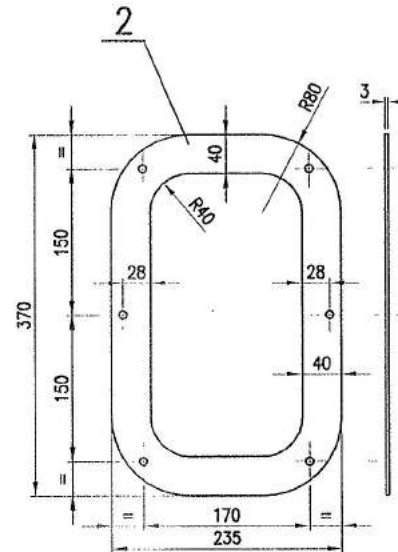
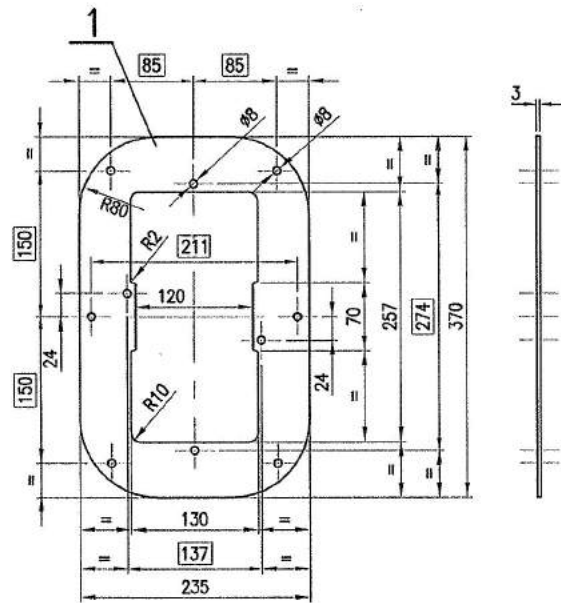


1848983/2023/HEP-SWM20915

DMU/DPC3/SS-9-0-309

ALTERATIONS

NOTE

1. THE ADAPTER PLATE SHALL BE PAINTED WITH MINIMUM THICKNESS OF 50 MICRONS TO COLOUR PEARL LIGHT GREY OF RAL 9022 AS PER COLOUR SCHEME TO DRG.NO. DMU/DPC13-8-3-301
2. THE FRAMED DIMENSIONS SHALL BE STRICTLY FOLLOWED.

* NO. OF ASSY. REQD. PER COACH.

COLS	1
COACH	
DMU/DPC	2

DMU/DPC3/SS-9-0-305	
ASSEMBLY DRAWINGS	
04-09-2014	<i>explosive</i>
DATE OF FIRST ISSUE	DY.CEE/D

1	EPDM GASKET (THICKNESS=3mm)	2		MDTS-046(LATEST)						
1	ADAPTER PLATE 3x235x370	1		SS 304						
NO.OFF	DESCRIPTION & DIMENSIONS	ITEM	REF. DRGS.	MAT.& SPEC	WEIGHT/UNIT	REMARKS				
II	I	GROUP : 9-0				SUPERSEDED BY:				
PER ASSY.	ADAPTER PLATE (FOR LED MARKER CUM TAIL LIGHT)					SUPERSEDES:				
						SCALE	SSE/D			
						1:5	CHD			
							ALT			
								DRN	A.T.SURENDRAMOCHAN	
							ALT			
CAD FILE : \ED-CAD\629 9-0 309--00.DWG										
* DATA CODE NO	INDIAN RAILWAY STANDARDS			SHEET	INTEGRAL COACH FACTORY CHENNAI-38.					
629				1 OF 1	DMU/DPC3/SS-9-0-309					

DEVELOPMENT COPY

Specification No.ELRS/Spec/PR/0022

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

SPECIFICATION FOR LED MARKER LIGHT FOR
ELECTRIC, DIESEL ELECTRIC AND DIESEL
HYDRAULIC LOCOMOTIVES OF INDIAN RAILWAYS

PAID
AS ON

Specification No: ELRS/Spec/PR/0022
Issue Date/Year –October 2002.

RESEARCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW – 226 011.

of 16

Issued on 28.10.2002

Specn. No. ELRS/Spec/PR/0022

**SPECIFICATION NO. ELRS/SPEC/PR/0022
FOR
LED MARKER LIGHT FOR
ELECTRIC, DIESEL ELECTRIC AND DIESEL
HYDRAULIC LOCOMOTIVES OF INDIAN RAILWAYS**

0.0 Marker lights are provided on locomotive to meet requirements of G & SR which stipulates as under :

1. A train shall not be worked at night or in thick, foggy or tempestuous weather impairing visibility or in long tunnels, unless the engine carries an electric headlight of an approved design and, in addition, **two oil or electric white marker lights.**
2. An engine employed exclusively on shunting at stations and yards shall, at night or during thick, foggy or tempestuous weather impairing visibility, display such headlights as are prescribed by the Railway Administration and **exhibit two red marker lights in front and in rear.**
3. In case the electric headlight fails or a train has to be worked with the engine running tender foremost in an emergency, **the engine shall display the two oil or electric white marker lights referred to in sub-rule (1) pointing in the direction of movement and the train shall run at a speed prescribed by special instructions.**

0.1 Marker light with incandescent lamps were adopted. The incandescent lamps, however, have a low life and need frequent maintenance. With development of high luminance LEDs, their use was considered for marker lights to obtain advantage of higher life and higher brightness.

0.2 Earlier specification No. ELPS/Spec/ Marker Light/01/Rev.2/Dec. 1999 for LED marker lights was reviewed to make it comprehensive ensuring higher standard of performance and reliability of marker lights in service on locomotives. This specification, thus supersedes the earlier specification.

0.3 This specification requires reference to the following standard specifications :

- | | | | |
|-------|-----------------------|---|---|
| (i) | IS:616 | - | Safety requirements for mains operated electronics or related apparatus for house-hold and similar general use. |
| (ii) | IEC:571(Pt.1)
1990 | - | Rules for electronic equipments used on Rail Vehicles. |
| (iii) | ELRS/Spec /SI/0015 | | Reliability of electronics used in rolling stock application.. |

1. SCOPE

This standard covers general features, performance requirements and test methods of LED marker light for Electric locomotives, Diesel Electric and Diesel hydraulic locomotives.

2.0 TYPES OF MARKER LIGHT

- 2.1 The supply system voltage on electric, diesel electric and hydraulic locomotives are different. Therefore the specification covers the following three types of marker light:

Type - E for electric locos.
Type - D for diesel electric locos.
Type - DH for diesel hydraulic locos.

- 2.2 The supply voltage system with its voltage variation for the three types of marker lights is as under:

	ELECTRIC LOCO	DIESEL ELECTRIC LOCO	DIESEL HYDRAULIC LOCO
MAXIMUM	135V	90V	30V
NOMINAL	110V	72V	24V
MINIMUM	85V	45V	16V

3.0 OPERATING SERVICE CONDITIONS.

- a) Ambient temperature upto 70 Deg.C
- b) Humidity Upto 100%.
- c) Atmosphere Extremely dusty and desert weather.
- d) Rain fall Very heavy. The equipment shall be designed to work in coastal areas in salt laden and corrosive atmosphere.
- e) Vibration and shocks - The marker light is mounted on locomotives and shall be subjected to the following vibration and shocks:

Max. vertical acceleration - 3.0g
Max. lateral acceleration - 3.0g
Max. longitudinal acceleration - 3.0g
"g" being acceleration due to gravity 981 cm/sec².

Shunting shocks - 3g in all the three directions.

f) Altitude - 1200 meters above Mean Sea Level.

4.0 INTERCHANGEABILITY AND DEVIATIONS.

- 4.1 The LED marker light will be mounted in existing housing and it will ensure its **interchangeability with existing incandescent lamp marker lights**. Increase in overall dimension and mounting dimensions shall not be allowed.
- 4.2 Deviation from the standard could be considered for improved performance. However, complete particulars with technical justification for deviation shall be furnished and got approved by RDSO.

5. GENERAL DESIGN FEATURES.

- 5.1 Each locomotive will be provided with 2 sets of marker lights on front and rear. One set consists of pair of red/white marker lamps. RED and WHITE LED marker lamp assemblies will be housed in two separate housing on electric locomotives but on diesel locomotives RED & WHITE LEDs will form one cluster and same will be housed in single housing provided on two sides both in front and rear.
- 5.2 The marker light shall be so designed that it fits in the existing housing of marker lights on locomotives. The outline dimensions of marker light housing for electric loco are given in Annexure – 'A' and the same are indicated in Annexure – 'B' & 'C' for diesel electric loco.
- 5.3 The RED and WHITE lamp units shall have 20 LEDs each arranged in series and parallel circuit.
- 5.4 All the LEDs shall be connected such that failures of one LED does not affect any other LED. For this purpose a resistance/Zener diode shall be provided across each LED.
- 5.5 The display area of lamp shall have diameter of 120mm for electric and 130mm dia. for diesel electric and diesel hydraulic locomotives unless specified otherwise.
- 5.6 The marker light shall be designed such that the average forward current through each of LEDs shall not exceed 20 mA. The manufacturer will submit design details to prove that current through LEDs does not exceed these limits.
- 5.7 The current regulation of LED lamp unit shall be better than 0.5% over entire input voltage range. The wattage of marker light shall not be more than 5W at rated voltage.
- 5.8 The equipment shall be designed to operate continuously at an ambient temperature of 70degree C around it and meets service conditions specified under clause 3.0. The wires/cables used for internal connections of the unit shall be elastomeric cables to RDSO Specification No.E-14/01 (Rev.2) 1993.
- 5.9 The resistors of less than 0.5 W shall not be used. Wattage rating of any resistor shall not be less than twice the load at 70 degree C under worst operating condition.

- 5.10 The RED LEDs used in lamp unit shall be of type HLMP – ED-16-WX000 of Hewlett Packard or equivalent with following parameters at an ambient temperature of 25 degree C.

SYMBOL	PARAMETER	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
V_F	Forward Voltage	$I_F = 20 \text{ mA}$	--	1.9	2.4	V
V_R	Reverse voltage	$I_R = 100 \mu\text{A}$	--	5	--	V
I_R	Reverse Current	$V_R = 5 \text{ V}$	--	--	100	μA
λ_p	Dominant Wavelength	$I_F = 20 \text{ mA}$	--	630	635	nm
$2\theta_{1/2}$	Half Intensity Angle	$I_F = 20 \text{ mA}$	--	15	--	Deg.
I_v	Luminous intensity	$I_F = 20 \text{ mA}$	--	5.5	--	cd
I_F	Forward current	--	--	20	50	mA

- The WHITE LEDs used in lamp unit shall be of type NSPW- 500 DS of Nichia Corporation of Japan or equivalent with following parameters at an ambient temperature of 25 degree C.

SYMBOL	PARAMETER	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
V_F	Forward Voltage	$I_F = 20 \text{ mA}$	--	3.6	4.0	V
V_R	Reverse voltage	$I_R = 100 \mu\text{A}$	--	5	--	V
I_R	Reverse Current	$V_R = 5 \text{ V}$	--	--	50	μA
$2\theta_{1/2}$	Half Intensity Angle	$I_F = 20 \text{ mA}$	--	20	--	Deg.
I_v	Luminous intensity	$I_F = 20 \text{ mA}$	--	5.6	--	cd
I_F	Forward current	--	--	20	50	mA

- 5.11 The lamps shall be operated through switch provided on the driver's desk in loco cab for Diesel locomotives as well as Electric locomotives.
- 5.12 The marker light shall have built in reverse input polarity protection. Fuse of suitable rating shall be provided on the lamps in fuse holder. A suitable surge protection shall also be provided for high voltage spikes. The surges of the order of 2 KV are expected in the system.
- 5.13 The marker lamp housing shall be fabricated from 1.6 mm MS sheet. The mounting shall be done through screws to fit in existing marker light housing on locomotive.
- 5.14 The lamp unit with LEDs mounted on PCB shall be sealed from the front with 5 mm toughened glass and suitable gaskets to ensure no entry of dust and water under operating conditions.
- 5.15 A suitable epoxy/DMC moulded connector shall be fitted on the LED lamp unit for connecting power supply.
- 5.16 The electronic components must "Burn-in" to eliminate infant mortality in components including semi-conductor devices as per Appendix A.

- 5.17 It being a safety requirement of operation, the marker light unit must have the high standard of reliability under severe environmental conditions such as dust, humidity, high ambient temperature, shocks and vibrations, electrical switching surges in supply system, variations in supply voltage etc. encountered in locomotive operation.
- 5.18 In order to ensure high reliability, the guidelines indicated in the Specification No. ELRS/Spec/SI/0015 - "Reliability of electronics used in rolling stock application" should be implemented to the extent possible. A reference should be made in the tender offer to the relevant clauses, which are not followed, and relaxation is required.
- 5.19 The identification details, rating, model No. etc. printed on components shall not be erased by manufacturer.

6.0 PERFORMANCE REQUIREMENTS.

- 6.1 Marker light being safety item should have high degree of reliability under all conditions of operations.
- 6.2 Marker light – both aspects white/red shall be clearly visible from a distance of 2 kms at night.
- 6.3 The LED marker light shall meet the lux requirements as follows, when measured in forward direction over entire range of input voltage as indicated in clause 2.2:

Lamp	Lux level at 1 Meter	Lux level at 3 Meters
RED	75 LUX	7 LUX
WHITE	75 LUX	7 LUX

7.0 INSPECTION & TESTS

- 7.1 The complete unit shall be subjected to the following type of tests:

1. Type Tests on 2 units.
2. Routine Tests on each unit.
3. Acceptance Tests as specified.

The type test will be conducted on two units of given design to verify that product meets the requirements specified. All the type tests shall be repeated once in two years by RDSO on sample basis so as to confirm the quality of the product to meet the specified requirements.

Routine tests are to be carried out to verify the properties of the product corresponding to those measured during type tests. Routine tests are to be performed by the manufacturer on each equipment.

7.2 The tests to be carried on complete unit are given in following table with clause numbers:

S.NO.	NAME OF TEST	Clause	Type Test	Routine Test	Acceptance Test
1.	Visual Inspection	7.3	Y	Y	Y
2.	Insulation Resistance Test	7.4	Y	Y	Y
3.	Performance test	7.5	Y	Y	Y*
4.	Lux test	7.6	Y	Y	Y
5.	Visibility Test	7.7	Y	--	-
6.	Dielectric Test	7.8	Y	Y	Y
7. x	Surge voltage test	7.9	Y	--	--
8.	Temperature Rise (Dry heat)	7.11	Y	--	--
9. x	Temperature Rise (Damp Heat) Test	7.12	Y	--	--
10 x	Test in corrosive atmosphere	7.13	Y	--	--
11 x	Combined Dust humidity and heat test	7.14	Y	--	--
12.	Vibration and shock test	7.15	Y	--	--
13. x	Water Tightness Test	7.20	Y	Y	Y*
14.	Over voltage test	7.18	Y	-	-
15 x	Measurement of Luminous intensity	7.16	Y	--	--
16 x	Measurement of dominant wave length	7.17	Y	--	--
17	Reliability test	7.21	Y	Y	-

* 10% of ordered quantity or minimum of 2 nos.

7.3 VISUAL INSPECTION:

Check for general workmanship fitting, finish and mounting arrangement as per approved drawing of purchaser.

Check for proper water tight fitting of LED lamp unit.

Check that main components i.e. switches, transistors, capacitors and devices are as per check list supplied by the manufacturers and approved by purchaser.

Check terminals, switches, indications, type number etc. as per approved drawing.

Verify that the electronic cards are coated with suitable adhesive coating (CRC Spray) and it is in dry condition.

Check that PCBs and their components are firmly mounted.

Check from supplier/maker record that the unit has been subjected to "burn in" procedure and there was no failure of any component. In case there was a failure of any component, check that the card has been again subjected to "burn in" test.

7.4 INSULATION RESISTANCE TEST

Megger the lamp unit with respect to earth and check the insulation level with 500V megger and ensure that the insulation resistances are greater than the following minimum requirements and record the actual values obtained :

- | | |
|------------------------------------|--------------|
| - 110/32/24V circuit and earth | : 20 M ohms. |
| - Control and Electronics to earth | : 10 M ohms. |
| - LED Lamp unit to earth | : 10 M ohms. |

7.5 PERFORMANCE TEST

Connect the marker unit to variable DC supply source and vary the voltage from minimum to maximum as specified in clause 2.2 and check the working of RED and WHITE LED lamps and check whether all parameters are within prescribed limits. The marker lamp should draw no current with application of reverse input voltage on terminals of marker light unit.

7.6 LUX TEST

The marker light shall be energised from a variable DC input power supply. The lux shall be measured in axial direction with lamp unit on at rated voltage. The value of measured lux shall not be less than 75 lux at one meter and 7 lux at 3 meter for RED and WHITE lamps under specified conditions. The average forward current through LEDs shall not be more than 20 mA. The variation in lux level will not be more than 5% over voltage range as specified in para 2.2.

7.7 VISIBILITY TEST :

The equipment will be checked to verify that it meets visibility criterion as laid down in clause 6.2. The red light and white light shall have clear visibility of 2 Kms at night.

7.8 DIELECTRIC TEST

The unit type "E" and type "EU" should be subjected to 1500V rms, type "D" and type "DH" for 1000V rms and type "DH" for 500V. The test voltage should be of sine wave, 50 Hz applied for one minute between the terminals of the circuit board short circuited and the metallic frame of the assembly box.

7.9 SURGE VOLTAGE TEST

The test shall be conducted as per IEC-571-1, clause 5.4.

7.10 TEMPERATURE RISE TEST.

The marker light shall be connected to rated voltage i.e. 110V dc for electric, 72 V dc for diesel electric and 24V for diesel hydraulic locos. The marker light shall be in operation until and unless, the housing temperature is stabilised as evidenced by three

consecutive readings at 15 minutes interval. All three readings at 15 minutes should not vary. The temperature rise of housing shall not exceed 15 °C above ambient.

7.11 TEMPERATURE RISE TEST (DRY HEAT)

The test is to be conducted as per IEC-571-1, clause 5.6. At the end of the period, a performance test is to be carried out

7.12 TEMPERATURE RISE TEST (DAMP HEAT)

The test is to be carried out as per clause 5.7 of IEC-571-1. After end of the period, a performance test is to be carried out.

7.13 CORROSIVE ATMOSPHERE TEST

The test is to be carried out as per clause 5.8 of IEC-571-1.

7.14 COMBINED DUST, HUMIDITY AND HEAT TEST

The test is to be conducted as per IEC-571-1, clause 5.9.

7.15 VIBRATION AND SHOCK TEST

The complete lamp unit shall be subjected to the following tests:

The unit under test shall be secured in a suitable position to a vibration machine producing vibrations of sinusoidal form with adjustable amplitude and frequency. The test frequency lower than 5 Hz may be omitted. The equipment will be in energised condition.

The marker light shall be subjected to vibration and shocks of 3g in all the 3 directions. ('g' being acceleration due to gravity.) The tests are considered satisfactory if there is no damage, loosening of connections, components/sub-assemblies or any abnormality in operation.

7.16 MEASUREMENT OF LUMINOUS INTENSITY:

The LEDs used in lamp unit shall conform to Para- 5.10 to meet the requirement of luminous intensity. The luminous intensity of LEDs shall not be less than 5.5 and 5.6 candella (cd) at 20 mA for RED and WHITE LEDs respectively.

7.17 MEASUREMENT OF DOMINANT WAVE LENGTH:

The dominant wave length of LEDs shall conform to Para-5.10. The dominant wave length shall lie at (630-635) nm for red LEDs.

7.18 OVER VOLTAGE TEST:

1.8 times the average system voltage shall be applied to the unit for two minutes and the unit shall work satisfactorily after the test.

7.19 POWER CONSUMPTION TEST:

Power consumption will be measured under rated condition and will not exceed the declared value as per design.

7.20 WATER TIGHTNESS TEST:

Marker light assembly shall be subjected to this test in its unpacked condition without any electric feed. One hour water spray test shall be carried out in accordance with IS:9000 (Pt.16) of 1983 (specification for environmental testing procedures for electronic and electrical items) and at the end of this test, the assembly shall be examined for any visible evidence of water ingress.

7.21 RELIABILITY TEST :

7.21.1 The reliability can only be determined in actual service. However, the following accelerated endurance 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 marker lamp unit shall be mounted in an oven maintained at 75^o C.
- b) The marker light will be operated at the specified maximum voltage and at 75^oC for a period of 100 hours.
- c) The switches shall withstand without damage at least 10,000 operations when switching the normal current with a resistive load. In lieu of actual test, the supplier may furnish a certification of such a type test from the original manufacturer of the control switch.

7.22 DIMENSIONS:

The marker light shall have dimensions such that it fits in existing housing of locomotives. The outline dimensions of housings have been shown in Annexure A,B &C.

8 INFRINGEMENT OF PATENT RIGHT:

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 marker light and any other factor which may cause such dispute.

9 GUARANTEE :

The manufacturer shall give warrantee of 12 months from the date of installation and 18 months from the date of dispatch which ever is earlier for any manufacturing/design defects.

10. MARKINGS:

The manufacturer shall engrave/emboss/imprint/ stencil permanent identification marks indicating their name/brand name/monogram and also the month and year of manufacture at a conspicuous place.

11. WITHDRAWAL OF APPROVAL:

The approval granted to the manufacturer is liable to be withdrawn in the event of noticing any change at a later date in the design or change from the bill of material as approved earlier without seeking RDSO's approval or using components of inferior specification/quality compromising with the reliability.

APPENDIX "A""BURN IN PROCEDURE FOR ELECTRONIC UNIT"

1. Each marker light unit containing semi-conductor devices, resistor, capacitor etc. must be "Burn In" to eliminate infant mortality in components. The components are stressed thermally by connecting to power supply bus and running at an elevated ambient of 70° C. Burn in is to be completed before final testing of the unit.

2. BURN IN PROCEDURE

2.1 The unit shall be connected as per relevant circuit diagram and power supply. Due care should be taken for connection, recording serial number of card, unit, failed component if replaced.

2.2 Power Supply - Based on type of equipment i.e., type "E", "D" or "DH", the voltage should be set corresponding to the rated voltage with tolerance of +10%. The supply bus must be protected by fuse. The use of fast acting fuse is recommended.

2.3 Temperature - The ambient temperature inside the burn in chamber is to be 70°C ± 5%.

2.4 Duration - Each card/unit is to be given a burn in for a period not less than 72 hours.

2.5 Replacement of Component/Components - During panel testing or after the burn in test, if it is found necessary to replace any component, the device/component failure must be recorded. On completion of the electronic tests on such cards, the card must be treated as "New" and as such must be given a "Burn In" again and retested before releasing the unit. Proper record of failures, if any, must be kept and a certificate must be issued along with the unit giving particulars, i.e., card number, unit number, date of burn in conducted, duration, tested by, passed by, etc.

APPENDIX "B"**INFORMATION TO BE SUPPLIED BY THE
MANUFACTURER ALONGWITH THE OFFER**

1. Type/Make
2. Input Voltage range
3. LED lamp current regulation
4. Lux measured at 1 meterLux.
at 3 metersLux.
5. Number of arrays in lamp unit
6. Number of LEDs in each array
7. Dielectric strength
8. Insulation resistanceM. ohms
9. Operating temperature range
10. Power consumption

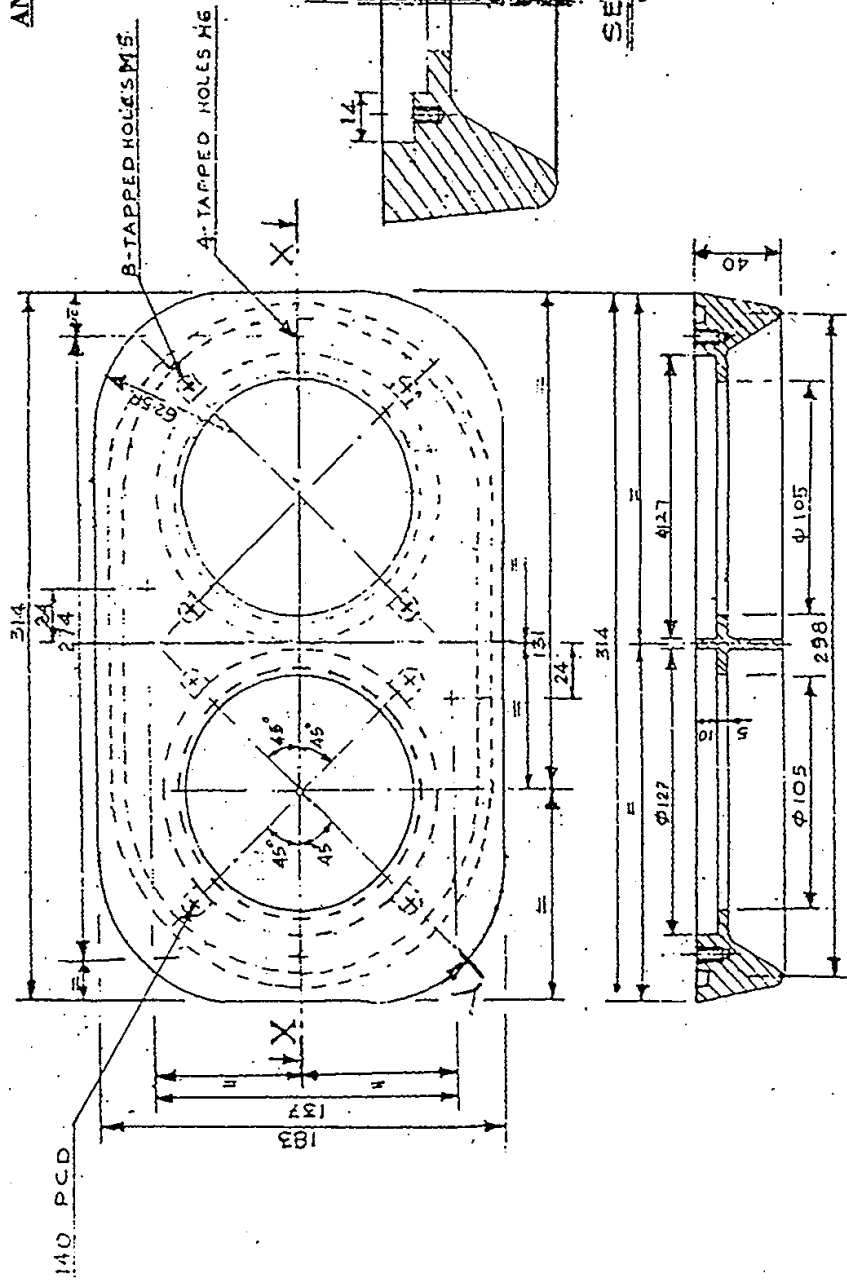
11. Component ratings:

S.No.	Symbol as per circuit diagram	Ratings	Loading under worst conditions	Safety factor	Make and Type No.

12. Circuit diagram
13. Dimensional drawing
14. Other particulars: The manufacturer may like to furnish details such as:
Units already manufactured and supplied to impart type test, service performance,
if already in service etc.
15. Test results in case the manufacturer has already tested the unit.

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ANNEXURE - 'A'



SEC. XX

Outline dimensions of Marker light Housing for Electric Loco

14

(91)



BOTTOM PLATE FOR R.H LIGHT ONLY.

Outline Dimensions of Bottom Plate of Marker light Housing for Diesel Locomotives.