TECHNICAL SPECIFICATION FOR LED SIGNAL LAMPS FOR MAIN COLOUR LIGHT SIGNALS (INTEGRATED) FOR RAILWAY SIGNALLING

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Abstract This document specifies technical specification and inspection criteria for LED Signal Lamps for Main Colour Light Signals (Integrated) for Railway Signalling.			

DOCUMENT CONTROL SHEET

NAME	ORGANISATION	FUNCTION	LEVEL
Rajneesh Kumar	**RDSO**	**Member**	**Prepare**
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REVISION/AMENDMENTS

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Technical Specification for LED Signal Lamps for Main Colour Light Signals (Integrated) for Railway Signalling

0. FOREWORD

0.1 This specification is issued under the fixed serial number ~~(Spec. No. will be give at the time of issue)~~ RDSO/SPN/199/2010 Rev. 1.2.

0.2 This specification requires reference to the following Indian Railway Standards / British Standards / International Standards specifications:

i) RDSO / SPN / 144 / 2006: Safety and reliability requirement of electronic signalling equipment

ii) STS/E/Relays/AC Lit LED Signal/09-2002: Tentative specification for universal plug-in type, tractive armature AC lamp proving relay ~~(metal to carbon)~~ for 110V AC LED signal lamp

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Tilak International (Signal)	The type of relay to be used should also be clarified.	RDSO Approved ECR which complies with the given clause may be used.

iii) IRS:S23: Indian Railway Standard specification for electrical and electronic based signalling and interlocking equipment

iv) BS 1376:1974: Specification for colours of light signals

v) CENELEC Standard EN 50126: Railway applications – The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS)

vi) CENELEC Standard EN 50129: Railway applications – Communication, signalling and processing systems – Safety related electronic systems for signalling

vii) IEC 127: International Standard for miniature fuses

0.3 Wherever in this specification any of the above mentioned specification is referred to by number only without mentioning the year of issue, the latest issue of the specification is implied, otherwise the particular issue referred to is meant.

0.4 This specification is intended to cover the technical provisions and it does not include all the necessary provisions of a contract.

1.0 SCOPE

1.1 This specification covers the general and technical requirements of LED signal lamps for main colour light signals (Integrated) for railway signalling application in RE & Non-RE areas of Indian Railways. This specification also covers the general and technical requirements of LED signal lamps for main colour light signals for high speed lines.

2.0 ABBREVIATIONS USED

RDSO: Research Designs & Standards Organisation

CENELEC: European Committee for Electrotechnical Standardisation

IEC: International Electrotechnical Commission

BS: British Standards

RE: Railway Electrification

ASM: Assistant Station Master

MTBF: Mean Time Between Failure

CLS: Colour Light Signalling

ECR: Lamp Proving Relay

LED: Light Emitting Diode

UV: Ultra Violet

OK: Okay

PCB: Printed Circuit Board

ABS: Acrylonitrile Butadiene Styrene

NO/NC: Normally Open/Normally Close

AC/DC: Alternating Current/Direct Current

3.0 TERMINOLOGY

3.1 The terminology used in this specification is covered by the definitions given in IRS: S 23.

3.2 The terms referred to in this specification but not covered in IRS: S 23, are defined below :

Blanking & Non-Blanking failure modes of LED signal lamps-

In **blanking mode**, an LED signal lamp shall extinguish when input current drawn by the current regulator falls outside specified limits of rated input current or illumination falls to a value which is not less than 40% of nominal illumination due to a failure or any other reason. In such case, current regulator should not draw input current more than 15 mA at maximum rated voltage to ensure dropping of AC LED ECR.

In **non-blanking mode**, an LED signal lamp shall remain lit when input current drawn by the current regulator falls outside specified limits of rated input current or illumination falls to a value which is less than 40% of nominal illumination due to a failure or any other reason. In such case, input current drawn by current regulator shall be limited to less than 40 mA to ensure dropping of AC LED ECR. Limit on input current shall apply when illumination has deteriorated to a value which is not less than 40% of nominal illumination.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

4.0 GENERAL REQUIREMENTS

4.1 The minimum visibility distance of LED signal lamps for main colour light signals shall be 600 m. in clear daylight with peak sunrays at rated voltage.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

4.2 LED signal lamps shall also be visible to a driver stopping at the foot of the signal.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

4.3 LED signal lamps shall be designed as one single unit (integrated) and they shall fit in the existing colour light signal housings as per Table-I given below, as applicable or as specified by the Purchaser. A conceptual diagram of integrated signal lamp unit is given in Annexure-III.

	Main Signal
Reference Drawing No.	SA : 23002 S 23024 / M

Table-I

Comments/Suggestions Received		
Name of the firms	Firm's Comment	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

4.4 LED signal lamps shall be used with AC LED ECRs as per STS/E/Relays/AC Lit LED Signal/09-2002 only.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

5.0 TECHNICAL REQUIREMENTS

5.1 Colour Co-ordinates :

Colour co-ordinates of LED Signal lighting Units shall be as follows: Red & Green: Class „ C‟ of BS: 1376
Yellow Aspect: Class „ B‟ of BS: 1376
Colour co-ordinates graph as per BS: 1376 is given in Annexure I.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

5.2 OPERATING PARAMETERS

Operating parameters of various types of LED Signal lamps when used with AC LED ECRs shall be as per Table- II given below:

Sl. No.	Parameter	Main Signal		
1.	Rated voltage at Input terminals of LED Signal lamp	110V ±25 %		
2	Current at rated voltage per unit at Input terminals of LED Signal lamp	110 to 150 mA (rms) *		
3.	Illumination measured at 1.5m from LED Signal Lighting Unit in axial direction at rated voltage	150 LUX –10% + 40%	175 LUX –10% + 40%	150 LUX –10% + 40%
4.	Colour	Red	Yellow	Green

Table II

Note: (i) *Input current shall be within the specified limits in all design conditions of lighting except for non-blanking failure mode.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.0 **DESIGN CRITERIA**

6.1 **LED SIGNAL LAMP**

6.1.1 LED signal lamp shall be so designed that in all designed conditions of its lighting, except for failure in non-blanking mode, it should ensure pick up of ECR and input current drawn should be more than specified maximum pick up current of ECR with ECR connected in circuit.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.2 ~~LED signal lamp shall remain lit or extinguish as per the Blanking or Non Blanking failure mode selected in the Current Regulator in case of deterioration of illumination or when input current falls outside specified limits of rated input current due to a failure or any other reason as stipulated in Cl.3.2.~~ LED signal lamp shall remain lit (for Non Blanking mode) or extinguish (for Blanking mode) in case of deterioration of illumination or when input current

falls outside specified limits of rated input current due to a failure or any other reason as stipulated in Cl.3.2.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Beacon Industries	Agreed & Complied; (a) it reassures that illumination sensing is necessary (b) it specifies any other reason which also relates to design deficiencies	Manufacturer has to assure that he complies with the requirements of blanking mode and non blanking mode whether through current sensing method or illumination method.
M/s Matsushi Power Technologies	(Latching to Blanking and Non-Blanking Signals): While clarity on blanking/non-blanking signals is appreciated, many signal failures observed are from design flaws under Clause 3.2. A thorough design review, based on field feedback, is recommended as per CENELEC Standards. Components have to align with the suitable design to meet the Operation and Safety requirements to ensure reliability and availability. We suggest design corrections to meet field performance needs and Safety Compliance of the Specification as per standards at system level with complete signal lighting circuit in picture and acceptance tests in compliance and verification of Operation and Safety Requirements under Field Conditions as per Specification. We are emphasizing on the above as we truly believe so and our Fail Safety Validation has been done Recently with Complete Evaluation of the Design Requirements wherein it became necessary to evaluate two models of ours, Type MS 400 being fully compliant at system level with complete signal lighting circuit in picture.	Suggestions may be deliberated in drafting of New specification.
M/s Power Technologies Corporation	Latching to Blanking and Non-Blanking Signals: We have noted that more clarity has been provided on the Blanking and Non-Blanking signal. It is amply clear that illumination sensing has to be fool proof. While these measures are commendable, it is important to also consider that many signal failures stem from design flaws which fall under "……or any other reason as stipulated in Cl.3.2", A more detailed review of the design based on feedback from actual field failures would be essential. The current design	Suggestions may be deliberated in drafting of New specification.

	should be reviewed to find and fix all potential problems that could affect performance. It is important to note that the components used have to align with the design needs, mere adressal of components may not have much standing. We therefore recommend correction in design in compliance with the field performance requirements for re area and safety spelt of in the specification, and further ensuring the same through necessary acceptance tests	
R T Vision Technologies (P) Ltd.	Accepted	
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.3 LED signal lamps of Green aspect shall be configured in blanking mode and LED signal lamps of Red aspect shall be configured in non blanking mode. LED signal lamps of yellow aspects shall have selectable option for blanking and non-blanking.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.4 Fluctuation in input voltage shall not result in latching of signal to Blanking/ non blanking failure mode.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.5 The LED signal lamp shall not reflect sunlight/headlight of loco as it may give misleading aspect to the driver.

Comments/Suggestions Received		
Name of the firms	Firm'sComments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.6 LED signal lamp shall not light upto 60 V.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd.	OK	

Kolkata		

6.1.7 Power factor of LED signal lamp shall be 0.8 or better.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.8 Voltage total harmonic distortion over full operating voltage range shall be less than 20%.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.9 Dispersion angle of LED signal lamp, measured as per Annexure II, shall be $\geq 4°$ and $\leq 10°$ at 50% power points.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.10 Light from LED signal lamp, when projected on a white target at 1.5 m from LED signal lamp the target shall be uniformly illuminated within half power points and shall be free from dark circles.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.11 The LED signal lamp shall work satisfactorily (Input current will remain in the limits as specified in Clause 5.2) in ambient temperature varying from -10°C to +70°C and a relative humidity upto 95%. at 40°C $\pm$ 2°C as specified in RDSO/ SPN/144/2006.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Power Technologies Corporation	**Temperature severities test (Clause 6.1.11 except humidity)** This may be included in specification for removing confusion during third party Inspection : Ambient Temp. Severities test: Temp. to be varied from -10° C to +70° C. Measurements may be taken after keeping the units ON for 30 minutes at each temp during regular inspection in acceptance test. Test may be carried out for one cycle only. Measurements at room temp. after	This Clause may be revised as under- "The LED signal lamp shall work satisfactorily (Input current will remain in the limits as specified in Clause 5.2) in ambient temperature varying from -10°C to +70°C as specified in RDSO/SPN/144/2006 Rev 2 or latest. Reading

	Ambient temp. Severities test may be taken after keeping the units ON at room temp. for half an hour. Five minutes switching OFF time may be permitted for transferring the unit from cold/hot chamber to a test bench, if required, after Ambient temp. Severities test.	should be taken after keeping the units ON for 30 minutes at each temp"
M/s Urban Engineering Association Pvt. Ltd. Kolkata	**OK**	
M/s VGS AND Technologies Pvt. Ltd.	Clarification is needed regarding the time duration details for the temperature severity test at -10"C and +70"C for TYPE test and as well as the acceptance criteria for the new inspection authorities	Clause is being revised as above.

6.1.12 Number of LEDs used should not be less than 60 for Red and Yellow, 30 for Green LED signal lamp. Variation from stipulated number may be considered based on merits of the design.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.13 LED signal lamp shall have a display area of 125 mm $\pm$ 1 mm diameter.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Matsushi Power Technologies	No comment needed.	
M/s Power Technologies Corporation	LED signal lamp shall have a display area of 125 mm ± 2 mm diameter	No issue related to display area has come to notice yet. Other Vendors may also comment on this with technical justification to deliberate it further.
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.14 LEDs in the lamp shall be arranged in more than one array so that in the eventuality of failure of an array, whole unit does not become blank. LEDs in the arrays shall be interleaved so that effect of failure of any array is spread out.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.15 It shall be ensured that LED signal lamp is lit and producing illumination while drawing current more than specified for blanked/extinguished signal. The method of achieving of the above shall be advised in detail.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.16 Design shall be such that failure of a LED shall not vary illumination by more than 5 % of nominal illumination.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.17 Sensing of illumination, if used, shall activate after LED signal lamp is completely lit to prevent hunting.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.18 Current regulation of current to LED arrays shall be within 2% for input voltage range as specified in Cl. 5.2.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.19 Design shall be such that normally LEDs of a LED array are driven within average drive current range recommended by the LED manufacturer and in no circumstances LEDs of an array shall be driven by current more than the maximum current recommended by the LED manufacturer. Details of the same shall be submitted at type approval stage.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.20 Power circuit and heat dissipating components shall be provided in a separate compartment in LED signal lamp with adequate heat dissipation arrangement through heat sink with fins. Current regulation circuit for LED arrays and LEDs shall be kept in a separate compartment with heat dissipation arrangement through heat sink.

Comments/Suggestions Received

Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.21 Isolation or step down transformer with line filter cct. should be provided at input stage of LED signal lamp in failsafe manner to filter power surges.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Matsushi Power Technologies	The Isolation Transformer is meant to be implemented in fail-safe manner. This should be part of acceptance tests, with performance checks under 110-400 Vac for our Type MS 400 The performance of the main signal, fitted with an isolation transformer, shall be checked for a minimum duration of 2 minutes with the MOV fitted, per the following 1. Apply 110 Vac to the aspect terminals with the ECR connected to the circuit. 2. Gradually increase the voltage in steps of 10 Vac up to 400 Vac, while monitoring the input current. 3. Ensure that there is consistent correspondence between the ECR and aspect at all voltage levels and aspect shall remain lit. 4. Maintain the unit at 400 Vac for 2 minutes, then reduce the voltage back to 110 Vac, ensuring that correspondence between the ECR and aspect is maintained. 5. Verify that the aspect operates normally throughout the test.	Suggestions may be deliberated in drafting of New specification.
M/s Power Technologies Corporation	The fail safe aspect of Isolation Transformer should be part of Acceptance Tests as follows: The Performance of Main Signal fitted with Isolation Transformer shall be check for a duration of not less than 2 minutes with MOV disconnected, as below: (i) Apply 110 Vac to Aspect Terminals with ECR connected in circuit (ii) Increase the voltage up to 250 Vac in steps of 10 vac and note the input current (iii) There should be correspondence between ECR and Aspect under all conditions (iv) Hold the Unit at 250 Vac for 2 minutes and reduce the voltage back to 110V AC, correspondence should be maintained between ECR & Aspect. (v) Aspect should work normally	Suggestions may be deliberated in drafting of New specification.

R T Vision Technologies (P) Ltd.	Change request- Isolation Transformer to be made for optional. Reason- The Isolation transformer does not have earth connection therefore, during high voltage input the transformer may get saturated, wherein the signal will cutt-off due to high voltage. In absence of any earth connection the energy stored by the transformer shall be released back in the input line which may lead to undesirable situation i.e. ECR pickup and signal is OFF. It also adds weight to the equipment which makes it heavier to carry for installation or replacement.	The isolation transformer has been provided to filter power surge. If remove it, the design will have to be changed. The design is not being changed in this revision. Due to the size and weight of the transformer, there has been no problem in the signal housing and fitting so far.
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.22 At input stage of LED signal lamp two bridge rectifier ccts. in parallel with each limb having two diodes in series should be provided. Electrolytic capacitors should also be used in series-parallel combination to achieve failsafe redundancy.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.23 Resistance used to dissipate power should be a series-parallel combination of standard SMD resistances or Aluminium encapsulated wire wound type to achieve failsafe redundancy and better heat dissipation.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.24 LED signal lamp shall be provided with a curved transparent cover of UV stabilized polycarbonate material having a thickness of 2.5 mm ± .5 mm.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.25 Body of LED signal lamp shall be made of industrial grade plastic like ABS or fibre glass. Metallic body parts may be used where these facilitate heat dissipation. LED signal lamp shall get fitted securely on the existing signal housings without any modification on them.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering	OK	

Association Pvt. Ltd. Kolkata		

6.1.26 Parts of body of LED signal lamp as visible from front after fitting in CLS unit shall be black. Colour of the body of the LED signal lamp shall be that of the aspect displayed to indicate aspect colour for LED signal lamp.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.27 Body of LED signal lamp shall fulfill IP-65 requirement as per international standard.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.28 Four Disconnect type terminal block ~~terminals~~ shall be provided on back of the lamp as per ~~Phosphorous bronze~~ RDSO Specification No. RDSO/SPN/189/2004 Ver 3.0 from RDSO approved Vendor. ~~shall be provided on back of the lamp~~. On inner two terminal MOV of 175V rating shall be provided. Outer terminals shall be marked as "input" terminals and used for input termination.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Beacon Industries	Agreed	4 conductor screw less terminal fixing hole 3.2 mm ϕ 2.5 mm^2, Cage clamp 2.5 mm^2, colour Grey. On inner two terminal MOV of 175 V rating shall be provided on back side of LED signal unit. Outer terminals shall be marked as "input" terminals and used for input termination. It is recommended to use M/s Wago Make connector with part no. 261-254 or similar for other manufacturer. Manufacturers of connector should have EN 60497, IEC-60998 certification.
M/s Efftronics Systems Pvt. Ltd.	Screw less connector shall be used Insulation material- Polyamide Conductor material- Copper Make- Wago/Design	Suitable connector mentioned above.

M/s GAEC Mumbai	There is not enough space to mount rail mounted terminal blocks as per RDSO specification. We recommend using Cage Clamp type PCB or panel mounted terminals of Wago / Phoenix / Similar make. We already proposed this earlier. Picture is attached herewith for reference.	Suitable connector mentioned above.
M/s Matsushi Power Technologies	The Wago connector change may be considered standardization of the Wago connector part number. Sufficient cut-in time for transition also needs to be allowed.	Suitable connector mentioned above.
M/s Power Technologies Corporation	There is an issue: Higher Voltage surges in RE area damage low voltage rating MOV, Increase in Voltage Rating of MOV 385 V and of the Signal Design to be suitable for RE area. MOV ratings as per RE area up to double distant recommended value 385Vac and Dia 14MM to 20MM as per design needs, having cut-in voltage above 410 Vac and clamping voltage of Voltage max. 720vac	Rating of MOV is not being changed in this revision.
R T Vision Technologies (P) Ltd.	Accepted- Proposed Wago type model 236-254 and 261-254 datasheets attached.	4 conductor screw less terminal fixing hole 3.2 mm ϕ 2.5 mm^2, Cage clamp 2.5 mm^2, colour Grey. On inner two terminal MOV of 175 V rating shall be provided on back side of LED signal unit. Outer terminals shall be marked as "input" terminals and used for input termination. It is recommended to use M/s Wago Make connector with part no. 261-254 or similar for other manufacturer. Manufacturers of connector should have EN 60497, IEC-60998 certification.
M/s Tilak International (Signal)	We strongly agree with Clause No. 6.1.28, as it is a very positive step by RDSO.	Suitable connector mentioned above.
M/s Urban Engineering Association Pvt. Ltd. Kolkata	The specific type (as mentioned) connector is much bigger than the available space in the back side of the LED Signal unit. The size of the connector with fuse assembly may please be selected so that it can be incorporated in the Signal Unit.	Suitable connector mentioned above.
M/s VGS AND Technologies Pvt. Ltd.	Please Provide Disconnect type terminal block Part Number with Manufacturer Details for Multi	Suitable connector mentioned above.

	vendor Discipline Purpose	
M/s Atlanta Tele Cables Roorkee	Proper phrase to avoid ambiguity as "Disconnect type terminal block having four terminals" to be used instead of the phrase "Four Disconnect type terminal block".	Suitable connector mentioned above.

6.1.29 All LED signal lamps shall meet the requirements as mentioned in clauses 2.3, 2.5, 5.2 & 6 of RDSO /SPN/144/2006.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Efftronics System Pvt. Ltd.	Clause No. 2.5 of RDSO/SPN/144/2006 Printed Circuit Board Manufacturing ABS and PC Plastic components molding Clause Clause No. 5.1 of RDSO/SPN/144/2006 Make and part number shall be specified. Part number shall be traceable to manufacturer. Clause No. 6.6 of RDSO/SPN/144/2006 (i) Reflow soldering technology is widely used for SMD technology and thus synonymous with SMD assembly process. This process is currently prevalent in all the SMD assembly lines and wave soldering process does not suit SMD assembly. (ii) Component technologies are rapidly migrating for through hole to SMD. Hence reflow soldering becomes more prominent over Wave soldering. (iii) Wave soldering is used in high volume through hole assembly, process parameters require very sensitive adjustments for proper assembly throughputs. In signals through hole assembly joints are few and high in capacity, these parameters make wave soldering less effective. (iv) Reflow soldering- for SMD components. (v) Manual hand soldering for through hole components.	Reflow soldering process may be proposed with technical justification by the firms in their process flow chart of QAP for consideration. Comments from other vendors are also invited.
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.30 LEDs used in LED signal lamp shall be of high performance quality and from reputed manufacturers as stipulated by RDSO. The maximum junction temperature of a LED shall not be less than 100 deg. and epoxy used in the LED shall have UV inhibitors.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	
M/s VGS AND Technologies Pvt. Ltd.	Please Give the Provision for SMD or Through Hole LED's with Reputed Manufacturer	Avago and Nichia make through hole LEDs is mentioned in Acceptance Test Format SMD LED may be deliberated in drafting of new specification.
M/s Atlanta Tele Cables Roorkee	There is a little contradictions in the Specification No. RDSO/SPN/199/2010 Rev. 1.1 and Acceptance test format No. "SIF 0385 Version 1" in AT format make Nichia and Avago have been marked there due to which no other option is left even though other products of other reputed manufacturers are available. Please provide some more clear information on this.	Avago and Nichia make through hole LEDs is mentioned in Acceptance Test Format

6.1.31 A The electronic components (THD/SMD), switches and connectors used shall be of Industrial grade and shall comply Cl. 5.1 of RDSO/ SPN/144/2006, as applicable. High life electrolytic capacitor with more than or equal to 8000 hours life and capacitance tolerance within ± 20% shall be used for power conditioning. The operating temperature rating of all electrolytic capacitors used shall be more or equal to 105 deg.C. Coils/ transformers wherever used should be fire retardant and conform to 'H'class.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Beacon Industries	Capacitors Life 8000hrs is required only for Power input filter Capacitor only. For rest 2000hrs is sufficient	Life of capacitor is not being changed in this revision.
M/s Matsushi Power Technologies	The electrolytic capacitors' lifespan can be : ≥8000 hours for power input filters and for other electrolytic capacitor ≥2000 hours for others, and may be clearly specified.	Life of capacitor is not being changed in this revision.
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.32 Manufacturer shall maintain proper accountal of LEDs and other ~~critical~~ all electronic components being used. The record shall include various details like source of supply, procurement invoice no. & date, quantity, incoming rejection, lot-wise consumption and Bill of material etc. which ~~may~~ shall be verified by inspecting officials.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Beacon Industries	Agreed	
M/s GAEC Mumbai	Accountal for LEDs and critical components are maintained for lot wise	To improve the quality of electronic

	consumption. Maintaining lot wise consumption for all electronic components is complex and difficult to verify. Traceability against lot received and accepted is maintained on regular basis for all items.	components, it is required.
M/s Matsushi Power Technologies	This is a standard need for manufacturer.	
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.1.33 At least 10% of LEDs and ~~other~~ ~~critical~~ 10% of each electronic components of every procured lot shall be tested before use to check electrical/optical characteristics as per LED manufacturer's data sheet. Lot-wise test record shall be maintained, which may be verified by inspecting officials.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Beacon Industries	The components are being procured from reputed manufacturers and the OEM ensures reliability and quality. We have not observed any deficiency on this account and There is no requirement of incoming inspection required 10 % on LEDs, It must be reduced. On the contrary procurement from the world reputed sources who comply the quality standards is a certificate of quality	Comments of M/s CLS Industries may be agreed upon. Other Vendors may comment on this.
M/s CLS Industries	Our proposal for testing of incoming materials is as follows: Resistors/Diodes/Capacitors- 1-2% Transistors and ICs- 5% LEDs- 10%	May be agreed. Other Vendors may comment on this.
M/s Efftronics System Pvt. Ltd.	(i) Genuity of the components shall be traceable to the manufacturing source i.e. invoice and batch number traceable to manufacturer. (ii) Wherever available, manufacturer test reports/inspection reports for the supplied lot shall also be considered as inward inspection data. (iii) SMD components packing is in reel form, and 10% inspection will not be possible, as once the reel is opened it does not support Pick and Place automation process.	Comments of M/s CLS Industries may be agreed upon. Other Vendors may comment on this.
M/s GAEC Mumbai	10% LEDs and critical components are checked for electrical and optical parameters as applicable. However, it is extremely difficult to check 10% of other material as once removed from SMD reel, the components can't be used.	Comments of M/s CLS Industries may be agreed upon. Other Vendors may comment on this.
M/s Matsushi Power Technologies	In our other products with 25 years of experience Product Burn in and pre burn-in and post burn-in traceability of parameters gives the complete verdict on quality assurance and Sacro scent completion of Quality QAP process. If no	Comments of M/s CLS Industries may be agreed upon. Other Vendors may

<table>
<tr><td></td><td>adverse result is found post burn-in it validates the complete process and ensures long term performance. In the event of any adverse result it directs towards to the corrective action in the pre-process. Thus Component procurement as per the Compliant Design and of Safe ratings from Reputed OEMs requires only mini sample check to reassure the value and rating for rest the process matters. Anything beyond this can be wasteful activity.</td><td>comment on this.</td></tr>
<tr><td>R T Vision Technologies (P) Ltd.</td><td>Change request- The 10% criteria for SMD components to be removed as they are in reels and can not be putted back in reel after testing hence shall add to wastage.</td><td>Comments of M/s CLS Industries may be agreed upon.

Other Vendors may comment on this.</td></tr>
<tr><td>M/s Tilak International (Signal)</td><td>Regarding Clause No. 6.1.33, instead of checking 10% of each electronic component in every procured lot, we may adopt the standard “IS 2500 (Part 1): 2000, ISO 2859-1:1999, Indian Standard Sampling Procedure for Inspection. For SMD components, the sample size may be reduced to 10 units per reel, as once the material is out of reel, it cannot be used for machine mounting..For all other incoming material the sampling plan is as below

Sampling Plan for incoming material as per IS 2500
<table><tr><th>LOT SIZE</th><th>Sample Size</th></tr><tr><td>2 to 8</td><td>2</td></tr><tr><td>9 to 15</td><td>3</td></tr><tr><td>16 to 25</td><td>5</td></tr><tr><td>25 to 50</td><td>8</td></tr><tr><td>51 to 90</td><td>13</td></tr><tr><td>91 to 150</td><td>20</td></tr><tr><td>151 to 280</td><td>32</td></tr><tr><td>281 to 500</td><td>50</td></tr><tr><td>501 to 1200</td><td>80</td></tr><tr><td>1201 to 3200</td><td>125</td></tr><tr><td>3201 to 10000</td><td>200</td></tr><tr><td>10001 to 35000</td><td>315</td></tr><tr><td>35001 to 150000</td><td>500</td></tr><tr><td>150001 to 500000</td><td>800</td></tr><tr><td>500001 and over</td><td>1250</td></tr></table></td><td>Comments of M/s CLS Industries may be agreed upon.

Other Vendors may comment on this.</td></tr>
<tr><td>M/s Urban Engineering Association Pvt. Ltd. Kolkata</td><td>l0% of LEDs and all the other critical components are tested as per the QA plan and accordingly records are maintained. However, for reeled SMD items. it seems</td><td>Comments of M/s CLS Industries may be agreed upon.</td></tr>
</table>

	to be huge waste as the l0 % taken out components from the reel cannot be used in the unit (1o be scrapped). So the quantity ma1 be reduced to l% for feasible solution against the intention.	Other Vendors may comment on this.

6.1.34 Number of LEDs and their Part no. shall not be changed without prior approval of RDSO.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

6.2 A rail mountable RDSO Approved fuse terminal block As per RDSO Specification No. RDSO/SPN/189/2004 Ver 3.0 (latest) with fuse link of 400 mA rating & a disconnect type terminal block as per RDSO specification No. RDSO/SPN/ 189/2004 Ver 3.0 (latest) and 175 V MOV shall be provided with a LED signal lamp. Terminal blocks shall be 3/4 conductor type (1/2 input and 2 output terminals) for terminating MOV on output side. Mounting rail of suitable length (12 inches length with supply of every 20 signal lamps or part thereof.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Beacon Industries	Agreed as follows: a. RDSO may approve more vendors for fuse links. We find " Sanarti" make also to be suitable b. MOV of 175Vac rating is under rated as its cut-in voltage is only 210+ volts which is highly underrated for distant and double distant signals. We recommend use of 385 Vac of min. 14 mm dia. rating as was also discussed in the meeting along with strengthening of components as per need. Cut-in period of 6 months may be given (see special comments below)	Rating of MOV is not being changed in this revision.
M/s Matsushi Power Technologies	MOV ratings should be increased to 385V for RE areas, with clamping voltage not exceeding 720V. Fail-safety validation should follow CENELEC EN 50126 & EN 50129 standards for SIL4.	Rating of MOV is not being changed in this revision.
M/s Power Technologies Corporation	Clause 6.2 MOV rating must be revised to 385Vac.(vendors can be given cut in period of 180 days to suitably strengthen the internal design where need, it will only improve the product]	Rating of MOV is not being changed in this revision.
R T Vision Technologies (P) Ltd.	Accepted, The Wago/Phoenix type terminals cage type panel/PCB mounted type are requested to be added.	Type of terminal is already mentioned in Cl. 6.1.28
M/s Urban Engineering	OK	

Association Pvt. Ltd. Kolkata		

7.0 DESIGN CRITERIA FOR HIGH SPEED LINES (165 Kmph)

7.1 LED signal lamp shall have a display area of 200 mm ± 10 mm diameter.

7.2 Number of LEDs used should not be less than 90 for Red and Yellow, 45 for Green LED signal lamp. Variation from stipulated number may be considered based on merits of the design.

7.3 The minimum visibility distance of LED signal lamps for main colour light signals shall be 1000 m. in clear daylight with peak sunrays at rated voltage.

7.4 Operating parameters of various types of LED Signal lamps when used with AC LED ECRs shall be as per Table- III given below:

Sl. No.	**Parameter**	**Main Signal**		
1.	Rated voltage at Input terminals of LED Signal lamp	110V ±25 %		
2	Current at rated voltage per unit at Input terminals of LED Signal lamp	60 to 100 mA (rms)		
3.	Illumination measured at 1.5m from LED Signal Lighting Unit in axial direction at rated voltage	300 LUX –10% + 40%	300 LUX –10% + 40%	300 LUX –10% + 40%
4.	Colour	Red	Yellow	Green

Table III

7.5 Rest design criteria and test criteria shall be same as that applicable for normal LED signal lamp.

Note: (i) Above parameters are tentative and shall be refined after development of prototype.

(ii) This lamp is proposed to be fitted in the slot of outer lens in the CLS housing. Hence, CLS housing will also require modification for fitting the lamp and maintenance from the rear of the CLS housing.

(iii) This will also require development of compatible ECR with fast to pick up and slow to drop feature in line with lighting time of the lamp.

8.0 TESTS & PERFORMANCE CRITERIA

8.1 LED signal lamp shall pass the climatic tests as per Sl. No. 1, 2, 3, 4, 5, 6, 7 & 12 of Cl. 9.3 of specification RDSO / SPN / 144 / 2006 as applicable for out-door track side electronic equipment upto & including 75 Kg. weight category.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

8.1.1 LED signal lamp shall pass driving rain test as per Sl. No. 9 of Cl. 9.3 of specification RDSO / SPN / 144 / 2006. These units shall be tested after fixing in an enclosure similar to colour light signal housing without hood and with backdoor open.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

8.1.2 After test as per every Sl. No. of Cl. 9.3 of specification RDSO / SPN / 144 / 2006, as specified above, no LED should fail; there should not be any damage in the unit or visual change in colour. Also input current and illumination will not change by more than ± 5% of original values and will be within specified values as per clause 5.2. After completion of all tests, colour co-ordinates shall remain within specified class as per clause 5.1.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Efftronics Systems Ltd.	(i) Test initial data is taken at room temperature. After Burn in test the units shall be brought to room temperature and the test data again. This test data shall be treated as after burn in test data. This data comparison shall satisfy the requirements of clause 8.1.2 (ii) The thermal profile of the Burn in test chamber shall be captured for test duration of 168 hrs. (iii) Burn in test shall be deemed passed when it meets the specified thermal profile mentioned in the test and satisfies the Clause 8.1.2. (iv) The pertaining test report as per above requirement shall be submitted	Procedure of Burn in test is mentioned in RDSO remark column of Cl. 8.6 of this specification.

	and which shall be audited and verified by third party inspection authority.	
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

8.2 Applied high voltage test for LED signal lamp: The lamp shall withstand for one minute without puncture and arcing a test voltage of 2000Volts rms applied between body and all AC line terminals looped together.

(For testing with part of body which is used as heat sink, test voltage shall be 1500Volts rms)

The test voltage shall be alternating of approximately sinusoidal waveform of any frequency between 50 Hz and 100 Hz. LED signal lamp should not glow during the test.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

8.2.1 During type test, HV test should also be carried out on a lamp with body in open condition to observe sparking, if any generated during HV test. In case of sparking lamp should be treated as failed.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

8.3 Insulation Resistance Test for LED signal lamp: This test shall be carried out-

(a) Before the high voltage test
(b) After the high voltage test
(c) After completion of the climatic test

The Insulation Resistance shall be measured between the body and the current carrying terminals looped together at a potential of 500 V DC. There shall not be appreciable change in the values measured before and after high voltage test and these values shall not be less than 100 Mega ohms. After completion of climatic test, the insulation resistance shall not be less than 10 Mega ohms for the equipment at a temperature of 40°C and relative humidity 60%.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark

M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

8.4 Dispersion Angle test: This shall be measured as per Annexure II.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

8.5 FAIL SAFETY

i) LED signal lamp shall be so designed that any short/open or any other defect in any of the component will not lead to unsafe / undesirable situation.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

ii) Spike protection shall be provided in the LED signal lamp. This shall be achieved by reliable means.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

iii) There shall never be any possibility of change in colour of signal light unit with variation in temperature, current, voltage and ageing to unsafe side i.e. in any usual / unusual circumstances.

Red to Yellow or Green
Yellow to Green
Lunar White to Yellow or Green

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd.	OK	

Kolkata		

iv) LED signal lamp shall comply Cl. 3 & 4 of specification RDSO / SPN / 144 / 2006, as applicable.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

v) Fail safety validation shall be done by an independent agency which has credentials & experience for similar validations. Fail safety validation shall be done as per CENELEC standards EN 50126 & EN 50129 for Safety Integrity Level 4.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Matsushi Power Technologies	Any field failure should trigger a design review within 120 days, as per CENELEC standards, to ensure corrective action.	Other Vendors may also comment on this to deliberate it further.
M/s Power Technologies Corporation	It may be suitably incorporated, that any failure in field shall be considered for review of design as per Cenelec Standards. A period of not more than 120 days be given to get the Design verified for corrective action as necessary.	Other Vendors may also comment on this to deliberate it further.
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

8.6 Burning in test: LED signal lamp shall be kept continuously ON for minimum 168 hrs. at 60 °C at rated voltage. There shall not be any difference in operating parameters before and after burning in test.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	This clause may be amended as under: "Burning in test: LED signal lamp shall be kept continuously ON for minimum 168 hrs. at 60 °C at rated voltage. No LED should fail; there should not be any damage in the unit or visual change in colour. Also input current and illumination will not change by more than ± 5% of original values and will be within specified values as per clause 5.2. After completion of all tests,

		colour co-ordinates and dispersion angle shall remain within specified class as per clause 5.1 and clause 6.1.9 respectively". Parameter should be measured at ambient/room temperature before and after burning in test.

8.7 Thermal cycling and power cycling tests: All PCBs and power supply modules shall be subjected to thermal cycling and power cycling tests respectively as per Cl. 9.3 of specification RDSO / SPN / 144 / 2006. Proper test record having traceability to respective PCB/module shall be maintained by the manufacturer.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Efftronics Systems Pvt. Ltd	(i) Thermal cycling shall be done on all the components populated and soldered PCB's as per the thermal profile mentioned in clause 9.3.13(i) of RDSO/SPN/144/2006. (ii) Thermal profile data of the Thermal cycling chamber shall be recorded and produced as evidence of the test. (iii) Inspection report of the PCBs after the Thermal Cycling test shall produced, showing the details of non-conformance observed. (iv)Power cycling test shall also be performed, and the test report shall be produced showing the details of the units and operating parameters during the test.	May be agreed.
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

8.8 Calculation details of MTBF as per Part stress method shall be furnished by the Govt/NABL Lab ~~manufacturer~~ at the time of initial approval.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Beacon Industries	Agreed; It may be noted that proper design based components which are procured from reputed manufacturers only shall comply these values. Failure due to Improper rating and/or improper design as per field conditions unrelates the product with	Quality of components is already mentioned in Cl. 6.1.31 & Cl. 6.1.32

	MTBF calculations	
M/s Efftronics Systems Pvt. Ltd	Pertaining Laboratory shall be mentioned. As laboratories do not have NABL accreditation for MTBF calculation.	Govt Lab or NABL accredited lab is mentioned.
M/s Matsushi Power Technologies	Agreed, agencies should have relevant application experience.	
R T Vision Technologies (P) Ltd.	Accepted	
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

9.0 INSPECTION CRITERIA

9.1 TYPE TEST

For type test, two prototype samples each of red, yellow and green aspects shall be subjected to following tests:

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(i) Visual inspection & dimensional check

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(ii) Colour co-ordinates (Clause 5.1)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(iii) Operating Parameters (Clause 5.2, 7.4)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(iv) Output current regulation of current regulator (Clause 6.1.18)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(v) Compatibility with ECR

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(vi) Ambient temperature test (Clause 6.1.11)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(vii) Climatic tests (Clause 8.1, 8.1.1, 8.1.2)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(viii) UV Stabilization test on cover (Clause 6.1.24)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(ix) Effect of reflected light (Clause 6.1.5)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(x) Visibility test (Clause 4.1, 4.2, 7.3)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(xi) Fail safety (Clause 8.5)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(xii) Applied high voltage test (Clause 8.2)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(xiii) Insulation resistance test (Clause 8.3)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(xiv) Minimum lighting voltage(Clause 6.1.6)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(xv) Dispersion Angle test (Clause 6.1.9, 8.4)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(xvi) Fluctuation in input voltage (Clause 6.1.4)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(xvii) Burning in test (Clause 8.6)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Beacon Industries	Agreed On routine test this test is conducted on 100% of lot	
M/s Efftronics Systems Pvt. Ltd.	This test must be seen in conjunction with Clause 8.1.2.	May be agreed
M/s Matsushi Power Technologies	Add burn-in (Clause 8.6), thermal cycling, and power cycling tests (Clause 8.7) to type testing. Burn-in at 60°C for 168 hours should be part of type testing. Power cycling should be	Agreed

	added just after 168 Hrs burn-in.	
M/s Power Technologies Corporation	Burning In Test at 60"C for 168 Hours is being done regularly as per Routine Testing and this may be better to add in Type testing. The inclusion of thermal and power cycling is a good practice to assess component durability. However, it would be wise to test for faults and design problems under these conditions too. Vendors should incorporate fault simulation into their validation process, based on CENELEC standards, to ensure that the system design remains robust under various operating conditions.	Manufacturers may do further internal testing to improve the reliability of their products.
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(xviii) Thermal cycling & power cycling tests (Clause 8.7)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Beacon Industries	Agreed as follows; Thermal cycling and power cycling as per existing practice is adequate. We observe that current practice of 100% assembled product burn-in for 168 hours at 60 degrees Celsius is established and suitable practice to reassure the product long term performance. It is important that design is correct and components used per design with safety factor based rating are from reputed manufacturers.	There is no change in the routine tests for this clause.
M/s GAEC Mumbai	For carrying out this test, fresh samples from manufacturing batch may be taken. It is not possible to be carried out on Type Test samples as these have already undergone Thermal Cycling tests during manufacturing.	Thermal cycling test shall be done on PCB populated with components and without conformal coating from manufacturing batch.
M/s Matsushi Power Technologies	Add burn-in (Clause 8.6), thermal cycling, and power cycling tests (Clause 8.7) to type testing. Burn-in at 60°C for 168 hours should be part of type testing. Power cycling should be added just after 168 Hrs burn-in.	May be agreed
M/s Power Technologies Corporation	Thermal and Power Cycling, In our experience proper burn-in of the finished product after the existing method of thermal cycling are adequate to weed out any component or assembly related problems. Power cycling may be added at the end of Burn In test for 168 Hrs as	

	the modules shall be subjected to 60 ONOFF cycles in 1 hour.	
M/s Tilak International (Signal)	Thermal cycling is an Assembled PCB-level test.	Thermal cycling test shall be done on PCB populated with components and without conformal coating from manufacturing batch.
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

9.1.1 An open blown out model of offered LED signals shall also be submitted for initial type test.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

9.1.2 Documents as per Cl. 14.0 shall be submitted alongwith samples.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

9.1.3 Fail safety is not required for subsequent maintenance approvals provided there is no change in circuit design.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

9.2 ACCEPTANCE TEST

Acceptance test shall be conducted only when the Cl. 6.1.32 & Cl. 6.1.33 are complied. Firm should submit the routine test report including the burn in test report as per Cl. 8.6 and thermal cycling and power cycling test report as per Cl. 8.7 to the inspecting officials.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Beacon Industries	Agreed; please see below 6.1.33- The components and its Limited manufacture List have been declared and submitted to RDSO, We will maintain data sheet of component and Conformity/test report of purchased components and will be provided as and when required. Beyond this our Existing sampling plans and ISO will be honoured and are adequate. 6.1.32- Accurate accountal of	The components and its manufacture list is mentioned in Firm's QAP.

	components is basic process in a manufacturing unit. It is more important to do a more comprehensive review of design by checking suitability with Upgraded Parametric ACCEPTANCE TESTS, and thereby validate the component interaction with design validation as per the Field operational needs for the application. This will ensure that the signal is designed in a way that minimizes the risk of failure in operational environments.	
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

9.2.1 ~~Out of a lot, 20% of the samples shall be subjected to following tests:~~ For a lot, take 20% of the samples from each color, with a minimum of 5 samples of each colour. If the lot has less than 5 LED Signals, then all LED Signals in the lot should be taken as samples

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
R T Vision Technologies (P) Ltd.	Accepted	
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(i) Visual inspection & dimensional check

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(ii) Effect of reflected light (Clause 6.1.5)

(iii) Operating Parameters (Clause 5.2, 7.4)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(iv) Minimum lighting voltage(Clause 6.1.6)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(v) Compatibility with ECR

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

9.2.2 ~~Minimum five samples of each type / colour of aspects from those which have passed tests as per Cl. 9.2.1 shall be subjected to following tests~~ Minimum five samples from those which have passed above tests as per Cl. 9.2.1 shall be subjected to following tests (In case lot comprises of more than one type of aspect minimum two samples of every type/colour subject to total of minimum five samples shall be tested-

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Beacon Industries	Agreed	
R T Vision Technologies (P) Ltd.	Accepted	
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(i) Temperature severities test (Clause 6.1.11 except humidity)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Matsushi Power technologies	Specify ambient temperature severities test from -10°C to +70°C, with measurements taken after 30 minutes of unit operation at each temperature only one cycle. Allow a 5-minute transfer time between chambers and the test	It is mentioned in Cl. 6.1.11 above.
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(ii) Colour co-ordinates (Clause 5.1)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(iii) Insulation resistance test (Clause 8.3 (a))

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(iv) Dispersion Angle test (Clause 6.1.9, 8.4)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark

M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(v) Fluctuation in input voltage (Clause 6.1.4)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

9.2.3 Acceptance tests as per Cl. 9.2.2 (ii) to (v) shall be conducted after temperature severities test. Operating parameters, minimum lighting voltage and compatibility with ECR tests shall also be conducted after temperature severities test.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

9.2.4 Failure in any of the tests is not acceptable.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

9.3 ROUTINE TEST

9.3.1 Following routine tests besides other tests, as deemed fit to ensure quality, reliability and compliance of this specification shall be done by the manufacturer on all the lamps:

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(i) Thermal cycling & power cycling tests (Clause 8.7)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(ii) Visual inspection & dimensional check

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(iii) Burning in test (Clause 8.6)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(iv) Effect of reflected light (Clause 6.1.5)

(v) Colour co-ordinates (Clause 5.1)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(vi) Operating Parameters (Clause 5.2, 7.4)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(vii) Output current regulation of current regulator (Clause 6.1.18)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(viii) Compatibility with ECR

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(ix) Insulation resistance test (Clause 8.3 (a))

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(x) Minimum lighting voltage(Clause 6.1.6)

Comments/Suggestions Received	

Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(xi) Dispersion Angle test (Clause 6.1.9, 8.4)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

9.3.2 Tests as per Cl. 9.3.1 (iv) to (x) shall be conducted after Burning in test. Proper record of routine tests shall be maintained by the vendor.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

10.0 DESCRIPTION TO BE GIVEN BY PURCHASER

(i) LED signal lamp- Red, Green or Yellow aspect (as required) for main colour light signal as per RDSO specification No. (No. will be given at the time of issue.)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

11.0 SCOPE OF SUPPLY

Scope of supply shall also include terminal blocks, fuse links and mounting rail as per Cl. 6.2.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

12.0 WARRANTEE

The vendor shall give a warrantee of 60 months for LED signal lamps as given below:

12.1 In case, LED signal lamps fail within 24 months of supply, vendor will jointly inspect the defective lamps with the railway after getting/telephonic/ written information from the railway. Defective lamps will be collected and replaced by the vendor free of cost by new

lamps within 45 days of information by the railway. New lamps will be supplied after RDSO inspection.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

12.2 In case, railway does not inform the vendor about the defective lamps within 60 days of expiry of 24 months, vendor"s liability will be limited to rectification of the defective lamps.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

12.3 During rest of the warranty period, the defective lamps shall be sent by the railway to the vendor which will be rectified by the vendor and tested by the vendor for routine tests as per Clause 9.3.1 (ii) to (x). Rectified lamps will be returned by the vendor within 45 days of receipt of defective lamps alongwith their routine test reports. Rectification / replacement record and failure analysis of ALL rectified/ replaced lamps shall be maintained by the vendor and submitted to RDSO every quarterly.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

13.0 **MARKING**

13.1 Clauses 12.1 and 12.2 of specification RDSO / SPN / 144 / 2006 (latest) shall be complied.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

13.2 The words Indian Railway Property shall be engraved /embossed on every unit in letters of 5mm size (minimum) at a conspicuous place.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

13.3 The anodized name plate shall be firmly attached to every unit and shall show the following information:

(a) Name or trademark of the manufacturer

(b) Serial number of the unit
(c) Version No. of the unit*
(d) RDSO‟s specification number
(e) Name and aspect of the signal
(f) Operating voltage- 110V AC
(g) Month and year of manufacture

*In case of an alteration in the design of a unit, new version number shall be assigned.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

14.0 DOCUMENTATION

Following documents shall be supplied-

(a) Two copies of Installation and maintenance manual. This should also include following information:
  (i) Guaranteed performance data, technical and other particulars.
  (ii) Schematic block diagram showing mounting arrangement of various components & details of each type of assembled PCB.
  (iii) Details of Hardware e.g. schematic diagrams of the system circuits/ components, details for each type of assembled PCB and part list.
  (iv) Mechanical drawings of every unit
  (v) Part no. and manufacturer‟s data sheet of LEDs used
  (vi) Trouble shooting procedure alongwith test voltages and waveforms at various test points in the PCBs
  (vii) Details/procedure of Trouble shooting through HMU
  (viii) Dos & Don‟ts (Pocket size laminated cards)

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

(b) Pre-Commissioning check list

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

15.0 PACKING

15.1 All LED signal lamps shall be individually wrapped in bubble sheet and packed in individual card board boxes. The empty spaces shall be filled with suitable filling material.. Alternatively, these may be packed in thermocole boxes. The units shall be finally packed in a wooden case or card boxes of sufficient strength so that it can withstand bumps and jerks

encountered in a road/ rail journey.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

15.2 Every box shall be marked with code numbers, contents and name of manufacturer. The upside shall be indicated with an arrow. Boxes should have standard signages to indicate the correct position and precaution "Handle with Care"" with necessary instructions.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

15.3 The units and their sub assemblies shall be so packed as to permit convenient handling and to protect against loss or damage during transit and storage.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

16.0 INFRINGEMENT OF PATENT RIGHTS

Indian Railways shall not be responsible for infringement of patent rights due to similarity in design, manufacturing process, use of components used in design, development of manufacturing of LED signal and any other factor which may cause such dispute.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

17.0 ISO PROCEDURES

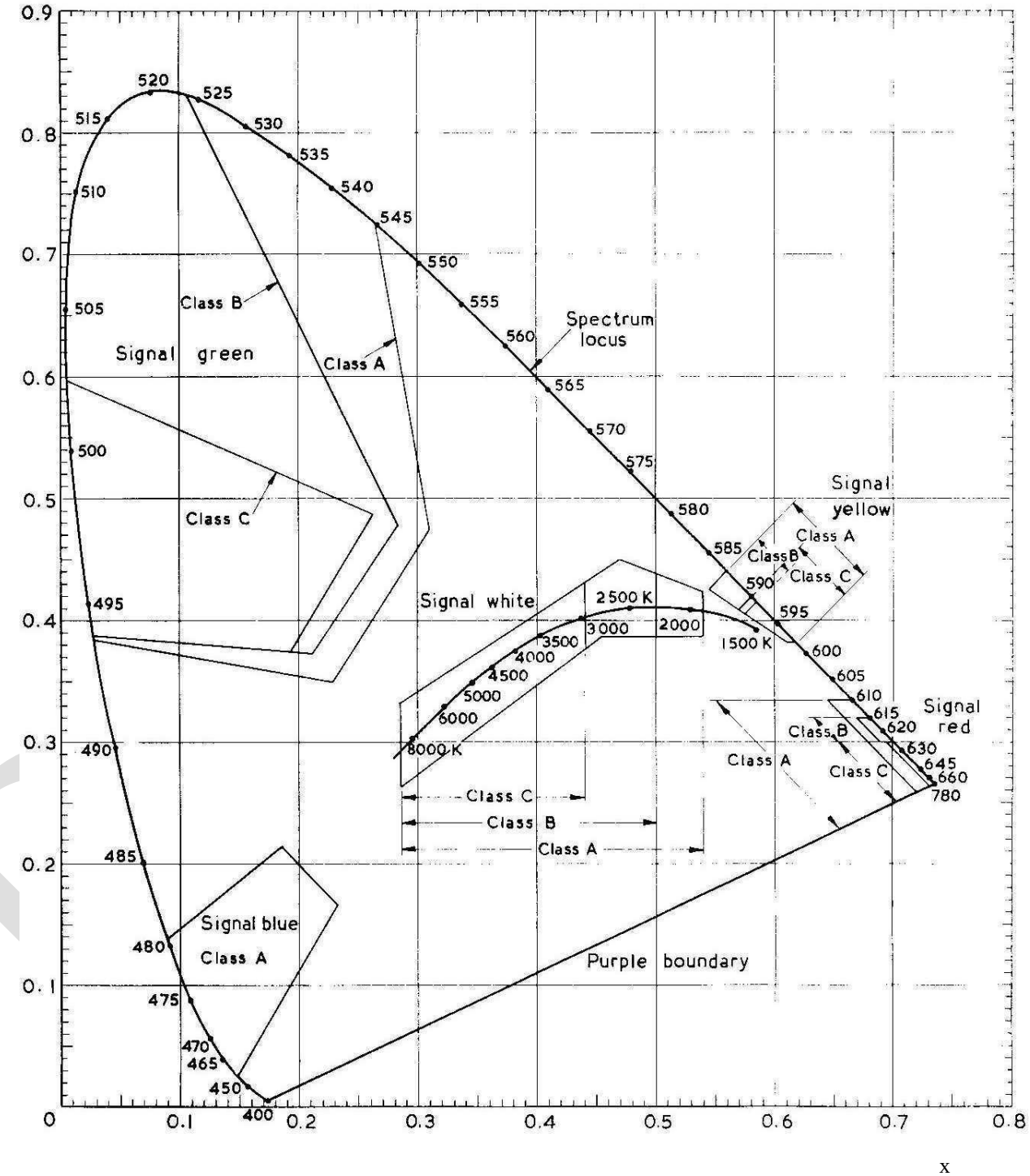
17.1 All the provisions contained RDSO"s ISO procedures laid down in Document No. QO-D-8.1.11 Ver. ~~1.0~~ 3.3 (latest) ~~dated 12.09.2018~~ ("Vendor - Changes in approved status") and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways.

Comments/Suggestions Received		
Name of the firms	Firm's Comments	RDSO Remark
M/s Urban Engineering Association Pvt. Ltd. Kolkata	OK	

------X------

Annexure I

BS 1376 : 1974

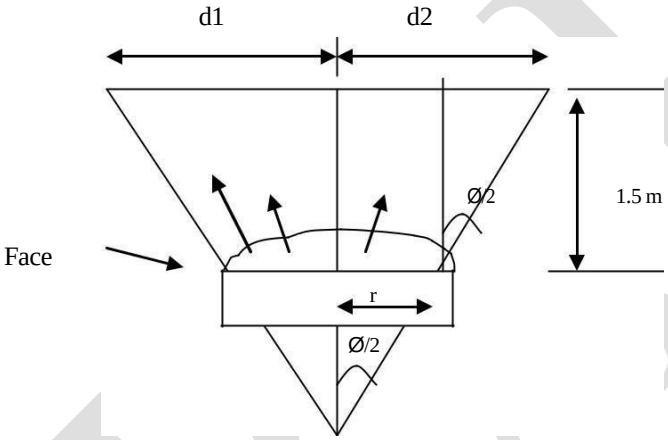


Chromaticity limits for signal colours

Annexure II

Measurement procedure for Dispersion Angle

1. Light up the aspect at the nominal voltage on 110 V and place it on the test bench.
2. The Dispersion Angle shall be calculated by measuring the half intensity points of the dominant wavelength at 1.5 m from LED signal lighting unit in axial direction on both the sides and taking average of the distances, d_1 & d_2 in metres
   ($d = (d_1 + d_2) / 2$)
3. The half intensity, point is where half of the normal illumination at rated voltage falls. The Dispersion Angle shall be calculated using the formula
   $\tan \frac{d - r}{1.5} = Ø/2$
4. 'r' is the distance from centre of the unit to the outer most LED provided in the unit.

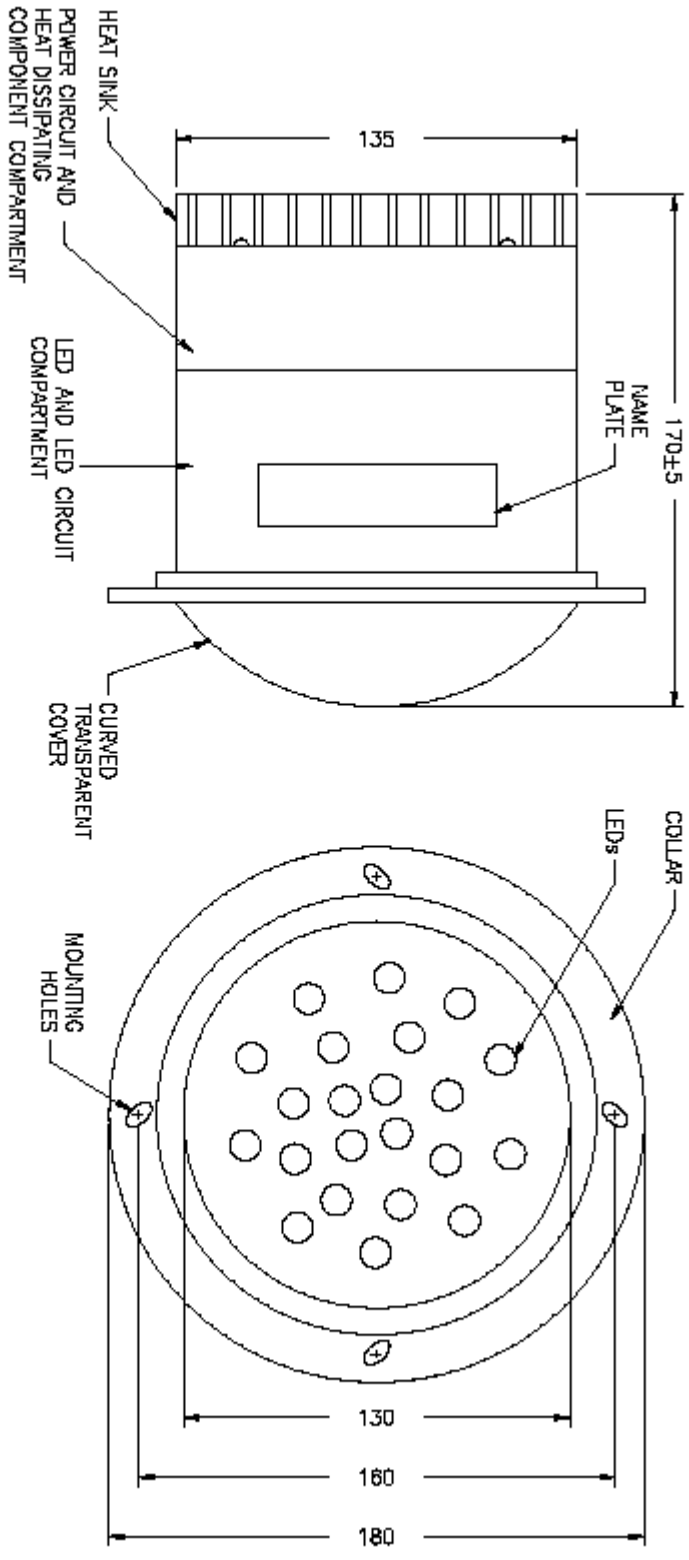


5. **Dispersion Angle = Ø**

…….x……..x…….

Annexure III

CONCEPTUAL DIAGRAM OF LED SIGNAL LAMP FOR MAIN COLOUR LIGHT SIGNAL (INTEGRATED)



NOTE : 1. ALL DIMENSIONS ARE IN MILLIMETER.

2. DIMENSIONS SHOWN ABOVE ARE JUST FOR GUIDANCE, IT CAN BE VARIED AS LONG AS SIGNAL UNIT PROPERLY FITS IN CLS HOUSING AS PER DRAWING No. SA 23002 AND S 23024/M.