

TECHNICAL SPECIFICATIONS & EXPLANATORY NOTES

SCOPE OF THE WORK

The scope of work includes **Rajkot Division : Replacement of Type-II (16 Nos.) Qtrs. at Kothi Compound colony Rajkot** per Tender schedule, Specification and drawings or at any other station/location on Rajkot division advised by the Railway at the time of execution of work.

This job is on Turn Key basis, if any work is required to be carried out regarding this job & not mentioned in tender document should be considered within the scope of work.

Any item not specifically mentioned in the scope, specification, schedule of rate etc but required for the completion of the work including commissioning shall be arranged by the contractor. Railways shall not provide any tools, plants, machineries etc for the work and the contractor has to arrange all those things at his own costs. It is therefore advised to the tenderers to do the site inspection before quoting. However, in case of urgency of work, certain T & P may be issued to the contractor at the discretion of Engineer – in charge. Contractor shall not have any claim / Right in this matter.

EXPLANATORY NOTES ON TENDER SCHEDULE – GENERAL

Explanatory notes and general information for various items of work schedule are given below:

- a) The basic quantities of components and materials required to make a unit of work for selected items, are indicated for guidance only. There may be minor variation to suit erection but adjustment in prices of schedule shall not be made on that account.
- b) In estimating the prices for various items of work, provision for loss and wastage in transit and erection should be provided for over and above the basic quantities, components and materials required to make a unit of work.
- c) For the reconciliation of materials supplied by the Purchaser, the following procedure shall be adopted for the final reconciliation of various equipments, materials, fittings and conductors if supplied by the Purchaser.

i. All the materials supplied by the Purchaser shall be correctly accounted for, and quantities reconciled on completion of the work by the Contractor. On completion of work, all surplus materials supplied by the Purchaser together with the ones found defective or that have become, defective or broken on account of defective materials and / or workmanship, shall be returned by the contractor.

ii. If there are any shortage during final reconciliation, their cost will be recovered by the purchaser from the Contractor at the Book Rate or the last purchase rate or the prevailing market rate whichever is higher plus 5% on account of initial freight, 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 purchaser's source of supply and the contractor's depot or Railway siding shall be to the contractor's account.

[Tenderer]


[Sr.DEE/P/RJT]

- iii. All material to be supplied after procurement from approved sources as indicated in the specification.
- iv. Wherever a list of material is indicated for supply and erection, then it will mean major materials but other minor material required for completion of concerned SOR items, tenderer has to arrange the same within the rates applicable to that particular item

EXPLANATORY NOTES

The technical specifications and contractors' scope of work against supply and erection for individual items of Schedule of Rates is defined below.

(Item No. 1,2,3,4,7,8,12,13): Wiring will done in Concealed / surface manner as per specification given below as per requirement of site and direction of site incharge.

The contractor shall supply the material and carry out the concealed wiring from switch board to load point by using three number copper wires with pipe or without pipe as mentioned in schedule of rates & quantity. The copper wires should be of FRLS PVC insulated, multi-strand, single core 1.1 KV grade for phase & neutral and earth continuity in the same conduit as internal earthing of points for light, fan and 6 A plug etc.

The point wiring shall include supply & providing modular switches, sockets & accessories such as suitable size chromium plated metal boxes, cover plate, lamp holders, 3 pin ceiling rose, modular plates, etc. There shall be sufficient space (Empty modules) on switchboard to provide fan regulator & sockets, which are supplied in other item of this schedule.

Wherever required the contractor shall provide metal Jn. boxes for main/submain & light points in concealed manner with PVC connector of suitable size on sidewall.

Area of conductor sq. mm	Nos. & Dia. of wire in mm	Nominal Thickness of insulation in mm
1.5 sq. mm	22/0.30	0.7
2.5 sq. mm	36/0.30	0.8
4 sq. mm	56/0.30	0.8
6 sq. mm	84/0.30	0.8
10 sq. mm	80/0.40	1.0

M.S. sheet metal Jn. boxes in concealed manner with PVC connector of suitable size on sidewall below the ceiling for the tapping the connections of light points, which are provided in "C" channel.

The mains/submain concealed wiring for lighting circuits shall be provided by multi-strand, single core, FRLS PVC insulated 1.1 KV grade three Nos. copper wires as mentioned in schedule of rates for phase & neutral and earth continuity in the same conduit as internal earthing.

[Tenderer]


[Sr.DEE/P/RJT]

There shall be no joint in wires in boards. However if required same should be through connectors of suitable capacity.

All wiring material such as modular switches, sockets, metal box, cover plate and modular plates, lamp holders, 3 pin ceiling rose etc. should be single one make for all items from mentioned makes.

All wiring material such as modular switches, sockets, metal box, cover plate and modular plates, lamp holders, 3 pin ceiling rose etc. should conforming to IS: 3854 -1997. Cat. Nos. of these materials given as under is illustrated example and equivalent of make of these materials are as per List of Approved Make given below.

S N	Item	Cat. No.
1	10AX 1 way modular switches	21011(Roma)
2	10AX 1 way modular switches for Fan point	30840(Roma)
3	10 Amp. multi socket	30373(Roma)
4	6A/16A Twin Socket ISI.	30828(Roma)
5	16 Amp 3 pin socket heavy duty	21124(Roma)
6	Fuse unit for 16/10A	21146
7	100W Fan Regulator, 2M, ISI	20507(Roma)
8	3-Pin Ceiling Rose	149A (Leader)
9	Angular Holder	39673(Anchor)
10	Metal Box up to 2 Module	21780(Roma)
11	Metal Box up to 3 Module	21452(Roma)
12	Metal Box up to 6 Module	21463(Roma)
13	Metal Box up to 8 Module	21474 or 30453(Roma)
14	Cover Plate with Frame 1 Module	35286(Lira)
15	Cover Plate with Frame 2 Module	35297(Lira)
16	Cover Plate with Frame 3 Module	35300(Lira)
17	Cover Plate with Frame 4 Module	35311(Lira)
18	Cover Plate with Frame 6 Module	35322(Lira)
19	Cover Plate with Frame 8 Module (Horizontal)	35344 (Lira)
20	Cover Plate with Frame 8 Module (Square)	35333 (Lira)
21	Cover Plate with Frame 9 Module (Horizontal)	35388 (Lira)
22	Cover Plate with Frame 12 Module	35355 (Lira)

[Tenderer]


[Sr.DEE/P/RJT]

1.1 General guidelines for wiring works:

The completed installation, shall be tested in accordance with the provision of I.E. Rules and code of practice.

Mains/Sub main: The connection from one main/submain board to another main/submain board.

Point wiring: All wiring in a building except that covered by the terms “Mains”/ “Sub mains” and also part of the wiring required for the light, fan or plug circuit as case may be will be considered as “point wiring”.

Wiring for separate board having 4 Nos. 6 Amps 5 pin socket with modular switch for each socket: Carry out the wiring up to 3 meter with 2.5 mm. sq. size multistrand FRLS PVC insulated ISI marked copper wire for phase, neutral & one number 1.5 sq. mm. copper wire for earth continuity with PVC pipe from MDB/SDB to this separate board. If as per site condition wiring more than 3 meters is required then the additional length shall be counted as 2.5 sq. mm. mains with pipe.

Wiring for separate board having 16 Amp multipin Modular socket and switch: Carry out the wiring up to 3 meter with 4 mm. sq. size multistrand FRLS PVC insulated ISI marked copper wire for phase, neutral & one number 2.5 sq. mm. copper wire for earth continuity with PVC pipe from MDB/SDB to this separate board. If as per site condition wiring more than 3 meters is required then the additional length shall be counted as 4 sq. mm. mains with pipe.
The internal wiring of above said separate board is to be done by 4 sq. mm. PVC flexible wire.

1.2 System of internal wiring: The wiring shall be done in accordance with the Indian Electricity act 1910 and Rules 1956 as amended up to date and Rules made there under and IS 732 (Pt. I) and 732 (Pt. II) (looping back system of wiring design and constructions).

1.3 The contractor shall have to maintain the standard colour code for circuit such as phase-red, neutral-Black, earth- green/grey.

1.4 Connection to light fitting & ceiling fans and other appliances shall be done with 3- core flexible copper cable of proper size.

1.5 Passing through floors and walls: Conductors passing through the walls are to be carried in PVC pipe of the suitable size for wiring. Care should be taken that the cable pass through in straight line without twist or cross in wires, on either end of such holes in the walls.

2. Switches: All the switches shall be placed in the live or phase conductors of the circuit. The entire switch shall be single pole switch of modular type from mentioned makes and shall be “ON” when the knob is down and of type quick make and break. Marking for lights, fans should be done on switches.

[Tenderer]


[Sr.DEE/P/RJT]

3. Cables: All cables of not less than 1100 volts grade shall be used for wiring. All conductors shall be of stranded copper and no conductor (except where flexible is used) shall have a cross section area of less than 1.5 mm Sq. all stranded conductor should be provided with cable socket and lug for connections, joints and termination.

Earth continuity shall be provided with FRLS PVC insulated, multi strand, copper wire for wiring of light/fan points and mains/ sub-main as mentioned in schedule of rates and shall run along with wiring in PVC conduit pipe and no tapping in between or twisting will be permitted. All metallic parts shall be suitably earthed. All plug sockets, regulators and fans should be connected with earth continuity wire such that the resistance at the remotest point do not exceed 1 ohm. The earth resistance value of all earthings will be displayed along with the date on which earth resistance tested. Earth resistance should be measured and tested jointly.

4. Wattages: Unless otherwise specified in the schedule, the following wattages for calculating the load may be taken-

- (i) For each light point (incandescent) = 60 watts.
- (ii) For each fan point = 100 watts.
- (iii) For each plug point = 100 watts.

5. The circuit loading shall conform to the following:

- (i) Maximum number of points on any circuit - 7 Nos.
- (ii) Maximum load of any sub circuit - 750 watts.

6. Mounting height from floor level shall be generally:-

Light fittings : 2740 mm

Switches and plug sockets : 1525 mm.

Fans : 2900 mm.

7. General: Also installation carried out shall conform to IS: 732 (Pt. II) 1983 as amended latest COP for electrical wiring and fittings in building. Special care shall be taken to give superlative look/get up and the quality of work by adopting standard wiring practice, layout etc., installations shall be carried out in conformity with the requirement of I.E. Act 1910, I.E. Rules 1956, as amended up to date.

All wiring shall be as near the ceiling as possible and due consideration shall be given for neatness and good appearance.

8.1 No bare or twisted joint shall be made at intermediate points in the through run of cables unless the length of a final sub-circuit, sub-main is more than the length of the standard coil as given by manufacturer of the cable. If any jointing becomes unavoidable, such joints shall be made through proper junction boxes open to easy inspection. No joints of wires inside Board shall be allowed, if necessary, wires should be connected through connectors.

8.2 Looping in system of wiring shall be adopted.

[Tenderer]


[Sr.DEE/P/RJT]

8.3 The wiring throughout the circuit should be such that there is no break in the neutral wire in the form of switch. The neutral should be distinctly marked.

8.4 In every case when switches and fuses are fitted on the same poles these fuse should be so arranged that fuses are not alive when their respective switches are in the off position.

8.5 The wiring of all fans/light point should terminate into three point ceiling rose.

8.6 Switches controlling the sockets should be on the live side of the line. All sockets outlet should be of multi pin type with earth terminal/pin connected to earth and following E.L.N. in clock wise as per ISS.

8.7 The wiring shall be carried out strictly as per code of practice for electrical wiring installations for system voltage of 650 V, (Revised) as per IS 732 (Pt. II) 1983 as amend latest.

8.8 Contractor should employ only qualified staff to supervise and carry out the wiring installation. The supervisor should have first class Electrical Supervisor's certificate and wireman, II class wireman certificate issued by the State Government Names of supervisor's employed should be furnished to the Sr. Divisional Electrical Engineer Rajkot. Any changes in the staff should also be similarly advised.

9. Measurements: Where wiring between two points is payable in terms of lengths involved, the length will be measured from center of the switch, meter, socket or other equipments at one end to the center of the switch, meter socket or other equipment at the other end and payment will be made treating this length as the length of wiring. The measurement will be made along the run of the wiring and rounded to nearest meter.

In case of point in which a single controlling switch (for example Bell Switch) is mounted separately from a mains or sub-main board the wiring between the feeding board and the controlling switch also should be included while determining the category of the point.

10 Testing: All tests such as Earth resistance test, earth continuity test, insulation resistance test will be carried out as per IS 732 (Pt. III) 1983 as amended latest and I.E. Act and Rules in presence of Railway's representative. Certificate be signed jointly. Test results of the wiring done to be submitted quarter wise and service building wise to Sr. DEE/P/RJT.

11. Special Clause:

(i) Wiring shall include "Main" and "sub-main" to be drawn from the respective main, sub distribution boards and switch boards located at convenient centers duly approved.

(ii) All phase and neutral wires shall be looped back only at switches and ceiling roses, where ever necessary and the looping shall be limited to only two wires at each terminal. If more than two wires are required to be looped the same shall be done by suitable mechanical connectors.

[Tenderer]


[Sr.DEE/P/RJT]

(iii) Any masonry work involved will be done by the contractor i.e. fixing of wooden plugs, filling up of holes, etc. and all surface properly done after the work and given white washing.

(iv) The work of wiring should be completed within the time limit specified in the tender schedule. Any deviation from above condition contractor should not be allowed to carry out work, unless taken prior approval from administration.

(v) For Providing switch, socket in existing board: Necessary modification in chromium plated metal boxes, modular plates, cover plates etc. are to be carried out by contractor at his own cost.

P.V.C. conduit pipe

The contractor shall supply and lay medium class rigid P.V.C. white coloured conduit pipe of minimum 25 mm. dia. in concealed manner. The pipe should be laid in the wall and ceiling of building at the time of its construction. The P.V.C. conduit pipe should be of ISI marked of make as per List of Approved Make given below with all accessories such as various sizes chromium plated concealed type metal box, Tee joints, bends, elbow and coupler etc. for concealed wiring. The P.V.C. conduit pipe should be conforming to IS-9537 part-III (as amended latest).

The rates are inclusive of chasing, providing pipes, fixing with staples and making good surface with cement plaster and the rates of chromium plated concealed type metal boxes are included in wiring item.

Special Instructions to tenderers regrading wiring

1. Casing capping, if used for open wiring, the colour should be matching with switch boards.
2. Overall wiring should look aesthetically good, Contractor shall have to do necessary changes in wiring if required (if not looking good or technically not correct, even if not mentioned in tender document), as per directions in railway
3. All light fittings, Fans and signages shall be connected using white colored (sleeve) 3 core 1.5sqmm copper wire.
4. All tube light fittings in cover shed should be installed using durable metallic clamp.
5. In cover shed, FOB, building etc. all wiring/cables/cable tray should be red coloured marked to distinguish power cables from other type of cables.
6. For total wiring points, contractor shall have to supply maintenance spares as given below i) 5% of total wiring points, 6 and 16 Amp sockets ii) 5% of total wiring points 6 and 16 Amp switches with plate assembly, Before proceeding for measurement recording.
7. Before recording of final measurement contractor shall provide single line diagram size A2 size diagram to be submitted.

[Tenderer]


[Sr.DEE/P/RJT]

Note: Wiring diagram plan to be submitted by contractor for approval of Sr.DEE and after completion of work wiring completion diagram to be submitted in A1 size.

Contractor shall have to supply materials as per List of Approved Make given at end of this document.

(Item No. 05) SITC of Television point:-

The contractor shall have to do supply, installation, testing and commissioning of Modular TV point with material and provide modular type RG-6 television socket along with cable drawn through PVC casing / capping or PVC pipe (MMS). Television cable shall be drawn from nearest point provided outside the building/ Quarter.

The modular television sockets shall be 21157 of Anchor/ Roma or equivalent of make and shall be got approved from Sr.DEE/P/RJT before supply.

Note: Television cable shall be run through separate casing capping / pipe

(Item No. 6) SITC of Call bell :-

The contractor shall have to do supply, installation, testing and commissioning of Electronic bell with wiring in concealed manner of Anchor roma with switch 21044 or its equivalent of make as per List of Approved Make given below. Wiring of bell point shall be done as per specification.

Note:-The make & model of above item shall be submitted by the contractor & sample got approved by Sr.DEE/P/RJT before supply.

(Item No. 9,10,16,23) SITC of LED fittings

The contractor shall have to do supply, installation, testing and commissioning of LED light fitting complete with all accessories as per WR specification No. WR/CCG/SPECIFICATION/P/001(Rev.01)-2018. Make and model of fitting should be got approved by Sr.DEE/P/RJT before erection.

Contractor shall provide proper clamps for fitting LEDs and give power supply connection using White colored 3 core 1.5 sq mm copper wire in aesthetically sound manner.

WR specification No. WR/CCG/SPECIFICATION/P/001(Rev.01)-2018 for LED Luminaire:

(1) Scope:

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

[Tenderer]


[Sr.DEE/P/RJT]

Each type of luminaire shall be supplied with associated driver circuit and required optics. The applications of Energy Efficient LED based luminaire are as under:

- (i) For outdoor: street light, High mast, and platform open area.
- (ii) Platform lighting.
- (iii) For indoor: offices, service buildings etc.

(2) Construction:

All the luminaire shall be finalized based on the performance requirement. The detailed calculation for lux level as per clause 5.8 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. Effort shall be made to keep the overall outer dimensions as minimum as possible.

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

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 manufacture shall submit the proof of procurement of LEDs from above OEMs at the time of testing.

Suitable reflector/lenses may also be provided to increase the illumination angle.

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.

Design of the thermal management shall be done in such a way that it shall not affect the properties of the diffuser.

2.1 High power and high lumen efficient LEDs suitable for following feature shall be used:

The efficiency of the LED lamps at 110 °C junction temperature shall be more than 80%. The working life of the lamp at junction temperature of 110 °C for 350 mA 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.

Adequate heat sink with proper thermal management shall be provided.

Colour temperature of the proposed white colour LED shall be between 5700K-6500K. Minimum view angle of the LED shall not be less than 120 degree.

[Tenderer]


[Sr.DEE/P/RJT]

The output of LED shall be more than **120 Lumens per watt** at minimum operating current and shall ensure guaranteed operation life of 50,000 burning hours with controlled junction temperature of 110 °C.

Efficiency of driver electronics shall be more than 85%.

Power factor of complete fitting shall be more than 0.95.

The Driver card shall withstand 440V & 1.5 KV \pm 3% surge protection and shall resume normal working when nominal voltage is applied again.

Thermal management shall be in such a way that LED junction temperature shall not go beyond 80 degree centigrade.

Lumen maintenance report as per LM 80 standards for the LEDs used and LM 79 standards for efficacy of fixture shall be submitted along with offer or at the time of prototype test.

The LED luminaire shall be free of glare.

Colour Rendering Index CRI \geq 75.

2.2 Specification for LED Driver:

Input voltage range within 180Vrms to 270Vrms.

Operating input voltage 240Vrms.

No load power consumption \leq 500mW

Maximum output voltage 105V DC \pm 3%.

Output voltage ripple should be within 3%.

Output over voltage protection 125VDC.

Power factor 0.95.

Full load efficiency \geq 85%.

THD \leq 10%.

Hot swapping.

Current waveform should meet EN 61000-3-2

LED driver shall withstand voltage of 440V for 2 hours and restore normal working when normal voltage is applied.

Maximum temperature rise \leq 10 °C @ 55 °C T_{amb} with safety margin of 10 °C.

The driver should comply to CISPR 15 for limits and methods of measurement of radio disturbance characteristics.

The equipment should comply to IEC 61547 for EMC immunity requirements.

The control gear should be complaint to IEC 61347-2-13, IEC 62031 and IEC 62384 as per the requirements.

2.3 The equipment should be complaint to IEC 60598-1, IEC 62031 and IEC/PAS 62612 depending on the type of luminaire.

[Tenderer]


[Sr.DEE/P/RJT]

3. Referred standards:

3.1 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, CISPR15	Limits and methods of measurement of radio disturbance characteristic of electrical lighting and similar equipments.
IEC 62031	LED modules for general lighting -safety requirements.
EN 61547	Equipment for general lighting purpose - EMC immunity requirement.
EN 60929	Performance, AC supplied electronics ballast for tubular fluorescent lamps performance.
IEC 60598-2-1	Fixed general purpose luminaries.
IEC 60598-1	Luminaries-General requirement and tests.
IEC 61000-3-2	Electromagnetic compatibility (EMC)-Limits for harmonic currents 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.

3.2. For outdoor lighting:

IS: 513	Cold -rolled low carbon steel sheets.
IEC 60529	Classification of degree of protections provided by enclosures.
EN 55015	RFI < 30 MHz
EN 55022	RFI > 30 MHz
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 currents emission -THD < 10%.
IEC 60068-2-38	Specification for permitted humidity test
IS 10322	Specification for the luminaries.
IS 4905	Method for random sampling

(4) Service condition:

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:

4.1 Environmental conditions:

Maximum ambient air temperature: 55 °C (For outdoor application) &
45 °C (For indoor application)

Minimum ambient air temperature: - 5 °C

Maximum relative humidity: 100%

Atmosphere: Extremely dusty and desert weather and desert terrain in certain areas. The dust contents in air may reach as high value as 1.6 mg/m³

Costal area: The equipment shall be designed to work in coastal area in humid, salt laden and corrosive atmosphere.

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

Max. pH value: 8.5

Sulphate: 7 mg/litre

Max. Concentration of chlorine: 6 mg/litre.

Max. Conductivity: 130 micro sec./cm.

Annual rainfall: Ranging between 1750 to 6250 mm with thunder storm.

Altitudes: Not exceeding 1200m above sea level.

4.3. The supplier shall provide “In the field service support” during guarantee period.**(5) Technical requirements:**

5.1 The luminaire casing/housing shall be made of 1.6 mm 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.

5.1 The electronic components used shall be as follows:

IC (Integrated Circuit) shall be of industrial grade or above.

Metallic film /Paper/polyester capacitor shall be rated for a maximum temperature of 105°C

The registers shall be preferably made of metal film of adequate rating. The actual loading versus rating shall be 3.

The junction temperature of the switching device such as transistors and MOSFETs etc. shall not exceed 125°C (Allowing thermal margin of 25°C)

The conformal coating used on PCBs should be clear and transparent and should not affect colour code of electronic components or the product code of the company.

[Tenderer]


[Sr.DEE/P/RJT]

The heavy components shall be properly fixed. The solder connection should be with good finish.

The electronic components covered for this equipment shall pass all the tests called for in the specification. The tenderer shall indicate the deviation or compliance otherwise the offer may not be considered for evaluation.

The infrastructure for quality Assurance facilities as called for in the specification shall be available for the manufacturing of this product.

5.3. The connecting wire 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.

5.4. 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 and IP 20 protection for indoor application as per IEC 60529.

5.5. 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 the ambient temperature.

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

5.7. All the material used in the luminaire shall be halogen free and fire retardant conforming to UL94.

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

Sr. No	Type of 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

[Tenderer]


[Sr.DEE/P/RJT]

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 1Mtr above ground level.	5500 to 7000
2	Corridors	2.743	125 on the floor	5500 to 7000

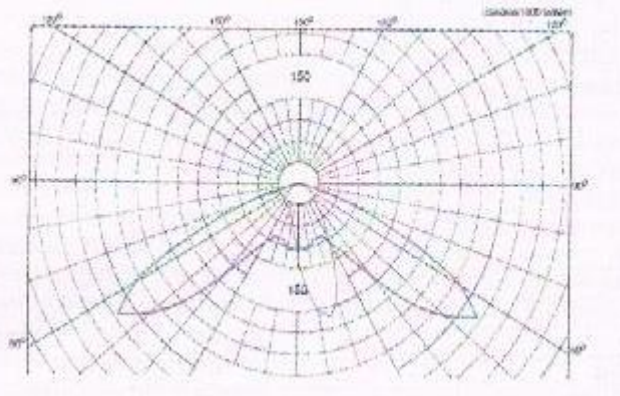
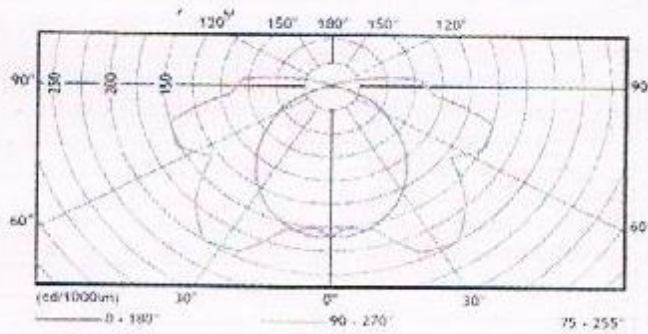
Note:

Variation in illumination shall be $\pm 2\%$ is allowed in input voltage range from 180VAC to 250VAC.

The illumination shall not have infra-red and ultra-violet emission. The test certificate from the NABI approved laboratory shall be submitted.
Electronic efficiency shall be more than 85%.

5.8.1 Polar Curves:

The typical distribution of illumination of these luminaries shall be as given below

a. Street light:**b. Platform light:**

[Tenderer]

[Sr.DEE/P/RJT]

(6) Tests for indoor and outdoor lighting:

Tests are classified as:

Type test

Acceptance test

Routine test

6.1. 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.

6.2. 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.

6.2.1. 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.

6.3. 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.

6.4. 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	7.1	Y	Y	Y	Y	Y
2	Checking of documents of purchase of LED	7.2	Y	Y	Y	Y	Y
3	Resistance to humidity	7.3	Y	Y	Y	---	---
4	Insulation resistance test	7.4	Y	Y	Y	Y	Y
5	HV Test	7.5	Y	Y	Y	Y	Y
6	Over voltage protection	7.6	Y	Y	Y	---	---
7	Surge protection	7.7	Y	Y	Y	---	---
8	Reverse polarity	7.8	Y	Y	Y	Y	Y
9	Temperature. rise test	7.9	Y	Y	Y	---	---

[Tenderer]

[Sr.DEE/P/RJT]

10	Ra (colour Rendering Index) Measurement test	7.10	Y	Y	Y	---	---
11	Lux measurement	7.11	Y	Y	Y	Y	Y
12	Fire retardant test	7.12	Y	Y	Y	---	---
13	Test for IP 20 & IP 65 protection	7.13	Y	Y	Y	---	---
14	Environmental test	7.14	Y	Y	---	---	---
15	Reliability test	7.15	Y	Y	---	---	---
16	Life test	7.16	Y	Y	Y	---	---
17	Endurance test	7.17	Y	Y	---	---	---
18	EMI/EMC (Only for indoor lighting)	---	---	---	Y	---	---

(7) Method of testing

7.1. 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.

7.2. Checking of documents of purchase of LED:

Check documents of purchase of LED lamps of approved sources Viz. NICHIA/OSRAM/ CREE / SEOUL/ PHILIPS LUMILEDS/ LEDNIUM/ AVAGO.

7.3. 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.

7.4. 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.

7.5. HV test:

Immediately after insulation resistance test, an AC voltage of 1.72 KV 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, flash over or tripping of supply.

7.6. Over voltage protection:

The outdoor luminaire shall withstand at 415 V AC for two minutes.

7.7. 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).

[Tenderer]


[Sr.DEE/P/RJT]

7.8. 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.

7.9. Temperature rise test:

Temperature rise test shall be conducted at 180VAC 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 condition 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 within the permissible limit. The maximum temperature rise of the electronics device 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 components shall be considered keeping RDSO informed.

7.10. 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.

7.11. 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.

7.12. Fire retardant test:

Fire retardant test shall be conducted as per IEC 332-I (for outdoor lighting) and IEC 60332-I (for indoor lighting) of the wire used in the fittings.

Test for IP 65 protection (for outdoor lighting) and test for IP 20 protection (for indoor lighting): This test shall be conducted as per IEC 60529.

[Tenderer]


[Sr.DEE/P/RJT]

7.13. Environmental tests:

The luminaire shall meet the following tests as prescribed in IEC 60571.

Dry heat test

Damp heat test

Test in corrosive atmosphere.

Combined dust, humidity and heat test.

7.14. Reliability test:

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.

The light unit shall be mounted in an oven maintained at 75°C for outdoor lighting and 45°C for indoor lighting.

The light will be operated at the specified maximum voltage and at 75°C for outdoor lighting and 45°C for indoor lighting for a period of 100 hours.

7.16. Life tests:

For outdoor lighting: The lumen maintenance and 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 LM80 report of LEDs.

7.17. 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" & "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.

7.18 Safety:

The luminaire shall comply with the safety requirements as per IEC 61195.

7.19. Vibration Test:

The complete unit cubicles together with its mounting arrangements (including shock absorbing device, if provided) shall be subjected to the vibration and shock testing (For category I class A/B) as per latest IEC 61373.

(8) 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.

[Tenderer]


[Sr.DEE/P/RJT]

9) Manufacturer's certificates:

Manufacturer should submit the certificate of having purchased LED from one of the approved source (LM80 certificate should be submitted).

Manufacturer's test certificate to be submitted for (i) mechanical strength, (ii) Endurance test and Thermal test, (iii) resistance to dust and moisture (iv) Insulation resistance and electrical strength (v) resistance to heat, fire and tracking and (vi) Photometric test as per the IS: 10322 Part-5, Sec. 2.

(10) Guarantee:

If LED light fitting is not commissioned on account of Railway.

Guarantee for LED light fitting (including driver etc.) is for a period of 60 months from the date of commissioning or 72 months from the date of supply whichever is earlier for their satisfactory performance and Security Deposit shall be released accordingly.

If LED light fitting is not commissioned within 12 months on account of contractor.

Guarantee for LED light fitting (including driver etc.) is for a period of 60 months from the date of commissioning and Security Deposit shall be released accordingly.

Contractor should give Guarantee period in writing.

Beam angle of 200 W flood light shall have to be 60 degree for high mast application.

Make of fitting as per approved make list.

(Item No. 11) SITC of LED integral decorative bollard with optical acrylic 9W luminaire:-

This item work in mainly consist of Supply, Installation, Testing and Commissioning of 9 Watt LED Bollard in cylindrical shape with opal acrylic diffuser and IP 66/ IP 65 protection, Color Temperature 3000-5000 K, in built driver with 4.5 KV surge protection, LED mounted on die cast aluminum base, rated voltage 240 VAC 50 Hz, PF 38 more than 0.90 complete with foundation and Nut/bolt etc. Provision shall be in conformity with IS :732/1989 (Latest version), IS: 4648/1968 (Latest Version). Warranty of the fitting shall be 60 months from the date of commissioning or 72 months from the date of supply, whichever is earlier.

Height of bollard light: -800mm to 1200mm

Model :- Elumx Bollard /DISC bollard/ Cone bollard Jaquar or combination of these makes, Approval shall be given after demonstration. Other makes: -Philips/Osram/Bajaj having equivalent features to abovementioned models.

[Tenderer]


[Sr.DEE/P/RJT]

(Item No. 14&15) Supply, installation, testing and commissioning of 5 star rated fan with EME type fan regulator :

Contractor shall have to do supply installation, testing and commissioning of 5 star rated ceiling fan, ISI marked, sweep size: 1230-1250 mm., BEE rating: 5 star or above rated power: Up to 36W, Minimum Air delivery: 230 Cubic Meter/Min, Total harmonic distortion: 10% (Max), Rated Voltage: 230V, 50 Hz, Single Phase AC, Copper winding, Power Factor: Not less than 0.9, Nos. of blades: 03 Nos, Blade material: Aluminum, Bearing: Double ball bearings, Shank and shackle kit, canopy: 2 Nos., colour standard: White/off white/off back as decided by railway , Service Value: 7, Class of insulation: B, Insulation resistance: > 2 Mega ohms, Temperature rise: 75 degree C, Warranty: Minimum 2 Years from the date of supply & all remaining accessories including Safety pin, Nut, Bolts, washers, earthing etc. Fan should be conforming to:

- 1) IS 374/2019.
- 2) The firm has to submit type test report from Government accredited test labs like NABL/CPRI etc.
- 3) Routine test certificate has to be submitted along with supply.

The contractor shall provide the mounting arrangement to fans with all necessary hardware such as hooks, clamp, nut-bolts, washer and powder coated MS down rods of minimum thickness 1.5 mm. and suitable length as per requirement at site to be maintained. The fan shall be connected through 1.5 sq. mm. 3 core flexible copper cable from the existing ceiling rose. The required standard and suitable hardware shall be arranged by contractor.

Contractor shall have to do supply, fixing, testing and commissioning of electronics step fan regulator. The fan regulator shall be as per Atomberg model no Erica Signature 1230mm BLDC or its equivalent 5 star rated(as per BEE data) of make as per list of approved make given below. Sample of Fan should be shown before approval.

Fan regulator should be suitable for operation on 230V 50 C/S A.C. supply.

Note: Input power should not be greater than 36 Watt. FAN should strictly controlled with regulator.

The contractor should submit the copy of challan or bill for fan and electronic fan regulator from the manufacturer/authorized dealer issued on the name of contractor.

Make should be got approved from Sr. DEE/P/RJT before supply

[Tenderer]


[Sr.DEE/P/RJT]

(Item No. 16) SITC of Exhaust fan 200 MM plastic body : -

Supply, installation, testing and Commissioning of the exhaust fan wall mounting type of size 200 mm of plastic body, suitable for operation on 220/240 volts single phase 50 Hz A.C. supply having totally enclosed continuous rated type. The fan blades should be dynamically balanced for smooth running. The exhaust fan should be supplied with the necessary mounting accessories.

Rack bolts of sufficient strength capable to withstand the load of exhaust fans shall be supplied by the contractor. Necessary civil work for making holes in the wall, fixing and grouting of rack bolts and re-surfacing of the wall as original shall be done by the contractor. Exhaust fans are to be connected by the contractor by using PVC insulated 3 core copper flexible wire(white coloured) of adequate size. The contractor should submit the copy of challan or bill for the exhaust fan from the manufacturer/authorized dealer / authorized supplier issued on the name of contractor, if asked by the Railway.

(Item No. 17) Supply of Cable 4 core 16 sq mm.

Supply Item Description: 1100 Volt Grade multi-stranded Aluminum conductor cable having galvanized steel strip armored of size 16 sq mm x 4 core Cross linked polyethylene, insulated, PVC sheathed with extruding process armored, confirming to IS: 7098(Part 1):1988 with amendment number 1 and 2 and 3 Reaffirmed 2005 & improved fire retardant features as category C2 FRLS type.

Note:

- (1) OEM proof of purchase to be submitted along with the Material supplied.
- (2) Type test certificate from NABL approved lab as per IS: 7098 part 2 2011.

(Only 5 lakha above)

For items costing above 5 lacs shall require RITES inspection as per IS: 7098(Part 1):1988 with amendment

Make should be got approved from Sr. DEE/P/RJT before supply.

(Item No. 18) Transportation, laying, installation, terminating, testing and commissioning of LT cable:-

The contractor shall have to transport all the cables to be used at site shall be issued by Railway from SSE/incharge store OR other places suggested by Railway and balance material shall also to be deposited back to SSE/Incharge store. Contractor shall lay the cable in existing trench, pipe & on Wall/ structure.

[Tenderer]


[Sr.DEE/P/RJT]

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 is to be done, contractor will make good the cost of damage as decided by railway.

Note: - Contractor has to digging carefully while working of exiting Power cable, Telephonic cable and Signaling cable. In cases during excavation work any cable damaged penalty will be imposed to the contractor as per Railway rules. (Appox. 1.5 lakhs per occurrence)

(Item No. 19) SITC of 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 decided 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.

Note :- Contractor has to do digging carefully while working of exiting Power cable, Telephonic cable and Signaling cable. In cases during excavation work any cable damaged penalty will be imposed to the contractor as per Railway rules. (Appox. 1.5 lakhs per occurrence)

[Tenderer]


[Sr.DEE/P/RJT]

(Item No. 20) SITC of DIGGING & RE-FILLING OF CABLE TRENCH IN PCC/RCC/HARD SOIL:

1. Scope of Work

This specification outlines the technical requirements for the excavation of a trench measuring 450 mm (width) and 1000 mm (depth) from the existing ground level, in PCC (Plain Cement Concrete), RCC (Reinforced Cement Concrete), or hard/stony soil, including cable bedding and backfilling, as part of electrical or communication cable laying works.

2. Description of Work

The work includes:

- Cutting and breaking of existing PCC/RCC/hard soil using appropriate equipment (e.g., mechanical breaker or manual digging).
- Excavation of a trench of specified dimensions (450 mm × 1000 mm).
- Providing a bedding layer of riddled soil (soft earth) below the cable.
- Laying of cable
- Covering the cable with riddled soil after laying.
- Backfilling with excavated soil or approved alternative.
- Compaction and restoration of surface to original condition.
- Making good any damage to surrounding structures/utilities at the contractor's cost.

3. Technical Specifications

3.1 Trench Dimensions

- Width: 450 mm ± 25 mm
- Depth: 1000 mm ± 50 mm (measured from natural ground level)
- Length: As per drawing/site requirement
- Debris Removal: Broken concrete/RCC pieces to be collected, transported, and disposed of in compliance with local environmental regulations.

3.2 Backfilling and Compaction

- Material: Excavated soil (if suitable), otherwise approved fill.
- Layering:
 - Backfilling in layers not exceeding 150 mm thickness.
 - Each layer to be rammed or compacted manually or mechanically.

3.3 Surface Restoration

- In RCC/PCC areas:
 - Surface shall be restored using RCC/PCC (M15 or M20 grade) as per original thickness.
 - If damer road necessary material to be used for resurfacing of damer road.
 - Curing for a minimum of 7 days.
- In Soil areas:
 - Surface to be leveled and compacted to match surrounding ground.

[Tenderer]


[Sr.DEE/P/RJT]

4. Damage Rectification

- Any damage caused to existing structures, utilities, cables, or property during execution shall be made good by the contractor at his own cost.
- If not rectified satisfactorily, Railway will rectify the damage, and cost as decided by the Railway/Engineer-in-Charge shall be recovered from the contractor's bill.

5. Safety and Protection

- Contractor shall adhere to safety protocols during breaking and excavation.
- Precaution to be taken to avoid damage to underground utilities. Contractor shall verify with Railway or concerned authority before breaking the ground.

Note: - Contractor has to dig carefully while working of existing Power cable, Telephonic cable and Signaling cable. In cases during excavation work any cable damaged penalty will be imposed to the contractor as per Railway rules. (Approx. 1.5 lakhs per occurrence)

(Item No. 21) SITC of Octagonal galvanized steel pole 5 meters:

The contractor has to supply and erect Octagonal GI pole 5 mtrs long on cement concrete foundation complete with foundation bolt, inbuilt junction box, etc. and shall be got approved from Sr.DEE/P/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 85 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 400 mm. length at the elevation of 600 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 & 6 Amp. MCB DP shall be provided inside the opening for the purpose of termination of cables /wires.

The contractor shall also have to provide suitable bracket length of arm 1 meter 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.

[Tenderer]


[Sr.DEE/P/RJT]

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.

(Item No. 23) Supply of Automatic Light controlling nature switch:

Supply, Installation, Testing and Commissioning (SITC) of IoT-enabled automatic light control system for outdoor/station lighting. The system shall automatically switch lights ON/OFF based on ambient light intensity through a photocell/lux sensor/astronomical timing unit and shall provide remote monitoring and control through a web-based dashboard/mobile application. The system shall be capable of real-time monitoring of supply voltage, load current, energy consumption, light status (ON/OFF), and fault conditions. It shall support configurable lux-level settings, time scheduling, manual override, data logging, alerts/notifications, and communication through GSM/4G/Wi-Fi/Ethernet as applicable. The controller shall operate on 230 V AC, be housed in a weatherproof enclosure of minimum IP65 protection, and include all sensors, communication modules, software licenses (if any), mounting hardware, wiring, commissioning, training, and warranty complete in all respects.

(Item No. 24) SITC of junction boxes:

The contractor shall have to supply, installation, testing and commissioning of Mild Steel enclosure boxes of size 200x200x120 mm. inside dimension for connecting the incoming & outgoing cables and connecting wire of street lights. Jn. boxes shall be complete with suitable connectors.

The junction box should be as per detail given under.

- > Shockproof and rustproof.
- > 100% weatherproof.
- > Pole mounting arrangement.
- > Tamper proof.
- > Pilferage proof.
- > Restricts unauthorized tapping.
- > Maintenance-free.
- > Fire retardant

[Tenderer]


[Sr.DEE/P/RJT]

Connection: 4 Way
 IP Rating: IP66
 Material: Mild Steel
 Mounting: Wall Mount
 Shape: Rectangular

Junction box should be equipped with

- * Polyamide Glands
- * Polyamide Stop Plus
- * Polyamide Terminals

Junction box shall be as per MSJ3 of Raychem make or list of approved make attached at end of document.

Make should be got approved from Sr. DEE/P/RJT before supply.

(Item No. 25) SITC of feeder pillar:

The contractor shall have to do supply, fixing, testing and commissioning of control panel for feeder pillar. The feeder pillar shall be fabricated out of 14 SWG CRCA sheet and finished with two coats of red oxide primer and grey enamel paint of shade 631 of IS-5. Feeder pillar RCC foundation should be done strong enough. Danger plate should be embossed.

The feeder pillar shall comprise of incoming 1 No 100Amp MCCB, 4 pole having minimum breaking capacity 36KA, and outgoing 3 Nos 63A MCCB FP connected through copper bus bar of capacity 1.6A per sq mm as per make mentioned at end of document.

Installation & Mounting Arrangement:

The enclosure shall be installed on a **self-supporting MS structure fabricated from suitable size MS angles (minimum 50 × 50 × 6 mm or as per site condition with prior approval)**. Four (04) numbers MS angle posts shall be fixed vertically in the ground by carrying out necessary excavation to adequate depth (minimum 600 mm or as directed by Engineer-in-Charge). The MS angles shall be grouted and embedded in **cement concrete (CC 1:2:4)** foundation of suitable size to ensure mechanical strength and stability. The exposed MS structure shall be properly aligned, welded/bolted, cleaned, and painted with one coat of red oxide primer followed by two coats of approved synthetic enamel paint. All civil works including digging, PCC/CC work, curing, backfilling and disposal of surplus earth shall be included in the scope of work

Feeder pillar shall be equipped with all misc accessories such as 4 pole connector strips for all MCCB connections, cable glands, earthing terminals etc.

[Tenderer]


 [Sr.DEE/P/RJT]

(Item No. 26) STIC of Distribution board :

1. 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.
2. 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.
3. The DB shall be cubicle type, wall mounted dust and vermin proof suitable for 3 phase, 4-wire, 415V, 50Hz AC supply system.
4. 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.
5. Minimum two earth terminals shall be provided in the DB. All sheet steel section shall be electrically connected with earth.
6. DB shall be mounted on wall/ pillar.
7. The MCCBs shall be of make as per List of Approved Make given below and shall be got approved from Sr.DEE/P/RJT before supply.
8. The breaking capacity of MCBs should not be less than 10KA & 'C' curve.
9. The breaking capacity of MCCBs should not be less than 35 KA.

The DB shall be comprised with following switch gears:

Incoming circuit: >1 No. 40 Amp MCB DP. shall be of Havells cat. No. DHMGCDPF040 or its equivalent of make as per List of Approved Make given below.

Outgoing circuit:

>4 Nos. 25 Amp. Legrand DX3 411325 30mA Double Pole RCBO or its equivalent of make as per List of Approved Make given below Contractor shall have to supply materials as per List of Approved Make given below

Contractor shall have to supply materials as per List of Approved Make given below and shall be got approved from Sr.DEE/P/RJT before supply.

[Tenderer]


[Sr.DEE/P/RJT]

(Item No. 27) Design, supply, erection, testing and commissioning of grid connected rooftop solar PV system and hybrid solar system with mono crystalline panel complete with all accessories, online monitoring system, inverter, structure, cables, net metering etc complete with five years' warrantee.

The proposed project shall be commissioned as per the technical specification **RDSO/PE/SPEC/PS/0092-2008 (Rev.'0')**, Amdt. 5. Any shortcoming will lead to cancelation of subsidy in full or part as decided by Railway & competent authority's decision will be final and binding on the bidder.

This specification covers the general and technical requirements for design, manufacturing, testing, supply, installation & commissioning of grid connected solar, generating system to be provided at **Stations over Rajkot Division as decided by Sr.DEE/P/RJT** for meeting the lighting and other Electrical load In such a fashion that solar supply only to be utilized for loads of same capacity against local supply.

1. DRAWINGS & MANUALS: i Two sets of Engineering, electrical drawings and Installation and O&M manuals are to be supplied. Bidders shall provide complete technical data sheets for each equipment giving details of the specifications along with make/makes in their bid along with basic design of the power plant and power evacuation, synchronization along with protection equipment. ii. Approved ISI and reputed makes for equipment be used.

2. PLANNING AND DESIGNING:

- i. The bidder should carry out Shadow Analysis at the site and accordingly design strings & arrays layout considering optimal usage of space, material and labor. The bidder should submit the array layout drawings along with Shadow Analysis Report to the Sr. DEE/P/RJT for approval.
- ii. Railways reserve the right to modify the landscaping design, Layout and specification of sub-systems and components at any stage as per local site conditions/requirements.
- iii. The bidder shall submit preliminary drawing for approval & based on any modification or recommendation, if any. The bidder submits three sets and soft copy of final drawing for formal approval to proceed with construction work.

3. DRAWINGS TO BE FURNISHED BY BIDDER AFTER AWARD OF CONTRACT

The Contractor shall furnish the following drawings and obtain approval

- i. General arrangement and dimensioned layout.
- ii. Schematic drawing showing the requirement of SPV panel, Power conditioning Unit(s)/ inverter, Junction Boxes, AC and DC Distribution Boards, meters etc.
- iii. Structural drawing along with foundation details for the structure.
- iv. Itemized bill of material for complete SPV plant covering all the components and associated accessories.
- v. Layout of solar Power Array.
- vi. Shadow analysis of the roof.

[Tenderer]


[Sr.DEE/P/RJT]

4. **SAFETY MEASURES:** The bidder shall take entire responsibility for electrical safety of the installation(s) including connectivity with the grid and follow all the safety rules & regulations applicable as per Electricity Act, 2003 (or latest) and CEA guidelines etc.
5. PV systems shall be provided with adequate rating fuses, fuses on inverter input side (DC) as well as output side (AC) for overload and short circuit protection as well as disconnecting switches to isolate the DC and AC system for maintenances.
6. Fuses of adequate rating shall also be provided in each solar array module to protect them against short circuit.
7. For safety reasons, PV inverter system shall be disconnected from the network following a fault or loss of supply on the power network.
8. Design and construction of foundation/ grouting for holding module mounting structures without puncturing the roof, maintaining proper drainage of rain water over terrace through the installation area, cable routings through PVC pipes not obstructing the movement on terrace.
9. Before commencement of work, the contractor has to obtain all approvals for related drawings from the concerned authorities.
10. Special care to be taken while designing all structures for modules to cater to heavy rainfall, strong winds and earthquake that may be prevalent in the area.
11. Test running of the grid connected solar facility including load trials at Projects Site, Prior to handover and commencing energy export for metering.
12. The interconnection of the rooftop solar system with the network of the Railways will be made as per the technical standards for connectivity of distributed generated resources regulations as may be notified by the competent authority.
13. The contractor will take all necessary and reasonable safety precaution with respect to providing the installation work solar power and system operations that will comply with all applicable law Laws pertaining to the health and Safety of persons and real and personal property.
14. Contractor Safety management to be strictly complied with by the contractor throughout project activity.
15. The contractor shall comply with the provision of all applicable Laws and Applicable Permits and conforms to Good Industrial practice for securing the safety of the solar rooftop power system.
16. Contractor shall liaison with statutory authorities as applicable for all the project approvals.
17. Contractor shall supply material and providing services which are not specifically mentioned but required for the successful commissioning of solar generating system.
18. The contractor shall maintain a high standard in the appearance and aesthetic quality of the rooftop solar project and achieve integration of the Solar rooftop power system.
19. Contractor has to use mono crystalline Solar PV Module as per suggestion given by Railway.
20. The following Statutory Clearances to be obtained by the contractor wherever applicable:
 - a. Electrical System approval (Electrical Inspector.)
 - b. Fire System approval (CFO)
 - c. Structure design approval. (Structure Architecture)
 - d. All equipment, accessories, Materials, civil construction & erection work should comply with statutory requirements and IS standards.

[Tenderer]


[Sr.DEE/P/RJT]

21. INTEGRATION OF PV POWER WITH GRID:

The output power from SPV would be fed to the inverters which converts DC produced by SPV array to AC and feeds in to the main electricity grid after synchronization. In case of grid failure, or low or high voltage, Solar PV system shall be out of synchronization and shall be disconnected from the grid. Once the DG Set comes in to service PV system shall again be synchronized with DG supply and load requirement would be met to the extent of availability of power. 4 pole isolation of inverter output with respect to the grid/ DG power connection need to be provided.

22. METERING:

- The bidirectional electronic energy meter (0.5 S class) shall be installed for the measurement of import/export of energy.
- The bidder must take approval /NOC from the concern DISCOM for the connectivity, technical feasibility, and synchronization of SPV plant with distribution network and submit the same to Railway before commissioning of SPV plant.
- Reverse power relay shall be provided by bidder (If necessary), as per the local DISCOM requirement.

23. POWER CONSUMPTION:

Regarding the generated power consumption, priority need to give for internal consumption first and thereafter any excess power can be exported to grid same can be accounted through net metering as per state regulation guidelines applicable from time to time.

24. CONNECTIVITY:

The maximum capacity for interconnection with the grid at a specific voltage level shall be as specified in the distribution Code/Supply Code of the state and amended from time to time. The following criteria have been suggested for selection of voltage level in the distribution system for ready reference of the solar suppliers.

Plant Capacity	Connecting Voltage
Up to 10 kW	240V-Single phase or 415V-Three Phase at the option of the consumer.
Above 10kW and up to 100 kW	415V-Three Phase.

Connecting Voltage guideline Gujarat solar power policy and Gujarat electricity grid code applicable from time to time may be followed

- Utilities may have voltage levels other than above, DISCOMS may be consulted before finalization of the voltage level and specification be made accordingly.
- Solar plant output termination is to be done in such a way that, below 100 kW. i.e. Multiple termination with separate devices may be required.

[Tenderer]


[Sr.DEE/P/RJT]

- c) Plant may be required to terminate at multiple LT/HT point. Necessary Net metering application and clearances by GEDA cost shall be borne by the contractor.
- d) The contractor shall take prior approval regarding Size of solar plant, string capacity, inverter capacity at each location list given by Sr. DEE(P) etc.

25. DANGER BOARD AND SIGNAGES:

Danger boards should be provided as and where necessary as per IE Act/IE rules and amended up to date. Three signages shall be provided one each at battery -cum-control room, solar array area and main entry from administrative block. Text of the signage may be finalized in consultation with Railway.

26. FIRE EXTINGUISHERS:

The fire fighting system for the proposed power plant for fire protection shall be consisting of:

- a. 2 Nos. 05 Kg. portable fire extinguishers in each control room for fire caused by electrical short circuit.
- b. Sand buckets in the control room.
- c. The installation of fire extinguishers should confirm to TAC regulations and BIS standards. The fire extinguishers shall be provided in the control room housing PCUs as well as on the roof or site where the PV arrays have been installed.

27. DISPLAY BOARD:

The bidder has to display a board at the project site mentioning the following:

- a) Plant Name, Capacity, Location, Type of Renewable Energy plant (Like solar wind etc.) Date of commissioning, details of tie-up with transmutation and distribution companies, Power generation and Export FY wise.
- b) Financial Assistance details from SECI/MNRE/ANY other financial institution apart from loan. This information shall not be limited to project site but also be displayed at site offices /head quarter offices of the successful bidder.
- c) The size and type of board and display shall be approved by engineer-in-charge before site inspection.

➤ **Technical details to be furnished by the purchaser in his tender: [As per Annexure-C of Spec. no. RDSO/PE/SPEC/PS/0092-2008 (Rev.'0'),Amdt.-5]**

1.	System Power Rating (KWp) and place of installation.	10KWp to 100KWp (Roof Top Mounting) at Stations over Rajkot Division as decided by Sr.DEE/P/RJT
2.	Is Compliance and certification to salt mist corrosion testing as per IEC 61701 required {Refer Cl. 6.9.1}*	Yes.

[Tenderer]


[Sr.DEE/P/RJT]

3.	Required galvanization thickness (Refer Cl. 6.10.3)*	120µm
4.	Support structure, design and foundation wind withstanding capability required (see Cl. 6.10.5)*	200 kmph
5.	Is supply of Export Metering (Bi-directional metering) required {Refer Cl. 4.1, 5.4}*	Yes
6 (a).	Is ground mounted solar system required {Refer Cl. 5.2}*	No.
6 (b).	If the answer to 6(a) is 'yes', then please specify the ground mounted system's KWp capacity, site location and fencing requirements.	NA
7 (a).	Will the overall rooftop KWp capacity be distributed across multiple rooftops {Refer Cl. 5.3}*	yes
7 (b).	If the answer to 7(a) is 'yes', then please give necessary details i.e. KWp distribution on multiple rooftops, inverters, site locations, etc.	Solar plant output termination is to be done in such a way that, below 100 kW.
8.	In what manner does the railway propose to continue to avail of web based monitoring service after the completion of warranty period:	
8 (a).	As a part of AMC services {Cl. 12.0}*	No.
8 (b).	web based monitoring required entire life of {Cl. 6.7.2}*	Yes

‘*’ Cl. Of Spec. no. **RDSO/PE/SPEC/PS/0092-2008 (Rev.‘0’), Amdt.-5**

Web based monitoring system should also be integrable with the exiting monitoring system of railways .**PLEASE NOTE THAT THE CONTRACTOR SHALL HAVE TO ENSURE THAT ALL SOLAR PLANTS GENERATION DATA TO BE PORTED INTO RJT DIVISION’s OWN ONLINE MONITOINRG SYSTEM HAVING IN HOUSE SERVER/CLOUD BASED SERVER.**

- **Technical data to be furnished by the tenderer in his offer: [As per Annexure-D of Spec. no. RDSO/PE/SPEC/PS/0092-2008 (Rev.‘0’), Amdt.-5]**

[Tenderer]

[ Sr.DEE/P/RJT]

I. Power rating of Solar Systems.

System power rating (KWp):

Solar Panel

a)	Make and model no.	
b)	Power rating of the module	
c)	Name of the manufacturer of PV Module	
d)	Name of the Manufacturer of Solar cells	
e)	Country of origin (separately for solar cells and module- Refer Clause 6.9.1)*	
f)	Peak Wattage, I_m and V_m for the module(Refer Clause 6.9.1)*	
g)	Operating voltage of array(Refer Clause 6.12)*	
h)	Efficiency of the module(Refer Clause 6.9.4)*	
i)	Fill Factor of the module(Refer Clause 6.9.5)*	
j)	Variation band of rated output of the module (Refer Clause 6.9.10)*	
k)	Galvanization thickness of the module mounting structure (Refer Clause 6.10.3)*	

II. Power Conditioning Unit (PCU)

a)	Make and model no.	
b)	Power rating	
c)	Output voltage and frequency range (Refer Clause 6.12)*	
d)	Voltage range of grid synchronization (from nominal)	
e)	Frequency range of grid synchronization (from nominal)	
f)	Communication interfaces offered	
g)	Data communication protocols	
h)	Input voltage range for MPPT operation(Refer Clause 6.12)*	
i)	Efficiency(Refer Clause 6.12.4)*	
j)	Voltage and Current THD (Refer Clause 6.12.2)*	
k)	IP protection (Refer Clause 6.12.5)*	
l)	Noise level (Refer Clause 6.12.18)*	
m)	Idling current	
n)	Surge protection on DC and AC side	
o)	Name of URL at which the purchaser can view the system performance data (Refer Cl. 6.7.2)*	

[Tenderer]

 [Sr.DEE/P/RJT]

- III. Details of Export Meter offered {Refer Cl. 5.4}*
- IV. Details of all cables to be supplied by the firm.
- V. Details of RCD (in case galvanic isolation doesn't exist in PCU)

(i) **Note:** '**' Cl. Of Spec. no. **RDSO/PE/SPEC/PS/0092-2008 (Rev.'0'), Amdt.-5**

(ii) **Note :- Photo-electric conversion efficiency of SPV module should be more than 19% instead of 14% given in the RDSO specification clause no. 6.9.4.**

(iii) **Note :- The Solar PV Module should preferably be made from mono crystalline Silicon Solar Cell /bifacial TOPCON module /Bifacial mono PERC as per Latest MNRE guidelines (ALMM list-II)of at least will be accepted only in instead of Mono / poly crystalline Silicon Solar Cell given in the RDSO specification clause no. 6.9.1.**

SOLAR HYBRID INVERTERS (PCU) WITH BATTERY BACKUP –

For HYBRID roof top solar PV power supply system, inverter should be both ON grid as well as OFF grid capable.

These Solar Power Plants are planned to meet the energy requirements of the concerned Level crossing gates/ other locations from solar power to ensure reliability. The system is required to power the electrical appliances round the clock. These inverters work with the Solar Panels, off grid supply or local power supply to support the load even during a power failure. The solar off grid inverter converts the DC power of the solar PV modules / Batteries to grid compatible AC power. These inverters should have inbuilt charge controllers, MPPT controller.

The system is expected to work in the following ways:-

1. During day time when sufficient sun light is available, the connected load should be powered from the solar electricity generated and any excess solar energy produced should be used to charge the storage batteries.
2. The detailed specifications of the solar off grid inverters are given below:-
 - a) 12 V DC, 150AH capacity, C-10, Solar Tubular inverter battery in poly propylene container maintenance free(lead acid type) including wheeled, modular plastic trolley. Battery charging (float, boost& Tracking (MPPT) equalize stages) for the long life of the battery.
 - b) Battery current limiting feature.
 - c) KWH meter for power generated.
 - d) There should be 1 channel of MPPT to ensure good yield of PV panels

[Tenderer]


[Sr.DEE/P/RJT]

- e) Over load Protection - 125% for 10 minutes, 150 % for 1 minute
- f) Output Voltage: 230 V (+10% to -20%)
- g) Operating frequency range - 48.5 – 51.5 Hz.
- h) Power factor of the inverter - > 0.8 lag to 1 (Within kVA and KW rating)
- i) Total harmonic distortion - < 3%
- j) Inverter efficiency - $\geq 90\%$.
- k) Protection degree - IP 20
- l) Built-in protection - AC high/low voltage & frequency.
- m) Operating temp. range - -0°C to $+50^{\circ}\text{C}$
- n) Humidity - 0-95% RH.
- o) Safety compliance - IEC 62109-1, IEC 62109-2
- p) Environmental testing - IEC 60068 -2(1, 2, 14, 30)/Equivalent BIS standard.
- q) Efficiency measurement - IS / IEC 61683 procedure.
- r) Display type - LCD for data display. LCD/LED for status display.
- s) Display parameters - Output power (W), cumulative energy (Wh), DC Voltage (V), DC Current (A), AC Voltage (V), AC frequency (Hz.), AC Current (A), cumulative hours of operation (h).
- t) Capacity: as per location/ site requirement.

Inverters should have in-built remote monitoring feature or related equipment's which can be connected through data logger/dongle/Wi-Fi or any other method for remote monitoring so that the health of the solar module and inverter as well as daily power generation can be checked centrally. The data should be able to be seen on the dashboards on laptop/table tops/ mobiles through application.

Batteries:-

- i) Type of Battery - 12 V DC, 150AH capacity, C-10, Solar Tubular inverter battery in poly propylene container. Maintenance free (lead acid type) including wheeled, modular plastic trolley. Battery should be suitable for solar inverters with charge controller unit complete all as per detailed specifications and as directed.
- ii) Governing specification - IEC 61427/IS:1651/IS:13369
- iii) Battery cells/Banks - 2V cells for 12 V (No paralleling of Battery Bank) Mono Block.
- iv) Rating – 12V, 150 AH C-10
- v) The battery cabinet shall be suitable for loading nos. of batteries including breaker and connecting cables, as per site requirement.
- vi) OEM Warranty Certificate for 5 years directly to the Railways from OEM to be submitted with supply of material.

Solar Battery make should be Exide/Luminous/Amaron/Microtek/Amar Raja

[Tenderer]


[Sr.DEE/P/RJT]

5 Acceptance Criteria:

The module is deemed to have passed the tests if the sample meets the following criteria:

- (i) There is no evidence of a major visual defect such as a cracked or broken window, bubbles or de-lamination in the encapsulate etc.
- (ii) There is no cell breakage and no water infiltration into terminal boxes.
- (iii) No sample exhibits any open circuit or ground fault.
- (iv) No visible evidence of major defects that may affect performance of the module.
- (v) Insulation Resistance not less than 50M-ohm at 500 V DC.
- (vi) Degradation of performance may not exceed 5% after each single test or 8% after the whole sequence.

The contractor shall submit all test certificates mentioned in the specifications before execution of work.

(Item No. 28) Automatic PV module cleaning system for solar power plant.:

“Automatic Cleaning system for Solar Modules” shall have the following features

Features:

- Very efficient cleaning with various types of sprinklers with colorful heat resistant material.
- Sprinklers can be set to any required angle for water flow due to its versatile design.
- Real time timer can be set for various timings and selective timing.
- Efficient water pump which provides suitable pressure and flow to clean as required.

System Components & Function

1. Multistage Timer with contactor

Multi stage timer having real time clock for precise time setting, with provision of weekly setting, any particular day planning etc. to operate Water pump to automatic clean daily as per set time and durations.

This timer shall have facility of wake up and sleep as per the set time and will operate for set duration which may be in a few minutes. It should automatically turns on at Set time and goes off after the set duration and repeats daily just like defined morning alarm. It should have features of changing set time and duration if required.

Acceptable makes for Timer: - L&T, GIC, Havells, ABB, SELEC, Schnieder or equivalent reputed make.

[Tenderer]


[Sr.DEE/P/RJT]

Acceptable makes for Contactor (Amp capacity suitable to take water pump load):- L&T, GIC, Havells, ABB, SELEC, Schnieder or equivalent reputed make.

2. Water tank

The contractor shall have to provide one syntax tank(ISI marked) of 500liter capacity at each location for water storage purpose for cleaning of solar panels. It should have proper float valve to stop excess water, its installation should be done with proper stand and inlet and outlet pipe connection with additional pie if required. Material of pipe: -U PVC pipe ISI marked.

3. Water pump

Mono block with rugged design having duty head designed to deal and assure water with optimum flow and pressure to all your solar panels for suitable cleaning.

It should have Advance Motor Dry Run Protection sensor, with inbuilt starter, manual /auto mode, MCB panel, with necessary supply (wiring/cabling in casing/capping) from nearest point from building. The capacity of pump 0.5Hp and above suiting/catering to size solar plants ranging from 10kw to 50kw.

Accepted makes:- Shakti, Lubi, Amrut, Calama, KSB, Kriloskar or equivalent

MCB:- Hager, MDS, GE, Indoasian, Indo kopp, HPL, Havells, Legrand, C&S, Bentec, L&T, WATTCAB

Wire:-Avocab, Polycab, Finolex, RR kabel, Paragon

4. Solenoid Valve

Solenoid Valve is meant to open and close path of water in connected pipe circuit and allow water flow to go to defined pipeline circuit as per the connections and Set timings and durations. It's a leak proof electrical gadget operates on 230V and goes on/off simultaneously with the motor.

It should have rugged design to withstand salt mist corrosion areas.

5. Sprinkler

Automatic cleaning system incorporates sprinklers to sprinkle water with suitable flow, pressure and degree in which water is required to be sprinkled for cleaning of Solar panels surface.

Solar panel Cleaning Sprinkler should have the following features: -

- Spray Nozzle
- 180degree projection area
- Wide spread water
- single sprinkler cleans whole panel
- Zero Shadow effect

[Tenderer]


[Sr.DEE/P/RJT]

- Zero maintenance
- Perfect water flow controller
- Utilizes less water
- Cleaning with High presser
- Compact design and Powerful cleaning
- Remove Dust & Bird drops
- Long life span
- Suitable with all types of panel
- Perfect fitting with UPVC & Lateral martial

6. Pipe, Valves & plumbing Accessories

The contractor shall provide hydrant line/pipe line with sprinkler along with the solar panels. Additionally for the interconnections pipes & connection accessories, valves to finally set up cleaning system by installing sprinklers U PVC or better pressure handing. U PVC Pipe & accessories like valve, Elbows, T Joints, and Pipes as below will be installed by installer at his own cost. Brass incorporated joints for leak proof installation and lifetime fittings.

The contractor shall have to provide proper drainage for disposal of waste water, either by integrating with existing gutter valley or by providing separate PVC pipe to nearby garden/plants.

This is turnkey project, any additional components (if not mentioned above) required for successful completion of this project shall be in contractor's scope only.

(Item No. 29) SITC of G.I. pipe earthing with B class GI pipe):

Earthing: Provision of earthing should be carried out strictly as per Drawing no 1. **The soil of earthing shall mostly be Hard.** The earth shall not be situated less than 1.5 meter from any building. These two strips to be connected properly with earth electrode to the Distribution Board, covered with green PVC sleeves of suitable size. The earthing lead shall be buried at least 30 cm (1 foot) deep below ground level.

Earthing should be carried out as per IS 3043- 1987 as amended latest drawing attached. The earth resistance value of all earthings will be displayed along with the date on which earth resistance tested and it should not more than Five ohms. Earth resistance should be measured and tested jointly with SSE incharge and contractor.

Details of earthing are given as under: -

The G.I. pipe for the earthing electrode shall be 50 mm dia. Of "B" class as per IS: 1239 and of ISI marked Zenith, Prakash Surya, Jindal, TATA, Swastika, Asian make's only.

It should have fennel of appropriate size with GI wire mesh at top end for recharging the charcoal or other material during maintenance.

[Tenderer]


[Sr.DEE/P/RJT]

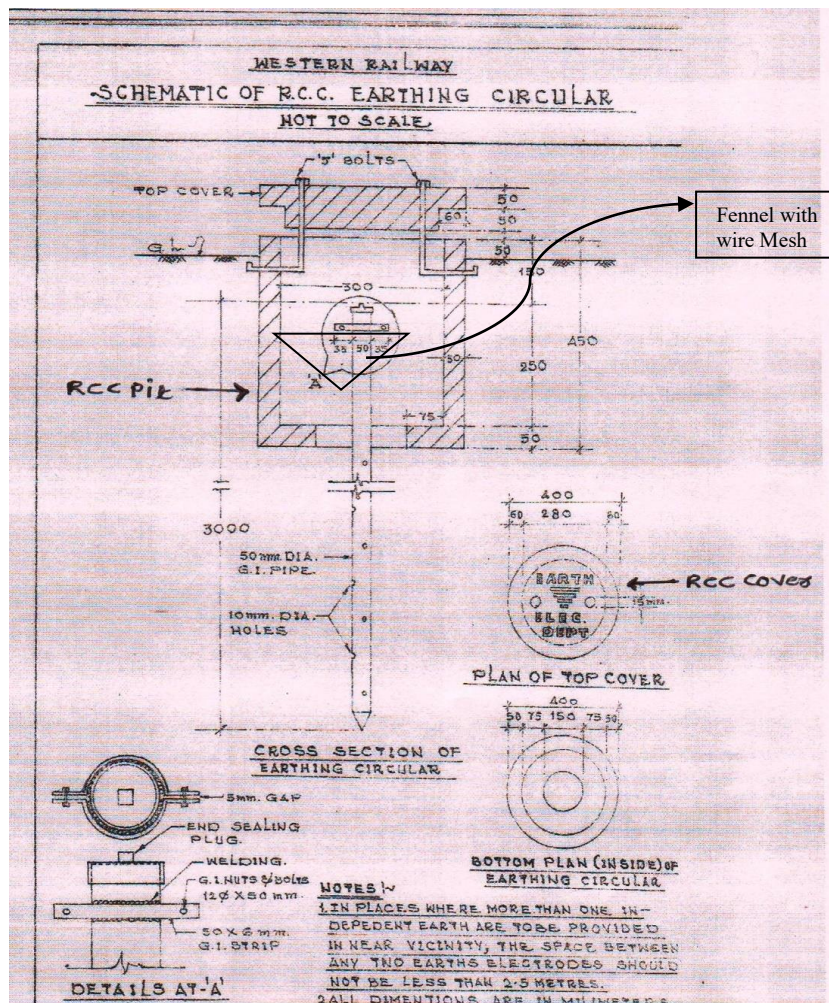
GI pipe electrodes shall be cut tapered at the bottom and provided with holes of 12 mm dia drilled not less than 7.5 cm. from each other up to 3 mtrs. of length from the bottom.

Earth pit of size 5ft x 5ft x 10ft or min 300 mm bore up to 10ft using earth auger shall be made.

The G.I. earthing strip ends shall be clamped between two G.I. washers of sufficient size and properly tightened with G.I. nut bolts of 12mm size.

Inspection chamber: A concrete box of 300X300X300 mm (inside dimension) & 50mm thickness of wall, with smooth cement plaster finish shall be provided on the top of the pit. A concrete lid, painted black, approx. 50 mm. thick with pulling hooks, shall be provided to cover the earth pit. PVC sleeve shall be provided in concrete wall to take out earthing connections.

On the backside of the cover, date of the testing and average resistance value shall be written with white paint on black background or any other color scheme advised by railway.



DRG-No-01 -Pipe Earthing

(Item No. 30) SITC of GI strip 25 mm x 6 mm:

1. The GI flat strip shall be hot dip galvanized, 75 microns (minimum) & min. size 25mm x 6 mm.
2. It shall be provided from Earth electrode / main earthing terminal MET to the LT panel board / electrical equipments in proper manner, as per instructions of the Engineer In-charge.
3. All work such as cutting, bending, supporting, soldering, coating, drilling brazing, clamping, bolting and connecting into structures, equipment frame, terminals, rails on other devices, shall be in the contractor's scope of work, and shall be done as per instructions of the Engineer In-charge.
4. The strip shall be properly fixed with suitable clamps and run along the wall / floor in such a manner that, it will not obstruct the movement. The extension of the flat shall be welded for earth continuity.
5. The material accessories and fitting such as bolts, washers, nuts, screws, cleats, clamps, anchors, fasteners etc. will be supplied by the contractor.
6. For installing earth strip on walls, special clamps shall be employed, which firmly accommodate the earth strips and are easily mounted. They can directly screwed to the wall. Fixing should be spaced not more than 1 m apart.
7. Earthing Strip which installed below ground should be covered with adequate insulating polyethylene sleeve to avoid corrosion.
8. Joints using GI conductors should be welded as far as possible. In case bolted joints cannot be avoided than there should be a minimum of 2 bolts of size 8X25MM for strip sizes up to 25 mm x 6 mm.
9. Overlap for joining the strips should be minimum 50mm. All Earthing Strip to be joined together with two bolt arrangement & lap welding joints at all junctions.
10. Strip to strip and strip to equipment connections shall be made using GI bolts and nuts, flat washer and spring washer. For bolted joints, at least a bolt M10, hardened and tempered bolts with hexagonal head are to be used.
11. Wires shall be joined by means of lugs of appropriate size connected by bolts, nuts, check nuts and washers. If the connection is on a painted surface, the paint shall be thoroughly removed and the metal exposed for making effective electrical contact. Lugs and bolts shall be of brass for copper wires and for GI strips / wires.
12. Joints should be provided with coating alternative layers of red oxide and aluminum paint. Joints shall be kept separated from air by a thick coating of hot bitumen/ tar/ grease or

[Tenderer]

 [Sr.DEE/P/RJT]

similar non-hygroscopic materials.

13. All existing and new earth connections to the proposed GI strip shall be made by the contractor using GI bolts and nuts, flat washer and spring washer or lug sockets, as per site requirement, & instructions of the Engineer Incharge.

14. Metallic frames of all electrical equipment shall be earthed by two separate and distinct connection with earthing system.

15. On completion of the installation, continuity of all conductors and efficiency of all bonds and joints shall be tested.

[Tenderer]


[Sr.DEE/P/RJT]

SPECIAL NOTES FOR TENDERERS

- i The contractor should visit the site before submitting the tender documents.
- ii. The material supplied to Railway shall be as per the approved brands & it should be approved by Sr.DEE/P/RJT or his authorized representative in writing.
- iii. This job is on Turn Key basis, if any work is required to be carried out regarding this job & not mentioned in tender document should be considered within the scope of work.
- iv Only the skilled staff of tenderer should be deployed for execution of this work.
- v. While carrying out the electrical work I.E. rules 1950 and safety code of practice should be followed.
Note- The earthing shall be conform to the following specification The IS: 3043 (1987) and National Electric Code 1985 section 12.

- vi Any item of work whether specifically mentioned in the scope of work or not but necessary for the completion of work and for proper commissioning of equipment/system as per Railways drawing/design/specification shall be deemed to be part of the scope of the work. Such item cost shall be borne by the contractor.
- vii The contractor should submit the copy of challan or bill for the material executed by the, from the Manufacturer/ Authorised dealer /Authorised supplier issued on the name of contractor, if asked by the Railway.

Contractor needs to submit test report of earthing system jointly tested with Sectional incharge in below format.

Test report of earthing system (To be connected by earth Tester)

i) Individual Earth Resistance

Sr No.	Location of earthing	Value(in ohms)	Date of measurement

[Tenderer]


[Sr.DEE/P/RJT]

Special Instructions to tenderers regrading Warrantee Equipments

For every Electrical equipment supplied by contractor, LED light, Fan, Water cooler, AC, Exhaust fan, Air circulator fan, air curtain, Refrigerator, geyser, Pumps, UPS, Batteries, Portable and other DG sets, Switch gears such as MCCB, MCBs, ACBs, contactor, Transformer, VCBs, Relay, RCBO, astronomical and other timers, Energy, voltage, current meters, solar Panels, Inverters etc. one QR code to be generated linking the equipment details in the below format QR code bear stickers having IP65 vinyl stickers(able to withstand sunlight) of suitable size(QR code (readable by QR code scanner) clearly readable) to be pasted.

NOTE:- for pump Steel /aluminum plate bearing QR code to be attached

Sample format

Equipment Warranty Details		
1.	Equipment Name	<i>40 Watt weather proof LED Light fittings IP65</i>
2.	Made & Model number	<i>XX-----XX----</i>
3.	Date of Purchase	<i>20.12.2024</i>
4.	Date of installation	<i>06.05.2025</i>
5.	Warranty	<i>6 years from date of purchase and 5 years from date of installation whichever is higher</i>
6.	Name of contractor	<i>M/S -----</i>
7	Contact number & email id	<i>XXXXXXXX</i>
8	Equipment manufacturer name and address	<i>Surya Roshni Noida</i>
9	Equipment manufacturer/distributors, local dealer contact number and email id	<i>Rajkot</i>
10	Tender no and item no	<i>To be specified</i>
11.	Specification and LOA copy	<i>Attached below</i>
12.	Copy of challan / purchase bill etc.	<i>Attached below</i>

[Tenderer]


[Sr.DEE/P/RJT]

APPROVED BRANDS

Item	Approved brands
Wiring	
Wire for wiring	Polycab, Asian, Nicco, Finolex, Bharatcab, RR Kabel, Havells, Avocab, L&T, Anchor, Pyroflex, Paragon, Fortgloster, KEI
Casing capping /PVC pipe	Presto Plast, Precision, Modi, Press Fit
Modular switch, board and socket Holder, ceiling rose, switches Plug/socket 6/16 Amp, adapter Electronic fan regulator, PVC Switch boards	Anchor/ Roma, Penta, Cona, Leader, Legrand, MK, Crabtree
Call Bell	Cona, Anchor, Leader, Precision, Havells
Lighting and controlling	
Octagonal pole	Bajaj, Philips, Crompton, AMBIKA, Transrail, Jetco tech
High Mast	Bajaj, Philips, Crompton, AMBIKA, Transrail
LED Light 9-10 Watt lamp	SYSKA, CG, BAJAJ, PHILIPS, WIPRO, HAVELL'S, OSRAM
LED Luminaire both outdoor and indoor (other than façade lighting)	Bajaj, Philips, Wipro, Jaquar, Havells, Lighting Technologies
LED integral decorative bollard with optical acrylic 9W	Jaquar, Havells, Vin, Bajaj, Polycab, Wipro, Crompton, GL
Post top lamp	Havells, Philips, Wipro, Bajaj, Crompton, GL, Jaquar
Decorative Garden poles	Jetcotech, Ambika, Bajaj, Polycab, Jaquar
Time Switches, Timers Astronomical &Solid state	L & T, Legrand, GE, Siemens, ABB, Schneider, CGL, BCH, Kirloskar, Selec, Havells, Anchor/ Panasonic,
Ventilation and air conditioning	
Ceiling Fans (BLDC type/star rated)	Orient, Usha, Atomberg, Havells, Bajaj, Crompton, Almonard
Air circulator Fan	Almonard, Crompton, Havells, CG, Bajaj, Orient, Usha.

[Tenderer]

 [Sr.DEE/P/RJT]

Item	Approved brands
Exhaust Fan	Crompton, Usha, Almonard, Inova, Khetan, Havells, Orient
Bracket fan	Almonard, Crompton, Havells, CG, Bajaj, Orient, Usha.
Air curtain:	Voltas, Usha, Acme, Crompton, Aircon, Almonard, Blue Star, Videocon, Dolphy, Eureka, orchid, mitzvah
Air conditioners	VOLTAS, LG, BLUSTAR, SAMSUNG, DAIKIN, IFB, HITACHI, O'General, Mitsubishi Heavy duty
Automatic Change over timer	Dynamic Micro Tech /Logic Technology /Aditya /T-Mech or similar
Cables and accessories	
Cable	Polycab, Avocab, Havells, Paragon, Finolex, Bharatcab, RR Kabel, Finolex, L&T, Anchor, KEI, Paragon, HPL, Fortgloster APAR industries
Cable – lugs & accessories for electrical general services.	MULTISHRINK, 3M, DOWELLS.
LT/HT End termination kit	Raychem, Denson, M-seal, 3M
Cable junction box	Sintex, National, Hensel, Schneider, Siemens
3 core flexible round Cu cable of 1.5 SQ MM	Polycab, Asian, Nicco, Finolex, Bharatcab, RR Kabel, Havells, Avocab, L&T, Anchor, Philco, Pyroflex, Paragon, Bentec, Fortgloster
HDPE PIPES	Tijariya, Himalyan, Konzept, Poddar, Unique, ASVA
DWC pipe	ALOM POLY, REX POLYEXTRUSION LTD, Gemini Group of Companies
G.I. Pipe	Zenith, Prakash Surya, Jindal, TATA, Swastika, Asian
PVC channel type perforated cable trunking	JETCO tech, Hensel, Presto Plast, Precision, Modi, Press Fit
Switchgears	
MCCB, MCB-DB, ELCB, RCCB, RCBO	Hager, GE, Schneider electric, L&T, ABB, siemens
Contactors	GE, Siemens, HPL, Havells, Legrand, ABB, Schneider, BCH, Hager, L&T
Air circuit Breaker	L & T, Legrand, GE, Siemens, ABB, Hager,

[Tenderer]


 [Sr.DEE/P/RJT]

Item		Approved brands
		Schneider only
VCB		ABB, Scheider, L&T, Siemens
LT panel 800 Amp.		L&T, GE, Siemens, Indoasian, Havells, ABB, Crompton Greaves, Schneider.
Distribution Transformer		Areva, ABB, EMCO, Crompton, BHEL, Voltamp, Kirloskar, IMP, Bharat Bijlee, NGEF, Voltas, GEC, Vivekanand, CG, Western Electric, Tesla, RTS, National, Vidyut TRANSFORMERS
Changeover Switch		L&T, ABB, Siemens, GE, HPL, Schneider, Legrand, CG, EE
Measuring Voltmeter/Ammeter	Instrument	AE, IMP, Motwani, Meco, Trinity, meter, Simco, Macco, Hitachi, L&T, Havells, BENTEC, Schneider, ABB
Electronic Meter(conventional)	Energy	L&T, Siemens, Meco, Havells, HPL, Bentec, Elmeasure, Anchor/Panasonic, Secure
Smart meter		L&T, El measure, Schneider, Anchor/Panasonic
Instrument transformer (CT/PT):		Ashmor, L&T, MECO, Virat, Kuppa, AE
Indication lamp:		L&T, Siemens, C&S, Teknik
Relay		Areva, Siemens, ABB, CG, Jyoti, MEI, L&T, BHEL, Voltas.
Capacitor bank:		Meher, Crompton, ABB, BHEL, L&T, EPCOS, Havells, HPL
Battery charger		RS Power systems-Jaipur, ABB or any RDSO approved source.
UPS DG and batteries		
DG Set:		Kirloskar, Cummins.
Battery		HBL / Amar Raja/ Excide/ CSB, Brentord/ Schneider electric/ Panasonic/ Hitachi/Yuvasa only
UPS		APC/Eaton/GE/Brentord/Libert/Luminous
Pumps and accessories		

[Tenderer]


 [Sr.DEE/P/RJT]

Item	Approved brands
Submersible pump sets	Kirloskar, C.G, Siemens, KSB, Calama, Lubi, Taxmo, Shakti, CRI. only.
Horizontal submersible pump sets	Kirloskar, C.G, Siemens, KSB, Calama, Lubi, Taxmo, Shakti, CRI. only.
Electrical pump control panel	HAGER, L & T, ABB, BHEL, GE, SIEMENS, schneider, CG.
Flat submersible Cable	Polycab, CRI, RR Cable, Havells, Finolex.
U PVC Pipe column	Ashirvad, Astral, Finolex only.
Other Misc items	
Kitchen Chimney	Glen, Hindware & Prestige VISTA 900
Desert coolers	Symphony, Orient, Havells, Bajaj, Kenstar, Voltas, Crompton.
Water Heater (Geyser)	I Racold Bajaj, Crompton Greaves, Orient
G I Sheets / M S Structure /beam /gurdar / channel	Jindal, SAIL, Essar, Tata, Zenith, Surya, NECO, IPR
Earthing	
Pipe for earthing	Zenith, Prakash Surya, Jindal, TATA, Swastika, Asian
Solar system	
Solar PV modules	As per latest MNRE guidelines (ALMM-list-II updated as on date of material approval)
Inverter	Polycab, Havells, ABB
Solar DC Cable	Polycab, havells, finolex, RR kable or any other make as of Ac cable.

Contractor shall have to supply materials as per above List of Approved Make or its equivalent as approved by Sr.DEE/P/RJT.

[Tenderer]


[Sr.DEE/P/RJT]

MATERIAL APPROVAL (CONTRACTOR SUBMISSION FORMAT)

Name of Work: _____

Contract Agreement / LOA No. & Date: _____

Consignee / Engineer-in-Charge: _____

Name of Contractor / Firm: _____

Sr. No.	Tender Item No.	Item Description	Qty.	Make (As per Tender)	Model No. (As per Tender)	Make (Proposed by Contractor)	Model No. (Proposed by Contractor)	Supporting Documents (PDF / CP No.)	Consignee Remarks

Contractor's Declaration:

I/We hereby certify that the materials proposed above strictly conform to tender specifications and relevant standards.

Name & Signature of Contractor: _____

Seal & Date: _____

For Department Use Only

Checked by (JE/SSE): _____ Date: _____

[Tenderer]

 [Sr.DEE/P/RJT]