

Editorial Comment

Flashing-Light Signal Failures

The proper maintenance and operation of highway-railroad crossing protection signals is equally, if not more, important than that of automatic block signals. If an automatic block signal fails or a lamp in such a signal burns out, the absence of a light is accepted by enginemen as equal to the most restrictive indication. However, if the lamp or lamps in a flashing-light or wig-wag crossing signal burn out, the absence of a light is taken by the average highway driver as a proceed indication. Furthermore, in the case of an accident, proof that an incomplete aspect was displayed will influence a court towards a decision adverse to the railroad.

On two occasions in the last 30 days, the writer has observed lamps in crossing signals which were not lighted when they should have been while a train was approaching. Both of these signals are on a double-track section of a large railroad which has a maintenance organization and signal engineering talent, far above the average.

The idea of leaving a lamp in service in a crossing signal until the filament burns out is recognized as poor practice. Therefore, a successful procedure is to determine the average life of the lamps used, in burning hours, and then replace them before this life has elapsed. The scheme outlined would seem to be easily effected, but nevertheless is sometimes difficult of attainment.

Many of the types of lamps used in crossing signals are rated to give a burning life of 1,000 to 1,500 hr. at rated voltage. Burning a lamp at less than its rated voltage, of course, extends the life considerably. A five per cent decrease in voltage should double the rated life.

However, the practice of burning a lamp too far below the rated voltage, for the purpose of increasing its life, is a Scotch trick that defeats itself because the crossing signal is thereby handicapped in giving adequate warning, especially under adverse sunlight conditions. For example, if a lamp is burned at 90 per cent of its rated voltage, the candlepower is reduced to 70 per cent of the candlepower at rated voltage, representing a loss of about 19 per cent, so that the range of the signal is about 84 per cent of that obtained with the lamp at rated voltage.

The voltage reading at the lamp socket should, of course, be taken when the lamp is in place and lighted. Perhaps the best method is to feed the lamp just a little under its rated voltage to protect against over-voltage. For example, in order to insure adequate daylight indication, one road requires that the voltage at a 10-volt lamp be adjusted to 9.3 to 9.4 volts and must never be less than 9.0 volts. At this voltage, experience over a period of years has shown that a lamp life of 90 burning days, equivalent to 2,160 hr., can be depended upon.

On this basis the maintenance supervisor is instructed to make a test of the time each signal operates for certain classes of trains, and check the number of train movements, thereby fixing the number of days which the lamps are to remain in service at each crossing signal location. The maintainer reports to the supervisor

when he changes the lamps, and a record of these changes is maintained in the supervisor's office. Then, when a lamp burns out before its estimated life has expired, the local conditions at the crossing are investigated.

If failures occur frequently, one of the first tests to be made in the field is to determine whether the a-c. supply is subject to over-voltage fluctuations during some portions of the 24-hr. period. A test with a recording voltmeter connected to the a-c. supply line for a few days will determine whether such conditions are causing the trouble. If over-voltage cannot be prevented, the burn-outs can perhaps be eliminated by feeding the lamps normally on direct current from the battery.

Lamps that are so constructed as to render a life shorter than normal will usually burn out in a comparatively short period. Therefore, some roads formerly gave all the lamps a 24-hr. burning period test in the shop before sending them to the maintainers, thus culling out those lamps which are most likely to fail. However, as soon as a lamp has been burned for a time, the filament becomes more fragile. Therefore, further experience indicated that the preliminary shop burning test was not satisfactory because too many filaments were broken in transit and handling. As a result, the practice was changed and the filament is not now energized until it is placed in service and the maintainer then gives it a 10 to 15-min. steady burning preliminary test. As a general rule, a lamp destined for a short life will give some indication of its condition within a short time. In many instances, the inside of the bulb will be slightly colored or the filament will be excessively bright, when rated voltage is applied. Therefore, a frequent inspection of the lamps during the first week of service is desirable. When inspecting a lamp, or when cleaning the cover glass or reflector, it is advisable not to disturb the bulb or remove it from its socket because such operations tend to damage the filament or loosen the bulb in its base.

However, in spite of the careful selection of lamps and adherence to a well-defined program of changing the lamps, some failures will occur. The best protection against this type of failure is to have some employee actually see the lamps lighted at frequent intervals three or four times a week or perhaps once each day. On regular automatic signaling territory, these observation tests can be made by the maintainer as a part of his regular routine. However, for signals at isolated crossings on branch lines where the maintainer makes infrequent trips, the duty of testing the signals must be assigned to some other employee. At such locations, some roads provide a special test switch, so mounted that it can be locked with a regular switch padlock. With this arrangement the track foreman can be instructed to test the signal daily. Some roads using these test switches require the track foreman to report each time such a test is made, post cards with a special form being furnished to facilitate the making of the report. These reports are filed for use as evidence in case of an accident at the crossing. If the foreman detects any improper operation of the signal, he telegraphs the maintainer at once.