



ELECTRICAL (CONSTRUCTION)
TENDER DOCUMENT

SPECIAL CONDITIONS OF ELECTRICAL DEPTT

Tender No:- DYCE-C-JAM-RANAVAV-01

Sub:-Electrification of Washing cum inspection pit line, Sick line cover shed, Office building & Other service building , and providing 11/0.433 KV substation for power supply & 11/0.750 KV substation for maintenance of EOG Coaches and battery charging facility & FL mast, in connection with Ranavav (RWO) Yard Remodeling and Develop Coaching Depot Terminal.

1- Electrical Contractor License:-

For participating in tenders for a work in any state the Contractors shall have to possess electrical license of appropriate voltage issued by any State Govt. under Clause 45 of compilation of rule of Indian Electricity Rules 1956 or as amended from time to time and a copy of the same should be submitted along with the offer. They shall keep valid license throughout the period of execution of work by getting it renewed at suitable intervals and submit an attested copy of the same to the Railways after each renewal. In the event of any discontinuity in validity of electrical license of the contractor, its authority to work with Railways will also automatically cease to be valid.

- i) The Tenderer should have valid license in the name of proprietor/partner/firm. Tenderer should enclose attested copy of valid Electrical Contractor License with tender.
- ii) In case, the license is under renewal, copy of challan (receipt of renewal fee) to be submitted along with the tender and attested copy of the valid electrical contractor license to be submitted within one month from the date of opening of tender. Otherwise the tender will not be considered.

- iii) If the attested copy of valid electrical contractor license or license under renewal with challan (receipt of renewal fee) is not enclosed with tender the tender will not be considered.

2-TENDEREER'S ELIGIBILITY CRITERIA AND CREDENTIALS

i-As per GCC Part –I Annexure-I (Contd..) para 10 & 11

Special condition for composite work

1. After issuance of LOA civil contractor along with electrical MOU contractor with bar chart and planning for execution of electrical works shall visit concerned SSE/EL/C/RJT work in charge and Dy.CEE/C/RJT office for detailed discussion for further course of electrical work and material approval. Accordingly joint note shall be prepared.
2. Contractor shall submit detailed drawing of wiring layout of building (duly showing) plug points, light points, fan points, location of AC etc. and shall take prior approval of Dy.CEE/C/RJT before laying of concealed pipes in walls, ceiling etc. This exercise to be completed at least one month before slab casting.
3. All electrical works related communications should invariably done with Electrical MOU contractor along with civil contractor, no other electrical sublet contractor shall be entertained.
4. Since Electrical items add great value to aesthetics of the buildings, hence Material approval shall not be limited to model numbers, if sample approval is required then necessary action to be taken by contractor.

The eligibility criteria for tenders costing above Rs. 50 Lakh shall be as under:

- i. *Contractor should have eligibility criteria as per GCC April 2022 for*

Similar nature of work shall mean for this work: “Execution of HT substation of equivalent or higher voltage and Wiring/Re-wiring in buildings with associated electrical works like control gear and protection arrangements in residential buildings or service buildings or railway stations /yards or colony/highway lightings. OR Lighting arrangement in buildings, circulating area, yard, street etc. with associated electrical works. OR Wiring/Rewiring, Lighting arrangement in buildings with associated electrical works”.

5. The tenderer must have successfully completed or substantially completed any one of the following categories of work(s) during last 07 (seven) years, ending last day of month previous to the one in which tender is invited:
 - (i) Three similar works each costing not less than the amount equal to 30% of advertised value of the tender, or
 - (ii) Two similar works each costing not less than the amount equal to 40% of advertised value of the tender, or
 - (iii) One similar work costing not less than the amount equal to 60% of advertised value of the tender.

ii-Qualification and Eligibility Criteria-**As per GCC Part –I Annexure-I (Contd.) para 10 & 11****As per GCC Part –I para-6****3-GUARANTEE CLAUSE:**

- (a) The work done by the contractor shall be guaranteed for satisfactory working of all the equipment and the installations provided by him, for a minimum period of **one year** from the date of completion of entire work unless it is mentioned in the chapter 'Technical Specification'. The guarantee for the spare parts should be coincident with the guarantee for entire work.
- (b) During this period of guarantee, the contractor shall keep available an experienced engineer and necessary equipment's to attend to any defective installations. The contractor shall bear the cost of all modifications, additions or substitutions that may be considered necessary due to faulty material, design or workmanship for the satisfactory working of the equipment's. The final decision shall rest with the Chief Electrical Engineer (construction) or his (their) successor(s).
- (c) During the period of guarantee the contractor shall be liable for the replacement of any equipment & any parts which may be found defective whether such equipments be of his own manufacture or those of his sub contract, whether arising from faulty design, material, workmanship or negligence in any manner on the part of the contractor at his (contractor's) own expenses. In case of type defect in the contractor's equipment and components detected during the guarantee period, the contractor should replace all such items irrespective of the fact that whether all such items have failed or not. The contractor shall bear the cost of the repairs carried out on his behalf by the contractor at site. In such a case, the contractor shall be informed in advance of the works proposed to be carried out by the contractor.
- (d) It becomes necessary for the contractor to replace or renew any defective portions of the installation under the Para aforesaid then the provisions of the said Para shall also apply to the portion of the installation so replaced or renewed until the expiration of six months from the date of such replacement or renewal or until the end of above mentioned period (see sub Para (a) above whichever is later. If any defect be not remedied within a reasonable time during the aforesaid period, the contractor may proceed to do the work at the contractor's risk and expense, but without prejudice to any other rights and remedies which the contractor may have against the contract in respect of such defects or faults.
- (e) The contractor will be responsible for any damage / theft for part of the work completed & paid in running bills till entire work is taken over by the Railway.
- (f) The repaired or renewed parts shall be delivered and erected on site free of charge to the contractor.

The contractor guarantees that the stores which he supplies will be fully in accordance with specifications and will be operate properly. In all cases, the contractor guarantees

that his designs would strictly follow the 'as made' detailed drawings with such modification as are modified in respect of each type. The contractor further guarantees that the store will be free from defects in materials and workmanship provided that the contractor's liability in this respect shall be limited to furnishing and installation of replacement parts free of any charge or the repair of defective parts only to the extent that such replacements or repairs are attributable to or arise from faulty workmanship or material or design in the manufacture of stores.

It shall be a condition of the guarantee hereunder that any defects complaint of shall be brought to the contractor's attention within a reasonable time of their being first discovered. The guarantee therein contains shall not apply to any material which shall have been repaired or altered by the contractor or on behalf in any way to misuse, negligence or incidents.

All replacement and repairs that the contractor shall take up on the contractor to delivery of the firm under this guarantee shall be delivered and perform by the contractor promptly and satisfactorily.

Any approval or acceptance by the contractor of the stores or of the materials incorporated therein shall not in any way limit the contractor's liabilities hereunder-

The decision of the contractor in regard the contractor's liability under guarantee shall be final and conclusive.

(g) Guarantee for LED lights shall be as per Latest WR specification for LED Lights.

4-SPECIAL CONDITIONS

01 For other Railway Stores-

If any material other than specified material is supplied by the Railway either at the contractors request or sue moto in order to prevent any possible delay in the execution of the work likely to occur due to the contractors inability to make adequate arrangement for supply thereof or otherwise, recovery will be made from contractor's bill at the book rate or last purchase rate whichever is higher plus 5%on account of initial freight and 2% on account of incidental charges together with supervision charges at 12.5 % of the total cost inclusive of material, freight and incidental charges, freight between the punchers source of supply and the contractors depot or rail head shall be to the contractors account.

If however, the material required by the contractor is not available in Railway's stock or the Railway decide not to the same be that for whatever reason, the Railway shall not be bound to arrange for the supply at cost quoted above or at any other cost nor will this fact be accepted as any other cost nor will this fact be accepted as an excuse for delay in execution of works.

5-PRICE VARIATION CLAUSE:

PRICE VARIATION: STANDARD PRICE VARIATION CLAUSE:

As per GCC Part –II para 46 A

6-FURNISHING WRONG INFORMATION:

If the Tenderer deliberately gives wrong information in his/their tender, creates/create circumstances for the acceptance of his/their tender, the Railway Administration reserve the right to reject such tender at any stage.

7-PERFORMANCE GUARANTEE:

As per GCC Part –II para 16 (4)

8-INSPECTION OF SITE BEFORE TENDERING:

The tenderer(s) shall inspect the proposed site of work and acquaint himself/themselves with the site conditions

9-TERMS OF PAYMENT:-

- a) 70% of price of supply of material on receipt and acceptance of material at site.
- b) Balance 20% of price of supply and 90% of price of erection after erection of equipment and material at site.
- c) Balance 10% of price of supply & 10% price of erection after commissioning and completion of entire work (**for General Service work**).

OR

- i. Balance 10% of price of supply & 10% price of erection after the portion of OHE charged, goods/passenger train operation has started on regular basis (**for TRD work**).
- ii. All payment shall be made on certificate of Dy. Chief Electrical Engineer (Construction), Western Railway or his authorized representative.

10-PREVAILING CONDITIONS:

- Railway's General condition of contract (GCC) will be applicable along with special conditions of contract
- In case of any conflict between special conditions of contract and the General conditions of contract (GCC), the special conditions of contract will prevail.

11-SUPPLY OF ELECTRICITY:-

As per GCC Part –II para 31 (4)

12- CARE OF STAFF:

No quarters will be provided by the Railway for the accommodation of the Contractor or any of his staff employed on the work. The contractor may be allowed to erect any labour camps for housing the labour at or near the site of work on available Railway land subject to payment of cess and water charges. The Contractor shall at his own cost make all necessary and adequate arrangement for the importation, feeding and preservation of the hygiene of his staff. The Contractor shall permit inspection at all

times of all sanitary arrangements made by him, by the Engineer or his assistant or medical staff of the railway. If the Contractor fails to make adequate medical, sanitary arrangements, these will be provided by the Railway, the cost thereof being recovered from the Contractor. In case some accommodation is available, it can be given on license fee.

13-DAMAGE BY ACCIDENT, FLOODS OR TIDES:

- (a) The Contractor shall take all precautions against damage from accident, floods or tides. No compensation will be allowed to the contractor for his plant or part or material lost or damaged by any cause whatsoever. The contractor shall be liable to make good the damages to any structure or part of structure, plant or material of every description belonging to the administration lost or damaged by any cause during the course of the Contractor's work.
- (b) The administration will not be liable to pay to the contractor any charges for rectification or repairs to any damage which may have occurred from any cause, whatsoever, to any part of the new/existing structure, during construction.

14-FIRST AID:

The Contractor shall maintain in a readily accessible place first aid appliances including an adequate supply of sterilized + cotton wool. The appliance shall be placed under the charge of a responsible person who shall be readily available during working hours.

15-INSPECTION REGISTER AND RECORDS:

The Contractor/s shall maintain accurate records, plans and charts showing the dates and progress of all main operations and the Engineer shall have access to this information at all reasonable times. Records of tests made shall be handed over to the Engineer's representative after carrying out the tests. The following registers will be maintained at site by the Contractor/s.

- a. Bar chart & Drawings
- b. Insulation Resistance Register
- c. Earth Resistance & Earth continuity Register
- d. Material Receipt from Railway & used at site Register

16-ENGAGEMENT OF QUALIFIED ENGINEER:

- 1- In terms of provisions of new Clause 26A.1 to the General Conditions of Contract (GCC), contractor shall also employ following Qualified Engineers during execution of the allotted work:

- a. One Qualified Graduate Engineer when cost of work to be executed is Rs.200 lakh and above, and
- b. One Qualified Diploma Holder Engineer when cost of work to be executed is more than Rs.25 lakh, but less than Rs.200 lakh.

- 02(a) The tenderer/s shall also give a declaration along with his/their tender to the effect that he/they shall engage and continue in service for the period of the contract,

One Electrical Engineer Degree Holder and also one Electrical Engineers Diploma Holder. If they are without experience of any kind, they will be given training by the contractor on stipend basis at the rate of not less than Rs.1000/- per month for a period of six months. Those who have gained experience and have completed the period of six months will thereafter be paid as under:

Electrical Engineering: Degree Holder	Not less than Rs.10000/- per month for the duration of the contract.
Electrical Engineering: Diploma Holder	Not less than Rs.6000/- per month for the duration of the contract.

If, the tenderer(s) fails/fail to comply the above declaration, his/their tender will be ignored. In case it is subsequently discovered that the declaration as aforesaid is in any way incorrect or the information furnished therein is wrong, the administration reserves the right to rescind the contract and to take action in accordance with clause 60 of the General Conditions of Contract.

(b) Declaration Form

I/We hereby declare that I/We shall engage and continue in service for the particular work for which tender is submitted one Civil Engineering Degree holder and one Civil Engineering Diploma holder. If they are without any experience of any kind they will be taken under training by us on stipend basis at the rate of not less than Rs.1000/-per month for a period of 12 months Those who have gained experience and have completed the period of 03 months will thereafter to paid as under :

- Electrical Engg. Degree Holders : Not less than Rs.10000/- p.m. for the duration of contract.
 - Electrical Engg. Diploma Holders : Not less than Rs.6000/-p.m. for the duration of contract.
- None of the Engineers will be related to me/us.

Date:

Signature of Tenderer/s

Further, in case the contractor fails to employ the Qualified Engineer, as aforesaid in Para 3.25.01 above, he, in terms of provisions of Clause 26A.2 to the General conditions of Contract, shall be liable to pay an amount of Rs. 40,000 & Rs. 25,000 for each month or part thereof for the default period for the provisions, as contained in Para 3.25.01 (a) & (b) above respectively.

Provision for deployment of Qualified Engineers (Graduate Engineer or Diploma Holder Engineer) shall be for the values as prescribed above. However, for the works contract tenders, if it is considered appropriate by the tender inviting authority, not to have the services of qualified engineer, the same shall be mentioned in the tender

documents by the concerned Executive with the approval of Officer not below the level of SAG Officer, for reasons to be recorded in writing.

17-WATER:

The contractor(s) shall make his/their own arrangements for potable and other water supply required for the execution of the work as well as for his labour. However, if water is supplied by the Railway, the contractor(s) will have to pay water charges as laid down in the General Conditions of Contract and in addition, the Contractor(s) will have to pay charges as levied by the Corporation/municipality.

18-DRINKING WATER:

The tenderer shall provide and maintain at suitable places easily accessible to labour a sufficient supply of water fit for drinking.

19-ERRORS, OMISSIONS AND DISCREPANCIES:

The tenderer(s) shall not take any advantage of any misinterpretation of the conditions due to typing or any other error and if any in doubt shall bring it to the notice of the Engineer without delay. In case of any contradiction, only the printed rules and books should be followed and no claim for the misinterpretation shall be entertained.

20- TRESPASS:-

The Contractor shall at all times be fully responsible for any damage or trespass committed by his agents or workmen in carrying out the work, even if such trespass is authorized by the Engineer.

21-INFLAMMABLE ARTICLES:

Inflammable materials, such as petrol, oil, etc., shall be stored separately from other materials and all due precautions as required under the Indian Explosives Act, or any other act shall be taken by the Contractor(s) to prevent any fires, etc.

22-TAXES AND ROYALTIES:

All rates quoted in the tender shall be deemed to be inclusive of all taxes, royalties payable by the Contractor(s) to the government or public body or local authority and no additional amount will be paid or claim entertained on this account by the Railway.

23-CABLE LAYING:

- (i) Contractor is instructed to carry out laying of cable as per specified depth and quantity mentioned in schedule with cable route marker as per specification & drawing at specified interval, failing which no payment will be made.
- (ii) In case of minor nature of works where shifting of cable is not required, in order to prevent damage to the cable, contractor shall take out the S&T or optical fibre cable or Electrical cable carefully from the trench and place it properly alongside at a safe location before starting the earthwork under the supervision of SE/Sig.

or SE/Tele or SE/Electrical (TRD or G). The cable shall be reburied soon after completion of excavation with proper care including placement of the brick over the cable under the supervision of S&T or Electrical supervisors. The contractor will go ahead with the shifting of cables as per the program decided.

- (iii) In case the cable are not executed as per approved plan, the penalty will be imposed for damages as under :

Cable damaged	Penalty per location
Only Quad cable or Signaling cable	Rs. 1.0 Lakh
Only OFC	Rs. 1.25 Lakh
Both OFC & Quad	Rs. 1.5 Lakh
Electrical Cable	Rs. 1.0 Lakh

Necessary debit in this regard shall be raised on the department undertaking the work who shall in turn levy the penalty on the defaulting contractor. S&T department shall raise the debits in case of damage to OFC or Quad or Signaling cable and Electrical department shall raise the debits in case of damage to Electrical cable. (Authority: Railway Board's letter No. 2003/Tele/RCIL/1 Pt. IX dt. 24.06.13)

TECHNICAL SPECIFICATION & EXPLANATORY NOTES**Tender No.- DYCE-C-JAM-RANAVAV-01**

Office of the
Dy.Chief Electrical Engineer
(Const.) Western Railway
Rajkot

Name of work: - Electrification of Washing cum inspection pit line, Sick line cover shed, Office building & Other service building , and providing 11/0.433 KV substation for power supply & 11/0.750 KV substation for maintenance of EOG Coaches and battery charging facility & FL mast, in connection with Ranavav (RWO) Yard Remodeling and Develop Coaching Depot Terminal.

SCOPE OF THE WORK:- This work involves Electrification of Washing cum inspection pit line, Sick line cover shed, Office building & Other service building , and providing 11/0.433 KV substation for power supply & 11/0.750 KV substation for maintenance of EOG Coaches and battery charging facility & FL mast, in connection with Ranavav (RWO) Yard Remodeling and Develop Coaching Depot Terminal in Bhavnagar Division of Western Railway in the guidance of Railway site Engineer as per schedule of approximate quantity and rates.

TECHNICAL SPECIFICATION:

1. The contractor shall carry out the electrical work as per IE Rules & Regulation, specification and shall be in work like manner. Relevant I S specifications wherever applicable shall be followed.
2. The work includes supply of materials, erection, installation, laying, terminating, connecting, testing, & commissioning of electrical assets as mentioned in the schedule of approximate quantity and rates and specification as enclosed in tender documents.
3. The contractor has to supply & provide ancillary materials required for the work even if they are not mentioned in the tender schedule for which no extra payment shall be made.
4. All the materials used in the work shall be of the make as per enclosed list and shall be got approved from Dy.CEE(C) RJT before its installation. Contractor shall have to arrange inspection at manufacturer's premises for LT panels DB, etc. by Railway representative. Material should be kept in safe custody by contractor. After entire completion of work the contractor shall have to deposit balance material to Sr.SE/Elect. Store- Rajkot.
5. The contractor if damage other installation / structure for the purpose of executing electrical works shall do reconditioning of floors, walls and ceilings to their original level of workmanship.
6. All required tools and instruments shall be arranged by the contractor.
7. The unit rate in the rate schedule includes supply, installation, testing, & commissioning including all contingent material like hard ware, bushes, PVC flexible pipe, seamless pipe down rods, chain, clamps, connecting wires etc.

- even if not specified in the rates schedule. All hardware like Nuts, bolts, washers, clamps etc should be of GI.
8. Electrical works shall be carried out by the contractor in supervision of the railway Engineers and contractor shall inform the railway representative before starting the work. All the hidden work i.e. laying of cables, foundation etc. shall be carried out in the presence of railway supervisor / representative.
 9. Any conflict/dispute/modification in specification given will be finalized by Dy.CEE (C) RJT and contractor has to accept the decision of Dy.CEE (C) RJT.
 10. The contractor will be responsible for any damage / theft for part of the work completed & paid in running bills till entire work is completed and taken over by the Railway.
 11. The electrical contractor having valid electrical contractor's license shall carry out the work under the tender.
 12. The contractor should have to carry Railway supervisors and engineers to the place of work for inspection and providing the required tools and equipments etc., inspection is the responsibility of the contractor for which no additional payment is to be made.
 13. The vehicle and equipment of the contractor can be the drafted by Railway administration in case of accident / natural calamities involving human lives.
 14. If the IS No. of any material in the tender is modified or amended, the latest shall be accepted.
 15. Railway may ask copies of challans, bills of Supplier/Manufacturer to verify genuineness of supplied material including taxes paid to government like **applicable GST and Cess on GST (if any)** etc.
 16. Lamp of the luminaries shall be of OEM make or if OEM used other reputed make lamps than it shall be accepted by Rly on production of OEM certificate by the contractor. If complete fitting catalogue no comprising with different assemblies catalogue nos., then such type of certificate shall be issued by OEM and submitted by the contractor to Rly. As per catalogue IP no. should be marked on the luminary or if it is not mentioned then, OEM certificate in this regard should be submitted by the contractor.
 17. The work done by the contractor shall be of aesthetic look.
 18. All switches, sockets, ceiling rose, lamp holders, switch boards should have engrave ISI marked in concave/convex manner.
 19. Before starting of work contractor should carry out joint survey with Railway Engineer of all work site & prepare drawing /design/layout of wiring, cabling, panels, DB and other electrical items to be provided at site & submitted to Dy.CEE/C/RJT for approval.
 20. ACB/MCCB/MCB/RCCB/RCBO should be IS/IEC marked.
 21. List of Approved makes shall be applicable for all concern schedule items.
 22. LED Luminaries as per WR specification No. WR /CCG/ SPECIFICATION /P / 001 (Rev.01)-2018 or Latest.

STANDARDS –

The following standards of latest/Revision edition and Indian Electricity Rules/Fire Insurance Regulations and rules shall be applicable:

IS No.	Items
IS : 1646/1997	Code of practice for fire safety of buildings (General) Electrical installation

IS : 9537 (Part - 3)/1983	Rigid non-metallic conduits for electrical wiring.
IS : 4648/1968	Guide for electrical layout in residential buildings.
IS 4615/1968	Switch socket out lets
IS 3419/1988	PVC Conduit accessories
IS 694:1990	Cables-LT PVC insulated multi-stranded single & multi-core
IS 3854/1997	Switches
IS 1293/2005	Plugs & sockets
IS 371/1999	ceiling rose
IS 1258/2005	Pendent holder, batten holder
IS 8828/1996	MCB
IS 13947-2/1993	MCCB
IS 12640 (Pt.I) 2000	RCCB
IS 732/1989	Code of practice for electrical wiring installation
IS 3043/1987	Earthing
IS 13032:1991	AC MCB board for voltage not exceeding 1000V-specification.
IS 13779 ISI marked clause-1 /1999	Electronic energy meter

1. General remarks for wiring.

- i. **Relevant code of practice for electrical wiring as per IS: 732/1989 or latest to be followed along with the following.**
- ii. All lamps shall be hung at a height of not less than 2.5 m above the floor level.
- iii. Switch boards shall be provided at 1.5 mtrs above the ground level.
- iv. Live wires of the points (half/phase) must be controlled by switches.
- v. Wiring shall be done by looping system. Phase/live conductors shall be looped at the switch box. For point wiring neutral/earth first looping shall be done in switchboard and subsequent loop shall be made at each point outlet. No joints shall be allowed in the wiring inside the PVC conduit/casing.
- vi. The contractor shall have to maintain the standard colour code for circuit such as phase- red, neutral- black, earth - green /gray. For 3-phase colour coding shall be Red, Yellow & Blue for Phases, Black for neutral and green/grey for earth.
- vii. Wiring shall be suitable for 240V AC between phase & neutral and 415 V AC between two phases.

- viii. All wiring shall be free from short - circuit/earth fault and shall be tested for these defects prior to being connected to the circuit.
- ix. There shall be a spacing of at least 125 mm between live parts and the mounting plane of the fixture.
- x. The clearance between the bottom most point of the ceiling fan and the floor shall be not less than 2.4 m. The minimum clearance between the ceiling and the plane of the blades shall be not less than 300 mm.
- xi. Light & Fan may be wired on common circuit. Such sub circuit shall not have more than a total of ten points of light, fan and 5A socket outlets. The load of such circuit shall be restricted to 800 watts.
- xii. 6/16Amp socket outlets shall be installed at the following positions, unless otherwise specified.
 - a) Non-residential building-23cm above floor level.
 - b) Kitchen - 23cm above working platform and away from the likely position of stove and sink.
 - c) Bathroom - no socket outlet is permitted for connecting portable appliances, thereto. MCB/IC switch may be provided 2m from fixed appliances, and at least 1m away from shower.
 - d) Rooms in residence – 23 cm above floor level or any other level in special cases with the approval of site engineer.
- xiv. Connection for electrical fitting shall be done with 3 core flexible copper wire ISI mark to from ceiling rose. Provided Chrome plated screw, nut, bolts, washer shall be used for electrical connection.
- xv. Wires used for wiring shall be multi-strand single core FRLS-PVC insulated 1.1kv grade Copper conductor with ISI mark. If any manufacturer discontinued FRLS wires, in such circumstances higher version FRLSH wires can be accepted. Make- As per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply. All wires should be of one make.
- xvi. PVC casing capping and accessories shall be as per IS14927 of minimum thickness of 1.2 mm, Casing capping/PVC conduit pipe shall be of MMS IS : 9537 (Part - 3)/1983 and of Ivory/white colour only , Wall crossing of wiring should be done through PVC Conduit pipe , make- As per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.
- xvii. Hardware, nut, bolts, washers, clamps etc. used for fixing shall be of G.I.
- xviii. As far as possible modular Switch, modular Socket and other accessories shall be of ISI mark .

2. **TESTING OF INSTALLATION**

Before a completed installation is put into service, the following tests shall be complied with

i. **INSULATION RESISTANCE**

The insulation resistance shall be measured by applying 500 volt megger with all fuses in places, circuit breaker and all switches closed.

The insulation resistance in mega-ohms of an installation, measured shall not be less than 50 mega-ohms divided by the number of points on the circuit.

The insulation resistance shall be measured between

EARTH TO PHASE
EARTH TO NEUTRAL
PHASE TO NEURAL
PHASE TO PHASE.

ii. **EARTH CONTINUITY PATH**

The earth continuity conductors shall be tested for electrical continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance or earth leakage circuit-breaker, measured from the connection, with the earth electrode to any point in the earth continuity conductor in the completed installation and shall not exceed one ohm.

iii. **POLARITY OF SINGLE POLE SWITCHES**

A test shall be made to verify that every single pole switch is connected to one of the phase of the supply system.

iv. **COMPLETION CERTIFICATES**

All the above tests shall be carried out in presence of Dy.CEE(C) RJT's representative and the results shall be recorded in prescribed forms. Any default during the testing shall be immediately rectified and that section of the installation shall be re tested. The completed test result form shall be submitted to the client for approval.

On completion of an electric installation a certificate shall be furnished by the contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. This certificate shall be in a prescribed form as required by the local electric supply authority.

SPECIFICATION FOR 1000 KVA TRANSFORMER (Item No. 1)

1.0	Transformer	:-11KV/0.415 KV, 1000 KVA 3-phase outdoor type, confirming to IS:1180 (Part1) 2014 Or latest, Level-2 with standard fitting and following particulars-
a.	Rating	:- 1000 KVA
b.	Winding	:- Three phase double copper wound
c.	Cooling	:- ONAN
d.	Rated primary voltage	:- 11KV, 3-phase
e.	Rated secondary voltage	:- 0.415 KV, 3 phase with neutral brought out.
f.	Rated frequency for primary / secondary	:- 50 Hz

g.	Connection: HV/LV	:-Delta / Star
h.	Vector group	:- Dyn 11 with neutral brought out as per IS: 2026 (Part-I)
i.	Impedance	:- 5.0 % As per IS 1180 (Part1) 2014
i	<i>Categories</i>	<i><u>B</u> as per IS 1180 (Part1) 2014</i>
k	<i>Energy efficiency level</i>	<i><u>Level-2</u> as per IS 1180 (Part1) 2014</i>
l	Max Temperature rise in oil	<i>IS 1180 (Part1) 2014.</i>
2-The temperature rise under full load at lowest tap or minimum HV should not exceed the limit give below		
a.	Winding	:- 45°C (Measured by resistance method)
b.	Insulating oil	:- 40° (Measured by thermometer)
k	Tapings	:- Off load tap changer on HV side for primary voltage variation of +5%,+2.5%, 0%, -2.5%,-5%,-7.5%,-10% . All taps shall be capable to carry full load current continuously.
L	Terminal marking and rating plate shall be in accordance with IS:	
3.	Transformer shall be complete with the required 1 st filling of oil and following fittings and accessories as per IS: 2026/1977 & IS 1180 (Part1) 2014 for its protection and efficient operation. All parts and accessories shall be deemed within the scope of the specification whether specifically mentioned or not.	
a.	Conservator tank with isolating valves, filling hole and cap and drain valves	
b.	Oil level gauge	
c.	Silica gel breather with oil seal& connecting pipe.	
d.	Lifting lugs.	
e.	Rating & diagram plate.	
f.	Oil temperature indicator with A/T contact.	
g.	Thermostat pocket with thermometer.	
h.	Earthing terminals 2 Nos.	
i.	Top and bottom filter valves, drain valve and sample valve double flange type.	
j.	Air release valve	
k.	Explosion vent	

l.	Under carriage with flange wheels.
m.	Off load tap changer
n.	Cable box for incoming suitable for 95 to 185sqmm HT XLPE cable.
o.	Cable box for outgoing suitable for 1600 A sandwich type <u>bus trunking</u> .
p.	Bi-directional flat rollers.
q.	Transformer base should be suitable for foundation mounting.
4-Tenderer shall furnish the following:-	
a.	Technical leaflet for the item offered
b.	Dimensional drawing
c.	Guaranteed technical particulars shall be mentioned
Note:-Transformer shall be of AREVA, ABB, EMCO, Crompton, BHEL, Voltamp, Kirloskar, Bharat Bijlee, NGEF, Voltas, GEC, Tesla, Siemens, Western Electric, IMP, Vivekanand, RTS, National make only. General drawing of the transformer shall be submitted to Dy.CEE(C) RJT's office for acceptance and approval.	

INSULATING OIL

The transformer shall be supplied with mineral insulating oil confirming to IS: 335. The transformer shall be transported with windings and core under oil and silica gel breather in position.

HT CABLE TERMINATION ARRANGEMENT

The transformer shall be suitable for termination of the 11 KV, XLPE (E) Grade, 3 core, 185 sqmm, and aluminum cable on HT side in an inbuilt cable box.

TRANSFORMER TEST

The contractor shall offer the inspection and testing of transformer by RITES at the manufacturer's premises (OEM) at his own cost for routine / acceptance test. However manufacturer's test certificate shall also be submitted for the type test. All tests will be carried out as per the relevant Para of IS: 2026/1977 or latest & IS 1180 (Part1) 2014 or latest. The RITES inspection certificate will be submitted by the contractor with the supply of transformer.

SPECIFICATION FOR VCB HT 11 KV / 800 AMP SWITCH BOARD (Item No. 2)

11 KV, 500 MVA, 800A, 25 KA/1 second rating one No incoming and others are outgoing VCB, indoor type, Metal clad horizontal isolation, horizontal draw

out type with 230V AC motor operated mechanism with manual operating mechanism - suitable for installation in 3 phase, 3 wire effectively earthed system which should as per sub clause 5.3 of IEC Publication 694 as detailed in IS:13118/1991 is applicable and should be suitable for indoor installation. Mounting of VCB in panel should be rack in & rack out type as per IS:13118. The design, construction and rating of the VCB should be as per relevant ISS. Each VCB panel (i.e. incoming and outgoing) shall also have arrangement for tripping and indication & alarm arrangement with Buchholz relay, OTI & WTI of transformer. (Panel shall be supply form approved OEM work place only system house or channel partner for the value addition in VCB shall not allowed)

Note:- The enclosure of VCB shall be such that all manual operation for operating VCB can be done after closing the doors of VCB to ensure safety of operating personnel. All the spring charging, metering and indication supply to be given from individual PT of each VCB panel.

The complete switchboard shall incorporate the following feature—

Sr. No.	Description	Incoming	Outgoing
1.	One No. tripping coil assembly 110V DC.	To be provided	To be provided
2.	One No. closing coil assembly 110 V DC.	To be provided	To be provided
3.	One set bus bar chamber (powder coated) with 800 Amp. Heat shrinkable PVC sleeved copper bus bars.	To be provided	To be provided
4.	One No. 230V AC space heater with ON/OFF switch and thermostat.	To be provided	To be provided
5.	One rear cable box for terminating HT, 11 KV, 3 core XLPE(E) cable as per standard design of the manufacturer size of the cable proposed to be used 11 KV, XLPE (UE), 3 core, 95/185 sqmm.	To be provided	To be provided
6.	One No. power pack suitable for 110V AC input from PT and 110V DC output (condenser type for closing & tripping circuit only).	To be provided	To be provided
7.	One No. Auxiliary switch with 4Nos. N/O & 4Nos. N/C contacts.	To be provided	To be provided
8.	One No. voltage transformer, 3 phase, 3 limb, draw out type feeder connected PT of ratio 11000/110volts of class 1.0 accuracy, 100 VA burden epoxy casted with HT& LT fuses.	To be provided	To be provided
9.	Epoxy casted CTs with 15 VA burden & class 1.0 accuracy for metering and 5P10 for protection.	To be provided	To be provided
10.	One No. 96sqmm ammeter with selector switch.	To be provided	To be provided
11.	One No. 96sqmm voltmeter with selector switch.	To be provided	To be provided
12.	One set of breaker ON/OFF& phase (R,Y,B) indication lamp-110V AC	To be provided	To be provided

	operated.		
13.	Digital Multi-Function Meter having voltage, Amp. Frequency, KW, PF, KVAR, KVA, KVAH, KWH, KVARH with CT	To be provided	To be provided
14.	One No. breaker control TNC switch with lock and bell alarm contact for auto trip indication with bell hooter.	To be provided	To be provided
15.	Spring charge indication 110V AC operated.	To be provided	To be provided
16	Auto trip indication 110V AC operated.	To be provided	To be provided
	PROTECTION		
a	One No. Numerical Communicable IDMT relay with 2 Over Current setting, one Earth Fault element setting , type 7SJ-600 of Siemens or equivalent as approved by DYCEE/C/RJT	To be provided	To be provided
b	One No. trip circuit healthy relay with lamp with push button 110V DC operated.	To be provided	To be provided
c	One No. Anti-Pumping Relay	To be provided	To be provided
d	One No. Master Trip Relay VAJH-13	To be provided	To be provided

The manufacture and design of the HT 11 KV VCB shall confirm to the latest IS: **13118/1991**. The VCB shall be similar to latest design of approved manufacturers, and as per IS: 13118/1991 read with IEC Pub 56 (1987) and IEC publication 694.

Make of VCB:- As per list of makes enclosed.

Make of meters:- IMP, MECO, AE only make or as per manufacture's recommendation.

Make of CT/PT :- KUPPA, ELS, SILKANA make or as per manufacture's recommendation.

Make of Relay:- AREVA, SIEMENS, ABB, MEI, Crompton Greaves, Jyoti, Biecco Lawrie, Voltas BHEL, L&T make or as per manufacture's recommendation.

The contractor shall submit three sets of drawing and wiring diagram of HT panel along with the technical leaflet / booklet of the panel supply. Contractor shall also be supplied First Aid box & shock treatment chart duly framed in the room of VCB.

VCB TEST:-

The contractor shall offer the inspection and testing of VCB by RITES at the manufacturer's (approved OEM) premises at his own cost for routine / acceptance test. However manufacturer's OEM test certificate shall also be submitted for the type test. All test will be carried out as detailed in

IS:13118/1991. The RITES inspection certificate will be submitted by the contractor with the supply of VCB.

NOTE :-Foundation & cable trench as recommended by manufacturer will be done by contractor at his own cost if required at site for which no extra payment will be made.

1600 A SANDWICH ALUMINIUM BUS TRUNKING (Item No. 03)

Contractor shall have to supply, erect, test and commission 1600 Amp current rating, sandwich insulated aluminium bus trunking along with AL earthing, bends, flexible connections, flange ends etc. Bus trunking shall be as per IS : 8623/1993 part I&II and IEC code 60439 / I &II. Bus trunking shall be suitable for indoor and out door application.

Supply voltage-

3 phase, four wire, 415/440V, 50Hz AC supply.

Construction.

The enclosure will be made from 16 SWG GI / CRCA powder coated steel sheet. Bus bar will be in sandwich construction and conductor will be individually insulated with four layers of insulating film. Inner layer will be of glass mica and outer layer of polyester material class-F. Alternatively extrusion of class –F material in form of epoxy insulation may be provided. No drilling of bus bars will be permitted. Aluminium conductor will be of 19501 grade with radialised edges. Length of section will be limited to maximum of 3-metres. Bus bars of one section of one section will be connected to bus bar of adjacent by uni-block joint system removable as separate sub assembly, so that it can be inserted or removed without disturbing the adjacent section. Neutral cross section will be same as phase cross section.

At the termination either on the transformer side or on generator end or on switchgear panel bus duct will be provided with flange ends, Adaptor box and copper flexible (preferably multi sheet types) to connect bus bar of bus duct to bus bar of switchgear panel or transformer terminations or generator terminals .

All the components like bus bar ducting, bands Hanger ends, Adopter boxes etc. will be made from CRCA or GI sheets. Two earth strips of aluminum pf size mention IEC 60439, depended on short circuit with stand capacity required will be provided throughout the length.

TECHNICAL PARAMETERS:

1. Bus Trunking will be designed to withstand short circuit current for one second.
2. Bus bar system should be designed for an ambient temperature of 40 deg. And temperature rise
Restricted to 55 deg. C max above ambient on conductor above ambient.

Temperature rise of the enclosure 40 deg. C maximum. Temp. rise terminals 70 deg. C maximum.

3. Maximum operating voltage = 1000 Volts. (600 volts)
4. Insulating Voltage = 1000 Volts
5. Bus bar trunking will be suitably chosen to give permissible voltage drop.

6. Rated impulse withstand voltage 12 KV at 1000 V (600 volts)

LIST OF TEST TO BE CARRIED OUT:

Type Tests: Copies of the following certificate should be submitted.

1. Verification of Temperature Rise limits.
2. Verification of dielectric prosperities.
3. Verification of short circuit strength.
4. Verification of degree of protection.

ROUTINE TESTS:

1. Verification of insulation, resistance.
2. Inspection of assembly, interlocks, locks etc.
3. Check on wiring if provided.
4. Dielectric test.

INSTALLATION:

Contractor shall have to provide necessary vertical / Horizontal Bends / Tees / Flexible copper bus as site requirement. Bus bar trunking will be rigidly fixed to the walls or suspended from ceiling / supports as per requirements. It will be provided from transformer LT terminal to LT panel ACB, Change over switch to AMF panel etc. For installation manufacturer's recommendation should be followed.

Make of sandwich insulated aluminum bus trunking as per List enclosed and shall be got approved from DYCEE/C/RJT before supply.

Note:-The contractor shall have to arrange inspection at the manufacturer's premises at his own cost.

SPECIFICATION FOR 400 KVAR APFC Panel (Item No.04)

- The contractor shall have to design, supply, install, test and commission APFC panel fabricated by 2mm thick MS sheet, standard angles, channels etc. as required in design. The drawing, design switch gears with make and model of the APFC panel shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before fabrication.
- The APFC panel shall be fabricated by CPRI approved manufacturer.
- The APFC panel shall be indoor rectangular cubicle type, dust and vermin proof suitable for 3 phase, 4-wire, 440V, 50Hz AC supply system.
- Bus bar for main circuit and neutral shall have uniform cross section electrolytic tinned copper with color coded heat shrinkable PVC insulated and current density of 1.6 Amp/mm² cross sectional area.
- Knock out / gland plates as applicable shall be provided. Gland plates of suitable size shall be designed for terminating cables in a straight and easy manner.
- All power connections from the bus bar shall be made such a manner that there is a clear metal to metal clearance at the tapping is available. Both spring washer and plate washer shall be used with stud/ nuts/to ensure proper contact pressure.

- The APFC panel shall have metal locks & operated by a common key. All covers & doors to be provided with neoprene gasket. Hinged doors shall be provided on both sides.
- The sheet steel enclosure / angle / channel used in the fabrication of panel shall be provided with double coating of red oxide and final coating of light grey powder coated paint.
- The APFC panel shall be supplied complete with base plate of 75mm, louver, four lifting hooks and feeder name plates completely wired and ready for commissioning.
- Caution board in Hindi, Gujarati & English of metallic type shall be provided on panel.
Minimum two earth terminals shall be provided in the APFC panel all sheet section shall be electrically connected with a separate G.I. earth strip of 50x6 mm size across the panel at bottom.
- CT shall be cast resin type & 15 VA burden, class 1.0 accuracy and shall be earthed through a separate earth link. One No. sensing CT to be provided for APFC panel. CT shall be of make as per List enclosed and shall be got approved from Dy.CEE (C) ADI.
- Ammeter of suitable capacity (According to ACB & MCCB Rating) with selector switch of make as per List enclosed and shall be got approved from DYCEE/C/RJT before supply only & CT on each phase of outgoing feeder having 63A or more capacity.
- Multi LED type indication lamp with control fuses on each incoming & outgoing feeder shall be provided. The indication lamps shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJT before supply only.
- APFC panel shall be mounted on the fabricated MS Angle on floor and cemented trench for incoming and outgoing cables shall be prepared by the contractor.
- The ACB, MCCB & Change Over shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJT before supply.
- The breaking capacity of MCCBs should not be less than 35KA with $I_{cs}=I_{cu}$ and should have variable setting type with thermal magnetic release & Rotary handle.
- The contractor shall submit drawing and wiring diagram of APFC panel along with panel at the time of supply.
- Contractor shall have to provide cable gland & lugs for cable termination.
- APFC panel should be of future extendable type.
- Capacitor shall be of heavy duty MPP type, 415 Volt.
- Contractor shall have to provide the control cable from LT panel CT to APFC panel.
- Make of capacitor & all other items are as per List enclosed and shall be got approved from DYCEE/C/RJT before supply.

The APFC panel shall be comprised with following switch gears—

Incomer:-

- 1 x 800A ACB, 3-pole (manually operated, draw out type, with over current, short circuit microprocessor based release and earth fault, $I_{cu}=I_{cs}=I_{cw}$ for 1 second, breaking capacity not less than 50KA)
- 01 No. APFC relay, 12 stage microprocessor base intelligent versions of make as per list enclosed and shall be got approved from DYCEE/C/RJT before supply.
- 02 Nos. auxiliary contactor of 10A capacity.
- 01 No. Ammeter 0-600A with CT, selector switch
- 01 No. Voltmeter 0-500V with selector switch.
- 01 No. Auto manual switch.
- 03 Nos. multi LED type indication lamp with control fuse.

- 02Nos Ventilating fans

Outgoing –

- 1 **50KVAR fixed capacitor feeder -one No.**
Each feeder consists of –
160A, 3 pole MCCB-01 No.- Fix type with rotary handle.
Heavy duty capacitor – 50 KVAR,415 V- 01 No.
- 2 **50KVAR capacitor feeder- 06 Nos.**
Each feeder consists of –
50KVAR fixed capacitor,415 V – 01 No.
Capacitor duty contactor suitable for 50KVAR – one No
160A, 3 pole MCCB- 01 No. Fix type with rotary handle.
ON/OFF push button with indication lamp with control fuse- two Nos.
On delay timer (Make L&T,GE, Siemens)- one No.
Auto manual switch – 01 No.
- 3 **25KVAR capacitor feeder- 02 Nos.**
Each feeder consists of –
25KVAR heavy duty capacitor,415 V – 01 No.
Capacitor duty contactor suitable for 25KVAR – 01No.
63A, 3 pole MCCB- 01 No. Fix type with rotary handle.
ON/OFF push button with indication lamp with control fuse.- 02 Nos.
On delay timer (Make L&T, GE, Siemens)- 01No.
Auto manual switch – 01 No

Note:- The contractor shall offer the inspection and testing of APFC panel by Dy.CEE/C/ADI at the manufacturer's premises at his own cost for routine / acceptance test. However manufacturer's test certificate shall also be submitted for the type test. All tests will be carried out as per relevant IS.

SPECIFICATION FOR 50 KVAR APFC Panel (Item No.05)

- The contractor shall have to design, supply, install, test and commission APFC panel fabricated by 2mm thick MS sheet, standard angles, channels etc. as required in design. The drawing, design switch gears with make and model of the APFC panel shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before fabrication.
- The APFC panel shall be fabricated by CPRI approved manufacturer.
- The APFC panel shall be indoor rectangular cubicle type, dust and vermin proof suitable for 3 phase, 4-wire, 440V, 50Hz AC supply system.
- Bus bar for main circuit and neutral shall have uniform cross section electrolytic tinned copper with color coded heat shrinkable PVC insulated and current density of 1.6 Amp/mm² cross sectional area.
- Knock out / gland plates as applicable shall be provided. Gland plates of suitable size shall be designed for terminating cables in a straight and easy manner.
- All power connections from the bus bar shall be made such a manner that there is a clear metal to metal clearance at the tapping is available. Both spring washer and plate washer shall be used with stud/ nuts/to ensure proper contact pressure.

- The APFC panel shall have metal locks & operated by a common key. All covers & doors to be provided with neoprene gasket. Hinged doors shall be provided on both sides.
- The sheet steel enclosure / angle / channel used in the fabrication of panel shall be provided with double coating of red oxide and final coating of light grey powder coated paint.
- The APFC panel shall be supplied complete with base plate of 75mm, louver, four lifting hooks and feeder name plates completely wired and ready for commissioning.
- Caution board in Hindi, Gujarati & English of metallic type shall be provided on panel.
Minimum two earth terminals shall be provided in the APFC panel all sheet section shall be electrically connected with a separate G.I. earth strip of 50x6 mm size across the panel at bottom.
- CT shall be cast resin type & 15 VA burden, class 1.0 accuracy and shall be earthed through a separate earth link. One No. sensing CT to be provided for APFC panel. CT shall be of make as per List enclosed and shall be got approved from Dy.CEE (C) ADI.
- Ammeter of suitable capacity (According to ACB & MCCB Rating) with selector switch of make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply only & CT on each phase of outgoing feeder having 63A or more capacity.
- Multi LED type indication lamp with control fuses on each incoming & outgoing feeder shall be provided. The indication lamps shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply only.
- APFC panel shall be mounted on the fabricated MS Angle on floor and cemented trench for incoming and outgoing cables shall be prepared by the contractor.
- The ACB, MCCB & Change Over shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.
- The breaking capacity of MCCBs should not be less than 35KA with $I_{cs}=I_{cu}$ and should have variable setting type with thermal magnetic release & Rotary handle.
- The contractor shall submit drawing and wiring diagram of APFC panel along with panel at the time of supply.
- Contractor shall have to provide cable gland & lugs for cable termination.
- APFC panel should be of future extendable type.
- Capacitor shall be of heavy duty MPP type, 415 Volt.
- Contractor shall have to provide the control cable from LT panel CT to APFC panel.
- Make of capacitor & all other items are as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.

The APFC panel shall be comprised with following switch gears—

i. Incomer:-

- 1 No. 160A MCCB, 4 pole. - variable setting type with thermal magnetic release & Rotary handle.
- 01 No. APFC relay, 6 stage microprocessor base intelligent versions of Meher, Crompton, ABB, BHEL, L&T, EPCOS make.
- 02 Nos. auxiliary contactor of 10 A capacity.
- 01 No. Ammeter 0-600A with CT, selector switch
- 01 No. Voltmeter 0-500V with selector switch.
- 01 No. Auto manual switch.
- 03 Nos. multi LED type indication lamp with control fuse.
- 02Nos Ventilating fans

ii-Outgoing –**10 KVAR capacitor feeder- 05 Nos.**

Each feeder consists of –

10KVAR heavy duty capacitor – 01 No.

Capacitor duty contactor suitable for 10 KVAR – 01No.

63A, 3 pole MCB, 10 KA - 01 No.

ON/OFF push button with indication lamp with control fuse.- 02 Nos.

On delay timer (Make L&T, GE, Siemens) - 01No.

Auto manual switch – 01 No.

Note:- The contractor shall offer the inspection and testing of APFC panel by Dy.CEE/C/ADI at the manufacturer's premises at his own cost for routine / acceptance test. However manufacturer's test certificate shall also be submitted for the type test. All tests will be carried out as per relevant IS.

SPECIFICATION FOR LT PANEL SWITCH BOARD 1600 Amp (Item No.06)**For Substation Main LT Panel**

- The contractor shall have to design, supply, install, test and commission LT panel fabricated by 2mm thick MS sheet, standard angles, channels etc. as required in design. The drawing, design switch gears with make and model of the LT panel shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before fabrication.
- The panel shall be fabricated by CPRI approved manufacturer.
- The LT panel shall be indoor rectangular cubicle type, dust and vermin proof suitable for 3 phase, 4-wire, 415V, 50Hz AC supply system.
- Bus bar for main circuit and neutral shall have uniform cross section electrolytic tinned copper with color coded heat shrinkable PVC insulated and current density of 1.6 Amp/mm² cross sectional area.
- Knock out / gland plates as applicable shall be provided. Gland plates of suitable size shall be designed for terminating cables in a straight and easy manner.
- All power connections from the bus bar shall be made such a manner that there is a clear metal to metal clearance at the tapping is available. Both spring washer and plate washer shall be used with stud/ nuts/to ensure proper contact pressure.
- The LT panel shall have metal locks & operated by a common key. All covers & doors to be provided with neoprene gasket. Hinged doors shall be provided on both sides.
- The sheet steel enclosure / angle / channel used in the fabrication of panel shall be provided with double coating of red oxide and final coating of light grey powder coated paint.
- The LT panel shall be supplied complete with base plate of 75mm, louver, four lifting hooks and feeder name plates completely wired and ready for commissioning.
- Caution board in Hindi, Gujarati & English of metallic type shall be provided on panel.
- Minimum two earth terminals shall be provided in the LT panel All sheet steel section shall be electrically connected with a separate G.I. earth strip of 50x6 mm size across the panel at bottom.

- LT panel shall be provide Digital Multi Function Meter having voltage, Amp. Frequency, KW, PF, KVAR, KVA,KVARH, KWH with CT in all phases and in **each incoming** feeder. Make as per List enclosed and shall be got approved from Dy.CEE (C) ADI.
- All CT shall be **cast resin** type & 15VA burden, class 1.0 accuracy and shall be earthed through a separate earth link. One No. sensing CT to be provided for APFC panel. All CT shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply only.
- Ammeter of suitable capacity (According to ACB & MCCB Rating) with selector switch & CT on each phase of outgoing feeder having 63A or more capacity. Make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.
- Multi LED type indication lamp with control fuses on **each incoming & outgoing** feeder shall be provided. The indication lamps shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply only.
- LT panel shall be mounted on the fabricated MS Angle on floor and cemented trench for incoming and outgoing cables shall be prepared by the contractor.
- The ACB, MCCB & Change Over shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.
- The breaking capacity of ACB should not be less than 50 KA with $I_{cs}=I_{cu}=I_{cw}$ for one second.
- The breaking capacity of MCCBs should not be less than 35KA with $I_{cs}=I_{cu}$ and should have variable setting type with thermal magnetic release & Rotary handle.
- The contractor shall submit drawing and wiring diagram of LT panel along with panel at the time of supply.
- Contractor shall have to supply and provide instruction chart of restoration of person suffering from electric shock in English, Hindi and Gujarati language and shall be displayed in an enclosed wooden and glass frame work.
- Contractor shall have to provide cable gland & lugs for cable termination in the LT panel.
- Contractor shall have to provide bus trunking between LT panel to transformer and DG set AMF panel. Suitable arrangement made on top of the panel.

The LT panel shall be comprised with following switch gears—

Incoming circuit -> 2 x 1600 A ACB, 4-pole (manually operated, draw out type, with over current, shrt circuit microprocessor based release and earth fault, Mechanical & Electrical interlocked for one incoming ON at a time.
 $I_{cu}=I_{cs}=I_{cw}$ for 1 second, breaking capacity not less than 50KA)

Outgoing circuit -> 6 x 800A ACB, 4-pole (manually operated, draw out type, with over current, short circuit microprocessor based release and earth fault, $I_{cu}=I_{cs}=I_{cw}$ for 1 second, breaking capacity not less than 50KA)

- 6 x 400A MCCB 4-pole adjustable type with thermal magnetic release with rotary handle.
- 6 x 250A MCCB 4-pole adjustable type with thermal magnetic release with rotary handle.
- 9 x 125A MCCB 4-pole adjustable type with thermal magnetic release with rotary handle.

- 1 x 1000 A 4-pole manually operated on-load changeover switch.

Note:- The contractor shall have to arrange inspection of the LT PANEL at the manufacturer's premises at his own cost. Existing panel available in sub station will be dismantled and shifted by contractor to Sr.SE/Elect./C/ADI's store or any other location in Ahmedabad area including loading / unloading, transportation etc and existing cables must be reconnect to new panel for which no extra charge will be given.

SPECIFICATION FOR LT PANEL SWITCH BOARD 600 Amp (Item No.07)

- The contractor shall have to design, supply, install, test and commission LT panel fabricated by 2mm thick MS sheet, standard angles, channels etc. as required in design. The drawing, design switch gears with make and model of the LT panel shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before fabrication.
- The panel shall be fabricated by CPRI approved manufacturer.
- The LT panel shall be indoor rectangular cubicle type, dust and vermin proof suitable for 3 phase, 4-wire, 415V, 50Hz AC supply system.
- Bus bar for main circuit and neutral shall have uniform cross section electrolytic tinned copper with color coded heat shrinkable PVC insulated and current density of 1.6 Amp/mm² cross sectional area.
- Knock out / gland plates as applicable shall be provided. Gland plates of suitable size shall be designed for terminating cables in a straight and easy manner.
- All power connections from the bus bar shall be made such a manner that there is a clear metal to metal clearance at the tapping is available. Both spring washer and plate washer shall be used with stud/ nuts/to ensure proper contact pressure.
- The LT panel shall have metal locks & operated by a common key. All covers & doors to be provided with neoprene gasket. Hinged doors shall be provided on both sides.
- The sheet steel enclosure / angle / channel used in the fabrication of panel shall be provided with double coating of red oxide and final coating of light grey powder coated paint.
- The LT panel shall be supplied complete with base plate of 75mm, louver, four lifting hooks and feeder name plates completely wired and ready for commissioning.
- Caution board in Hindi, Gujarati & English of metallic type shall be provided on panel.
- Minimum two earth terminals shall be provided in the LT panel All sheet steel section shall be electrically connected with a separate G.I. earth strip of 50x6 mm size across the panel at bottom.
- LT panel shall be provided with Digital Multi-Function Meter for each incoming feeder having voltage, Amp. Frequency, KW, KWH, PF, KVAR, KVA with CT in all phases as per relevant IS. Make as per List enclosed of Energy meter/ Measuring instrument and shall be got approved from Dy.CEE (C) ADI.
- All CT shall be **cast resin** type & 15VA burden, class 1.0 accuracy and shall be earthed through a separate earth link. One No. sensing CT to be provided for APFC panel. CT shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply only.
- Ammeter of suitable capacity (According to ACB & MCCB Rating) with selector switch & CT **cast resin** type & 15VA burden on each phase of outgoing feeder having 63A or more capacity. Make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.

- Multi LED type indication lamp with control fuses on each incoming & outgoing feeder shall be provided. The indication lamps shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJT before supply only.
- LT panel shall be mounted on the fabricated MS Angle on floor and cemented trench for incoming and outgoing cables shall be prepared by the contractor.
- The ACB, MCCB & Change Over shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJT before supply.
- The breaking capacity of ACB should not be less than 50 KA with $I_{cs}=I_{cu}=I_{cw}$ for one second.
- The breaking capacity of MCCBs should not be less than 35KA with $I_{cs}=I_{cu}$ and should have variable setting type with thermal magnetic release & Rotary handle.
- The contractor shall submit drawing and wiring diagram of LT panel along with panel at the time of supply.
- Contractor shall have to supply and provide instruction chart of restoration of person suffering from electric shock in English, Hindi and Gujarati language and shall be displayed in an enclosed wooden and glass frame work.
- Contractor shall have to provide cable gland & lugs for cable termination in the LT panel.

The LT panel shall be comprised with following switch gears—

Incoming circuit - ➤ 2 x 600A ACB, 4-pole (manually operated, draw out type, with over current, short circuit microprocessor based release and earth fault, Mechanical & Electrical interlocked for one incoming ON at a time.
 $I_{cu}=I_{cs}=I_{cw}$ for 1 second, breaking capacity not less than 50KA)

Outgoing circuit - ➤ 6 x 250A MCCB 4-pole adjustable type with thermal magnetic release with rotary handle.

- 6 x 125A MCCB 4-pole adjustable type with thermal magnetic release with rotary handle.
- 1x400 A On load ,4-pole change over switch with rotary handle.

Note:- The contractor shall have to arrange inspection of the LT PANEL at the manufacturer's premises at his own cost. Existing panel available in sub station will be dismantled and shifted by contractor to Sr.SE/Elect./C/ADI's store or any other location in Ahmedabad area including loading / unloading, transportation etc and existing cables must be reconnect to new panel for which no extra charge will be given.

SPECIFICATION FOR LT PANEL-400 Amp (Item No.08)

- The contractor shall have to design, supply, install, test and commission LT panel fabricated by 2mm thick MS sheet, standard angles, channels etc. as required in design. The drawing, design switch gears with make and model of the LT panel shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before fabrication.
- The panel shall be fabricated by CPRI approved manufacturer.
- The LT panel shall be indoor rectangular cubicle type, dust and vermin proof suitable for 3 phase, 4-wire, 415V, 50Hz AC supply system.

- Bus bar for main circuit and neutral shall have uniform cross section electrolytic tinned copper with color coded heat shrinkable PVC insulated and current density of 1.6 Amp/mm² cross sectional area.
- Knock out / gland plates as applicable shall be provided. Gland plates of suitable size shall be designed for terminating cables in a straight and easy manner.
- All power connections from the bus bar shall be made such a manner that there is a clear metal to metal clearance at the tapping is available. Both spring washer and plate washer shall be used with stud/ nuts/to ensure proper contact pressure.
- The LT panel shall have metal locks & operated by a common key. All covers & doors to be provided with neoprene gasket. Hinged doors shall be provided on both sides.
- The sheet steel enclosure / angle / channel used in the fabrication of panel shall be provided with double coating of red oxide and final coating of light grey powder coated paint.
- The LT panel shall be supplied complete with base plate of 75mm, louver, four lifting hooks and feeder name plates completely wired and ready for commissioning.
- Caution board in Hindi, Gujarati & English of metallic type shall be provided on panel.
- Minimum two earth terminals shall be provided in the LT panel All sheet steel section shall be electrically connected with a separate G.I. earth strip of 50x6 mm size across the panel at bottom.
- LT panel shall be provided with Digital Multi-Function Meter for each incoming feeder having voltage, Amp. Frequency, KW, KWH, PF, KVAR, KVA with CT in all phases as per relevant IS. Make as per List enclosed of Energy meter/ Measuring instrument and shall be got approved from Dy.CEE (C) ADI.
- All CT shall be **cast resin** type & 15VA burden, class 1.0 accuracy and shall be earthed through a separate earth link. One No. sensing CT to be provided for APFC panel. CT shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply only.
- Ammeter of suitable capacity (According to ACB & MCCB Rating) with selector switch & CT **cast resin** type & 15VA burden on each phase of outgoing feeder having 63A or more capacity. Make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.
- Multi LED type indication lamp with control fuses on each incoming & outgoing feeder shall be provided. The indication lamps shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply only.
- LT panel shall be mounted on the fabricated MS Angle on floor and cemented trench for incoming and outgoing cables shall be prepared by the contractor.
- The ACB, MCCB & Change Over shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.
- The breaking capacity of ACB should not be less than 50 KA with Ics=Icu=Icw for one second.
- The breaking capacity of MCCBs should not be less than 35KA with Ics=Icu and should have variable setting type with thermal magnetic release & Rotary handle.
- The contractor shall submit drawing and wiring diagram of LT panel along with panel at the time of supply.
- Contractor shall have to supply and provide instruction chart of restoration of person suffering from electric shock in English, Hindi and Gujarati language and shall be displayed in an enclosed wooden and glass frame work.
- Contractor shall have to provide cable gland & lugs for cable termination in the LT panel.

The LT panel shall be comprised with following switch gears—

Incoming circuit -> 2 x 400A MCCB, 4-pole adjustable type with thermal magnetic release

Outgoing circuit -> 4 x 250A MCCB 4-pole adjustable type with thermal magnetic release

- > 4 x 125A MCCB 4-pole adjustable type with thermal magnetic release.
- > 4 x 63 A MCCB 4-pole adjustable type with thermal magnetic release

Note:- The contractor shall have to arrange inspection of the LT PANEL at the manufacturer's premises at his own cost.

SPECIFICATION FOR SUB LT PANEL BOARD-250 Amp(Item No -9)

- > The contractor shall have to design, supply, install, test and commission LT panel fabricated by 2mm thick MS sheet, standard angles, channels etc. as required in design. The drawing, design switch gears with make and model of the LT panel shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before fabrication.
- > The panel shall be fabricated by CPRI / ISO approved manufacturer. Contractor should submit the copy of CPRI / ISO certificate issued to panel manufacturer.
- > The LT panel shall be indoor rectangular cubicle type, dust and vermin proof suitable for 3 phase, 4-wire, 415V, 50Hz AC supply system.
- > Bus bar for main circuit and neutral shall have uniform cross section electrolytic tinned copper with color coded heat shrinkable PVC insulated and current density of 1.6 Amp/mm² cross sectional area.
- > Knock out / gland plates as applicable shall be provided. Gland plates of suitable size shall be designed for terminating cables in a straight and easy manner.
- > All power connections from the bus bar shall be made such a manner that there is a clear metal to metal clearance at the tapping is available. Both spring washer and flat washer shall be used with stud/ nuts/to ensure proper contact pressure.
- > The LT panel shall have metal locks & operated by a common key. All covers & doors to be provided with neoprene gasket & Hinges.
- > The sheet steel enclosure / angle / channel used in the fabrication of panel shall be provided with double coating of red oxide and final coating of Siemens grey powder coated paint.
- > The LT panel shall be supplied complete with C-channel base plate of 75mm, louver on sides, four lifting hooks and feeder nameplates completely wired and ready for commissioning.
- > Caution board in Hindi, Gujarati & English of metallic type shall be provided on panel.
- > Minimum two earth terminals shall be provided in the LT panel all sheet steel section shall be electrically connected with a separate G.I. earth strip of 50x6 mm size across the panel at bottom.
- > Voltmeter of suitable capacity with selector switch on each incoming feeder. Make as per List enclosed and shall be got approved from DYCEE/C/RJT before supply.
- > All CT shall be 10 VA burden, class 1.0 accuracy. CT shall confirming to IS:2705.

- Ammeter of suitable capacity (According to MCCB Rating) with selector switch & CT shall be provided on each phase of outgoing feeder having 63A or more capacity. The meters shall be confirmed as per relevant IS.
- Multi LED type indication lamp confirming to relevant IS having colour code Red, Yellow & blue with control fuses on each incoming & outgoing feeder shall be provided. LT panel shall be mounted on the fabricated MS Angle on floor and the contractor shall prepare cemented trench for incoming and outgoing cables.
- The MCCB shall be as per IS 13947-2/1993 or IEC.
- MCCB shall be as per List enclosed and shall be got approved from DYCEE/C/RJT before supply only.
- The breaking capacity of MCCBs should not be less than 35 KA with $I_{cs}=I_{cu}$ and should have variable setting type with thermal magnetic release & Rotary handle.
- The contractor shall submit three sets of drawing and wiring diagram of LT panel along with panel at the time of supply.

The LT panel shall be comprised with following switch gears—

Incoming circuit -> 2 x250A MCCB 4-pole adjustable type with thermal magnetic release with rotary handle.

Outgoing circuit -> 6 x125 A MCCB 4-pole adjustable type with thermal magnetic release with rotary handle.
 ➤ 2 x 63 A MCCB 4-pole adjustable type with thermal magnetic release with rotary handle.

Note:- The contractor shall have to arrange inspection of the LT PANEL at the manufacturer's premises at his own cost.

SITC of 1000 KVA Transformer (item No. 10)

Contractor shall have to supply, install, testing & commissioning of 1000 KVA, 11KV/750V, DYN 11 outdoor type transformer (ONAN) complete with all accessories. Specification of transformer given as under:

1.0 Scope

1.1 This specification is applicable to three phase power Transformer and associated auxiliary equipment to meet the electrical power requirements and also covers the design, manufacture, testing at works, supply and delivery at site, erection, testing and commissioning aspects of the same.

1.2 The transformer shall be complete with all parts and accessories necessary for its protection and efficient operation. All parts and accessories shall be deemed to be within the scope of this specification whether specifically mentioned or not.

2.0 Governing specification:

2.1 Generally the Transformer shall conform to IS 2026 with latest amended and unless otherwise stated following standards or the latest amended shall be applicable.

S. No.	Standard	
1	IS 2026 Part 1 to 5	Power Transformers
2	IS 6600	Guide for loading of oil immersed transformers
3	IS 12463	Inhibited mineral insulating oils
4	IS 1271	Thermal evaluation and classification of electrical

		insulation
5	IS 2099	Bushing for alternating voltage above 1000V
6	IS 3639	Specifications for fittings and accessories for power transformers
7	IS 13947 Part 1 to 5	Specification for low voltage switchgear and control gear
8	IS 2705 Part 1 to 4	Current transformers
9	IS 3024	Grain oriented electrical steel sheet and strips

2.2 The equipment and accessories for which Indian standards are not available shall be designed, manufactured and tested in accordance with the latest standards published by any other recognized national standards institution.

2.3 The equipment shall also conform to the latest Indian Electricity Rules as regards safety, earthing and other essential provisions specified therein for installation and operation of electrical plants.

2.4 In case of any conflict between the above standards and the stipulations made in this specifications, the later shall prevail.

3.0 Environmental (Weather) Conditions:

3.1 The weather conditions under which the Transformer will have to work, very widely. The limiting conditions which the Transformer has to withstand in service are indicated below:

Maximum Temperature of air in the shed : 50°C

Minimum Temperature of air in the shed : 5°C

Maximum temperature attainable by an object exposed to sun : 65.5°C

Maximum Relative humidity : 100%

Average annual rain fall : 2000mm

Maximum wind pressure : 200Kg/m²

Altitude : Not exceeding 1000M.

The area where this Transformer is likely to be installed is prone to heavy lighting thunders and exposed to heavy rain falls. This should be taken into account while designing the transformer.

3.2 It would be also subjected to vibration on account of train running on Railway tracks near-by. The amplitude of these vibrations lies in the range of 30 to 150 microns with instantaneous peak going up to 150 microns. These vibrations occur with rapidly varying time periods.

4.0 General Design and Constructional Features:

4.1 All materials used shall be of best quality and of the class most suitable for working under the site conditions and shall withstand the variations of temperature, vibrations, atmospheric conditions, overloads, over-excitation, short circuit as per applicable standards, without distortion or deterioration or the setting up of undue stresses in any part, and also without affecting the strength and suitability of the various parts for the work which they have to perform.

4.2 The design shall be such that all apparatus, including bushing insulators and fittings shall be so designed that water cannot collect at any point. Marshaling kiosks, boxes etc. shall be adequately ventilated to prevent condensation of moisture and so treated internally as to prevent growth of fungi on any coils, wires and insulating materials used.

4.3 The transformer shall operate with minimum noise and vibration. The cores, tank and other structural parts shall be properly constructed so that mechanical vibrations are kept to the minimum, thus reducing the noise.

4.4 The design of the transformer shall be such that changes in transformer connections can be made by a simple change of link connection inside the tank.

4.5 Transformer shall be of the latest design, oil filled.

4.6 The magnetic circuit of transformer shall be so designed as to minimize eddy currents and hysteresis losses in the core.

4.7 All electrical connections and contacts shall be of ample section for carrying the rated current without excessive heating.

4.8 All mechanisms shall be of stainless steel, brass gun metal, or other suitable material to prevent sticking due to rust or corrosion.

5.0 Transformer Tank

5.1 The tank shall be constructed of steel plates with a single tier construction shaped in such a way to minimize the welding required. The tank shall be electrically welded and all welding stresses shall be properly relieved. The tank shall withstand standard atmospheric pressure under 95% vacuum for one hour without any leakage or deformation. The tank shall also withstand for oil leakage for an additional pressure of half atmosphere.

5.2 The transformer tank, auxiliary equipment and fittings shall be provided with necessary devices for lifting the transformer filled with oil and haulage facilities. The tank shall be fitted with a suitable under-carriage and mounted on four wheels. When the transformer is installed in the final portion the wheels should be locked by suitable locks or other means to prevent accidental movement of the transformer.

5.3 Inspection covers shall be provided on the transformer upper tank to inspect the bushings and the leads of off-circuit tap changer switch.

6.0 Core

6.1 The magnetic circuit shall be built of transformer grade cold rolled grain oriented low loss steel stampings having high permeability and conforming to standards. Stampings shall be annexed after cutting and insulated from each other with material having high inter-lamination insulation resistance and rust inhibiting property and also capable of withstanding pressure, mechanical vibration and action of heat and oil, thus reducing the possibility of sludge formation to a minimum.

6.2 The framework, clamping arrangement and general structure of the cores of each transformer shall be of robust construction and shall be capable of withstanding any shock to which they may be subjected during transport, installation and service. In assembling the core, air gaps shall be minimized and necessary cooling ducts shall be provided in the core and yoke for heat dissipation from the core and the assembled core shall be securely clamped, on the limbs and the yoke, to build up a rigid structure. The clamping pressure shall be uniform over the whole of the core and so adjusted as to minimize noise and vibration in the core when the transformer is in service. The framework and the core bolts shall be efficiently insulated from the core so as to reduce the circulating currents to a minimum.

6.3 All laminations used for stacking the core shall be level, free from waves, deformation, scaling of core plating insulation or signs of rust and coated on both sides with suitable insulation capable of withstanding stress relief annealing. The core clamping frame shall be provided with lifting eyes for the purpose of tanking and un-tanking the active parts of the transformer. The core shall be electrically connected to the tank for providing earthing to equalize electrostatic potential which would develop.

6.4 An approved type of core grounding system shall be used; the grounding connections being located at the top of the core for easy access from the inspection hole.

6.5 Adequate provision shall be made to prevent movement of core and winding from the tank during transport and installation while in service, specifically during the short circuit faults on the transformer.

7.0 Winding

7.1 The windings shall be suitable to withstand:

- i) Magnetizing inrush current due to repeated, switching „ON“ of the transformer from „OFF“ position.
- ii) Repeated short circuits.
- iii) Frequent load variations.
- iv) Frequent variation in supply voltage.
- v) Overloading of the transformer as specified.

The ratio of width to thickness of winding copper conductor winding strip shall be less than 5:1 to avoid tilting of conductors when the windings are subjected to axial and radial forces. The winding conductor shall have proper radius to avoid sharp edges which may damage the paper insulation of the conductors. Wood insulation used on the core and winding shall be well compressed, seasoned and dried and shall have minimum strength of 1000 kg/mm².

Normally no joint in the winding conductor shall be allowed and any joint under exceptional conditions shall be electrically butt-welded and the joint outside the winding for lead wires shall be crimped.

7.2 The coils shall be wound with paper (insulation grade) of suitable thickness $\frac{1}{2}$ overlap single layer and shall withstand insulation levels as per clause 5 of IS 2026 part III

7.3 The current density adopted for selecting copper conductor for LT as well as HT be specified by tenderers but shall be 4.5 Amps. Per mm² or less.

7.4 Liberal ducts shall be provided to prevent any hot spot temperature in the winding that may adversely affect the life of the transformer. Adequate supports, wedges and spacers of hard insulating material shall be so fitted that they will neither move nor permit relative movement of any part of winding during transit of normal service or under terminal short circuit, nor damage the winding insulation in any way. All leads and connections shall be robust, adequately insulated, protected and clamped. The winding assembly shall be dried in vacuum with tested insulating oil of approved standard. The windings shall be subjected to a thorough shrinking and seasoning process so that no further shrinkage of winding occur during service at site. However, adjustable devices shall be provided for taking up any possible shrinkage of coils in service. The assembly shall be held in position under adequate axial compression to withstand the axial thrust likely to occur under terminal short circuit.

7.5 The winding assembly shall be dried in vacuum at manufacturer's works before filling up of oil in the tank.

7.6 The winding shall be designed to reduce out of balance force in the transformers to the barest minimum at all taps. The winding shall be suitably designed and braced to withstand without damage the thermal and dynamic effects of external short circuits. All leads and connections shall also be mechanically strong, protected and rigidly clamped to withstand dynamic stresses due to terminal short circuits.

7.7 The transformer shall be suitable for operation at full rated power on all tapings without exceeding the specified temperature rise as indicated in the applicable standards.

8.0 Insulating Material:

8.1 The transformer shall be supplied complete with inhibited mineral insulating oil conforming to IS 12463 with latest amended for first fillings and shall be suitable in all respects for operating the transformer at the rating and under conditions specified in specifications. The transformer shall be transported with the windings and core under oil. Sufficient oil shall be supplied for the first filling of transformer, the oil circulating equipment and the tank containing tap changing mechanism. Test certificates for the oil shall be furnished.

8.2 If the above is not possible from transport considerations, the transformer shall be transported filled within nitrogen under pressure. In such case, the oil shall be supplied in non-returnable steel drum.

8.3 In either case, 10% extra oil shall be supplied in non-returnable steel drums.

8.4 Class A insulating materials specified in IS 1271 shall be used. Paper insulation shall be new and free from punctures. Wood insulation, where used shall be well seasoned and treated.

9.0 Bushing and Terminal arrangement:

9.1 Bushings shall conform to IS 2099 or the latest and other relevant standards.

9.2 The transformer shall be provided with inbuilt cable end boxes on primary and secondary side. Secondary side shall be suitable for connecting four Nos of 120mm², single core cable. The box shall be provided with fiber glass sheet around.

10.0 Electrical and Performance Requirement:

10.1 Transformer shall operate without injurious heating at the rated KVA at any voltage within $\pm 10\%$ of the rated voltage of that particular tap.

10.2 Transformer shall be designed for 110% continuous over fluxing withstand capability.

10.3 The neutral terminals of the winding with star connection shall be designed for the highest over current that can flow through the winding.

10.4 Overloads shall be allowed within the conditions defined in the loading guide of the applicable standard. Under these conditions, no limitations by terminal bushings, tap changers or other auxiliary equipment shall apply.

10.5 Temperature rise shall be continuously rated for full load. The temperature rise shall not exceed 45°C by thermometer in oil or 55°C by resistance over an ambient of 45°C .

11.0 Earthing terminals: Two separate earthing terminals to be provided at the bottom of the tank on opposite sides. The terminals shall be of clamp type suitable for connections to owners grounding strip.

Internal Earthing:

The framework and clamping arrangements of core and oil shall be securely earthed inside the tank by adequately sized copper strip connections to the tank.

12.0 Test

12.1 Type tests

i) Temperature rise test.

ii) Impulse test.

NOTE: Manufacturer to furnish the type test report of identical / similar transformer using similar material workmanship recently manufactured by them, otherwise the type test is to be carried out by the manufacturer at their own cost and test certificate to be submitted. Similar transformer means voltage and MVA rating same or more than specified rating.

12.2 Routine Tests:

The transformer shall be subjected to all routine tests in accordance with IS 2026 with latest amended at the factory before dispatching the same and test certificates shall be furnished.

a) Measurement of winding resistance.

b) Measurement of voltage ratio and check of voltage vector relationships.

c) Measurement of Impedance voltage / short circuit impedance (principal tapping) and load loss.

d) Measurement of no-load loss and current.

e) Measurement of insulation resistance (Before and after carrying out all tests)

f) Dielectric tests

g) Tests on on-load tap-changers, where appropriate.

13.0 Fittings and Accessories

The transformer shall be provided with all standard fittings and accessories specified in the applicable standard for the size and type of transformer concerned.

14.0 Schedule of Guaranteed Technical Particulars:

The manufacturer shall furnish full guaranteed tech. Particulars as per Annexure „B“ (Clause 13.1 B-1) of IS 2026 part I with latest amended.

15.0 Erection:

Transformer shall be erected in accordance with the provisions of IE Rules and IS specifications.

16.0 Drawings and O&M Manuals:

16.1 Two copies of manual of complete instructions for the installation, operation, maintenance and repairs circuit diagrams, foundation and trenching details shall be provided with the transformer. List of spare parts shall also be indicated.

16.2 The drawings in (Two sets) to be furnished by the supplier for approval after acceptance of his order shall include the following.

a) GA showing front and side elevations and plan of transformer and all accessories and external features detailed dimensions, oil quality, HT/LT clearances etc.

- b) Drawings of bus duct / cables termination arrangement.
- c) HV cable box arrangement & disconnecting chamber GA & details drawings.
- d) Drawing of each type of bushing (wherever required)
- e) Name plate and terminal making and connection diagram.
- f) Control wiring and schematic diagram showing polarity and vector group of windings, CTs and OTI, WTI, circuits, OLTC control, Alarm/trip circuits etc.
- g) GA of plinth foundation.

17.0 Losses:

At full load and unity power factor total losses should not exceed 1.5% or as per latest IS

18.0 TRANSFORMER TEST

The contractor shall offer the inspection and testing of transformer by RITES at the manufacturer's premises at his own cost for routine / acceptance test. However manufacturer's test certificate shall also be submitted for the type test. All tests will be carried out as per the relevant Para of IS: 2026/1977 or latest & The RITES inspection certificate will be submitted by the contractor with the supply of transformer.

19.0 Foundation for Transformer

The contractor shall design the foundation according to site & transformer dimension and got approval from competent authority i.e. Sr.DEE/G/ADI. The size of foundation is approx. 6.5 cu. Mtr. of M20 grade reinforced cement concrete.

20.0 Fencing for Transformer

The contractor shall has to supply and fabricate fencing with 8 SWG XPM enclosure around the transformer foundation & according to transformer foundation dimensions with about 2.0 Mtrs in height above the ground level and got approval from competent authority i.e. Sr.DEE/G/ADI. All corners & gate sides should be provided with angle size 75x75x 6 mm, support at every one mtr. shall be provided of angle size 40x40x6 mm, Gate size 2 mtrs in width & double Door with Locking Arrangement (One Pad lock not less than 70 mm to be supplied). Contractor should also plane the ground surface with spreading ballast inside the fencing.

Ratings and General data

1.1 The rating and other particulars of the 11KV / 750V transformer shall be as under:

a)	Rating KVA	1000 KVA
b)	Type	Three phase step down transformer for outdoor installation.
c)	Rated frequency	50 Hz (subject to variation of $\pm 3\%$)
d)	Rated primary voltage	11KV
e)	Rated secondary voltage	750 V (phase to phase) Star connected
f)	Polarity	Subtractive
g)	Vector group	DYn 11 with neutral brought out.
h)	Tapping	Off load tap changer for group operation of all phases + 5% to -15% in steps of 2.5% and having pad-locking facilities.
i)	Temperature rise	As per clause 4 of IS 2026 (Part II) or latest. The temperature rise under full load at lowest tap or minimum HV shall not exceed the limit given below: (i) Winding -55°C (by resistance method) (ii) Insulation oil - 45°C (by thermometer)

j)	Impedance at 75°C	As per IS 2026 (Part I) with latest amendment.
k)	Efficiency	Maximum at 75% rated out-put.
l)	Noise level	Not to exceed 75 dbs. At one meter distance.
m)	Type of cooling	ONAN
n)	Overload capacity	Class „A” of IS 2026 with latest amendment, viz (a) 100% continuous followed by (b) 150% for 15 minute.

Terminal making and rating plate shall be in accordance with IS 2026 with latest amended.

Note:-Transformer shall be of Areva, ABB, EMCO, Crompton, BHEL, Voltamp, kirloskar, IMP, Bharat bijlee, NGEF, Voltas, GEC, Vivekanand, CG, Western Electric, Tesla, RTS, National make only. General drawing of the transformer shall be submitted to Railway for acceptance and approval.

SPECIFICATION FOR VCB HT 11 KV / 630 AMP SWITCH BOARD (Item No. 11)

11 KV, 500 MVA, 630A, 25 KA/1 second rating one No incoming and others are outgoing VCB, indoor type, Metal clad horizontal isolation, horizontal draw out type with 230V AC motor operated mechanism with manual operating mechanism - suitable for installation in 3 phase, 3 wire effectively earthed system which should as per sub clause 5.3 of IEC Publication 694 as detailed in IS:13118/1991 is applicable and should be suitable for indoor installation. Mounting of VCB in panel should be rack in & rack out type as per IS:13118. The design, construction and rating of the VCB should be as per relevant ISS. Each VCB panel (i.e. incoming and outgoing) shall also have arrangement for tripping and indication & alarm arrangement with Buchholz relay, OTI & WTI of transformer. (Panel shall be supply form approved OEM work place only system house or channel partner for the value addition in VCB shall not allowed)

Note:- The enclosure of VCB shall be such that all manual operation for operating VCB can be done after closing the doors of VCB to ensure safety of operating personnel. All the spring charging, metering and indication supply to be given from individual PT of each VCB panel.

The complete switchboard shall incorporate the following feature—

Sr. No.	Description	Incoming	Outgoing
1.	One No. tripping coil assembly 110V DC.	To be provided	To be provided
2.	One No. closing coil assembly 110 V DC.	To be provided	To be provided
3.	One set bus bar chamber (powder coated) with 630 Amp. Heat shrinkable PVC sleeved copper bus bars.	To be provided	To be provided
4.	One No. 230V AC space heater with	To be provided	To be provided

	ON/OFF switch and thermostat.		
5.	One rear cable box for terminating HT, 11 KV, 3 core XLPE(E) cable as per standard design of the manufacturer size of the cable proposed to be used 11 KV, XLPE (UE), 3 core, 95/185 sqmm.	To be provided	To be provided
6.	One No. power pack suitable for 110V AC input from PT and 110V DC output (condenser type for closing & tripping circuit only).	To be provided	To be provided
7.	One No. Auxiliary switch with 4Nos. N/O & 4Nos. N/C contacts.	To be provided	To be provided
8.	One No. voltage transformer, 3 phase, 3 limb, draw out type feeder connected PT of ratio 11000/110volts of class 1.0 accuracy, 100 VA burden epoxy casted with HT& LT fuses.	To be provided	To be provided
9.	Epoxy casted CTs with 15 VA burden & class 1.0 accuracy for metering and 5P10 for protection.	To be provided	To be provided
10.	One No. 96sqmm ammeter with selector switch.	To be provided	To be provided
11.	One No. 96sqmm voltmeter with selector switch.	To be provided	To be provided
12.	One set of breaker ON/OFF& phase (R,Y,B) indication lamp-110V AC operated.	To be provided	To be provided
13.	Digital Multi-Function Meter having voltage, Amp. Frequency, KW, PF, KVAR, KVA, KVAH, KWH, KVARH with CT	To be provided	To be provided
14.	One No. breaker control TNC switch with lock and bell alarm contact for auto trip indication with bell hooter.	To be provided	To be provided
15.	Spring charge indication 110V AC operated.	To be provided	To be provided
16.	Auto trip indication 110V AC operated.	To be provided	To be provided
	PROTECTION		
a	One No. Numerical Communicable IDMT relay with 2 Over Current setting, one Earth Fault element setting , type 7SJ-600 of Siemens or equivalent as approved by DYCEE/C/RJT	To be provided	To be provided
b	One No. trip circuit healthy relay with lamp with push button 110V DC operated.	To be provided	To be provided
c	One No. Anti-Pumping Relay	To be provided	To be provided
d	One No. Master Trip Relay VAJH-13	To be provided	To be provided

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The manufacture and design of the HT 11 KV VCB shall confirm to the latest IS: 13118/1991. The VCB shall be similar to latest design of approved manufacturers, and as per IS: 13118/1991 read with IEC Pub 56 (1987) and IEC publication 694.

Make of VCB:- As per list of makes enclosed.

Make of meters:- IMP, MECO, AE only make or as per manufacture's recommendation.

Make of CT/PT :- Kuppa, ELS, SILKANA make or as per manufacture's recommendation.

Make of Relay:- AREVA, SIEMENS, ABB, MEI, Crompton Greaves, Jyoti, Biecco Lawrie, Voltas BHEL, L&T make or as per manufacture's recommendation.

The contractor shall submit three sets of drawing and wiring diagram of HT panel along with the technical leaflet / booklet of the panel supply. Contractor shall also be supplied First Aid box & shock treatment chart duly framed in the room of VCB.

VCB TEST:-

The contractor shall offer the inspection and testing of VCB by RITES at the manufacturer's (approved OEM) premises at his own cost for routine / acceptance test. However manufacturer's OEM test certificate shall also be submitted for the type test. All test will be carried out as detailed in IS:13118/1991. The RITES inspection certificate will be submitted by the contractor with the supply of VCB.

Contractor shall have to do necessary relay testing, parameter setting coordination for numeric relay.

NOTE :- Foundation & cable trench as recommended by manufacturer will be done by contractor at his own cost if required at site for which no extra payment will be made.

LT PANEL 1000 Amp (item No 12)

The contractor shall have to design, supply, install, test and commission LT panel fabricated by 2mm thick MS sheet, standard angles, channels etc. as required in design.

1) The drawing, design switch gears with make and model of the LT panel shall be submitted by the contractor & got approved by DyCEE/C/ADI before fabrication.

2) The panel shall be fabricated by CPRI approved manufacturer. Contractor should submit the copy of CPRI certificate issued to panel manufacturer.

3) The LT panel shall be indoor rectangular cubicle type, dust and vermin proof suitable for 3 phase, 4-wire, 750V, 50Hz AC supply system.

4) 1200A current carrying capacity bus bar for main circuit and neutral shall have uniform cross section electrolytic tinned copper with color coded heat shrinkable PVC insulated and current density of 1.6Amp/mm² cross sectional area.

- 5) Knock out / gland plates as applicable shall be provided. Gland plate of suitable size shall be designed for terminating cables in a straight and easy manner.
- 6) All power connections from the bus bar shall be made such a manner that there is a clear metal to metal clearance at the tapping is available. Both spring washer and plate washer shall be used with stud/ nuts/to ensure proper contact pressure.
- 7) The LT panel shall have metal locks & operated by a common key. All covers & doors to be provided with neoprene gasket. Hinged doors shall be provided on both sides.
- 8) The sheet steel enclosure / angle / channel used in the fabrication of panel shall be provided with double coating of red oxide and final coating of light grey powder coated paint.
- 9) The LT panel shall be supplied complete with base plate of 75mm, louver, four lifting hooks and feeder name plates completely wired and ready for commissioning.
- 10) Caution board in Hindi, Gujarati & English of metallic type shall be provided on panel.
- 11) Minimum two earth terminals shall be provided in the LT panel. All sheet steel section shall be electrically connected with a separate G.I. earth strip of 50x6 mm size across the panel at bottom.
- 12) LT panel shall be provided with Digital Multi-Function Meter for each incoming feeder having voltage, Amp. Frequency, KW, KWH, PF, KVAR, KVA with CT in all phases as per relevant IS. Make of Digital Multi-Function Meter as per List of Approved Make given below of Energy meter/ Measuring instrument and shall be got approved from DYCEE/C/RJT
- 13) All CT shall be cast resin type & 15VA burden, class 1.0 accuracy and shall be earthed through a separate earth link. CT shall be of make as per List of Approved Make given below.
- 14) Digital Voltmeter and Digital Ammeter of suitable capacity (According to ACB Rating) with selector switch (make- Salzer / Thakor / Kaycee) & CT cast resin type & 15VA burden on each phase of outgoing feeder having 63A or more capacity.
- 15) Multi LED type indication lamp with control fuses on each incoming & outgoing feeder shall be provided. The indication lamps shall be of make as per List of Approved Make given below.
- 16) The contractor shall carry out necessary masonry work for the proper foundation of LT panel as per site condition.
- 17) LT panel shall be mounted on the fabricated MS Angle on floor and cemented trench for incoming and outgoing cables shall be prepared by the contractor including brick works.
- 18) The ACB shall be of make as per List of Approved Make given below.

19)The contractor shall submit three sets of drawing and wiring diagram of LT panel along with panel at the time of supply.

20)Contractor shall have to supply and provide instruction chart of restoration of person suffering from electric shock in English, Hindi and Gujarati language and shall be displayed in an enclosed wooden and glass frame work. 21)Contractor shall have to provide cable gland & lugs for cable termination in the LT Panel.

The LT panel shall be comprised with following switch gears: Incoming circuit: – 1 Nos. 1000A ACB, 4-pole (MDO type, microprocessor based release Mechanical & Electrical interlocked for one incoming ON at a time. $I_{cs} = 100\%I_{cu}$, I_{cw} (kA) for 1 second breaking capacity not less than 50KA. Rated operational voltage at 50/60 Hz up to 800V AC, Rated insulation voltage at 50/60 Hz up to 1250V AC. ACB should be U-Power Omega MTX 3.5 of L&T make or equivalent of make as per List of Approved Makes given below. Outgoing circuit: 2 Nos. 630A ACB, 4-pole MDO type, microprocessor based release Mechanical & Electrical interlocked for one incoming ON at a time. $I_{cs} = 100\%I_{cu}$, I_{cw} (kA) for 1 second breaking capacity not less than 50KA. Rated operational voltage at 50/60 Hz up to 800V AC, Rated insulation voltage at 50/60 Hz up to 1250V AC. ACB should be U-Power Omega MTX 3.5 of L&T make or equivalent of make as per List of Approved Makes given below. Note:- The contractor shall have to arrange inspection of the DB/LT PANEL at the manufacturer's premises at his own cost.

Contractor shall have to supply materials as per List of Approved Make given below.

Firm: M/s S. International, Mumbai & M/s. MaaLaxmi Industry, Howrah.

Indoor End Termination Kit suitable to 3 core 150-240 sq. mm. HT cable (Item No.13)

The contractor shall supply, installation, testing & commissioning of heat shrinkable indoor type end termination kits suitable for 3.3 KV (E) 3 core 150-240 sq. mm. HT XLPE armoured Aluminium cable. The end termination kit shall be of M-seal (3M), Denson or Raychem or similar make & got approved from DyCEE/C/ADI before supply.

Indoor End Termination Kit suitable to single core 120-185 sq. mm. HT cable (Item No. 14):

The contractor shall supply, installation, testing & commissioning of heat shrinkable indoor type end termination kits suitable for 3.3 KV (E) single core 120-185 sq. mm. XLPE (E) Aluminium HT cable. The end termination kit shall be of M-seal (3M), Denson or Raychem or similar make & got approved from DyCEE/C/ADI before supply. All the materials and man power for installation of termination kit along with transportation shall be arranged and done by the contractor at his own cost. Digging of pit for cable repair and refilling shall also be done by the contractor.

The contractor shall engage skilled cable jointer for making the end termination and it should be provided only in presence of Railway representative. The contractor should submit the copy of challan or bill for the cable end termination kit supplied from the manufacturer/authorized dealer issued on the name of contractor.

SITC of LHB type socket assembly (item no. 15)

The contractor shall supply, installation, testing and commissioning of coupling socket assembly with locking arrangement for terminals suitable for inter vehicular coupler (ZS coupling 400Amp, 750 Volts) for LHB type AC coaches as per RCF specification No. EDTS 105 (Rev E) Amdt 1 & 2. The scope of work includes, supply, fixing, testing and commissioning of LHB type socket assembly 400Amp, housed in stainless steel housing of size 3 feet x 2 feet x 2 feet with one contactor AC3 series 370Amp, 415 Volts AC coil to ON / OFF set with fixing stand to be fixed in cement concrete foundation. Coupling socket assembly shall be as per S. International's part No. SI/LHB/CSA/00/CAB The Coupling socket assembly shall be of RDSO/RCF approved firms only.

Double ended Jumper plug assembly. (item no. 16)

The contractor shall supply, installation, testing and commissioning of double ended Jumper plug assembly with cable and locking arrangement for terminals, suitable for inter vehicular couplers (ZS coupling) End on Generation system 750Volts, 3 phase, 400 Amp, 50 Hz, suitable for LHB type AC coaches, as per RCF specification No. EDTS – 105 (Rev E) Amdt 1 & 2. The scope of work includes, supply, fixing, testing and commissioning of double ended „Jumper plug Assembly“ with 10 mtr. Polyamide conduit and 120mm² cable for phase and 95mm² cable for neutral, suitable for LHB type coupler 400Amps / 750Volts capacity MCCB with enclosure. The Coupling socket assembly shall be of RDSO/RCF approved firms only. Firm: M/s S. International, Mumbai & M/s. Maa Laxmi Industry, Howrah. The MCCB shall be as per following specifications: Supply, fixing, testing and commissioning of 400A, 3 pole MCCB, with enclosure The MCCB switch shall be three pole type of 400A capacity confirming to IS/IEC 60947-2 & IEC 60947-2. 1. The switch shall be in sheet steel enclosure duly painted with enamel /Powder coated paint as final two coats in white or off white in colour to M.S. enclosure. 2. The enclosure shall be provided with earth terminal on side wall and shall be connected with the earthing. 3. The connections of the cables shall be provided with crimping socket of bi-metallic type. 4. The 3 pole MCCB with thermal magnetic release shall be as per L & T DN3-400A range cat No. CM94003OOR1OG or equivalent of make as per List of Approved make given below. 5. The enclosure having 3 pole 400A MCCB shall be fixed with proper size of fasteners in sufficient numbers. 6. Thermal release range: 320 – 400A Breaking capacity at 415V AC, 50 Hz: 50KA

HT CABLE END TERMINATION BOXES (Outdoor type) (Item No.17)

The contractor shall supply the heat shrinkable type outdoor end termination kits for 3-core 185sq.mm, aluminium conductor, XLPE insulated 11 KV (E) grade cable, of 3M, Denson or Reychem make.

The individual cores of the cables shall be properly identified to avoid cross connections of the core while jump ring them to the corresponding wire of the overhead lines.

The contractor shall engage skilled cable jointer for making the end termination and it should be provided` only in presence of Railway representative after taking proper shut down. For termination of cable, proper size of cable gland and lugs to be provided.

HT CABLE END TERMINATION BOXES (Indoor type) (Item No.18)

The contractor shall supply the heat shrinkable type indoor end termination kits for 3-core 185 sq.mm, aluminium conductor, XLPE insulated 11 KV (E) grade cable, of 3M, Denson or Reychem make.

The individual cores of the cables shall be properly identified to avoid cross connections of the core while jumping them to the corresponding wire of the overhead lines.

The contractor shall engage skilled cable jointer for making the end termination and it should be provided only in presence of Railway representative after taking proper shut down. For termination of cable, proper size of cable gland and lugs to be provided.

11KV HT STRAIGHT THROUGH JOINT ITEM NO. 19

The contractor shall supply the heat shrinkable straight through jointing kits for 3-core 185 sq.mm OR 3 x 95 sqmm (UE) aluminium conductor, XLPE insulated 11 KV(E)/UE grade. Required as per site condition. Make- M- Seal (3 M), DENSON” or Raychem make and provide it in the existing 11KV (E)/UE grade cable by skilled cable jointer in presence of Railway representative.

Digging of pit for cable repair and refilling shall be done by the contractor.

MAIN DISTRIBUTION BOARD 125 A Item No -20

- The contractor shall have to design, supply, install, test and commission DB fabricated by 2mm thick MS sheet, standard angles, channels etc. as required in design. The drawing, design switch gears with make and model of the MDB shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before fabrication.
- The DB shall be indoor cubicle type, rectangular size wall mounted dust and vermin proof suitable for 3 phase, 4-wire, 415V, 50Hz AC supply system.
- All power connections from the Copper bus bar shall be made such that there is a clear metal to metal aerial contact at the tapping. The nuts and bolts used for connections to the bus bar shall be of GI/ Crom plated. Both spring washer and plate washer shall be used with stud/ nuts/to ensure proper contact pressure.
- The sheet steel enclosure / angle / channel used in the fabrication of distribution board shall be provided with double coating of red oxide and final coating of light grey powder coated paint.
- The MDB shall be fabricated by CPRI approved manufacturer.
- LT panel shall be provide one common volt meter with selector switch.
- Multi LED type indication lamp having colour code Red, Yellow & blue with control fuses on incoming feeder shall be provided. Make as per List enclosed.
- Minimum two earth terminals shall be provided in the DB. All sheet steel section shall be electrically connected with earth.
- DB shall be mounted on wall/pillars.
- The breaking capacity of MCCBs should not be less than 35KA with $I_{cs}=I_{cu}$ and should have variable setting type with thermal magnetic release.
- The MCB & MCCB shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJT before supply.
- The breaking capacity of MCBs should not be less than 10KA & ‘C’ curve

The MDB shall be comprised with following switch gears—

Incoming circuit -> 1x125 A MCCB 4-pole 35 KA adjustable type with thermal magnetic release.

Outgoing circuit -> 2 x 63 A 4-pole MCB & 10 KA Breaking Capacity of C-curve

> 2 x 40 A DP MCB & 10 KA Breaking Capacity of C-curve.

> 10 x 16 A DP MCB & 10 KA Breaking Capacity of C-curve.

Note:-The contractor shall have to arrange inspection of the MDB at the manufacturer's premises at his own cost.

SPECIFICATION FOR FEEDER PILLAR 400 A(Item No -21)

- > The contractor shall have to design, supply, install, test and commission feeder pillar fabricated by 2mm thick MS sheet, standard angles, channels etc. as required in design. The drawing, design switch gears with make and model of the feeder pillar shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before fabrication.
- > The feeder pillar shall be fabricated by CPRI approved manufacturer.
- > The feeder pillar shall be indoor rectangular cubicle type, dust and vermin proof suitable for 3 phase, 4-wire, 415V, 50Hz AC supply system.
- > Bus bar for main circuit and neutral shall have uniform cross section electrolytic tinned copper with color coded heat shrinkable PVC insulated and current density of 1.6 Amp/mm² cross sectional area.
- > Knock out / gland plates as applicable shall be provided. Gland plates of suitable size shall be designed for terminating cables in a straight and easy manner.
- > All power connections from the bus bar shall be made such a manner that there is a clear metal to metal clearance at the tapping is available. Both spring washer and plate washer shall be used with stud/ nuts/to ensure proper contact pressure.
- > The feeder pillar shall have metal locks & operated by a common key. All covers & doors to be provided with neoprene gasket. Hinged doors shall be provided on both sides.
- > The sheet steel enclosure / angle / channel used in the fabrication of panel shall be provided with double coating of red oxide and final coating of light grey powder coated paint.
- > Caution board in Hindi, Gujarati & English of metallic type shall be provided on feeder pillar.
- > Minimum two earth terminals shall be provided in the feeder pillar all sheet steel section shall be electrically connected with a separate G.I. earth strip of 50x6 mm size across the panel at bottom.
- > Feeder pillar shall be mounted on the fabricated MS Angle (Size 50x50x6mm) on floor and cemented trench for incoming and outgoing cables shall be prepared by the contractor.
- > The MCB & MCCB shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJT before supply
- > The breaking capacity of MCCBs should not be less than 35KA with Ics=Icu and should have variable setting type with thermal magnetic release & Rotary handle.
- > Approx size- 1000mm height, 600mm width and 500mm depth

The feeder pillar shall be comprised with following switch gears—

Incoming circuit -> 1 x 400 A, MCCB 4-pole adjustable type with thermal magnetic release with rotary handle.

Outgoing circuit -> Distribution copper bus bar of 500mm length.

NOTE:- The contractor shall have to arrange inspection of the feeder pillar at the manufacturer's premises at his own cost.

FEEDER PILLAR 250 A (Item No -22)

- The contractor shall have to design, supply, install, test and commission feeder pillar fabricated by 2mm thick MS sheet, standard angles, channels etc. as required in design. The drawing, design switch gears with make and model of the feeder pillar shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before fabrication.
- The feeder pillar shall be fabricated by CPRI approved manufacturer.
- The feeder pillar shall be indoor rectangular cubicle type, dust and vermin proof suitable for 3 phase, 4-wire, 415V, 50Hz AC supply system.
- Bus bar for main circuit and neutral shall have uniform cross section electrolytic tinned copper with color coded heat shrinkable PVC insulated and current density of 1.6 Amp/mm² cross sectional area.
- Knock out / gland plates as applicable shall be provided. Gland plates of suitable size shall be designed for terminating cables in a straight and easy manner.
- All power connections from the bus bar shall be made such a manner that there is a clear metal to metal clearance at the tapping is available. Both spring washer and plate washer shall be used with stud/ nuts/to ensure proper contact pressure.
- The feeder pillar shall have metal locks & operated by a common key. All covers & doors to be provided with neoprene gasket. Hinged doors shall be provided on both sides.
- The sheet steel enclosure / angle / channel used in the fabrication of panel shall be provided with double coating of red oxide and final coating of light grey powder coated paint.
- Caution board in Hindi, Gujarati & English of metallic type shall be provided on feeder pillar.
- Minimum two earth terminals shall be provided in the feeder pillar all sheet steel section shall be electrically connected with a separate G.I. earth strip of 50x6 mm size across the panel at bottom.
- Feeder pillar shall be mounted on the fabricated MS Angle (Size 50x50x6mm) on floor and cemented trench for incoming and outgoing cables shall be prepared by the contractor.
- The MCCB shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJT before supply.
- The breaking capacity of MCCBs should not be less than 35KA with Ics=Icu and should have variable setting type with thermal magnetic release & Rotary handle.
- Approx size- 1000mm height, 600mm width and 500mm depth

The feeder pillar shall be comprised with following switch gears—

Incoming circuit -> 1 x 250 A, MCCB 4-pole, 35 KA adjustable type with thermal magnetic release with rotary handle.

Outgoing circuit -> Distribution copper bus bar of 500mm length with 250 Amp Capacity.

NOTE:- The contractor shall have to arrange inspection of the feeder pillar at the manufacturer's premises at his own cost.

CONSTANT VOLTAGE / CONSTANT CURRENT BATTERY CHARGER - 300 AMP (Item No. -23)

Scope :

This specification covers manufacture and supply of Thyristors controlled battery chargers for sealed maintenance free batteries fitted on AC & TL coaches for giving normal charging/freshening charge in constant voltage and constant current mode.

Service conditions:

1. The battery chargers covered by this specification shall be natural air cooled suitable for an ambient temperature varying from 9 to 55 deg C with maximum humidity of 98% in altitudes up to 1200 meters above sea level and in dusty atmospheric conditions to be used for charging and discharging sealed maintenance free batteries either fitted on AC & TL coaches in a rake formation or in depots/workshop.
2. The unit should be of simple and robust design, capable of being easily maintained and shall withstand satisfactorily the vibration normally encountered in service.
3. The battery charger shall be suitable for connecting to an input supply of 415 volts + 15% AC, 3 phases, 4 wire, 50 Hz in charging modes.

The battery charger shall be designed for the following ratings and other particulars as per RDSO specification No. RDSO/PE/SPEC/AC/08/Rev.1/Aug./04 or latest.

Type	:	Constant Voltage/Current with current limiting
Input Voltage	:	Nominal voltage 415 V AC
		Operating voltage range 380 to 480 V AC, 50 HZ
DC output Voltage	:	110 V DC – 155 V DC
Output current	:	:0-300 A
Operating modes	:	The Charger shall have two modes of operation namely charging and discharging. In charging mode the unit shall be suitable to work either in constant voltage (CV) or in constant current (CC) mode, while in discharge it shall work in constant current mode, discharging the battery into AC input mains at constant preset current.

Output regulation :-

- (a) Constant Voltage :
- Under this mode of working, the charger shall give a DC output voltage adjustable over a range of 2.0 V to 2.75 V per cell by means of voltage control potentiometer. The output voltage shall be maintained within + 0.05 V per cell of the set value over the entire range of the input AC supply variation and the output load variation from 10% to 100% rated capacity.

- (b) **Constant Current** : Under this mode of working, the charger shall be capable of delivering an output current whose magnitude shall be selected by means of current control potentiometer. The current shall be maintained constant within + 2 A per cell of the set value at 10% to 100% load, with the input voltage varying between 380 V to 480 V AC.
- Ripple Content** : The Charger shall be equipped with suitable Filter circuit on the output to reduce the voltage/current ripple factor less than or equal to 5% rms at full load when measured across a resistive load.
- Auto mode charging** : The charger shall be provided with a suitable circuitry to charge the battery either in float or boost mode automatically. It shall go to boost mode whenever charging current exceeds 5-6% of voltage capacity and boost to float mode when the charging current reduces in 3-4% of voltage capacity.

PROTECTIONS

- Over Voltage** : An electronic circuit shall be employed to avoid the charger giving high voltage beyond the set level by blocking the gate pulses. Release of gate pulses shall be possible only when the charger is switched OFF and turned ON again.
- Current Limit** : The charger unit output current shall be limited to 102% of the rated output current by dropping the output voltage.
- Short Circuit protection** : The charger shall be protected against short circuit at DC output by limiting the output current to a maximum of 115% of its rated current.
- AC Input Fuse** : There shall be a HRC fuse of suitable rating in the circuit of incoming supply.
- Bridge fuse** : There shall be an appropriate fuse connected at the output of the charger.
- AC Over/Under Voltage** : There shall be an electronic circuit employed to sense the input voltage and cut off the output at 380V and 480 V with audio visual alarm.

CONTROLS :

The Charger shall be provided with the following minimum controls:

1. AC input circuit breaker for emergency shutdown.
2. Unit ON/OFF control rotary switch.
3. Battery input circuit breaker.
4. Charge/OFF/Discharge selector switch.
5. Constant Voltage/constant current selector switch.

6. Current variable potentiometer.
7. Voltage variable potentiometer.
8. Low voltage variable potentiometer.
9. Low voltage reset push button.

MEASURING INSTRUMENTS :

DC digital Voltmeter and Ammeter to measure and display the voltage and current during charging. The display shall be up to the one decimal place. The output DC voltage/current or battery voltage/current should be able to be monitored by means of a toggle switch.

AC digital Voltmeter and Ammeter shall be provided to measure/indicate the AC input voltage and current.

INDICATIONS :

The following indications by LED lamp shall be provided:

1. Indication for availability of the main supply.
2. Indication for unit ON.
3. Indication for unit ON in Constant Voltage (CV) Mode.
4. Indication for unit ON in Constant Current (CC) Mode.
5. Indication for charger over voltage.
6. Indication for unit fault for failures of input phase/bridge fuse.
7. Indication for AC under voltage.
8. Indication for AC over voltage.
9. Indication for charger failure.

SPECIAL FEATURES :

- *Two earthing pads on each side with MS screws, washers shall be provided. Electrometric multistrand cables shall only be used.*
- *Cables shall be supported with suitable stiffeners. All cables shall have code markers/ ferrules to indicate the numbers for identification and circuit tracing.*
- *The charger shall be housed in a robust sheet metal, naturally ventilated cubical suitable for mounting on the shop floor and provided with easily accessible screwed cover for facility of connections/replacement etc. The front cover shall be made in two parts- one with meters, indications, control switches, potentiometers and the MCBs having knobs protruded outside the cover so that hinged on one side and other side provided with adequate captive screws and the other part of the bottom portion shall be fixed with adequate captive screws. All the covers shall be fixed with the hexagonal screws and tapped pads, which are duly welded inside the frame member.*
- *All hardware shall be standard metric size and cadmium plated.*
- *Each SCR or diode shall be rated for a current not less than 1.5 times of its actual flowing current. The PIV of these devices shall be at least 1000 V.*
- *The condensers used for filtering shall have voltage at least 200 V DC.*
- *The cable entry holes shall be provided at the bottom of the cubicle.*
- *The charger cubicle shall be cleaned initially using tank cleaning process and shall be powder coated in gray.*
- *The grommets of suitable sizes shall be provided.*

- *All the copper links/plates shall be electro tinned.*
- *All cable end connections shall be done with solder less pre-insulated crimped type cable sockets. Soldering of connections will not be acceptable.*
- *The insulation shall be class B and the temperature rise above maximum specified ambient temperature of 55 deg C shall be limited to 125 deg C. The highest operating temperature of the SCRs/silicon diodes shall not exceed the rated junction temperature at max. specified ambient of 55 deg C.*
- *All insulating boards shall not be less than 5 mm thickness. There shall be proper insulating barrier between transformer and diode sections so that the heat generated by the transformer does not effect the working of semiconductor devices.*
- *A potential free contact of rating 230 V AC/2 amps for charger failed conditions shall be made available for use of indication/interlocking by railway.*
- *Anti corrosive protection coating on PCB shall be applied to avoid corrosion in service. The protective coating shall be transparent so that type/rating of components is readable. The protective coating of the track side shall be of solder able type.*
- *Hylem PCBs are not acceptable since the insulation level reduces drastically in the rainy seasons. PCBs used shall be of glass Epoxy.*
- *Control limit shall be protected against the spikes in the line voltages/transients by providing line surge suppressors on the input side.*
- *The charger shall have soft start feature whereby on energisation, the output voltage should build up slowly 10 seconds, eliminating starting surges considerable.*
- *The AC line terminals shall be indicated by the letters R,Y,&B and the neutral terminal by N. Earthing terminal may be indicated earthing symbol.*
- *The DC output positive terminal shall be indicated by the symbol “+” and negative by “-“*

TEST AND PERFORMANCE :

1. Routine Test: The routine tests are to be carried out at their premises of the manufacturer to ensure compliance with specifications.
2. Acceptance Test: These tests are to be carried out by the inspecting authority at the manufacturers premises to ensure the compliance with the specifications on charger unit picked up at random.
3. Visual Inspection : Checking of the unit for workmanship, proper layout, components mounting, circuit, adequacy of components, connections, dimensions and construction etc.
4. Performance Test: The charger unit will be tested for its output performance in the charger mode by connecting a resistive load connected across the output terminals. The tests shall be carried out at AC input voltage of 380 V, 415 V and 480 V with 10%, 50% and 100 % loads. The parameters like DC output volts, DC amps, ripple, % regulation etc.
- 5-Charger will be tested on Constant voltage and Constant current mode separately.

Constant Voltage mode: The charger will be tested for working voltage control and variations at rated output currents, voltages and then setting the voltage at 2.75 V per cell and recording the output currents, voltages and regulation readings

for line and load variations at AC supply of 380 V, 415V and 480V from 10% to full load.

Constant Current mode: The charger will be tested at the setting of 2.75V per cell using voltage adjustment pot and loading the unit to full capacity. The unit shall be subjected to 75%, 50% and 25% of the rated capacity without disturbing the load and the changes in output current setting shall be recorded for input AC supply of 380 V, 415 V and 480 V. The variation in set current shall not exceed by + 2 Amps.

Discharge mode: The charger will be tested for discharge mode on its rated parameters and overload capacity and protections thereafter.

6. **Short Circuit Test:** Short circuit test will be performed by shorting the output terminals and switching on the charger to measure the short circuit currents.
7. **Surge Test:** The charger shall be connected to AC input supply and a fully discharged battery. Then the AC supply will be frequently switched ON and OFF for 10 times with a gap of 5 sec. After this the charger components will be checked for damage.
8. **Dielectric Test:** The capacitors and the diodes will be disconnected and following dielectric test shall be conducted:
 - (i) Between AC input & earth : Limit 1.5 kV RMS for
 - (ii) Between DC output : 1 minute
 - (iii) Between AC input and DC output
9. **Insulation Resistance:** This test will be performed prior to starting of any other tests and after performing all the tests.
10. **Output Current Limit Test:** The charger shall be loaded to its 100% capacity at nominal voltage and the DC voltage shall be recorded. Further the load is increased beyond 100% and drop in voltage is recorded.
11. **Ripple Measurement:** Ripple of the output measured by true RMS multimeter shall not be more than 5% of the set value. The wave form shall be recorded through storage oscillograph having suitable interface with PC or printer for recording the waveforms.

The charger shall be marked with all technical and periodic details as per the instruction of inspecting authority.

Make of battery charger shall be got approved from DYCEE/C/RJT before supply.

NOTE: Contractor shall arrange inspection of battery charger unit at manufacturer's premises at his own cost.

Approved make : RS Power systems-Jaipur, ABB or any RDSO approved source.

110V BATTERY CHARGING TERMINALS (EFT) (Item No. 24)

The contractor shall have to supply, fix and connect 110V battery charging terminals and design shall be as per sample available in this office. Only two cables shall be taped from the outgoing of the battery charger and contractor shall go on looping the charging terminals comes in alignment. The looping shall take place at the charging terminals. Cables shall be terminated / looped at the charging terminals with crimping socket, nuts, bolts etc.

The battery charging terminals shall be securely mounted on pillar / wall. The 110V charging terminals shall be painted with yellow enamel paint. The cable shall be properly clamped with wall. On EFT, write "110V DC" and mark symbol '+' & '-' for identification of polarity.

WELDING TERMINALS (Item No.25)

The contractor shall have to supply, fix and connect Welding terminals comprising positive, negative terminals made aluminium of size. The cross section of aluminium terminals should be not less than 150sqmm and design shall be got approved from Rly. before supply. Terminals should be based & separated with each other with 12mm thick hylum sheet. Only two cables shall be taped from the outgoing of the Welding Machine and contractor shall go on looping the Welding terminals comes in alignment. The looping shall take place at the Welding terminals. Cables shall be terminated / looped at the Welding terminals with crimped lugs, nuts, bolts etc.

The Welding terminals shall be securely mounted on cover shed pillars with necessary MS clamps, nuts, bolts etc. The Welding terminals shall be painted with Blue enamel paint. The cable shall be properly clamped with the pillars. On Welding terminals write "WELDING" and mark symbol '+' & '-' for identification of polarity.

The drawing, design of the welding terminal shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before fabrication.

63A & 16/20A PLUG & SOCKET BOX (Item No 26)

The contractor has to supply, install, test and commission of 16/20A & 63A plug socket with TOP enclosed in metal Box. Metal box shall be made of 2mm thick MS sheet, powder coated, dust and vermin proof comprising as following

- (i) Three phase, 5-pin 415V, 63A capacity plug socket shall be heavy duty metal body type, spring loaded butt type contacts, self-aligned and self-wiping type confirming to IEC:60309 or latest. The plug socket shall be controlled by 63A, 4-pole MCCB shall be of 35 KA, rupturing capacity with $I_{cs}=I_{cu}$, The MCCB shall be as per IS 13947-2/1993. **MCCB make L&T, GE, Siemens** or similar as per List enclosed and shall be got approved from DYCEE/C/RJT before supply only.
- (ii) Single phase, 230V, 16/20 A capacity 3-pin plug socket shall be heavy duty metal body type. The 16/20A Plug socket (make-L&T, GE, Schneider, BCH) shall be controlled by C-curve type DP MCB of 20A capacity. **MCB make L&T, GE, Siemens, Indo-Asian** or similar as per List enclosed and shall be got approved from DYCEE/C/RJT before supply only. The rupturing capacity of MCBs shall be 10 KA, C curve.

The box shall be internally wired by PVC insulated, single core flexible copper cable of suitable size with copper crimping lugs. Terminal strips shall be provided for loop in

loop out connections of cables. The door of the box shall have locking arrangement. The box shall be securely mounted on wall with necessary MS clamps, nuts, bolts etc.

Note:-The drawing, design plug socket, switch gears with make and model of the box shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad. Contractor shall have to arrange the inspection of plug socket box at manufacturer's premises before supply at site at his own cost.

LED 20 W SYSTEM WATT BULK HEAD LIGHT FITTING -(Item No. 27)

The contractor shall have to supply, erection, testing & commissioning of minimum 20 W System Watt LED type Bulkhead light fitting complete with driver and all other accessories. Input operating voltage range of driver shall be **110 V**, 50 Hz. Luminaire should have lumen output of minimum 60 lumens/ Watt. Optical cover should be of high quality Opal Polycarbonate. For proper heat dissipation housing should be made of High Pressure die cast aluminium / polycarbonate. HPL MODEL No-HLPLEDBH20 or similar makes as per list enclosed and shall be got approved from DYCEE/C/RJT before supply.

LED light fitting should be mounted on wall / toilet/stairs with mounting arrangement. The connection of the light fitting shall be done by flexible, 3-core, multi strand copper conductor, PVC insulated & sheathed wires.

TRANSFORMER 440/110 V, 3 PHASE, 5.0 KW - (Item No. 28)

- 1 The contractor shall have to supply, erection, testing & commissioning of 5.0 KVA, 440V/100-120V, 50 Hz transformer housed in MS box. Suitable for outdoor installation.
- 2 The transformer should be of the weather proof design, out door application, copper wound with tapping for 110- 120 V on low voltage side.
- 3 Each tapping Shall be provide 63 Amp 4 pole MCB on incoming side and 3x40 Amp DP MCB on outgoing side.
- 4 For erection provide suitable size MS angle iron size 50x50 mm stand frame.
- 5 Make-TRIO or approved by Railway

DIGGING OF TRENCH & LAYING OF CABLE (Item No 29, 30 & 31)

(i) DIGGING & RE-FILLING OF CABLE TRENCH: -

A trench of 450 mm in width and 1000 mm depth from the normal ground level in normal soil shall be made by the contractor and while laying the cable a layer of riddle soil shall be provided below and above the cable. After doing this the trench can be filled up with soil available thereby. If any damage done, contractor will make good the cost of damage as decide by railway. If any infringement comes in the digging route then contractor should remove the same. If any hard /stony soil, Contractor should adopt new technology method as per scope of work.

(ii) DIGGING & RE-FILLING OF CABLE TRENCH IN PCC/RCC/HARD SOIL: -

A trench of 450 mm in width and 1000 mm depth from the normal ground level in PCC/RCC/Hard soil shall be made by the contractor by using breaker and while

laying the cable a layer of riddle soil shall be provided below and above the cable. After doing this the trench can be filled up with soil available thereby. If any damage done, contractor will make good the cost of damage as decide by railway. If any hard /stony soil, Contractor should adopt new technology method as per scope of work.

(iii) LAYING AND COMMISSIONING OF CABLES: -

The contractor shall have to transport all the cables to be used at site shall be issued by Railway from **Sr.SE/Elect/S&C/ADI** store, Ahmedabad OR other places suggested by Rly and balance material shall also to be deposited back to Ahmedabad. Contractor shall lay the cable in existing trench, pipe & on Wall/ structure.

Before laying the cable in the ground / Pipes or on the wall/pillars/cable tray cable should be secured properly by providing saddling/clamping arrangement of proper size at suitable interval.

Before and after laying the cable, the IR value should be checked and the contractor shall arrange all the testing instruments. In case of any failure contractor will again re-lay the cable at his own cost.

Armoring of the cable shall be earthed at both end of the cable.

Cable route marker shall be provided on the turning points and in straight portion. The cable marker shall be approved design and should be got approved before providing.

Wherever the cable comes out of the ground at least one loop of sufficient radius should be provided under the ground.

While laying the cable and while digging the trench it should be ensured that no obstruction should come in way of drainage line, power cables, telecommunication cables etc.

If any damage done, contractor will make good the cost of damage as decided by railway.

LT CABLE ROUTE MARKERS: (Item No.32)

The contractor shall supply, installation and commissioning cable route markers on route of cable at each turning point and suitable distance in straight portion as guided by Railway representative.

The cable route marker shall be casted of C.I. with description as given in this office drawing No. Dy. CEE/C/ADI/608/2011 After fabrication the complete marker assembly, it shall be hot dip galvanized to make it anti corrosive and got approved from Rly before bulk supply.

HALF ROUND RCC PIPE 100 & 150 MM (Item No.33 &34)

The contractor shall supply half Round RCC pipes of 100 & 150mm inner dia. and 1.0 Mtr in length as per given description. The internal surface shall have a smooth finish without any bulge or projections to avoid damage to the cable.

Internal dia.	External dia.	Thickness	Approx. Weight	Approx.Steel Weight
100mm	125mm	25mm	11.5 Kg	190 gm
150mm	184 mm	25 mm	14.5 kg	240 gm

LAYING OF PIPES:-

Half round pipes shall be laid above cables for mechanical protection on laid cables in the existing trench. After doing this the trench can be filled up with soil available thereby. If any damage done, contractor will make good the cost of damage as decide by railway.

SUPPLY OF HDPE PIPE 110 MM (Item No.35)

The contractor shall supply, installation and commissioning of HDPE (High Density Polyethylene) pipe of 110 mm nominal dia. as per IS 4984-1995 With accessories required for laying such as coupler, bend etc.

Make-Tijaria, Himalyan, Konzept, Poddar, Unique OR similar and shall be got approved from DYCEE/C/RJT before supply.

Material grade and class	Description	Nominal diameter (mm)	Wall thickness of pipes (mm)	
			Minimum	Maximum
PE-80 & PN-6	HDPE (High Density Polyethylene) pipe	110	6.3	7.1

The contractor shall lay the HDPE pipes in the ground under the tracks/Road by push through method or by open excavation method (digging of trench) at a depth indicated in drawing supplied by Rly below the formation level. The term “formation” level means the earth surface just below the bedding of the ballast. If any hard /stony soil, Contractor should adopt new technology/ mechnised method in push through method or digging of trench.

Each length of the pipes shall be joined together properly using proper size of socket and aligned in a straight line, keeping an inclination to facilitate the draining of water.

Note- For push through & digging of trench rates will be given separately in schedule item.

LAYING OF PIPES:-

Half round pipes shall be laid above cables for mechanical protection on laid cables in the existing trench. After doing this the trench can be filled up with soil available thereby. If any damage done, contractor will make good the cost of damage as decide by railway.

LAYING OF HDPE/GI PIPES (Item No. 36):-

The contractor shall lay the HDPE/GI pipes in the ground under the tracks/Road by push through method at a depth indicated in drawing supplied by Rly below the formation level. The term “formation” level means the earth surface just below the bedding of the ballast. If any hard /stony soil, Contractor should adopt new technology method in push through method.

Each length of the pipes shall be joined together properly using proper size of socket and aligned in a straight line, keeping an inclination to facilitate the draining of water.

SUB DISTRIBUTION BOARD 63 A (Item No –37)

- Distribution Board (DB) shall be pre-wired in sheet steel enclosure, with DIN channel, neutral bus-bar. The box and cover shall be properly pretreated, phosphatized with powder coated finish and surface mounted type.
- **Detachable plate with Knock out holes shall be provided at the top/bottom of board. Complete board shall be factory fabricated and pre-wired in factory ready for installation at site.**
- The DB shall be indoor cubicle type, wall mounted dust and vermin proof suitable for 3 phase, 4-wire, 415V, 50Hz AC supply system.
- The sheet steel enclosure / angle / channel used in the fabrication of distribution board shall be provided with double coating of red oxide and final coating of light grey powder coated paint.
- Minimum two earth terminals shall be provided in the DB. All sheet steel section shall be electrically connected with earth.
- DB shall be mounted on wall/ pillar.
- The MCBs shall be of make as per List enclosed and shall be got approved from DYCEE/C/RJT before supply.
- The breaking capacity of MCBs should not be less than 10KA & ‘C’ curve
The SDB shall be comprised with following switch gears—

Incoming circuit – 2 x 63 A 4-pole MCB

Outgoing circuit - 8 x 16 A DP MCB

2 x 32 A DP MCB

4 x 16 A SP MCB

SUB DISTRIBUTION BOARD-32 Amp (Item No –38)

The contractor shall have to supply; erection, testing & commissioning of Distribution Board (DB) shall be pre-wired in sheet steel enclosure, double door with DIN channel, neutral bus-bar. The box and cover shall be properly pretreated, phosphatized with powder coated finish and surface mounted type.

Detachable plate with Knock out holes shall be provided at the top/bottom of board. Complete board shall be factory fabricated and pre-wired in factory ready for installation at site. Following switchgears shall be provided. :-

Incoming- 1 x 32 Amps MCB, DP, 10 KA ,C Curve .

Outgoing - 6 x16 Amps MCB, SP, 10KA,C Curve.

Distribution Board & MCB shall be of make as per list enclosed and shall be got approved from DYCEE/C/RJT before supply.

OCTAGONAL GALVANISED STEEL POLE-5 Mtr (Item No – 39)

The contractor has to supply and erect Octagonal galvanized steel pole 5 mtrs long on cement concrete foundation complete with foundation bolt etc. Make- Bajaj, Philips, Crompton or as per list enclosed and shall be got approved from DYCEE/C/RJT before supply.

DESIGN OF POLE:-

The Octagonal Poles shall be designed to withstand the maximum wind speed as per IS 875 as these poles. The top loading i.e. area and the weight of fixtures are to be considered to calculate maximum deflection of the pole. The pole shall be **octagonal** cross section and shall be continuously tapered with **single longitudinal welding without** any circumferential welding. The bottom dia shall be 130mm (Across Face) and top dia shall be 70mm (Across Face) made up of 03mm thick plate. The base plate shall be of size not less than 200x200x12mm. The hot dip galvanization shall be not less than 65 micron and shall be uniform and smooth finish. No minus side variation in dimensions is allowed.

The octagonal Poles shall have door opening of approximate 500 mm length at the elevation of 500 mm from the Base plate. The door shall be vandal resistance and shall be weather proof to ensure safety of inside connections. The door shall be flush with the exterior surface and shall have suitable locking arrangement. There shall also be suitable arrangement for the purpose of earthing. The pole shall be adequately strengthened at the location of the door to compensate for the loss in section. Bakelite sheet with stud terminal & fuse shall be provided inside the opening for the purpose of termination of cables /wires.

The contractor shall also have to provide suitable bracket on the top of the pole for mounting one/two Nos. Street light fitting. Supply price shall include poles, Suitable bracket, terminal strip & OEM name plate.

DESIGN OF FOUNDATION.

The RCC foundation shall be of 500x500 square and 1000 mm long. The foundation shall be 200mm above the ground level. The foundation shall have 04 Nos. M 16x 600 long 'J' type GI bolts along with template and suitable reinforcement. Cement concrete shall be of the ratio 1:3:4. The contractor shall arrange cement, sand, concrete & water on their own cost.

Connection to the street light fittings shall be given through inside the pole with flexible, 3-core, multistrand copper conductor, PVC insulated & sheathed wire. Erection of pole means RCC foundation, J bolt, wiring, testing & commissioning etc.

Note:- The octagonal pole, bracket and foundation bolt shall be supplied by OEM only. The Inspection of poles shall be offered by contractor at the approved make manufacturer's premises at his own cost before supply at site

LED 45W SYSTEM WATT STREET LIGHT LED FITTING - (Item No. 40)

The contractor shall have to supply, erection, testing & commissioning of minimum 45 System Watt, surface mounted LED street light fitting complete with driver and all other accessories as per **WR specification No. WR /CCG/ SPECIFICATION /P /001 (Rev.01)-2018 (Specification enclosed with tender documents).**

LED street light fitting should be mounted on wall/pole/gantry with mounting arrangement. Contractor shall provide suitable bracket of suitable size for the fixing of fitting. The connection of the light fitting shall be done by flexible, 3-core, multi strand copper conductor, PVC insulated & sheathed wires

Note:-The make & model of fitting with manufacturer's certificate shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before supply at site.

SURFACE WIRING

LIGHT /FAN/CALL BELL & 6AMP MODULAR PLUG POINT (ITEM NO.41 & 42)

The contractor shall have to supply, installation, testing and commissioning of Light, fan, call bell & 6 amp plug point with modular switch & plug and carry out wiring from switch board to load/ ceiling rose point in PVC casing / capping of minimum 25 mm size or more size wherever required in PVC casing / capping or PVC pipe (MMS). For light, fan, call bell point & 6 A plug point 1.5sqmm multi-strand single core FRLS-PVC insulated 1.1kv grade Copper conductor wire for phase & neutral and 1.5sqmm multi-strand single core FRLS -PVC insulated 1.1kv grade copper conductor wire with ISI mark for internal earthing in the same casing / capping.

The contractor shall have to supply and provide modular type Molded Poly Propylene switch boards for points and plug-socket etc.

Rate of the point wiring shall include supply, erection and commissioning of standard size board box, modular switches with all accessories as specified, lamp holders / ceiling rose, adopter / lamps etc. with matching colour. There shall be sufficient space on switchboard to provide modular fan regulator & modular plug socket.

The modular switch board, modular switches, modular sockets & modular bell switch: Make- As per List enclosed and shall be got approved from DYCEE/C/RJT before supply.

16/6 A MODULAR PLUG POINT (Item No. 43)

The contractor shall have to supply, installation, testing and commissioning of modular type plug point with material and provide 16/6A modular plug socket & 16A modular switch with modular type Molded Poly Propylene board in surface manner with 4.0 sq mm FRLS-PVC insulated multi strand copper wire for phase and neutral and internal earthing in 25 mm size PVC casing / capping or PVC pipe (MMS). Contractor should supply modular plug socket and modular switch separately after that erected on board. Measurement of wiring up to 16/6 Amp plug point shall be given separately from 4.0 Sq mm sub main item.

The modular switches & modular sockets- Make- As per List enclosed and shall be got approved from DYCEE/C/RJT before supply.

MAIN-SUB MAIN 2.5 SQMM Item No -44

The contractor shall have to supply, installation, testing and commissioning of main & sub- main circuit for phase, neutral and internal earthing from SDB to switch board & switch board to switch board shall be carried out in PVC casing / capping or PVC pipe (MMS) with 2.5 sqmm (as given in schedule) multi-strand, FRLS-PVC insulated 1.1 KV grade single core copper conductor wire.

Make- as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.

MAIN-SUB MAIN 4.0 SQMM Item No –45

The contractor shall have to supply, installation, testing and commissioning of main & sub- main circuit for phase, neutral and internal earthing from SDB to switch board & switch board to switch board shall be carried out in PVC casing / casing or PVC pipe (MMS) with 4.0 sqmm (as given in schedule) multi-strand, FRLS-PVC insulated 1.1 KV grade single core copper conductor wire.

Make- As per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.

MAIN-SUB MAIN 6.0 SQMM Item No –46

The contractor shall have to supply, installation, testing and commissioning of main & sub- main circuit for phase, neutral and internal earthing from SDB to switch board & switch board to switch board shall be carried out in PVC casing / casing or PVC pipe (MMS) with 6.0 sqmm (as given in schedule) multi-strand, FRLS-PVC insulated 1.1 KV grade single core copper conductor wire.

Make- As per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.

WIRING OF 2-WAY LIGHT POINT (ITEM No-47)

The contractor shall supply the material and carry out 2 way wiring from switch board to load/ ceiling rose point in PVC conduit pipe/ casing capping of minimum 25 mm size or more size wherever required. For light point 1.5sqmm multi-strand single core FRLS-PVC insulated 1.1kv grade Copper conductor wire for phase & neutral and 1.5sqmm multi-strand single core FRLS -PVC insulated 1.1kv grade copper conductor wire for internal earthing in the same conduit pipe/ casing.

The contractor shall have to supply and provide modular type Molded Poly Propylene switch boards for points and plug-socket etc.

Rate of the 2 way point wiring shall include supply, erection and commissioning of standard size switch board, front plate required for multi-point switches with all accessories as specified, lamp holders / ceiling rose, adopter / lamps etc. with matching colour.

The 2 way modular switches: Make- As per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.

CALL BELL (Item No. 48)

The contractor shall have to supply and provide Electronic call bell. Make as per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.

Note:-The make & model of above item shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before supply at site.

CEILING FAN (ITEM NO.49)

The Contractor shall have to supply, installation, testing and commissioning of energy efficient 1200 mm Ceiling Fan complete with all accessories, without regulator, white colour confirming to IS 374 and provide the ceiling fan at different locations as decided by Railway site Engineer. Necessary arrangement for anchoring with suitable length of down rod of 20 mm dia seam less MS pipe or as received with fan if length is suitable, with nut, bolt & split pin to be provided by the contractor to maintain height of ceiling fan not less than 2.4mtr from the room floor.

The connection of the ceiling fan in buildings shall be done by flexible, 3-core, multi-strand copper conductor from catenary/ ceiling rose/Mains.

Note:-The make & model of Ceiling Fan as per approved list shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before supply at site.

FAN REGULATOR (ITEM NO. 50)

The contractor shall have to supply, installation, testing and commissioning of modular step type hum-free fan regulator of 100W on existing switchboard.

The modular fan regulator- Make- As per List enclosed and shall be got approved from DYCEE/C/RJT before supply.

LED 20 W SYSTEM WATT BULK HEAD LIGHT FITTING -(Item No. 51)

The contractor shall have to supply, erection, testing & commissioning of minimum 20 W System Watt LED type Bulkhead light fitting complete with driver and all other accessories. Input operating voltage range of driver shall be **230 V**, 50 Hz. Luminaire should have lumen output of minimum 60 lumens/ Watt. Optical cover should be of high quality Opal Polycarbonate. For proper heat dissipation housing should be made of High Pressure die cast aluminium / polycarbonate. HPL MODEL No-HLPLEDBH20 or similar makes as per list enclosed and shall be got approved from DYCEE/C/RJT before supply.

LED light fitting should be mounted on wall / toilet/stairs with mounting arrangement. The connection of the light fitting shall be done by flexible, 3-core, multi strand copper conductor, PVC insulated & sheathed wires.

CONCEALED WIRING

CONCEALED WIRING OF LIGHT /FAN/CALL BELL & 6AMP PLUG POINT

(ITEM No.- 52 & 53)

The contractor shall supply the material and carry out wiring from switch board to load/ ceiling rose point in PVC conduit pipe of minimum 25 mm size or more size wherever

required in **concealed manner**. For light, fan, call bell point & 6 A plug point 1.5sqmm multi-strand single core FRLS-PVC insulated 1.1kv grade Copper conductor wire for phase & neutral and 1.5sqmm multi-strand single core FRLS -PVC insulated 1.1kv grade copper conductor wire for internal earthing in the same conduit pipe.

The contractor shall have to supply and provide **concealed** MS metal box duly GI/chromium-plated for points and plug-socket etc. The concealed switchboard of **modular type** to be provided by the contractor with suitable front plates and all required modular accessories.

Rate of the point wiring shall include supply, erection and commissioning of standard size concealed metal box, front plate required for multi-point switches / single switches piano switches with all accessories as specified, lamp holders / ceiling rose, adopter / lamps etc. with matching colour. There shall be sufficient space on switchboard to provide fan regulator & 3 pin (1 phase 1 neutral & 1 earth) plug socket.

The switches, sockets & bell switch: Make- As per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply. There shall be sufficient space on switch board to provide fan regulator.

CONCEALED WIRING OF 16/6 A PLUG POINT (Item No. 54)

The contractor shall have to supply of material and provide modular type 16/6A socket with 16A switch with suitable metal box, front plate with accessories in concealed manner with 4.0 sq mm FRLS-PVC insulated multi strand copper wire for phase and neutral and internal earthing in 25 mm size PVC conduit pipe. Measurement of wiring up to 16/6 Amp plug point shall be given separately from 4.0 Sq mm sub mains.

The switches & sockets- Make- As per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.

CONCEALED WIRING OF MAIN-SUB MAIN 2.5 SQMM (Item No -55)

The wiring for the main & sub- main circuit for phase, neutral and internal earthing from SDB to switch board & switch board to switch board shall be carried out in concealed manner with 2.5 sqmm (as given in schedule) multi-strand, FRLS-PVC insulated 1.1 KV grade single core copper conductor wire in minimum 25 mm or more size PVC conduit pipe. Make- As per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.

CONCEALED WIRING OF MAIN-SUB MAIN 4.0 SQMM Item No -56

The wiring for the main & sub- main circuit for phase, neutral and internal earthing from SDB to switch board & switch board to switch board shall be carried out in concealed manner with 4.0 sqmm (as given in schedule) multi-strand, FRLS-PVC insulated 1.1 KV grade single core copper conductor wire in minimum 25 mm or more size PVC conduit pipe. Make- As per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.

CONCEALED WIRING OF MAIN-SUB MAIN 6.0 SQMM Item No -57

The wiring for the main & sub- main circuit for phase, neutral and internal earthing from SDB to switch board & switch board to switch board shall be carried out in concealed manner with 6.0 sqmm (as given in schedule) multi-strand, FRLS-PVC insulated 1.1 KV grade single core copper conductor wire in minimum 32 mm or more size PVC conduit pipe. Make- As per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.

CONCEALED WIRING OF MAIN-SUB MAIN 10.0 SQMM (Item No -58)

The wiring for the mains for each three phase, neutral & earth wire (total five wires) from main DB to SDB shall be carried out in concealed manner with 10.0 sqmm (as given in schedule) multi-strand, FRLS-PVC insulated 1.1 KV grade single core copper conductor wire with in minimum 32 mm or more size PVC conduit pipe. Make- As per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.

FAN REGULATOR MODULAR TYPE (ITEM NO. 59)

The contactor shall have to supply and fix the modular step type 100 w, hum-free fan regulators on existing concealed metal box switchboard with plates and accessories.

The fan regulator- Make- As per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply.

EXHAUST FAN (Item No. 60)

Contractor shall have to supply, install test and commission the 300 mm sweep, heavy duty metal body exhaust fan with Louvers. Make- As per List enclosed and shall be got approved from DYCEE/C/RJTbefore supply. Contractor should provide Wire mesh on outside of exhaust fan as safety measure.

The connection of the exhaust fan shall be done by flexible, 3-core, multistrand copper conductor, PVC insulated & sheathed wires.

1x (18- 20) W LED TUBE LIGHT FITTING - (Item No.61)

The contractor shall have to supply, erection, testing & commissioning of minimum (18-20) System Watt, surface mounted LED tube light fitting, CRCA made complete with driver and all other accessories as per **WR specification No. WR /CCG/ SPECIFICATION /P /001 (Rev.01)-2018 (Specification enclosed with tender documents).**

Mounting arrangement including hardware shall be provided by the contractor. The connection of the light fitting shall be done by flexible, 3-core, multistrand copper conductor, PVC insulated & sheathed wires.

Note:-The make & model of fitting with manufacturer's certificate shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before supply at site.

RECESS MOUNTED 36-38 W (2'X2' Sq feet) LED FITTING - (Item No. 62)

The contractor shall have to supply, erection, testing & commissioning of 36-38 System Watt, 2'x2' sq feet LED type recess indoor mounted LED fitting complete with driver and all other accessories as per **WR specification No. WR /CCG/ SPECIFICATION /P /001 (Rev.01)-2018 (Specification enclosed with tender documents).**

Mounting arrangement including hardware shall be provided by the contractor. The connection of the light fitting shall be done by flexible, 3-core, multistrand copper conductor, PVC insulated & sheathed wires.

Note:-The make & model of fitting with manufacturer's certificate shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before supply at site.

CAPSULE TYPE 2 x (18-20) W LED TUBE LIGHT FITTING - (Item No.63)

The contractor shall have to supply, erection, testing & commissioning of minimum 2 x (18-20) System Watt, corrosion proof ,suspended, surface mounted LED tube light fitting complete with driver and all other accessories as per **WR specification No. WR /CCG/ SPECIFICATION /P /001 (Rev.01)-2018 (Specification enclosed with tender documents).**

Mounting arrangement including hardware shall be provided by the contractor. The connection of the light fitting shall be done by flexible, 3-core, multistrand copper conductor, PVC insulated & sheathed wires. Fittings shall be provided in cover shed.

Note:-The make & model of fitting with manufacturer's certificate shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before supply at site.

MAINS 4.0 SQ MM FOR WIRING (Item No 64):-

Contractor has to Supply of material and wiring of mains for fittings and fas by 3 wire x 04 sq mm multi-strand, FRLS -PVC insulated 1.1 KV grade single core copper conductor wire in minimum 25 mm size PVC hard rigid conduit pipe or more size wherever required or existing pipes. Mains will be loop from light point to light point & provide connectors for tapping supply of bulk head fittings.

Makes as per list enclosed and shall be got approved from Dy. CEE (C) ADI before supply.

CATENARY WIRE 16 SQ MM (Item No. 65)

The contractor shall have to supply & draw 3/4/5/6 wire line in cover shed with 16 sq mm PVC insulated & sheathed Aluminium conductor wire complete with supporting angle (50x50x6mm), insulators. One wire of 8 SWG G I Earth wires will run throughout the catenary.

The contractor shall have to provide the supporting angle with insulators, clamps made with 50x3 mm MS flat suitable to fix with cover shed. The design of the supporting angle should be got approved from Railway before fabrication and fixing.

The catenary wire shall be drawn in such a way that the height of the any of the lowest conductor from the ground shall meet the IE rules.

Note:-Unit rate of one meter of the catenary wire means one No. of the catenary wire per meter including required insulator, clamps etc as required at site

AIR CIRCULATOR FAN 600 MM (Item No.66)

Contractor shall have to supply, install, test and commission Air circulator fan of 600mm sweep, Heavy duty wall mounted, single-phase. It will be provided in cover shed Steel column. Necessary mounting arrangement made by contractor.

The connection of the fan shall be done by flexible, 3-core, multi-strand copper conductor, PVC insulated & sheathed wire of size not less than 0.5sqmm as per IS.

Note:-The make & model of Air circulator fan shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before supply at side.

6/16 AMP SWITCH BOARD (Item No-67):-

The contractor has to supply, install, test and commission of 16/6A modular plug point with 16 Amp modular switch & 2 Nos 6 amp modular switch on Molded Poly Propylene switch board duly wired with 4.0 sq mm FRLS-PVC insulated multi strand copper wire for phase and neutral and 4.0 sq mm FRLS-PVC insulated multi strand copper wire for internal earthing. Measurement of wiring up to 16/6 Amp plug point shall be given separately from 4.0 Sq mm sub main item.

The switches & sockets shall be as pre list enclosed and shall be got approved from DYCEE/C/RJT before supply

JUNCTION BOXES Item No. 68

The contractor shall have to supply, installation, testing and commissioning of Jn. boxes of SINTEX, HENSEL, NATIONAL OR SIMILAR for connecting the incoming & out going cables and connecting wire of street lights fittings. Jn. boxes shall be complete with suitable connectors and fuse unit for streetlight. Complete unit shall be mounted on the pole/wall/Pillars by necessary hard ware Terminal strip, Cable glands, clamps etc.

Make & Model shall be got approved from DYCEE/C/RJT before supply.

HIGH BAY LIGHT FITTING 250 W (Item No. 69)

The contractor shall have to supply, erection, testing & commissioning of minimum System Watt 250 or more, high bay LED Flood light fitting complete with driver and all other accessories as per **WR specification No. WR /CCG/ SPECIFICATION /P /001 (Rev.01)-2018 (Specification enclosed with tender documents)**. Input operating voltage 230V, 50 Hz, IP-66, Housing-Pressure dia cast aluminum & complete with Glass. Mounting arrangement in on wall/ pole /cover shed including hardware shall be provided by the contractor. The connection of the light fitting shall be done by flexible, 3-core, multistrand copper conductor, PVC insulated & sheathed wires.

Note:-The make & model of fitting along with manufacturer's catalog shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before supply at site. *Inspection of fitting at manufacture premises as per above spec.*

LED 90 SYSTEM WATT LIGHT LED FITTING - (Item No. 70)

The contractor shall have to supply, erection, testing & commissioning of minimum System Watt 90 or more, light fitting complete with driver and all other accessories as per **WR specification No. WR /CCG/ SPECIFICATION /P /001 (Rev.01)-2018 (Specification enclosed with tender documents)**. Input operating voltage 230V, 50 Hz, IP-66, Housing-Pressure dia cast aluminum & complete with Glass. Mounting arrangement in on wall/ pole /cover shed including hardware shall be provided by the contractor. The connection of the light fitting shall be done by flexible, 3-core, multistrand copper conductor, PVC insulated & sheathed wires.

Note:-The make & model of fitting along with manufacturer's catalog shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before supply at site.
Inspection of fitting at manufacture premises as per above spec.

LED 30W WATT FOCUS TYPE LED LIGHT FITTING – (Item No. 71)

The contractor shall have to supply, erection, testing & commissioning of minimum System Watt 30 or more, Focus type light fitting complete with driver and all other accessories as per **WR specification No. WR /CCG/ SPECIFICATION /P /001 (Rev.01)-2018 (Specification enclosed with tender documents)**. Input operating voltage 230V, 50 Hz, IP-66, Housing-Pressure dia cast aluminum & complete with Glass. Mounting arrangement in on wall/ pole /cover shed including hardware shall be provided by the contractor. The connection of the light fitting shall be done by flexible, 3-core, multistrand copper conductor, PVC insulated & sheathed wires.

Note:-The make & model of fitting along with manufacturer's catalog, LM-79, LM-80 test certificate shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before supply at site.

SUB DISTRIBUTION BOARD FOR STREET LIGHT Item No –72

1. The contractor shall have to design, supply, install, test and commission DB fabricated by 2mm thick MS sheet, outdoor type with rain shed, standard angles, channels etc. as required in design or company made. The drawing, design switch gears with make and model of the DB shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before fabrication.
2. The panel shall be fabricated by CPRI / ISO approved manufacturer. Contractor should submit the copy of CPRI / ISO certificate issued to panel manufacturer.
3. The DB shall be indoor cubicle type, wall mounted dust and vermin proof suitable for 3 phase, 4-wire, 415V, 50Hz AC supply system.

4. All power connections from the bus bar shall be made such that there is a clear metal to metal aerial contact at the tapping. The nuts and bolts used for connections to the bus bar shall be of Aluminium alloy. Both spring washer and plate washer shall be used with stud/ nuts/to ensure proper contact pressure.
5. The sheet steel enclosure / angle / channel used in the fabrication of distribution board shall be provided with double coating of red oxide and final coating of light grey powder coated paint.
6. Minimum two earth terminals shall be provided in the DB. All sheet steel section shall be electrically connected with earth.
7. DB shall be mounted on wall/ pillar/mast.
8. The MCBs, contactor, time switch shall be of approved make as per list enclosed. The breaking capacity of MCBs should not be less than 10KA & 'c' curve

The DB shall be comprised with following-

- 1) 63 A 4-Pole MCB- 1 No
- 2) time switch- 1 No
- 3) Contactor 3 Phase, 40 Amp-1 No
- 4) Auto/ manual switch- 1 No
- 5) O/G 40 Amp SP MCB-3 Nos with Neutral link of 40 amp.
- 6) ON indication Lamp.

Note:- The contractor shall have to arrange inspection of the SDB at the manufacturer's premises at his own cost.

UPVC PIPES 50 MM DIA. (Item No. 73)

The contractor shall supply UPVC pipes of 50 mm nominal bore dia and working pressure 14Kg /sq cm along with coupling, elbow, tee etc. for protecting the cable. The upright cable shall be encased in UPVC pipes for mechanical protection. The pipe shall be clamped with flat MS clamp at each location on upright cable length.

UPVC Pipe shall be as per ASTM-D:1785. SCH-80

Note:- Make shall be got approved from DYCEE/C/RJT before supply.

LAYING OF UPVC PIPES:

The contractor shall lay the UPVC pipes in the ground/Road & under the track by digging open trench method or on wall/ pole/structure with proper saddling/clamps for cable protection.. Each length of the pipes shall be joined together using proper size of UPVC coupler properly and aligned in a straight line, keeping an inclination to facilitate the draining of water.

Supply, fixing, testing and commissioning of 600x600x3.5 mm copper plate earthing] (Item No. 74)

Provision of earthing should be carried out as per drawing, having copper plate size of 600x600x3.5 mm, GI pipe having 19 mm dia. approx 2.7 meter long B class of Zenith, Prakash Surya, Jindal, TATA, Swastika, Asian makes only to be used with wire mesh funnel. The earth shall not be situated less than 1.5 meters from any building. Plate Earthing should be carried out as per IS 3043- 1987 as amended latest.

The earth resistance value shall be measured and tested jointly. The earth resistance should be less than one ohm. It shall be displayed at site by painting nearby wall with red paint surface of size 200X200 mm and noted with white paint as Date of measurement, Earth resistance in Ohms and W/O no. The earthing shall be connected from earth pit to transformer body / neutral point/ VCB body/ LT panel with 25X6 mm size Annealed Cu strip with PVC green sleeve & other accessories as required.

The electrode shall be suitably protected from mechanical injury by being recessed in walls. The earthing strip shall be buried at least 30 cm (1 foot) deep below ground level and on wall with suitable clamp and connection/ testing. The casing-capping shall be used on wall in place of PVC pipe as per site requirement. An earthing chamber of cement concrete with RCC slab as per drawing shall be provided on each earthing. Copper purity certificate of copper plate testing shall be submitted by contractor from Govt. approved laboratory.

The contractor should submit the copy of challan for satisfying that Copper plate have been purchased from manufacturer/authorized dealer of particular make being used

Note –Plate Earthing to be provided for VCB, Transformers and DG set .

PIPE EARTHING & EARTH WIRE (Item No. 75 & 76)

PIPE EARTHING

At each location the tenderer shall supply the material and erect 'pipe earthing stations' one each for individual end termination on both the ends of the cable laid and other locations as required. The earthing station shall be provided as per drawing No.DEE/C/ADI/252/2000.If any hard /stony soil, Contractor should adopt new technology method to dig earth pit as per drawing.

The GI pipe for the earthing electrode shall be 50 mm nominal bore dia. Medium class as per IS :1239 & 3.0 m in length and shall be of make as per list enclosed and shall be got approved from DYCEE/C/RJTbefore supply.. Proper connecting arrangement with clamp, G.I. nut and bolts of 12mm size shall be provided at the top end of the pipe-earthing electrode, by the tenderer.

The earthing wire shall laid from end terminations to earthing electrode through G.I. pipe along with the cables. Properly supported and clamped. The earthing electrode pipe shall not protrude more than 250 mm above ground level. The end sealing G.I .cap shall be provided at the top of the pipe-earthing electrode. An earthing chamber as per drawing shall be provided at the each earthing electrodes. Earth resistance of each and every earth station shall be recorded with date in presence of Railway representative and painted on the earth chamber. Details of earth resistance recorded should be submitted jointly signed by contractor and Railway representative. Payment will be arranged only after joint verification & painting.

The contractor shall supply and connect the earth electrode by earth wire of 2 Nos. 8 SWG with PVC sleeve insulated & connect G.I. wire between each point to be earthed and individual earthing station. The G.I. earthing wire ends shall be clamped between two G.I. washers of sufficient size and properly tightened with G.I. nuts and bolts of 12mm size. Earth wire should be drawn through the pipe laid for cable protection.

CABLE TRAY SUPPLY & ERECTION (Item No 77)

The contractor shall have to fabricate supply and fix the MS angle iron tray on side of pit line & between platforms for cable laying.

1. The fixing arrangement shall be robust and the fixing shall have to be done by fabricating of MS clamp, nut, bolt or welding along with rail pieces on pitline / water hydrant line between P/F.
2. Cable tray shall be 200 mm wide and both the outer sides MS angle shall not be less than 40 x 40 x 6 mm. In case non-availability of the required size next higher size can be used.
3. The cable tray shall be provided with MS flat of size 30mm x 6mm in between the MS angle by welding. The space in between the MS flats shall not be more than 15 cm.
4. The cable tray shall be firmly fixed /supported on the rail pieces on pit line / water hydrant line between P/F through MS angle iron clamps of higher size than the section of the angle of the tray. Erection of rail pieces is schedule item & paid separately.
5. The design& fixing arrangement shall have to be approved by Railway before fabrication and installation.
6. The cable tray shall be painted with one coat of Red Oxide and two coats of aluminium paint.
7. Provide proper clamping arrangement for cables laid on it.

VERTICAL SUBMERSIBLE PUMP -5-7.5 HP (Item No. 78 & 79)

The contractor shall have to supply, test and commission 5-7.5 HP submersible pump set complete with all accessories suitable for bore well. The pump set shall be suitable to deliver required water discharge at required Head at duty point as decided by Rly at the time of Supply, electric motor suitable for 415V, 3 phase, 50Hz AC. Pump head & delivery will be decided after getting data from Engg deptt.

Delivery size of pump shall be of 50 mm dia.

Pump set shall be of KSB, CROMPTON GREAVES, AMRUT, KRANTI make or similar as per list enclosed.

Make & Model shall be got approved from DYCEE/C/RJT before supply.

Pump shall be supplied complete with the following accessories, suitable for pump

1	Non return valve of suitable size of referred pump with flange and gasket with nuts & bolts	1 No.
2	Supporting clamps of suitable size for column pipe complete with nuts and bolts	2No.
3	Heavy-duty 90-degree bend with coupling at one end and flange at other end.	1No
4	a 450 mm long nipple made up from MS heavy-duty pipe, having 11 TPI threads at one-end 8TPI threads at other end.	1 No

	b	450 mm long nipple made up from MS heavy-duty pipe, having 11 TPI threads at one-end 8TPI threads at other end with 8 TPI MS coupling.	1 No
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Note:- Inspection of pump shall be offered by contractor at the manufacturer's premises at his own cost before supply at site.

STARTER FOR -5-7.5 HP (Item No. 80)

The contractor shall have to supply, erect, test and commission Pump starter, DOL, 3 Phase, for 5.0-7.5 HP capacity pump motor, 415V, 50 Hz with Ammeter, voltmeter, SPP and overload protection or OEM of pump.

Note- Starter shall be of make as per pump make or L&T , kirloskar, GE, Siemens, CG, GELCO, OCLEG, ABB, Minilec or similar Make- as per list enclosed and shall be got approved from DYCEE/C/RJT before supply.

Supply and installation of 50 MM dia. UPVC column pipe with required accessories (Item No.-81)

The contractor shall have to supply and install UPVC column pipes of 50 mm. dia (2" inch) in 3 meter length, white colour, HEAVY Class having Outer dia of 60 mm and inner dia of 50 mm with both end male square threaded. One end of UPVC column pipes should be joined with coupler with internal threads and locked with SS wire. The working pressure of pipe shall be of 27 kgf/cm² suitable rubber seals should be present in the coupler joints so that there is no leakage of water. Information regarding OD, ND and working pressure shall be printed on the pipe. Pipe shall be tested as per tests stated below:

sl.no.	requirement	specification limit	test methods
1	wire lock system	pipe should be locked to one end of the coupler with square threads and ss wirelock system with internal "o" ring system for prevention of any leakage	-
2	visual appearance	the colour of the pipes shall be white slight variation in appearance of the colour are permitted. the internal & external surfaces of the pipes shall be smooth. clean & free of any defects. the ends shall be clean & square with the axis of the pipes.	
3	colour	white	-
4	dimension	a) outside diameter : 59.5 to 60.20 mm	is – 4985:2000

			is – 12235 (part-1)
		b) end thickness 7.80 to 9.70 mm	is – 4985:2000 is – 12235 (part-1)
		c) barrel thickness 5.30 to 6.60	is – 4985:2000 is – 12235 (part-1)
		d) length of pipe without coupler 2998+/-3 mm	is – 4985:2000 is – 12235 (part-1)
		e) length of thick portion on male thread side 200 mm minimum	-
		f) Length of thick portion on coupler wire lock side 200 mm minimum.	-
5	specific gravity	As per IS	is – 4985:2000 is – 12235 (part-14)
6	tensile strength	As per IS	annexure “a” of is – 12818-92
7	joint leakage test	27 kgf/ cm ² test duration- 1hr	is-12235(part-8/sec-1) is-12235(part-8/sec -4)
8	hydro-static pressure test	As per IS burst test- As per IS	is – 4985:1988 is – 12235 (part-8/sec-1) is-12235(part-8/sec -4)
9	resistance to external blow at 00 c	As per IS	is – 4985-2000
10	thread fitment test		Inter changeability

Required accessories for UPVC column pipes of 2” dia.

TOP adaptors: Material-SS, to be able to sustain a pressure of 35 kgf/cm² (for a testing duration of 1 hour.)

Bottom Adaptors: material-SS, to be able to sustain a pressure of 35 kgf/cm² (for a testing duration of 1 hour.) and free from blow holes.

Flange for pump guard fitment: Material mild steel, the flanges shall have powder coated surface.

M12 stud rod: The M12 stud rod is of SS.

PVC small Piece: The overall length of small PVC piece shall be 35 mm.

Make- Ashirvad, Astral, Swastik or as approved by Railway.

SUBMERSIBLE FLAT CABLE-3x4.0 SqMM (Item No.82)

The contractor has to supply 3x 4.0 sqmm submersible flat cable for the pumps. The cable shall be finolex, Polycab, Avocab, Havell's make or similar as per list enclosed and shall be got approved from DYCEE/C/RJT before supply. This cable shall be suitably connected to pump motor and starter panel and suitably bonded with the delivery pipe of the pump.

HORIZONTAL MONO BLOCK 3 PHASE, 5 HP SUBMERSIBLE PUMP (ITEM No.83)

The contractor shall have to supply, install, test and commission Horizontal mono block submersible pump set complete with all accessories suitable for sump. The pump set shall be 5.0 HP, 415V, 3 phases; 50Hz AC. Suction and delivery size shall be of 50mm x 50 mm dia. Pump head & delivery will be decided after getting data from Engg deptt. All reducer & coupling etc. shall be arranged by contractor. Delivery pipe connection shall be done by contractor.

Note- Pump shall be of make as per list enclosed and shall be got approved from DYCEE/C/RJT before supply.

HORIZONTAL MONO BLOCK 3 PHASE, 5 HP SUBMERSIBLE PUMP (Spare) ITEM No.84)

The contractor shall have to supply Horizontal mono block submersible pump set complete with all accessories suitable for sump. The pump set shall be 5.0 HP, 415 V, 3 phase; 50Hz AC. Suction and delivery size shall be of 50mm x 50 mm dia. Pump head & delivery will be decided after getting data from Engg deptt. All reducer & coupling etc. shall be arranged by contractor as spare supply.

Note- Pump shall be of make as per list enclosed and shall be got approved from DYCEE/C/RJT before supply.

STARTER FOR SUB. 3 PHASE, 5 HP PUMP ITEM NO. 85

The contractor shall have to supply, erect, test and commission Pump starter, DOL, 3 Phase, for 5.0 HP capacity pump motor, 415V, 50 Hz with Ammeter, voltmeter, SPP and overload protection or OEM of pump.

Note- Starter shall be of make as per pump make or L&T, kirloskar, GE, Siemens, CG, GELCO, OCLEG, ABB, Minilec or similar Make- as per list enclosed and shall be got approved from DYCEE/C/RJT before supply.

SUBMERSIBLE NON CLOG PUMP SET (ITEM No. 86)

Contractor shall have to Supply, Erection, Testing & Commissioning of submersible non clog pump set, automation control panel, flat cable (copper), MS clamp , fixing arrangement including out let and in let GI pipe of suitable size will be done by the tenderer.

Submersible non clog pump set Make and model shall be got approved by Dy.CEE/C/RJT.

Note:- Inspection of above item shall be offered by contractor at the manufacturer's premises at his own cost before supply at site.

HIGH MAST 20 Mtrs HEIGHT (Item No 87)

The contractor shall have to supply, install, test and commission the 20 meter high mast including all accessories like electrical control panel for hoist motor etc. shall be done by original equipment manufacturer (OEM)/Authorized representative only in section as per manufacturer's design and drawings. Certificate to this effect may be put in record. Structure and foundation design shall be done for providing minimum twelve Nos. of flood light fittings on it and considering area wind pressure. Contractor should submit the manufacturer design and drawings before execution of work.

Applicable standards

Sr. No.	Code No.	Title
1.	IS:875(part-III)-1987	Code and practice for wind loads
2.	ILE TR-7, Latest addition	Specification of mast
3.	BS-5649, Part-7	Structure design
4.	BSEN 100025/100027 BS:4360	Mast section
5.	IS:2062	Base plate, Top plate and Accessories.
6.	BS-5135 or 9595	Welding
7.	BS-729 / IS-2629	Galvanizing
8.	IS-367	Foundation

STRUCTURE

The high mast shall be of continuously tapered, polygon cross section, at least 20 sides, presenting a good and pleasing appearance and shall be based on proven in-tension design confirming to IS: 875 (Part III)/1987 to give an assured performance and reliable service.

The make of mast shall be as per Attached approved make List.

CONSTRUCTION

The mast shall be fabricated from special steel plates Mast and 04mm thick for bottom, 03mm thick for top section, confirming to BS-EN 10025, cut and folded to form a polygonal section as stated above and mast shall be in two sections. The welding shall be in accordance with BS: 5135. There shall be only one longitudinal seam weld per section. Each mast section shall have only two sections and shall be jointed together by slip stressed fit method at site. No site welding or bolted joint shall be done on the mast.

The detailed parameters are as under

Height	Bottom dia. in mm (A/F i.e. outer to outer)	Top dia. in mm (A/F i.e. outer to outer)	Bottom section Plate thickness in mm	Top section Plate thickness in mm	PCD in mm	Foundation bolt in mm	Luminary capacity at 55m/s (Nos)
20mtrs.	460	150	4	3	590	M30/850x8	12

The base flange shall be provided with supplementary gussets between the bolt holes to ensure elimination of helical stress concentration. For the environmental protection of the mast, the entire fabricated mast shall be hot dip galvanized, internally and externally having a uniform thickness of 85/65 microns for the bottom and top sections respectively.

DYNAMIC LOADING FOR THE MAST

The mast structure shall be capable to withstand the wind load as per IS 875 as these masts will be provided in the section and 12 Nos. 400W HM fitting shall be mounted on the high mast. Wind excited oscillations shall be damped by the method of construction and adequate allowance shall be made for the related stress.

DOOR OPENING

An adequate door opening shall be provided at the base of the mast and the opening shall be such that it permits clear access to equipment like winches, cables, plug and socket etc. and also facilitate easy removal of the winch. The door opening shall be complete with a close fitting, vandal resistant, weatherproof door provided with a heavy-duty double internal lock with special paddle key.

The door opening shall be carefully designed and reinforced with welded steel section, so that the mast section at the base shall be unaffected and undue buckling of the cut portion is prevented.

LANTERN CARRIAGE

A fabricated lantern carriage shall be provided for fixing and holding the flood light fittings and control gears. The lantern carriage shall be of special design and shall be of steel tube construction, the tubes acting as conduits for wires, with holes fully protected by grommets. The lantern carriage shall be so designed and fabricated to hold the required number of flood light

fittings and the control gearboxes and also to have a perfect self-balance. The lantern carriage shall be fabricated in two halves and jointed by bolted flanges with stainless steel bolts and plastic lock type stainless steel nuts to enable easy installation or removal from the erected mast.

The inner lining of the carriage shall be provided with PVC arrangement so that no damage is caused to the surface of the mast during the raising and lowering operation of the carriage.

The entire lantern carriage shall be hot dip galvanized after fabrication.

JUNCTION BOX

Weather proof junction box, made of cast aluminum shall be provided on the carriage assembly as required from which the inter-connections to the designed number of the flood light luminaries and associated control gears fixed on the carriage shall be made.

RAISING AND LOWERING MECHANISM WINCH

The winch shall be of completely self-sustaining type with raising and lowering arrangement, without the need for brake or clutches. Each driving spindle of the winch shall be positively locked when not in use, gravity activated pawls. Individual drum also should be operated for fine adjustment of lantern carriage. The capacity, operating speed, safe working load and the recommended lubrication and serial number of the winch shall be clearly marked on each winch. The minimum-working load shall be not less than 750Kg. The winch shall be self-lubricating type by means of an oil bath and the oil shall be readily available grades of reputed producers.

HEAD FRAME

The head frame, which is to be designed, as a capping unit of the mast shall be of welded steel construction, galvanized both internally and externally after assembly.

The top pulley shall be of appropriate diameter, large enough to accommodate to stainless steel wire ropes and the multi-core electric cables. Self-lubricating bearings stainless steel shaft shall be provided to facilitate smooth and maintenance free operation for a long period. The pulley assembly shall be fully protected by a canopy galvanized internally and externally. Close fitting guides and sleeves shall be provided to ensure that the ropes and cables do not dislodge from their respective position in the grooves.

STAINLESS STEEL WIRE ROPE

The suspension system shall essentially be without any intermediate joints and shall consist of only non-corroding stainless steel of AISI 316 or better grade.

The stainless steel wire ropes shall be of 7/19 constructions, the central core being of the same material. The overall diameter of the rope shall not be less than 6mm.

ELECTRICAL SYSTEM, CABLE AND CABLE CONNECTIONS

The electrical connections shall be made with at least 5 (five) core flexible round sheath power cables using copper conductor of appropriate rating. A suitable terminal box shall be provided at part of contract at the base compartment of the high mast for terminating the incomer cable. **The system shall have inbuilt facilities for testing the luminaries while in lowered position.** Also suitable provision shall be made at the base compartment of the mast to facilitate the operation of externally mounted, electrically operated power tool for raising and lowering of the lantern carriage assembly. The trailing cables of the lantern carriage rings shall be terminated by means

of metal clad plug and socket provided in the base compartment to enable easy disconnection when required.

POWER TOOL FOR THE WINCH

A suitable, high powered, electrically driven, internally mounted power tool, with manual over ride, shall be supplied for the raising and lowering of the lantern carriage for maintenance purpose.

The speed of the power tool shall be single speed, provided with motor of the required rating. The power tool shall be supplied complete with suitable control. The capacity and speed of the electrical motor used in power tool shall be suitable for the lifting of the design load installed on the lantern carriage.

The power tool mounting shall be so designed that it will be not only self-supporting but also aligns the power tool perfectly with respect to the winch spindle during the operations. Also a handle for the manual operation of the winches in case of problems with the electrically operated tool shall be provided and shall incorporate a torque-limiting device.

LIGHTNING FINIAL

One number heavy duty hot dip galvanized lightning finial shall be provided for each mast. The lightning finial shall be minimum 1.2 mtr in length and shall be provided at the center of the head frame. It shall be bolted solidly to the head frame to get direct conducting path the earth through mast. The lightning finial shall not be provided on the lantern carriage under any circumstances in view of safety of the system.

AVIATION OBSTRUCTION LIGHTS

Suitable aviation obstruction lights of reliable design and reputed manufacturer shall be provided on the top of the mast.

FEEDER PILLAR:-

Each mast shall be provided with a feeder pillar fabricated out of 14 SWG CRCA sheet and finished with two coats of red oxide primer and grey enamel paint. The feeder pillar shall comprise of incoming 63 amp TPN MCB, Copper wiring, outgoing terminals and contactors for reversing the motor .One time switch for ON/OFF also to be provided with feeder pillar.

Note-Feeder pillar shall have to design & supply by high mast OEM only.

EARTHING TERMINALS

Suitable earthing terminal using 12 mm diameter stainless steel bolts shall be provided at a convenient location on the base of the mast for lightning and electrical earthing of the mast.

***Note:** - The contractor shall have to arrange inspection of the high mast at the manufacturer's premises at his own cost.*

FOUNDATION FOR FL MAST (Item No-88)

The drawing of foundation shall be submitted before casting the foundation as per manufacturer's design.

Contractor shall have to supply the materials including hardware items and cast the foundation suitable for 20 mtrs high mast. The foundation design shall be done by considering soil condition, dynamic loading on the mast as per ILE TR-7 and IS: 875 and static loading of the total mast structure. The mast will be provided at section. The ratio of cement, sand and metal shall be 1:2:4. The contractor shall supply all accessories and water required for casting the foundation. Foundation will be casted in the presence of railway representative.

Contractor shall also to be provided the sturdy fencing of rails/pipes/angles around the foundation of size 3x3mtrs of 1.5mtr height from ground level. The fencing shall be made the eight Nos. of 50x50x5mm angles/rails/pipes and barbed wire to safe guards it against damage from moving vehicles as well as to prevent unauthorized persons in its close proximity. Confirmation to this effect may be put on record. The Rails/pipes/angles shall be buried by providing suitable RCC foundation.

G.I. PORTAL (Item No.89)

1. Supply and erection of R- type portal (as specified by RDSO/CORE) comprise the supply of portal upright, boom pieces, end pieces, central portion, knee bracing with an approximate clear span of 40 Mtrs. The price shall cover the cost of fabrication, galvanization, supply, erection, alignment and setting before grouting individual mast
2. Contractor shall inspect the site before starting fabrication of portal mast structure so has to take clear measurement of each portal span as per site requirement, clear idea of foundation, erection procedure and got approval of change from Sr. DEE/ADI.
3. The portal shall be used for providing light fittings to illuminate the pit line.
4. The portal shall be procured through RDSO/CORE approved suppliers only.
5. The price shall cover the cost of fabrication, galvanization, supply, erection, alignment and setting before grouting individual tractions mast.
6. Galvanization thickness shall be as per Railway specification No.ETI/OHE/13(4/84) with c.s. 4/90 or latest.
7. For standard fabrication of steel work or structure for which RDSO or CORE approved drawing are available, the black steel weight of steel work as specified in RDSO / CORE drawing, shall be considered for payment.
8. In case, required size of channels are not available as per approved drawing, higher size of channel can be used with approval of Sr. DEE/ADI and payment as per actual black steel weight will be paid.
9. The price shall also include the strengthening of mast/ portal uprights etc. bent during transit and cutting of mast/portal upright to suit the site condition.
10. However in case the unit sectional weight of any member indicated in RDSO's drawing is not in conformity with the unit sectional weight as per the latest IS specification the weight of the fabricated steel work shall be calculated on the basis of latest IS specification and the same will be considered for payment for the non standard fabricated steel work, the calculated weight to be considered for payment under this item shall be included in the relevant drawing based on latest IS sectional weight at the time of submitting the designs for approval for the purchaser. Small parts steel (Nut, Bolt & washers etc) also considered for payment in addition to portal weight.
11. There will be no addition for increased weight due to galvanizing or painting or reduction for holes or screw cut.

12. Galvanization damaged during transportation / carting will be touchup with cold ZINC paints by tenderer.
13. Material will be supplied at site of work.

INSPECTION:-

- All material covered under RDSO/CORE approved suppliers list, material shall be procured from approved suppliers only as per latest specification.
- All the material shall be inspected by M/s RITES. Railway reserve the right to change the inspection authority From M/s. RITES to consignee. Inspection charges of M/s RITES will be born by contractor.
- Inspection of galvanized steel structures and small part steel (SPS) to be carried out in two stages as under:-

(a) Inspection after fabrication.

- I. Inspection after fabrication of the structures/SPS shall be done at the CORE approved fabricator's premises by M/s RITES. It should conform to IS-2062 or its latest version.
- II. The manufacturer's certificate about the quality of the steel being used for fabrication of the structure shall be obtained and placed on record, along with inspection certificate. The steel should conform to IS-2062 or its latest version. The steel required (i.e. M.S. Angles, channels, rods and joints etc.) for manufacturing must be procured from main producers (i.e. M/s. SAIL, IISCO, TISCO & RINL etc.) or from the CORE approved re rollers supported by test certificate conforming to relevant IS CODES (i.e. is-2062 Gr. A SK and IS 808). The physical and chemical testing must be carried out as per relevant IS CODE.
- III. If excessive rust found on the fabricated steel structure, then this has to be cleaned before galvanization as per clause no. 3.2 & 3.3 of RDSO's specn. No. ETI/OHE/13(4/84) or latest. The same shall be recorded in the inspection note. The structure shall be offered again for inspection after through cleaning, before being sent for galvanizing.

(b) Inspection after galvanization

- I. Inspection of hot dip galvanization shall be done at the premise of CORE approved galvanizer by RITES. It should conform to RDSO's specn. No. ETI/OHE/13(4/84) with c.s. 4/90 or latest with galvanization thickness of 1000 gram per sq. meter.
- II. Specimen test piece of steel measuring 100 Sq. cm. area (90 cm. Long test piece in case of mast) to be tied with proposed structure being galvanized. This test sample shall be removed in the presence of inspecting official in order to find out the mass of zinc coating for stripping test in terms of clause 7.4 of RDSO's specn. No. ETI/OHE/13(4/84) or latest.
- III. Galvanization defects noticed after erection to be attended as per clause no. 8.2 or 8.3 of RDSO's specn. No. ETI/OHE/13(4/84) OR LATEST.

Casting of foundation, Grouting and Muffing of Portal (Item No.90)

The price shall includes the excavation and casting of foundation- based on guiding RDSO's/CORE's/CEE, W.Rly's/IS/BS specification with latest A&C slip.

The price shall cover excavation, supply and handling of all materials and accessories, temporary arrangements for excavation of all class of soil, casting concrete including

frame work whatever necessary, temping of concrete, grouting of structures and finishing the top of concrete foundation or anchor blocks as per approved design/drawings. The price shall also include dismantling of all connected temporary arrangements. The payable volume of the foundation shall be designs one as shown in the approved drawings, irrespective of the actual configuration assumed by the later. The depth of the excavation shall be measured from the foundation level to the maximum excavated point. For the computation of volume of steel work shall be ignored. The prices shall also cover the cost of diversion of masonry earth drain wherever necessary for casting of foundation. Contractor shall also arrange all tools and plants for carrying out the works at his own cost.

Foundation shall be cast as prescribed in RDSO letter No. TI/CIVE/FND/0 dtd. 9.9.2002. Concrete mixed for foundation shall have minimum grade for different exposures as per the table 5 of IS 456 – 2000 all latest which are indicated as under.

Sr.No	Exposure condition	Grade of concrete
1	Moderate	M-15 with concrete for core in M-20.
2	Severe	M-20 with concrete for core in M-20

Contractor has to prepare standard cube of size 150x150x150mm for every 10 cum of foundation cast & is to be tested in the Govt. approved laboratory as per IS-516/1959(or Latest) to obtain the result as per IS 456/2000 or latest.

Cement used shall confirm to IS 1489 – 1976 or latest & grade 53. The price also cover cost for smooth plasters on exposed foundation and muff.

Foundation casting shall be done in compliance of IS-456-2000 in each and every respect particularly material quantity, mixing, casting, curing, frame work etc. Poor workmanship shall not be acceptable.

The graded coarse aggregate 40mm nominal size table 2 of the latest version of IS 383-1970 shall be used for foundation. A coarse aggregate for grouting and muffling shall be 20mm grade nominal size as table 2 of the latest version of IS 383-1970 (specification for coarse and fine aggregate for natural sources for concrete) Fine aggregate shall be graded from 10mm down wards.

Notes for Item No. 2

The prices under item 2 shall be same for any shape or size of concrete blocks in calculating the individual volume of concrete, fraction of a cubic meter beyond the third decimal shall be rounded of to the next nearest third decimal.

The prices under item 2 shall apply for concreting of all foundation for masts, portals, anchor blocks for guy rods. For purpose of computation of volume of concrete of under item No. 2 volume of steel work embedded in the foundation block and muff shall be subtracted.

Cost of all concrete will be paid for only under item No.2 and the prices of other items shall not include.

For purpose of computation of volume of concrete under item No.2 the volume of concrete shall include the volume of sand and bitumen in sand cored foundation.

For purpose of computation of volume of concrete the volume of each muff for all mast shall be taken as 0.02 cu. M. Except for mast with balance weights and for column of portal, each head span mast, 2 or 3 track cantilever mast and special fabricated mast for which the volume of muff shall be taken as 0.08 cum.. Irrespective of the size and shape of muff on a flat basis.

Mixture for casting of foundation shall be 1:3:6 and mixing for grouting shall be 1:2:4. The gradation of concrete mixture is as per IS 456-2000 or latest.

Curing of foundation shall be done by contractor for 28 days.

The contractor shall used mechanized methods (vibrator) for casting of foundation.

Only soft water shall be used for casting & curing of foundation.

TABLE – 3 : PROPORTIONS FOR NOMINAL MIX CONCRETE:

Grade of Concrete	Total quantity of dry aggregate by mass per 50 kg. of cement, to be taken as the sum of the individual masses of the fine and coarse aggregates max.	Proportion of fine aggregate of coarse aggregate (by mass)	Quantity of water per 50 kg of cement max.
1	2 (KG)	3	4 (Litres)
M 5	800	Generally 1:2 but subject to an upper limit of 1: 1:5	60
M 10	480		34
M 20	250		30

NOTE: The proportions of the fine to coarse aggregates should be adjusted from upper limit to lower limit progressively, as the grading of the fine aggregates becomes finer and the maximum size of coarse aggregate becomes larger. Graded coarse aggregate shall be used.

Example:

For an average grading of the fine aggregate (that is zone 11 of table 4 of IS : 383. 1970) the proportions shall be 1:1.5. and 1: 2 and 1:2.5 for maximum size of aggregate 10mm, 20mm and 40mm respectively.

Method of test for aggregates for concrete part-III specific gravity, density, voids, absorption and bulking.

In judging the acceptability of the materials, quality of concrete and the method of work, the Purchaser will generally observe the provisions of the “ Indian Standard code of Practice for Plain and Reinforced Concrete, IS : 456- 1978 or latest. The crushing strength of concrete shall not be less than the limits given below:-

Crushing strength of 15cm cubes by works test,

<u>Concrete</u>	<u>At 7 days age</u>	<u>At 28 days age.</u>
(a) M-10	70kg/cm ²	100 kg/cm ²
(b) M-15	100kg/cm ²	150kg/cm ²

NOTE: (a) Test specimen of works tests shall be taken at the site of work from mixture of concrete ready for pouring into the foundation hole. All tests shall be carried out in accordance with IS: 518-1959 or its latest version. The sample of concrete from which test specimens are made shall be representative of the entire batch.

(a) Age is reckoned from the day of casting.

SIZE AND GRADING OF AGGREGATES :

The graded coarse aggregate 40 mm nominal size (table 2 of IS: 383-1970) shall be used for foundation. A coarse aggregate for grouting muffs and embedding shall be of 20 mm graded nominal size as per table 2 of IS : 383-1970 or latest (specification for coarse and fine aggregate from natural sources for concrete).

Fine aggregate shall be graded from 10 mm down wards. The maximum size of aggregate for under reamed pile foundation shall be 20 mm graded nominal size.

CEMENT :

The cement to be used in the construction of RCC structures should be of ordinary Portland cement to IS : 1489-1976 or latest.

FOUNDATIONS :

The contractor shall have to supply the materials and cast P-12 type (As specified by RDSO/CORE) foundation for portal.

The mixture for casting of foundation shall be 1 :3 :6 and ratio of cement, sand and grit for grouting mixture shall be 1:2:4.

- The contractor shall supply all the materials like cement, sand, concrete and water.
- Curing of foundation shall be done by contractor for 28 days.
- No scroll will be supplied by Railway, contractor will use his scroll.
- Necessary details like, type, implantation, chain, age shall be supplied by Railway
- The price shall be including all the works mentioned in specification in all type of soil.
- The price shall also include the cost of digging and refilling also in the cost of per cubic meter rate of foundation.

The Contractor shall carry out soil pressure tests in accordance with methods approved by the purchaser to determine permissible bearing pressure of various representative types of soils in the presence of the purchaser's representative during the pegging out of site inspection. He shall adopt only those values as accepted by the purchaser for the design of foundations.

METHOD OF INSTALLATION

The Contractor shall adopt mechanized method (Concrete mixer) for installation of foundation in the station areas with five track lines or more. The Contractor may adopt either manual or mechanized method for installation of foundations in the other areas. He may erect traction masts or structures in the same operation as casting of foundations or erect them subsequently in cored holes left in foundation blocks and grout them separately. In any case, the method of casting of foundation blocks and erection of mass or structures shall be subject to the approval of the purchaser.

CONCRETING

All concreting or grouting shall be done in accordance with para 3 with ballast graded for the purpose specified in para 4 The concrete shall be poured and temped properly in accordance with the method approved by the purchaser. The contractor shall arrange to provide concrete testing samples for tests once every week or as and when required by the purchaser, in determine crushing strength after 7 days or 28 days curing as required. Testing shall be arranged by the purchaser at his own cost.

MUFFS

All anchor blocks and foundations of structures carrying overhead equipment shall be provided with concrete muffs. The top of these muffs shall be above the level of ground of the track formation and of adequate height of not less than 15 cm to afford reasonable protection during rainy weather. Muffs may be installed at the same time masts are grouted or after the mast/structure is loaded with equipment. The foundations of structures for switching stations need not, however, be provided with muffs. The top of such foundations shall be given a slope of 1 in 50 towards the edge to ensure that water does not collect at the base of the structure of the frame work of the equipment.

Earth excavation should be carried out very cautiously so that Electrical/Telecommunication/Signaling cable passing through underground enroute the rail periphery do not get damage. if any damaged caused to OFC/Quad cable or Electrical cable during execution of the work, necessary debit shall be raised.

FLOOD LIGHT LED LIGHT FITTING 250 W FOR HIGH MAST (Item No. 91)

The contractor shall have to supply, erection, testing & commissioning of minimum System Watt 250 or more, high bay LED Flood light fitting complete with driver and all other accessories for FL mast as per **WR specification No. WR /CCG/ SPECIFICATION /P /001 (Rev.01)-2018 (Specification enclosed with tender documents)**. Input operating voltage 230V, 50 Hz, IP-66, Housing-Pressure dia cast aluminum & complete with Glass. Mounting arrangement in on wall/ pole /cover shed including hardware shall be provided by the contractor. The connection of the light fitting shall be done by flexible, 3-core, multistrand copper conductor, PVC insulated & sheathed wires.

Note:-The make & model of fitting along with manufacturer's catalog shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before supply at site. Inspection of fitting at manufacture premises as per above spec.

Preparation of Design, Drawing, line diagram etc. (Item No. 83)

The price also cover cost for preparation of digitalized diagram and supply of minimum 6 sets of hard copy with soft copy. The list of drawings to be submitted is as below-

- i) *Single line wiring diagram from GEB to main supply panel & cable distribution of station & LC gate.*
- ii) *Earthing layout of Station & LC gate.*
- iii) *LT, HT and EHT crossings for Entire Section showing clearance of transmission line tower and angle of crossing.*

The price also covers cost for retracing of existing drawings on new drawings. Preparation of Power supply diagram and sectioning diagram also included in item for complete section 90% of the price will be paid on approval of the drawing for execution and balance 10 % after successful completion of the work and handing over of the soft and hard copies to the client.

Inverter type Split A/C units of 1.5 ton Capacity (Item No 92)

GENERAL SPECIFICATION:

1. The rates shall be inclusive of the supply of AC units as per the technical specifications, transportation, installation, commissioning and testing.
2. Air conditioners shall be provided at site by the contractor. No any extra payment will be made for indoor unit bracket, outdoor stand, drain pipe and other required accessories for erection of air conditioner the same will be supplied and erected by the contractor at his own cost.
3. All AC units shall be earthed properly.
4. Contractor shall take care to the installation so as not to cause any damage to Railway property. Any damage to the installation as well as to the Railway property would be recovered from the contractor.
5. All the decision taken by Dy.Chief Electrical Engineer, Construction, Ahmedabad should be binding to both parties in respect of any dispute arising during the tenure of this work.
6. Carpentry works and masonry work for packing of gaps developed after providing AC units will be of superior quality and to be done completely by contractor on his own cost.

Technical Specification

- The contractor shall have to supply, installation, testing & commissioning of new 1.5 Ton inverter type Split Air Conditioner units complete with installation of indoor and outdoor unit. The AC units, originally shall be supplied with manufacturer's test certificate as per the parameter given in IS 1391 part II/1992.).
- Accepted make of Split AC: Hitachi, LG, Samsung, Voltas, Blue star, Carrier, Fedders Lloyd, Videocon, Godrej, Onida, Toshiba, Panasonic, Haier, O General, Daikin only.

1.5 Ton inverter type split AC conforming to IS 1391 part II/1992.).	
Star Rating	5
ISEER	4.7 or More
Supply	230V +/- 10% 50 HZ, single-phase AC supply
Connecting pipe	Cu-Cu (1/2" & 1/4")
Condenser coil	Copper/PFC
Refrigerant Gas	R410A/ R32/ R290

The AC units originally shall be supplied with manufacturer's test certificate/ challan. Drainage pipe will be provided by contractor up to toilet or other suitable location.

Note:-The make & model of AC unit with manufacturer's certificate shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before supply at site.

20A PLUG & SOCKET with Metal Enclosure (Item No. 93):-

The contractor shall have to installation, testing and commissioning of 20 A plug point with material and provide 20A metal clad plug socket with top and 20A DP MCB, 10 KA with metal box & 4 sq mm FRLS-PVC insulated multi strand copper wire for phase and neutral and 4.0 sq mm PVC insulated multi strand copper wire for internal earthing in 32 mm or more size PVC casing / caping. Measurement of wiring up to 20 Amp plug point shall be given separately from 4.0 Sq mm sub main item. This point used for Geyser & Air conditioner.

The 20A Plug socket, 20 A DP, 10KA MCB with metal box shall be of make as per list enclosed and shall be got approved from DYCEE/C/RJT before supply. Socket shall be suitable for Air conditioners, Geyser & water coolers etc.

DISMANTLING OF RAIL/TUBULAR POLES AND OVERHEAD LINES Item No. 94

The contractor shall have to dismantle existing rail/ tubular poles with cables and overhead lines at various locations. All the dismantled materials shall be stacked at suitable location near site and shall be handed over to Sr.SE/Electrical (S&C) Ahmedabad.

The dismantling of span including its main conductors and guarding net shall be carried out by contractor and same shall be deposited at Sr.SE/Electrical (S&C) Ahmedabad. If required to shift dismantled pole than loading & unloading has to be arranged by the contractor.

EXCAVATION OF NORMAL SOIL (Item No. 95)

A pit/trench of required size of width and depth from the normal ground level in soil (except Rock) shall be made by the contractor for the purpose of cable laying by push through method. After laying the cable , refill the same by riddle soil in the pit/trench. After doing this the pit/trench can be filled up with soil available thereby. If any damage done, contractor will make good the cost of damage as decided by railway. If any hard /stony soil, Contractor should adopt new technology method as per scope of work. Qty will be measured in Cubic meter.

EXCAVATION OF HARD SOIL (STONE/ROCK/RCC/PCC) (Item No.-96): -

A pit/trench of required size of width and depth from the normal ground level in all type of hard soil (Stone/Rock/RCC/PCC etc) shall be made by the contractor for the purpose of cable laying by push through method. After laying the cable , refill the same by riddle soil in the pit/trench. After doing this the pit/trench can be filled up with soil available thereby and resurface the same. If any damage done, contractor will make good the cost of damage as decided by railway.

If any hard /stony soil, Contractor should adopt new technology method as per scope of work. Qty will be measured in Cubic meter.

LT STRAIGHT THROUGH JOINTS (Item No. 97 & 98)

The contractor shall supply & provide heat shrinkable straight through jointing kits for 1.1KV grade suitable to 3.5/4 core up to 70 & 120 sqmm LT aluminum cable, manpower & transportation to carry out the repairing of faulty LT cable. The straight through joints shall be of M-seal (3M), Dension or Raychem or similar as per List enclosed and shall be got approved from DYCEE/C/RJT before supply.

All the materials and man power for repairing work along with transportation shall be arranged by the contractor. Digging of pit for cable repair and refilling shall also be done by the contractor.

500KVA DG SET WITH AMF PANEL WITH SOUND & WEATHER PROOF ACOUSTIC ENCLOSURE (Item No. 99)

The contractor shall have to supply, installation, testing and commissioning of 3 phase, 500 KVA DG Set complete with all accessories.

Make- Cummins, Kirlosker Green, Caterpillar, Greaves Cotton, Ashok Leyland, Mahindra, TATA, Panta-Volvo only.

(A) DETAILED SPECIFICATION FOR ALTERNATOR, TURBO-CHARGED DIESEL ENGINE AND AMF CONTROL PANEL:-

Diesel Generating set complete with turbo charged Diesel Engine, Alternator and AMF Control Panel conforming to the specification given below. Turbo charged Diesel engine and alternator shall be closely coupled or provided with flexible coupling and mounted on a base plate of robust in construction. DG Set shall meet the requirements of environmental protection rules, 1986 as laid down by Ministry of Environmental & Forest read with GSR 371(E) dated 17.05.2002, GSR 520(E) dated 01.07.2003, GSR 448(E) dated 12.07.2004, GSR 771(E) dated 11.12.2013 & GSR 232(E) dtd. 31.03.2014, Gazetted notification no. 167 dtd. 31.03.2014 & gazetted notification no. 578 dtd. 11.11.2014 amended upto date, in respect of "emission norms" for the engine and in respect of "noise norms" for DG sets. DG Set shall meet the requirements of latest CPCB emission & noise norms. Turbocharged engine shall conform to IS:13018/1990(reaffirmed 2005) AND IS: 10,000 series (with latest amendments).

DG Set should have protection against under voltage, over voltage, under frequency, over frequency, low battery voltage, over current, earth fault, short circuit, phase sequence change etc.

(1) ALTERNATOR:

The alternator shall be self excited and self regulated of 500 KVA rating in three phase at 415 Volts, 4 wire, 50 Hz, 1500 RPM & 0.8 PF and shall conform to IS:13364(Part 2)/1992 (reaffirmed 2008). The alternator shall be of brushless type only with VG-2 Grade of voltage regulation. The alternators shall be screen protected, drip proof with IP-21 or better degree of protection as per IS:4691/85 (reaffirmed 2004). The alternator should be suitable to take unbalanced load as per IS:13364(Part-2)/1992(reaffirmed 2008). The Alternator shall have Class H insulation.

(2)TURBOCHARGED DIESEL ENGINE:

The turbocharged Diesel Engine shall be water cooled, electric start developing required BHP at 1500 RPM with class A-2 or better governing to deliver continuous 500 KVA output at 0.8 Power Factor Lag at NTP conditions. The Diesel engine should be capable of providing 10% overload for one hour in every 12 hours continuous running at full load. The turbocharged Diesel engine shall conform to IS:13018/1990(reaffirmed 2005) AND IS: 10,000 series (with latest amendment) Specific fuel consumption(SFC)shall be as per IS specification.

The Turbocharged Diesel engine shall be complete with the following accessories:

- a) Fuel tank with air breather, drain plug with capacity of Minimum 990 Liter.
- b) Engine controller consisting of start button with display for , lube oil temperature and pressure gauges, RPM indicator and hour meter with additional feature of auto start/remote start and auto stop.
- c) Safety control to shut down the engine in the event of over-speed, low lube oil pressure and high engine water temperature.
- d) Exhaust silencer residential type.
- e) 24 V starting system complete charging alternator or dynamo and cutout.
- f) Low Maintenance Lead Acid batteries of suitably rated AH with connecting cables. The batteries shall be supplied conform to relevant IS. Only the following make of batteries shall be accepted- **Amar Raja, Excide, CSB, Hitachi, Okaya, Panasonic, Luminous, Amron.**
- g) Anti-Vibration mountings for complete DG set in case of flexible coupling and for turbocharged engine in case of direct coupling.
- h) The fuel level should be indicated with the help of fuel gauge meter.
- i) There should be provision for filling the fuel from outside with locking arrangement.
- j) Contractor shall have to provide one spare battery charger set suitable for 12V/24V, 240 AH LMLA batteries.
- k) During the warranty period, scheduled 'B' check shall have to be carried out by contractor at his own cost.

Contractor shall carried out following work two times during the 'B' check maintenance.

S. No.	Description of item
1	Removing of existing diesel filter and providing of new one.
2	Removing of existing oil filter and providing of new one.
3	Removing of existing super bypass filter and providing of new one.
4	Supply and providing of coolant 4 Tin each of 5 liters

5	Removing of existing air filter element outer and providing of new one.
6	Removing of existing air filter element inner and providing of new one.
7	Removing of existing C R element with plates and providing of new one.
8.	Removing of existing turbo oil filter elements outer and providing of new one.
9.	Replacing of the lube oil. The Lube Oil shall be supplied by Railway for B check.

AUTOMATIC MAINS FAILURE PANEL -500 KVA (AMF Panel):-

AMF control panel shall be able to start up the DG set and transfer the load to DG set on the Mains failure without requiring any human intervention. Similarly on restoration of the Mains supply it shall be able to transfer the load to Mains supply and switch off the DG Set automatically.

AMF panel suitable for 500 KVA DG set suitable for two incoming supply one from local and other from DG set supply.

- The contractor shall have to design, supply, install, test and commission AMF panel fabricated by 2mm thick MS sheet, standard angles, channels etc. as required in design. The drawing, design switch gears with make and model of the AMF panel shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before fabrication.
- The AMF panel shall be fabricated by DG Set manufacturer or CPRI approved manufacturer.
- The AMF panel shall be indoor rectangular cubicle type, dust and vermin proof suitable for 3 phase, 4-wire, 415V, 50Hz AC supply system.
- Bus bar for main circuit and neutral shall have uniform cross section electrolytic tinned copper with color coded heat shrinkable PVC insulated and current density of 1.6 Amp/mm² cross sectional area.
- Knock out / gland plates as applicable shall be provided. Gland plates of suitable size shall be designed for terminating cables in a straight and easy manner.
- All power connections from the bus bar shall be made such a manner that there is a clear metal to metal clearance at the tapping is available. Both spring washer and plate washer shall be used with stud/ nuts/to ensure proper contact pressure.
- The AMF panel shall have metal locks & operated by a common key. All covers & doors to be provided with neoprene gasket. Hinged doors shall be provided on both sides.
- The sheet steel enclosure / angle / channel used in the fabrication of panel shall be provided with double coating of red oxide and final coating of light grey powder coated paint.
- The AMF panel shall be supplied complete with base plate of 75mm, louver, four lifting hooks and feeder name plates completely wired and ready for commissioning.
- Caution board in Hindi, Gujarati & English of metallic type shall be provided on panel.
- Minimum two earth terminals shall be provided in the AMF panel all sheet steel section shall be electrically connected with a separate G.I. earth strip of 50x6 mm size across the panel at bottom.
- CT shall be cast resin type & 15VA burden, class 1.0 accuracy and shall be earthed through a separate earth link. CT shall be of Virat / Mecor / Ashmor, C&S, kuppam make or approved by Rly.

- Multi LED type indication lamp with control fuses on each incoming & out going feeder shall be provided.
- AMF panel shall be mounted on the fabricated MS Angle on floor and cemented trench for incoming and outgoing cables shall be prepared by the contractor.
- The MCB/MCCB and ACB shall be as per list enclosed make.
- The breaking capacity of MCCBs should not be less than 35KA with $I_{cs}=I_{cu}$ and should have variable setting type with thermal magnetic release & Rotary handle.
- The breaking capacity of MCBs should not be less than 10KA & 'C' curve
- The contractor shall submit three sets of drawing and wiring diagram of AMF panel along with panel at the time of supply.
- Contractor shall have to provide bus trunking between LT panel to DG set AMF panel. Suitable arrangement made on top of the panel.

The AMF panel shall be comprised with following —

- 800 Amps. – ACB, 4-pole (manually operated, draw out type, with over current, short circuit microprocessor based release and earth fault, $I_{cu}=I_{cs}=I_{cw}$ for 1 second, breaking capacity not less than 50KA - **3 Nos**
- Four Pole Power Contactor of 800 Amp – 02 Nos. (AC-3 Duty) (415V) along with 2NO+2NC Aux Contacts. – **02 Nos.**
- Thermal Based overload relay - 01Nos. Make: L&T / GE / Siemens.
- Battery Charger having 230V AC Input and 12V / 24V DC Output for battery backup of D.G. Set Battery charger complete with voltage regulator, float or booster selector switch, ON-OFF switch, Voltmeter and Ammeter for charging the battery from Mains. This will be in addition to the battery charging alternator fitted on the engine. – 01 Nos. Make: Realtech / Lunar or approved by railway.
- 1 Nos. Earth Leakage Relay along with CBCT make: L&T / Minilec / Ellico / Space
- Indicating Lamp – 230V AC Supply / 24V DC Supply for Phase Indication and Function indication as required.
- Push Button for D.G. Operations as required .
- Analog type Ampere Meter with Selector switch having capacity of 0-800/5A .
- Analog type AC voltmeter(s) of class 1.5 accuracy, 0-500 volts with selector switch. Separate voltmeter shall be provided for Mains and Alternator.
- Frequency meter Make: AE / Nippen
- Counter type Hour meter.
- Ampere Meter and Volt Meter (DC Supply) – 01 Set.
- C.T. – 15vA - 03 Nos. of Virat / Meco/ Ashmor, C&S, kuppa Make

- Digital Load Manager with RS-485 Port – 01 Nos. Make: HPL / Konzerv / L&T
- Suitable Control Terminal and Power Terminal.
- Suitable Control and Power Ckt wiring shall be done from 1.0 Sq.mm copper wire.
- Suitable copper Busbar of 800 A Capacity.
- MCB for control wiring.
- Emergency push button
- Complete Panel shall have throughout earthing bus bar.
- AC Ammeter(s) of class 1.5 accuracy and of suitable range, with selector switch.
- Mode selector switch for setting the panel on any one position such as off or auto or manual or test.
- Engine ON-OFF switch (push button type).
- Instruments and control fuses of suitable rating.
- Five nos. indicating lamps to indicate Mains Low Voltage, Load On Mains, DG Set running, Load on set and Battery charger ON.
- Audio Visual alarm for Low Lubricating Oil Pressure, High water temperature, Start Failure and DG O/L. Provide Hooter for Visual Alarm.
- Over current relay protection.

(4) ACCOUSTIC ENCLOSURE:

The accoustic enclosure shall confirm to the drawings TYPE approved by a Govt lab, for conformity to noise norms. This aspect shall also be verified by purchaser at the time of INSPECTION.

The Accoustic enclosure should consist of following :

- a) The enclosure should be fabricated out of CRCA sheet of minimum 1.6 mm thick.
- b) The sheet metal components should be suitably pretreated and should be powder coated to have long life of enclosure.
- c) The battery should be accommodated in a separate tray in the enclosure.
- d) There should be provision of drain plugs for draining lube oil and diesel.
- e) The doors should be gasketed with quality gaskets to avoid leakage of sound.
- f) The door handle should be lockable type.
- g) Sound proofing of enclosures should be done with high quality rock wool/ mineral wool/foam/fiberglass wool.
- h) The rock, mineral, fiberglass wool is further covered with fiberglass cloth and perforated powder coated sheet.

- i) A special residential silencer should be provided along with the enclosure to control exhaust noise.
- j) Specially designed louvers should be provided to control sound at air entry to the container and exit from the container.
- k) It should have Type approval certificate and also COP certificate (if applicable) from certification agencies mentioning MOEF notification No. 371(E) dated 17.05.2002 or as amended and applicable at the time of supply.
- l) Ambient temperature limit inside the canopy should be specified.
- m) There shall be provision for emergency STOP from outside the enclosure.
- n) Accoustic Enclosure shall conform to pollution noise norms stipulated in notification GSR 371(E) dated 17.05.2002, amended upto date.

(B) Supplier shall provide the testing facilities for the following tests in their works at the time of inspection. The inspection report proforma is attached alongwith.

- (i) The testing of diesel generating sets of all rating will be done with a load of 0.8 pf lag.
- (ii) The sample size shall be 100% of the offered quantity of DG sets for conducting acceptance tests except test at S.No.vi below (i.e. load test), for which only 10% sample shall be tested.
- (iii) The facility for checking of alignment of DG set before subjecting to load test for which tolerance is 0.01 mm in case of flexible coupled DG set and not applicable for direct coupled.
- (iv) Voltage regulation test at 0.8 pf lag.
- (v) Full load test for 4 hours at rated KW at 0.8 pf lag.
- (vi) After 4 hours full load test, 10% overload test shall be conducted for one hour at 0.8 pf lag. DG set should be capable of running at full-load test for one hour, after the overload test. The parameters should meet the requirements at full load, conducted after the over-load test.
- (vii) High voltage test at 1.6 KV for one minute after the load test.
- (viii) Insulation resistance test.
- (ix) Checking for the trouble free starting and oil leakage.
- (x) High voltage and insulation resistance tests should be conducted on alternator as well as control panel after the load test.
- (xi) The control panel will be checked for functional requirements and completeness.
- (xii) Vibration test: Vibration below AVM's should not exceed 100 microns.

(C) Supplier shall also provide following documents to purchaser at the time of inspection.

1. DG Sets manufacturer's shall furnish invoices and OEM's test certificates for turbocharged engine/alternators used, at the time of inspection from the original

manufacturer. The Invoice should have been billed directly to DG sets manufacturer. Original will be shown to the visiting inspector for verification during inspection.

2. Valid Calibration certificates of all the testing meters from any Govt. Lab.
3. Complete & satisfactory Type test certificate (TTC) for turbocharged engines, alternators complete with enclosure to be used by them for DG sets clearly identifying make, model and ratings of the DG sets tested to the purchaser at the time of pre despatch inspection. The TTC of three phase alternators shall cover unbalanced load test as per cl.24 of IS:13364(part2)/1992(reaff 2008) as applicable. The TTC shall be from any Govt. Lab. Type testing witnessed by the representative of purchaser at the firm's premises shall also be acceptable.
 - a) For turbo charged engines, which are in market in more than 500 nos. prior to date of T.O., tenderers shall submit "endurance test" conforming compliance with IS:13018/1990 (Reaff 2005) for LOWEST & HIGHEST rating of these turbo charged engines. These endurance tests may be carried out by engine manufacturers on their own test beds and under their own supervision. The self certified copies (i.e. certified by engine manufacturers) of these tests shall be submitted by firms for registration.
 - b) For new models of turbocharged engines i.e. the engines which are not in market in more than 500 nos. prior to date of Tender opening, tenderers shall submit "endurance test" for EACH and every model of engine conforming compliance to IS: 13018/1990 (Reaff 2005) from a Govt. Lab.

Apart from above, these Engine manufacturers shall also carry out "rating tests" conforming compliance with IS:13018/1990(reaffirmed 2005)AND IS: 10,000 series. covering governing speed, specific fuel consumption, Lube oil consumption & exhaust temperature tests for each model of the engine in the presence of rep. of purchaser for the purpose of testing.

However, all the turbocharged engines models/ratings will need other relevant certifications as per norms in both the cases.

4. Type approval certificate for "emission norms" for engine from certification agency as per notification no.GSR 371(E) dated 17.05.2002 amended up to date.
5. Type approval certificate of DG set for "noise norms" with turbo engine model combination from certification agency as per notification no.GSR 371(E) dated 17.05.2002 amended up to date.
6. Type test certificate from any Govt Lab for IP-53 degree of protection for AMF pan
7. Routine Test certificate of engine, alternator and control panel under supply.
8. DG Sets should be self-contained units supplied with the acoustic enclosure. Therefore supplier shall have to furnish the foundation details along with the DG Set to facilitate the process of installation & erection of DG set.
9. While dispatching the DG Sets to the consignee, the supplier shall issue letters to respected Engine /alternator manufacturer whose engine/alternator have been used in their DG Set supplied, informing them about the consignee's details including Name, Location so as to take care of the maintenance requirement in future at consignee's end. Simultaneously, Consignees will also be informed about the above details of service centre i.e. Name, mailing address, e-mail address, telephone Nos. and name of the contact person etc. of the turbo engine/alternator manufacturer who may be contacted for obtaining the service support & due maintenance.

(D). Tenderer shall confirm that DG set shall meet the requirements of Environmental (Protection) rules 1986 as laid down by Ministry of Environment and Forest read with GSR 371(E) dated 17.05.2002, GSR 520(E) dated 01.07.200, GSR 448(E) dated 12.07.2004, GSR 771(E) dated 11.12.2013 & GSR 232(E) dated 31.03.2014 in respect of emission norms for engine & noise norms for DG Sets. The latest amendments to above GSRs shall be applicable.

(E). DG set shall also meet all the other statutory requirements as notified by the Government from time to time. Tenderers shall give complete details as per the questionnaire in this regard for each item quoted.

INSTALLATION AND COMMISSIONING OF 500 KVA DG SET:

The responsibility for installing and commissioning of DG sets shall be that of the firm. The bidder shall have to complete installation, testing and commissioning of DG set. The scope of installation and commissioning shall be as follows:

1. Foundation:

Foundation shall be of RCC type with the ratio of 4:2:1. The length and breadth of the foundation shall be 300 mm more from the respective length and breadth of the DG set. The height of the foundation shall be 400 mm i.e. 200 mm below and 200 mm above the ground level.

2. Cable:

Armoured Aluminium LT cable and its necessary laying and termination shall be done by tenderer. For DG sets, 4 core or higher core cables shall be used. Contractor shall have to provide Control cable from DG sets to AMF control panel.

3. Earthing:

Building suitable earthing station and necessary connections shall be done by bidder. The total number of earthing pits/stations shall be 4 i.e. 2 for neutral and 2 for body-earthing.

The consignee should choose installation site in such a way that the earthing stations can be made within 20 metres of the DG set. Earthing station shall be typically built as per prevalent standard practices.

4. Installation of Fuel tank, battery charging, and battery connection.
5. Unloading and placement of DG set on foundation.
6. First fill of lube oil and all filters shall be provided by the contractor. The contractor shall have to provide 200 litres diesel.
7. The consumables provided by the contractor cover the trial run of DG set as well. The contractor shall conduct trial run of the DG set with the available electrical load at site. The trial run shall be for ONE hour. The available electrical load shall be less than or equal to the rated capacity of the DG set.
8. Exhaust piping shall be provided by the contractor.

SPECIAL NOTE TO TENDERERS:

- 1) DG set and diesel engine shall meet the specified norms of Central Pollution Control Board. They shall submit certificate in this regard.
- 2) Necessary gauges/meter shall be installed to indicate the quantity of diesel input, quantity of diesel consumed and the number of hours of DG set operation.

- 3) Tenderer shall indicate specific fuel consumption of DG set.

TESTING:

The contractor has to arrange for testing and inspection of DG set complete with AMF panel at manufacture's work for which all arrangement i.e. fixing of time & date with manufacturer, arranging testing instruments, etc. shall have to be made by contractor at his own cost. The DG set shall be tested in accordance with IE rules and relevant ISS & standard code of practice.

Note:- 1-Contractor has to submit drawing of complete set including AMF panel and battery system before supplying of DG set at site.

2- The contractor has to supply one toolbox having all standard tools and spanners and operating manuals etc.

3-Contractor has to supply manual operated fuel pump for filling diesel in DG set tank.

4-After erection of DG set, on load test to be done, for which required diesel will be arranged by the contractor.

5-Foundation & cable trench as recommended by manufacturer will be cast by contractor at his own cost for which no extra payment will be made.

250 KVA DG SET WITH AMF PANEL WITH SOUND & WEATHER PROOF ACOUSTIC ENCLOSURE (Item No. 100)

The contractor shall have to supply, installation, testing and commissioning of 3 phase, 250 KVA DG Set complete with all accessories.

Make- Cummins, Kirlosker Green, Caterpillar, Greaves Cotton, Ashok Leyland, Mahindra, TATA, Panta-Volvo only.

(A) DETAILED SPECIFICATION FOR ALTERNATOR, TURBO-CHARGED DIESEL ENGINE AND AMF CONTROL PANEL:-p

Diesel Generating set complete with turbo charged Diesel Engine, Alternator and AMF Control Panel conforming to the specification given below. Turbo charged Diesel engine and alternator shall be closely coupled or provided with flexible coupling and mounted on a base plate of robust in construction. DG Set shall meet the requirements of environmental protection rules, 1986 as laid down by Ministry of Environmental & Forest read with GSR 371(E) dated 17.05.2002, GSR 520(E) dated 01.07.2003, GSR 448(E) dated 12.07.2004, GSR 771(E) dated 11.12.2013 & GSR 232(E) dtd. 31.03.2014, Gazetted notification no. 167 dtd. 31.03.2014 & gazetted notification no. 578 dtd. 11.11.2014 amended upto date, in respect of "emission norms" for the engine and in respect of "noise norms" for DG sets. DG Set shall meet the requirements of latest CPCB emission & noise norms. Turbocharged engine shall conform to IS:13018/1990(reaffirmed 2005)AND IS: 10,000 series (with latest amendments).

DG Set should have protection against under voltage, over voltage, under frequency, over frequency, low battery voltage, over current, earth fault, short circuit, phase sequence change etc.

(1) ALTERNATOR:

The alternator shall be self excited and self regulated of 250 KVA rating in three phase at 415 Volts, 4 wire , 50 Hz, 1500 RPM & 0.8 PF and shall conform to IS:13364(Part 2)/1992 (reaffirmed 2008). The alternator shall be of brushless type only with VG-2 Grade of voltage regulation. The alternators shall be screen protected, drip proof with IP-21 or better degree of protection as per IS:4691/85 (reaffirmed 2004). The alternator should be suitable to take unbalanced load as per IS:13364(Part-2)/1992(reaffirmed 2008). The Alternator shall have Class H insulation.

(2)TURBOCHARGED DIESEL ENGINE:

The turbocharged Diesel Engine shall be water cooled, electric start developing required BHP at 1500 RPM with class A-2 or better governing to deliver continuous 250 KVA output at 0.8 Power Factor Lag at NTP conditions. The Diesel engine should be capable of providing 10% overload for one hour in every 12 hours continuous running at full load. The turbocharged Diesel engine shall conform to IS:13018/1990(reaffirmed 2005) AND IS: 10,000 series (with latest amendment) Specific fuel consumption(SFC)shall be as per IS specification.

The Turbocharged Diesel engine shall be complete with the following accessories:

- l) Fuel tank with air breather, drain plug with capacity of Minimum 990 Liter.
- m) Engine controller consisting of start button with display for, lube oil temperature and pressure gauges, RPM indicator and hour meter with additional feature of auto start/remote start and auto stop.
- n) Safety control to shut down the engine in the event of over-speed, low lube oil pressure and high engine water temperature.
- o) Exhaust silencer residential type.
- p) 24 V starting system complete charging alternator or dynamo and cutout.
- q) Low Maintenance Lead Acid batteries of suitably rated AH with connecting cables. The batteries shall be supplied conform to relevant IS. Only the following make of batteries shall be accepted- **Amar Raja, Excide, CSB, Hitachi, Okaya, Panasonic, Luminous, Amron.**
- r) Anti-Vibration mountings for complete DG set in case of flexible coupling and for turbocharged engine in case of direct coupling.
- s) The fuel level should be indicated with the help of fuel gauge meter.
- t) There should be provision for filling the fuel from outside with locking arrangement.
- u) Contractor shall have to provide one spare battery charger set suitable for 12V/24V, 240 AH LMLA batteries.
- v) During the warranty period, scheduled 'B' check shall have to be carried out by contractor at his own cost.

Contractor shall carried out following work two times during the 'B' check maintenance.

S. No.	Description of item
1	Removing of existing diesel filter and providing of new one.
2	Removing of existing oil filter and providing of new one.
3	Removing of existing super bypass filter and providing of new one.
4	Supply and providing of coolant 4 Tin each of 5 liters
5	Removing of existing air filter element outer and providing of new one.
6	Removing of existing air filter element inner and providing of new one.
7	Removing of existing C R element with plates and providing of new one.
8.	Removing of existing turbo oil filter elements outer and providing of new one.
9.	Replacing of the lube oil. The Lube Oil shall be supplied by Railway for B check.

AUTOMATIC MAINS FAILURE PANEL -250 KVA (AMF Panel):-

AMF control panel shall be able to start up the DG set and transfer the load to DG set on the Mains failure without requiring any human intervention. Similarly on restoration of the Mains supply it shall be able to transfer the load to Mains supply and switch off the DG Set automatically.

AMF panel suitable for 250 KVA DG set suitable for two incoming supply one from local and other from DG set supply.

- The contractor shall have to design, supply, install, test and commission AMF panel fabricated by 2mm thick MS sheet, standard angles, channels etc. as required in design. The drawing, design switch gears with make and model of the AMF panel shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before fabrication.
- The AMF panel shall be fabricated by DG Set manufacturer or CPRI approved manufacturer.
- The AMF panel shall be indoor rectangular cubicle type, dust and vermin proof suitable for 3 phase, 4-wire, 415V, 50Hz AC supply system.
- Bus bar for main circuit and neutral shall have uniform cross section electrolytic tinned copper with color coded heat shrinkable PVC insulated and current density of 1.6 Amp/mm² cross sectional area.
- Knock out / gland plates as applicable shall be provided. Gland plates of suitable size shall be designed for terminating cables in a straight and easy manner.
- All power connections from the bus bar shall be made such a manner that there is a clear metal to metal clearance at the tapping is available. Both spring washer and plate washer shall be used with stud/ nuts/to ensure proper contact pressure.

- The AMF panel shall have metal locks & operated by a common key. All covers & doors to be provided with neoprene gasket. Hinged doors shall be provided on both sides.
- The sheet steel enclosure / angle / channel used in the fabrication of panel shall be provided with double coating of red oxide and final coating of light grey powder coated paint.
- The AMF panel shall be supplied complete with base plate of 75mm, louver, four lifting hooks and feeder name plates completely wired and ready for commissioning.
- Caution board in Hindi, Gujarati & English of metallic type shall be provided on panel.
- Minimum two earth terminals shall be provided in the AMF panel all sheet steel section shall be electrically connected with a separate G.I. earth strip of 50x6 mm size across the panel at bottom.
- CT shall be cast resin type & 15VA burden, class 1.0 accuracy and shall be earthed through a separate earth link. CT shall be of Virat / Meco/ Ashmor, C&S, kuppa make or approved by Rly.
- Multi LED type indication lamp with control fuses on each incoming & out going feeder shall be provided.
- AMF panel shall be mounted on the fabricated MS Angle on floor and cemented trench for incoming and outgoing cables shall be prepared by the contractor.
- The MCB/MCCB and ACB shall be as per list enclosed make.
- The breaking capacity of MCCBs should not be less than 35KA with $I_{cs}=I_{cu}$ and should have variable setting type with thermal magnetic release & Rotary handle.
- The breaking capacity of MCBs should not be less than 10KA & 'C' curve
- The contractor shall submit three sets of drawing and wiring diagram of AMF panel along with panel at the time of supply.
- Contractor shall have to provide bus trunking between LT panel to DG set AMF panel. Suitable arrangement made on top of the panel.

The AMF panel shall be comprised with following —

- 800 Amps. – ACB, 4-pole (manually operated, draw out type, with over current, short circuit microprocessor based release and earth fault, $I_{cu}=I_{cs}=I_{cw}$ for 1 second, breaking capacity not less than 50KA - **3 Nos**
- Four Pole Power Contactor of 800 Amp – 02 Nos. (AC-3 Duty) (415V) along with 2NO+2NC Aux Contacts. – **02 Nos.**
- Thermal Based overload relay - 01Nos. Make: L&T / GE / Siemens.
- Battery Charger having 230V AC Input and 12V / 24V DC Output for battery backup of D.G. Set Battery charger complete with voltage regulator, float or booster selector switch, ON-OFF switch, Voltmeter and Ammeter for charging the battery from Mains. This will be in addition to the battery charging alternator fitted on the engine. – 01 Nos. Make: Realtech / Lunar or approved by railway.
- 1 Nos. Earth Leakage Relay along with CBCT make: L&T / Minilec / Ellico / Space

- Indicating Lamp – 230V AC Supply / 24V DC Supply for Phase Indication and Function indication as required.
- Push Button for D.G. Operations as required .
- Analog type Ampere Meter with Selector switch having capacity of 0-800/5A .
- Analog type AC voltmeter(s) of class 1.5 accuracy, 0-500 volts with selector switch. Separate voltmeter shall be provided for Mains and Alternator.
- Frequency meter Make: AE / Nippen
- Counter type Hour meter.
- Ampere Meter and Volt Meter (DC Supply) – 01 Set.
- C.T. – 15vA - 03 Nos. of Virat / Meco/ Ashmor, C&S, kuppa Make
- Digital Load Manager with RS-485 Port – 01 Nos. Make: HPL / Conzerv / L&T
- Suitable Control Terminal and Power Terminal.
- Suitable Control and Power Ckt wiring shall be done from 1.0 Sq.mm copper wire.
- Suitable copper Busbar of 800 A Capacity.
- MCB for control wiring.
- Emergency push button
- Complete Panel shall have throughout earthing bus bar.
- AC Ammeter(s) of class 1.5 accuracy and of suitable range, with selector switch.
- Mode selector switch for setting the panel on any one position such as off or auto or manual or test.
- Engine ON-OFF switch (push button type).
- Instruments and control fuses of suitable rating.
- Five nos. indicating lamps to indicate Mains Low Voltage, Load On Mains, DG Set running, Load on set and Battery charger ON.
- Audio Visual alarm for Low Lubricating Oil Pressure, High water temperature, Start Failure and DG O/L. Provide Hooter for Visual Alarm.
- Over current relay protection.

(4) ACCOUSTIC ENCLOSURE:

The accoustic enclosure shall confirm to the drawings TYPE approved by a Govt lab, for conformity to noise norms. This aspect shall also be verified by purchaser at the time of INSPECTION.

The Accoustic enclosure should consist of following :

- o) The enclosure should be fabricated out of CRCA sheet of minimum 1.6 mm thick.
- p) The sheet metal components should be suitably pretreated and should be powder coated to have long life of enclosure.
- q) The battery should be accommodated in a separate tray in the enclosure.
- r) There should be provision of drain plugs for draining lube oil and diesel.
- s) The doors should be gasketed with quality gaskets to avoid leakage of sound.
- t) The door handle should be lockable type.
- u) Sound proofing of enclosures should be done with high quality rock wool/ mineral wool/foam/fiberglass wool.
- v) The rock, mineral, fiberglass wool is further covered with fiberglass cloth and perforated powder coated sheet.
- w) A special residential silencer should be provided along with the enclosure to control exhaust noise.
- x) Specially designed louvers should be provided to control sound at air entry to the container and exit from the container.
- y) It should have Type approval certificate and also COP certificate (if applicable) from certification agencies mentioning MOEF notification No. 371(E) dated 17.05.2002 or as amended and applicable at the time of supply.
- z) Ambient temperature limit inside the canopy should be specified.
- aa) There shall be provision for emergency STOP from outside the enclosure.
- bb) Accoustic Enclosure shall conform to pollution noise norms stipulated in notification GSR 371(E) dated 17.05.2002, amended upto date.

(B) Supplier shall provide the testing facilities for the following tests in their works at the time of inspection. The inspection report proforma is attached alongwith.

- (i) The testing of diesel generating sets of all rating will be done with a load of 0.8 pf lag.
- (ii) The sample size shall be 100% of the offered quantity of DG sets for conducting acceptance tests except test at S.No.vi below (i.e. load test), for which only 10% sample shall be tested.
- (iii) The facility for checking of alignment of DG set before subjecting to load test for which tolerance is 0.01 mm in case of flexible coupled DG set and not applicable for direct coupled.
- (iv) Voltage regulation test at 0.8 pf lag.
- (v) Full load test for 4 hours at rated KW at 0.8 pf lag.
- (vi) After 4 hours full load test, 10% overload test shall be conducted for one hour at 0.8 pf lag. DG set should be capable of running at full-load test for one hour, after the overload test. The parameters should meet the requirements at full load, conducted after the over-load test.

- (vii) High voltage test at 1.6 KV for one minute after the load test.
- (viii) Insulation resistance test.
- (ix) Checking for the trouble free starting and oil leakage.
- (x) High voltage and insulation resistance tests should be conducted on alternator as well as control panel after the load test.
- (xi) The control panel will be checked for functional requirements and completeness.
- (xii) Vibration test: Vibration below AVM's should not exceed 100 microns.

(C) Supplier shall also provide following documents to purchaser at the time of inspection.

1. DG Sets manufacturer's shall furnish invoices and OEM's test certificates for turbocharged engine/alternators used, at the time of inspection from the original manufacturer. The Invoice should have been billed directly to DG sets manufacturer. Original will be shown to the visiting inspector for verification during inspection.
2. Valid Calibration certificates of all the testing meters from any Govt. Lab.
3. Complete & satisfactory Type test certificate (TTC) for turbocharged engines, alternators complete with enclosure to be used by them for DG sets clearly identifying make, model and ratings of the DG sets tested to the purchaser at the time of pre despatch inspection. The TTC of three phase alternators shall cover unbalanced load test as per cl.24 of IS:13364(part2)/1992(reaff 2008) as applicable. The TTC shall be from any Govt. Lab. Type testing witnessed by the representative of purchaser at the firm's premises shall also be acceptable.
 - a) For turbo charged engines, which are in market in more than 500 nos. prior to date of T.O., tenderers shall submit "endurance test" conforming compliance with IS:13018/1990 (Reaff 2005) for LOWEST & HIGHEST rating of these turbo charged engines. These endurance tests may be carried out by engine manufacturers on their own test beds and under their own supervision. The self certified copies (i.e. certified by engine manufacturers) of these tests shall be submitted by firms for registration.
 - b) For new models of turbocharged engines i.e. the engines which are not in market in more than 500 nos. prior to date of Tender opening, tenderers shall submit "endurance test" for EACH and every model of engine conforming compliance to IS: 13018/1990 (Reaff 2005) from a Govt. Lab.

Apart from above, these Engine manufacturers shall also carry out "rating tests" conforming compliance with IS:13018/1990(reaffirmed 2005)AND IS: 10,000 series. covering governing speed, specific fuel consumption, Lube oil consumption & exhaust temperature tests for each model of the engine in the presence of rep. of purchaser for the purpose of testing.

However, all the turbocharged engines models/ratings will need other relevant certifications as per norms in both the cases.

4. Type approval certificate for "emission norms" for engine from certification agency as per notification no.GSR 371(E) dated 17.05.2002 amended up to date.
5. Type approval certificate of DG set for "noise norms" with turbo engine model combination from certification agency as per notification no.GSR 371(E) dated 17.05.2002 amended up to date.

6. Type test certificate from any Govt Lab for IP-53 degree of protection for AMF pan
 7. Routine Test certificate of engine, alternator and control panel under supply.
 8. DG Sets should be self-contained units supplied with the accoustic enclosure. Therefore supplier shall have to furnish the foundation details along with the DG Set to facilitate the process of installation & erection of DG set.
 9. While dispatching the DG Sets to the consignee, the supplier shall issue letters to respected Engine /alternator manufacturer whose engine/alternator have been used in their DG Set supplied, informing them about the consignee's details including Name, Location so as to take care of the maintenance requirement in future at consignee's end. Simultaneously, Consignees will also be informed about the above details of service centre i.e. Name, mailing address, e-mail address, telephone Nos. and name of the contact person etc. of the turbo engine/alternator manufacturer who may be contacted for obtaining the service support & due maintenance.
- (D). Tenderer shall confirm that DG set shall meet the requirements of Environmental (Protection) rules 1986 as laid down by Ministry of Environment and Forest read with GSR 371(E) dated 17.05.2002, GSR 520(E) dated 01.07.200, GSR 448(E) dated 12.07.2004, GSR 771(E) dated 11.12.2013 & GSR 232(E) dated 31.03.2014 in respect of emission norms for engine & noise norms for DG Sets. The latest amendments to above GSRs shall be applicable.
- (E). DG set shall also meet all the other statutory requirements as notified by the Government from time to time. Tenderers shall give complete details as per the questionnaire in this regard for each item quoted.

INSTALLATION AND COMMISSIONING OF 250 KVA DG SET:

The responsibility for installing and commissioning of DG sets shall be that of the firm. The bidder shall have to complete installation, testing and commissioning of DG set. The scope of installation and commissioning shall be as follows:

1. Foundation:

Foundation shall be of RCC type with the ratio of 4:2:1. The length and breadth of the foundation shall be 300 mm more from the respective length and breadth of the DG set. The height of the foundation shall be 400 mm i.e. 200 mm below and 200 mm above the ground level.

2. Cable:

Armoured Aluminium LT cable and its necessary laying and termination shall be done by tenderer. For DG sets, 4 core or higher core cables shall be used. Contractor shall have to provide Cotrol cable from DG sets to AMF control panel.

3. Earthing:

Building suitable earthing station and necessary connections shall be done by bidder. The total number of earthing pits/stations shall be 4 i.e. 2 for neutral and 2 for body-earthing.

The consignee should choose installation site in such a way that the earthing stations can be made within 20 metres of the DG set. Earthing station shall be typically built as per prevalent standard practices.

4. Installation of Fuel tank, battery charging, and battery connection.

5. Unloading and placement of DG set on foundation.

6. First fill of lube oil and all filters shall be provided by the contractor. The contractor shall have to provide 200 litres diesel.
7. The consumables provided by the contractor cover the trial run of DG set as well. The contractor shall conduct trial run of the DG set with the available electrical load at site. The trial run shall be for ONE hour. The available electrical load shall be less than or equal to the rated capacity of the DG set.
8. Exhaust piping shall be provided by the contractor.

SPECIAL NOTE TO TENDERERS:

- 4) DG set and diesel engine shall meet the specified norms of Central Pollution Control Board. They shall submit certificate in this regard.
- 5) Necessary gauges/meter shall be installed to indicate the quantity of diesel input, quantity of diesel consumed and the number of hours of DG set operation.
- 6) Tenderer shall indicate specific fuel consumption of DG set.

TESTING:

The contractor has to arrange for testing and inspection of DG set complete with AMF panel at manufacture's work for which all arrangement i.e. fixing of time & date with manufacturer, arranging testing instruments, etc. shall have to be made by contractor at his own cost. The DG set shall be tested in accordance with IE rules and relevant ISS & standard code of practice.

Note:- 1-Contractor has to submit drawing of complete set including AMF panel and battery system before supplying of DG set at site.

2- The contractor has to supply one toolbox having all standard tools and spanners and operating manuals etc.

3-Contractor has to supply manual operated fuel pump for filling diesel in DG set tank.

4-After erection of DG set, on load test to be done, for which required diesel will be arranged by the contractor.

5-Foundation & cable trench as recommended by manufacturer will be cast by contractor at his own cost for which no extra payment will be made.

TOOL KIT BOX (Item No. –101)

Supply, testing and demonstration of the tool kit for maintenance staff and training purpose. The each set of tool kit shall comprise the following:

S.No.	Description	Qty.
1	Tool box (Suitcase) of size 325x440x120mm approx, with fixing arrangement for tools and locking arrangement with two no. of keys	1 No.
2	Screw driver set (star head and normal) size 200mm, 12 pieces.	1 Set
3	Combination of pliers insulated with thick CA sleeve with joint outer length 200mm	1 No.
4	T-spanner set sizes 10,13,15,17 & 18	1 Set

5	Panel key, square type ¼ size suitable for opening of control panel of ac coaches make MB/Hindustan	1 No.
6	Key suitable for opening FL & CFL fittings of AC coaches make MB/Hindustan	1 No.
8	Torch two cell along with two nos cell 1.5 volt make Everyday/Geep	1 No.
9	DE spanner set 8 pcs of size 6/7, 8/9, 10/11, 12/13, 14/15, 16/17, 18/19, 20/22. Make Taparia/Jhalani.	1 Set
10	Allen key size 1/16", to 3/8" 10 pcs. Make Taparia/Jhalani.	1 Set
11	Heavy duty cable cutting knife adjustable in-aluminum casing overall size 140 mm make Taparia/Jhalani.	1 No.
12	Adjustable spanner length 250mm make Taparia/Jhalani	1 No.
13	Digital thermometer pen type range -50 to 300 deg. Centigrade. With Fahrenheit and centigrade reading (imported)	1 No.
14	Nose plier 6" make Taparia/Jhalani	1 No.
15	Digital type 3.75 digital tong tester range (1000 V dc). 750 V AC as per Meco model DT 2250 make Meco/Motwane/Agronic.	1 No.
16	Hammer 500 gm with handle make Taparia/Jhalani/Gador	1 No.
17	Hacksaw frame complete with blade and one spare blade make Taparia/Jhalani/Gador	1 No.
18	Referigrent gas charging line- length 2 meter, make galaxy or similar	1 No.
19	Referigrent gas charging adopter, make DIJ or similar.	1 No.
20	Phase Tester, make Taparia/Jhalani.	1 No.

Note- The make and model and shall be got approved from Dy.CEE (C) RJT before supply

WATER COOLER-150 Ltrs (ITEM No.-102)

The Contractor shall have to supply, installation, testing and commissioning Self Contained Drinking water cooler with (Non CFC Refrigerant) Energy Efficient Compressor. Cooling Capacity-Ltrs/Hr-150, IS: 1475 latest, Type-Storage, Storage Capacity- ltrs-150, stainless steel body. Provide the same at different locations as decided by Railway site Engineer. Necessary mounting arrangement, flexible pipe and accessories of water cooler done by contractor

Make- Voltas, Blue star, Usha, Fedders Lloyd as per list enclosed.

Note:-The make & model of water cooler shall be submitted by the contractor & got approved by Dy. Chief Electrical Engineer (Constn) W-Rly, Ahmedabad before supply at site.

8 LOCKER STEEL CUP BOARD (Item No.103)

Contractor has to supply 8 locker steel cup board made of 18 SWG CRCA sheet. Having individual locker/s inbuilt locking Arrangement, size -6.5 feet x3.0 feet x 19 inch & light gray colour and got approved By Rly.

Make- Heera or HOF or Ambica or Godrej or approved by Rly before supply at site.

Note:- Inspection of above item shall be offered by contractor at the manufacturer's premises at his own cost before supply at site.

ALMIRAH STEEL(Item No.104)

Contractor has to supply steel almirah made of 18 SWG CRCA sheet. Having 5 shelves, inbuilt locking Arrangement, size –78” x 36” x 19” light gray colour & Got approved By Rly before supply at site. Make-Heera or HOF or Ambica or Godrej or approved by Rly before supply at site.

CHAIR (Item No. 105)

The chair shall be made A type MS pipe & cushion type seat and back of Heera model No. VC -13 or HOF model no SVA-101 or Ambica model no-360 or approved by Rly before supply at site.

Note:- Inspection of above item shall be offered by contractor at the manufacturer's premises at his own cost before supply at site.

STEEL TABLE (Item No. 106)

The table shall be made of MS pipe frame, Sun mica wooden top size 4.5 feet x 2.5 feet , double drawer with locking arrangement & light gray colour.

Make- Heera, HOF , Ambica, Godrej or approved by Rly before supply at site.

Note:- Inspection of above item shall be offered by contractor at the manufacturer's premises at his own cost before supply at site.

PORTABLE HAND DRILL MACHINE(Item No. 107)

The contractor shall to supply hand operated light duty drilling machine, 230V rating 15 minutes ON & 15 minutes OFF complete with connecting cord and suitable 3 pin top for drill bit of sizes up to 10mm. This also includes the supply of one set of drill bits of sizes 1mm to 13mm in the steps of 0.5mm (25nos. total drill bits).

The make and model of table shall be got approved by Dy.CEE/C/ADI before supply at site.

PORTABLE BLOWER (Item No.108)

Portable air blower suitable for 230V AC, 50 Hz. Wolf model no NWB, 350 w, Air velocity -308 KMPH /Hitachi-335 W, 2.3 Cub Mtr/Min OR other ISI mark approved by Railway.

DIGITAL CLIP-ON METER (TONG TESTER (Item No 109)

Contractor has to supply digital clip-on meter MECO model No.3600 OR KUSAM MECO Model No-9999 or similar approved by railway complete with testing leads, Battery, Manual & Carrying case.

DIGITAL EARTH TESTER WITH TESTING KIT (Item No.110)

Contractor has to supply digital type earth tester with LCD digital display complete with external probe & battery operated of KUSAM MECO model No. KM 1520 OR Motwane model no-DET20 with accessories or Agrawal Electronics model no WACO-

DERT for Earth tester with AGRRONIC-KIT for testing kit complete with testing leads, spikes, hammer etc

DIGITAL INSULATION TESTER (Item No-111)

Contractor has to supply digital insulation tester of KUSAM MECO make model No. KM 370 OR Agrawal Electronics model no AGRONIC-IT2V complete with testing leads.

SELF SUPPORTING LADDER (Item No. 112)

Contractor has to Supply Aluminium self-supporting ladder with flat step Size 8 feet height & made of 12 Gauge Aluminium C section. Make:- Heera model No. HI 154 or Balaad or Stackers & Movers India or similar as per List enclosed and shall be got approved from DYCEE/C/RJT before supply only.

Note:- Inspection of ladder shall be offered by contractor at the manufacturer's premises at his own cost before supply at site.

RUBBER MATTING:- Item No. -113

Contractor has to supply and provide ISI mark rubber matting sheet suitable for 11KV, Class-B in panel room for the insulation above the ground. As per IS 15652/2006 with latest amendment, Max use voltage-11 KV, AC proof voltage -22 KV, Dielectric strength-45 KVA, Leakage current-Max 10 Micro Ampere, Width-1.0 Mtr & thickness - 2.5 mm. Rubber matting Sheet will be supplied with Test certificate for routine test as per relevant ISS & got approved By RLY before supply at site as per IS – 5424 or latest.

DCP TYPE FIRE EXTINGUISHER (Item No 114)

Contractor has to supply dry chemical powder type fire extinguisher of 05 kg capacity duly filled & ready for use and got approved By Rly before supply at site. It should be provided on wall with suitable clamp. Location shall be advice by Site Engineer.

FIRE BUCKET (item No. 115)

Contractor has to supply set of 6Nos. fire bucket of approx. 10 liter capacities, filled with river sand, Red painted & mounted on MS stand at outside substation. MS stand fabricated by MS Channel (I Section) of suitable size, MS Rod & locking arrangement etc. MS stand shall be grouted by providing RCC foundation.

SELF SUPPORTING LADDER (Item No. 116)

Contractor has to Supply Aluminium self-supporting ladder with flat step Size 15 feet height & made of 12 Gauge Aluminium C section. Make:- Heera model No. HI 154

or Balaad or Stackers & Movers India or similar as per List enclosed and shall be got approved from DYCEE/C/RJT before supply only.

Note:- Inspection of ladder shall be offered by contractor at the manufacturer's premises at his own cost before supply at site.

RMPU MAINTANANCE LADDER (Item No. -117)

1. Manufacture, supply and fixing of ladder for sick line for access to Roof of AC coaches for RMPU checking as per drawing 207/Chg/NDLS/06.
2. The welding quality for fabrication shall be as per IS standards. There shall be no sharp edges after fabrication and all sharp edges shall be smoothened.
3. Paint touch ups shall be done after complete fitment of the ladder at the washing line and primer coat of polyurethane must be provided before painting.
4. The ladder shall be manufactured keeping in view the best balance while workmen are standing at top corner position of ladder.
5. Four nos. suitable wheels to bear the shall be provided at the base of the ladder for smooth movement of the ladder. The wheels shall be so fitted that movement of ladder. The wheels shall be so fitted that movement of ladder is easy.
6. Where ever MS sheets is to be used, it should be of checkered type.
7. All MS pipe shall be heavy duty MS pipe.

Note- The make and model and shall be got approved from DYCEE/C/RJT before supply

HAND GLOWS (Item No 118)

Contractor has to supply rubber Hand Gloves suitable for working potential 20 KV, test potential 33 KV, as per ISI spec -4770-1991 , glove size -380 mm & got approved by Rly before supply at site.

G.I. STRIP FOR CONNECTING EARTHING Item No. 119

Contractor has to supply and provide GI strip size-50x6 mm with PVC sleeve for providing interconnections for different panels and transformers to earthing. GI strip should be connected with nuts/bolts if required and not by welding.

LIST OF APPROVED MAKES

- 1) **Transformer:-** AREVA, ABB, EMCO, Crompton, BHEL, Voltamp, Kirloskar, Bharat Bijlee, NGEF, Voltas, GEC, Tesla, Siemens, Western Electric, IMP, Vivekanand, RTS, National.
- 2) **DG Set Silent** : Cummins, Kirlosker Green, Caterpillar, Greaves Cotton, Ashok Leyland, Mahindra, TATA, Panta-Volvo.
- 3) **A.C. Unit (Window/Split Type)** - Hitachi, LG, Samsung, Voltas, Blue star, Carrier, Fedders Lloyd, Videocon, Godrej, Onida, Toshiba, Panasonic, Haier, O General, Daikin.
- 4) **All type of Fans** –Crompton, Usha, GEC, Almonard, Khaitan, Bajaj, Havells, Orient, Anchor, Polar, Alfa, Inova, Unique.
- 5) **Water Heater/ Geyser** - Venus, Bajaj, Recold, Voltas, Ditz, Crompton, Usha, Havells, Spherehot.
- 6) **Water Cooler**- Voltas, Blue star, Usha, Fedders Lloyd.
- 7) **Motor & Pump sets** – Kirloskar, Crompton, Siemens, NGEF, KSB, Taxmo, ABB, Jhonson, Jyoti, Shakti, Beacon, Calama, Amrut, Shriram, Lubi, KDS.
- 8) **Electrical Switch Gear and Relays** – L & T, GE, Siemens, Indo Asian, Havells, ABB, Crompton, Schneider, C&S, HPL, Beicco Lawrie, Voltas, BHEL, Areva, Legrand, BCH, Standard, Bentec, MEI, Jyoti.
- 9) **G.I. Octagonal Pole/ High Mast**- Bajaj, Philips, Crompton, BPP, Utkarsh, Transrail, Ambica.
- 10) **LED LUMINAIRES** – As per CEE/WR Spec. WR/CCG/Specification/P/001 (Rev-01) 2018 or Latest. (Ref-RDSO Specification No-RDSO/PE/SPEC/PS/0123 (Rev-0)-2009 with Amendment-1 .
- 11) **Lead Acid battery** – Amar Raja, Excide, CSB, Hitachi, Okaya, Panasonic, Luminous, Amron.
- 12) **Modular Switches/ Fan Regulator/ Socket and Accessories** – Anchor/Roma, Cona, Leader, Crabtree, Legrand, C&S, HPL, Indo Asian, Havells, Standard, Bentec, Elleys, Precision, Vihan.
- 13) **LT/HT Joints and End Termination** - Raychem, Denson, M-Seal, 3M, CCI, Mahendra & Mahendra.
- 14) **Copper Wire / PVC Casing Caping / PVC Conduit** –ISI mark confirming to relevant IS with Approval of Officer incharge.

Note- For all other items Not included specifically in above list, Contractor shall supply material as per relevant standard as indicated in the tender with Approval of Officer incharge.



WESTERN RAILWAY
पश्चिम रेलवे
GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
भारत सरकार
रेल मंत्रालय

**SPECIFICATION FOR ENERGY EFFICIENT LED BASED LUMINAIRE
 FOR OUTDOOR & INDOOR APPLICATION (GENERAL SERVICES)
 SPECIFICATION NO. WR/CCG/SPECIFICATION/P/001(REV-01) – 2018**

1. FOREWORD :

At present conventional type luminaries are being provided for Indoor lighting offices, street lights & platform lighting. By introduction of white high power lights emitting diode, LED having more than 50,000 working hours. It is possible to use LED lamps in place of existing fluorescent T-8/T-5/HVSV/Metal halide. LED lights are almost maintenance free and as a result total power saving is expecting to be more than 50% keeping in view energy conservation, increased life and recurring savings on account of maintenance, use of environment friendly energy efficient LED base luminaire is being considered for indoor & outdoor lighting.

2. DETAILS OF EXISTING & PROPOSED FITTINGS –

Sr. No.	Type of Existing fitting	Wattage of existing fitting.	Proposed fittings	Maximum wattage of LED fitting	Minimum Initial Lumen Output	Application
A	For Outdoor: Street light, High Mast & Platform open area.					
i) a.	HPSV/ HPMV	70W	LED	50W	4000	Circulating area.
b.		150W	LED	100W	8000	Outdoor Lighting,
c.		250W	LED	170W	13500	Yard Lighting,
d.		400W	LED	260W	20000	High Mast.
ii)a.	Metal Halide	70W	LED	50W	4000	Circulating area.
b.		150	LED	100W	8000	Outdoor Lighting,
c.		250W	LED	190W	15000	Yard Lighting, High Mast.
iii)a.	FTL	1X40W	LED	30W	2400	Street Lighting
b.		2X40W	LED	60W	4800	
iv)	Platform Lighting : (for cover sheds)					
a.	FTL	1X40W	LED	30W	2400	Platform Lighting
b.		2X40W	LED	60W	4800	
c.		1X28W	LED	18W	1440	

B	For Indoor : Offices, Service Buildings etc.					
v)	T-5/T-8 Fitting 4 ft. size	28/36W	LED	18/20W	1440/ 1600	Office & Service building
vi)	CFL Lamps	11W	LED Lamps	7W	560	Office & Service building
vii)	Recess mounting fitting 2 x 2 ft. size	2X14W	LED	2X9W	1440	Office & Service building
viii)	Down lighter	70/150 W	LED	40X80W	3200/ 6400	Office & Service building
ix)	4 ft. Tube light	28W	LED	18/20W	1440/ 1600	Office & Service building
x)	2 ft. Tube light	20W	LED	10W	800	Bulkhead LED down lighter.

3. **SCOPE**

The scope includes design, development, manufacturing, testing and supply of energy efficient luminaire complete with all accessories, LED lamps with suitable current control driver circuit including mounting arrangement for street light, platform light, recessed type & ceiling mounting arrangements etc. The luminaire shall be suitable for rugged service under the operational and environmental conditions.

Each type of luminaire shall be supplied with associated driver circuit and required optics.

The application of Energy Efficient LED based Luminaire are as under

- (i) *For outdoor : Street light, High Mast & platform open area*
- (ii) *Platform Lighting*
- (iii) *For Indoor: offices, service buildings etc.*

4. **CONSTRUCTION :**

- a) *All the luminaire shall be finalized based on the performance requirement. The detailed calculation for lux level as per clause no. 7.8 with uniform distribution including the lux distribution curve/ graph/ spatial distribution shall be submitted in support of the dimensions selected and variation thereof. Housing shall be made of 1.6mm or more thick sheet Steel conforming to IS: 513 (Grade O) or aluminum die cast having high conductivity preferably to grade 5000 or similar to high conductivity heat sink material for outdoor fittings and 1 mm or more thick sheet Steel conforming to IS: 513 (Grade O) for indoor fittings. Efforts shall be made to keep the overall outer dimensions as minimum as possible.*

All out door light fittings shall be provided with toughened glass of sufficient strength under the LED chamber to protect the LED and luminaries.

- (b) Suitable number of LED lamps shall be used in the luminaries. LED lamps of NICHIA/ CREE/ OSRAM/ SEOUL/ PHILIPS LUMILEDS/ LEDNIUM/ AVAGO make shall be used for the purpose. The manufacturer shall submit the proof of procurement of LED from above OEMs at the time of testing.
- (c) Suitable reflector / lenses may also be provided to increase the illumination angle
- (d) Supplier will be solely responsible for testing and performance of the luminaries after installation and shall also ensure the specified and uniform illumination and comfort level on the street/platform for outdoor and work desk/floor for indoor lighting.
- (e) Design of the thermal management shall be done in such a way that it shall not affect the properties of the diffuser.

4.1 High power and high lumen efficient LEDs suitable for following features shall be used:

- a) *The efficiency of the LED lamps at 110°C junction temperature shall be more than 80%.*
- b) *The working life of the lamp at junction temperature of 110°C for 350mA current shall be more than 50,000 hours of accumulative operation and shall be suitable for continuous operation of 24 hours per day these features shall be supported with datasheet.*
- c) *Adequate heat sink with proper thermal management shall be provided.*
- d) *Colour temperature of the proposed white colour LED shall be between 5700 – 6500K.*
- e) *Minimum view angle of the LED shall not be less than 120 degree*
- f) *The output of LED shall be more than 100 lumens per watt at minimal operating current and shall ensure guaranteed operation life of 50,000 burning hours with controlled junction temperature of 110°C.*
- g) *Efficiency of driver electronics shall be more than 85%.*
- h) *Power factor of complete fitting shall be more than 0.95.*
- i) *The driver card shall withstand 440V & 1.5 KV \pm 3% surge protection and shall resume normal working when nominal voltage is applied again.*
- j) *Thermal management shall be in such a way that LED junction temperature shall not go beyond 80 degree centigrade.*
- k) *Lumen maintenance report as per LM 80 standards for the LEDs used & LM 79 standards for efficacy of fixtures shall be submitted along with the offer or at the time of prototype test.*
- l) *The LED luminaire shall be free of glare.*
- m) *Color rendering index CRI \geq 75*

4.2 Specification for LED Driver :

- a) *Input voltage Range within 180Vrms to 270Vrms.*
- b) *Operating input voltage 240Vrms.*
- c) *No load power consumption $\leq 500\text{mW}$*
- d) *Maximum output voltage 105V DC $\pm 3\%$.*
- e) *Output voltage ripple should be within 3%.*
- f) *Output over voltage protection 125V DC*
- g) *Power factor 0.95.*
- h) *Full Load Efficiency $\geq 85\%$.*
- i) *THD $\leq 10\%$.*
- j) *Hot swapping.*
- k) *Current waveform should meet EN 61000-3-2*
- l) *LED Driver shall withstand, withstand voltage of 440V for 2 hours and restore normal working when normal voltage is applied.*
- m) *Maximum Temperature rise $\leq 10^\circ\text{C}$ @ 55°C T_{amb} with safety margin of 10°C*
- n) *The driver should comply to CISPR 15 for limits and methods of measurement of Radio Disturbance Characteristics.*
- o) *The equipment should comply to IEC 61547 for EMC immunity requirements.*
- p) *The control gear should be compliant to IEC 61347-2-13, IEC 62031 and IEC 62384 as per the requirements*

4.3 *The equipment should be compliant to IEC 60598-1. IEC 62031 and IEC/PAS 62612 depending on the type of luminaire.*

5.0 REFERRED STANDARDS

5.1 A For Indoor Lighting:

IS : 513	Cold rolled low carbon steel sheets and strips
IEC 60529	Classification of degree of protections provided by enclosures.
EN 55015, CISPR 15	Limits and methods of measurement of radio disturbance characteristic of electrical lighting and similar equipment.
IEC 62031	LED modules for general lighting - Safety requirements
EN 61547	Equipment for general lighting purposes – EMC immunity requirement.
IEC EN 60929	Performance, AC supplied electronics ballast for tubular fluorescent lamps performance requirement.
IEC 60598-2*1	Fixed general purpose luminaries.
IEC 60598-1	Luminaries – General requirement and tests.
IEC 61000-3-2	Electro Magnetic compatibility (EMC) Limits for Harmonic current emission – (equipment input current ≤ 16 Amps per phase.
IEC 60068-2-38	Environmental Testing - Test Z-AD: composite temperature / humidity cyclic test.
IEC 61347-2-13	Lamp control gear: particular requirements for DC or AC

	supplied electronic control gear for LED modules
IS 10322	Specification for the luminaries.
IS 4905	Method for random sampling.
LM 79	LED luminaire photometry measurement.
LM 80	Lumen Maintenance.
IEC 62384	DC or AC supplied electronic control gear for LED modules performance requirements.
IEC/PAS 62612	Self-ballasted LED lamps for general lighting services – Performance requirements.

5.2 For Outdoor Lighting:

IS : 513	Cold rolled low carbon steel sheets.
IEC 60529	Classification of degree of protections provided by enclosures.
EN 55015	RFI < 30MHZ
EN 55022	RFI > 30MHZ
EN 61000-3-2	Harmonics.
EN 61547	Immunity
EN 60929	Performance
IEC 60598-2-1	Fixed General purpose luminaries.
IEC 60598-1	General requirement and tests.
IEC 61000-3-2	Limits for Harmonic current emission–THD< 10%.
IEC 60068-2-38	Specification for Permitted Humidity Test
IS 10322	Specification for the luminaries
IS 4905	Method for random sampling.

6.0 SERVICE CONDITIONS :

Street light/Indoor light on pipe/Recess mounting type light unit complete with luminaries and mounting accessories shall be suitable for street, office complex railway platforms (covered and open) and residential colonies of Indian Railways under the following environmental conditions:-

6.1 Environmental conditions –

Maximum ambient air temperature	: 55°C (For outdoor application) & 45°C (For indoor application)
Minimum ambient air temperature	: -5°C
Max. Relative humidity	: 100%
Atmosphere	: Extremely dusty and desert weather and desert terrain in certain areas. The dust contents in air may reach as high values as 1.6 mg/m ³
Coastal area	: The equipment shall be designed to work in coastal area in humid, salt laden and corrosive atmosphere.

6.2 The maximum value of the condition in the coastal area will be as follows:

Max. pH value	: 8.5
Sulphate	: 7mg/liter

Max. Concentration of chlorine	:	6 mg/liter
Max. Conductivity	:	130 micro sec./cm
Annual rainfall	:	Ranging between 1750 - 6250 mm with thunder storm
Altitudes	:	Not exceeding 1200m above sea level.

6.3 The supplier shall provide “In the field service support” during guarantee period.

7.0 TECHNICAL REQUIREMENTS

7.1 The luminaire casing / housing shall be made of 1.6mm or more thick sheet steel conforming to IS:513 (Grade-O) or aluminum die cast having high conductivity preferably to grade 5000 or similar to high conductivity heat sink material for outdoor fittings and 1 mm or more thick sheet Steel conforming to IS: 513 (Grade O) for indoor fittings.

7.2 The electronic components used shall be as follows:-

- a) *IC (Integrated circuit) shall be of industrial grade or above.*
- b) *Metallic film/ Paper/ Polyester Capacitor shall be rated for a maximum temperature of 105°C.*
- c) *The resistors shall be preferably made of metal film of adequate rating. The actual loading versus rating shall be 3.*
- d) *The junction temperature of the Switching devices such as transistors and MOSFETs etc. shall not exceed 125°C (allowing thermal margin of 25°C).*
- e) *The conformal coating used on PCBs should be cleared and transparent and should not affect colour code of electronic components or the product code of the company.*
- f) *The heavy components shall be properly fixed. The solder connection should be with good finish.*
- g) *The electronics covered for this equipment shall pass all the tests called for in the specification. The tender shall indicate the deviation or compliance otherwise the offer may not be considered for evaluation.*
- h) *The infrastructure for Quality Assurance facilities as called for in the specification shall be available for the manufacturing of this product. The compliance shall be indicated clearly in the tender itself.*

7.3 The connecting wires used inside the luminaire, shall be low smoke halogen free, fire retardant e-beam/ PTFE cable and fuse protection shall be provided in input side.

7.4 Care shall be taken in the design that there is no water stagnation anywhere. The entire housing shall be dust and water proof having IP 65 protection for outdoor application & IP 20 protection for indoor application as per IEC 60529

7.5 The control gear shall be designed in such a way so that temperature rise of heat sink shall not be more than 10°C with respect to ambient temperature.

7.6 For platform lighting, luminaire shall be such that the glare from individual LED is restricted and shall not cause inconvenience to the public.

7.7 All the material used in the luminaire shall be halogen free and fire retardant confirming to UL 94.

7.8 Illumination Level: The fitting shall be so designed that the illumination level shall be evenly distributed and shall be free from glare. Illumination level types of luminaire shall be as below:

Sr. No.	Type Luminaries	Vertical Distance of fittings from the floor level (Mtrs.)	Minimum Illumination Level (Lux) at centre	Colour of Illumination Street Light
Street Light :				
1.	50W	5	25	Daylight white
2.	100W	7	25	Daylight white
3.	170W	7	25	Daylight white
4.	260W	7	25	Daylight white
5.	190W	7	25	Daylight white
6.	30W	5	25	Daylight white
7.	60W	7	25	Daylight white
Platform Light :				
8.	30W	4	50	Daylight white
9.	60W	4	50	Daylight white

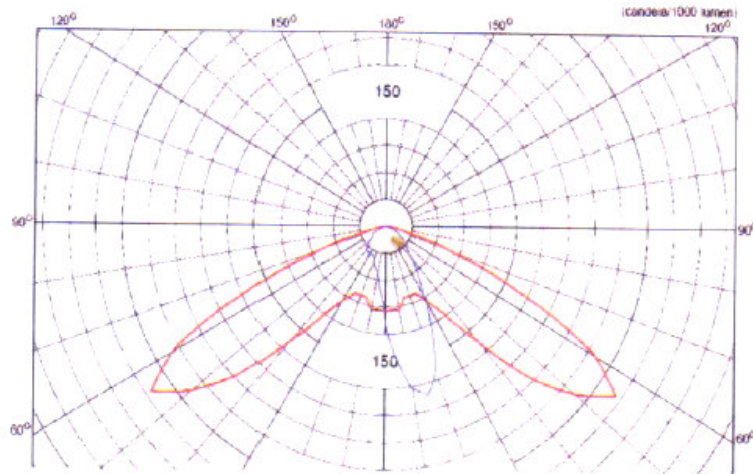
Sr. No.	Place to be illuminated	Vertical Distance of fittings from the floor level (Mtrs)	Average Illumination Level (Lux)	Colour Temp in 'K'
Indoor Light				
1.	Work areas like cabins and work stations.	2.743	250 at 1 Mtr above ground level	5500 to 7000
2.	Corridors.	2.743	125 on the floor	5500 to 7000

- Note:-**
1. Variation in illumination level shall be $\pm 2\%$ is allowed in input voltage range from 180V AC to 250V AC.
 2. The illumination shall not have infra-red and ultra-violet emission. The test certificate from the NABL approved laboratory shall be submitted.
 3. Electronic efficiency shall be more than 85%.

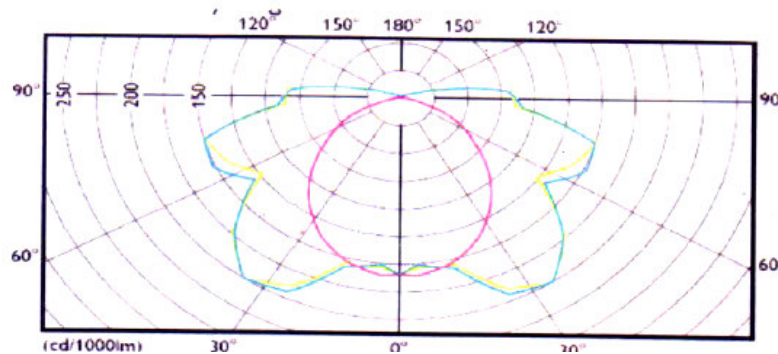
7.8.1 Polar Curves:

Typical distribution of illumination of these luminaires shall be given below:

a. Street light: (insert image)



b. Platform light: (insert image)



8.0 TESTS for Indoor and Outdoor Lighting

Tests are classified at –

- Type Test
- Acceptance Test
- Routine test

8.1 Type Test:

All the tests mentioned in the specifications should be carried out by NABL accredited lab by the manufacturer and be submitted to the inspecting agency. The inspecting agency should inspect the material based upon the same. However, no test certificate should be more than 3 years old.

8.2 Acceptance Tests:

These tests are carried out by an inspecting authority at the supplier's premises on sample taken from a lot for the purpose of acceptance of a lot. Acceptance tests shall not be carried out from particular size from the lot on which type tests have already been conducted. Recommended sampling plan is given below.

8.2.1 Sample size and criteria for conformity:

The luminaries shall be selected from the lot at random. In order to ensure randomness of selection, procedures given in IS 4905-1968 (Reaffirmed 2001) may be followed.

8.3 Routine Tests:

These tests shall be performed by the manufacturer on each complete unit of the same type and the results shall be submitted to the inspecting agency, prior to offering the lot for acceptance test the firm shall maintain the records with traceability

8.4 Test Scheme:

Sr. No.	Description of Test	Clause No.	Prototype Test (Only for outdoor)	Type Test		Acceptance Test	Routine Test
				Outdoor	Indoor		
1.	Visual and Dimensional check	9(i)	Y	Y	Y	Y	Y
2.	Checking of documents of purchase of LED	9(ii)	Y	Y	Y	Y	Y
3.	Resistance to humidity	9(iii)	Y	Y	Y	--	--
4.	Insulation resistance test	9(iv)	Y	Y	Y	Y	Y
5.	HV test	9(v)	Y	Y	Y	Y	Y
6.	Over-voltage protection	9(vi)	Y	Y	Y	--	--
7.	Surge protection	9(vii)	Y	Y	Y	--	--
8.	Reverse polarity	9(viii)	Y	Y	Y	Y	Y
9.	Temperature rise Test	9(ix)	Y	Y	Y	--	--
10.	Ra (Colour Rendering Index) measurement test	9(x)	Y	Y	Y	--	--
11.	Lux measurement	9(xi)	Y	Y	Y	Y	Y
12.	Fire retardant Test	9(xii)	Y	Y	Y	--	--
13.	Test for IP 65 protection	9(xiii)	Y	Y	Y	--	--
14.	Environmental tests	9(xv)	Y	Y		--	--
15.	Reliability Test	9(xvi)	Y	Y		--	--
16.	Life Test	9(xvii)	Y	Y	Y	--	--
17.	Endurance Test	9(xviii)	Y	Y		--	--
18.	EMI/EMC (Only for Indoor Lighting)	--	--	--	Y	--	--

9.0 Method of Testing

(i) **Visual and Dimensional Check:**

The unit shall be checked visually for all dimensions as per approved design and drawing. General workmanship should be good, all the components properly secured and sharp edges shall be rounded off. Check the marking and quality of the workmanship visually. Check the rating and make of electronic / electrical items.

(ii) **Checking of documents of purchase of LED**

Check Document of purchase of LED lamps of approved sources viz. NICHIA/OSRAM/SEOUL/PHILIPS LUMILEDS/LEDNIUM/AVAGO.

(iii) **Resistance to Humidity Test**

This is carried out by suspending the painted panels in corrosion chamber maintained at 100% RH and temperature cycle of 42 to 48 deg. C for 7 days and examining it for any sign of deterioration and corrosion of metal surface.

(iv) **Insulation Resistance Test**

The insulation resistance of the unit between earth and current carrying parts shorted together shall not be less than 2 M Ohms when measured with 500V megger.

(v) **HV Test**

Immediately after insulation resistance test, an AC voltage of 1.72KV rms (1500 + 2 x rated voltage) of sine wave form of 50 Hz shall be applied for one minute between the live parts and frame. There shall not be any kind of break down, flashover or tripping of supply.

(vi) **Over voltage protection**

The outdoor luminaire shall withstand at 415 V AC for two minutes.

(vii) **Surge protection:**

It shall withstand a surge of 1.5kV \pm 3% for 50 microsecond's \pm 20% at the input terminals for all types and shall resume normal working when nominal voltage is applied again. (Tests shall comply with Clause 5.4 of latest IEC 60571-1).

(viii) **Reverse polarity**

The Luminaire shall withstand polarity reversal. It shall be operated with reverse voltage for 5 minutes at maximum value of voltage range. At the end of this period, the supply shall be made correct polarity and Luminaire shall operate in a normal way.

(ix) **Temperature rise Test:**

Temperature rise Test shall be conducted at 180V AC for outdoor lighting and 100VAC for indoor lighting with full load. The temperature rise shall be recorded by temperature detectors mounted at the specified reference points on the body of semiconductors, capacitors and other components as agreed between purchaser and manufacturer. The maximum recorded temperature under worst conditions shall be corrected to 55°C and compared with maximum permissible temperature (for power devices at junction). Under loading conditions as specified above, the corrected temperature of the power devices shall have a safety margin of minimum 10°C Temperature at junction shall not exceed 100°C when corrected

to 55°C. The Luminaire shall also be subjected for short time rating after continuous loading to ensure the temperature rise is within the permissible limit. The maximum temperature rise of the electronics devices on the PCBs shall be in limit for industrial grade components suitable for 85°C environment. In case of exceeding limit use of MIL grade component shall be considered keeping RDSO informed.

(x) Ra (Colour Rendering Index) measurement test :

The lumen is the unit of luminous flux, which is equal to the flux emitted in a solid angle of one Steradian by a uniform point source of one candela.

The initial reading of the chromaticity co-ordinates x & y shall be within 5 SDCM (Standards Deviation for Colour matching) from the standardized rated value as per Annex. D of IEC 60081 – 1997.

The initial reading of the general colour rendering index (Ra) shall not be less than the rated value decreased by 3.

The lumen maintenance of the lamp shall not be less than 80% of the initial lumen after 20000 burning hours and 70% of the initial lumen after 50000 hours. The initial lumen will be taken after 100 hours aging.

Photometric test shall be conducted as per annexure-B of IEC 60081-97. The lumen maintenance test shall be done as per annexure C of IEC 60081-97.

(xi) Lux Measurement –

Lux measurement with the help of Lux meter shall be done at a distance as shown in para 5.8 above. Value obtained shall not be less than the Lux specified in the table therein, considering 10% Lumen is absorbed by the reflector.

(xii) Fire Retardant Test

Fire Retardant test shall be conducted as per IEC 332-1 (For outdoor Lighting) and IEC 60332-1(For indoor lighting) of the wire used in the fittings.

(xiii) Test for IP65 protection (For outdoor Lighting) & Test for IP20 protection (For Indoor Lighting)

This test shall be conducted as per IEC 60529.

(xiv) Environmental Tests –

The Luminaire shall meet the following tests as prescribed in IEC – 60571.

- a) *Dry heat test.*
- b) *Damp heat test*
- c) *Test in corrosive atmosphere*
- d) *Combined dust, humidity and heat test.*

(xv) Reliability Test:

The reliability can only be determined in actual service. However, the following tests shall be carried out on the prototype to simulate as close as possible, the service conditions. There shall be no failure during this test.

(a) *The light unit shall be mounted in an oven maintained at 75° C for outdoor lighting and 45° C for indoor lighting.*

(b) *The light will be operated at the specified maximum voltage and at 75° C for outdoor lighting and at 45°C for indoor lighting for a period of 100 hours.*

(xvi) Life Test –

For Outdoor Lighting: The lumen maintenance & life test shall be done as per annexure C of IEC 60081-97.

For Indoor Lighting: The lumen maintenance and life test shall be done as per annexure C of LM 80 report of LEDs.

(xvii) Endurance Test:

The Luminaire shall be kept “ON” with input voltage of 250VAC for 200 hours. After this the Luminaire is subjected to 20,000 cycles of “ON” and “OFF”, each cycle consisting of 3 seconds “ON” and 10 seconds “OFF” period. Luminaire should survive this test. Test is to be continued for one lakh cycles, followed by performance test.

(xviii) Safety:

The Luminaire shall comply with the safety requirements as per IEC 61195.

(xix) Vibration Test:

The complete unit cubicles together with its mounting arrangements (including shock absorbing devices, if provided) shall be subjected to vibration & shock testing (for category I class A/B) as per IEC 61373

10.0 MARKING:

The following information shall be distinctly and indelibly marked on the housing

- a) *Year of manufacture / Batch Number / Serial Number*
- b) *Name of Manufacturer*
- c) *Rated watt and voltage*
- d) *Input frequency.*

11.0 Manufacturer's Certificates:

Manufacturer should submit the certificate of having purchased LED from one of the approved source (LM-80 certificate should be submitted).

Manufactures test certificate to be submitted for (i) Mechanical strength, (ii) Endurance test and Thermal test. (ii) Resistance to dust and moisture (iv) Insulation resistance and electrical strength (v) resistance to heat, fire and tracking and (vi) photometric tests as per the IS 10322 Part-5 Sec.-2.

12.0 Guarantee :

The complete system of LED lights (including Driver etc.) shall be guaranteed for satisfactorily performance and manufacturing defects for a period of 60 months from date of commissioning or 72 months from the date of supply whichever is earlier.

End of Tender Document

(Item No. 52) 250 KVA DG set:

SITC of sound and weatherproof Diesel Generating set 250 KVA duly enclosed in Acoustic enclosure with AMF panel

Contractor shall supply, installation, testing and commissioning of 250 kVA DG Set with AMF panel having specification given as under.

Prime Rating at rated RPM (as per ISO85258)		kVA	250
		kW	200
Frequency		Hz	50
Power factor		lagging	0.8
Voltage		V	415 V, 3 Phase
Governing class (As per ISO 8528 Part-V)			G3
Noise level		dBA	<75
Fuel Consumption	At 100% load	Ltrs/hr	56.9
	At 75% load		42.6
	At 50% load		29.9
Fuel tank capacity		Ltrs	460
Electrical Battery starting Voltage		Volt-DC	24
Engine			
Rated output (Prime continuous rating as per ISO 8528-1)		kW	228
		HP	310
No. of cylinder		Number	6
Cubic Capacity		Ltrs	8.86
Bore x stroke		mm	118 x 135
Rated speed		RPM	1500
Aspiration			TA
Lube oil change period		Hrs.	500
Lube oil sump Capacity		Ltrs	27
Coolant capacity		Ltrs	31.8
Alternator			
Insulation Class			Class H
Ingress Protection			IP 23
Alternator Efficiency (at 100% Load) 0.8 pf**			93.6
Alternator Efficiency (at 75% Load) 0.8 pf**			93.9
Permissible voltage Dip at full load 0.8 pf lag			≤19%
Time Permitted to build up rated voltage at rated RPM			<1 sec provided engine reach the rated speed.
Short Circuit Ratio			0.45
Short Circuit Withstand Time		sec	3 times rated current for <3 sec
Overload Withstand Capacity		%	10% overload for one hour once in 12 hours & for 150% for 30 sec.

Contractor shall supply, installation, testing and commissioning of 250 kVA DG Set with AMF panel. Make: DG set - KOEL model No. KG1-250WS or upgraded model / or similar model of CUMMINS make and Alternator make - CROMPTON GREAVES / KIRLOSKER ELECTRICAL / STAMFORD)

INSTALLATION AND COMMISSIONING OF 250 KVA DG SET:

The responsibility for installing and commissioning of DG sets shall be that of the contractor. The bidder shall have to complete installation, testing and commissioning of DG set. The scope of installation and commissioning shall be as follows:

1. Foundation:

Foundation shall be of RCC type with the ratio of 4:2:1. The length and breadth of the foundation shall be 300 mm more from the respective length and breadth of the DG set. The height of the foundation shall be 500 mm i.e. 250 mm below and 250 mm above the ground level. cable trench of size 450mm (Breadth) x 600 mm (Depth) x 3000mm (Length) or as required at site will be made by contractor at his own cost for which no extra payment will be made.

2. Cable:

Contractor shall have to supply and provide control cable from DG sets to AMF control panel. Armoured Aluminium LT cable and its necessary laying and termination shall be done by tenderer. For DG sets, suitable size LT cable shall be used (LT cable will be supplied by Railway).

3. Earthing:

Building suitable earthing station and necessary connections shall be done by bidder. The total number of earthing pits/stations shall be 4 i.e. 2 for neutral and 2 for body earthing. The consignee should choose installation site in such a way that the earthing stations can be made within 20 metres of the DG set. Earthing station shall be typically built as per prevalent standard practices. The connection of earth to body/neutral will be done by 25 X 4 GI strip or 10 Sq. mm. PVC insulated copper wire.

NOTE:-The costing of above earthings is included in the DG set item rate itself. No separate payment shall be processed by railway for the same.

4. Installation of Fuel tank, battery charging, and battery connection.

5. *Unloading and placement of DG set on foundation.*
6. *First fill of lube oil and all filters shall be provided by the contractor. The contractor shall have to provide 100 litres diesel.*
7. *The consumables provided by the contractor cover the trial run of DG set as well. The contractor shall conduct trial run of the DG set with the available electrical load at site. The trial run shall be for ONE hour. The available electrical load shall be less than or equal to the rated capacity of the DG set. For testing load box of 100KW to be arranged by the contractor.*
8. *Exhaust piping shall be provided by the contractor.*

9. **TESTING:**

The contractor has to arrange for testing and inspection of DG set complete with AMF panel at manufacture's premises for which all arrangement i.e. fixing of time & date with manufacturer, arranging testing instruments, etc. shall have to be made by contractor at his own cost. The DG set shall be tested in accordance with IE rules and relevant ISS & standard code of practice.

AUTOMATIC MAINS FAILURE PANEL -250 KVA (AMF Panel):-

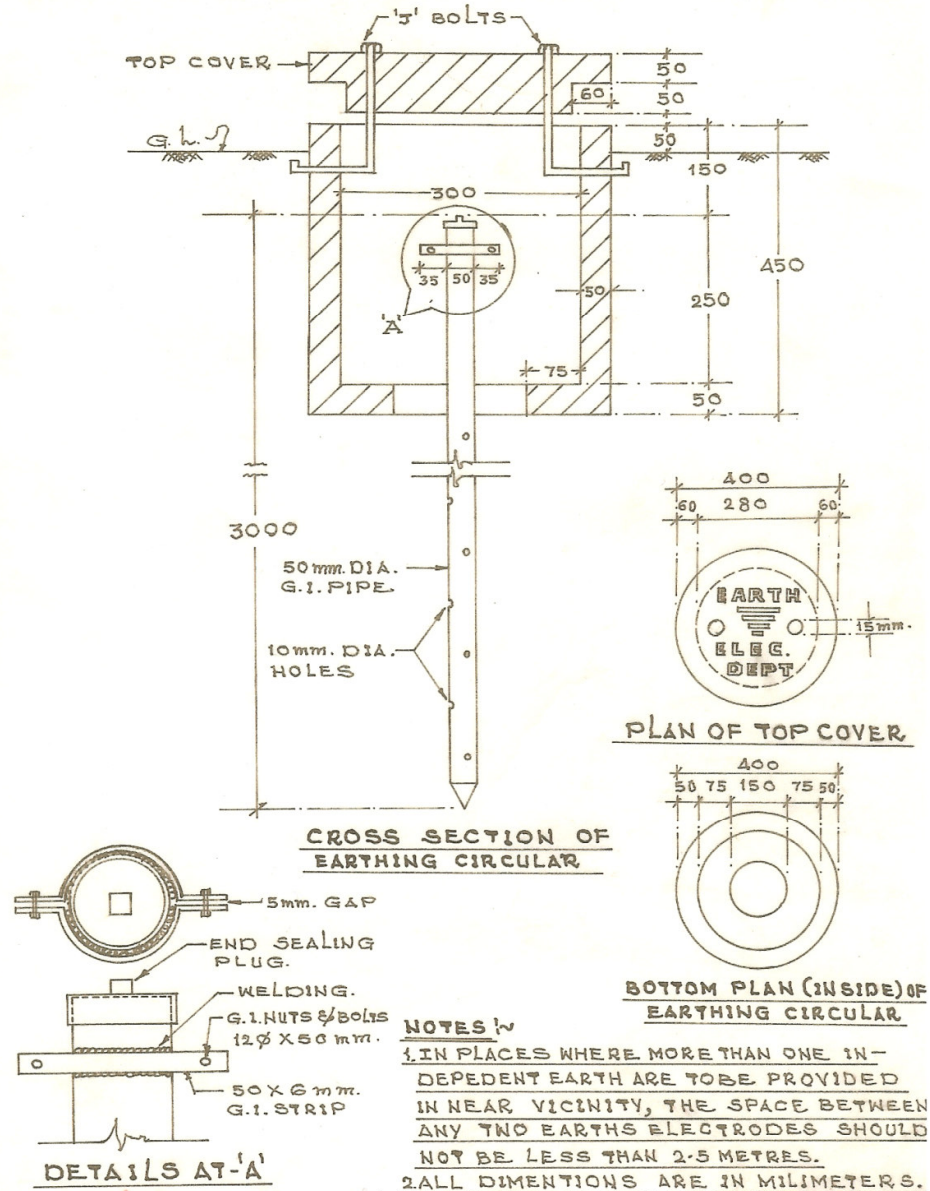
AMF control panel shall be able to start up the DG set and transfer the load to DG set on the Mains failure without requiring any human intervention. Similarly on restoration of the Mains supply it shall be able to transfer the load to Mains supply and switch off the DG Set automatically.

AMF panel suitable for 250 KVA DG set suitable for two incoming supply one from local and other from DG set supply.

Note:-

1. *Contractor has to submit drawing of complete set including AMF panel and battery system before supplying of DG set at site.*
2. *The contractor has to supply one toolbox having all standard tools and spanners and operating manuals etc.*
3. *Contractor has to supply manual operated fuel pump for filling diesel in DG set tank.*
4. *After erection of DG set, on load test to be done, for which required diesel will be arranged by the contractor.*

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