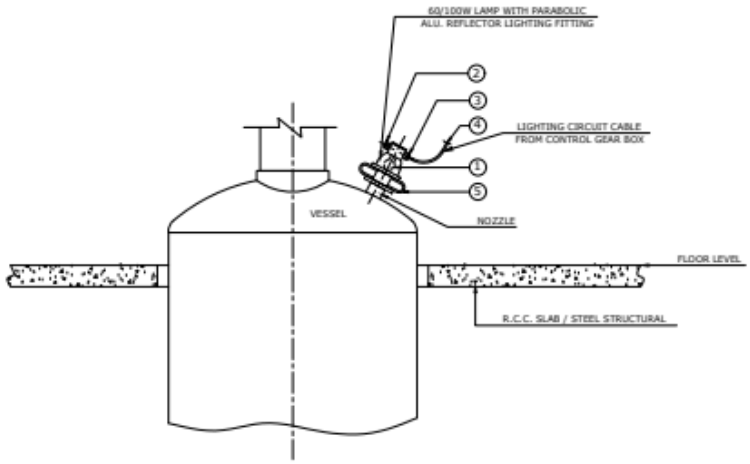
	TYPICAL MOUNTING DETAILS OF VESSEL LIGHT GLASS LIGHTING FITTING	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1	60/100 W LAMP & PARABOLIC ALUMINUM REFLECTOR	1 NO.	BY PURCHASER
2	PLUG	1 NO.	BY PURCHASER
3	CABLE GLAND (TO SUIT CIRCUIT CABLE)	AS REQUIRED	BY PURCHASER
4	CIRCUIT CABLE	AS REQUIRED	BY PURCHASER
5	6mm THK. M.S. MOUNTING BRACKET (SIZE TO SUIT)	1 NO.	BY PURCHASER

NOTES:

1. LONGER CABLE ROUTE SHALL BE SELECTED TO KEEP EXTRA LENGTH OF CABLE FOR REGLANDING IF NECESSARY.

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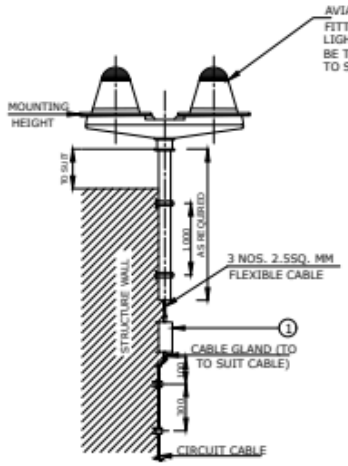
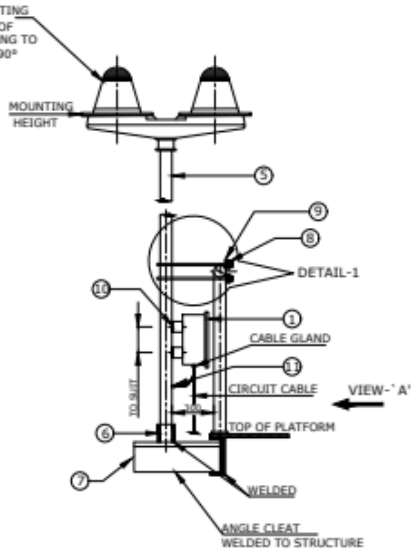
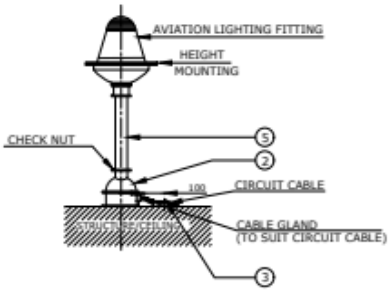
	TYPICAL MOUNTING DETAILS OF DOUBLE OBSTRUCTION LIGHT FOR AVIATION LIGHTING FITTING	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



FITTING MOUNTED ON SIDE SUPPORT TO STRUCTURE/ WALL MOUNTING TYPE-PM11



FITTING MOUNTED ON PLATFORM MOUNTING TYPE-PM11



FITTING DIRECTLY MOUNTED ON STRUCTURE/ CEILING MOUNTING TYPE PM-11

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1.	JUNCTION BOX WEATHER PROOF TYPE	1 No.	
2.	JUNCTION BOX WEATHER PROOF WITH DOME COVER TO SUIT 40 MM DIA G.I. PIPE.	1 No.	
3.	SADDLE/CLEAT WITH FIXING M.S. 60MM LONG SCREWS/ STUCS, NUTS & LOCK WASHER FOR CIRCUIT CABLE.	AS REQUIRED	
4.	SADDLE/CLEAT WITH FIXING M.S. 60MM LONG SCREWS/ STUCS, NUTS & LOCK WASHER FOR 40 MM DIA PIPE.	AS REQUIRED	
5.	40 MM DIA G.I. PIPE (LENGTH AS REQUIRED) WITH BOTH ENDS THREADED & CHECK NUTS.	1 No.	
6.	G.I. COUPLING SUITABLE FOR 40 MM DIA G.I. PIPE.	1 No.	
7.	ISMC-100x50x350 MM LONG.	1 No.	
8.	10 MM DIA 'U' BOLT SUITABLE FOR 40 MM PIPE WITH BOTH ENDS THREADED WITH NUTS 2NO. PLAIN AND 1NO. SPRING WASHERS WITH SUITABLE LENGTH.	4 No.	
9.	50x6x150MM LONG G.I. FLAT WITH 2NO. 12 MM DIA HOLES	4 No.	
10.	150X150x6 THICK M.S. PLATE WITH 2NO. 12MM DIA HOLES OR 50x6X300 LONG G.I. FLAT WITH 2NO. 12MM DIA HOLES	1 No.	
11.	RUBBER GROUMENT TO SUIT FLEXIBLE WIRE.	2 No.	

NOTES:

1. WEIGHT OF FITTING 5.5 KG.
2. USE FLEXIBLE WIRE FOR CONNECTION TO LIGHTING FROM JUNCTION BOX.
3. MOUNTING HEIGHT OF THE AVIATION LIGHTING FITTING SHALL BE AT HIGHER ELEVATION THAN THE STRUCTURE ON WHICH FITTING IS TO BE MOUNTED.

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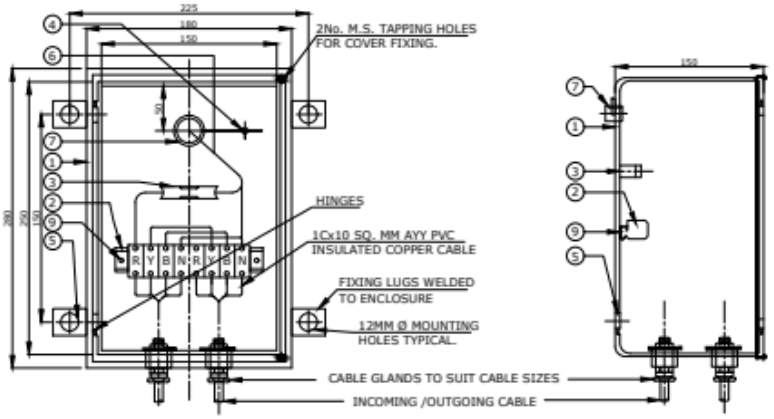
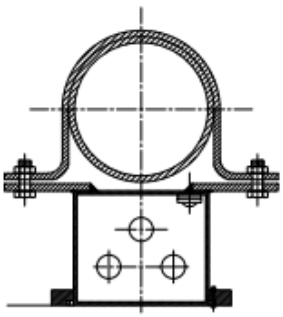
Date: 2026.02.13 19:41:32

	TYPICAL DETAILS OF LOOPING BOX FOR STREET LIGHTING FITTING	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



ELEVATION
(WITHOUT COVER)

SIDE VIEW



PLAN

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1.	2 MM THICK SHEET STEEL ENCLOSURE WITH COVER	1 No.	
2.	6 No. 30A, TERMINAL CONNECTOR SUITABLE FOR TERMINATING OF 4Cx16 SQ. MM CABLE (CHANNEL MFG.)	1 No.	
3.	4A, HRC FUSE	1 No.	
4.	M4x20 MM LONG ROUND HEAD EARTHING SCREW WITH 2 No. PLAIN WASHER & 1 No. SPRING WASHER.	2 No.	
5.	25x3 MMx70 MM LONG MS FLAT WITH 12 MM Ø HOLE WELDED TO ENCLOSURE LOGS FOR MOUNTING	4 No.	
6.	3Cx2.5 SQ. MM PVC FLEXIBLE WIRES.	AS REQUIRED	
7.	20 MM Ø -25 MM LONG G.I. PIPE WELDED TO ENCLOSURE	1 No.	
8.	M10x40 MM LONG BOLTS WITH NUT , LOCK NUT & PLAIN WASHERS FOR ENCLOSURE FIXING.	4 No.	
	MOUNTING CHANNEL SUITABLE FOR 6 No. 30A, TERMINAL CONNECTOR (LENGTH AS REQUIRED)	1 No.	

NOTES:

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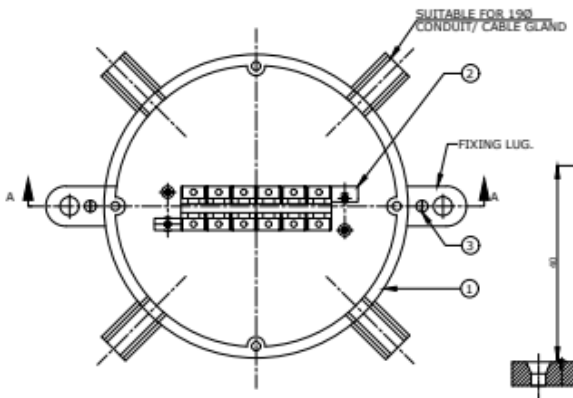
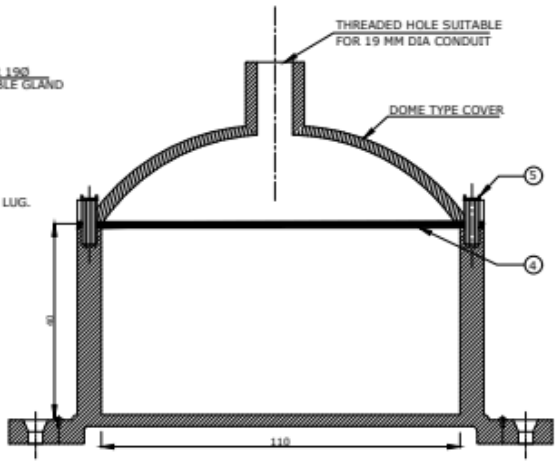
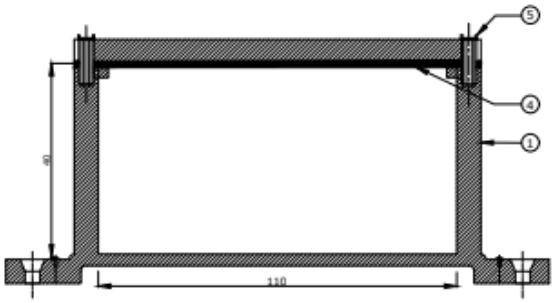
	TYPICAL DETAILS OF DUST/WEATHERPROOF ROUND JUNCTION BOX	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



VIEW WITH COVER ROMOVED



JUNCTION WITH DOME COVER
SECTION `A-A'



JUNCTION WITH PLANE COVER
SECTION `A-A'

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1.	JUNCTION BOX (CAST ALUMINIUM)	AS REQUIRED	
2.	30A, 4 WAY, TERMINAL BLOCK	1 No.	
3.	8 MM LONG BRASS SCREW WITH 2 No. PLAIN AND SPRING WASHER FOR INTERNAL AND EXTERNAL EARTHING TERMINAL.	2 No.	
4.	DISC TYPE NEOPRENE GASKET.	1 No.	
5.	COVER FIXING G.I. SCREWS WITH WASHER	4 No.	

NOTES:

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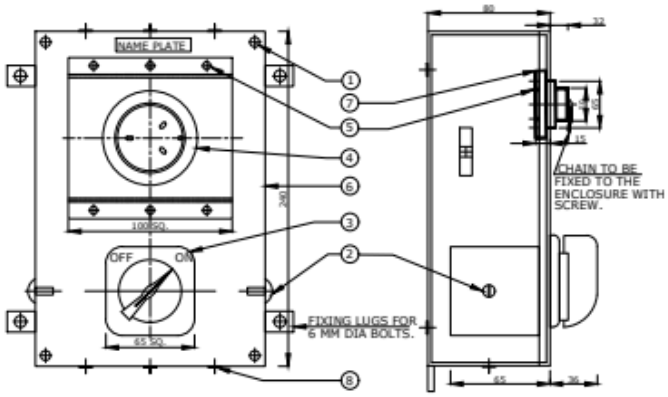
	TYPICAL MOUNTING DETAILS OF SINGLE PHASE SOCKET OUTLET ON HANDRAIL	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



FRONT VIEW

SIDE VIEW

MATERIAL TAKE-OFF

ITEM NO.	DESCRIPTION	QUANTITY	REMARKS
1.	5 MM DIA M/C SCREWS.	4 No.	
2.	5 MM DIA EARTHING SCREW WITH 2 No. PLAIN 1 No. SPRING WASHER.	2 No.	
3.	16A, 2 POLE, ON-OFF ROTARY SWITCH.	1 No.	
4.	10A, 1Ø AND EARTH METAL CLAD SOCKET OUTLET	1 No.	
5.	3 MM ,DIA M/C SCREWS	6 No.	
6.	14 SWG M.S. BOX WITH COVER FOR MOUNTING OF SWITCH AND SOCKET OUTLET	1 No.	
7.	14 SWG M.S. SHEET FIXED TO COVER PLATE FROM INSIDE FOR MOUNTING OF SOCKET	1 No.	
8.	19 MM DIA KNOCKOUT	6 No.	

NOTES:

1. SIMILER ARRANGEMENT CAN BE EMPLOYED FOR 20A, SP & E, 30A, TP & E, SD WITH 30A, DP & 63A, TP SWITCH RESPECTIVELY.
2. EPOXY BASED PAINT OF SPECIFIED SHADE SHALL BE APPLIED.
3. REAR ENGRAVED PERSPEX OF LAMINATED PLASTIC NAME PALTE WITH APPROPRIATE INSCRIPTION SHALL BE FIXED ON COVER WITH OR SUITABLE ADHESIVE.

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	GENERAL NOTES-EARTHING	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 2		

GENERAL NOTES:

1. ENTIRE EARTHING INSTALLATION SHALL COMPLY WITH THE REQUIREMENT OF IS-3043 INDIAN ELECTRICITY RULES OISD REGULATION AND OTHER APPLICABLE STATUTORY REGULATIONS AND SAFETY CODES IN THE LOCALITY OF THE INSTALLATION.
2. PIPE ELECTRODE SHALL BE USED FOR EARTH ELECTRODES. THE EARTH ELECTRODES SHALL BE KEPT SUFFICIENTLY AWAY FROM STRUCTURE TO CLEAR FOUNDATIONS, FOOTING ETC. SPACING OF MINIMUM 6 METERS SHALL BE KEPT BETWEEN ADJACENT EARTH ELECTRODES.
3. RESISTANCE OF EARTHING STATION SHALL BE MEASURED AT EACH EARTH ELECTRODE AFTER ITS INSTALLATION BY MEANS OF AN EARTH MEGGER. RESISTANCE OF EARTHING GRID SHALL BE MAINTAINED WITHIN 1 OHM (BY ADDITION OF EARTH ELECTRODE IN PARALLEL, IF NECESSARY).
4. THE MAIN EARTH LOOP (MEL) IN PLANT AREAS SHALL BE GENERALLY ROUTED UNDERGROUND. EARTH CONDUCTORS TO INDIVIDUAL EQUIPMENT SHALL BE RUN ALONG WITH POWER AND CONTROL / LIGHTING CABLES. WHEN EQUIPMENT ARE LOCATED AWAY FROM M.E.L. , SUITABLE SUB LOOPS MAY BE RUN UP TO THEM FOR DERIVING CONNECTIONS FOR INDIVIDUAL EQUIPMENT.
5. ALL ELECTRICAL EQUIPMENT SHALL BE EARTHED AT TWO DISTINCT POINTS WITH EARTH CONDUCTOR.
6. PROCESS/ UTILITY PIPE RACK COLUMN SHALL BE EARTHED AT EVERY 25 mtr. AT NEAREST AVAILABLE EARTHING NETWORK AS PER IS : 3043.
7. ALL STRUCTURE STEEL WORK TO BE CONNECTED TO EARTHING SYSTEM.
8. FOR CONDUIT WIRING OF LIGHTING CIRCUITS, FOR EARTHING OF LIGHTING FITTINGS, JUNCTION BOXES 14 SWG
9. THE LIGHTNING PROTECTION SYSTEM SHALL BE DESIGNED IN ACCORDANCE WITH IS :62305`CODE OF PRACTICE FOR PROTECTION OF BUILDING AND ALLIED STRUCTURES AGAINST LIGHTNING'.
10. EARTH SYSTEM AND LIGHTNING PROTECTION SHALL BE BONDED TO EACH OTHER TO PREVENT SIDE FLASH OVER, IF ADEQUATE CLEARANCE BETWEEN THE TWO SYSTEM CAN NOT BE MAINTAINED.
11. WHEN EQUIPMENT DO NOT HAVE EXTERNAL EARTHING TERMINAL ELECTRICAL CONTRACTOR SHALL PROVIDE THE SAME ON EQUIPMENT. SIZES OF EARTH CONDUCTORS SHALL GENERALLY AS PER REQUIREMENTS.

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	GENERAL NOTES-EARTHING	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	2 OF 2		

EQUIPMENT EARTHING SCHEDULE

TYPE OF EQUIPMENT	EARTHING CONDUCTOR SIZE (SEE NOTE-1)
MOTORS UPTO & 3.7 kW	8 SWG SOLID G.I. WIRE
MOTORS FROM 5.5kW TO 30kW & WELDING RECEPTACLES	10mm (3/8") DIA G.I. WIRE ROPE
MOTORS ABOVE 30kW INCLUDING HV MOTORS	16mm (5/8") DIA G.I. WIRE ROPE/ 40x5 mm G.I. STRIP
BUILDING COLUMNS	40x5 mm G.I. STRIP
STORAGE TANKS (VERTICAL & HORIZONTAL)	40x5 mm G.I. STRIP
LOADING RACKS	40x5 mm G.I. STRIP
VESSELS & HEAT EXCHANGERS	40x5 mm G.I. STRIP
SMALL EQUIPMENT & INSTRUMENTS	8 SWG SOLID G.I. WIRE
LIGHTING, POWER & INSTRUMENT PANEL	10mm (3/8") DIA G.I. WIRE ROPE
MAIN EARTH BUS / MV & HT SWITCH GEAR INTERCONNECTIONS / POWER TRANSFORMER	AS SPECIFIED
EHV & HV SUB-STATION	AS SPECIFIED
PUSH BUTTON STATION	8 SWG SOLID G.I. WIRE
STREET LIGHTING POLES	10mm (3/8") DIA G.I. WIRE ROPE
LIGHTING TRANSFORMER	16mm (5/8") DIA G.I. WIRE ROPE
PIPE RACK	40x5 mm G.I. STRIP
BONDING OF PIPE	25 SQ. mm INSULATED FLEXIBLE CU. CABLE
LIGHTNING PROTECTION	25x3 mm G.I. EARTH STRIP

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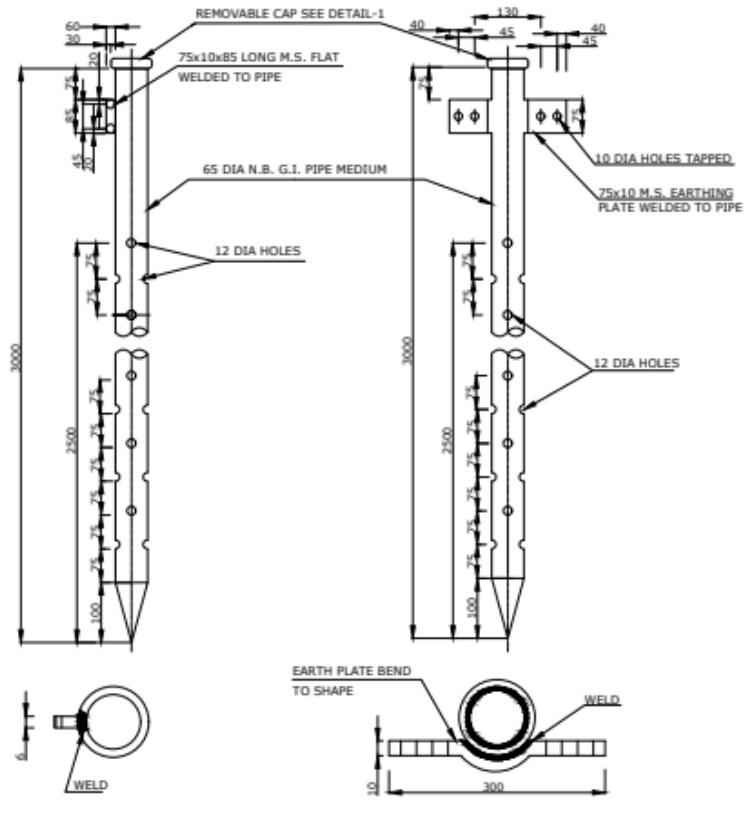
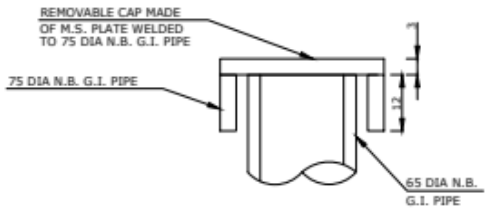
	ELECTRODE FOR EARTHING SYSTEM	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		





DETAIL-1

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.

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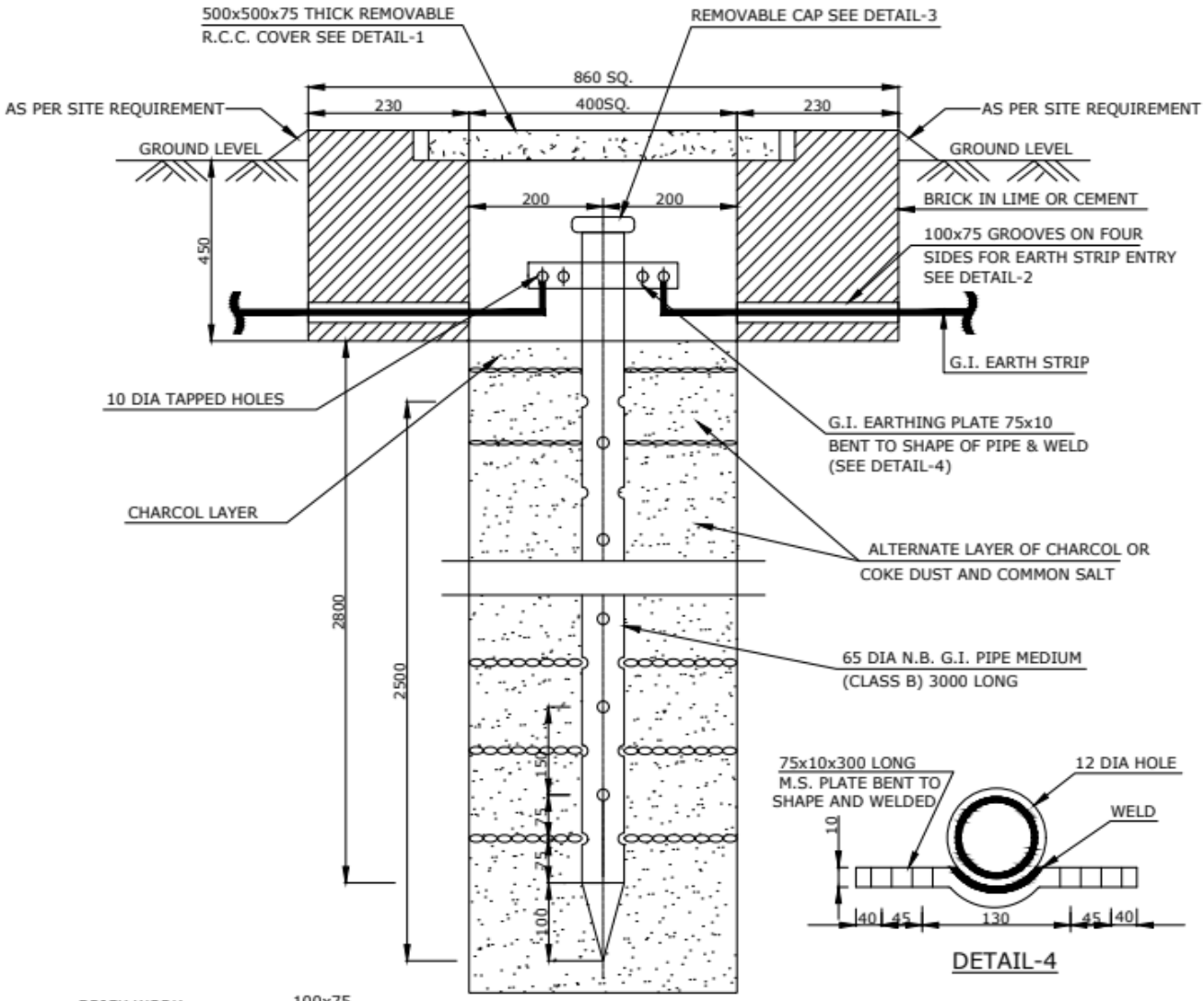
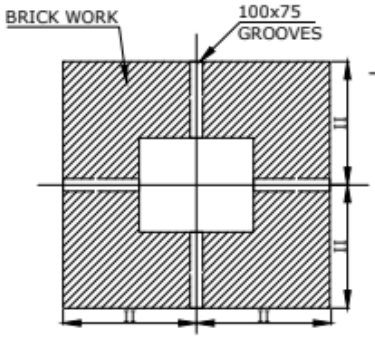
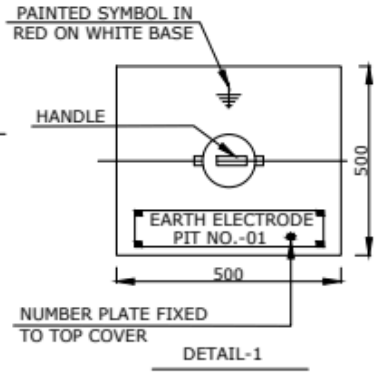
	EARTH ELECTRODE IN TEST PIT	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 2		



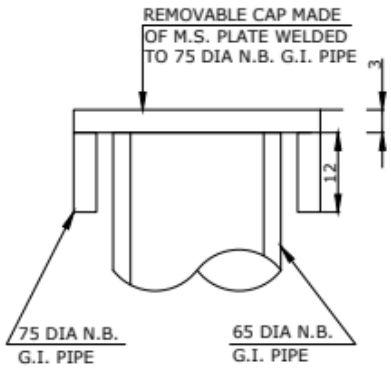
DETAIL-4



DETAIL-2



DETAIL-1



DETAIL-3

NOTES:

1. THE PIPE ASSEMBLY SHALL BE HOT DIP GALVANISED AFTER FABRICATION.
2. BRICK WORK SHALL BE DONE AFTER COMPACTING THE SOIL.

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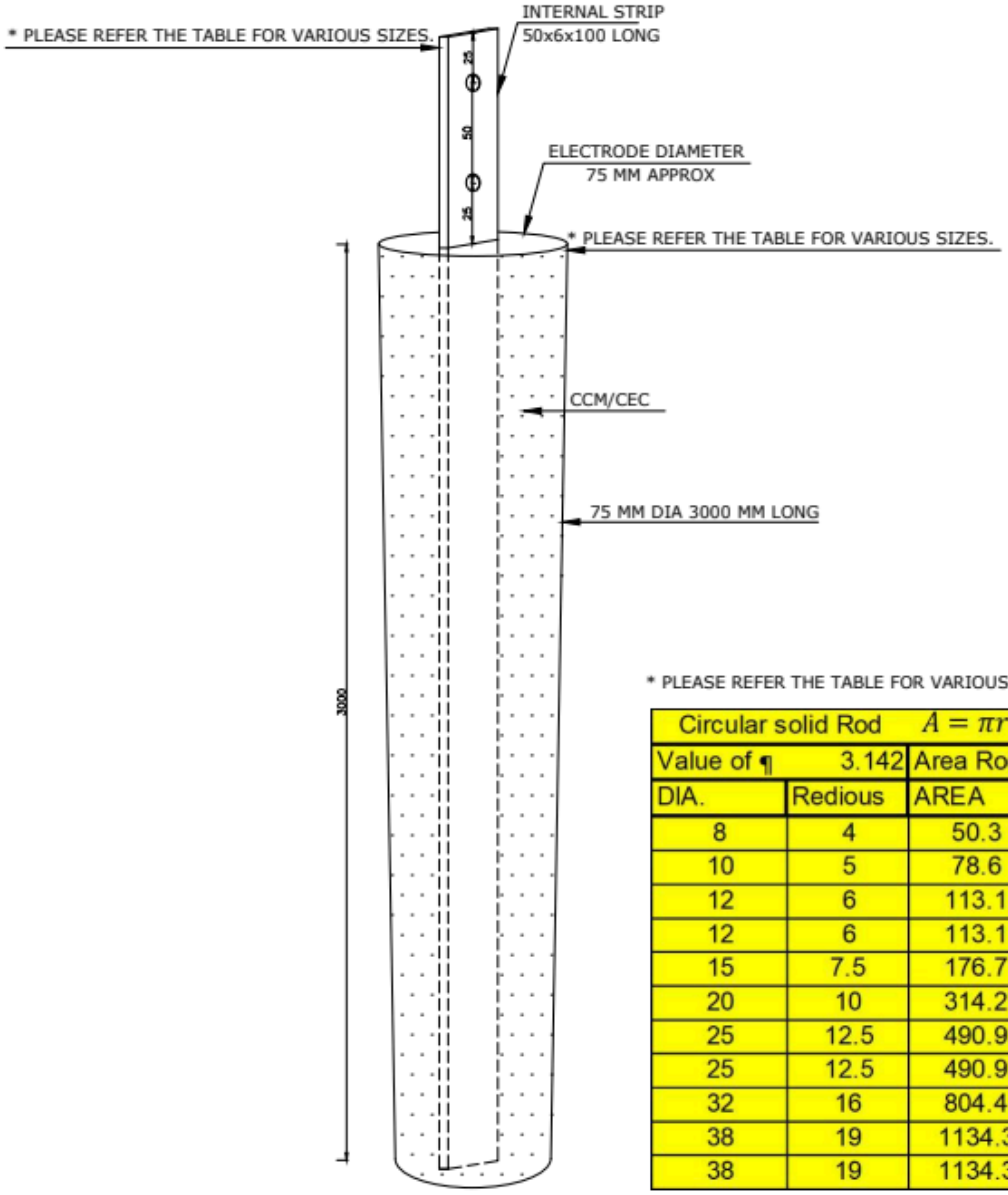
	TYPICAL DETAILS OF DIRECTLY BURIED CHEMICAL EARTHING	STANDARD DRAWING NO.		REV.	SIZE
				01	A4
		SHEET NO.	2 OF 2		



* PLEASE REFER THE TABLE FOR VARIOUS SIZES.

Circular solid Rod $A = \pi r^2$			A = L X W	Earthing Strip		
Value of ¶ 3.142		Area Rod	Area Srip	Earthing strip		
DIA.	Redious	AREA	AREA	Length	Width	Nos
8	4	50.3	50	20	2.5	1
10	5	78.6	75	25	3	1
12	6	113.1	125	25	5	1
12	6	113.1	128	32	4	1
15	7.5	176.7	192	32	6	1
20	10	314.2	300	50	6	1
25	12.5	490.9	500	50	10	1
25	12.5	490.9	520	65	8	1
32	16	804.4	750	75	10	1
38	19	1134.3	1200	100	12	1
38	19	1134.3	1200	75	8	2

NOTES:

1. CCM-CRYSTALLINE CONDUCTIVE MATERIAL / CEC-CHEMICAL EARTHING COMPOUND.
2. IT'S SUPERIOR CONDUCTIVE MATERIAL THAT SOLVES TOUGHEST GROUNDING PROBLEMS & MAKES CONDUCTIVITY LAYER CONTACTING WITH A ELECTRODE CLOSELY.
3. THE CCM/CEC NATURAL FEATURES OF STRONG ABSORBENT & MOISTURE RETENTION KEEP THE SOIL MOIST FOR A LONG TIME AND REDUCE SURROUNDING SOIL RESISTANCE.
4. CCM/CEC ENHANCING COMPOUND IS ENVIRONMENT FRIENDLY AND DOES NOT HARM GROUND WATER & NO HAZARDOUS CHEMICAL.
5. CCM/CEC CONTAINS CORROSION INHIBITOR TO PROTECT THE ELECTRODES AND PIPES.
6. CCM/CEC IS HIGHLY CONDUCTIVE & HANDLE ANY CLIMATIC CONDITION.
7. GI STRIP SHALL BE HOT DEEP GALVANIZE ZINK OXIDE.
8. CCM/CEC SHALL BE GRAPHITE,ALUMINUM SILICATE,IRON OXIDE,NATURAL EARTH MINERALS.
9. EARTHING SHALL BE COMPLY TO LATEST IS-3043.

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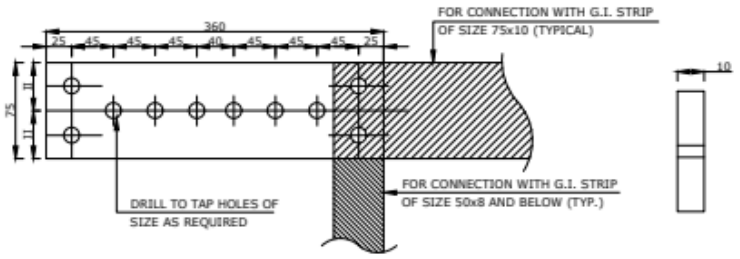
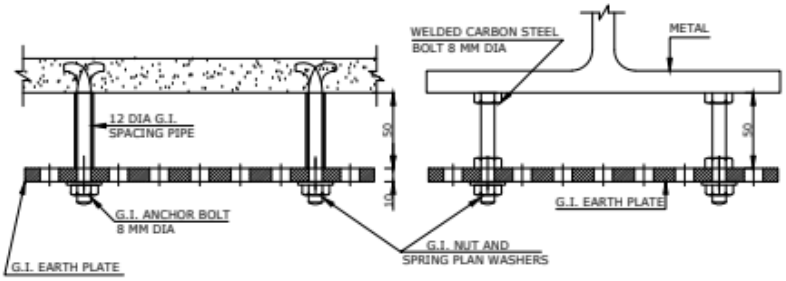
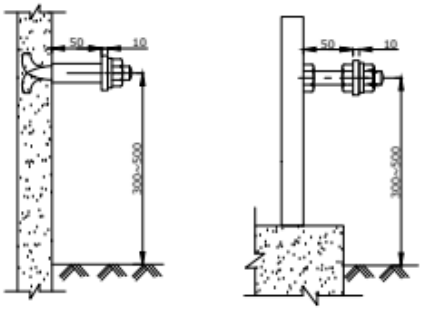
	EARTH PLATES FIXING DETAILS	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



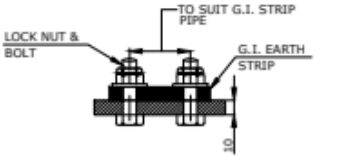
G.I. EARTH PLATE





TYPICAL INSTALLATION OF EARTH PLATE ON R.C.C. STRUCTURES

TYPICAL INSTALLATION OF EARTH PLATE ON STEEL STRUCTURES



TYPICAL FIXING DETAIL OF G.I. EARTH STRIP TO EARTH PLATE

NOTES:

1. WHERE FIRE PROOFING OF STEEL STRUCTURES ARE ENCOUNTERED LENGTH OF CARBON STEEL BOLT SHALL BE INCREASED FOR FIXING OF EARTH PLATE.
2. ALL CONNECTIONS WITH EARTH PLATE SHALL BE MADE WITH G.I. BOLT, NUT, SPRING AND PLAIN WASHERS.

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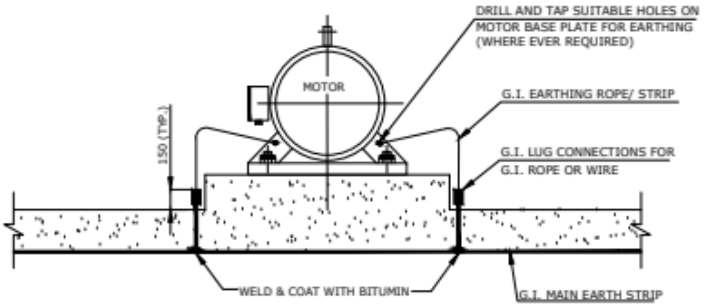
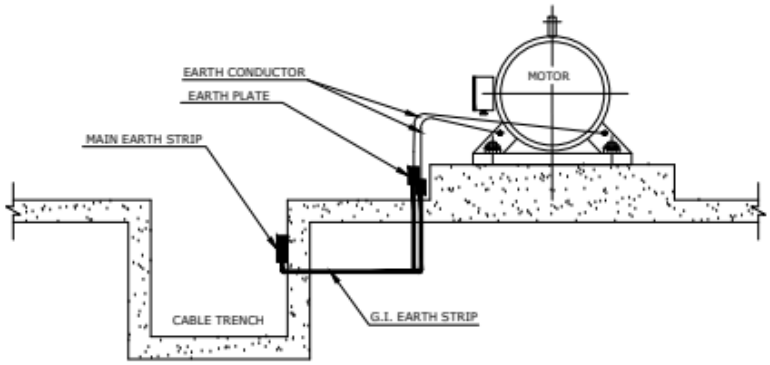
	TYPICAL EARTHING FOR MOTOR	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



DETAIL-1
REMOTE EARTH PLATE



DETAIL-2
LOCAL EARTH PLATE

NOTES:

1. MOTOR FOUNDATION BOLT SHALL NOT BE USED FOR EARTHING.

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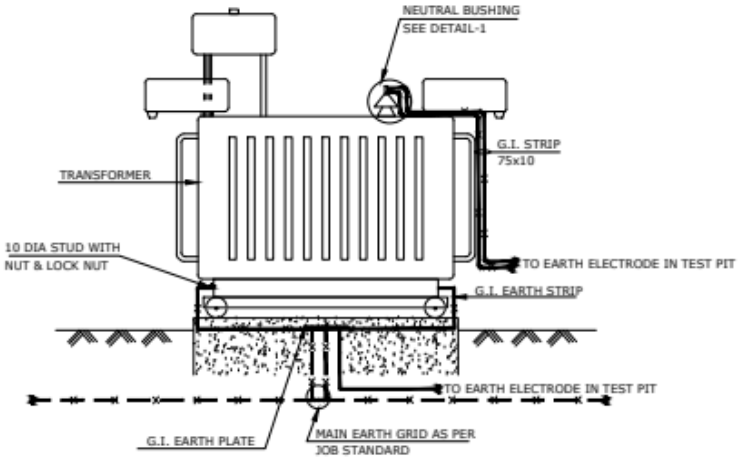
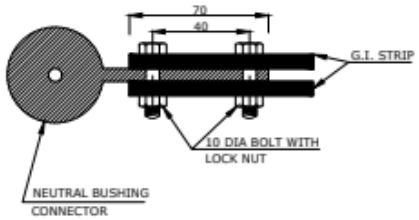
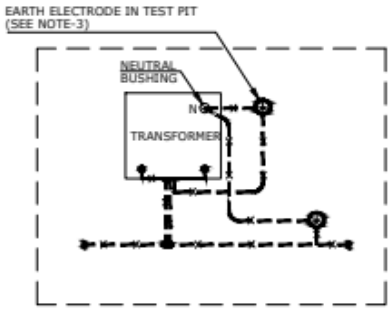
	TYPICAL ARRANGEMENT FOR TRANSFORMER EARTHING (NEUTRAL SOLIDLY EARTHED)	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		





DETAIL-1



LING DIAGRAM

NOTES:

1. WHEREVER SEPERATE NEUTRAL BUSHING FOR EARTHING IS NOT PROVIDED THE NEUTRAL EARTHING SHALL BE DONE FROM BUS DUCT.
2. EARTH ELECTRODE IN TEST PITS SHALL BE SO LOCATED THAT DISTANCE BETWEEN TWO PITS SHALL BE MINIMUM 6 METER.
3. WHERE TRANSFORMERS NEUTRAL EARTHING IS DONE THROUGH N.G.R. THE CONNECTIONS BETWEEN NEUTRAL AND N.G.R. SHALL BE THROUGH CABLE. THE OTHER END END OF N.G.R. SHALL BE CONNECTED TO EARTH ELECTRODE.

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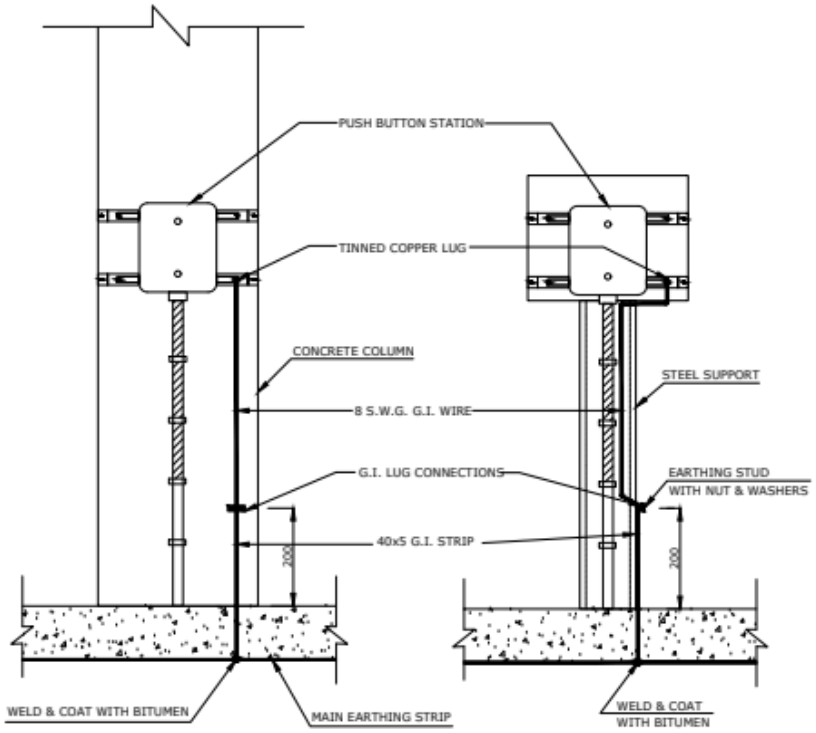
	TYPICAL EARTH CONNECTION FOR PUSH BUTTON STATION	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



NOTES:

1. ALTERNATIVELY CONNECTION SHALL BE TAKEN FROM THE NEAREST AVAILABLE EARTH PLATE.

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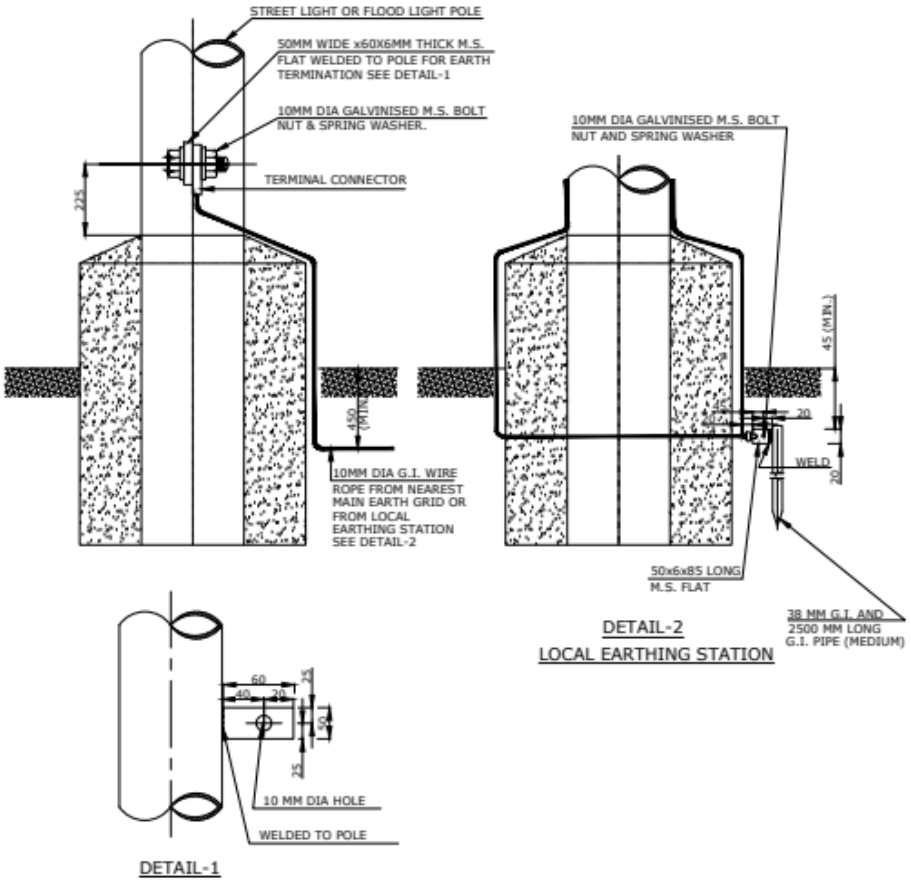
	TYPICAL EARTH CONNECTION FOR STREET LIGHT POLE	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



NOTES:

1. USE TWO EARTH WIRES IF VOLTAGE IN THE POLE JUNCTION BOX IS 415 VOLTS.

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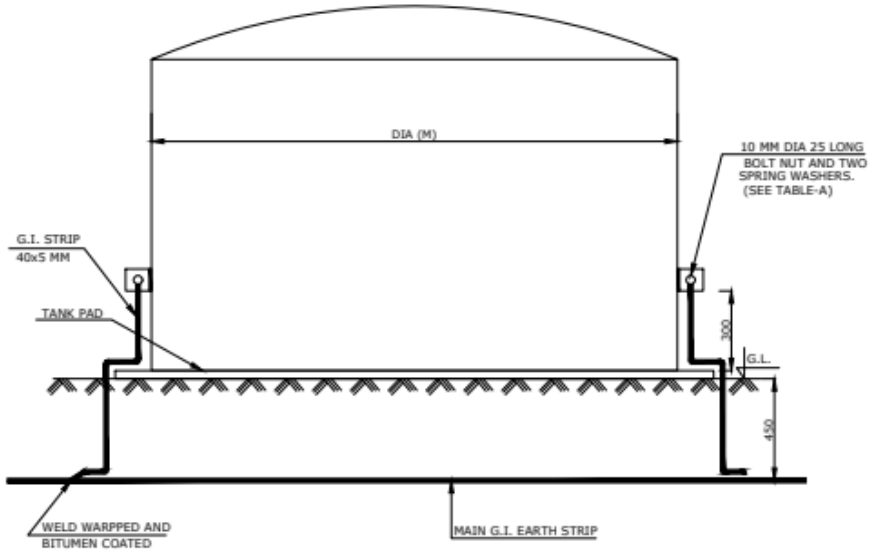
	EARTHING OF TANKS, VESSELS AND SPHERES	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 2		



DETAIL-1 (TANK)

TABLE-A

TANK DIAMETER (M)	EARTHING CONNECTION
<5	1
<20	2 AT 180°
<30	3 AT 120°
>40	4 AT 90°
>50	5 AT 72°
>60	6 AT 60°
>70	7 AT 51.43°
>80	8 AT 45°
>90	9 AT 40°

EARTH LUG ON TANK

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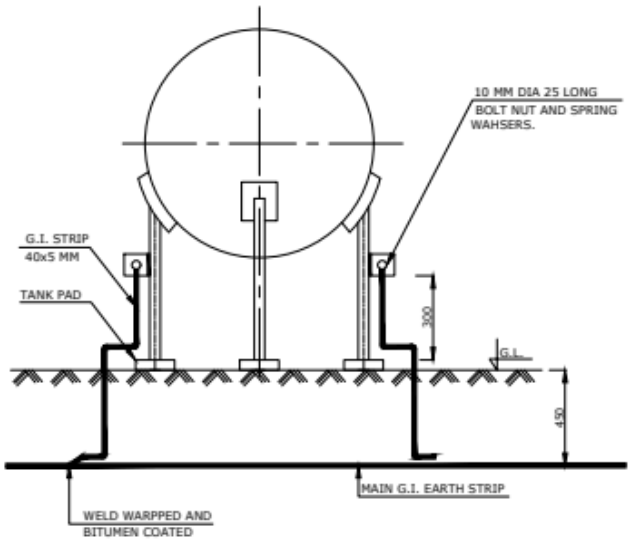
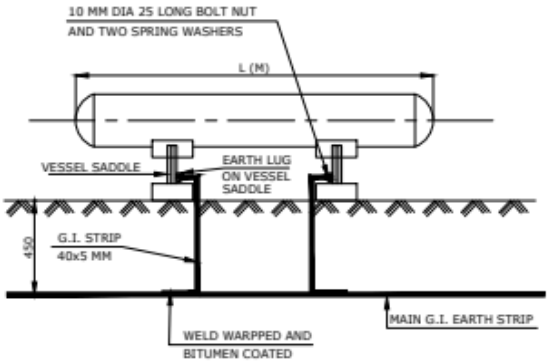
	EARTHING OF TANKS, VESSELS AND SPHERES	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	2 OF 2		



DETAIL-3 (SPHERE)



DETAIL-2 (HORIZONTAL VESSEL)

NOTES:

1. TWO NOS. OF EARTHING LUGS WILL BE AVAILABLE ON LEG SUPPORTS (DIAMETRICALLY OPPOSITE) OF EQUIPMENT FOR PROVIDING EARTH CONNECTION.
2. ALL VESSELS, SPHERES AND COLUMNS SHALL HAVE TWO EARTH CONNECTIONS IN GENERAL.
3. HORIZONTAL VESSEL OF LENGTH MORE THAN 20 METERS:-
   TWO EARTH LUGS ARE PROVIDED ON EACH SADDLE OF HORIZONTAL VESSELS.
   AS SUCH THERE SHALL BE TWO EARTH CONNECTIONS TO THE EARTH GRID FROM EACH SADDLE.

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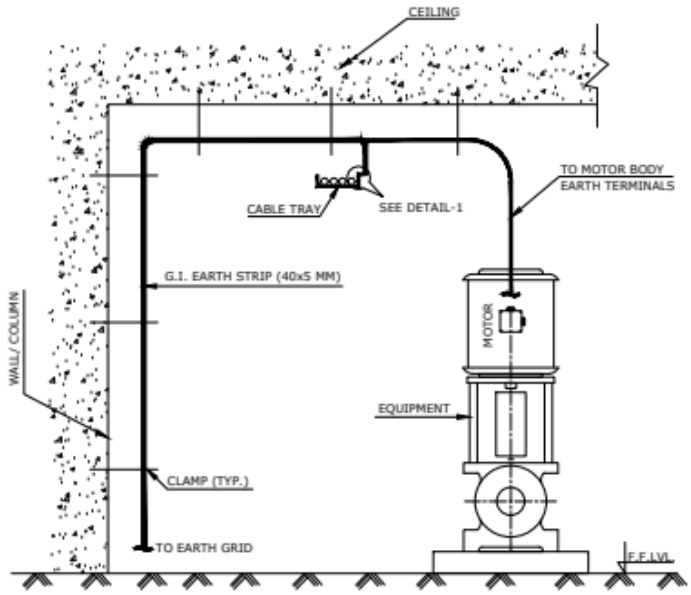
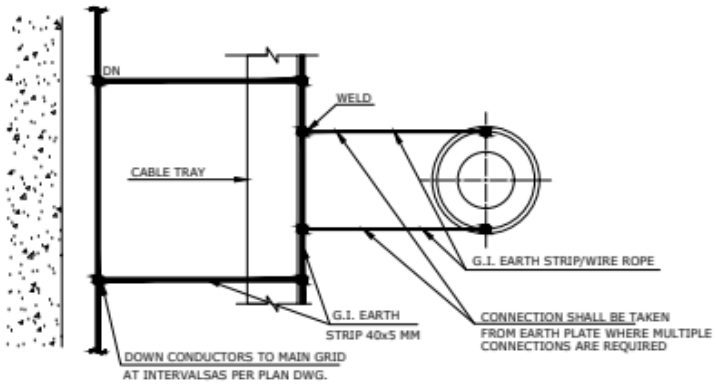
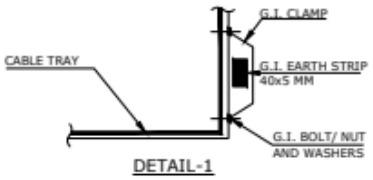
Date: 2026.02.13 19:41:32

	TYPICAL EARTHING OF CABLE TRAY AND ELECTRIC MOTOR	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



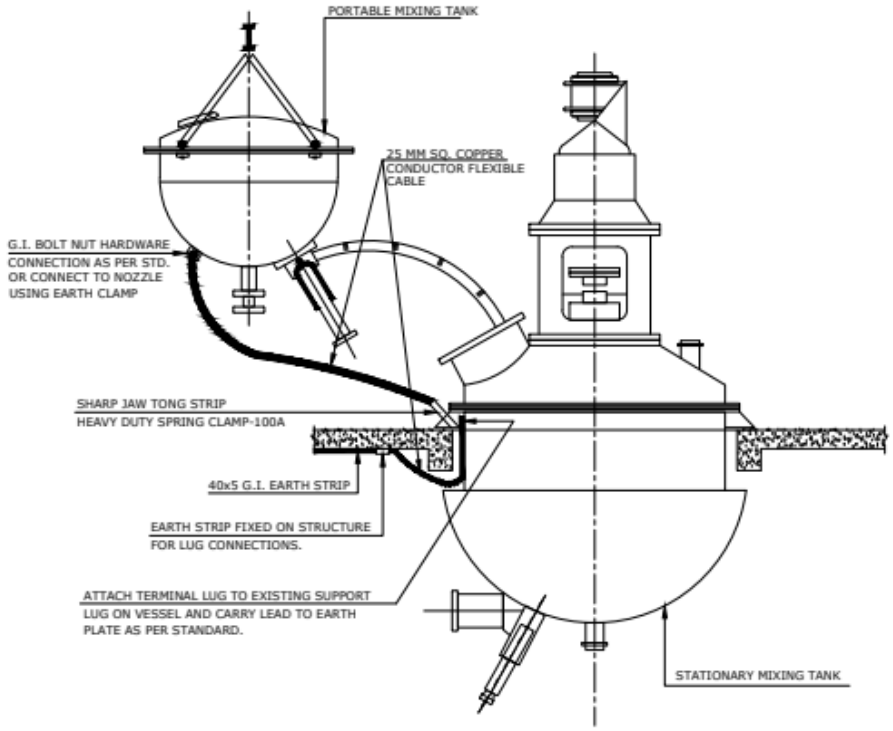




DETAIL-1

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

	TYPICAL EARTHING ARRANGEMENT FOR PROCESS EQUIPMENT	STANDARD DRAWING NO.		REV.	SIZE
		\		02	A4
		SHEET NO.	1 OF 1		



NOTES:

1. ALL PROCESSING EQUIPMENT SUCH AS MIXTURES, CHURNS, AUTOCLAVES, COLUMNS, CENTRIFUGES, FILTER PRESS PUMPS ETC. SHALL BE EARTHED IF NOT INDIRECT CONTACT WITH PROPERLY EARTHED STEEL MEMBERS.
2. ALL TEMPORARY EARTH CONNECTIONS SHALL BE MADE BEFORE OPENING THE VESSEL.

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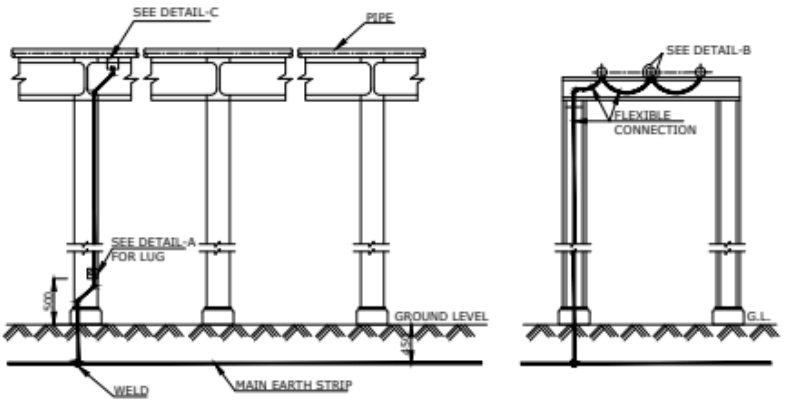
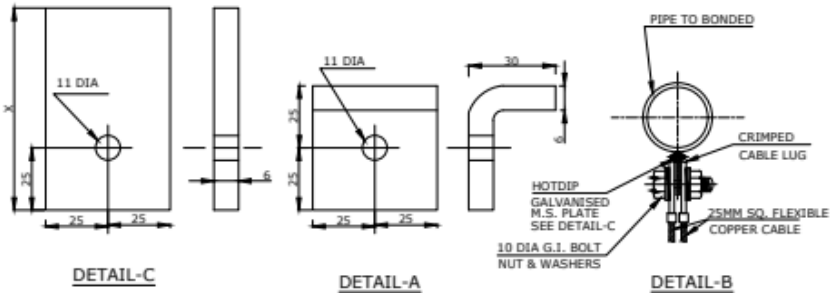
Date: 2026.02.13 19:41:32

	EARTHING/BONDING OF PIPES AND PIPE RACKS	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 2		



FRONT VIEW

SIDE VIEW



DETAIL-C

DETAIL-A

DETAIL-B

NOTES:

1. UNLESS MENTIONED OTHERWISE ON PLANS OR JOB SPECIFICATIONS. THE PIPELINES SHALL BE BONDED AND EARTHED AT THE ENTRY AND EXITS POINTS OF BATTERY LIMIT.
2. STEEL PIPE RACKS IN THE PROCESS UNIT AND OFFSITE AREA SHALL BE EARTHED AT EVERY 24 METRES.

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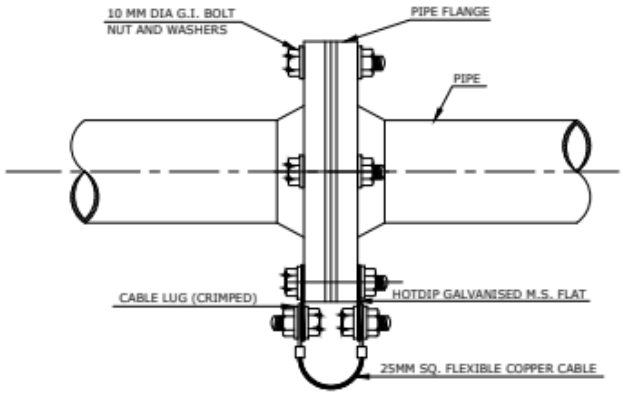
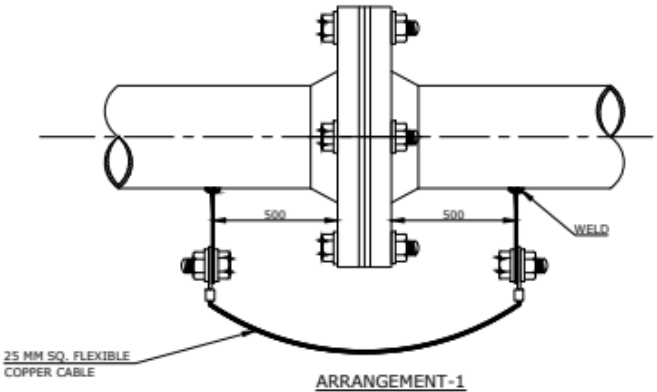
Date: 2026.02.13 19:41:32

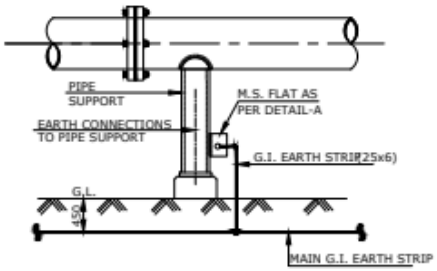
	EARTHING/BONDING OF PIPES AND PIPE RACKS	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 2 OF 2		



ARRANGEMENT-2



ARRANGEMENT-1



ARRANGEMENT-3

NOTES:

1. HOT DIP GALVANISHED M.S. FLAT (50x 10x (x+50) WHERE x IS THE INSULATION THICKNESS) SHALL BE PROVIDED BY THE PIPING CONTACTOR.
2. SUPPLY OF FLEXIBLE COPPER CABLE, LUGS, BOLTS, NUTS, WASHERS HARDWARE AND MAKING CONNECTIONS, SHALL BE DONE BY ELECTRICAL CONTACTOR.

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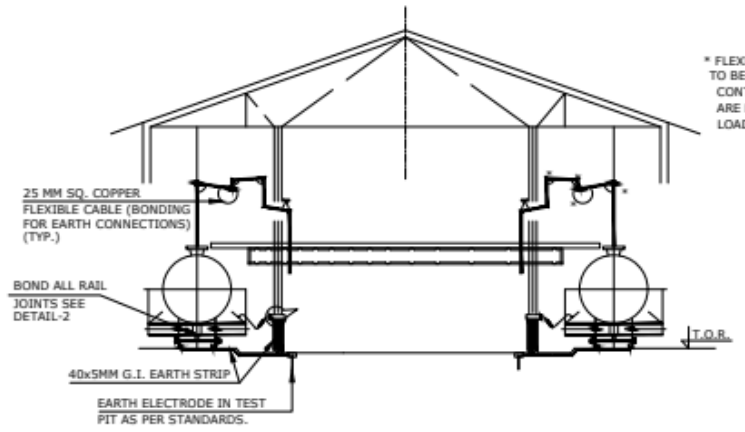
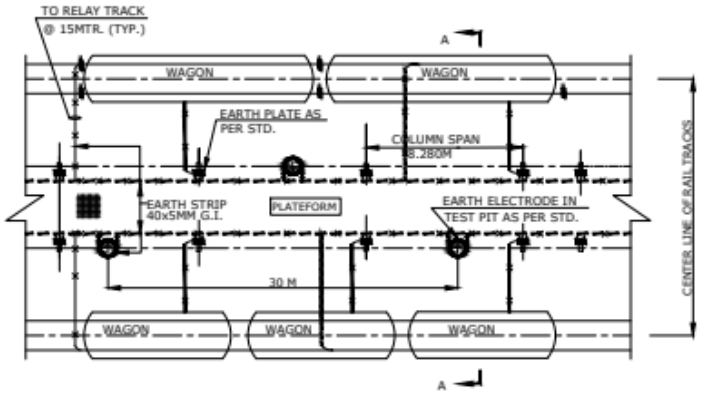
Date: 2026.02.13 19:41:32

	TYPICAL EARTHING ARRANGEMENT-WAGON	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 2		



SECTION A-A



TYPICAL PART PLAN

NOTES:

1. SUPPLY OF FLEXIBLE CABLE AND SPRING CLAMPS BY ELECTRICAL CONTACTOR ARE NOT REQUIRED WHEN MONITORING OF EARTH SCHEME AND THE ABOVE MATERIAL ARE INCLUDED AS PART OF PLANT AUTOMATION PACKAGE.

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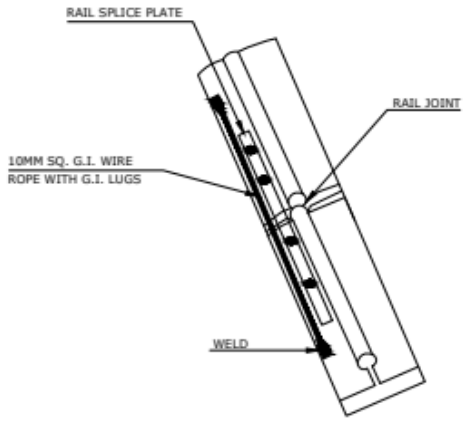
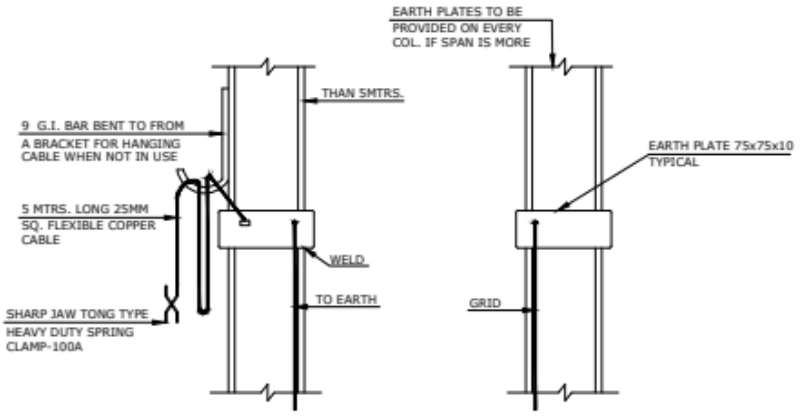
Date: 2026.02.13 19:41:32

	TYPICAL EARTHING ARRANGEMENT-WAGON	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	2 OF 2		



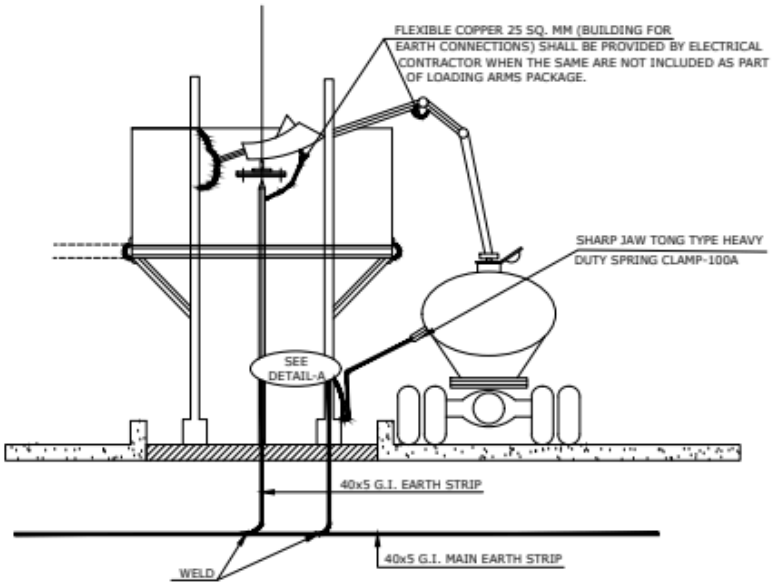
BONDING OF SINGLE RAIL
DETAIL-2

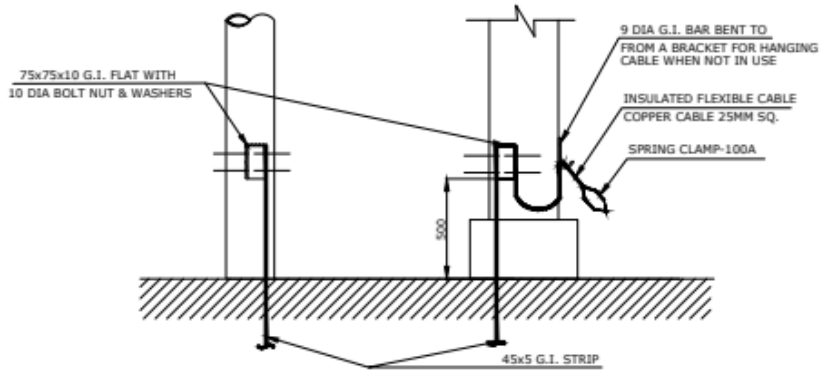


DETAIL-1

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

	EARTHING-TRUCK LOADING PLATFORM	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		





DETAIL-A

NOTES:

1. SUPPLY OF FLEXIBLE CABLE AND SPRING CLAMPS BY ELECTRICAL CONTACTOR ARE NOT REQUIRED WHEN MONITORING OF EARTH SCHEME AND THE ABOVE MATERIAL ARE INCLUDED AS PART OF PLANT AUTOMATION PACKAGE.

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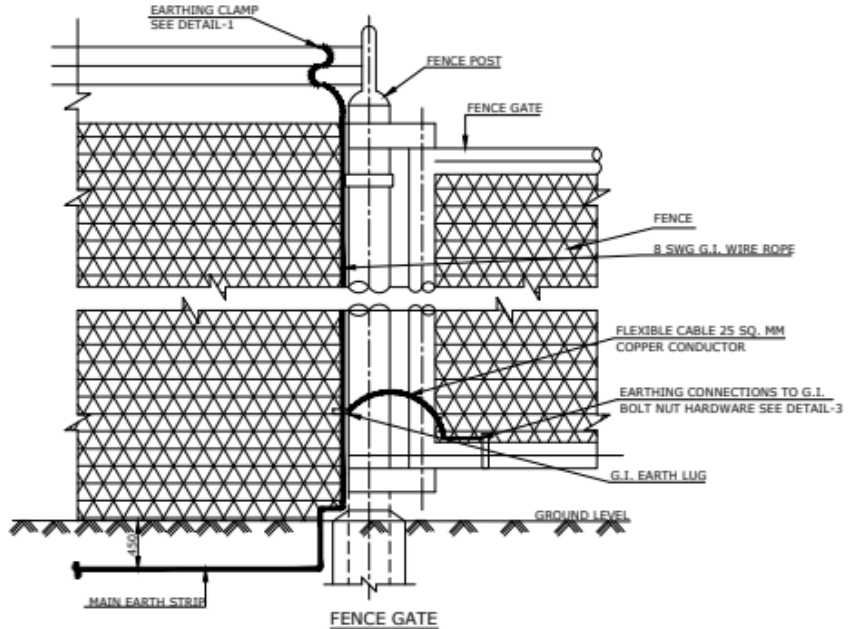
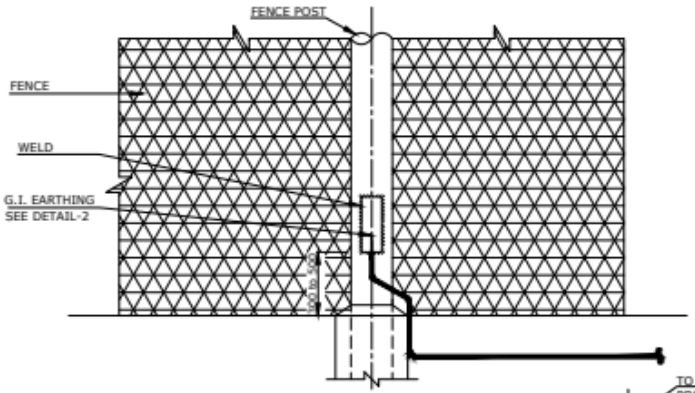
Date: 2026.02.13 19:41:32

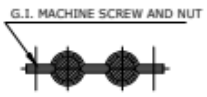
	FENCE GATE EARTHING (TRANSFORMER YARD)	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



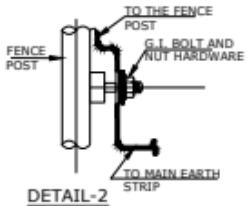
FENCE GATE



FENCE POST



DETAIL-1



DETAIL-2

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Date: 2026.02.13 19:41:32

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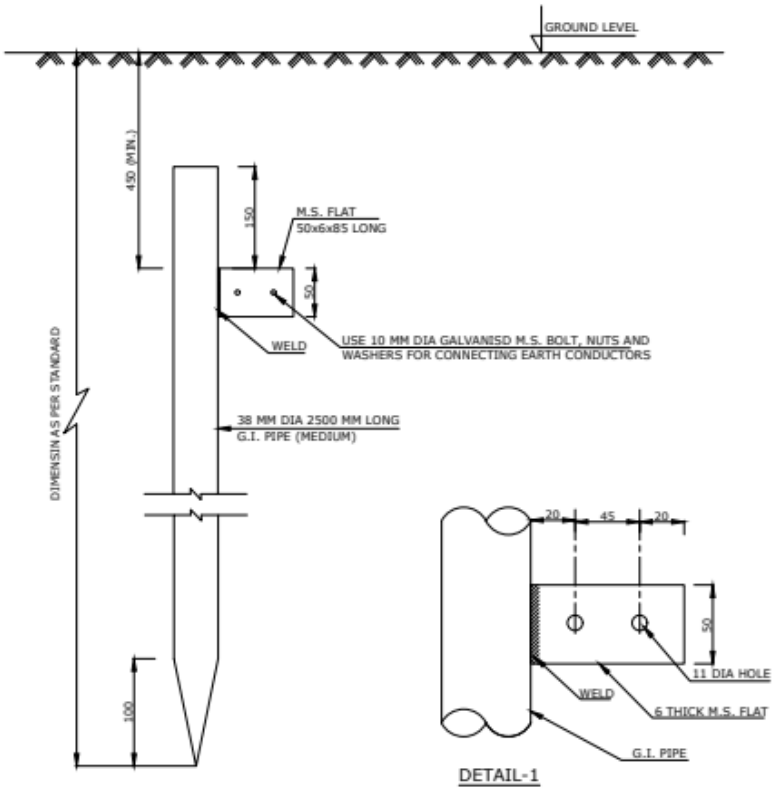
Date: 2026.02.13 19:41:32

	TYPICAL DETAILS OF DIRECTLY BURIED EARTH ELECTRODE	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



DETAIL-1

NOTES:

1. ASSEMBLY SHALL BE HOT DIP GALVANISED AFTER FABRICATION.
2. THE ELECTRODE SHALL BE DRIVEN TO A DEPTH TO REACH PERMANENT MOIST SOIL.

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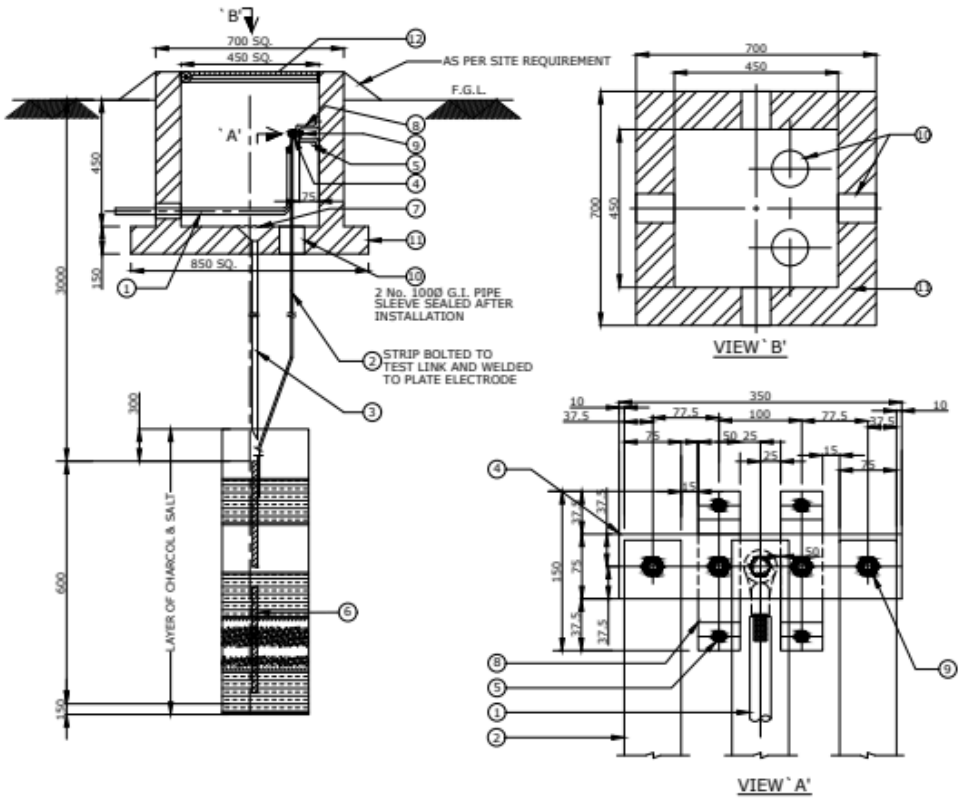
Date: 2026.02.13 19:41:32

	TYPICAL DETAILS OF PLATE EARTH ELECTRODE	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



MATERIAL TAKE-OFF

ITEM No.	DESCRIPTION	QUANTITY	REMARKS
1.	75x10mm G.I. STRIP/ 25x3mm COPPER STRIP/ 1C PVC INSULATED CABLES AS SPECIFIED IN CONTRACT DOCUMENTS.	AS REQUIRED	
2.	75X8mm G.I. STRIP/ 25x3mm COPPER STRIPS	2 No.	
3.	25Ø G.I. PERFORATED PIPE FOR WATERING.	1 No.	
4.	350x75x10 mm THICK G.I. TEST LINK	1 No.	
5.	M8 STAINLESS STEEL ANCHOR STUD WITH BOLT AND WASHER	4 No.	
6.	600x600x10 mm THICK G.I./3mm THICK COPPER EARTH ELECTRODE.	1 No.	
7.	WIRE MESH	1 No.	
8.	50x6 mm THICK 350 LONG G.I. SADDLE.	2 No.	
9.	M10 STAINLESS STEEL BOLT WITH 2 No. PLAIN & 1 No. SPRING WASHERS.	5 No.	
10.	100Ø G.I. PIPE SLEEVE SEALED AFTER INSTALLATION.	6 No.	
11.	BRICK WATERING CHAMBER WITH PLASTER FINISH INSIDE & OUTSIDE	1 No.	
12.	C.I. REMOVABLE COVER HINGED TO CAST IRON FRAME.	1 No.	

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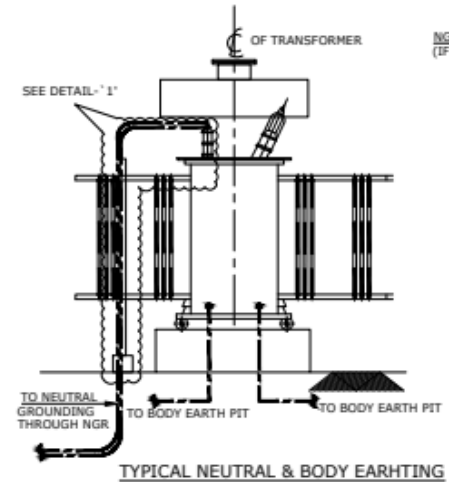
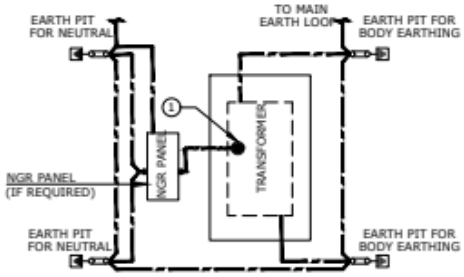
Date: 2026.02.13 19:41:32

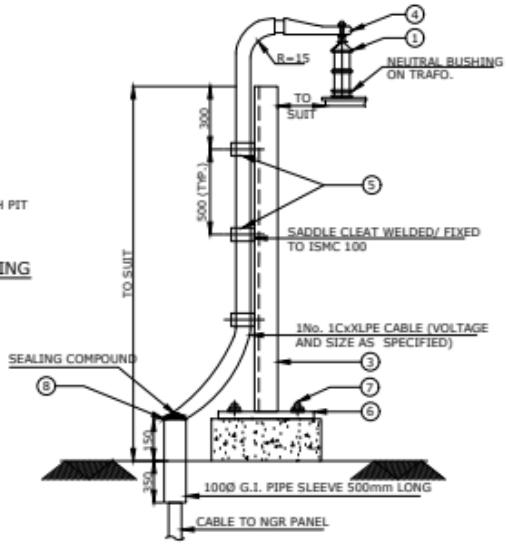
	TYPICAL TRANSFORMER NEUTRAL & BODY EARTHING DETAILS FOR RESISTANCE GROUNDED SYSTEM	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



TYPICAL NEUTRAL & BODY EARHTING DETAILS UP TO 6.6kV



SCHEMATIC BLOCK DIAGRAM



DETAIL-`1'

MATERIAL TAKE-OFF

ITEM No.	DESCRIPTION	QUANTITY	REMARKS
1.	NEUTRAL BUSHING	1 No.	
2.	NUT & SPRING WASHERS TO SUIT TRANSFORMER BODY EARTHING	2 No.	
3.	ISMC 100-LENGTH TO SUIT	1 No.	
4.	CABLE LUG SUITABLE FOR CABLE SIZE	1 No.	
5.	MS SADDLE/ CLEAT TO SUIT CABLE DIA.	AS REQUIRED	
6.	150x150x6mm THICK PLATE WITH 4 No. 12Ø HOLES.	1 No.	
7.	M10 ANCHOR STUD WITH PLAIN AND SPRING WASHERS.	4 No.	
8.	SEALING COMPOUND	AS REQUIRED	

NOTES :-

1. ALL HARDWARE SHALL BE OF STAINLESS STEEL.
2. ALL STEEL STRUCTURE USED FOR ELECTRICAL INSTALLATION SHALL BE APPLIED TWO COATS OF ANTI CORROSIVE PRIMER AND EPOXY PAINT OF APPROVED SHADE.

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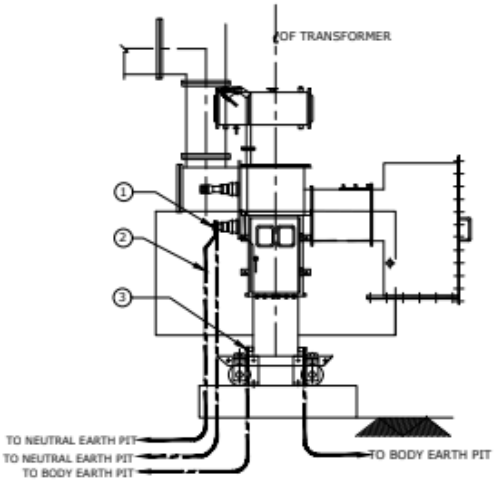
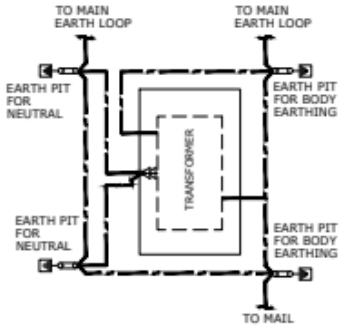
Date: 2026.02.13 19:41:32

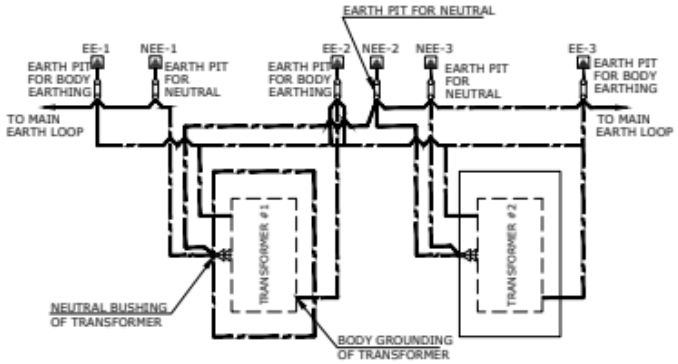
	TYPICAL TRANSFORMER NEUTRAL & BODY EARTHING SOLIDLY GROUNDED SYSTEM	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



TYPICAL NEUTRAL & BODY EARTHING
DETAILS UP TO 0.433kV



SCHEMATIC DIAGRAM
FOR SINGLE TRANSFORMER



SCHEMATIC DIAGRAM
FOR TWO TRANSFORMER

MATERIAL TAKE-OFF

ITEM No.	DESCRIPTION	QUANTITY	REMARKS
1.	NEUTRAL BUSHING BY TRANSFORMER VENDOR	-	
2.	G.I. EARTH STRIP	AS PER DRG.	
3.	EARTHING PAD WITH BOLT NUT & SPRING WASHERS BY TRANSFORMER VENDOR	-	

NOTES :-

1. ALL HARDWARE SHALL BE OF STAINLESS STEEL.
2. ALL DAMAGE TO GALVANISED FINISHES SHALL BE PAINTED WITH ZINC RICH PAINT.
3. ALL STEEL STRUCTURE USED FOR ELECTRICAL INSTALLATION SHALL BE APPLIED TWO COATS OF ANTI CORROSIVE PRIMER AND EPOXY PAINT OF APPROVED SHADE.

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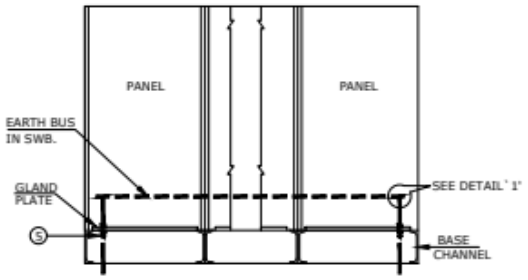
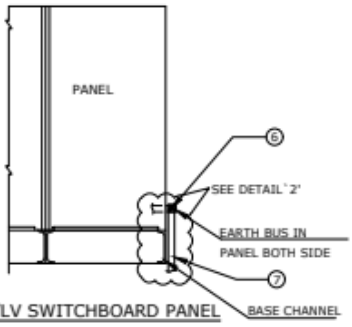
Date: 2026.02.13 19:41:32

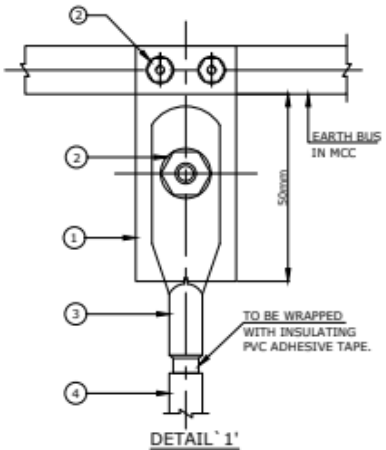
	TYPICAL EARTHING DETAILS OF HV/LV SWITCHBOARD PANEL	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



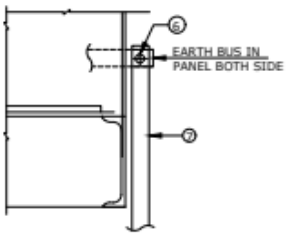
HV/LV SWITCHBOARD PANEL



HV/LV SWITCHBOARD PANEL



DETAIL`1'
EARTHING BY CABLE
ALTERNATIVE-1



DETAIL`2'
EARTHING BY G.I. STRIP
ALTERNATIVE-2

MATERIAL TAKE-OFF

ITEM No.	DESCRIPTION	QUANTITY	REMARKS
1.	COPPER/ALUMINUM ADAPTER PLATE.	2 No.	ALT.-1
2.	M10 STAINLESS STEEL BOLT WITH 2No. PLAIN &1No. SPRING WASHERS.	6 No.	ALT.-1
3.	CABLE LUG AND SOLDER	2 No.	ALT.-1
4.	1C ALUMINUM PVC INSULATED CABLE, CABLE SIZE AS SPECIFIED IN CABLE SCHEDULE	AS REQUIRED	ALT.-1
5.	CABLE GLAND SUITABLE FOR ITEM No. 4	2 No.	ALT.-1
6.	M10 BOLTS WITH 2No. PLAIN & 1No. SPRING WASHERS.	2 No.	ALT.-2
7.	G.I. STRIP.	AS REQUIRED	ALT.-2

NOTES :-

1. PETROLEUM CONDUCTING JELLY SHALL BE APPLIED TO ALL SURFACES TO BE JOINED.
2. ALL STEEL STRUCTURE USED FOR ELECTRICAL INSTALLATION SHALL BE APPLIED TWO COATS OF ANTI CORROSIVE PRIMER AND EPOXY PAINT OF APPROVED SHADE.
3. ALL HARDWARE SHALL BE OF STAINLESS STEEL.

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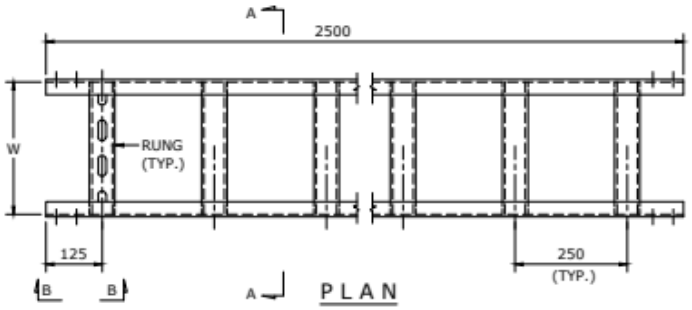
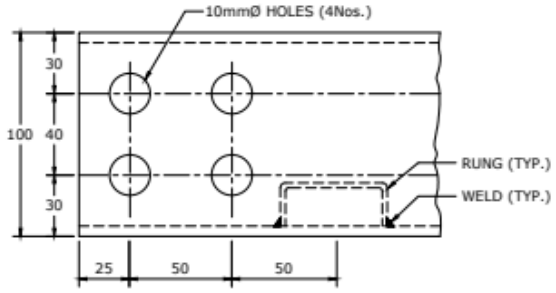
Date: 2026.02.13 19:41:32

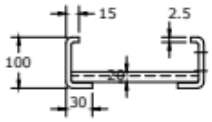
	STANDARD DRAWING NO.	REV.	SIZE
STANDARD DRAWING LADDER TYPE CABLE TRAY		02	A4
	SHEET NO. 1 OF 1		



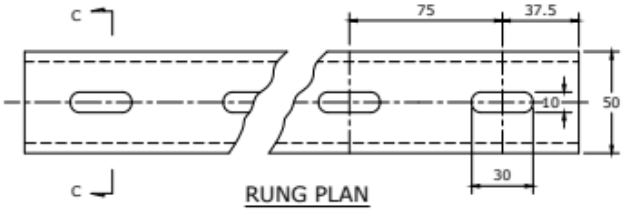
PLAN



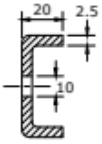
SECTION `B-B'



SECTION `A-A'



RUNG PLAN



SECTION `C-C'

INSIDE TRAY WIDTH (W) - 150,300,450,600,800MM (AS PER MTO)
MATERIAL - 12 GAUGE (2.5MM) M.S.SHEET/G.S/AL/FRP (AS PER MTO)

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. M.S. SHEET SHALL CONFORM TO IS2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. CABLE TRAY SUPPLIED WITH OTHER MATERIALS SHALL CONFIRMED TO RELEVANT IS/INTERNATIONAL STANDARDS.
3. THE MATERIAL DIMENSIONAL DETAILS SHOWN ARE TYPICAL FOR GS STRESS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRE HARDWARE AS PER DRG. No. SD-75-6706.
5. CABLE TRAYS SHALL DESIGN FOR 3000mm SUPPORT SPAN UNLESS NOTED OTHERWISE FOR SPECIFIED TRAY LOADING.

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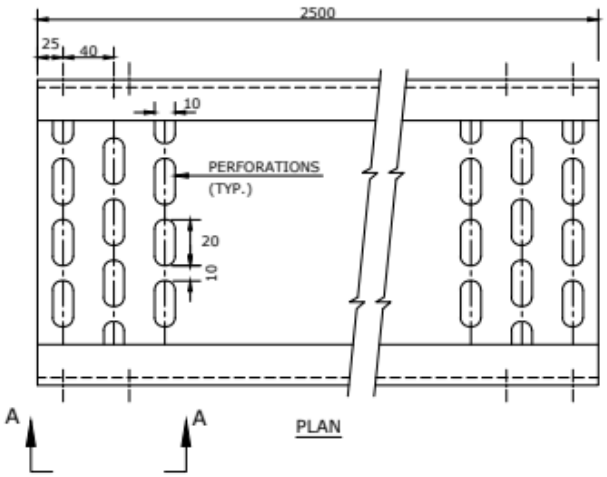
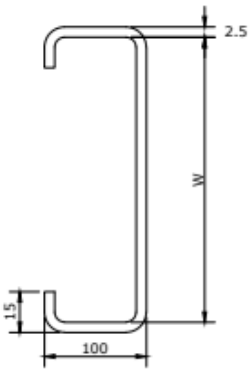
Date: 2026.02.13 19:41:32

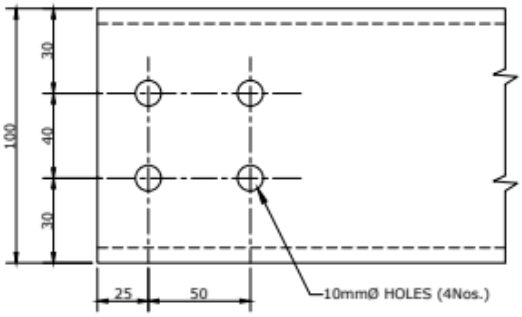
	STANDARD DRAWING PERFORATED TYPE CABLE TRAY	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



PLAN



END VIEW



SECTION `A-A'

INSIDE WIDTH (W) - 100,150,300,450,600,800MM (AS PER MTO)
MATERIAL - 12 GAUGE (2.5MM) M.S.SHEET/G.S./AL/FRP (AS PER MTO)

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. M.S. SHEET SHALL CONFORM TO IS2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. CABLE TRAY SUPPLIED WITH OTHER MATERIALS SHALL CONFIRMED TO RELEVANT IS/INTERNATIONAL STANDARDS.
3. THE MATERIAL DIMENSIONAL DETAILS SHOWN ARE TYPICAL FOR GS STRESS.
4. EACH CABLE TRAYS SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRED HARDWARE AS PER DRG. No. SD-75-6706.
5. CABLE TRAYS SHALL BE DESIGNED FOR 3000mm SUPPORT SPAN UNLESS NOTED OTHERWISE FOR SPECIFIED TRAY LOADING.

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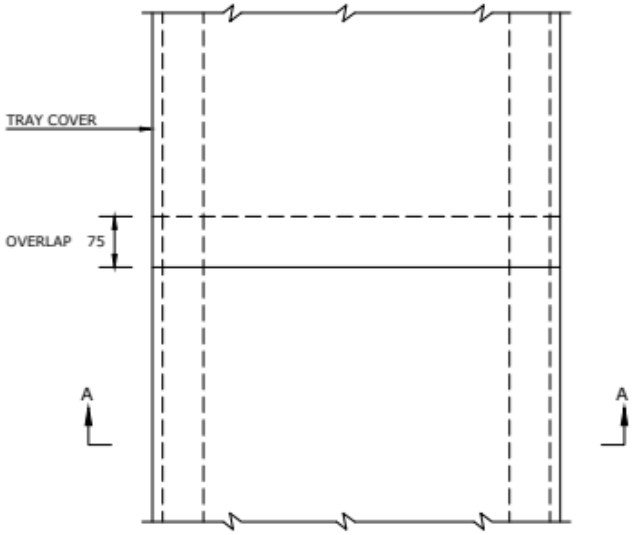
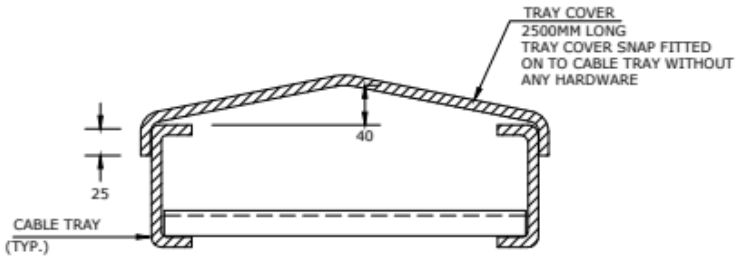
Date: 2026.02.13 19:41:32

	STANDARD DRAWING CABLE TRAY COVER	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		

TYPICAL ARRANGEMENT OF COVERING CABLE TRAY



PLAN



SECTION `A-A'

MATERIAL-16 GAUGE(1.7MM) M.S. SHEET/G.S./AL/FRP (AS PER MTO)
TRAY COVER MATERIAL SAME AS OF TRAY & TRAY WIDTH AS PER MTO

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. M.S. SHEET SHALL CONFORM TO IS2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. CABLE TRAY SUPPLIED WITH OTHER MATERIALS SHALL CONFORMED TO RELEVANT IS/INTERNATIONAL STANDARDS.

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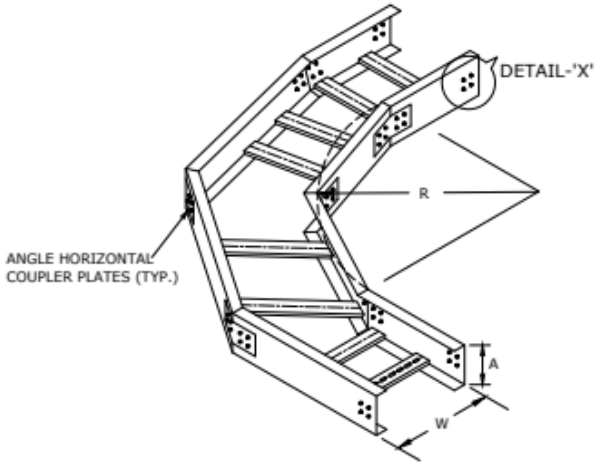
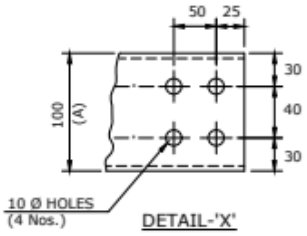
Date: 2026.02.13 19:41:32

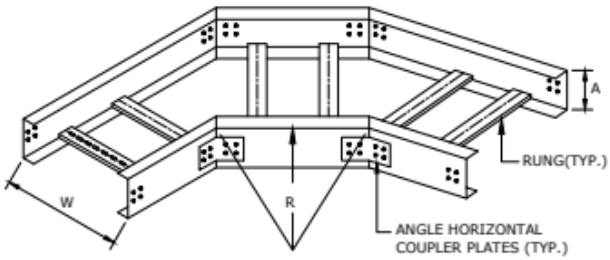
	STANDARD DRAWING CABLE TRAY ACCESSORIES	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 7		



90° HORIZONTAL RADIUS ELBOW



DETAIL-'X'



45° HORIZONTAL RADIUS ELBOW

(W) INSIDE WIDTH OF TRAY - 150,300,450,600,800MM (AS PER MTO)

(A) DEPTH OF TRAY - 100MM UNLESS NOTED

(R) BENDING RADIUS (AS PER MTO)

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL - 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER MTO).
3. M.S. SHEET SHALL CONFORM TO IS 2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS 4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. TRAY FITTINGS SUPPLIED WITH OTHER MATERIAL SHALL CONFORM TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRE HARDWARE AS PER DRG. No. SD-75-6706.
5. ALL TRAY FITTINGS SHALL BE SUPPLIED COMPLETE WITH MATCHING ANGLE HORIZONTAL COUPLER PLATES & HARDWARE. ALTERNATIVELY WELDED ASSEMBLY MAY BE SUPPLIED FOR G.S. CABLE TRAY FITTINGS.

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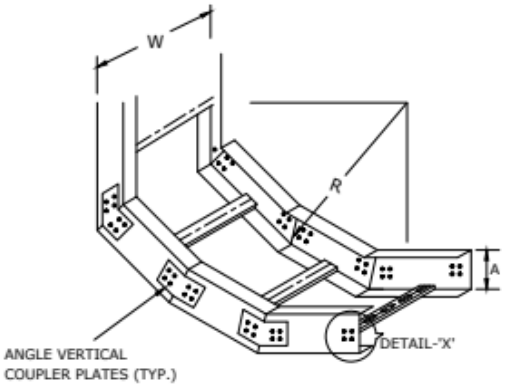
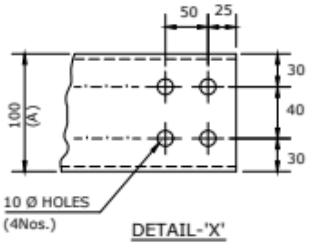
	STANDARD DRAWING CABLE TRAY ACCESSORIES	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	2 OF 7		

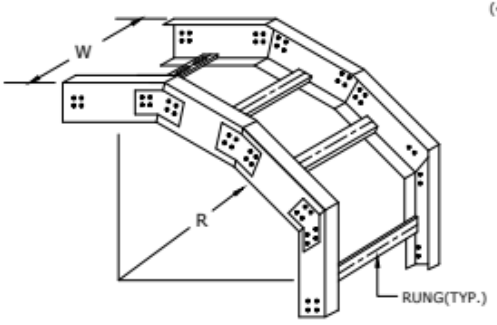
90° VERTICAL RADIUS ELBOW



INSIDE



DETAIL-'X'



OUTSIDE

(W) INSIDE WIDTH OF TRAY - 150,300,450,600,800MM (AS PER MTO).
(A) DEPTH OF TRAY - 100MM UNLESS NOTED.
(R) BENDING RADIUS (AS PER MTO).

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL - 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER MTO).
3. M.S. SHEET SHALL CONFORM TO IS 2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS 4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. TRAY FITTINGS SUPPLIED WITH OTHER MATERIAL SHALL CONFORM TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRE HARDWARE AS PER DRG. No. SD-75-6706.
5. ALL TRAY FITTINGS SHALL BE SUPPLIED COMPLETE WITH MATCHING ANGLE HORIZONTAL COUPLER PLATES AND HARDWARE. ALTERNATIVELY WELDED ASSEMBLY MAY BE SUPPLIED FOR G.S. CABLE TRAY FITTINGS.

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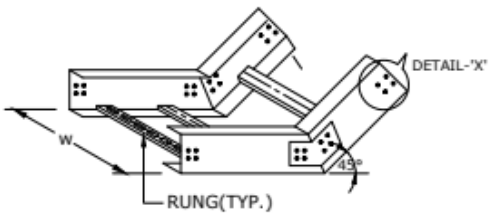
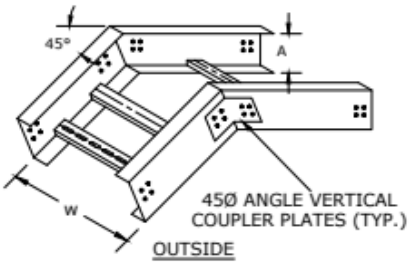
	STANDARD DRAWING CABLE TRAY ACCESSORIES	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	3 OF 7		

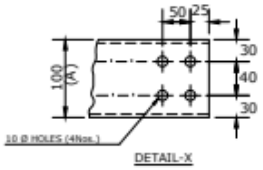
45° DIRECT VERTICAL ELBOW



INSIDE

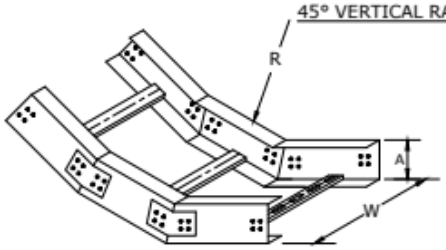


OUTSIDE

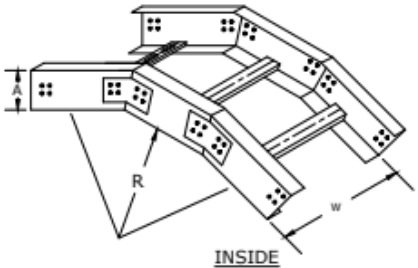


DETAIL-X

45° VERTICAL RADIUS ELBOW



OUTSIDE



INSIDE

(W) INSIDE WIDTH OF TRAY - 150,300,450,600,800MM (AS PER MTO)

(A) DEPTH OF TRAY - 100MM UNLESS NOTED

(R) BENDING RADIUS (AS PER MTO)

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL - 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER MTO).
3. M.S. SHEET SHALL CONFORM TO IS 2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS 4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. TRAY FITTINGS SUPPLIED WITH OTHER MATERIAL SHALL CONFORM TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRE HARDWARE AS PER DRG. No. SD-75-6706.
5. ALL TRAY FITTINGS SHALL BE SUPPLIED COMPLETE WITH MATCHING ANGLE HORIZONTAL COUPLER PLATES & HARDWARE. ALTERNATIVELY WELDED ASSEMBLY MAY BE SUPPLIED FOR G.S. CABLE TRAY FITTINGS.

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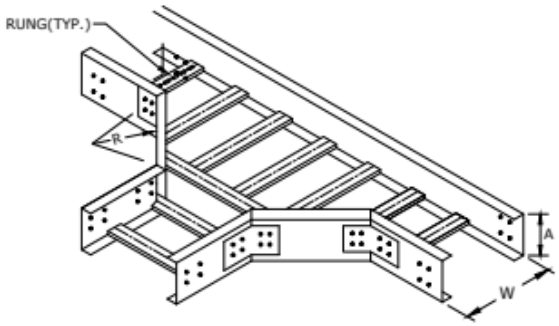
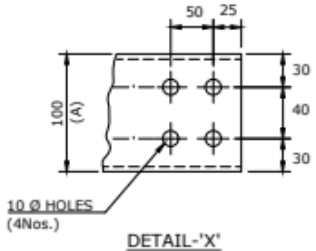
Date: 2026.02.13 19:41:32

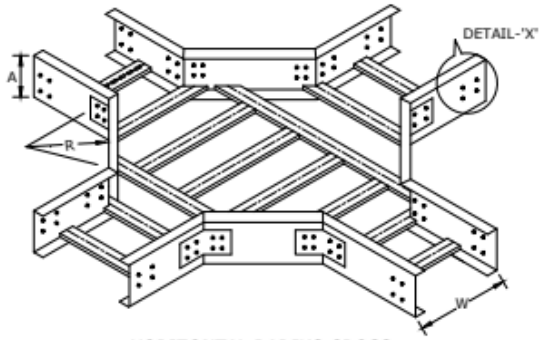
	STANDARD DRAWING CABLE TRAY ACCESSORIES	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	4 OF 7		



HORIZONTAL RADIUS TEE



DETAIL-'X'



HORIZONTAL RADIUS CROSS

(W) INSIDE WIDTH OF TRAY - 150,300,450,600,800MM (AS PER MTO)

(A) DEPTH OF TRAY - 100MM UNLESS NOTED

(R) BENDING RADIUS (AS PER MTO)

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL - 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER MTO).
3. M.S. SHEET SHALL CONFORM TO IS 2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS 4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. TRAY FITTINGS SUPPLIED WITH OTHER MATERIAL SHALL CONFORM TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRE HARDWARE AS PER DRG. No. SD-75-6706.
5. ALL TRAY FITTINGS SHALL BE SUPPLIED COMPLETE WITH MATCHING ANGLE HORIZONTAL COUPLER PLATES AND HARDWARE. ALTERNATIVELY WELDED ASSEMBLY MAY BE SUPPLIED FOR G.S. CABLE TRAY FITTINGS.

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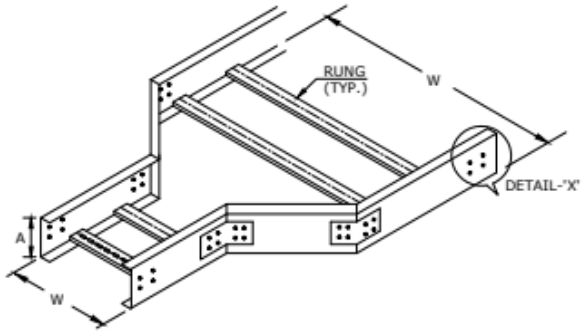
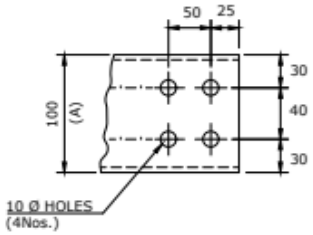
Date: 2026.02.13 19:41:32

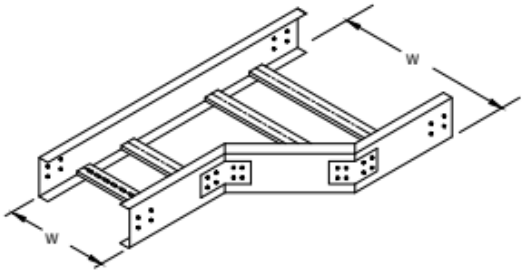
	STANDARD DRAWING CABLE TRAY ACCESSORIES	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	5 OF 7		



STRAIGHT REDUCER



DETAIL-'X'



RIGHT TO LEFT HAND REDUCER

(W) INSIDE WIDTH OF TRAY - 150,300,450,600,800MM (AS PER MTO)

(A) DEPTH OF TRAY - 100MM UNLESS NOTED

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL - 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER MTO).
3. M.S. SHEET SHALL CONFORM TO IS 2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS 4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. TRAY FITTINGS SUPPLIED WITH OTHER MATERIAL SHALL CONFORM TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRE HARDWARE AS PER DRG. No. SD-75-6706.
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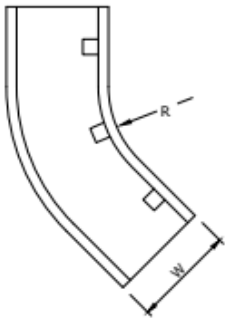
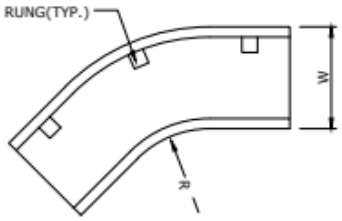
Date: 2026.02.13 19:41:32

STANDARD DRAWING CABLE TRAY ACCESSORIES	STANDARD DRAWING NO.		REV.	SIZE
			02	A4
	SHEET NO.	6 OF 7		

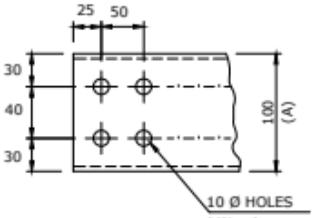
45° VERTICAL RADIUS ELBOW



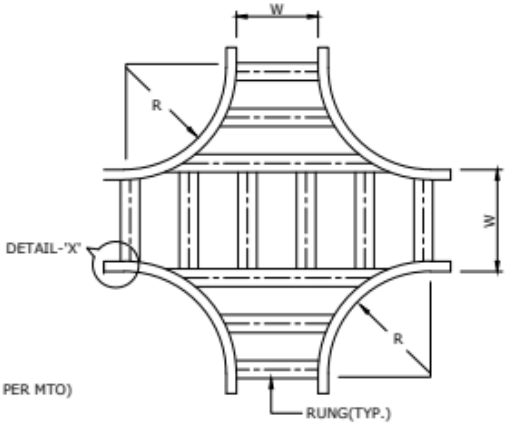
INSIDE



OUTSIDE



DETAIL-'X'



HORIZONTAL RADIUS CROSS

(W) INSIDE WIDTH OF TRAY - 150,300,450,600,800MM (AS PER MTO)
(A) DEPTH OF TRAY - 100MM UNLESS NOTED
(R) BENDING RADIUS (AS PER MTO)

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL - 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER MTO).
3. M.S. SHEET SHALL CONFORM TO IS 2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS 4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. TRAY FITTINGS SUPPLIED WITH OTHER MATERIAL SHALL CONFORM TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRE HARDWARE AS PER DRG. No. SD-75-6706.
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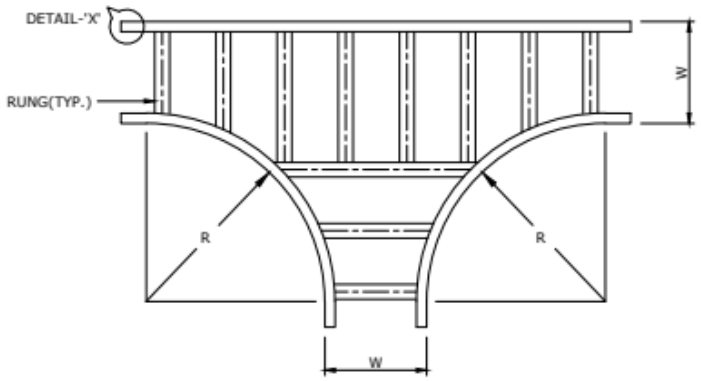
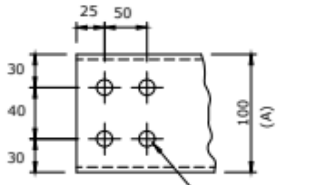
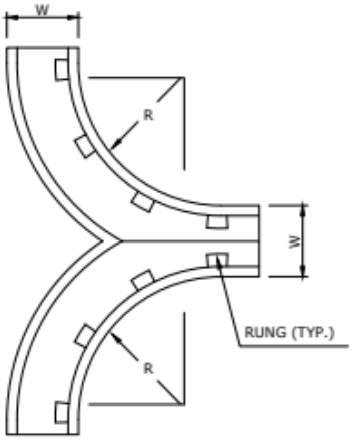
	STANDARD DRAWING CABLE TRAY ACCESSORIES	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	7 OF 7		



HORIZONTAL RADIUS TEE



DETAIL-'X'



90° VERTICAL RADIUS TEE

(W) - INSIDE WIDTH OF TRAY-150,300,450,600,800MM (AS PER MTO)

(A) - DEPTH OF TRAY-100MM UNLESS NOTED

(R) - BENDING RADIUS (AS PER MTO)

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL - 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER MTO).
3. M.S. SHEET SHALL CONFORM TO IS 2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS 4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. TRAY FITTINGS SUPPLIED WITH OTHER MATERIAL SHALL CONFORM TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRE HARDWARE AS PER DRG. No. SD-75-6706.
5. ALL TRAY FITTINGS SHALL BE SUPPLIED COMPLETE WITH MATCHING ANGLE HORIZONTAL COUPLER PLATES AND HARDWARE. ALTERNATIVELY WELDED ASSEMBLY MAY BE SUPPLIED FOR G.S. CABLE TRAY FITTINGS.

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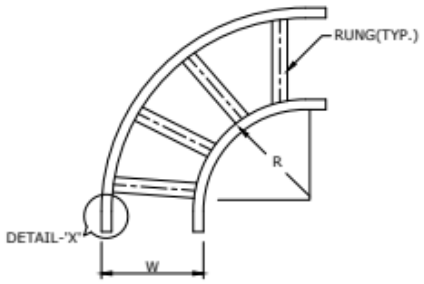
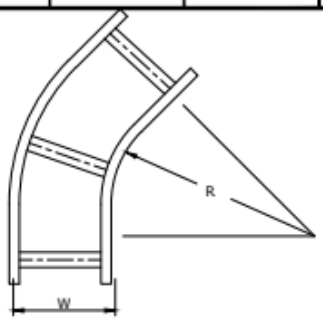
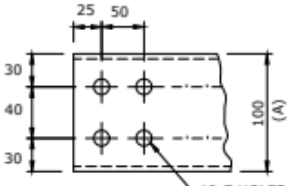
	STANDARD DRAWING CABLE TRAY ACCESSORIES (FRP)	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



90° HORIZONTAL RADIUS ELBOW



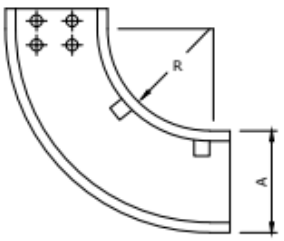
45° HORIZONTAL RADIUS ELBOW



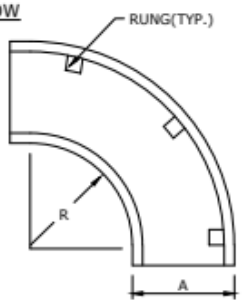
DETAIL-'X'

(W) INSIDE WIDTH OF TRAY - 150,300,450,600,800MM (AS PER MTO)
(A) DEPTH OF TRAY - 100MM UNLESS NOTED
(R) BENDING RADIUS (AS PER MTO)

90° VERTICAL MOULDED RADIUS ELBOW



INSIDE



OUTSIDE

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL - 12 GAUGE(2.5MM) M.S. SHEET/G.S/AL/FRP (AS PER MTO).
3. M.S. SHEET SHALL CONFORM TO IS 2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS 4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. TRAY FITTINGS SUPPLIED WITH OTHER MATERIAL SHALL CONFORM TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. EACH CABLE TRAY SHALL BE SUPPLIED COMPLETE WITH MATCHING COUPLER PLATES WITH REQUIRE HARDWARE AS PER DRG. No. SD-75-6706.
5. ALL TRAY FITTINGS SHALL BE SUPPLIED COMPLETE WITH MATCHING ANGLE HORIZONTAL COUPLER PLATES AND HARDWARE. ALTERNATIVELY WELDED ASSEMBLY MAY BE SUPPLIED FOR G.S. CABLE TRAY FITTINGS.

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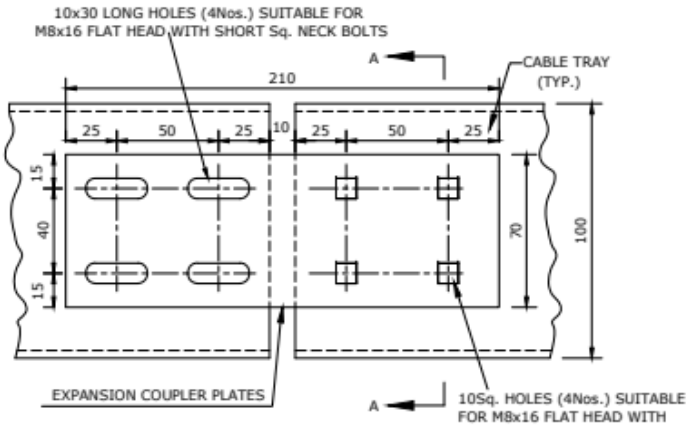
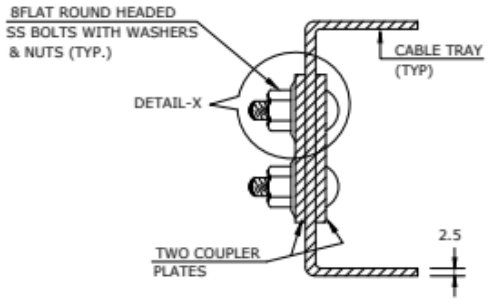
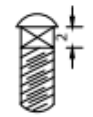
	STANDARD DRAWING CABLE TRAY COUPLER PLATE	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



COUPLER PLATE
TYPICAL FOR LADDER TYPE.
AND PERFORATED TYPE TRAYS



SECTION `A-A'



DETAIL-X

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL - 3MM M.S. SHEET/G.S/AL/FRP (AS PER MTO).
3. M.S. SHEET SHALL CONFORM TO IS 2062: 1992 OR EQUIVALENT INTERNATIONAL STANDARDS AND HOT DIP GALVANIZING SHALL BE DONE AS PER IS 4759: 1996 OR EQUIVALENT INTERNATIONAL STANDARDS. TRAY FITTINGS OF OTHER MATERIALS SHALL CONFORM TO RELEVANT IS/INTERNATIONAL STANDARDS.
4. NUTS/BOLTS/LOCKNUTS SHALL BE AS PER IS 1363(PART-1,2,3) : 1992/IS 1367(PART-5) : 1980 OR EQUIVALENT INTERNATIONAL STANDARDS.
5. WASHERS SHALL BE AS PER IS 2016 : 1967 OR EQUIVALENT INTERNATIONAL STANDARDS.

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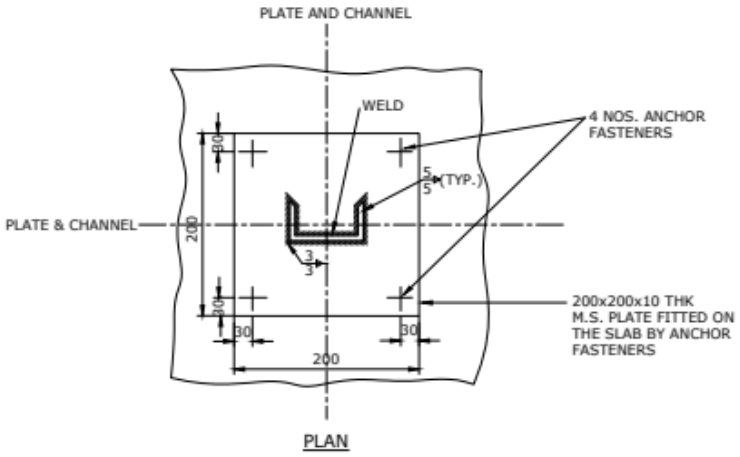
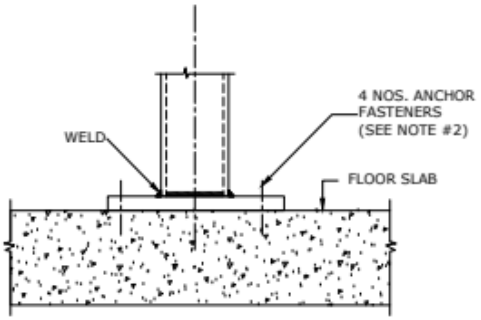
	STANDARD DRAWING CABLE TRAY MOUNTING PLATE	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



PLAN



TYPICAL DETAIL OF FIXING M.S. PLATE TO FLOOR BY ANCHOR FASTENER FOR WELDING TRAY SUPPORT. (WHEREVER EMBEDDED PLATES OR STRUCTURAL BEAMS ARE NOT AVAILABLE).

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. THE ANCHOR FASTENER SHALL BE OF HEAVY DUTY TYPE. THE AXIAL HOLDING STRENGTH SHALL BE AS FOLLOWS
   BOLT DIAMETER. 16mm -- 5000Kg
   FOR ADEQUATE SAFETY FACTOR 25% OF THE ABOVE VALUE SHALL BE USED.
3. SAME DETAILS HOLD GOOD IF THE PLATE ARE FASTENED TO THE UNDERSIDE OF THE FLOOR SLAB.
4. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992.
5. WELDING SHALL BE DONE AS PER IS 816:1969.

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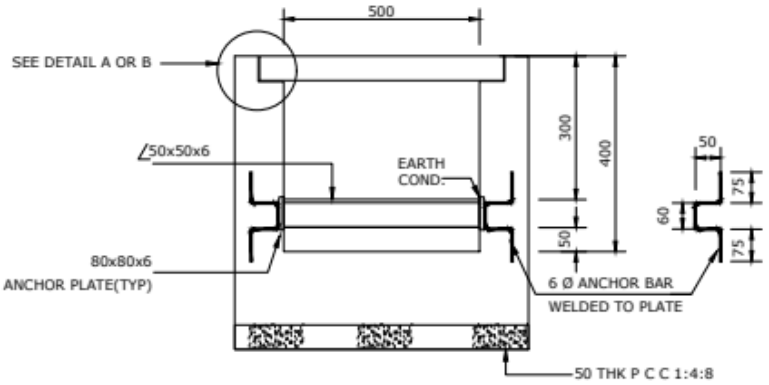
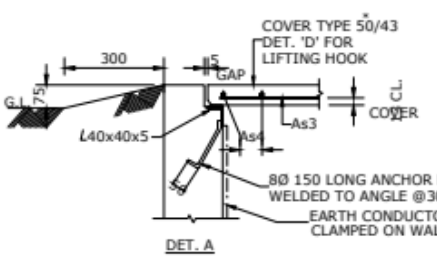
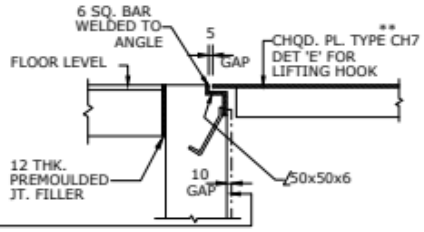
	STANDARD DRAWING CABLE TRENCH TYPE - 0504	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



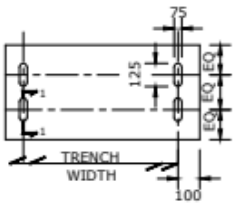


DET. A

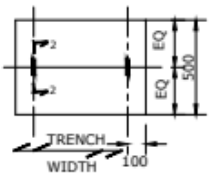


DET. B

**CH7 = 7 THK. CHQD. PL



PLAN

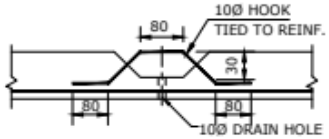


PLAN

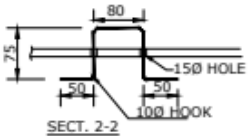
*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/72	50	7-6Ø	7-6Ø
50/36	50	7-6Ø	4-6Ø

50/36 MEANS 50mm. THK.x36 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



SECT. 1-1
DET. D



SECT. 2-2
DET. E

NOTES:

1. ALL DIMENSIONS ARE IN MM
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

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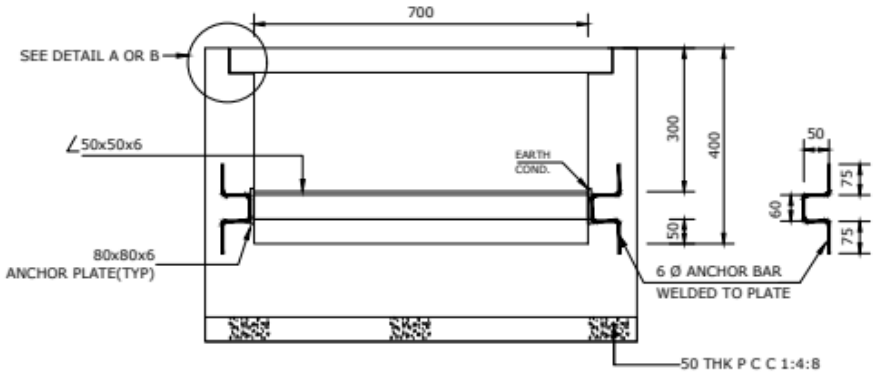
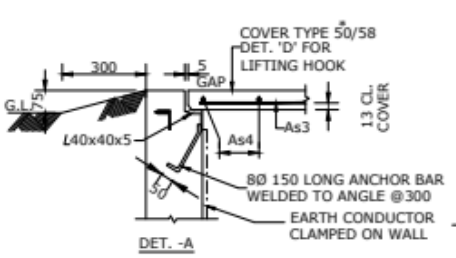
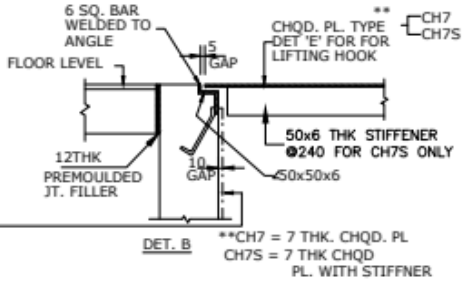
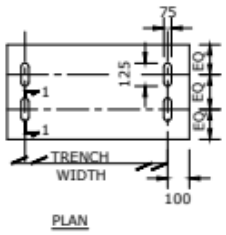
	STANDARD DRAWING CABLE TRENCH TYPE - 0704	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		

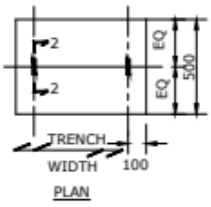






**CH7 = 7 THK. CHQD. PL
CH7S = 7 THK CHQD
PL. WITH STIFFNER

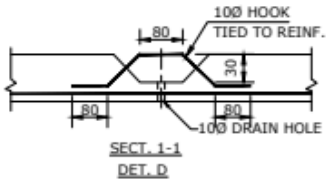


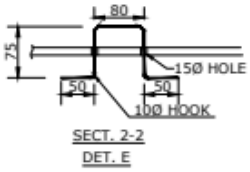


*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/58	50	7-6Ø	7-6Ø

50/58 MEANS 50mm. THK.x58 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.





NOTES:

1. ALL DIMENSIONS ARE IN MM
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

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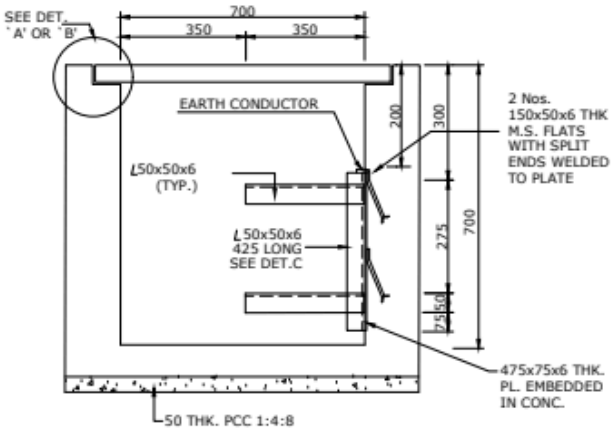
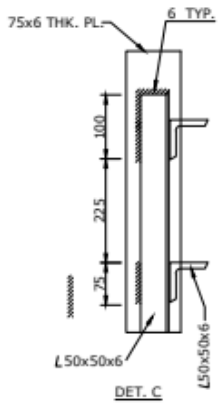
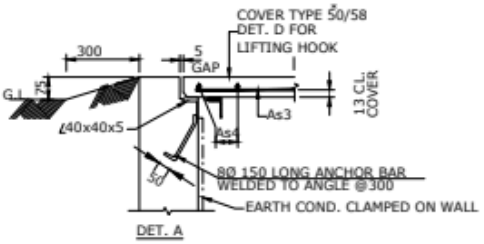
Date: 2026.02.13 19:41:32

	STANDARD DRAWING CABLE TRENCH TYPE - 0707	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		

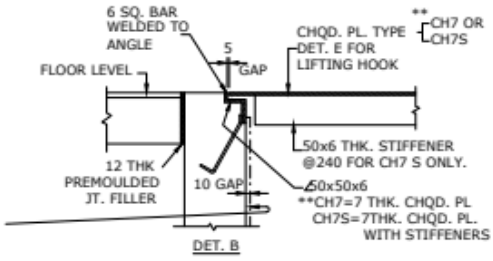




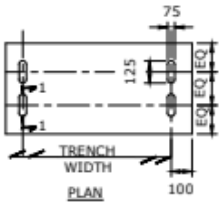
DET. C



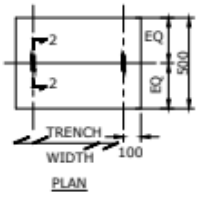
DET. A



DET. B



PLAN



PLAN

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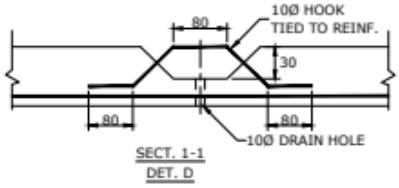
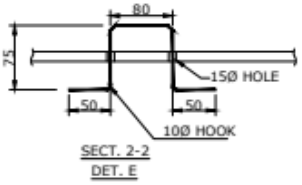
R C COVER TYPE	THICKNESS mm.	As3	As4
50/58	50	7-6Ø	6-6Ø

50x58 MEANS 50mm. THK.x58 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



SECT. 1-1
DET. D



SECT. 2-2
DET. E

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

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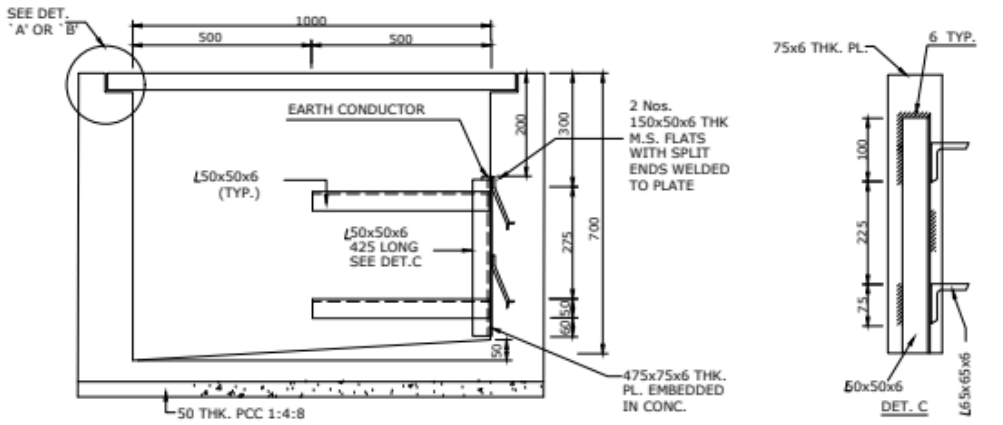
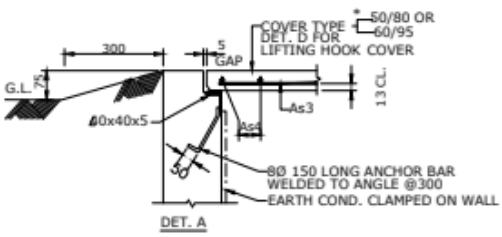
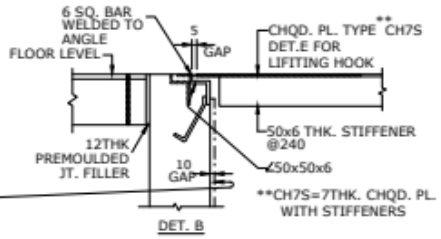
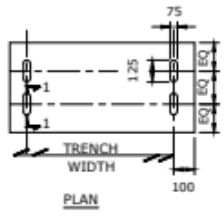
Date: 2026.02.13 19:41:32

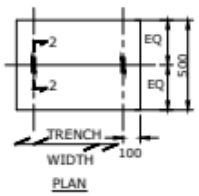
	STANDARD DRAWING CABLE TRENCH TYPE - 1007	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		







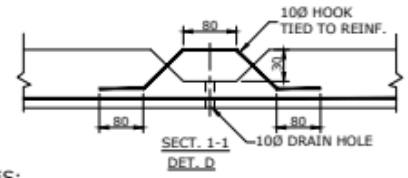


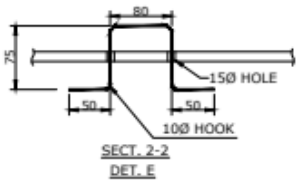


*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/80	50	7-6Ø	6-6Ø
60/95	60	7-8Ø	6-8Ø

60x95 MEANS 60mm. THK.x95 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.

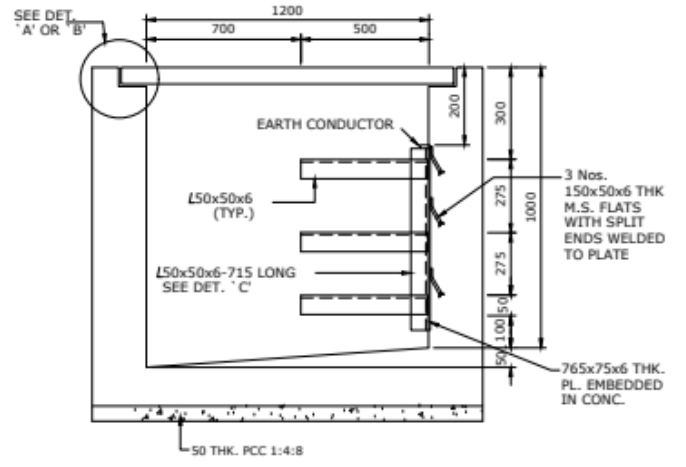


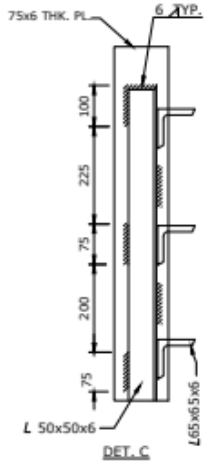


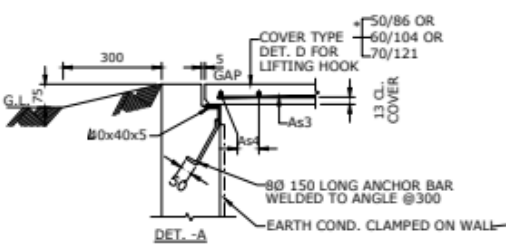
NOTES:
1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

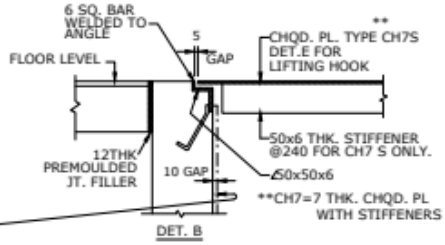
Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

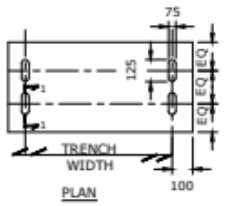
	STANDARD DRAWING CABLE TRENCH TYPE - 1210	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		

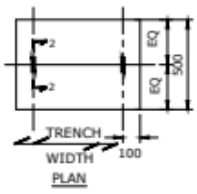








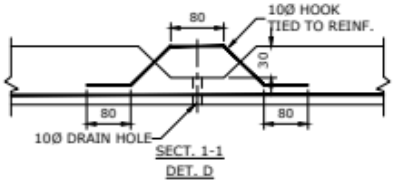


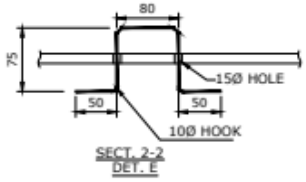


*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/86	50	7-6Ø	9-6Ø
60/86	60	6-8Ø	7-8Ø
70/181	70	5-8Ø	7-8Ø

60/104 MEANS 60mm. THK.x86 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



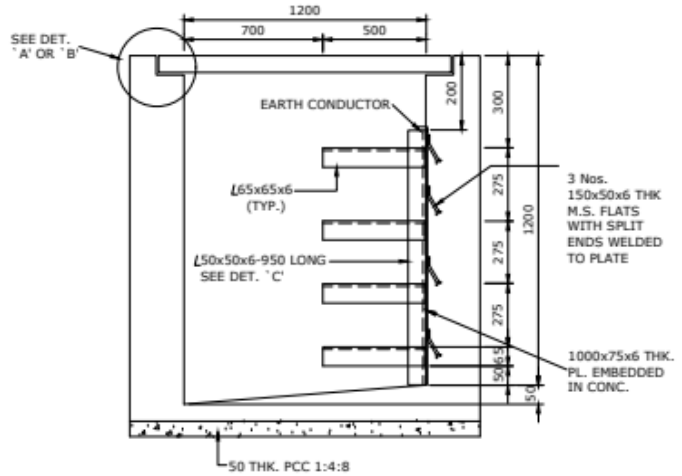


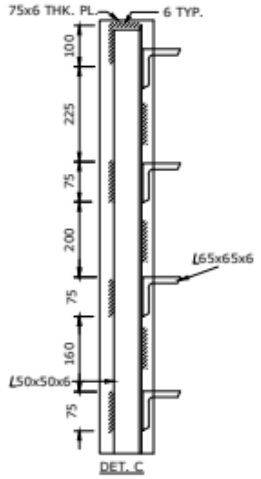
NOTES:

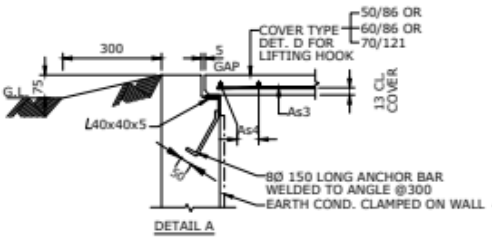
1. ALL DIMENSIONS ARE IN MM
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

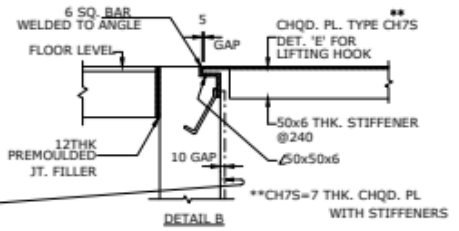
Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

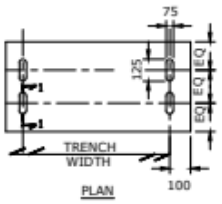
	STANDARD DRAWING CABLE TRENCH TYPE - 1212	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		

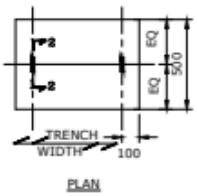








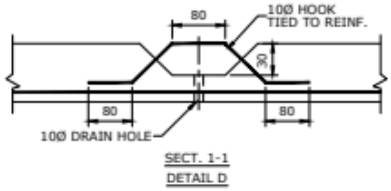


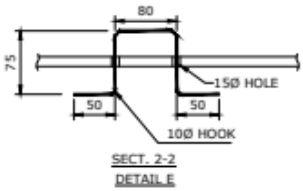


*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/86	50	7-6Ø	9-6Ø
60/104	60	6-8Ø	7-8Ø
70/121	70	5-8Ø	7-8Ø

60x104 MEANS 60mm. THK.x104 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



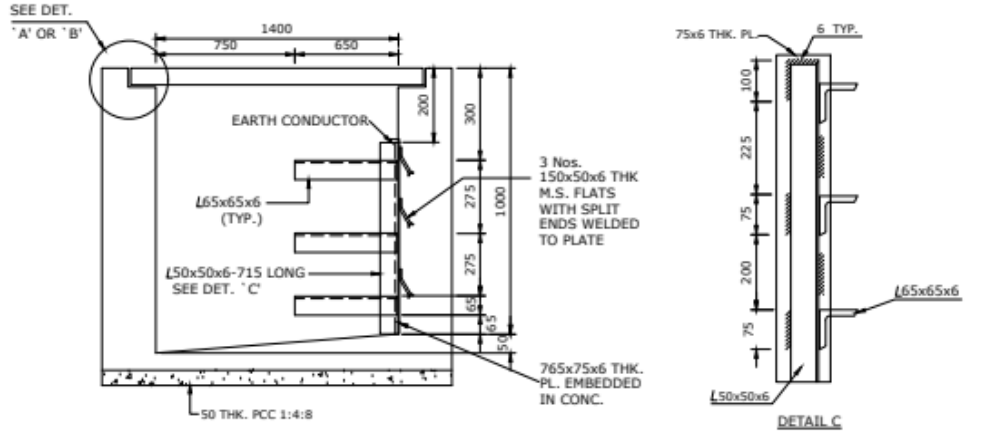


NOTES:

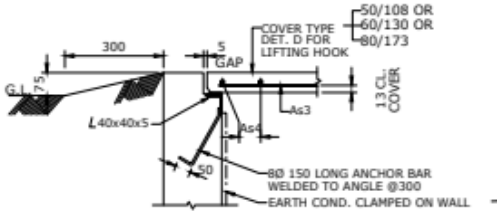
1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

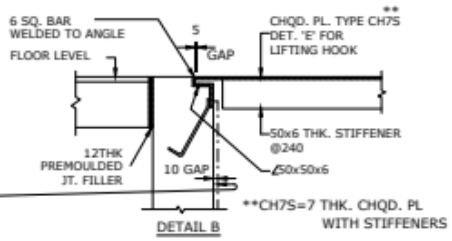
	STANDARD DRAWING NO.	REV.	SIZE
STANDARD DRAWING CABLE TRENCH TYPE - 1410		02	A4
	SHEET NO. 1 OF 1		



DETAIL C

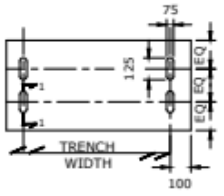


DETAIL A

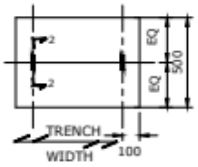


DETAIL B

**CH7S=7 THK. CHQD. PL WITH STIFFENERS



PLAN



PLAN

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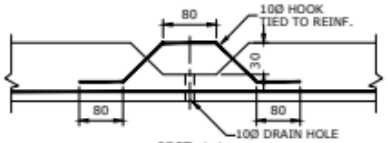
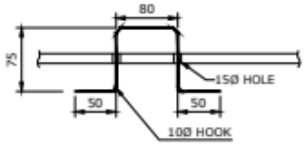
R C COVER TYPE	THICKNESS mm.	As3	As4
50/108	50	7-6Ø	9-6Ø
60/130	60	6-8Ø	7-8Ø
80/173	80	5-8Ø	7-8Ø

60x130 MEANS 60mm. THK.x130 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



SECT. 1-1
DETAIL D



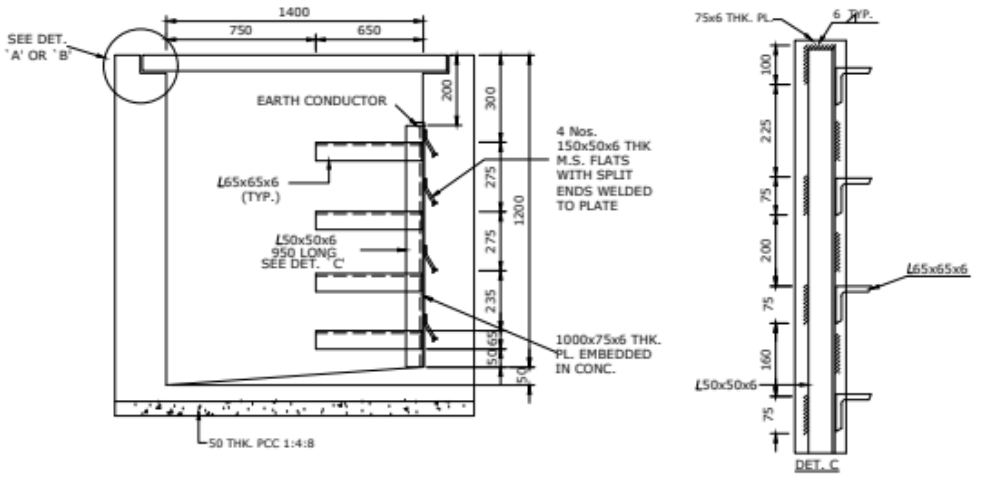
SECT. 2-2
DETAIL E

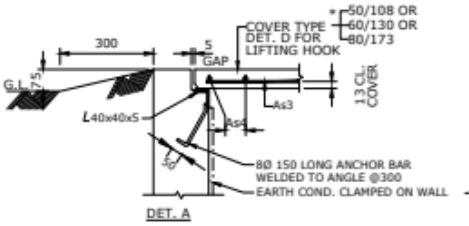
NOTES:

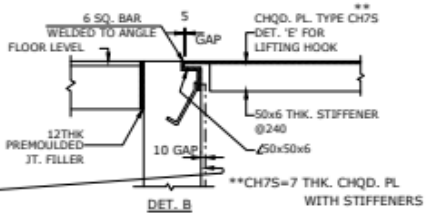
1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

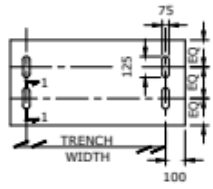
Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

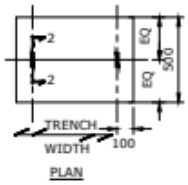
	STANDARD DRAWING CABLE TRENCH TYPE - 1412	STANDARD DRAWING NO.	REV.	SIZE
		'	02	A4
		SHEET NO. 1 OF 1		







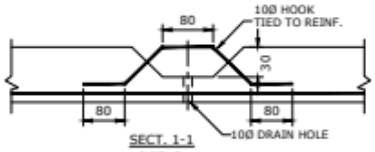


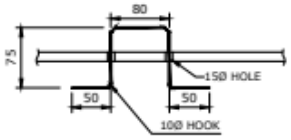


*

R C COVER TYPE	THICKNESS mm.	As3	As4
50/108	50	7-6Ø	9-6Ø
60/130	60	6-8Ø	8-8Ø
80/173	80	5-8Ø	8-8Ø

60x130 MEANS 60mm. THK.x130 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



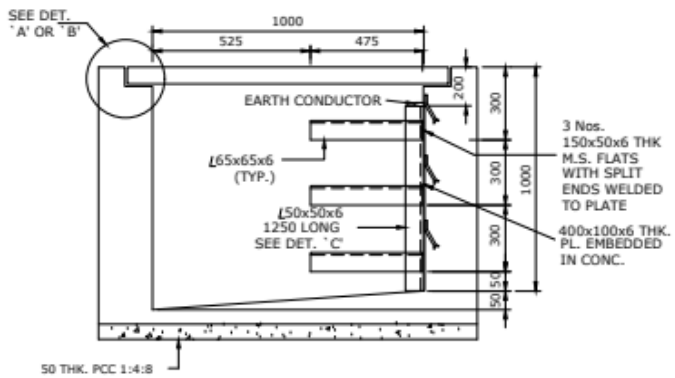


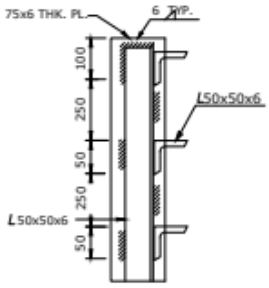
NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

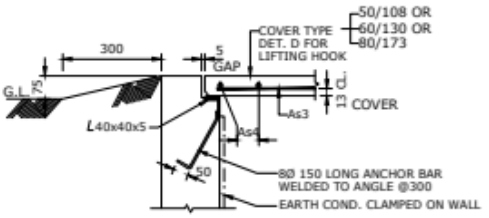
Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

STANDARD DRAWING CABLE TRENCH TYPE - 1415	STANDARD DRAWING NO.	REV.	SIZE
		02	A4
	SHEET NO. 1 OF 1		

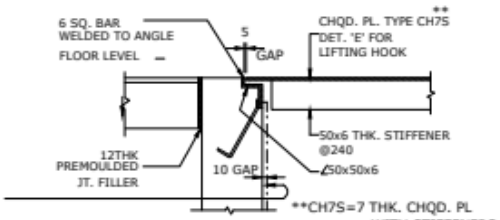




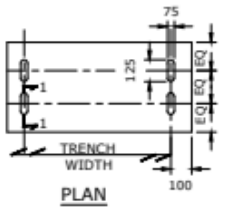
DET. C



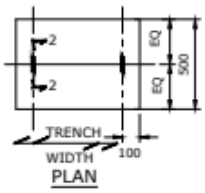
DETAIL A



DETAIL B



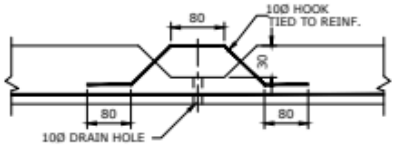
PLAN



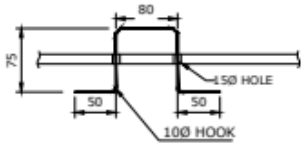
PLAN

R C COVER TYPE *	THICKNESS mm.	As3	As4
50/108	50	7-6Ø	10-6Ø
60/130	60	6-8Ø	8-8Ø
80/173	80	5-8Ø	8-8Ø

60x130 MEANS 60mm. THK.x130 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



SECT. 1-1
DETAIL D



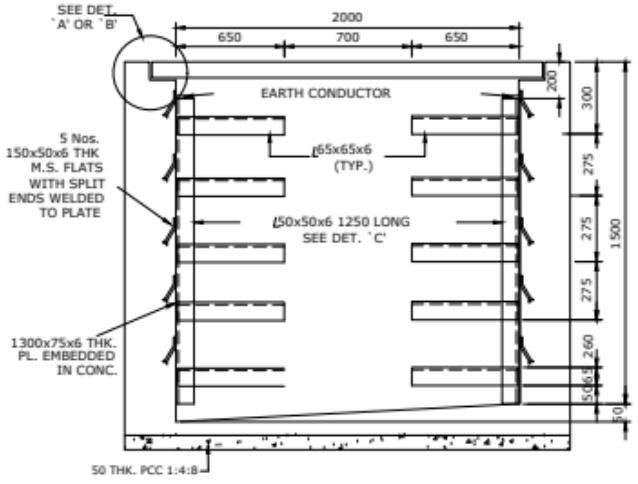
SECT. 2-2
DETAIL E

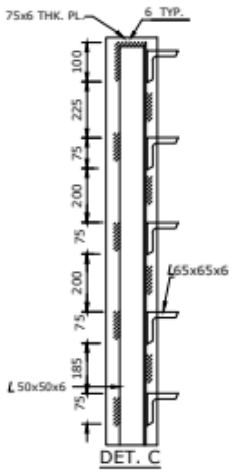
NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

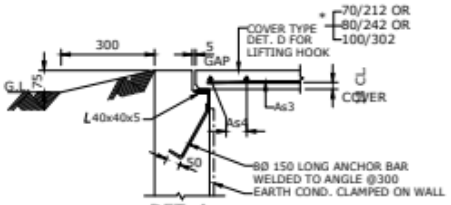
Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

	STANDARD DRAWING CABLE TRENCH TYPE - 2015	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		

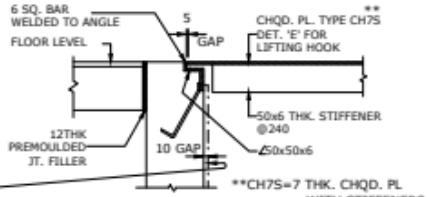




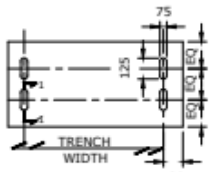
DET. C



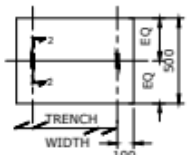
DET. A



DET. B



PLAN



PLAN

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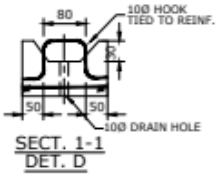
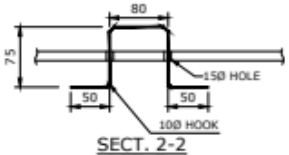
R C COVER TYPE	THICKNESS mm.	As3	As4
70/212	70	5-8Ø	11-8Ø
80/242	80	5-8Ø	11-8Ø
100/302	100	6-8Ø	11-8Ø

70x130 MEANS 70mm. THK.x212 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10.0m LENGTH OF TRENCH.



SECT. 1-1
DET. D



SECT. 2-2
DET. E

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

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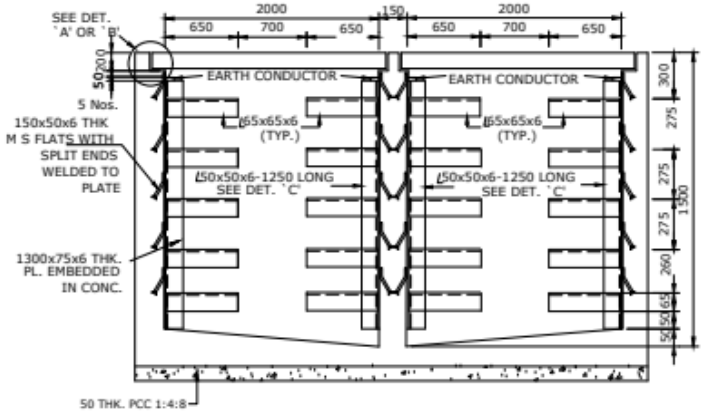
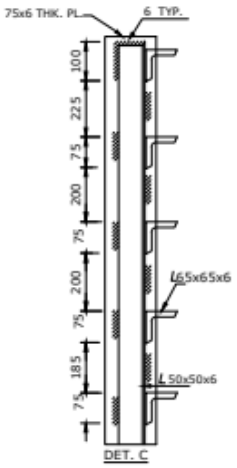
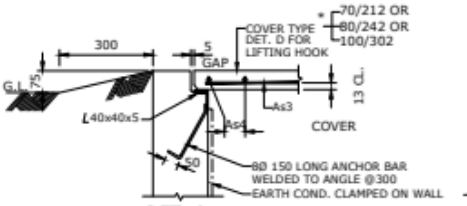
	STANDARD DRAWING CABLE TRENCH TYPE 2/2015	STANDARD DRAWING NO.	REV.	SIZE
		\	02	A4
		SHEET NO. 1 OF 1		

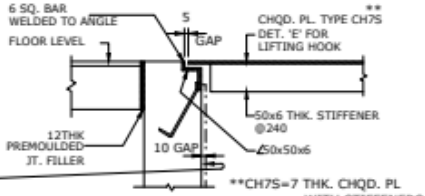




DET. C

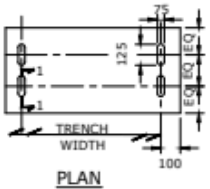


DET. A

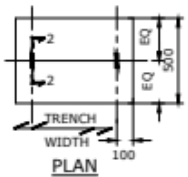


**CH7S=7 THK. CHQD. PL WITH STIFFENERS

DET. B



PLAN

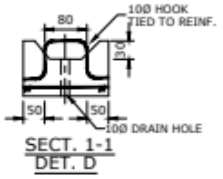


PLAN

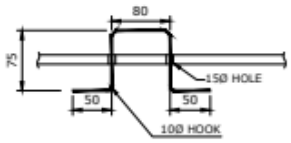
*

R C COVER TYPE	THICKNESS mm.	As3	As4
70/212	70	5-8Ø	11-8Ø
80/242	80	5-8Ø	11-8Ø
100/302	100	6-8Ø	11-8Ø

70x212 MEANS 70mm. THK.x212 Kg. COVER WEIGHT OF 600mm COVER WIDTH. PROVIDE TWO COVERS OF 300mm WIDTH FOR EVERY 10m LENGTH OF TRENCH.



SECT. 1-1
DET. D



SECT. 2-2
DET. E

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. STRUCTURAL STEEL SHALL BE AS PER IS 2062:1992

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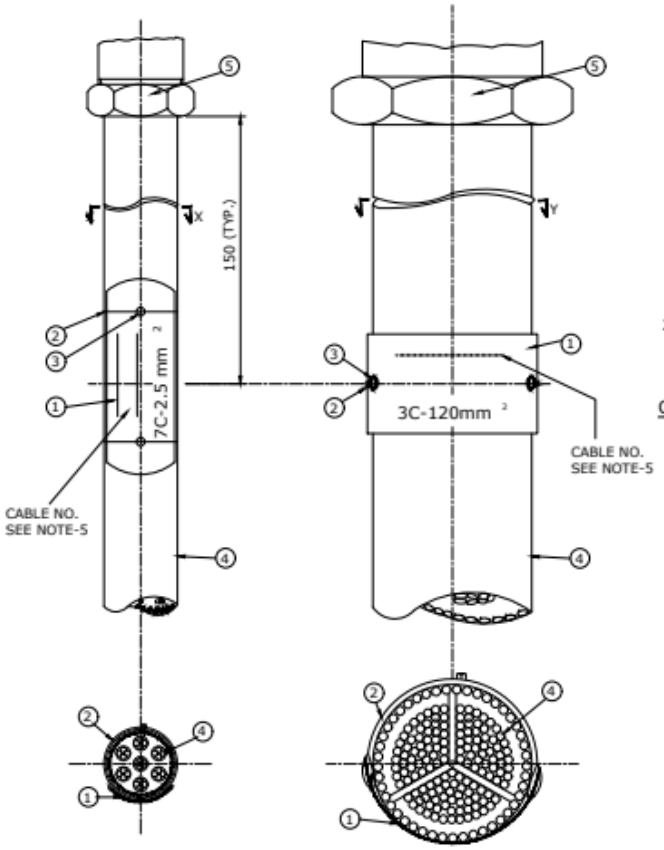
	STANDARD DRAWING CABLE IDENTIFICATION TAG	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		

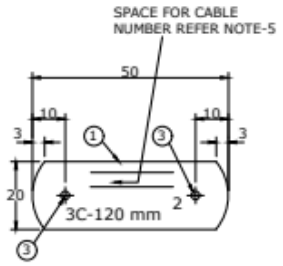


TYPE-A (SECTION X-X)

TYPICAL METHOD OF TYING THE TAG FOR CABLES WITH OVERALL DIA. <25 (ONLY FOR MULTICORE CABLES)

TYPE-B (SECTION Y-Y)

TYPICAL METHOD OF TYING THE TAG FOR CABLES WITH OVERALL DIA.>25



CABLE IDENTIFICATION TAG

LEGEND

1. CABLE IDENTIFICATION TAG FABRICATED FROM 12 GAUGE ALUMINIUM SHEET
2. 16 GAUGE G.I. BINDING WIRE
3. 3Ø HOLE
4. ARMOURED CABLE
5. CABLE GLAND

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. THE CABLE IDENTIFICATION NUMBER, NUMBER OF CORES AND SIZE SHALL BE EMBOSSED ON THE TAG.
3. THE TAG SHALL BE SUITABLY TIED APPROXIMATELY 150mm AWAY FROM THE CABLE GLAND AT BOTH ENDS OF THE CABLE.
4. THE TAG SHALL BE FREE FROM SHARP EDGES.
5. CABLE NUMBER SHALL BE EMBOSSED AS PER CABLE SCHEDULE.

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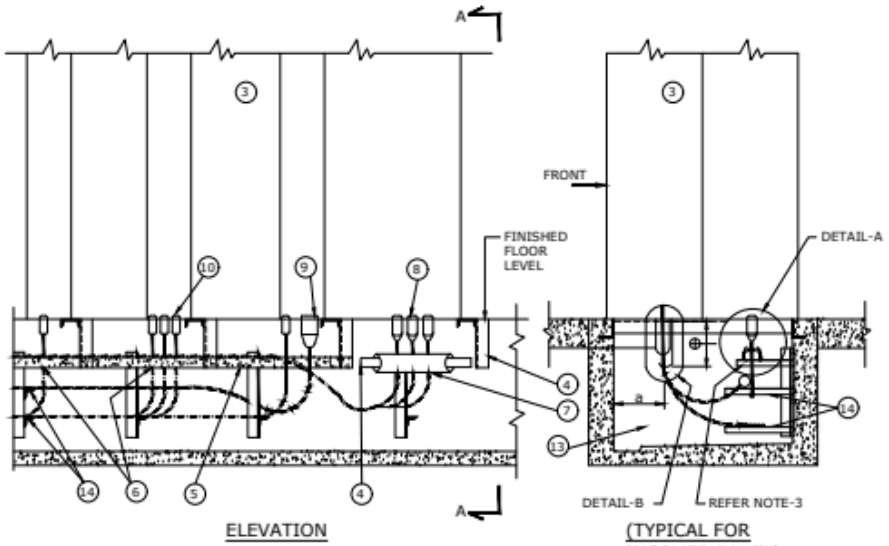
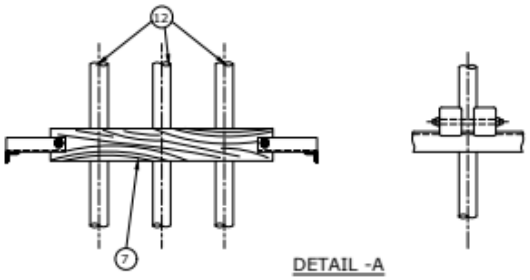
	STANDARD DRAWING CABLE INSTALLATION PRACTICE FOR BOTTOM ENTRY TO SWITCH BOARDS/CONTROL PANELS	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



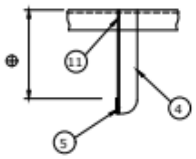
ELEVATION

(TYPICAL FOR INCOMER PANEL)



DETAIL -A

SECTION A-A



DETAIL-B

LEGEND

(1) TO (12) REFER SH. 1 OF 2

(13) CABLE TRENCH

(14) CABLE SUPPORTING ARM

NOTES:

1. FOR NOTES REFER SHEET 1 OF 2.
2. CONTROL AND POWER CABLES IN TRENCH SHALL BE TIED TO THE SUPPORTING ARM WITH 3Ø NYLON CORD, IF CABLE TRAY IS NOT USED.
3. 50x50x6 FOR CLAMPING 1/C CABLES TO BE SUITABLY GROUTED AT SITE.

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	GENERAL NOTES & LEGENDS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		

NOTES:-

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE MENTIONED.
2. THE AREA CLASSIFICATION CONFORM TO THE LATEST ISSUE OF IS : 5572. INDIAN PETROLEUM RULES OISD-STD-113. OIL MINES REGULATIONS/DGMS GUIDELINES (FOR PROJECTS UNDER DGMS JURISDICTION) & RECOMMENDATIONS OF PROCESS LICENSOR AND PROJECT DESIGN BASIS.
3. THE AREA WITHIN 1.5M (EXTENDING IN ALL DIRECTIONS) OF SAFETY VENTS, PRODUCT SAMPLING LOCATIONS,PROCESS WATER DRAINS, ONLY SEWERS VENTS, INSPECTION HATCHES, DISCHARGE ORIFICE OF FIXED LIQUID LEVEL GAUGES, ROTARY OR DIP GAUGES, FILLER OPENINGS SHALL BE CLASSIFIED AS ZONE-1. FURTHER AN AREA FROM 1.5M TO 3.0M (EXTENDING IN ALL DIRECTIONS) FROM VENTS SHALL BE CLASSIFIED AS ZONE-2. HOWEVER THE VENTS OR DRAINS BLANKED DURING NORMAL OPERATION AND USED ONLY WHEN THE PLANTIS DEPRESSURISED OR UNDER SHUTDOWN, SHOULD NOT BE REGARDED AS AN OPERATIONAL VENT OR DRAIN OR SOURCE OF HAZARD.
4. OPEN TRENCHES, PITS OR SUMP BELOW GRADE WITHIN ZONE-2 AREA SHALL BE CLASSIFIED AS ZONE-1 AREA.
5. IN CASE OF PIPELINE HANDLING FLAMMABLE MATERIAL, WHERE WELL MAINTAINED VALVES, FITTINGS AND METERS ARE INSTALLED IN WELL VENTILATED AREAS OR PIT, THE EXTENT OF ZONE-2 AREA ABOVE THE GROUND SHALL BE CONSIDERED AS 4.0M IN ALL DIRECTIONS FROM THE POSSIBLE SOURCE OF HAZARD, ALTHOUGH THE PIT ITSELF SHALL BE CLASSIFIED AS ZONE-1 AREA.
6. GAS GROUPS ARE AS PER IS: 9570.
7. ROADS FULLY/PARTLY COVERED UNDER HAZARDOUS AREA CLASSIFICATION SHALL BE BARRICADED FOR VEHICULAR MOVEMENT.

LEGENDS:-

- ZONE-1, GAS GROUP IIA/IIB HAZAROUS AREA
- ZONE-2, GAS GROUP IIA/IIB HAZAROUS AREA
- ADDITIONAL ZONE-2, GAS GROUP IIA/IIB AREA (AREA SUGGESTED WHERE LARGE RELEASE OF VOLTAGE PRODUCTS MAY OCCUR)
- ZONE-1, GAS GROUP IIC HAZAROUS AREA
- ZONE-2, GAS GROUP IIC HAZAROUS AREA
- SAFE AREA (NON HAZARDOUS)

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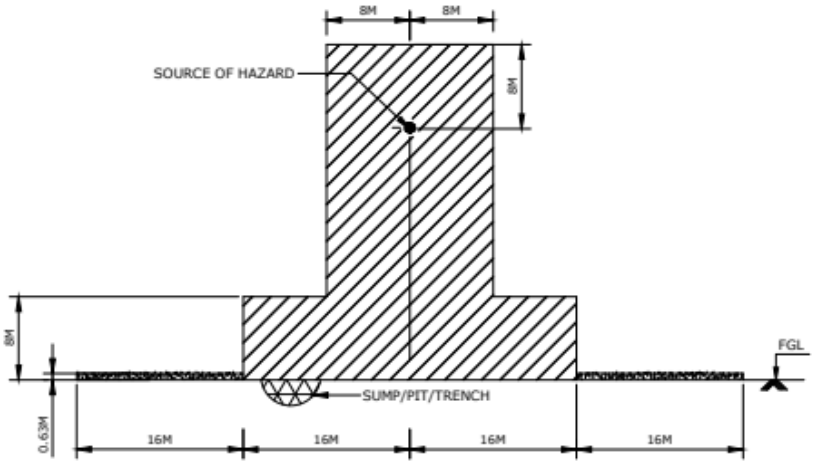
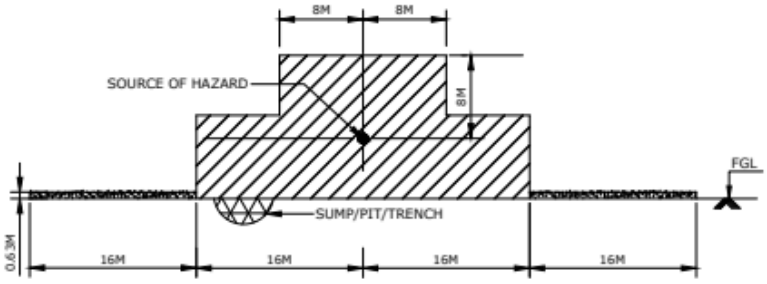
	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



DETAIL-1

FREELY VENILATED PROCESS AREA
(HEAVIER THAN AIR GASES OR VAPOURS)
(SOURCE OF HAZARD LOCATED ABOVE GROUND LEVEL)



DETAIL-2

FREELY VENILATED PROCESS AREA
(HEAVIER THAN AIR GASES OR VAPOURS)
(SOURCE OF HAZARD LOCATED NEAR GROUND LEVEL)

NOTES:

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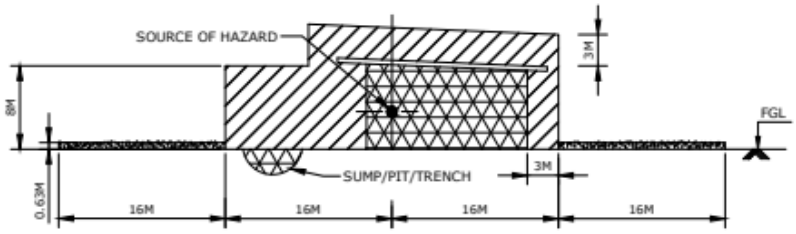
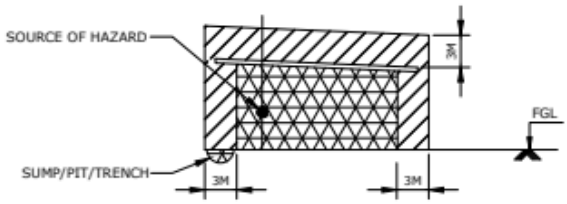
	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



DETAIL-3

PROCESS AREA WITH RESTRICTED VENTILATION
(HEAVIER THAN AIR GASES OR VAPOURS)



DETAIL-4

PROCESS AREA WITH RESTRICTED VENTILATION
(HEAVIER THAN AIR GASES OR VAPOURS)

NOTES:

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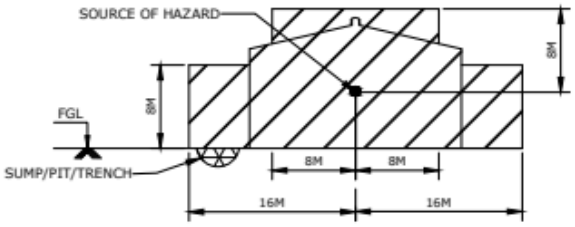
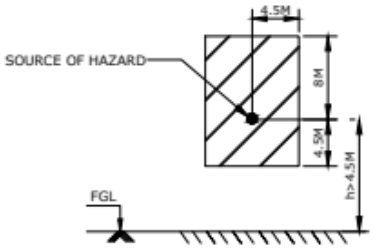
Date: 2026.02.13 19:41:32

DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.		REV.	SIZE
			02	A4
	SHEET NO.	1 OF 1		

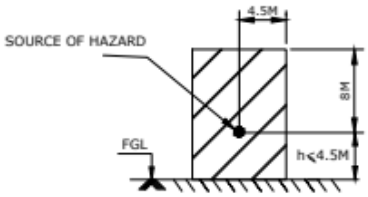


DETAIL-5

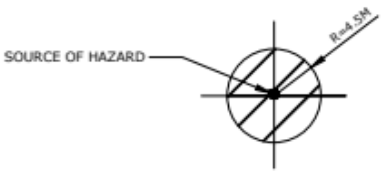
WELL VENTILATED INDOOR AREA
(HEAVIER THAN AIR GASES OR VAPOURS)



ELEVATION



ELEVATION



PLAN

DETAIL-6

(FREELY VENTILATED PROCESS AREA)
(FOR LIGHTER THAN AIR GASES OR VAPOURS)

NOTES:

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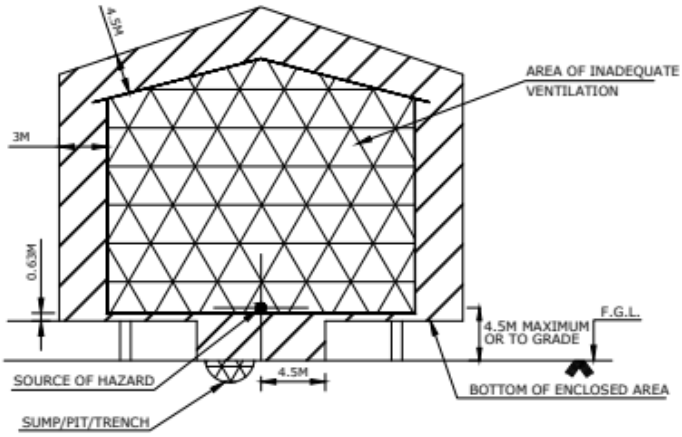
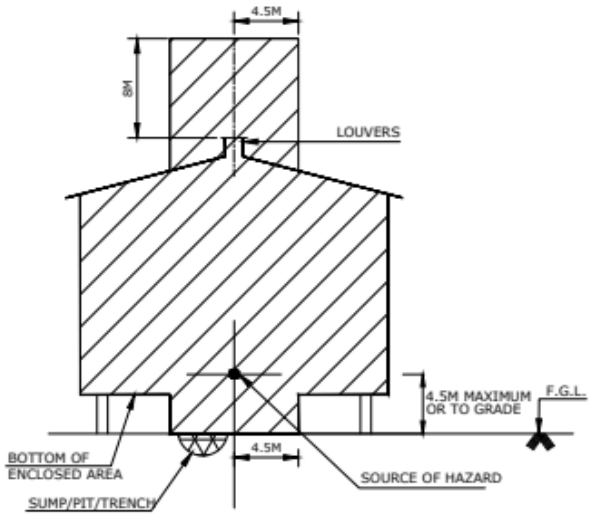
Date: 2026.02.13 19:41:32

	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



DETAIL-7

INADEQUATELY VENTILATED COMPRESSOR SHELTER
(LIGHTER THAN AIR GASES OR VAPOURS)



DETAIL-8

ADEQUATELY VENTILATED COMPRESSOR SHELTER
(LIGHTER THAN AIR GASES OR VAPOURS)

NOTES:

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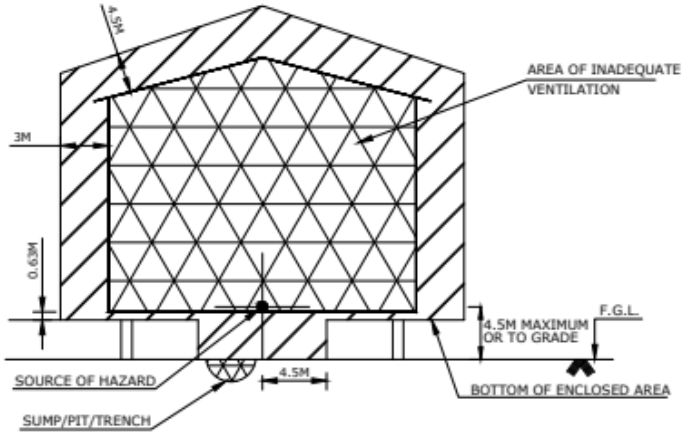
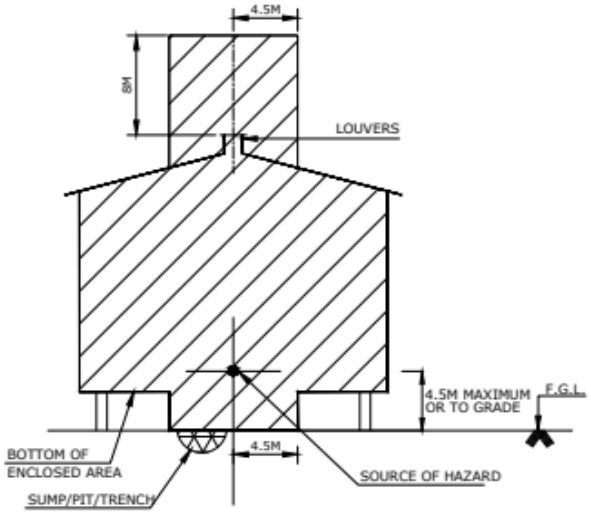
Date: 2026.02.13 19:41:32

	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



DETAIL-7

INADEQUATELY VENTILATED COMPRESSOR SHELTER
(LIGHTER THAN AIR GASES OR VAPOURS)



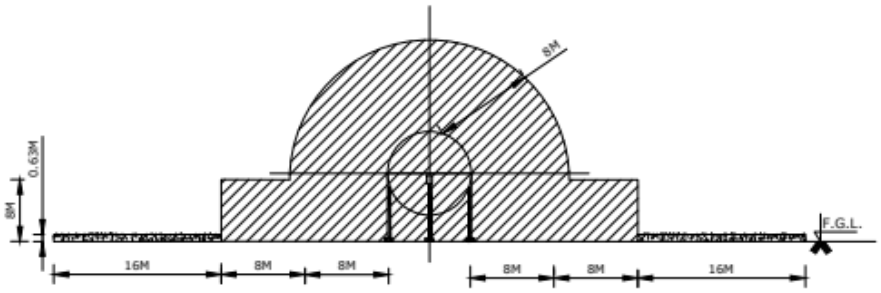
DETAIL-8

ADEQUATELY VENTILATED COMPRESSOR SHELTER
(LIGHTER THAN AIR GASES OR VAPOURS)

NOTES:

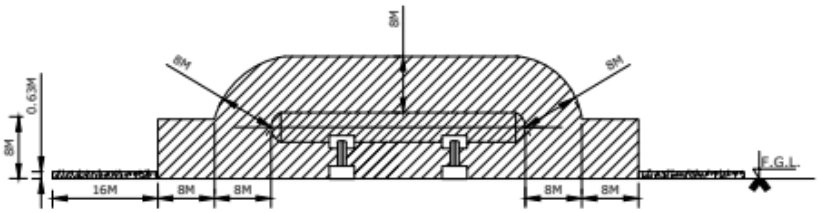
Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



DETAIL-12 (SPHERE)

(HEAVIER THAN AIR GASES OR VAPOUR)



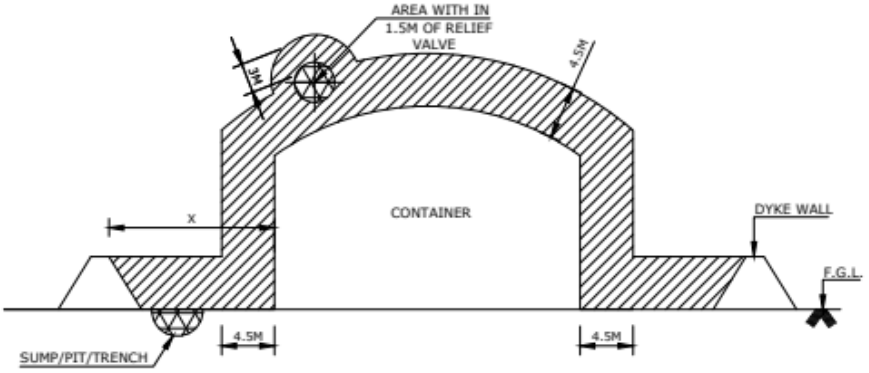
DETAIL-13 (BULLET)

(HEAVIER THAN AIR GASES OR VAPOUR)

NOTES:

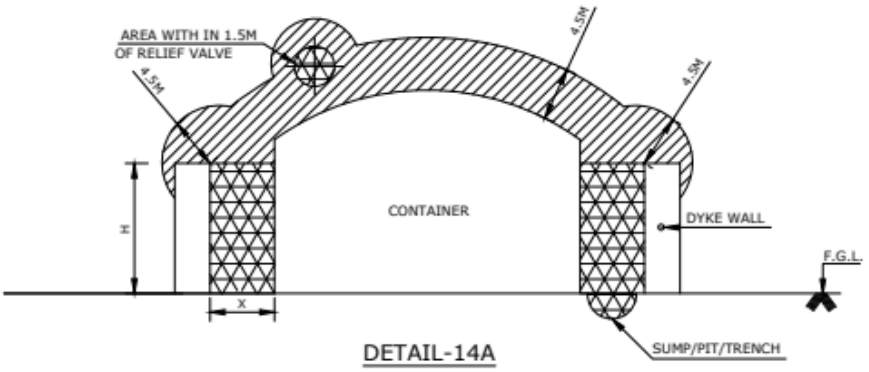
Digitally signed by Pradeep Kumar Yadav
Date: 2026.02.13 19:41:32

	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



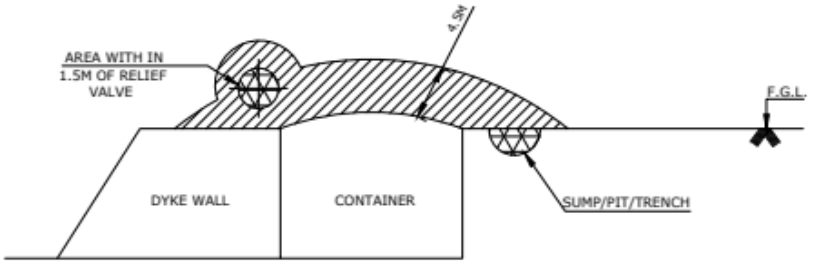
DETAIL-14A

DYKE HEIGHT LESS THAN DISTANCE FROM CONTAINER TO DYKE (H LESS THAN X)



DETAIL-14A

DYKE HEIGHT LESS THAN DISTANCE FROM CONTAINER TO DYKE(H GREATER THAN X)



DETAIL-14C (STORAGE BELOW GRADE)

STORAGE TANKS FOR CRYOGENIC LIQUIDS

NOTES:

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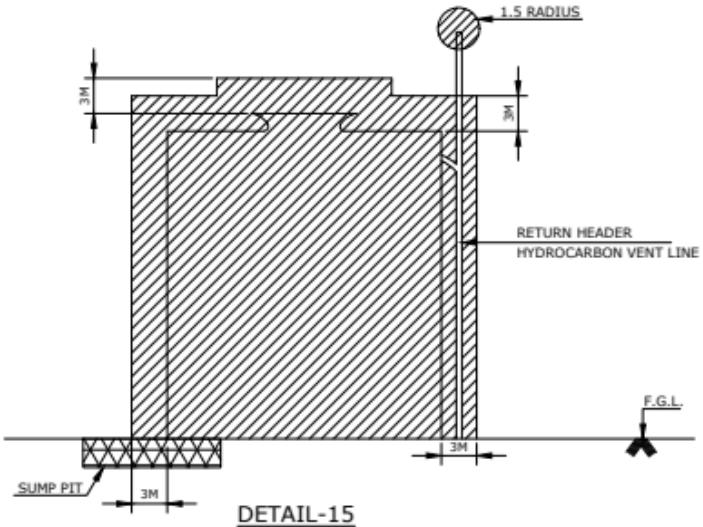
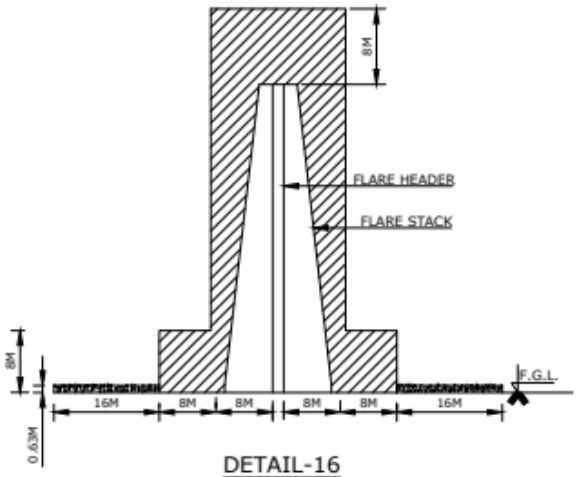
Date: 2026.02.13 19:41:32

	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



DETAIL-15

(HANDLING HYDROCARBON PROCESS COOLING WATER)



DETAIL-16

FLARE

NOTES:

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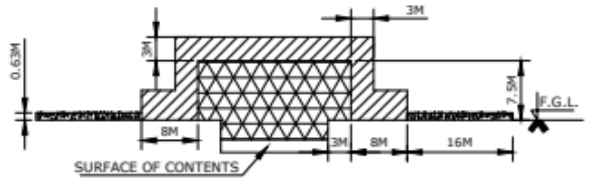
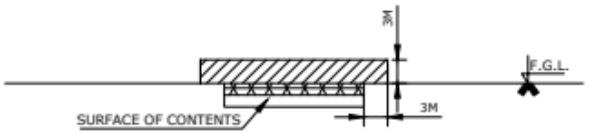
Date: 2026.02.13 19:41:32

	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



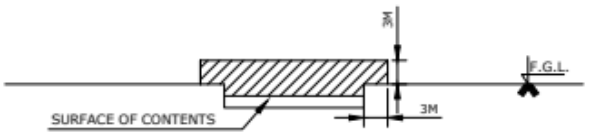
DETAIL-17

UNIT SEPARATORS, PRE-SEPARATORS AND SEPERATORS
(APPLICABLE FOR OPEN TANKS OR BASINS)



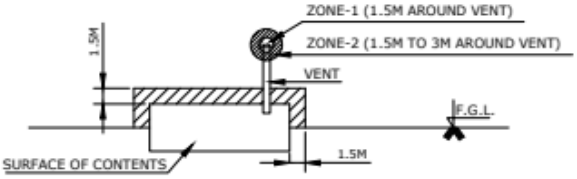
DETAIL-18

DISSOLVED AIR FLOATATION (DAF) UNITS
(APPLICABLE FOR OPEN TANKS OR BASINS)



DETAIL-19

BIOLOGICAL OXIDATION (BIOX) UNITS



DETAIL-20

UNDERGROUND COVERED SUMP OR OILY WATER SEPARATOR

NOTES:

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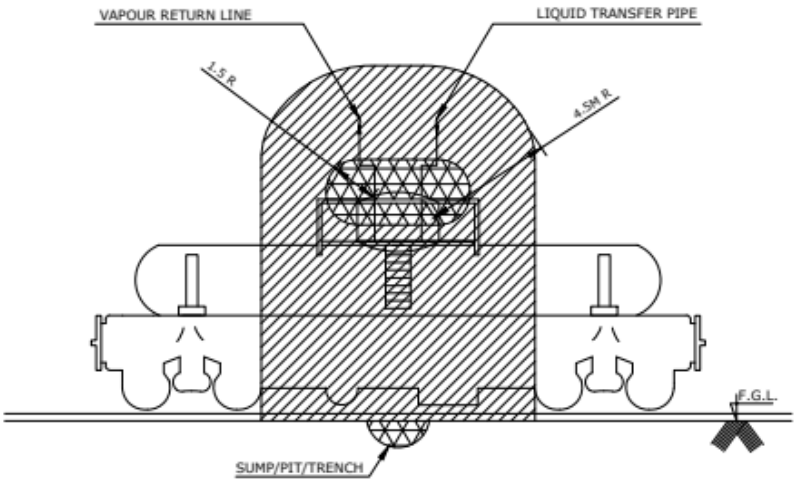
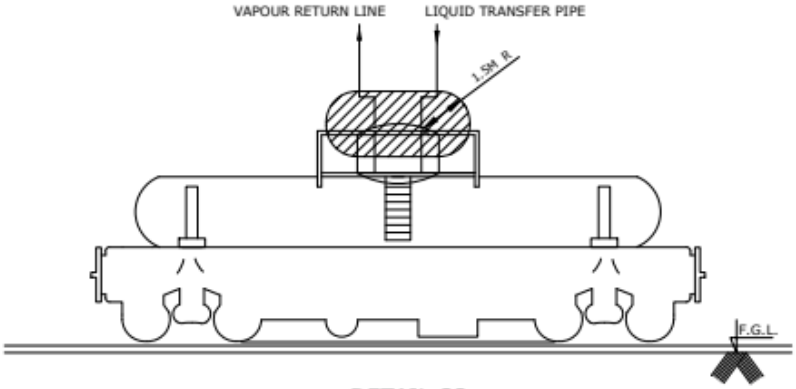
Date: 2026.02.13 19:41:32

	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



DETAIL-21

(MATERIAL: LIQUIFIED GAS/ COMPRESSED GAS/ CRYOGENIC LIQUID)
WAGON/TANK TRUCK LOADING AND UNLOADING VIA CLOSED SYSTEM.
PRODUCT TRANSFER THROUGH DOME ONLY



DETAIL-22

(MATERIAL: FLAMMABLE LIQUID)
WAGON/ TANK TRUCK LOADING AND UNLOADING VIA CLOSED SYSTEM.
PRODUCT TRANSFER THROUGH DOME ONLY

NOTES:

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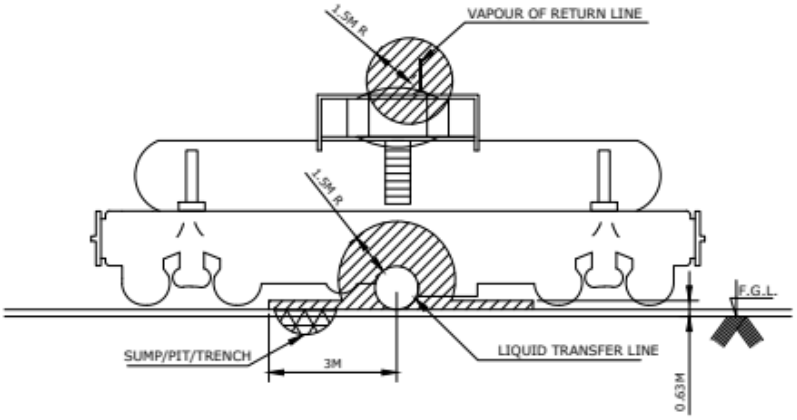
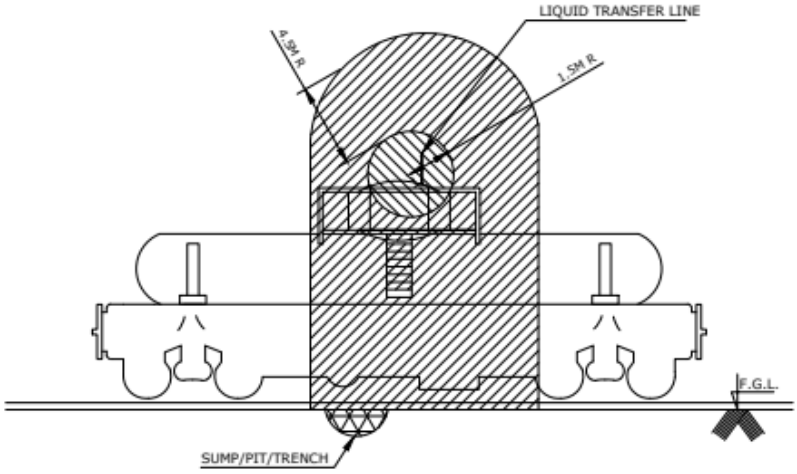
	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



DETAIL-23

(MATERIAL: FLAMMABLE LIQUID)
WAGON/TANK TRUCK LOADING AND UNLOADING VIA CLOSED SYSTEM.
BOTTOM PRODUCT TRANSFER ONLY



DETAIL-24

(MATERIAL: FLAMMABLE LIQUID)
WAGON/TANK TRUCK LOADING AND UNLOADING VIA OPEN SYSTEM.
TOP OR BOTTOM PRODUCT TRANSFER ONLY

NOTES:

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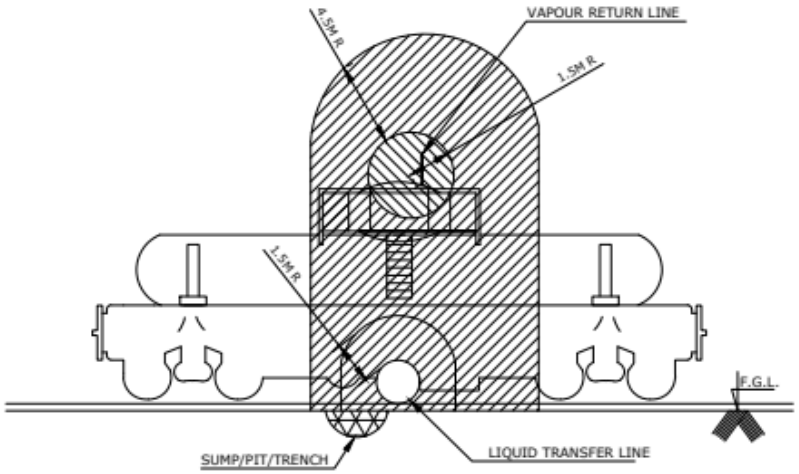
	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



DETAIL-25

(MATERIAL: LIQUIFIED GAS/ COMPRESSED GAS/ CRYOGANIC GAS)
WAGON/TANK TRUCK LOADING AND UNLOADING VIA CLOSED SYSTEM.
PRODUCT TRANSFER THRUGH BOTTOM ONLY

NOTES:

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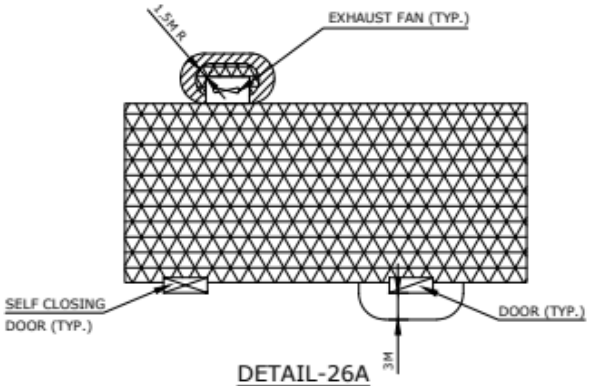
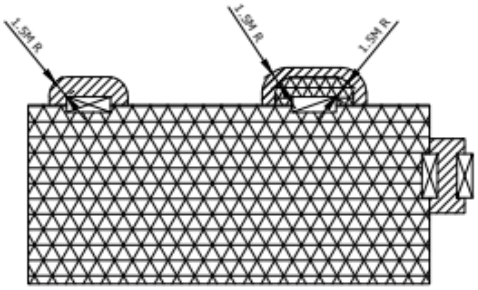
	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



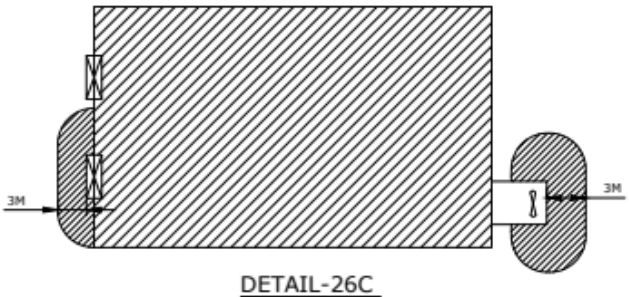
DETAIL-26A

FLAMMABLE SUBSTANCE RELEASED DURING NORMAL OPERATION WITH INADEQUATE VENTILATION



DETAIL-26B

FLAMMABLE SUBSTANCE RELEASED DURING ABNORMAL SITUATION OR INFREQUENT OPERATIONS WITH INADEQUATE VENTILATION



DETAIL-26C

FLAMMABLE SUBSTANCE RELEASED DURING ABNORMAL SITUATION OR INFREQUENT OPERATIONS WITH ADEQUATE VENTILATION

NOTES:

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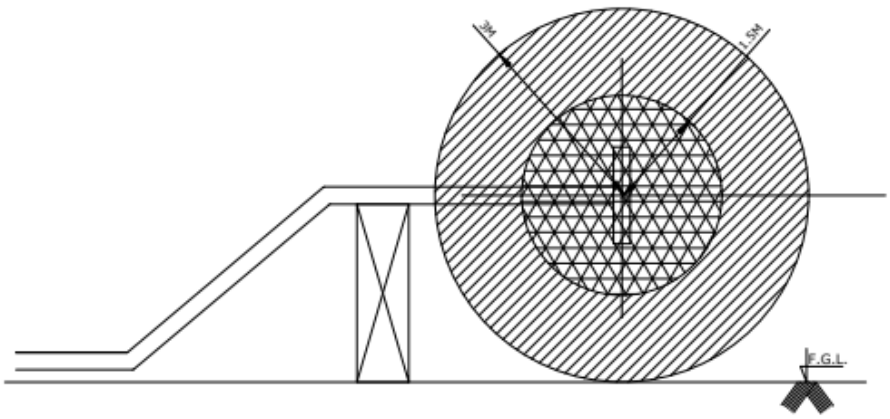
	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



DETAIL-27

BALL OR PIG LAUNCHING OR RECEIVING INSTALLATION
IN A NON-ENCLOSED, ADEQUATELY VENTILATED AREA

NOTES:

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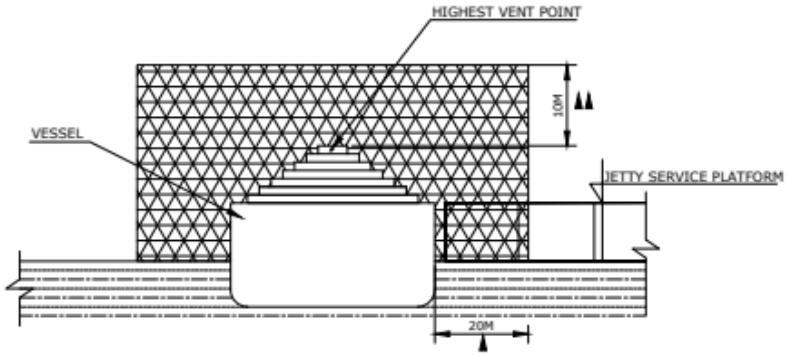
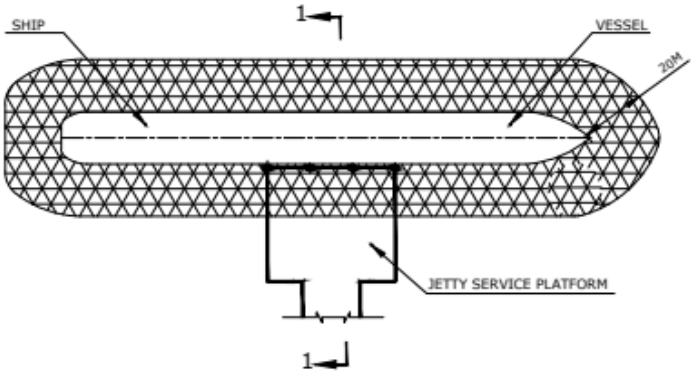
	DETAILS FOR AREA CLASSIFICATION (OIL/GAS INSTALLATION)	STANDARD DRAWING NO.	REV.	SIZE
			02	A4
		SHEET NO. 1 OF 1		



SECTION 1-1



PLAN

DETAIL-28

JETTIES OR MARINE FACILITIES

NOTES:

▲ SHALL BE REDUCED TO 10M IN CASE OF VESSELS WITH LOADING OR DISCHARGES RATES $\leq 10M^3$/MIN.

▲▲ SHALL BE REDUCED TO 5M FOR LOADING RATES $\leq 10M^3$/MIN.

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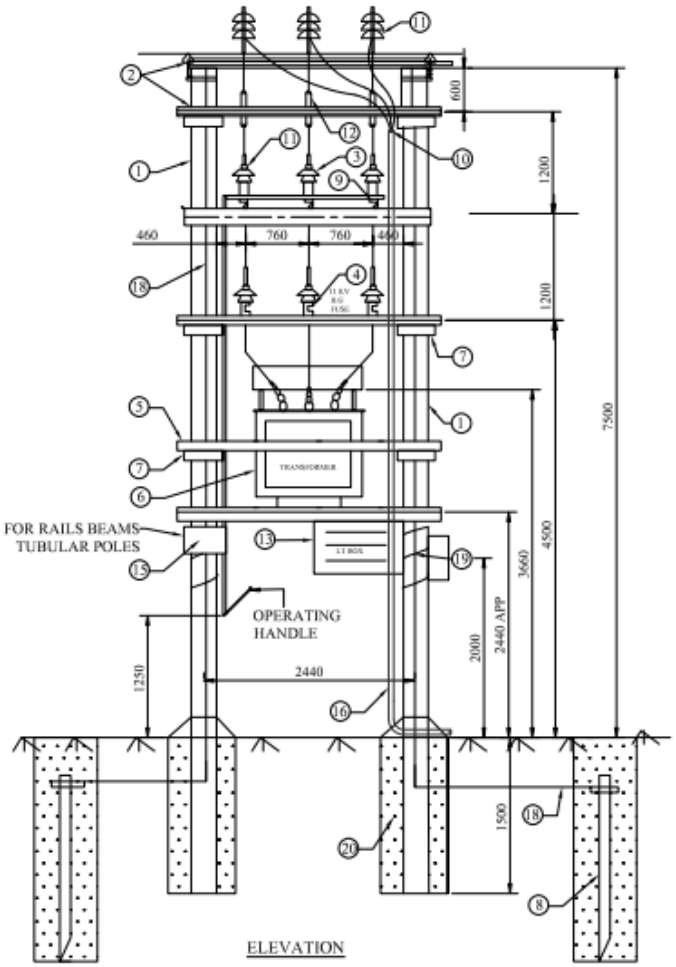
	2 POLE STRACTURAL	STANDARD DRAWING NO.		REV.	SIZE
				02	A4
		SHEET NO.	1 OF 1		



ELEVATION

BILL OF MATERIAL (APRX. QTY.)

S.No	
1 POLE (RCC/MS) - 9m	2
2 CHANNEL 100X50	2
3 AB ISOLATOR / G.O. SWITCH	2
4 H.G. FUSE	3
5 ANGLE 50X50X6 - 2800 (APP.)	3
6 TRANSFORMER	1
7 CLAMP	1
8 EARTHING PIT	2
9 G.O. AB SWITCH	1
10 HT CABLE	1 SET
11 11 kV INSULATOR	1 SET
12 11 KV LIGHTING ARREST'S	3
13 DISTRIBUTION BOX	1
14 LT CABLE	2
15 DANGER BOARD	1
16 HT CABLE PIPE	AS REQD
17 LT CABLE PIPE	AS REQD
18 EARTHING STRIP	AS REQD
19 BARBED WIRE	AS REQD
20 POLE FOUNDATION	2

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