during a dust storm in the day time. Color-light signals generally have a greater range of visibility in dust storms than semaphore signals.

In one place, sand accumulated in the track and was ground into the ball of the rail by the wheels to such an extent that the track circuits momentarily failed to become shunted for track occupancy. However, the dust did not have the same effect as sand because it was so fine that it would blow off the rail and would not insulate the circuit.

Most of the signal housings are tightly sealed and very little dirt has entered. However, in instances where housings are not tightly sealed, dust blows in, and as much as ½ in. of fine dust has been found on shelves and relays. Cable painted last year has not been damaged, but the braid on weathered cable has been badly cut by blowing sand.

The accumulation of dry dust in the track does not cause trouble until rains occur but during some of the recent rains the formation of mud in the track has caused track-circuit failures. So far as can be determined at present, no permanent damage has been caused to any signal apparatus, but rains will cause wet track circuit failures unless the dust can be cleaned away from the rails before rains occur.

Color-Light Signals Advantageous

E. M. Kempe

Signal Supervisor, Missouri Pacific
Dodson, Mo.

On a recent inspection trip from Pueblo, Colo., to Hoisington, Kan., I found that our relays are in good condition and are not in any way damaged by dust. The signal-heads have some dust that has worked in through the doors but this has been of no particular harm. Considerable dust accumulates on battery tops, however, without material damage.

Switch circuit controllers are the source of most of the trouble resulting from dust. After each storm, the men are obliged to clean out the switch boxes and contacts. Color-light signals have been of great advantage in the operation of trains as their indication penetrates through a cloud of dust much better than the indication of a semaphore signal.

As an illustration of the damage done by the dust storms, a wig-wag signal at one point becomes inoperative after every storm, as a result of dust working into the mechanism. It is, therefore, necessary to clean this mechanism before the wig-wag will operate properly. Such difficulty may be compared with the small amount of trouble experienced with flashing-light signals at three other locations.

Another trouble resulting from the dust storms involves difficulty with switch mechanisms owing to dust clogging the gears. Train-order signals, where the pipe line passes under a track, become inoperative owing to dust working into the conduit pipes and packing so tightly that the operating pipe cannot be moved without great difficulty. Switch lamps have been known to be full of dust.

▼ ▼ ▼

Re-Use of Plug-Type Bond Wires

"Is it good practice to re-install a cable-type bond after it has been removed from service, when new rail is laid?"

Questionable Practice

C. F. Grundy

Signal Engineer, Kansas City Southern
Kansas City, Mo.

Six years ago we re-installed a small number of the plug-type bonds. Although not noticeable at the time they were installed, the plugs did not seal the holes, and corrosion set in, so that all of the bonds failed in about 18 months. These plugs, however, were somewhat rough due to tool or die marks made during their manufacture, and the plugs did not seem to taper quite as much as the ones we get now.

The present-day bonds, with a smooth galvanized or tinned-finish plug, tapered in accordance with A.A.R. specifications, might give better results, but I would hesitate to re-install any great number of them on new rail, without further experiments, especially if the plugs were well "driven home" the first time.

Bonds Carefully Selected For Re-Use

B. F. Dickinson

Engineer Telegraph & Signals, Pennsylvania
Pittsburgh, Pa.

A hard and fast rule covering the re-use of plug-type bonds can hardly be made, as there are a number of conditions to be considered. If bonds have been in service for several years and have been subject to brine drippings, they will be corroded to a greater or lesser degree, strands may be broken, etc., which would make it inadvisable to use them again on new rail, which will remain in service for many years.

When a bond is first applied, the terminal plug, when being driven, is shaped or seated in the drilled hole in the rail, and as all holes are not exactly the same due to differences in bits, the manner in which they are drilled, etc., the pin shapes itself to the hole and when removed it retains this shape. When it is applied the second time, the plug may not fit properly and this results in the possibility of moisture entering and later causing a failure.

The general practice we follow is to sort the bonds when they are removed from service on account of rail renewals; the plugs of those that are fit for further service are dipped in oil or other preservative compound and again applied, preferably the same day they are removed. If it is not practicable to apply them on the same day, they are bundled and placed where they will be protected from cinders and corrosion until they can be used.

▼ ▼ ▼

Night Intensity of Signal Lamps

"Is it desirable to reduce the voltage on color-light signals at night in order to secure a strong indication in daylight and not too brilliant an indication at night? How can this be accomplished economically?"

Line Voltage Reduced

By E. P. Weatherby

Signal Engineer, Texas & Pacific
Dallas, Tex.

On some sections of our automatic block territory where color-light signals with 8-volt 18-watt lamps are used, we have provided an arrangement to reduce the voltage on the signal lamps from 8 volts in daylight to 6 volts at night, thus reducing the glare during the hours of darkness.

The power for the signal system is supplied to us at 2,300 volts, and we provide a 2,300-550 volt transformer to reduce the voltage to 550 volts for distribution over the territory. At each location where we buy power, an Edison sun relay is used to control an auxiliary relay through con-

(Continued on page 326)

tacts of which connections to special taps on the 2,300-550 volt transformer are changed to reduce the line voltage at night from 550 to 380 volts.

This arrangement has been used successfully for several years on both a-c. primary and a-c. floating territories. This automatic adjustment of the lamp voltage has two advantages. It permits us to have a strong color-light signal aspect that can be readily seen at long distances under even the most adverse conditions of sunlight and, on the other hand, the reduction of the voltage at night prevents too strong a glare in the eyes of enginemen at night. Without the automatic control of the lamp voltage, a compromise, not exactly satisfactory for either condition, is necessary.

▼ ▼ ▼

Braking Distance with Signals

"What data is available on the braking distance of modern high-speed passenger and freight trains, on which to base the spacing of automatic block signals?"

Tonnage Freight Train Usually Establishes Distances

J. P. Muller
Signal Engineer, Boston & Maine
Boston, Mass.

Spacing of automatic block signals on the Boston & Maine for the modern high-speed passenger and freight trains is based primarily on braking curves and retardation curves furnished by the mechanical department. Curves for tonnage freight trains are available at 5-m.p.h. intervals for all speeds from 25 m.p.h. to 50 m.p.h., while curves designed for 16-car passenger trains are in use up to 75 m.p.h. Acceleration and deceleration curves have been furnished for the new high-speed streamlined train, "The Flying Yankee."

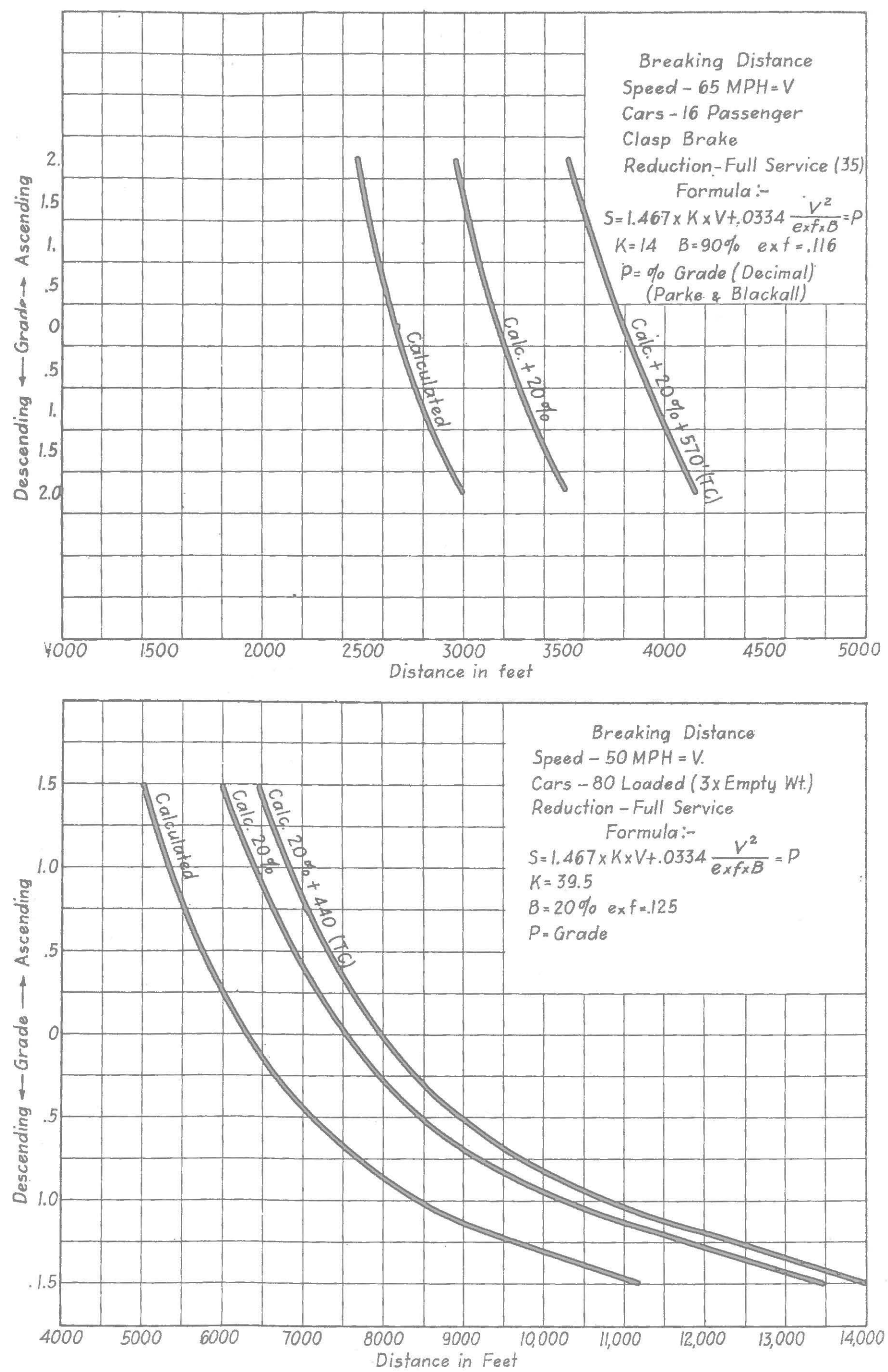
Typical curves are shown herewith. The curve ordinarily used is the one marked "calculated plus 20 per cent." Up to the time that our automatic train-stop system was changed to a cab-indicator system, an additional distance was allowed in this territory for the air-brake apparatus to take effect.

Braking distances are based on maximum authorized time-table speeds plus 5 m.p.h., giving due regard to locations where speed restrictions are in effect as to whether they appear to be permanent restrictions or are likely to be lifted at some later date. The additional 5 m.p.h. is used on the higher speed ranges to provide a margin, owing to the fact that most locomotives have no speed indicators and the engineman has no way to determine his speed accurately. Its use on low speed ranges is dependent somewhat on local conditions.

On primary main lines, the tonnage freight train is usually the train which establishes the maximum braking distance, although in terminal territory or on secondary main lines, the passenger train may be the determining feature. Care must be taken not only to provide braking distance from high speed, medium speed, and slow speed to stop, but also where medium-speed or slow-speed interlocking signals are used to route trains over medium- or slow-speed turnouts to diverging routes, to provide sufficient distance and proper indications to bring the train down to proper speed before reaching the turnout.

Whether two-block three-indication, three-block four-indication or four-block five-indication signaling should be used in any particular territory, is determined by a combined study of braking distances and traffic density. In some instances, it is advisable to

(Continued on page 328)



Calculated braking distance curves for passenger and freight trains