

# Signaling Busy Passenger Terminals

By T. Holt

Signal Engineer, Chicago Union Station Company, Chicago

**T**RAIN speed in congested terminal territory must of necessity be retarded. The current of traffic is in both directions on all tracks, with train movements deflected over crossovers and turnouts which are arranged for a multiplicity of routes. There is little need of high speed signals, but a great need for a system of signaling which will permit train movements at the maximum authorized terminal speed when the route set up is unoccupied. Such a system should also provide an indication for retarding train movements to a speed which allows them to follow each other with safety to occupied tracks.

Two general schemes of signaling have been used on the important terminals in this country, one a dwarf signal scheme with dwarfs operating in three indications; the other a two-arm high signal scheme using four indications, usually known as special terminal signaling.

With the dwarf signal clear, information is conveyed to the engineman to proceed at maximum authorized terminal speed, that the track is clear to the next signal, which is either at clear or caution. The dwarf signal at caution indicates that the next signal is at stop and the track between the caution and the stop signal may or may not be occupied. The stop indication gives information that the route is not set. These three indications are considered by some operating officers as giving sufficient information for the proper governing of traffic on a busy terminal. However, other operating officers feel that information should be given as to whether the track ahead is occupied when a caution signal is displayed.

The top arm of the two-arm signal in special terminal signaling has three indications and is used to govern to all routes, showing clear when the track is clear and the next signal at caution or clear; showing caution when the track is clear and the next signal at stop and showing stop when the route is not set. The bottom arm has but two indications, one in a proceed indication in combination with the top arm at stop which shows that the switches are set for a route which is occupied. The other is a stop indication in combination with the top arm at stop which shows that the switches are set for a route which is occupied. The other is a stop indication in combination with the top arm at stop, which indicates that the route is not set.

The unusual use of the top arm to govern to all routes is based on the assumption that the maximum authorized speed in the terminal territory is the safe speed for all turnout and crossover movements. This same assumption makes it possible to move trains at the maximum authorized terminal speed by dwarf signal indication.

The chief advantage derived from the use of special terminal signaling is the information as to the occupancy of the track ahead. This not only quickens the movement on a caution indication but makes follow-up moves safer.

The chief disadvantage is the difficulty of placing signals at the proper points to allow the tracks to be used to full capacity, as the complicated track layouts with crowded clearances usually found on important terminals make it almost impossible to erect the overhead structures at fouling points for the support of high signals.

The dwarf signal has the advantage of being located at the proper point to permit trains to occupy tracks to full capacity, but as it is used today it cannot give the information as to the occupancy of the track ahead. The

engineman running under a dwarf signal caution indication must determine for himself whether the track immediately ahead is occupied. His decision depends largely on his view of the track. The careful engineman will proceed with caution prepared to make a stop, watching the line-up of switches to determine whether he is to be deflected to an occupied track. The optimistic engineman will take a chance and proceed without reduction of speed, prepared to stop at the next signal, but he may have to make an emergency stop before he reaches it. The first man may slow up the terminal movement unnecessarily. The second man may make follow-up move-

COLOR LIGHT	POSITION LIGHT	NAME	INDICATION
		STOP SIGNAL	STOP
		CAUTION SIGNAL	APPROACH NEXT SIGNAL PREPARED TO STOP
		CLEAR SIGNAL	PROCEED AT AUTHORIZED TERMINAL SPEED
		PERMISSIVE SIGNAL	PROCEED WITH CAUTION PREPARED TO STOP SHORT OF TRAIN OR OBSTRUCTION

Four-Indication Dwarf Signal Aspects

ments hazardous. The only factor of safety is to have the maximum speed permitted in the terminal slow.

Actual observations of the speed at which train movements are made through short slips and crossovers on some terminal layouts would indicate that the track engineer has allowed for a considerable factor of safety in his decision as to the safe speed at which these deflecting moves should be made. Unless enginemen are constantly checked up the speeds are usually exceeded, but very rarely with disastrous results. This has an important bearing on the need in indicating definitely when the track ahead is occupied, as the speed of the optimistic engineman may be one that makes an emergency stop difficult. Having in mind the cautious and the confident engineman, it is seen that the addition of the fourth indication, which is gained by using two-arm high signals, will speed up the first man on the other indications and will retard the second man when moving to occupied track.

Considering the two schemes of signaling, we find that if the addition of one indication were made to the dwarf signal scheme it would have the advantage of special terminal signaling without its disadvantages, and the advent of the light signal makes this fourth indication possible without any change in the design of the signal as now used for three indications. This would seem to make the dwarf signal particularly adapted for the proper governing of traffic on a busy terminal, as it combines the advantages of the two systems as now used on our important terminals without their disadvantages and makes possible the operation of a busy terminal to its full capacity. The four indications are shown in the sketch.