SPECIFICA TION OF LED LIT SEMAPHORE SIGNAL LAMP

TENTATIVE

0. FOREWORD

0.1 This specification is issued under the fixed Serial No. RDSO/SPN/169/2001 followed by the year of adoption as standard or in the case of revision, the year of latest revision.

ADOPTED

0.2.1 This specification requires reference to the following specifications:

IRS: S 84-92	Specification for Solar PhotoVoltaic module
IS:104-79	Ready mixed paint, brushing, zinc chrome, priming.
IS:128-62	Ready mixed paint, brushing, finishing, semi-glass for general purpose. 15:2074-92 Ready mixed paint, air drawing, red-oxide-Zinc chrome priming IS: 9000 Basic environmental testing procedures for electronics and Electrical items. BS: 1376-1974 Specification for Colour of light signals.

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

1. SCOPE

1.1 This specIfication is intended chiefly to cover the general and technical provisions for fitment in existing posts for LO & UO signals in Non -RE area of Indian Railways.

2. GENERAL REQUIREMENTS

2.1 The LED lit semaphore signal lamp shall be so designed that they fit in the existing fixture as per table given below or as specified by the purchaser.

2.2 The minimum visibility of LED lit semaphore signal lamp in conjunction with relevant signal Roundels shall be as per relevant para of Indian Railway Signal Engineering manual.

2.3 The life of LED lit semaphore signal shall not be less than 1,00,000 hours.

2.4 LED lit semaphore signal lamp shall be suitable to work with solar powered Battery. Provision of external supply for charging the battery shall also be made available

2.5 Minimum four number of high power LED's shall be provided for signal lighting and two number for backlight indications.

2.6 A glass lens inside stepped Dia. 136mm & Focal length 89 mm ,clear (Drg. No. S2749/M), shall be provided in front of LEDs (signal aspect) in the LED lit semaphorc Signal lamp

3.0 TECHNICAL REQUIREMENTS

3.1 Colour Co-ordinates:

Colour co-ordinates of LED lit semaphore signal lamp shall be as follows.

i) For signal light: white class 'C' of BS: 1376/1974
ii) For back light: white class 'C' of BS 1376/1974

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iii} Colour co-ordinates graph as per B 1376/1974 as given in Appendix 1 when LED lit signal lamp tested in conjunction with requisite signal roundels.

3.:: Operating parameters

Operating parameters of LED lightig signal lamp shall be as given below.

! Rated voltage 12V DC .t 10% fed by rechargeableI' maintenance free batte fitted in the lam. I

: Current at rated volta e 50mA max) !

! Coiour of LED signal light -white back ii ht -white

3.3 The LED lit semaphore signal lamp shall pass vibration test as per clause 5.5 of IR5: 557/93, as per Appendix II.

3.4 The LED lit semaphore signal lamp shall work satisfactorily for the input current as specified in clause 3.2 in ambient temperature varying from -10 deg. C to 60 deg. C and a relative humidity of 90%.

3.5 Fail safety-

i} LED lit semaphore signal units shall be so designed that any short / open or any other defect in any of the component shall not lead to unsafe situation.

ii} Color of LED shall not change during its life cycle.

iii} Ughtening protection shall be provided in the LED lit semaphore signal lamps.

3.6 LED's in the semaphore signal units shall be arranged in more than one array so that in the event of failure of an LED, whole unit does not become blank. LED's in the arrays shall be interleaved so that effect of failure of any array is spread out.

3.7 The resistors and capacitors used shall conform to the relevant 15 Specifications and of tolerance not more than 10q'o.

3.3! Printed circuit Board:

3.8.1 PCB Material: Material for the printed circuit board shall be copper clad glass epoxy of grade FR-4 or equivalent.

3.8..? The nominal board thickness shall be 1.6 mm. Thickness of copper cladding shall be 70 microns \minimum).

3.3.3 The track width shall be 0.5 mm (nominal).

3.8.-+ Lacquer cellulose clear to 15:349 to be sprayed thinly all over the PC8.

,,~~ - ~. ~.~ esting of t\vllight switch shall be done for ItS proper and reliable functIoning.

3.9 Bum- In
3.9.1 After mounting of components, the populated PCB cards kept in proper chassis in energised condition shall be bum in for 24 hours at 60 deg. C.
3.10 C:imatic Test
The LED lit semaphore signal lamp except battery compartment, shall be ..~rmetically sealed and shall be able to withstand following environmental tests as ~er IS: 9000.

S.NI	Name of test Pt. & section as per IS: 9000 period	Recovery
1	IDry Heat Test at 85°C :t2°C (one cycle of 16 hours) issue	Pt.111 /Section 3 of 1977 2 hours
2	I: Cold Test at -10OC .t 3 Deg.C {one cycle of 16 hours) , 1979 Issue	Part -11/Section 3 of 2 hours
3	! Damp heat cycling tcst (one cycle of ~2 + 12 =24 hours) {upper 1981 issue : temperature 55 ~C}	Part V /Section 2 of 2 hours
4	Salt Mist test (4 cycles of 7 days) 1983 issue	Part II /Procedure 2 of 4 hours
~	Driving rain test for two hours 'C' clause 7.1.3 of 1983 issue	Part XVI (test condition 4 hours
6	Dust test at 40°C .t 3°C and RH 50% for one hour	of Part XII of 1981 issue 2 to 4 hours

.-\tier these tests, it shall not fail and visibility, colour co-ordinates, input current ~lI1d illumination shall not change by more than :r. 5% of initial values and shall be \within specified values of clauses 3.1,3.2, & 3.22.
3. ~ I l1:tttery
'.
3. .1.1 The battery shall be of 12V, 7AH(min) and shall broadly meet the requirements of
IRS: S 93i96. It shall last minimum tor 180 hours after one charge- The luminosity ()Ithe LED cluster ::;hall not tall during this 180 hours,
3.1::? 'rile Solar photovoltaic module shall be of 12V, lOW to specification No. IRS: S ~()./9.? with suitable diodes.
3.1::?.1 Provision tor housin!! two more batteries shall be made in the semaphore signal unit and all battery c~nnections shall be paralleled.
3, 1 :.: '\ -L'ntilated compartment tor \'RL.-\ battery shall be provided So that jts temperature
liocs not rise abo\'e ambient temperature,

3.13 The Solar photovoltaic module shall be of 12V, lOW to specification No. IRS: S 89/92 with suitable diodes.
3.14 a) It shall be possible to see a backlight using two high power white LEDs through the back light screen. The intensity of the back light shall be such that the backlight of the fanhest signal is visible from the station where clear line of sight is available.
b) Each of the back light LEDs shall be in series with: the respective LED lit semaphore signal lamp.
3.15 LED lit semaphore signal lamp shall have the provision for giving the indication for
'Light repeater' at ASMs office I cabin about the glowing of LED where signal lamp back light is not visible at the station. The lamp should be provided with sourcing as well as sinking mode. In sourcing mode drain on lamp battery shall be less than 7.5 mA and in sinking mode drain on battery shall be less than 6 mA.

3.16 The lamp shall be provided with a tWilight switch having double eye with covered window in the back of the lamp and a potentiometer suitably protected and also accessible to adjust bias level. The twilight switch setting shall not be affected by drop in battery voltage.
3.17 Battery charging
Battery re-charging shall be done with external solar panel for which screwable connector shall be provided. A separate chargIng socket shall also be provided for charging through 220V.
Battcry charger tor charging the battery should be temperature compcnsatcd tor cyclic usc.
3. 18 Currcnt rcgulation of the system shall be better than :i: 2%.
3.19 Protection/Indications
(i) The lamp $hatl have a built in reverse input polarity protection (non-destructive type) .
(ii) The lamp $hail havc $olar charging input COMector and built- in chargc controller with the tollowing indications :
la) y cilow: tor over charging indication protection
(b) Rcd: tor low battcry cut otfindicator.
(c) GI.een: tor fully charging indication.
(d) ..\II the Jbove indicators should be cover with the U. \' .stabliscd poiycarbonate sheet.
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(iii) Lamp shall be provided with suitable heat dissipation / thermal control means to reduce the effect of temperature on performance of the signal lamp.
3.20 Backlight and all indication shall be suitably protected from dust and rain. All connectors shall be located inside an openable cover to prevent direct exposure to dust-and rain-
.
3.21 LED lit semaphore signal lamp casing shall be made either of mild steel sheet 1.0 mm thick or of industrial grade plastic like AB5. LED lit semaphore signal lamp shall get fitted securely on the existing structure without any modifications.
3.21.1 Semaphore signal lamp made out ofM5 sheet shall be painted with black paint to IS: 128/62 with one primary coat of zinc-chromate primer to IS: 104-79 followed by one coat of red oxide -zinc chromate primer to 15:2074-92 allover except on the working surfaces. Before the application of next coat sufficient drying time shall be allowed after each coat.
3.22 Illumination test
The radiating area brightness of the aspect shall be not less than 5 lux measured at a distance of5 meters on the front axis of the lamp.
3.23 The LED lit semaphore signal lamp shall have dielectric strength of more than 1500
V r.m.s and insulation resistance of more than 100 M ohm. when measured at 500 V DC
3.24 ,\CCELE~\ TED LIFE TEST:
LED lit semaphore signal lamp shall be continuously kept on burning for 10. 000 hours. At the end of this period its lux out put shall not fall more than 5% of the initial value.
-I. INPECTION AND TESTING:
-1.1 Type tests:
For type tests. three samples ot.LED lit semaphore signal lamp shall be subjected to tlJllowing tests.

APPENDIX I

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~~S:S5~

5.5 Vibration Test :

The vibration test shall be conducted as a part of "type approval test on lamp: selected for life test before commencing the life test.

5.5.1 Vibration characteristics :

After setting the lamp on a vibration tester in the standard position as used in tht field, a DC or AC voltage as laid down in Table 3 shall be applied. The AC tesl voltage shall be approximately sine-wave form and of any frequency between 50 & 60 Hz. The vibration test shall then be performed and the lamp shall withstand the following test conditions for a period of 30 minutes.

i) Frequency; 25 to 100 Hz

ii) Acceleration: 0.5 9

iii) Direction ofvibration: ~ Y& Z

iv) Duration: 30 minutes

v) Test Voltage 12 V

If any resonance frequency is observed, the lamp should be further put on vibration test at that particular frequency tor halfan hour.