



SPECIAL CONDITION AND SPECIFICATION OF CONTRACT PART II

Name of Work: ST-BRC & AKV-Raj Section: Extension of high-level platforms at AKV and MYG stations, provision of lifting barriers and duty bunks at level crossings in Ankleshwar-Rajpipla Section, and provision of a track circuit maintenance room at Ankleshwar.

Scope of Work:-

1. **Ankleshwar - Extension of High Level Platform No. 1 by 30m and Platform No. 2/3 by 24m at ST end without slewing of track.**
2. **Miyagam Karjan - Extension of High Level Platform No. 1 by 32m towards BRC end and 12m towards BH end, and Platform No. 2/3 by 20m towards BRC end and 15m towards ST end.**
3. **AKV & BH: Water fountain, Toilet block and Cover shed.**
4. **Construction of Building 6 M X 6M at AKV.**
5. **Ankleshwar-Rajpipla Section: Provision of lifting barriers and construction of duty bunks at 05 level crossings (LC Nos. 3, 4, 7, 8 & 17).**

1.0 CONDITIONS IN GENERAL: -

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1.1 The locations, quantities and execution methodologies are tentative and Railway administration reserves right to alter these at their own discretion and will without assigning any reason for the same.

1.2 The Entire work covered under the scope of this tender shall be carried out in accordance to WR Headquarters letter No W65/O(Policy) Vol.VI/E401 dated 14.01.2021 for procedure for ensuring safety at work site. At no cost the safe movement of trains shall be compromised to during the execution of the work and contractor shall be solely held responsible for any accidents arising out of noncompliance of safety instructions and shall be liable to pay for the damage to railway assets and other charges as applicable.

1.3 The work is required to be completed within a specified period in the NIT and tender documents from the date of issue of acceptance letter.

1.4 The work is to be carried out as per direction of the ADEN/SSE(P.Way)/SE in charge of the work.

1.5 All precautions have to be taken by the contractor to avoid damage to Railway assets, track, signaling and OHE gears while working & carting out materials. Contractor will be completely responsible for safety of materials and his labour. The Contractor has to ensure provisions mentioned in JPO issued as Telecom Circular No 09/2023 dated 12.06.2023 for undertaking digging work in the vicinity of under ground signalling, electrical & telecommunication cable. In case of damage is caused to OFC/Quad Cables etc or any other cable during the execution of the work, the contractor is liable to pay a penalty as mentioned in JPO No 09/2023 for damaging the cable. Further damage to railway assets, if any are liable to be recovered from the bills of the contractor at the prevailing market rates. The JPO on Joint survey and cable route marking during execution of any digging/excavation work, circulated vide JPO No SG 216/1 (Misc) Date: 28.02.2025 which can be collected from the division office must be ensured at all the times during the work execution.

1.6 The contractor shall be completely responsible for any safety of his labour while working at site as also for the safety of train or traveling passengers pass in through the site.

1.7 Contractor is required to inspect the site of work to make himself satisfied before tendering his rates for complete working, including all lead and lift involved for successful completion of work.



1.8 In terms of CTE-CCG's letter No. W 632/0 (Gangman uniform) Vol. I dated 18.03.2016, contractor should ensure that workman of contractor wear safety type of reflective jackets, safety Helmets and all the associated safety gears & items invariably while working on site.

1.9 Before submitting tender, the tenderer are required to satisfy themselves by actual inspection of site and locality of the work that all conditions liable to be encountered during execution of works are taken in to account and the rates entered in tender schedule are adequate and all inclusive of contract for completion of the works to the entire satisfaction of the Engineer.

1.10 All tools and equipment's shall be arranged by the contractor as necessary for execution of work. Required sets of Dip Lorry will be supplied by Railway and necessary hire charges as applicable will be recovered from contractor.

1.11 Work should be done in daytime between sunrises to sunset only, under traffic block, which will be arranged by the Engineer's representative at site.

1.12 All the activities of renewal should be executed under suitable traffic block or under Speed restriction, which will be imposed by the Sectional PWI as per necessity. There may be no block/restriction on working on National Holidays and weekly rests as previously decided between Railway and Contractor.

1.13 Safe guard of materials to be released from track and new materials taken from the Railway Station to the site of work or the materials which will be supplied to the contractor from PWI's depot/stores will be the contractor's responsibility till:-

(i) Sorting and stacking in lots completed in the PWI's depot or any other place as directed and verified by the PWI and the materials received through proper hand receipt.

(ii) Laying of new material in track completed and surplus materials are handed over to the PWI at his stores /depot through Hand receipt.

1.14 Housing accommodation and watering facilities for Contractor's labour will have to be arranged by the contractor. Cess and Water charges will be recovered from contractor's bills as per extant rules.

1.15 Before commencement of work the list of released materials shall be jointly prepared on the basis of a field survey to be conducted by SSE P-Way and contractor's representative after work has been awarded before the dismantling work is allowed to be commenced. The joint inventory shall be recorded in the register duly signed and certified by SSE & ADEN and if any variation is happening due to maintenance activities/ or due to other reason, during progress of work on un-dismantled stretch then it should be recorded in register with reason during next record measurement. The contractor shall be bound to hand over the materials according to the entries made in the register duly signed and certified by SSE & ADEN and the contractor shall be responsible for any deficit of material issued or released at any stage from the joint inventory. In terms of Para 320 (3) (9) the sectional AEN shall carry out test checks to the extent of 20% of each item and makes entries to this effect in the summary sheet.

1.16 In case of any loss, damage or shortage to any materials (either released or new) from the custody of contractor, recovery will be made from the contractor's bills as per prevailing rates of disposal/procurement of such items by the Railway, depending upon the released or new materials as the case may be.

1.17 Loading and unloading of materials would be done in safe manner as per direction of Railway officials. At no time the materials shall infringe the track, so also removed rail panels shall be cleared off ballast section. Damages to railway assets if any due to contractor's fault are liable to be recovered from the contractor at the prevailing market rates.

1.18 Whenever a train is to be passed during the progress of work, immediate on hearing the lookout whistle the site should be kept free from men and tools by contractor after making necessary arrangement for safe passage of the trains including insertion of wooden blocks, where necessary as per direction of the Railway's representative at site and resume to work again as soon as the train passes. Wooden blocks have to be arranged by the contractor at his own cost.

1.19 Observation of bonded labour system (Abolition) Ordinance-1975:- The contractor shall have to observe the provision of bonded labour system (Abolition) Ordinance-1975.

1.20 Contractor shall ensure the all P.Way materials are properly used and no damage is done to P.Way materials new or released. In the event of any damage to P. Way materials contractor shall be responsible for damage and , recovery will be made from the contractor's bills as per prevailing rates of



disposal/procurement of such items by the Railway, depending upon the released or new materials as the case may be.

1.21 Contractor shall be responsible for proper maintenance of track within the restricted portion of length. Restriction will only be removed when track is fully maintained by the contractor up to specification of IRPWM and satisfaction of the Engineer's representative in charge at site for 30 KMPH & 45 KMPH.

1.22 Before commencement of the work, contractor along with his supervisors and labour should get clear "Know how" of the work from the Railway officials to avoid confusion during the progress of work.

1.23 The entire work is to be done in workman like manner and the track shall be handed over to Railway.

1.24 Safe Working Methods:-All or some of the works executed under this contract involves works on or alongside the Railway track on which the Railway Traffic is kept operative during or immediately after the completion of one or more phases of the contract. In view of the position, maintaining safe working conditions at work site at all times for the safe passage of the Railway traffic is a primary over riding condition required to be fulfilled by the contractor at all time.

For this purpose, it is understood and agreed to by the contractor that the work executed by him under this contract shall at all time fulfill all the safety conditions in force on the Railway from time to time to operate the Railway Traffic.

A large number of men and machinery are deployed by the contractor for Track Renewal, it is essential that adequate safety measures are taken for safety of the trains as well as the work force. The following measures shall invariably be adopted:-

- (i) The contractor shall not start any work without the presence of Railway Supervisor at site.
- (ii) Whenever the road vehicle and/or machinery are required to work in close vicinity of Railway lines, the work shall so carried out that there is no infringement to the Railway's schedule of dimensions. For this purpose the area where road vehicles and/or machinery are required to ply, shall be taken for running/reversal of road vehicle/machinery without infringement the running track. Barricading shall be provided wherever justified and feasible as per site condition.
- (iii) The look out and whistle caution order shall be issued to the trains and speed restriction imposed where considered necessary for protection of trains.
- (iv) The unloaded ballast/rails/sleepers/Other P.Way materials after unloading along the track shall be kept clear off moving dimensions and stacked as per the specified and distance from the running track.
- (v) Supplementary site specified instructions wherever considered necessary shall be issued by the Engineer in Charge.
- (vi) The contractor shall not allow any road vehicle belonging to him or his supplies etc. to ply in Railway land next to the running line. If for execution of certain works viz. earthwork for parallel Railway line and supply of ballast for new or existing rail line gauge conversion etc. Road vehicle are necessary to be used in Railway land next to the Railway line, the contractor shall apply to the Engineer in Charge for permission giving the type and no. of individual vehicles, name and license particulars of the drivers, location, duration & timings for such work/movement. The Engineer in Charge or his authorized representative will personally counsel, examine and certify, the road vehicle drivers, contractor's flagman and supervisor & will give written permission giving names of road vehicle drivers, contractor's flagman and supervisor, drivers contractor to be deployed on the work, location, period and timing of the work. This permission will be subject to the following obligatory conditions.
 - (a) The road vehicles will ply only between sunrise and sunset.
 - (b) Nominated vehicles and drivers will be utilized for work in the presence of at least one flagman and one supervisor certified for such work.
 - (c) The vehicle shall ply 6m clear of track. Any movement/work at less than 6m and up to minimum 3.5m clear of track center, shall be done only in the presence of Railway employee authorized by the Engineer in Charge. No part of the road vehicle will be allowed at less than 3.5 meter from track center. Cost of such Railway employee shall be borne by the Railway.
 - (d) The contractor shall remain full responsible for ensuring safety and in case any accident shall bear cost of all damages to his equipment and man and also damages to Railway and its passengers.



(e) Engineer in Charge may impose any other condition necessary for a particular work or site.

1.25 Instructions/directive of the Engineer's representative:-

The contractor shall at all time, execute the contract work only in the presence of and under the supervision of Engineer's representative of a Railway Employee specially appointed on his behalf. No work under the contract shall, therefore, be commenced by contractor without the permission of Engineer's representative.

(i).The contractor shall always execute the work under contract in strict compliance with the instructions or directive by the Engineer's representative of Railway. Act of non compliance with the instructions, directives issued by the Engineer's representative shall be considered as a default of the contractor, where after the Railway shall be free to take further appropriate action as provided in the contract for dealing with such default of the contractor. The decision of the Engineer's representative where there has been an act of non compliance with the instructions/ directives of the Engineer's representative for the purpose of this clause shall be final and conclusive.

(ii).The instructions/directives by the Engineer's representative shall not however, absolve the contractor of his responsibility or reduce his responsibility in any manner whatsoever in regard to maintaining at all the safe working condition at the work site.

1.26 Non-Compliance with the instructions/directive of the Engineer's representative:-

The contractor shall always comply with the instructions/directive issued by the Engineer's representative from time to time. In the event of any non-compliance with such instructions/directives apart from and in addition to other remedies available to the Railway as specified herein above, the Engineer's representative may employ at the work site the Railway workman with necessary equipment's as considered appropriate and adequate by him to provide the requisite condition for the safe and unhampered movement of Railway traffic. The decision of the Engineer's representative in regard to the need, appropriate and adequacy of the deployment of the Railway workmen with necessary equipment's shall be final and conclusive.

When the workman with necessary equipment's are deployed in the above manner, recovery at the following rates shall be made from the contractor's dues under this contract or any other money of the contract available with the Railway under this contract or any other contract. The recovery for the total workmen hours employed at the work site for the above purpose shall be made at the rate of Rs. 1000/- (Rupees One Thousand) per workman hours irrespective of the type and grade of the Railway employee actually employed. The aggregate period of the workmen hours for the above recoveries shall be reckoned from time the Railway workman are actually deployed at the site till the work is completed to the satisfaction of the Engineer's representative, whose decision in this regard shall be final and conclusive.

If the contractor does not comply with the instructions, directives of the Engineer's representative, as part from an in addition to the remedies available to Railway as specified herein above without prejudice to the Railway's right in this regard, the Engineer's representative, which for the purpose of this clause shall exclude suspended the contractor work till the Engineer's representative is satisfied that the contractor is in a position/will comply with the instructions/directives issued by the Engineer's representative.

The decision of Engineers' representative in this regard shall be final and conclusive. The Contractor shall not have any claim whatsoever against the Railway for such a short terms/long terms suspension of the contacted work.

During the above-mentioned period of suspension of work, the contractor shall not in any manner attempt to carry out any work at the work site. Any such attempt of the contractor shall than be liable for further appropriate action under the relevant provision of Indian Railway Act.

1.27 Contractor shall not start any work without the personal presence of the SSE(P.Way)/SE(P. Way) in-charge or his authorized representative at site. In case the contractor's representative starts

any work in absence of Railway's authorized representative, it shall be treated as unauthorized and illegal tampering with track and shall be liable for action under the Indian Railway Act.

1.28 Penalties up to an upper limit of 100% of the total cost of the work shall be imposed in case there is an accident for which the contractor is responsible.

1.29 Railway administration reserves the right to terminate the contract with immediate effect if the contractor is found responsible for the accident without giving any further notice to the contractor.



1.30 During the period of work, the contractor shall keep required watchman for guarding P. Way materials in his stock and material laid in the track. Railway shall not be responsible for any theft during the currency of contract. The contractor shall borne entire cost of the material if lost due to any reason. The work will be treated as handed over to Railway only after completion of entire work. The contractor shall provide maintenance gangs for the completed work till its SR is relaxed to normal. Even after relaxing speed to normal, during the currency of work, the contractor may be asked to do slack picking if required for which nothing extra shall be paid.

1.31 Speed Restriction and disconnection:-

(i) Necessary speed restriction will be imposed by SSE(P. Way) incharge or his representative of the work for execution of Through Sleeper Renewal, Deep Screening, lifting and other works as per requirement etc.

(ii) Contractor after ensuring that speed restriction is imposed where he has to do the work, he should progress with the work in a systematic manner keeping in view the speed restriction will be for minimum period and should utilize in most progressive manner for which before starting the work, the contractor in consultation with Railway's representative should check out the program date wise and operation wise. Any delay on account of contractor's negligence will be taken up seriously and necessary action will be taken as per G.C.C and extant rules which may amount to termination of contract.

(iii) Flag-man as necessary during day and night will be arranged by agency, which will be counseled by CPWI/PWI and competency will be issued by concerned CPWI to ensure proper work site safety. Agency shall ensure deputation of same staff to ensure work site safety. Nothing extra shall be paid for this.

1.32 Safety Hazards:-

(i) The work should be done in the presence of the authorized Railway supervisor.

(ii) No work should be carried out during rains and foggy weather or when working conditions do not permit.

(iii) He should ensure for providing sufficient number of technical supervisors including retired PWI having sufficient experience constantly during the progress of work at site.

(iv) The contractor will ensure that no obstructions are caused which may endanger to safety of track while working at site. Any loss caused to Railways due to negligence of the contractor will be recoverable from the contractor, as decided by the Railway Administration.

(v) The work will be done during speed restriction as and when imposed. No compensation will be payable for idling of the labour.

1.33 Contractor's Supervisor:-

(i) Contractor should comply and post at site qualified technical supervisor who should be well experienced in executing the Permanent Way Work in the opinion of Engineer In Charge. If the supervisors are not fit to be in charge of the work, then the contractor should replace them and keep retired PWIs, APWIs and P.Way Mistry for supervising the work. However it will be obligatory on the part of the contractor to engage at least one well experienced PWI/APWI (retired) for each site of work separately.

(ii) No work on the track should be done unless and until Contractor's technical supervisor not below the rank of SSE/SE (P. Way) of Railway's is present at site.

(iii) The standard track parameters will be in accordance with latest prevailing circulars of Railway.

(iv) Dressing of ballast will be done to the standard of LWR profile as per direction of site in charge. Dressing of ballast will be done after if packing is done by machine.

(v) Clean ballast cushion will be measured below the rail seat from the bottom of the sleeper. Even with desired lifting net clean ballast should not be less than 350/300mm.

1.34 Additional instructions for Execution of Works :-

(i) Working in Yard:-Since part of the works are to be executed in yard and stable loop lines, all care should be taken to safe guard labour, plants and other equipment and also no infringement to either side of running lines. Yard where Track machines will be stabled for work, agency has to maintain those stabling lines



to ensure work site safety.

(ii) The lifting of track shall be as specified in IRPWM. The muck of deep screening shall be spreading out evenly in low lying area as directed by Engineer in Charge. Suitable location for deep disposal of muck shall be decided by Engineer in Charge at site.

(iii) No space between yard lines (either side) is available for spreading muck. It may be noted that no extra payment shall be made for carting/leading/unloading of muck. Contractor has to take over all the released muck immediately away from the site and disposed off as per the direction of Engineer in Charge.

(iv) All the released CST-9A/ST/Wooden/PRC sleepers are to be carted, sorted out serviceable and unserviceable and stacked as directed by Engineer in Charge. The released fittings are to be handed over to SSE(P. Way)'s nominated depot.

(v) All the standard new fittings will be handed over to contractor from SSE/SE (P. Way)'s nominated store.

(vi) Procedure for transportation of materials is to be followed strictly as directed by Engineer in Charge.

(vii) For insertion of PRC sleepers, transported PRC sleepers to be spreaded out all along the track without infringement moving schedule of dimension of passing/stabled trains.

(viii) Carriage of materials items includes loading, unloading, sorting and stacking out of each items as directed by the Engineer In Charge. The contractor shall have to lead the P. Way Materials like released rails, CST-9, ST, Wooden, PRC sleepers and also tie bras, fish plates, ACB/MS plates, small fittings etc.

(ix) The small fittings like keys, cotters, spikes, fish bolts shall be carted by the contractor from site to SSE/SE (P. Way)'s stores but shall not be accounted for payment.

(x) Mode of payment for CST-9 Sleepers, Tie Bars, fish plates, ACB, ST sleepers shall be calculated as nominal weight for new materials as per IRSTM. The weight shall be reduced by 5% for S/H and released materials.

(xi) Mode of payment for wooden sleeper i.e. Hard Wooden Sleepers and soft wooden sleepers will be actual weightment of respective sample.

1.35 Railway administration reserves the right to add suitable additional special conditions & specifications as per necessity during the work execution.

1.36 Typographical errors if any shall be interpreted as per the discretion of the railway administration.

1.37 All the relevant Data like Signed Copies of Site order books, Day wise - item wise progress registers, Work progress registers duly signed by SSE PWAY In charge & ADEN, all the measurement references, Hinderance registers as proof for DOC Extension, Material Testing Register's, labour records, tax invoices, test reports of samples, tests of luminance as per the ASTM for engineering indicator boards & all other tests involved, competency certificates for labour supervisors, All relevant papers of truck, tractor, hydra, JCB and all other relevant documents in support of the recorded measurements must be submitted to the division with each running bill duly signed by SSE Pway In charge & ADEN.

1.38 In accordance with Railway Board's Letter No 2019/V3/ECR/Engg/08-PC(R) dt. 08.04.2021& its recommendations, and vide WR HQ CCG's letter No WR-HQENG(WWTC)/2/2021/E-426740 Dated 08.02.2024, The Original Invoice of material should be obtained to ensure traceability & useage for each and every material component (Including steel, cement etc).Additionally, it must be ensured by the concerned field officials/officers that for each and every material transaction (i.e of Cement/Steel/Other Material/etc) , its original invoices must be obtained from the contractor mandatorily with clear cut enlisting of details on the invoice like details of agency, Name of Project, site location etc by the executing officials before submitting each bill to division. The invoices should be signed by railway officers, SSE/JE, to confirm their acceptance. Consolidated record of the invoice of the work shall be meticulously maintained. It must also be ensured that third party material test certificate have batch No/Lot No./Cast No./Batch Code etc along with agency, name of project, site location, GSTIN number etc endorsed by executing officials before passing the bill to ensure traceability of each and every test report for co relation at later stage.



Additional Instructions to Tenderer and field office.

1.39 It may be ensured by the field supervisor/SSE/PWAY Incharge and ADEN incharge of the work that the variation should not be exceeded by +25% of the agreement value. Variation in excess of +25% should normally be avoided and in rare cases, decision may be taken at the level of competent authority. SSE(P. Way) and ADEN incharge to ensure critical review of the contract during currency that variation should not be exceeded by +25% of the agreement values.

1.40 Tenderer should note that Railway reserves the right to foreclosure of contract at any time during the currency with due notice. No any claim shall be entertained due to foreclosure of contract by Railway with due notice at any time.

Competency Certificate

Competency Certificate to the contractor's supervisor will be issued by the Asst Engineer of the work as given in the following format.

Certified that Shri _____, P. Way supervisor of the contractor M/s _____, has been examined regarding P. Way working on

(Name of Work). His knowledge has been found satisfactory and he is capable of supervision the work safely.

Assistant Engineer Date:-

Instructions for Execution of WR USSOR2021 Items .

1.41 The items of WRUSSOR 2021 shall be executed as per the Item Description and the linked specifications of IRUSSOR 2021 for the linked items of IRUSSOR 2021 based on which WRUSSOR 2021 has been framed. Before the execution of the item it must be ensured that all the relevant requirements and specifications of the items like RDSO standards, ASTM Standards, BIS standards etc are complying and suitable test results are available. The item description must be carefully gone through and understood before execution. The contractor shall execute the items in accordance with the item description and relevant specifications as mentioned in the item description. All the relevant test results, quality checks, tests and proof of compliance of required standards as per the specifications mentioned in the item like ASTM standard, RDSO Drawings, BIS standards etc shall be complied to and the test results for the same shall be submitted to the division with each bill without fail. Non Compliance with the standards or specifications as prescribed in the item specification like as per RDSO specification or as per ASTM or as per any other standards shall lead to non payment of the concerned item, responsibility of which shall be of the contractor. The decision of Engineer in charge shall be final and bounding to the contractor for the work execution with items of new USSOR. The following codes, manual, standards and guidelines shall be used for different items of Permanent Way Works for execution, quality assurance, tests, check and acceptance and forms parts of the specification.

1. Indian Railway Permanent Way Manual (with latest CS)
2. Manual of Instructions on Long Welded Rail(with latest CS)
3. Manual for Ultrasonic Testing of Rails and Welds (with latest CS)
4. IRS Specification for Fusion Welding of Rails by Alumino - Thermic Process (with latest CS)
5. RDSO Guidelines for Handling and Stacking of Rails
6. Manual for Glued Insulated Rail Joints (with latest CS)
7. Manual for Flash Butt Welding of Rails (with latest CS)
8. Indian Railways Standard Schedule of Dimensions (with latest CS)
9. General & Subsidiary Instruction
10. Indian Railways Small Track Machine Manual

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11. Track Manual Volume-I
12. Track Manual Volume-II
13. Indian Railway Works Manual
14. Manual For Reconditioning Of Medium Manganese (MM) Steel Points And Crossings, SEJs
15. Work Procedure For Reconditioning Of Cupped At Welding Joints And Wheel Burn/Scabs Using "Robotic Welding Machine" (Provisional)
16. Indian Railways Code For The Engineering Department
17. Accident manual
18. IR GCC (with Amendment)
19. Any other reference considered in the item description.

Additional Instructions for Execution of WRUSSOR 2021 Items

1.42 The Agency/Contractor/Bidder must ensure that Minimum Wages along with all applicable allowances and charges as applicable are paid to the Labour's arranged for the work.

Instructions for Execution of CPWD DSR-2023 WR-USSOR-2021 Items

1.0 The items of CPWD DSR-2023 & WR-USSOR-2021 shall be carried out in accordance with the item description and specifications of the items mentioned in the item description and its corresponding specifications in the CPWD and USSOR respectively. Specifications and test results in proof of the materials used, confining to the specifications mentioned in the CPWD and USSOR specifications shall be submitted with each progress bill. It must be ensured that the item is executed as per the CPWD and USSOR specifications.

SPECIFICATION OF CEMENT

(A) The cement used shall be any of the following and type selected should be appropriate for the intended use.

- (i) 53 Grade Ordinary Portland Cement conforming to IS:269
- (ii) Rapid hardening Portland Cement conforming to IS:8041
- (iii) Portland slag cement conforming to IS:455
- (iv) Hydrophobic Cement Conforming to IS:8043
- (v) Low heat Portland cement conforming to IS:12600
- (vi) Sulphate resisting Portland cement conforming to IS:12330

(B) The cement shall be packed in jute sacking bags conforming to IS:2580-1982, double hessian bituminized (CRI type) or woven HDPE conforming to IS:11652-1986 woven polypropylene conforming to IS:11653-1986, jute synthetic union conforming to IS:12174-1987, or any other approved composite bags, bearing the manufacturers name or his registered trade mark if any, and grade and type of cement.

(C) Every delivery of cement shall be accompanied by a producer's certificate confirming that the supplied cement confirms to relevant specification. These certificates shall be endorsed to the Engineer for his record. Certified copy of the same shall be submitted to Divisional Office along with running bills/final bills.

(D) Every consignment of cement must have identification marks on packages indicating date of manufacture and grade and type of cement. **Cement when brought to work shall not be more than 6 weeks**



old from the date of manufacture. In case due to some reason it is not possible to use the cement within three months then it should be use only in lean concrete and PCC work only. Effective precautionary measures shall be taken to eliminate dust nuisance during loading or transferring cement. The procurement of cement shall be planned by the contractor this does not affect the progress of work.

(E) Cement in bags shall be stored and stacked in a shed which is dry, leak proof and as moisture proof as possible. Flooring of the shed shall consist of the two layers of dry bricks laid on well consolidated earth to avoid contact of cement bags with the floor. Stacking shall be done about 150 to 200mm clear above the floor using wooden planks, old wooden sleepers or scrap GI sheets. Cement bags shall be stacked at least 450mm clear of the walls and in rows of two bags leaving in a space of at-least 600mm between two consecutive rows. In each row the cement bags shall be kept close together so as to reduce air circulation. Stacking shall not be more than 10 bags high to avoid lumping under pressure. In stacks more than eight bags high, the cement bags shall be arranged in header and stretcher fashion, i.e. alternately lengthwise and crosswise so as to tie the stacks together and minimize the danger of toppling over.

(F) Different type of cement shall be stacked and stored separately. Cement bags shall be stacked in a manner to facilitate their removal and use in the order in which they are received. For extra safety during monsoon, or when cement is expected to be stored for an unusually long period, each stack shall be completely enclosed by a water proofing membrane, such as polyethylene/tarpaulin, which shall cover the top of the stack. Care shall be taken to see that the water proofing membrane is not damaged at any time during use. Cement which is set or partially set should on no account be used. Storage of cement at the worksite shall be at the contractor's expense and risk. Any damage occurring to cement due to faulty storage in contractor's shed or on account of negligence on his part shall be the liability of the contractor.

(G) After receipt of each lot of cement at go-down a sample of cement at the direction of Engineer in charge shall be tested at contractor's own cost for (a) Fineness, (b) Soundness, (c) Setting time (initial and Final), (d) Compressive strength & (e) consistency of standard cement paste as prescribed in IS code) IS:4031 Part-II, Part-III, Part-V & Part-VI for each lot or every 50 tonnes or part thereof. Only on receipt of satisfactory certificates this cement shall be allowed to be used on the work. Certified copy of the same shall be submitted to Divisional Office along with running bills/final bills.

(H) "Cement shall be procured/purchased from cement factories/authorized dealers/retailers from various popular brands mentioned under Chief Engineer (Works & SD) letter No. WR-HQENG6(WWTC)/4/2019/E-907 dt.21.08.2025. (Any relaxation in these cement brands should require prior approval of Competant authority of Railway) The contractor shall have to submit the cash memo along with the lot of cement purchased from the various cement factories/authorized dealers/retailers to Engineer in Charge in token proof of purchase of cement from reputed cement factories/authorized dealers/retailers. No cement shall be accepted by the Engineer in charge without cash memo. Certified copy of the same shall be submitted to Divisional office along with running bills/final bills"

(I) No payment shall be made for the cement used in works rejected by Engineer. All empty bags shall be taken away by the contractor after use of cement and cost of empty cement bags shall not form part of quoted rates against the item of cement.

(J) Cement consumption register shall be meticulously maintained giving quantity of work done/consumption of cement of each day.

(K) Cement bags left after completion of work shall be taken away by the contractor and Railway shall not make any payment against these bags.

SPECIFICATION OF STEEL ITEMS

REINFORCEMENT STEEL (TMT BARS) AND STRUCTURAL STEEL

a) All Reinforcement Steel (TMT Bars) and structural Steel shall be procured as per specifications mentioned in BIS's documents-IS:1786 and IS:2062 respectively. Independent tests shall be conducted, wherever required, to ensure that the materials procured conform to the specifications.

b) Steel shall be procured only from those firms, which are established, reliable, indigenous and Primary



producers of steel, having integrated steel plants (ISP), using iron ore as the basic raw material and having in-house iron rolling facilities, following by production of liquid steel and crude steel, as per Ministry of Steel's guidelines and should be as per **Chief Engineer (Works & SD) letter No. WR-HQENG6(WWTC)/4/2019/E-907 dt.21.08.2025. (Any relaxation in these steel brands should require prior approval of concerned DEN/Sr.DEN).**

c) However, only certain isolated sections of structural steel, not being rolled by ISPs, can be procured from the authorized re-rollers of ISPs or authorized licensee of BIS having traceability system and who use billets produced by ISPs.

d) The steel procured shall be reasonably free from cracks, surface flaws, laminations, rough and imperfect edges and all other harmful defects. Steel sections, shall be free from excessive rust, scaling and pitting and shall be well protected. The decision of the Engineer regarding rejecting any steel section on account of any of the above defects shall be final and binding.

e) Structural steel work shall conform to the requirement as specified in CPWD Delhi Schedule of Rates of 2023 (DSR - Vol-I & Vol.-II), CPWD Specifications (Vol. 1 & Vol. 2).

f) **Necessary purchase bill along with test certificate for steel shall be obtained and submitted to the Engineer in Charge. Steel without the test certificate from approved laboratory/ Engineering college shall not be used in the work. Certified copy of the same shall be submitted to Divisional Office along with running bills/final bills. Steel shall be tested for Tensile strength and bend test as per IS:1599 as specified in CPWD Delhi Schedule of Rates of 2023 (DSR - Vol-I & Vol.-II), CPWD Specifications (Vol. 1 & Vol. 2) and USSOR 2021.**

g) Quantity for this item shall be calculated as per nominal weight of steel section for the length actually used in the work. No payment will be made for the wastage and the contractor will be allowed to take away the scrap and excess steel away from site.

h) **The contractor shall be responsible for getting the measurement of steel entered in to steel register and signed by the Engineer in charge of the work before concreting is done to avoid dispute regarding quantity of steel used in the work. After finishing concrete binding wire shall be cut and sealed.**

i) The rates quoted for this item is deemed to be inclusive of the cost of binding wire and no separate payment shall be admissible for the same.

j) The steel shall be kept by the contractor under his custody at the site of work and Railway will not be responsible for any theft thereof.

k) The quantity so payable under relevant item shall be restricted to the quantity as per approved plan/drawing and decision of the Engineer in Charge in this regard shall be final and binding upon the contractor.

SPECIAL CONDITION FOR DRAWING, DESIGN AND ARCHITECTURAL VIEW WITH ALL RESPECT TO PLAN ELEVATION AND SECTION OF CIVIL WORK.

(A) Contractor will provide a copy of approved work/ buildings in the subject tender by the Engineer in charge of site. Based on which contractor will submit **detailed drawing, including foundation design, RCC design and structural design etc. for the approval of Sr. DEN / DEN of the work. No extra payment will be made for submission of drawing/design by the contractor.**

(B) The contractor shall submit the name, qualifications and experience of government approved design Engineer who has prepared detailed drawing of proposed Civil works.

(C) The contractor has to prepare and submit the design calculations and drawings within 30 days of acceptance of the tender.

(D) The contractor shall submit all the detailed design calculation along with structural & working drawings as mentioned above duly checked and certified only by **IIT/NIT/Govt Engineering College**. In the



calculation references consulted or where ever any formulas on tables are used should be mentioned.

(E) The design Engineer will be required to attend the meeting at office of the Railway for preliminary discussing of scrutiny remarks extra. Whenever required with all reference data, books, IS specifications etc. at his own cost.

(F) It will be the duty of the contractor and design Engineer of the contractor to clarify, modify, redesign, finalize and submit the design and drawings as per scrutiny remarks offered by the Railways within 30 days of the issue of acceptance letter.

(G) On final approval, contractor shall supply free of cost **Four** sets of design and Drawings duly bound for the use of the Railways in soft and hard copy including original tracing.

(H) The design submitted by the tenderer will be the property of the Railway and Railway shall free to use the same for future.

(I) Cost of design and geological investigation i.e., bearing capacity of soil etc. will be borne by the contractor and payment for consultant, foundation design, RCC design etc. shall not be payable by the Railway and any alteration, amendments in design or drawing etc. as required by Engineer during execution shall be borne by the contractor and rates offered by the contractor shall be deemed to be inclusive of such cost.

(J) Any other civil works will be carried out as per Railways approved plan, which will be advised by Railway as finalized by competent authority.

Instructions for Execution of NS Items

The NS item of Schedule D & E shall be carried out in accordance with the item description and specifications of the items mentioned in the item description. It must be ensured that the item is executed as per the item Description



ELETRICAL POWER CONDITION ARE STARTS FROM HERE BELOW

TERMS AND GENERAL CONDITIONS

1. The tenderer himself or the Sub-Contractor appointed by him, the detail of which should be furnished in the tender by the main tenderer, shall have valid Electrical Contractor License for carrying out Electrical works. A copy of the license shall be uploaded along with the tender offer, failing which the offer shall be summarily rejected. The license must be valid as on the date of opening of the tender. During course of execution, if Contactor proposes for change of electrical sub contractor, prior approval shall be taken from electrical department.
2. **Guarantee/Defect Liability –**
The contractor shall furnish guarantee for all the material supplied and commissioned as under –
Schedule ‘A’ – Twelve months from the date of commissioning and Security Deposit shall be released accordingly.
Schedule ‘B’ – Sixty months from the date of commissioning and Security Deposit shall be released accordingly.
3. All loading/unloading and transportation that may be required shall be done by the contractor at his own cost. Any damage to plaster or any other item of railway during the course of execution of work shall be made good by the contractor and restoring it to match the general décor of the wall/ceiling etc.
4. This is a complete turnkey job as such any item, minor civil/fabrication work or any other minor work required to be carried out for commissioning of the work should also be considered within the contractor's scope of work for which no extra payment would be admissible. The price quoted shall be firm and inclusive of all taxes, labour, transportation charges and any other contingency charges that may be necessary to complete the work satisfactorily.
5. Work shall be carried out as per specification and IS shall be followed. All the spare parts to be used shall be genuine and of good quality and reputed make and the same shall be got approved from Site Engineer before replacing the same.
6. **Error/omission and discrepancies** – The tenderer shall not take advantage of any error due to typing or otherwise. If there is any doubt it shall be brought to the notice of Sr. DEE (Power) Vadodara without delay and same shall be dealt as per Railway's requirement and to Railway's advantage only.
7. The contractor has to supply and provide ancillary materials such as nuts, bolts, clamps, brackets etc. that are required for the work even if they are not mentioned in the tender schedule.
8. Removal of existing wiring and accessories if any, and handing over the same to Railway representative at their office/store is within the scope of the work. Released materials should be handed over to Railway with joint receipt note.

**ANNEXURE 'A'****DETAILED TECHNICAL SPECIFICATIONS FOR SCHEDULE ITEMS****Schedule - A**

Item No. 1 – Wiring of light/fan/exhaust fan points in concealed manner with modular accessories – The price shall cover for concealed wiring of light/fan/exhaust fan point with 1.5 sq. mm PVC insulated, unsheathed, multi-stranded, FRLS copper conductor of 1100 Volt grade, ISI marked, conforming to IS: 694/1990 with 1.0 sq. mm PVC insulated, unsheathed, multi-stranded, FRLS copper conductor of 1100 Volt grade, ISI marked, conforming to IS: 694/1990 as earthing wire with all accessories in concealed type of wiring in medium grade PVC conduit and accessories of Precision/Modi/Prestoplast/Gerard make. The accessories shall be of modular type of C&S/MK/North West/L&T/Crabtree/Siemens/Anchor/Legrand/ Havells/Luminous make.

Item No. 2 – Providing plug point 6 Amp in concealed manner on existing board with modular accessories – The price shall cover for providing plug point with modular type universal socket and switch, 6 Amp, 230 Volt, AC on existing board in concealed manner. The accessories shall be of modular type of C&S/ MK/North West/L&T/Crabtree/Siemens/Anchor/Legrand/Havells/Luminous make.

Item No. 3 – Providing plug point, 6 Amp in concealed manner on separate board with modular accessories – The price shall cover for providing plug point board with modular type universal socket and switch, 6 Amp, 230 Volt, AC with modular accessories. The accessories shall be of modular type of C&S/MK/ North West/L&T/Crabtree/Siemens/Anchor/Legrand/Havells/Luminous make. The price shall also cover for concealed wiring of sub-main with 1.5 sq. mm, PVC insulated, unsheathed, multi-stranded, FRLS copper conductor of 1100 Volt grade, ISI marked, conforming to IS: 694/1990 with 1.0 sq. mm, PVC insulated, unsheathed, multi-stranded, FRLS copper conductor of 1100 Volt grade, ISI marked, conforming to IS: 694/1990 as earthing wire with all accessories in concealed type of wiring in medium grade PVC conduit and accessories of Precision/Modi/Prestoplast/Gerard make.

Item No. 4 – Providing plug point 16 Amp in concealed manner on separate board with modular accessories – The price shall cover for providing power plug point with modular type universal socket and switch, 16 Amp, 230 Volt, AC on separate board with modular accessories in concealed manner. The accessories shall be of modular type of C&S/MK/North West/L&T/Crabtree/Siemens/Anchor/Legrand/ Havells/Luminous make. The price shall also cover for concealed wiring of plug point with 2.5 sq. mm, PVC insulated, unsheathed, multi-stranded, FRLS copper conductor of 1100 Volt grade, ISI marked, conforming to IS: 694/1990 with 1.5 sq. mm, PVC insulated, unsheathed, multi-stranded, FRLS copper conductor of 1100 Volt grade, ISI marked, conforming to IS: 694/1990 as earthing wire with all accessories in concealed type of wiring in medium grade PVC conduit and accessories of Precision/Modi/Prestoplast/Gerard make.

Item No. 5 – Concealed wiring of sub-main with 2.5 sq. mm in PVC conduit – The price shall cover for concealed wiring of sub main with two-wire single core 2.5 sq. mm PVC insulated, unsheathed, multi- stranded, FRLS copper conductor of 1100 Volt grade, ISI marked, conforming to IS: 694/1990 and one wire of 1.5 sq. mm PVC insulated, unsheathed, multi-stranded, FRLS copper conductor of 1100 Volt grade, ISI marked, conforming to IS: 694/1990 in concealed manner as per site requirement in PVC conduit.

Item No. 6 – Concealed wiring of sub-main with 4.0 sq. mm in PVC conduit – The price shall cover for concealed wiring of sub main with two-wire single core 4.0 sq. mm PVC insulated, unsheathed, multi- stranded, FRLS copper conductor of 1100 Volt grade, ISI marked, conforming to IS: 694/1990 and one wire of 2.5 sq. mm PVC insulated, unsheathed, multi-stranded, FRLS copper conductor of 1100 Volt grade, ISI marked, conforming to IS: 694/1990 in concealed manner as per site requirement in PVC conduit.

Item No. 7 – Providing electronic fan regulator, modular type – The price shall cover for supply, fixing, testing and commissioning of hum-free modular type electronic fan regulator suitable for 80/100-Watt ceiling fan of step type with 'OFF' position, surface/flush type on existing board and its connection from existing supply. Miniature switch type regulators shall not be accepted. The regulator shall be of Anchor-Roma/Cona/ Leader/Crabtree/Legrand/C&S/HPL/Indo Asian/Havells/Standard/Bentec/Elleys/Precision make.

Item No. 8 – Fixing, testing and commissioning of ceiling fan – The price shall cover for fixing, testing and commissioning of ceiling fan on existing hook and its connection by FRPVC insulated, flexible copper cord, 1100 Volt grade, 24/0.20mm from existing ceiling rose with earth connection. A suitable suspension clamp made from G.I. flat of 40 x 6 mm with MS 'S' shaped hook of diameter not less than 10 mm shall be



provided as per site requirement if fan hook is not available and is included in the scope of work. The ceiling fans shall be supplied by railways at site in-charge's office/store.

Item No. 9 – Providing heavy-duty Exhaust fan 300 mm sweep/heavy duty with louver/bird guard – The price shall cover for supply of heavy duty, industrial Exhaust Fan of metal body, 300 mm sweep with bird guard operating on 230 Volt, 50 Hz AC supply complete with all accessories of make Crompton Greaves/GEC/ Almonard/Usha/Bajaj. The price shall also cover for fixing, testing and commissioning of the Exhaust Fan on existing pocket with rake bolts/Anchor fasteners of suitable size as per site condition, and its connection from existing ceiling rose with three-core, 24/0.20 mm size, FRPVC insulated, flexible copper wire of 1100 Volt grade.

Item No. 10 – Providing MCB and starter with three-pin plug point for Air Conditioner unit in concealed manner with modular accessories – The price shall cover for supply, erection, testing and commissioning of power unit for Air Conditioner in enclosure with MCB DP 20/25 Amp, 3 KA breaking capacity, DOL starter of 16 – 25 Amp capacity suitable for 1.5/2.0 TR A.C. unit, one No 16/20/25 Amp socket and three-pin plug top, 16/25 Amp of ANCHOR-ROMA/CRABTREE/NORTH-WEST make with concealed wiring of sub main with two-wire single core 4.0 sq. mm PVC insulated, unsheathed, multi-stranded, FRLS copper conductor of 1100 Volt grade, ISI marked, conforming to IS: 694/1990 and one wire of 2.5 sq. mm PVC insulated, unsheathed, multi-stranded, FRLS copper conductor of 1100 Volt grade, ISI marked, conforming to IS: 694/1990 as earthing wire in concealed manner at an approximate distance up to 3 meter as per site requirement in PVC conduit. The enclosure shall be of modular type and its colour of should be in sync with the décor of the room and as decided by site engineer.

Item No. 11 – Providing MS stand for outdoor unit of Split Air Conditioner – The price shall cover for fabrication, supply, fixing and commissioning of MS angle frame/stand made from MS angle for outdoor unit of split AC. The size of angle shall be 40 x 40 x 6 mm painted with two coats of red oxide primer and finished with one coat of black enamel paint. The angle stand shall be fixed at site with anchor bolts. Necessary civil works involved are included in the scope of work.

Item No. 12 – Providing lighting control board with MCB DP, 32 Amp - 1 No, Time Switch, 16 Amp - 1 No and Single-Phase Contactor, 32 Amp - 1 No – The price shall cover for supply, fixing, testing and commissioning of lighting control board fabricated from CRCA sheet steel, powder coated with grey finish, dust and vermin proof, water resistant with metallic door complete with MCBs of 10 KA breaking capacity. The board shall be equipped with MCB DP, 32 Amp - 1 No, Time switch, 16 Amp - 1 No and Single phase contactor of 32 Amp rating - 1 Nos. The MCB shall be of ABB/L&T/HPL/GE/MDS/Siemens/BCH/C&S/ Schneider/CGL/Havells make, the contactor shall be of L&T/BCH/C&S/CGL/Schneider/Siemens make and Digital Time Switch “CRONO” of L&T make or similar of Siemens/Minilec make. The board shall be completely wired with multi-stranded copper wire of suitable capacity and shall be provided with heavy duty connectors of suitable capacity for termination of incoming and outgoing wires and shall be provided with two nos of earthing terminals on each side of the board and riveted metallic caution board in three languages.

Item No. 13 – Providing Distribution Board with incomer MCB DP, 16/32 Amp - 1 No, RCBO, two-pole, 25 Amp - 1 No and outgoing MCB SP, 6/10/16 Amp - 4 Nos – The price shall cover for supply, fixing, testing and commissioning of pre-fabricated, double door, MCB distribution board fabricated from CRCA sheet steel, powder coated with grey finish, dust and vermin proof, water resistant with metallic door complete with MCBs of 10 KA breaking capacity. The DB shall be equipped with incomer MCB DP 16/32 Amp - 1 No, RCBO, two-pole, 30 mA sensitivity, 25 Amp - 1 No and outgoing MCB SP, 6/10/16 Amp - 4 Nos. The MCBs/RCBOs shall be of ABB/L&T/HPL/GE/MDS/Siemens/BCH/C&S/Schneider/CGL/Havells make. The board shall be completely wired with multi-stranded copper wire of suitable capacity and shall be provided with heavy duty connectors of suitable capacity for termination of incoming and outgoing wires and shall be provided with two nos of earthing terminals on each side of the board and riveted metallic caution board in three languages.

Item No. 14 – Laying of cable on wall/cover shed/existing tray with MS clamp – The price shall cover for laying, testing and commissioning of LTUG armoured cable on wall/cover shed/in existing tray and its connection at both ends. The cable shall be tested with 500 Volt Megger before laying it in the tray. The cable cores shall be tested for continuity, absence of cross phasing, Insulation Resistance between conductors to earth/armour and between conductors. The results should be recorded in presence of railways' representative. A composite cable layout plan on ferro-print or computerized print duly laminated in A-4 size should be submitted by the contractor to site engineer and Divisional Office after laying of cable.

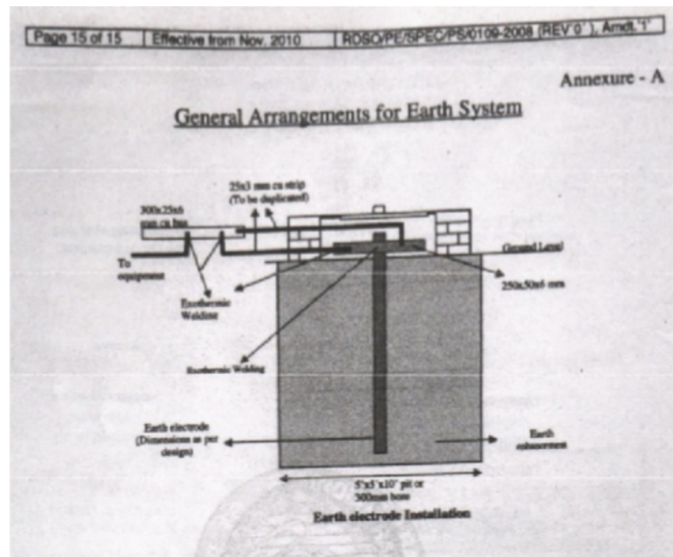
Item No. 15 – Providing maintenance free earthing – The price shall cover for providing maintenance free earthing as per the following specifications –

1. High tensile-low carbon steel rod having diameter not less than 17 mm complying with requirements of BS 4360 Grade 43A or EN10025:2-004 S275JR, molecularly bonded by 99.99% pure high conductivity copper on outer surface with copper coating thickness of 250 micron or more, Length 3000 mm (minimum). Certificates from NABL approved labs shall be submitted with test results.
2. Copper earth bus-bar of size 250 mm x 50 mm x 6 mm having electrical conductivity of 101% IACS, minimum 99.9% copper content shall be exothermically welded to rod with 4 holes of 12 mm diameter (two on each side) for connecting earthing conductor.
3. Earth Enhancement compound should have characteristics as mentioned in the RDSO specifications. It should have low resistivity preferably below 0.2 Ohm-meter, supplied in sealed bags (minimum 75 kg per pit for 5' x 5' x 10' size pit and minimum 50 kg per pit for 300 mm bore type pit. The bags shall be marked with



manufacturer's name or trade name, quality, Batch No. and date of manufacture. Certificates from NABL approved labs shall be submitted with test results, for at least following parameters –

- i) Composition of Earth Enhancement compound
 - ii) Resistivity – < 2 Ohm-meter
 - iii) pH value – > 7 but < 9
 - iv) Moisture retaining capacity – $> 10\%$ at 105 degrees Celsius
 - v) Water solubility – $< 5\%$
4. Backfill material – Good quality soil or excavated soil free from sand, gravel and stones shall be used for backfilling.
 5. Earth pit of size 5 feet x 5 feet x 10 feet or min 300 mm bore up to 10 feet using earth auger shall be made.
 6. Inspection chamber – A concrete box of 300 x 300 x 300 mm (inside dimensions) and 50 mm thickness of wall, with smooth cement plaster finish shall be provided on the top of the pit. A concrete lid, painted black, approximately 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.
 7. On backside of the cover, date of the testing and average resistance value shall be written with yellow paint on black background.
 8. Instead of copper bus-bar and strips mentioned in the drawing, a GI main bus-bar of minimum size 300 mm x 75 mm x 8 mm to be installed on nearby wall etc. It shall be connected to earthing with two GI strips of 50 mm x 6 mm size each, up to a distance of 10 meters from earth bus-bar (minimum 3 meters x 2 Nos GI strips to be supplied).
 9. Earthing shall generally be carried out in accordance with the requirement of I.E. Rules, 1956, as amended from time to time and shall confirm to IS: 3043 of 1987 with latest amendment.
 10. The earth value shall be measured and recorded at the site by painting on earth pit or nearest wall along with date of testing. It shall be less than 2 Ohms and neutral to earth voltage shall be less than 3 Volt.
 11. Earthing performance after a year of installation shall be jointly checked and measured. It should be less than 2 Ohm.
 12. General arrangement of the earth system shall be as per following drawing –



Schedule - B

Item No. 1 – Providing four-feet long, 18/20 Watt LED fitting complete with all accessory and LED tube – The price shall cover for supply of 1 x 18/20 Watt LED batten fitting. The fixture shall be of CRCA channel finished with white polyester powder coating with high UV and corrosion resistance. The fixture shall be equipped with end caps, push fit type lamp holders and mains connector to directly fix 4 feet long LED tube. The LED lamp shall be of 18/20 Watt as per Western Railways' specification no. WR/CCG/Specification/P/001 (Rev. 01) - 2018. The tube shall be of polycarbonate material. The entire fixture shall be of reputed quality and make.

The price shall also cover for fixing testing and commissioning of the complete fitting at site by means of bracket made from GI flat of 25 x 3 mm with nuts, bolts and washers or on heavy duty, ISI marked PVC square box as per site requirement. Connection shall be given by means of 24/0.2 mm three-core flexible copper wire through connector and heavy duty flexible PVC conduit. Removal of existing fittings along with brackets and handing over the same to the site in-charge is included in the scope of work.



GENERAL REMARKS FOR WIRING

- i) Relevant code of practice for electrical wiring as per IS: 732/1989 or latest to be followed along with the following.
- ii) All lamp fittings shall be fixed at a height of not less than 2.5 meter above the floor level.
- iii) Switch boards shall be provided at 1.5 meter above the floor level.
- iv) Live wires of the points (half/phase) must be controlled by switches.
- v) Wiring shall be done by looping system. Phase/live conductors shall be looped at the switch box. For point wiring neutral/earth first looping shall be done in switchboard and subsequent loop shall be made at each point outlet. No joints shall be allowed in the wiring inside the PVC conduit/casing.
- vi) The contractor shall have to maintain the standard colour code for circuit such as phase - red, neutral - black, earth - green/grey. For three phases, colour coding shall be Red, Yellow and Blue for phases, Black for neutral and green/grey for earth.
- vii) Wiring shall be suitable for 240 Volt, 50 Hz AC supply between phase and neutral and 415 Volt, 50 Hz AC supply between two phases.
- viii) All wiring shall be free from short - circuit/earth fault and shall be tested for these defects prior to being connected to the circuit.
- ix) There shall be a spacing of at least 125 mm between live parts and the mounting plane of the fixture.
- x) The clearance between the bottom most point of the ceiling fan and the floor shall be not less than 2.4 meter. The minimum clearance between the ceiling and the plane of the blades shall be not less than 300 mm.
- xi) The number of wires and its overall diameter in the PVC/MS conduit should not exceed as recommended in latest ISS.
- xii) Lights and fans may be wired on common circuit. Such sub circuit shall not have more than a total of seven points of light, fan and 5 Amp socket outlets. The load of such circuit shall be restricted to 800 Watt.
- xiii) 6/16 Amp socket outlets shall be installed at the following positions unless otherwise specified –
 - a) Non-residential building – 0.23 meter above floor level.
 - b) Kitchen – 0.23 meter above working platform and away from the likely position of stove and sinks.
 - c) Bathroom – No socket outlet is permitted for connecting portable appliances, thereto. MCB/IC switch may be provided 2.0 meter from fixed appliances, and at least 1.0 meter away from shower.
 - d) Rooms in residence – 0.23 meter above floor level or any other level in special cases with the approval of site engineer.
- xiv) Connection for electrical fitting shall be done with ISI marked three core flexible copper wire from ceiling rose. Chrome plated screw, nut, bolts, washers etc shall be used for electrical connection.
- xv) Wires used for wiring shall be multi-stranded, single core, FRLS-PVC insulated 1100 Volt grade copper conductor conforming relevant and latest IS. If any manufacturer discontinues FRLS wires, in such circumstances higher version FRLSH wires can be accepted and shall be got approved from site in- charge before supply. All wires should be of similar make.
- xvi) PVC casing capping and accessories shall be as per IS: 14927 of minimum thickness of 1.2 mm and of ivory/white colour only. Wall crossing of wiring should be done through ISI marked PVC conduit pipe of reputed make and shall be got approved from site in-charge before supply.
- xvii) Hardware, nut, bolts, washers, clamps etc. used for fixing shall be of galvanized iron.
- xviii) As far as possible switches, sockets and other accessories shall be ISI marked and of similar make.
- xix) The MCBs to be provided should be ISI marked, 10 KA breaking capacity, “B” / “C” curve and of suitable current rating as specified in the detailed specification. All the MCBs should be connected with crimped copper lugs of respective wire size. PVC numbering/ferrules should be provided at all the wire/circuit in distribution panel boards/switch boards for easy identification.
- xx) Switches, plug sockets, Angular/batten holders, three-plate ceiling rose, bell push switches, electronic fan regulator shall be of modular type. The switch board and cover plate shall be of off-white/white colour. Modular cover plate shall be glaze finished. Bell push switches should be marked for “bell” indication.
- xxi) The switch board and cover plate shall be of off-white/white colour. Modular cover plate shall be glaze finished.
- xxii) The dimensions of the RCC circular box for earthing shall be as per this office drawing No. EL/111/1/116. The date of testing of earth and earth resistance (Ohm) should be painted on each earth box by the contractor. Earthing shall be done as per specifications in the tender. The drawing is for general guidance for installation purpose only.
- xxiii) Earth resistance shall be as per IE regulations.

TESTING OF INSTALLATION



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

a) **INSULATION RESISTANCE –**

The insulation resistance shall be measured by applying 500 Volt Megger with all fuses in places, circuit breaker and all switches closed. The insulation resistance in mega-ohms of an installation, measured shall not be less than 50 MΩ divided by the number of points on the circuit. The insulation resistance shall be measured between Earth to Phase, Earth to Neutral, Phase to Neutral and Phase to Phase.

b) **EARTH CONTINUITY PATH –**

The earth continuity conductors shall be tested for electrical continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance or earth leakage circuit-breaker measured from the connection, with the earth electrode to any point in the earth continuity conductor in the completed installation and shall not exceed 1.0 Ω.

c) **POLARITY OF SINGLE POLE SWITCHES –**

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

d) **COMPLETION CERTIFICATES –**

All the above tests shall be carried out in presence of site in-charge or his authorized representative and the results shall be recorded in prescribed forms. Any default during the testing shall be immediately rectified and that section of the installation shall be re-tested. The completed test result forms shall be submitted to the site in-charge for approval. On completion of an electric installation a certificate shall be furnished by the contractor, countersigned by Railways' site in-charge under whose direct supervision the installation was carried out. This certificate shall be in a prescribed form as required by the local electric supply authority if necessary.



Technical Specifications of Energy efficient LED based Luminaries for Outdoor and Indoor application (Western Railway)

Western Railways' Specification No. WR/CCG/Specification/P/001 (Rev. 01) - 2018

1.0 FOREWORD –

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

2.0 Details of Existing and Proposed Fittings –

Sr No	Type of existing fitting	Wattage of existing fitting	Proposed fitting	Maximum wattage of LED fitting	Minimum initial lumen output	Application
A	For outdoor: Street light, High Mast and platform open area					
i a.	HPSV/HPMV	70 W	LED	50 W	4000	Circulating area, Outdoor lighting, Yard lighting, High Mast
b.		150 W	LED	100 W	8000	
c.		250 W	LED	170 W	13500	
d.		400 W	LED	260 W	20000	
ii a.	Metal Halide	70 W	LED	50 W	4000	Circulating area, Outdoor lighting, Yard lighting, High Mast
b.		150 W	LED	100 W	8000	
c.		250 W	LED	190 W	15000	
iii a.	FTL	1x40 W	LED	30 W	2400	Street Lighting
b.		2x40 W	LED	60 W	4800	
	Platform Lighting					
iv a.	FTL	1x40 W	LED	30 W	2400	Platform Lighting
b.		2x40 W	LED	60 W	4800	
c.		1x28 W	LED	18 W	1440	
B	For Indoor – Offices, service buildings etc.					
v	T-5/T-8 Fitting 4 ft. size	28/36 W	LED	18/20 W	1440/1600	Offices & service buildings
vi	CFL lamps	11 W	LED	7 W	560	Offices & service buildings
vii	Recess mounting fitting 2x2 feet size	2x14 W	LED	2x9 W	1440	Offices & service buildings
viii	Down lighter	70/150 W	LED	40/80 W	3200/6400	Offices & service buildings
ix	4 feet Tube light	28 W	LED	18/20 W	1440/1600	Offices & service buildings
x	2 feet Tube light	20 W	LED	10 W	800	Offices & service buildings

3.0 SCOPE –

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

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

The applications of Energy Efficient LED based luminaries are as under –

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



4.0 CONSTRUCTION –

- a) All the luminaries shall be finalized based on the performance requirement. The detailed calculation for lux level as per clause 7.8 with uniform distribution including the lux distribution curve / graph / spatial distribution shall be submitted in support of the dimensions selected and variation thereof. Housing shall be made of 1.6 mm or more thick sheet steel conforming to IS 513 (Grade O) or aluminium die cast having high conductivity preferably to grade 5000 or similar to high conductivity heat sink material for outdoor fittings and 1.0 mm or more thick sheet steel conforming to IS: 513 (Grade O) for indoor fittings. Efforts shall be made to keep the overall outer dimensions as minimum as possible.

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

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

4.1 High power and high lumen efficient LEDs suitable with following features shall be used –

- a The efficiency of the LED lamps at 110°C junction temperature shall be more than 80%.
- b The working life of the lamp at junction temperature of 110°C for 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 data sheet.
- c Adequate heat sink with proper thermal management shall be provided.
- d Colour temperature of the proposed white colour LED shall be between 5700°K – 6500°K.
- e Minimum view angle of the LED shall not be less than 120°.
- f The output of LED shall be more than 100 lumen per watt at minimal operating current and shall ensure guaranteed operation life of more than 50,000 burning hours with controlled junction temperature of 110°C.
- g Efficiency of driver electronics shall be more than 85%.
- h Power factor of complete fitting shall be more than 0.95.
- i The driver card shall withstand 440 V and 1.5 KV $\pm 3\%$ surge protection and shall resume normal working when nominal voltage is applied again.
- j Thermal management shall be in such a way that LED junction temperature shall not go beyond 80°C.
- k 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.
- l The LED luminaire shall be free of glare.
- m Colour rendering index – CRI ≥ 75 .

4.2 Specification for LED driver –

- a. Input voltage range within 180 V_{rms} to 270 V_{rms}
- b. Operating input voltage – 240 V_{rms}
- c. No load power consumption – ≤ 500 mW
- d. Maximum output voltage – 105 V DC $\pm 3\%$
- e. Output voltage ripple should be within 3%
- f. Output over voltage protection – 125 V DC
- g. Power factor – 0.95
- h. Full load efficiency – $\geq 85\%$
- i. THD – $\leq 10\%$
- j. Hot swapping
- k. Current waveform should meet EN 61000-3-2



- l. LED driver shall withstand voltage of 440 V for 2 hours and restore normal working when normal voltage is applied
- m. Maximum temperature rise – $\leq 10^{\circ}\text{C}$ @ 55°C T_{amb} with safety margin of 10°C
- n. The driver should comply to CISPR 15 for limits and methods of measurement of radio disturbance characteristics
- o. The equipment should comply to IEC 61547 for EMC immunity requirements
- p. The control gear should be compliant to IEC 61347-2-13, IEC 62031 and IEC 62384 as per the requirements

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

5.0 Referred Standards –

5.1 For Indoor Lighting –

IS: 513	Cold-rolled low carbon steel sheets and strips
IEC 60529	Classification of degree of protections provided by enclosures
EN 55015, CISPR 15	Limits and methods of measurement of radio disturbance characteristic of electrical lighting and similar equipment
IEC 62031	LED modules of general lighting-safety requirements
EN 61547	Equipment for general lighting purposes – EMC immunity requirement.
EN 60929	Performance, AC supplied electronics ballast for tubular fluorescent lamps performance requirement.
IEC 60598-2-1	Fixed general purpose luminaires
IEC 60598-1	Luminaires –General requirement and tests
IEC 61000-3-2	Electro Magnetic compatibility (EMC) – Limits for harmonic current emission – (equipment input current 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 luminaires
IS 4905	Method for random sampling
LM 79	LED luminaire photometry measurement
LM 80	Lumen Maintenance
IEC 62384	DC or AC supplied electronic control gear for LED modules – Performance requirements
IEC/PAS 62612	Self-ballasted LED lamps for general lighting services – Performance requirements

5.2 For Outdoor Lighting –

IS: 513	Cold-rolled low carbon steel sheets
IEC 60529	Classification of degree of protections provided by enclosures
EN 55015	RFI < 30 MHz
EN 55022	RFI >30 MHz
IEC 61000-3-2	Harmonics
EN 61547	Immunity



EN 60929	Performance
IEC 60598-2-1	Fixed general purpose luminaries
IEC 60598-1	General requirement and tests
IEC 61000-3-2	Limits for Harmonic current emission –THD <10%
IEC 60068-2-38	Specification for Permitted Humidity test
IS 10322	Specification for the luminaries
IS 4905	Method for random sampling

6.0 Service Conditions –

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

6.1 Environmental Conditions –

- Maximum ambient air temperature : 55°C (for outdoor applications) and 45°C (for indoor applications)
- Minimum ambient air temperature : -5°C
- Max. Relative humidity : 100%
- Atmosphere : Extremely dusty and desert weather and desert terrain in certain areas. The dust contents in air may reach as high values as 1.6 mg/m³
- Coastal area : The equipment shall be designed to work in coastal area in humid salt laden and corrosive atmosphere.

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

- Max. pH value : 8.5
- Sulphate : 7 mg/liter
- Max. Concentration of chlorine : 6 mg/liter
- Max. Conductivity : 130 micro sec/cm
- Annual rainfall : Ranging between 1750 to 6250 mm with thunder storm
- Altitudes : Not exceeding 1200 m above sea level

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

7.0 TECHNICAL REQUIREMENTS –

- 7.1 The luminaire casing/housing shall be made of 1.6 mm or more thick sheet steel conforming to IS: 513 (Grade O) or aluminium die cast having high conductivity preferably to grade 5000 or similar to high conductivity heat sink material for outdoor fittings and 1.0 mm or more thick sheet steel conforming to IS: 513 (Grade O) for indoor fittings.
- 7.2 The electronic components used shall be as follows –
- 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 resistors shall be preferably made of metal film of adequate rating. The actual loading versus rating shall be 3.
 - The junction temperature of switching devices 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.
 - The heavy components shall be properly fixed. The solder connection should be with good finish.
 - The electronics 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.



- 7.3 The connecting wires used inside the luminaire shall be low smoke halogen free, fire retardant e- beam/PTFE cable and fuse protection shall be provided in input side.
- 7.4 Care shall be taken in the design that there is no water stagnation anywhere. The entire housing shall be dust and water proof having IP 65 protection for outdoor application and IP 20 protection for indoor application as per IEC 60529.
- 7.5 The control gear shall be designed in such a way so that temperature rise of heat sink shall not be more than 10°C with respect to ambient temperature.
- 7.6 For platform lighting, luminaire shall be such that the glare from individual LED is restricted and shall not cause inconvenience to the public.
- 7.7 All the material used in the luminaire shall be halogen free and fire retardant confirming to UL 94.
- 7.8 Illumination level: The fitting shall be so designed that the illumination level shall be evenly distributed and shall be free from glare. Illumination level of different types of luminaire shall be as below –

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

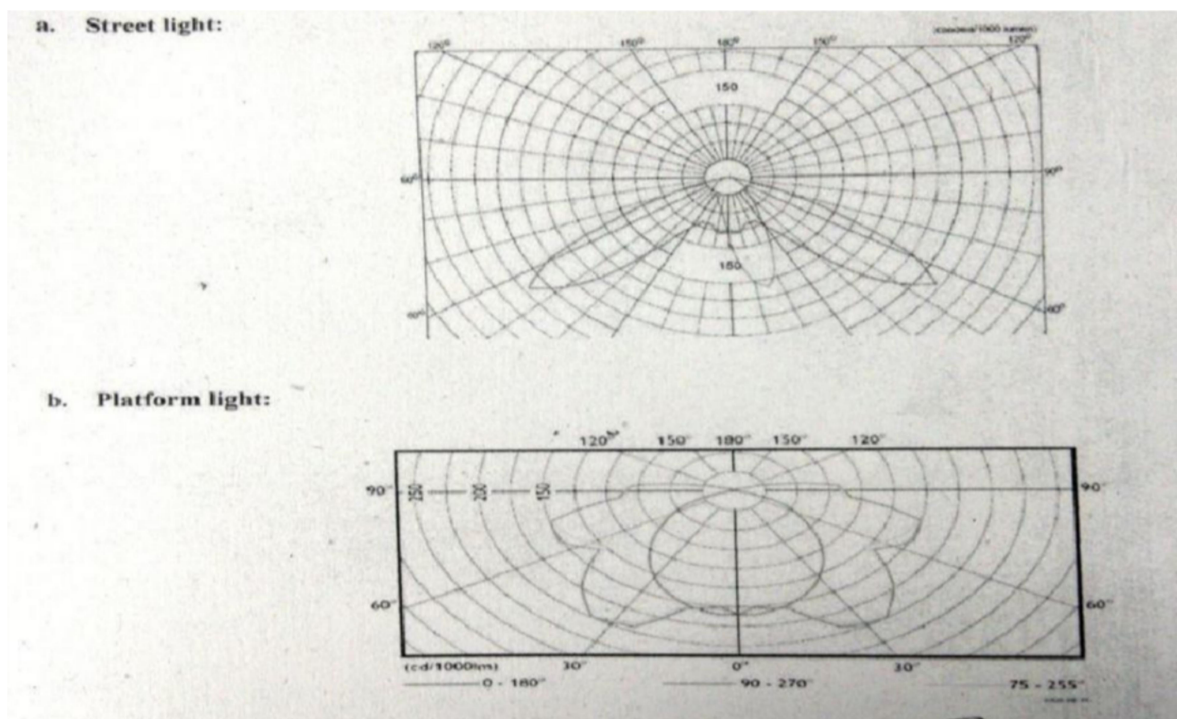
Sr No	Place to be illuminated	Vertical distance of fittings from the floor level (Mtrs)	Average Illumination level (Lux)	Colour Temp in °K
Indoor Light				
1	Work areas like cabins and work stations	2.743	250 at 1 meter above ground level	5500 to 7000
2	Corridors	2.743	125 on the floor	5500 to 7000

Note:

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

7.8.1 Polar curves –

Typical distribution of illumination of these luminaries shall be as given below –



8.0 Tests For Indoor and Outdoor Lighting –

Tests are classified as:-

- Type test
- Acceptance test
- Routine test

8.1 Type Test –

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

8.2 Acceptance Test –

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 the lot. Acceptance tests shall not be carried out from particular size from the lot on which type tests have already been conducted. Recommended sampling plan is given below –

8.2.1 Sample size and criterion for conformity –

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

8.3 Routine Test –

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

8.4 Test Scheme –

Sr No	Description of test	Clause No.	Prototype Test (only for outdoor)	Type test		Acceptance Test	Routine Test
				Outdoor	Indoor		
1	Visual & Dimensional check	9 (i)	Y	Y	Y	Y	Y
2	Checking of documents of purchase of LED	9 (ii)	Y	Y	Y	Y	Y
3	Resistance to humidity	9 (iii)	Y	Y	Y	--	--
4	Insulation resistance test	9 (iv)	Y	Y	Y	Y	Y



5	HV test	9 (v)	Y	Y	Y	Y	Y
6	Over voltage protection	9 (vi)	Y	Y	Y	--	--
7	Surge protection	9 (vii)	Y	Y	Y	--	--
8	Reverse Polarity	9 (viii)	Y	Y	Y	Y	Y
9	Temperature rise test	9 (ix)	Y	Y	Y	--	--
10	Ra (Colour rendering index) measurement test	9 (x)	Y	Y	Y	--	--
11	Lux measurement	9 (xi)	Y	Y	Y	Y	Y
12	Fire retardant test	9 (xii)	Y	Y	Y	--	--
13	Test for IP 65 protection	9 (xiii)	Y	Y	Y	--	--
14	Environmental tests	9 (xv)	Y	Y	--	--	--
15	Reliability test	9 (xvi)	Y	Y	--	--	--
16	Life test	9 (xvii)	Y	Y	Y	--	--
17	Endurance test	9 (xviii)	Y	Y	--	--	--
18	EMI/EMC (only for indoor lighting)	--	--	--	Y	--	--

9.0 Method of Testing –

i) Visual and Dimensional Check –

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

ii) Checking of documents of purchase of LED –

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

iii) Resistance to humidity test –

This is carried out by suspending the painted panels in corrosion chamber maintained at 100% RH and temperature cycle of 42 to 48°C for 7 days and examining it for any sign of deterioration and corrosion of metal surface.

iv) Insulation resistance test –

The insulation resistance of the unit between earth and current carrying parts shorted together shall not be less than 2 MΩ when measured with 500 Volt Megger.

v) HV test –

Immediately after insulation resistance test, an AC voltage of 1.72 KV_{rms} (1500 + 2 x rated voltage) of sine waveform of 50 Hz shall be applied for one minute between the live parts and frame. There shall not be any kind of break down, flashover or tripping of supply.

vi) Over voltage protection –

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

vii) Surge protection –

It shall withstand a surge of 1.5 KV ± 3% for 50 microsecond ± 20% at the input terminals for all types and shall resume normal working when nominal voltage is applied again. (Tests shall comply with Clause 5.4 of latest IEC 60571-1).

viii) Reverse polarity –

The luminaire shall withstand polarity reversal. It shall be operated with reverse voltage for 5 minutes at maximum value of voltage range. At the end of this period, the supply shall be made correct polarity and luminaire shall operate in a normal way.

ix) Temperature rise test –

Temperature rise test shall be conducted at 180 V AC for outdoor lighting and 100 V AC 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 at 55°C and compared with maximum permissible temperature (for power

devices at junction). Under loading conditions as specified above, the corrected temperature of the power devices shall have a safety margin of minimum 10°C. Temperature at junction shall not exceed 100°C when corrected to 55°C. The luminaire shall also be subjected for short time rating after continuous loading to ensure the temperature rise is within the permissible limit. The maximum temperature rise of the electronics devices on the PCBs shall be in limit for industrial grade components suitable for 85°C environment. In case of exceeding limit, use of MIL grade component shall be considered keeping RDSO informed.

x) Ra (Colour Rendering Index) measurement test –

The lumen is the unit of luminous flux, which is equal to the flux emitted in a solid angle of one Steradian by a uniform point source of one candela.

The initial reading of the chromaticity co-ordinates x & y shall be within 5 SDCM (Standard Deviation for Colour Matching) from the standardized rated value as per Annexure 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 20,000 burning hours and 70% of the initial lumen after 50,000 hours. The initial lumen will be after 100 hours aging.

Photometric test shall be conducted as per Annexure B of IEC 60081-97. The lumen maintenance test shall be done as per Annexure C of IEC 60081-97.

xi) **Lux measurement –**

Lux measurement with the help of Lux meter shall be done at a distance as shown in para 7.8 above. Value obtained shall not be less than the lux specified in the table therein, considering 10% Lumen is absorbed by the reflector.

xii) **Fire retardant test –**

Fire retardant test shall be conducted as per IEC 332-1 (for outdoor lighting) and IEC 60332-1 (for indoor lighting) of the wire used in the fittings.

xiii) **Test for IP65 protection (For outdoor lighting) and Test for IP 20 protection (For indoor lighting)**

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This test shall be conducted as per IEC 60529.

xiv) **Environmental tests –**

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

- a. Dry heat test
- b. Damp heat test
- c. Test in corrosive atmosphere
- d. Combined dust, humidity and heat test

xv) **Reliability Test –**

The reliability can only be determined in actual service. However, the following tests shall be carried out on the prototype to simulate as close as possible, the service conditions. There shall be no failure during this test.

- a. The light unit shall be mounted in an oven maintained at 75°C for outdoor lighting and 45°C for indoor lighting.
- b. The light will be operated at the specified maximum voltage and at 75°C for outdoor lighting and 45°C for indoor lighting for a period of 100 hours.

xvi) **Life Test –**

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 LM 80 report of LEDs

xvii) **Endurance Test –**

The luminaire shall be kept "ON" with input voltage of 250VAC for 200 hours. After this the luminaire is subjected to 20,000 cycles of "ON" and "OFF", each cycle consisting of 3 seconds "ON" and 10 seconds "OFF" period. Luminaire should survive this test. Test is to be continued for one lac cycles, followed by performance test.

**xviii) Safety –**

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

xviii) Vibration test –

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

10.0 Marking –

The following information shall be distinctly and indelibly marked on the housing –

- a) Year of manufacture / Batch Number / Serial Number.
- b) Name of Manufacturer
- c) Rated watt and voltage
- d) Input frequency

11.0 Manufacturer's certificates –

Manufacturer should submit the certificate of having purchased LED from one of the approved source (LM 80 certificate should be submitted).

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 IS 10322 Part –5, Sec. -2.

12.0 Guarantee –

The complete system of LED lights (including Driver etc.) shall be guaranteed for satisfactory performance and manufacturing defects for a period of 60 months from date of commissioning or 72 months from the date of supply whichever is earlier.

END OF SPECIAL CONDITION AND SPECIFICATION OF CONTRACT PART-II