



Signal Training Bulletin

**COMMITTEE G: Education
& Training
Communication & Signal
Division, AAR**

A-15 Optical System — Wayside Signals

Approved November 1981

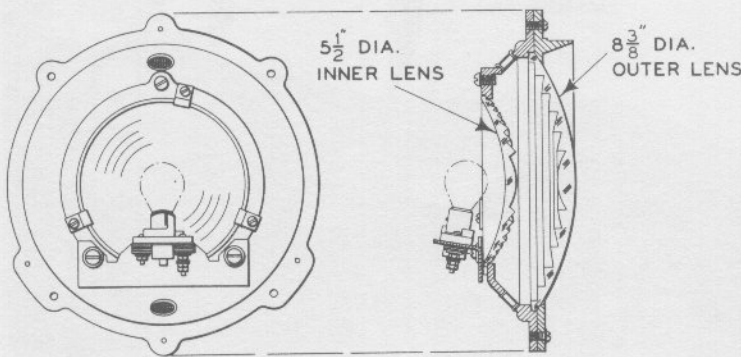
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The Signalman's Journal

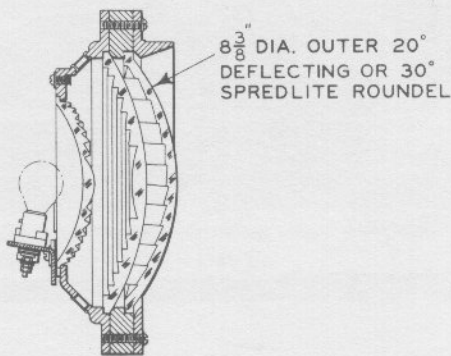
Definition: A system so designed and arranged with a selection of reflectors and lens or lenses alone so as to make as visible as possible the aspect of a wayside signal.

Symbol: None

Description: The optical system in the colorlight signal consists of an electric lamp to supply illumination, an outer lens in clear glass or plastic designed to provide various angles of beam deflection and an inner lens either red, green or yellow to provide the desired aspect. Lenses of blue and lunar white are also available. Figure 1 illustrates the layout of a doublet lens arrangement in a colorlight signal.



A - For tangent track.



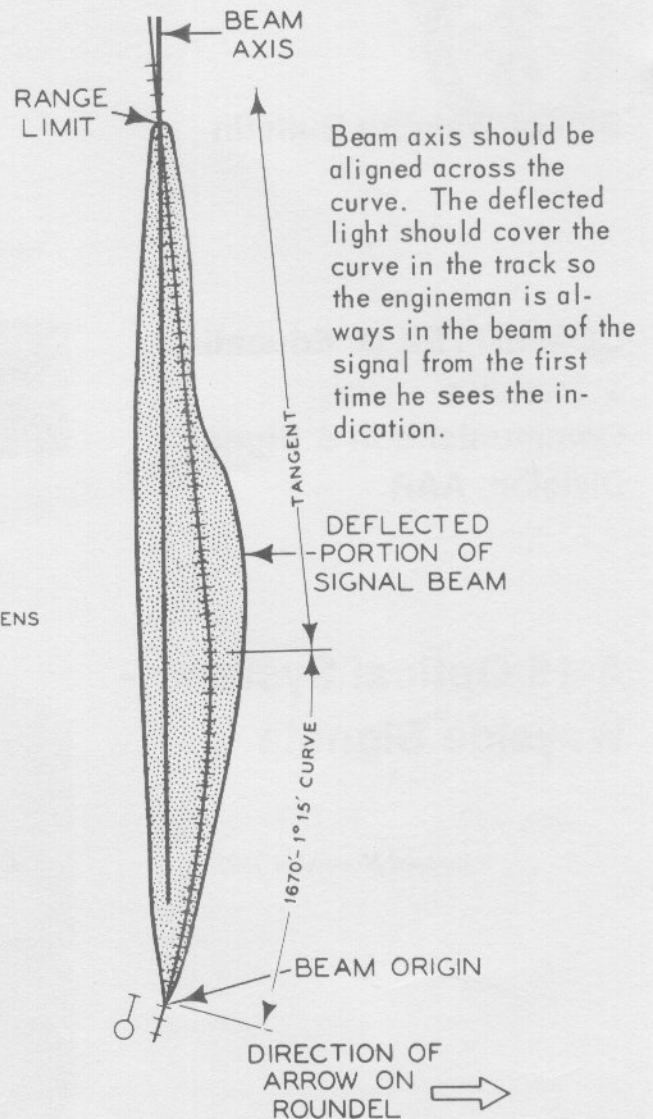
B - For curved track.

Figure 1—Colorlight signal lens system.

The optical system of the compound lens searchlight signal consists of an electric lamp, a reflector unit, colored roundels (red, yellow, green), inner lens and outer lens. Spreader and deflector roundels are added as required.

The beam from the lamp is concentrated close to the colored roundel. The lamp socket is adjusted and sealed at the factory.

As illustrated in Figures 2(a) and 2(b) the elliptical glass reflector is used to concentrate the light at the roundel.



Beam deflection for right-hand curve approaching a signal.

Figure 2(a)—Compound lens system showing beam covers with different lens combinations. Lens system shown viewed from side of mast; beam coverage shown looking down on track. This is a type SA-1 searchlight signal.

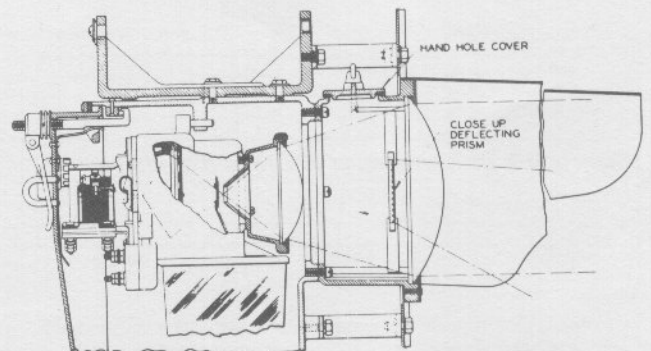


Figure 2(b) View showing optical principle and assembly of style H-2 searchlight signal with ground doublet lens combination.

The colored roundels are mounted on a spectacle and are rotated in and out of the light beam as desired. The action is explained in Signal Training Bulletin A-16.

After passing through the colored roundel, the lens system condenses the light into a parallel beam.

Purpose and Application: Lens systems are used to deflect or concentrate the light beam to give the most visible aspect to the engineman. The signal aspect should be seen as far as practicable. On straight track the lens system is set up to give a long narrow beam, while on curves the lens system is set up to give wide deflected beams to cover all segments of the curve.

Detailed Operation: The compound lens searchlight has a small deflecting lens to provide a close up aspect for the engineman who stops under a high signal or over a low signal. This lens or "hot spot" is adjusted by removing the hand hole cover on the lens barrel and turning the close up lens in the desired direction. See Figure 3 (a, b, c).

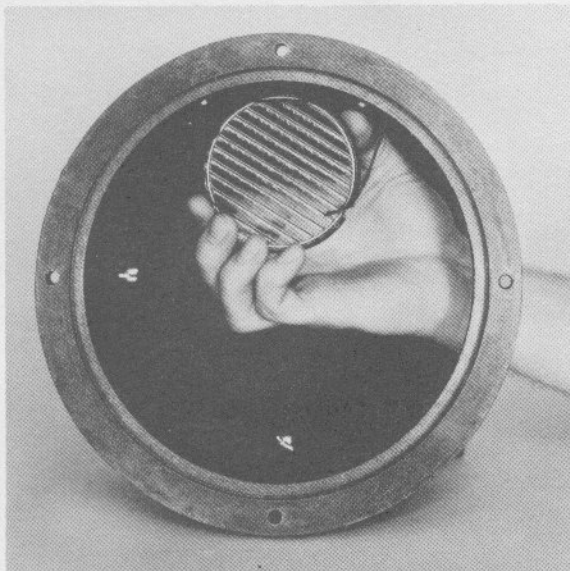
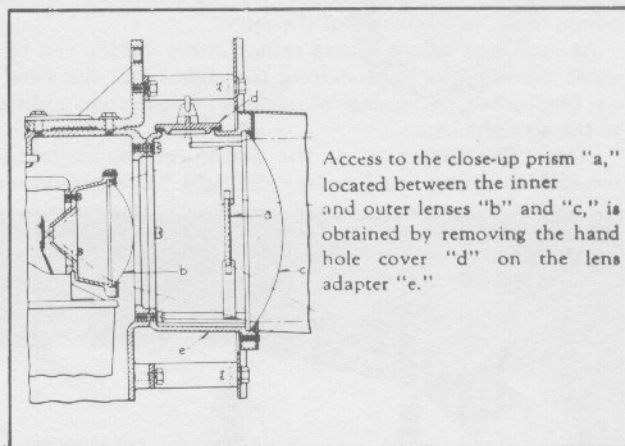


Figure 3(a) Adjusting the close-up deflecting roundel in a compound lens signal.



Access to the close-up prism "a," located between the inner and outer lenses "b" and "c," is obtained by removing the hand hole cover "d" on the lens adapter "e."

Figure 3(b) Location of a close-up prism in an H-2 signal.

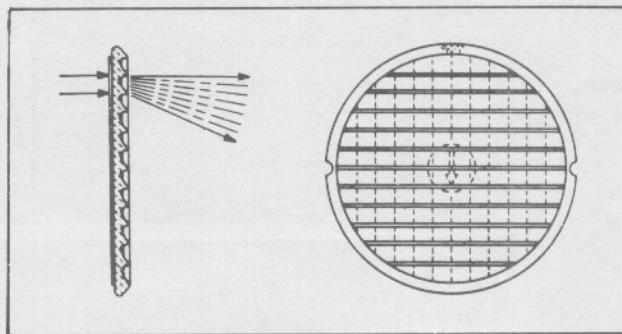


Figure 3(c) A close-up prism.

Roundel Selection: Outer roundels may be added to the housings of signals to spread or deflect the basic beam pattern. These roundels enable one to adapt the signals to suit curvature or topographical conditions.

Outer roundels are separated into three types.

(a) Straight Outer Roundel (See Figure 4).

All housings are equipped with straight outer roundels.

These roundels combined with deflecting hot spots are used at locations with 1000 feet or more of tangent track approaching the signal or in cases where a curve restricts the view of the signal due to bluffs, cuts, tunnels, etc., (where a deflecting or spread lens will not improve the visibility of the signal aspect).

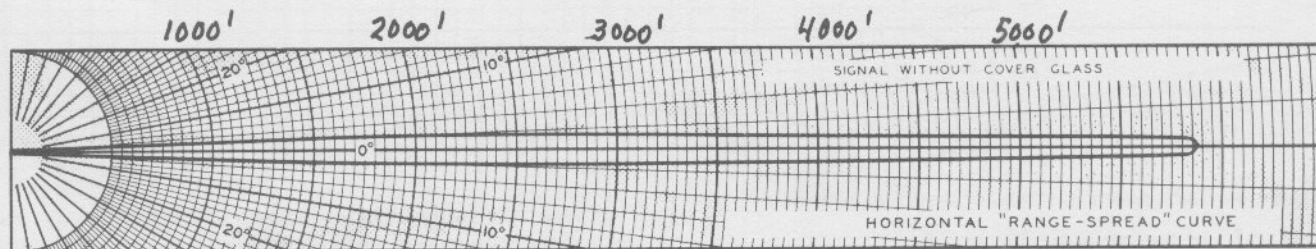


Figure 4—Light beam pattern of a straight outer roundel.



(b) Deflecting Roundels (See Figure 5)

At locations where there is less than 1000 feet of tangent track approaching the signal and a short or sharp curve impairs the visibility of the signal aspect, but where the view of the signal is not obstructed, deflecting roundels are used in addition to the straight outer roundels. Units shall be installed so that the arrow on the deflecting roundel points towards the inside of the curve.

At locations where a long minor curve is followed by a short minor curve approaching the signal and the view is not obstructed, deflecting roundels are also used in addition to the straight lens.

Note: The direction of the arrow on the deflecting roundels indicates the direction the light beam is reflected.

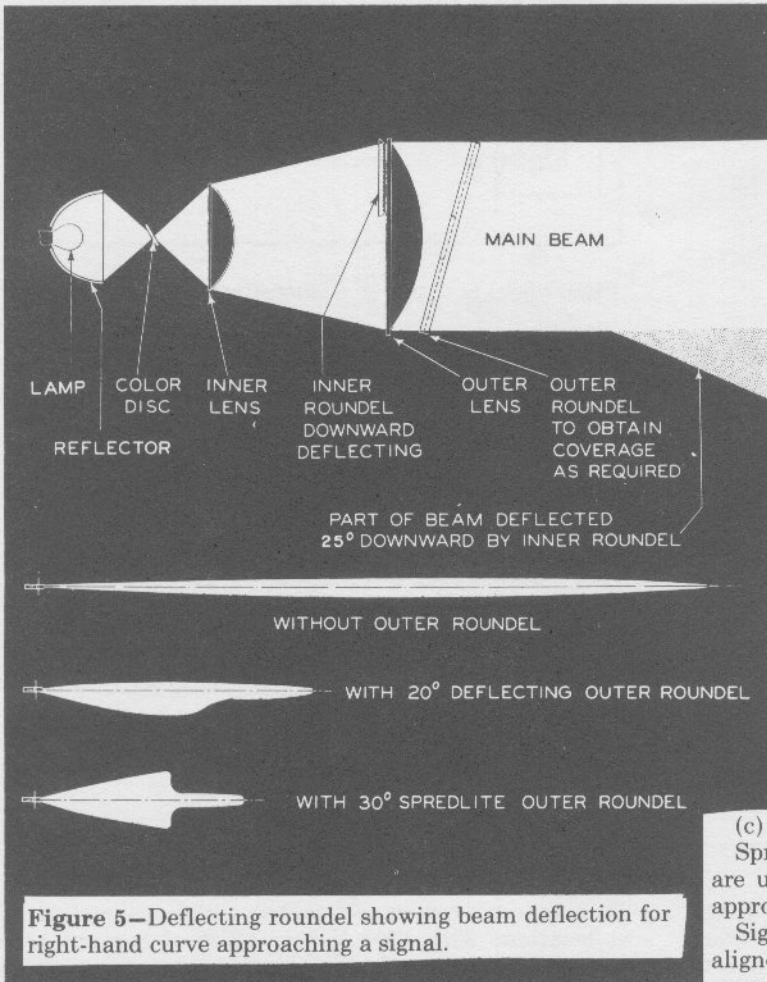


Figure 5—Deflecting roundel showing beam deflection for right-hand curve approaching a signal.

(c) Spread Roundels (See Figure 6)

Spreadlight roundels in addition to straight outer lenses are used at locations where there is a long major curve approaching the signal and the view is not obstructed.

Signals equipped with this type of roundel should be aligned so that they are continuously visible along the curve from the signal to a point as far down the track as possible.

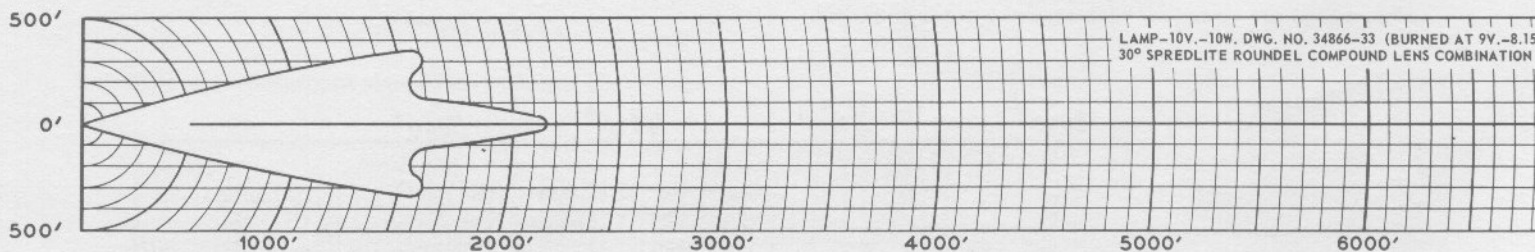


Figure 6—Light beam pattern for a spread roundel.

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