

Editorial COMMENT

Non-Stop Permissive Signals

AT THIS time, when every reasonable measure should be adopted to expedite train movements, thought should be given to the possibility of eliminating unnecessary train stops at permissive automatic block signals, the most restrictive indication of which is Stop-and-Proceed. Such a practice will improve train operation in general, obviate damage to lading, and reduce wear and tear on equipment. The saving of fuel is also important.

Many roads have recognized the futility of requiring trains to stop at permissive signals on ascending grades, and have equipped such signals with markers which authorize a train, when encountering a red aspect in the signal, to pass, without stopping, and proceed in the block with caution. The discussion herein has to do with the extension of the application of such operation to permissive automatic signals on level track, and its application to passenger as well as freight trains.

Arguments may be advanced to the effect that if a permissive signal is displaying its most restrictive aspect, a train should be stopped, not only as a definite check that the engineman is aware of the possibility of hazard ahead, but also to be sure that the speed of the train is fully under control. On the other hand, it may be argued that the stop at a Stop-and-Proceed signal is a "hang-over" from the days before enginemen could be depended upon to observe and be governed by signals. In reality, safety depends on whether an engineman obeys the speed restrictions and observes caution *after* passing the signal; therefore, the item of stopping or not stopping *at* the signal is not the vital factor.

Confining consideration for the moment to lines with two or more tracks and single direction operation, signals with grade markers do not actually ever display the Stop-and-Proceed aspect, because the inclusion of the grade marker forms a complete aspect equivalent to A. A. R. Code Rule 290. One may question, therefore, under these circumstances, why signals should not be used whose most restrictive aspect is red-over-yellow, A. A. R. Code Rule 290, with an indication "proceed at restricted speed." Such an aspect is used in place of a grade signal at locations on the Lehigh Valley, and some other roads, where the rules regarding the omission of the stop apply to passenger as well as freight trains.

On double-track lines on the Union Pacific where the ascending grade is 0.5 per cent or more, as, for example, on the westward track from Cheyenne, Wyo., to the summit of Sherman hill, the westward automatic signals that were installed last year, do not display a red light, and, therefore no Stop-and-Proceed aspect is possible. The most restrictive aspect displayed by these signals is a yellow light in the color-light signal head, and a yellow

light in a marker unit located on the mast about 6 ft. below the signal head. Each such signal is designated as a permissive signal by a disk marker displaying the letter P. If the filament in the lamp in the marker fails, the lamp in the yellow unit in the head is extinguished, and the result is the display of an improper signal, which is equivalent to the most restrictive aspect of that signal.

On the Atchison, Topeka & Santa Fe, the aspect of a semaphore arm at 45 deg. and/or a yellow light is in effect practically the equivalent of Code Rule 290, Restricting. On long ascending mountain grades of 2 per cent or more on double track grades, as, for example, east of San Bernardino, Cal., between Highland Junction and Summit, this road has, for many years, used signals whose most restrictive aspect is an arm at 45 deg. and/or a yellow light.

In the examples discussed so far, the principal objective has been to obviate the stopping of trains on ascending grades, where the starting of trains may be difficult and drawbars may be pulled out. An outstanding example of non-stop permissive signals applicable on level track as well as on ascending grades, and to passenger as well as freight trains, is on those territories on various roads where cab signaling is used, the most restrictive indication of which is Caution-Slow-Speed. If this practice is safe with cab signaling, why is it not safe with reference to wayside signaling? This idea of a non-stop aspect at permissive wayside signals has been considered by many roads at various times in the past. The Illinois Central, however, seems to be the only road which has applied the non-stop idea on extensive mileages in automatic block territory where wayside signals are used. In March, 1930, this road modified its Rule 282 (the Stop-and-Proceed rule, Code 291) effective on all divisions outside the Chicago terminals, to read as follows: "On two or more tracks, trains may pass "Stop-and-Proceed signals without stopping, proceeding at a speed of not exceeding 15 m.p.h." In July, 1933, the rule was made effective on single-track lines where absolute permissive block signaling is in service. A total of 1,375 miles of multiple tracks and 1,083 miles of single track automatic block with wayside signals is now involved.

For consideration with reference to new signaling installations or extensive reconstruction programs, one road has set an interesting example on a new installation on a double-track line which handles freight trains exclusively. On this project the most restrictive aspect displayed by a permissive automatic block signal is red-over-yellow, Restricting, Code Rule 290. This practice applies to the signals on the entire territory, regardless of whether the grade is level or ascending, although, as a matter of fact, no heavy grades are involved.

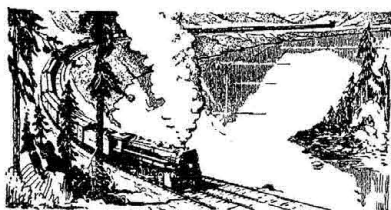
On multiple-track lines where each track is signaled for one direction only, this practice as explained in the

above, of using the yellow-over-red as the most restrictive aspect could be adopted, providing no difference is made between passenger and freight trains in the acceptance of a non-stop permissive signal. Various roads, such as the Union Pacific, the Southern, the Louisville & Nashville, the Missouri Pacific and the Denver & Salt Lake, use grade signals at which the non-stop rule applies for passenger as well as freight trains. By the same reasoning, non-stop signals on level track might well apply to passenger as well as freight trains. Certainly no one would admit that the enginemen of passenger trains are not as reliable as those of freight trains, in-so-far as the observance of signals and rules are concerned.

On Single Track

On a single-track line, the one-in-a-million chance that two opposing trains might pass normal clear opposing head-block, station-leaving signals simultaneously, brings into consideration I. C. C. Signaling Rule 207. The point of importance under such a circumstance is that the intermediate signals display a Stop-and-Proceed aspect without the "grade" light when an opposing train is involved, but, for following trains, the grade lamp is illuminated in combination with the red light of the signal ahead to form a non-stop aspect. This phase of the matter is too involved for discussion here, but, in brief, *if* an installation includes station-leaving signals which *normally* display the Stop aspect, Code Rule 292, consideration of I. C. C. Rule 207 is obviated with respect to opposing trains as involved in the intermediate signals. For this reason, the non-stop aspect, Code Rule 290, could be used as the most restrictive aspect of intermediate signals on single track as well as on tracks signaled for train movements in one direction only.

Thus, in brief, the signal aspects are available to permit elimination of unnecessary train stops at permissive signals, but the crux of the question is whether operating officers will accept responsibility for their enginemen obeying the signal indications and observing the speed regulations when proceeding in a block after passing a non-stop signal with the indication, Restricting, Code Rule 290.



Michigan Central Crossing Protection

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track in either direction is to be made over Kalamazoo street and the barriers and traffic signals are not in their most restrictive positions, then a black and white controller, either F or G, must be operated towards the "Start" position to cause the barriers and traffic signals to operate to their restrictive positions, and the controller is left in that position until the head end of the train passes on to Kalamazoo street, at which time the switch key can be removed. In short words, the yellow controllers are for both cutting-in and cutting-out operation when a track is occupied, whereas the black and white controllers are full-normal and only for cutting-in of the operation of the crossing facilities, thus providing semi-automatic controls. Special track circuits as 2T, D2T, E1T, or 1T, which are 60 to 75 ft. in length, provide constant protection should any part of an engine, track or car foul the crossing.

The signal lighting, flasher relays and barriers are controlled through "XR" relays having 6 points and a resistance of 670 ohms. All track and control relays are of the General Railway Signal Company Type K. Track relays have a resistance of 4 ohms. A Ward-Leonard 110-volt, a-c., 60-cycle, 0 Sec.—35 Sec. relay takes care of the hesitation period of the barrier, set for approximately five seconds.

Housing and Apparatus

An insulated frame relay house shelters a good part of the control relays, whereas an insulated, welded sheet-metal instrument case, 6 ft. high, 9 ft.-8 in. long, and 23 in. wide, houses the relays, batteries, etc., directly involved in the operation of the barriers. The a-c. primary system is used on the track circuits, 1 cell of Edison 1000-a.h., Type-1002 primary battery being used on each track circuit with a G.R.S.-BQX $\frac{1}{2}$ rectifier including an adjustable reactor. The power supply comes from the City of Marshall Electric Company lines nearby on Kalamazoo street at 110-volt, a-c., 60 cycle. A meter is placed on the outside of the relay house to record the amount of power consumed. A pilot light to indicate that a-c. power is on is located inside the relay house. The rays of light from this lamp are directed through a hole in the wall in which a magnifying glass has been provided. By this means, any employee passing the location can readily determine whether

the a-c. power is in service. This lamp is rated at 10-volt-watts and is fed from a Type K2 transformer rated at 400 v.a. which was provided especially for this purpose. The power supply for the control of the electro-pneumatic valves consists of a 32-volt set of Exide, Type DMGO-7 cells, on floating charge by a G.R.S. Size-232, BXT rectifier. A 10-volt battery for relay control, crossing bells and signal circuits, consists of 5 cells of Exide, Type EM-7.

Compressed air for the barriers is supplied by an Ingersoll-Rand Model-A compressor, rated at 2.7 cu. ft. per minute, and equipped with a pressure switch, which closes when the pressure in the reservoir drops to 100 lb. and opens when the pressure reaches 125 lb. The compressor motor is a Westinghouse, Type F.U., $\frac{1}{2}$ -hp., 1725-r.p.m., 110-120-volt, 60-cycle, equipped with a thermal overload circuit breaker. The intake and exhaust valves for barrier pistons are rated at 32-volt, 3-amp. direct current. An adjustable air-cock is provided in each intake as well as each exhaust pipe leading to the cylinder. By means of these cocks, the volume of air can be adjusted to control any desired speed of intake and exhaust of air, thus controlling the speed of rising or falling of the barriers.

Traffic signals are of the G.R.S. Type XA with "Spredlite" roundels. Traffic signals are equipped with 10-volt, 18-watt, single-filament and single-contact bayonet-base type lamps, which are standard on the Michigan Central. The underground parkway cables were supplied by General Cable Company. The 10-volt d-c. crossing bells were supplied by the Western Railroad Supply Company. Raco terminal blocks in strip form are used throughout. Everett 2-3-4-9-ohm resistance units are used on track circuits in series with the battery. Raco Type 445 bootleg risers are used for circuit connections to the rails, using a Copperweld plug-type bond. Raco plug-type rail head bonds are used at joints, and Type 313 junction boxes are used for cable junctions.

The new crossing protection at Marshall is a part of the program of the State of Michigan financed by federal funds appropriated for the improvement of safety on highways. The project was planned and installed under the direction of R. E. Green, assistant signal engineer, Michigan Central, and under the supervision of William C. Rachor, signal supervisor. The Evans Products Company furnished the Auto-Stop barriers, and the General Railway Signal Company furnished the signals, relays, rectifiers, transformers and the insulated sheet-metal instrument cases.