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अनुक्रमांक
Roll No : _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

पाठ्यक्रम
Course : _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

दिनांक
Date : _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

प्राप्तांक
Marks Awarded :

अनुदेशक के आद्यक्षर
Instructor Initial :

STUDY OF COLOUR LIGHT SIGNALS

Colour light signal means signalling equipment use to display aspects of running & subsidiary signal by means of electrically controlled lamps / LED lamps and coloured lenses enclosed in modular metal/ fiber unit. The CLS are available for main/ running signal, shunt signal, calling on signal and route indicator.

Advantages :

The following are the main advantages of colour light signals over semaphore signals.

(a) The same aspect is displayed both by day and night.
(b) High intensity beams produced by these signals have great penetrating power.
(c) No moving parts are used. Hence, maintenance is less, less no of Failure
(d) As the structure is light and small, mounting is easier.
(e) Backgrounds such as trees and buildings etc., which are bad backgrounds for semaphore signals, are good backgrounds for colour light signals.
(f) Aspects can be displayed at driver's eye level.
(g) Long range of operation is possible

Colour light signal for running/ main signal

Colour Light Signals gives the same aspects both by day and night by colours corresponding to the night aspects of semaphore signals. The multi-unit type signals are of 2 aspect unit, 3 aspect unit or 4 aspect unit type depending upon the number of aspects to be displayed. As they are modular, the 4aspect -unit can also be derived by combining two 2- aspect unit types or one single aspect unit and one three aspect unit. The CLS units are fixed vertical and the Red aspect at driver's eye level from Rail level.

Parts of colour light signal

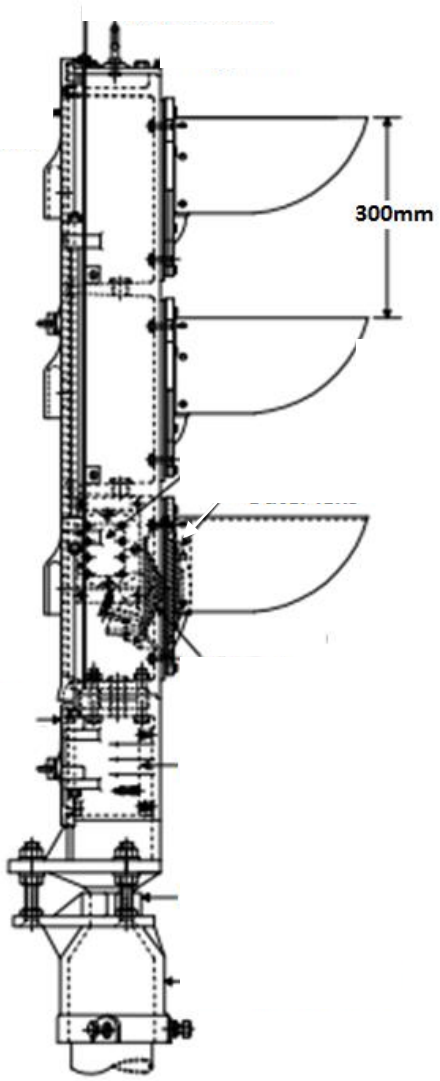
1. CLS unit
2. CLS base 160mm
3. Signal Tubular Post 3.5 Mts, 4.5 Mts & 5.5 Mts
4. Signal Numbering Plate
5. Signal Post Ladder with guard / rest as per signal post length
6. Ladder shoe

Parts of colour light signal unit

The CLS unit comprises of body of CLS unit, colour & clear lenses and lighting unit

BODY OF CLS UNIT

It can be divided in three parts, main compartment with door for each aspect (which accommodates lighting unit, signal transformer and MECR unit & lenses), cable termination box with door, mounting socket and turn table. CLS are made of either cast iron or sheet metal. The glass reinforced plastic is also available.



1. Background (Color)
2. Hood
3. Cover
4. Ventilator
5. Mounting Socket
6. Tripod Turn Table
7. Sighting Aperture
8. Cable Termination Box

Exercise-1 Identify parts of CLS

- Each aspect is normally provided with a hood to shield the lens unit from external light to prevent entry of external light on signal lens there by avoids “Phantom” effects. It also increases contrast and visibility. Cover is provided with the gasket to prevent entry of water/dust inside the compartment. It is locked with universal lock to prevent outside interference. Outside of cover/door is painted in black with diagonal cross of aluminum/white colour paint.

- Breathing holes are provided on the cover, one for each compartment to ensure ventilation and to prevent the over-heating of transformer and lamp.

- The complete CLS unit is fixed over the turntable. It is useful to turn the unit both horizontally and vertically for correct adjustment of the beam of light.

- A signal post consists of a tube of section 140 mm outer diameter, having each a thickness of 5 to 9mm.

- The signal post is mounted on a signal base (160 mm dia). It is made of cast iron and height of the base is 550mm

- To increase the visibility, backgrounds are provided around the CLS unit.

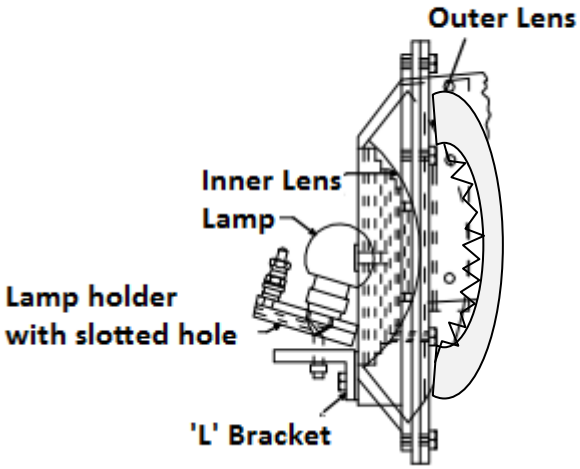
CLS UNIT ACCESSORIES	DIAMETER MATERIAL & COLOUR	TYPE	FOCAL LENGTH
Main running signal(inner lens)	140mm glass/polycarbonate Red/Green/yellow (spec No.IRS-S7/92)	Out side step	13mm
Main running signal(OUTER lens)	230mm glass/polycarbonate Red/Green/yellow (spec No.IRS-S7/92)	Ins side step	102mm
Route indicator junction type I (inner lens)	92mm, glass and lunar white	Out side step	16mm
Route indicator junction type(outer lens)	127mm glass/polycarbonate and clear	In side step	70mm
Shunt signal (inner lens)	101mm glass/polycarbonate and clear	In side step	
Shunt signal (outer lens)	101mm glass/polycarbonate and Lunar white	Out side step	89mm
Calling ON signal	136mm, Glass/ Yellow	In side stepped	89mm
CLS post	140mm Steel(tubular)	Available in length 3.5Mt,4.5Mt & 5.5Mt	
CLS post	160mm Cast iron adjacent foundation bolt hole to hole spacing 29.5cm		
CLS Unit Single Aspect Two Aspect Three Aspect Four Aspect Shunt signal	Cast iron/ Fiber Height x width 0.67M(On post 0.55M) x 0.45M(including back ground) Height x width 1.37M(On post 1.18M) x 0.45M(including back ground) Height x width 1.63M(On post 1.51M) x 0.45M(including back ground) Height x width 1.92M(On post 1.80M) x 0.45M(including back ground) Height x width 0.45M Including directional arrow (cover closed)		

Lighting unit with Lenses

Two types of glass/ polycarbonate concave convex lenses are used in lighting unit to give parallel beam of coloured light.

- The outer lens is a clear lens. The diameter of outer lens is 213 mm. The outer surface of lens is plane and inner surface is stepped. Polycarbonate lenses are used being unbreakable . Inner lens is coloured lens i.e. Green, yellow or Red. The diameter of inner lens is 140mm. Inner lenses are stepped outside and plain inside.

1 'L' Bracket with slotted hole
2 Lamp holder with slotted hole
3 Lamp
4 Inner colour lens
5 Outer clear lens



- Doublet lens (outer and inner lens) is used on the unit because more beam candlepower.for directing the light Lamp holder is made of PBT. It has two slotted holes, helpful in focusing signal and is provided for fixing the lamp. 'L' bracket has also two slotted holes, helpful in focusing signal and Lamp holder is mounted on it
- A signal lamp consists of a helix of tungsten wire mounted within a sealed glass envelope.
- Generally three types of lamps are used in Colour Light Signals.
    - Double pole single filament (SL 18).
    - Double pole double filament (SL 21).
    - Triple pole double filament (SL 35).

The following table indicates lamps to be used in cascaded and non-cascaded aspect of a signal.

Reference:	Pins, Pole & filament & other	Main / Auxiliary filament Rating	Remarks
SL 18,	Three pin double pole & single filament	12V/24W	OFF Aspect (cascaded ckts)
SL 17	Three pin double pole & double filament	12v /16W/ 16v /12W	OFF Aspect(Non cascaded ckt)
SL –21		12V/24W 16V/12W	ON Aspect only
SL35A	Three pin triple pole & double filament	12V /24W 12V /24W	Cascaded OR non-cascaded CLS OFF Aspect
SL–35AL (Long life)		12V/24W 12 v/24w	
SL-35B		12V/33W 12V/33W	Cascaded OR non-cascaded CLS ON Aspect
SL-35BL (Long life)		12V/33W 12V/33W	
LED signal unit	NA	110 ±20%DC At 13 to 16 W	Cascaded OR non-cascaded CLS ON /OFF Aspect
	The jumper selection for blanking for cascaded and non-blanking (for non-cascaded aspect shall be done on current regulator)		

Focusing of a CLS signal:

The signal transformer is used to step down the 110 Volts AC to 12 Volts. The terminal voltage of lamp and no-load current of transformer shall not be less than 90% of rated voltage of lamps and 5 m Amp respectively.

The table below indicates the various Electrical parameters of Signal Transformer and Lamp

Electrical parameters of Signal Transformer and Lamp			
Lamp glow voltage.	2.3 Volt		
Lamp terminal voltage	10.8V or 90% of lamp's rated voltage		
Fuse rating	0.63 Amp for 110/12 aspect control circuit		
Signal transformer Rating	110v / 12v, 40VA	Primary tapping 0 & 110	Secondary tapping 0, 0.5 & 1 volts and 13,14.5 & 16 volts
No Load current	Should not be more than 05 ma		
Fuse rating	Shall be 2.5 times of normal working current of circuit		

Focusing of a CLS signal:

If The Loco Pilot gets the aspect of the signal from a long distance then his confidence level will be high and he can regulate the speed accordingly. The Colour light signal must be visible to the driver from prescribed visibility distance.This require signal to be focused

The procedure of adjustment to bring filament of signal lamp at focal point of combination of outer clear and inner colour lens to get parallel beam of light is called as

focusing of signal. The net focal length of a doublet lens combination provided on CLS units is about 19 mm.

The focusing of signal (visibility) is checked at initial stage of installation and periodically by group of supervisors from S&T, Mechanical and traffic department during day and night

Common causes of signal visibility disturbances are:

a) Loosening of holder Or holder clamp Or both
b) Fusing of main filament
c) Displacement of lenses Or Increase Or decrease of gap between two lenses
d) Replacement of lamp
e) Slight shift in position of signal foundation itself in ground or of the base over the foundation or a tilt in it which are unnoticeable; and
f) A small turn in the unit sideways on the post caused by heavy winds and loosened bolts on its turntable.

Focusing of new signal

The steps involved in focusing a new signal are

1. Check that all terminals are properly tight in side location box and the CLS unit.
2. Check the no Load current of signal transformer 110/ 12 Volts 40 VA which shall not more than 05 mAmps
3. Check fuse provided in 110 Volt aspect control circuit and shall be of proper ratting
4. Plumb the signal vertically straight (use turn table)
5. Align the signal with the help of two pin holes at the bottom of the CLS unit
6. Check that the lens are fixed properly and are not moving (Gasket/ asbestos rope is fixed)
7. Check the terminal voltage of signal lamp which shall not be more than 90% of rated voltage. If less, then shall be adjusted by using the tappings available on the secondary side of signal transformer
8. Try to bring the filament of signal lamp at the center of lens by moving the' L' bracket up and down and tight it in that position
9. Place a man with communication device or other means of communication at required visibility distance of a signal
10. The technician on the top of the CLS will slowly move the holder to and fro while the man with communication will continuously guide technician about the visibility of the signal.
11. When the visibility will be the best the technician will tight the holder at that place, a white bright spot will appear at is this stage.

DO's and DON'Ts

Do's

- Always replace the lamp on or before due date.

- Replace the lamp during morning period as experience shows that mostly bulbs fuse during first 5 hours.
- Lamp condition should be checked for any blackish/whitish spot, if so observed, such lamps should be immediately replaced.
- Signal transformer should be checked for its firm connection and its heating.
- Clean the lenses and bulbs to ensure proper visibility.
- Check the gasket, specially before monsoon and replace, if found defective.
- Partially Cover the door of the unit while focusing the signal

8.2 Don'ts

- Forget to provide M-Seal before monsoon to avoid the possibility of leakage.
- Forget to take the NO LOAD CURRENT of signal transformer. No load current to be within 05 mA for the cascading to be effective.
- Forget to close and lock the CLS unit cover after completion of work.
  Forget to tight all the nuts of the L- bracket and lamp holder.

OBSERVATIONS

1. The diameter of outer lens is ----------
2. Polycarbonate lenses are ----------Lenses used to increase signal visibility
3. Inner lenses are stepped ----------and plain inside.
4. Breathing holes are provided on the cover, one for each compartment to ensure ----------

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5. The complete CLS unit is fixed over ----------
6. Signal lamp terminal voltage is --------volts
7. Rating of Signal transformer is ----------
8. Diameter of signal post & Base are ---------- ----------

EXPERIMENT:

Answer the followings

1.Write advantages of CLS ?

2.Write procedure for focusing of CLS ?

3.Write types of Lamps used in CLS ?

4, Measure the distance of main line starter signal S-2 of IRISET YARD NO.1 from main and loop line and verify weather signal infringes recommended dimension (2.36Mts)

5. What is the purpose of Hood

Date

Signature of the Trainee