What's the Answer?

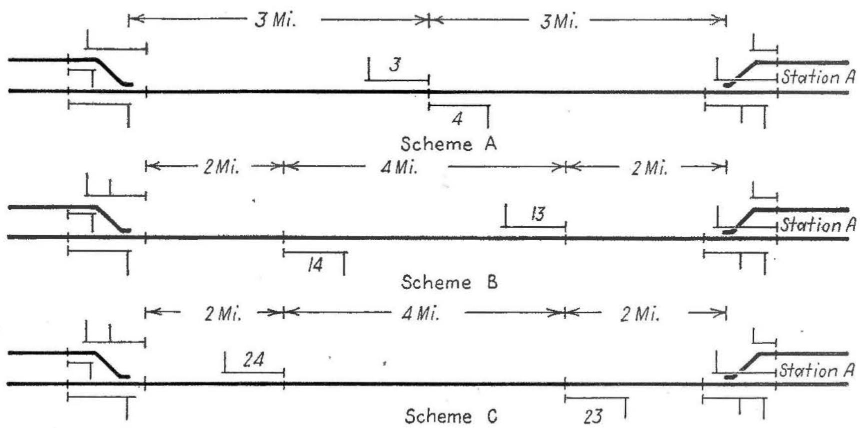
Intermediate Signals In C.T.C.

(1) Under circumstances in which a decision has been made to use only two intermediate signals in each of the station-to-station blocks of a C.T.C. project, which of the schemes shown in the accompanying sketches do you prefer and why?

In giving your answer, assume that 6 passenger and 24 freight trains are operated in the proposed territory daily, with little fleeting. Assume level tangent track. The distance between the sidings shown in the sketches is typical of others in the same territory.

Depends on Traffic

An assumption can be made that all the 24 freight trains handle similar rush traffic, and, therefore, there would be a minimum number of occasions for a freight train to take siding for a freight train of the same direction to pass by. Such, of course, would not be the case if the railroad handled several hot-shot merchandise freight trains as well as numerous solid trains of dead freight, such as coal. In view of the fact that only six passenger trains are operated as compared with 24 freight trains, there would be only a limited number of instances in which a freight train would take siding to allow a passenger train in the same direction to pass. A conclusion, therefore, is that the number of meets between opposing trains would predominate, in comparison with the number of passes. For this reason, the intermediate signals should be located to facilitate meets rather than passes. This result would be accomplished by using the layout shown in Scheme C. For example, if an eastbound train is to take siding at station A for a meet with a westbound train, the eastbound train should operate at maximum permissable speed for maximum distance before encountering a restrictive aspect. Thus in Scheme C, this train would not encounter a restrictive aspect until arriving at eastward intermediate signal 23, whereas in Scheme B, an eastward train would encounter a restricting aspect at signal 14, and in obedience to Standard Code Rules, would be required to immediately reduce to half authorized speed and continue through the remainder of 6 miles at that speed. The idea that an engineman could continue at maximum speed until he passed some red barn, and then apply the brakes, is not



Track and signal plan of three schemes

consistent with obedience to signal aspects. On the other hand, in Scheme C, signal 23 is in the proper place as a distant signal, so that the eastbound train would be operated for a minimum distance at half authorized speed.

Presumably the man who submitted the question may have had in mind that the layout in Scheme B would facilitate passes, in that the train to pull out of a siding could start as soon as the preceding train passed beyond the first intermediate such as signal 13 which is only 2 miles, whereas in Scheme C signal 24 is 4 miles from the siding to the rear. Presuming that the train which holds the main line is a passenger train, operated at at least 60 m.p.h., Scheme B would permit the following freight train to leave the siding 2 minutes sooner than would be the case with reference to Scheme C. In other words, if the traffic is such that the number of passes predominate, as compared with meets, Scheme B would save time for the trains which pull out of sidings after being passed by trains in the same direction. An objection to Scheme B, however, is that signals 13 and 14 are not in the proper locations as distant signals, in approach to their respective semi-automatic station-entering signals.

The layout shown in Scheme A, with the two intermediate as a double location at mid-point, would allow equal advantage for meets and passes. This Scheme A would be better than Scheme B with reference to the distance between a distant signal and its respective semi-automatic station-entering signal. Also Scheme A would have the advantage of concentrating line drops and apparatus at one location rather than at two, as in Scheme B or Scheme C.

On the other hand, if coded track circuits are to be used, each such circuit could be two miles long so that only three such circuits would be required in either Scheme B or Scheme C, and, furthermore, the ends of the track circuits would be at the proper places for signal locations. Looking to the future, traffic conditions may change so that two double locations of intermediate may be needed. If Scheme A is installed, the double location would have to be moved, whereas if either Scheme B or Scheme C is installed, a signal could be added at each of the two existing locations, and, with a minimum number of changes in circuits, the job would be complete.

Therefore, in answer to the question as stated, the answer is to use Scheme C. On the other hand, with a traffic of 6 passenger and 24 freight trains daily, the decision as stated in

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Correction—In the article concerning battery for coded track circuits, by R. M. Gilson, on page 215 of the April issue there was a typographic error in the thirteenth line. The resistance of a code-following track relay is 0.3 ohms not 9.3 ohms, as shown in the article.

the question, i. e., to use only two intermediate signals, seems questionable. In other words, a traffic of 30 trains daily most likely will involve enough passes, as well as meets, to justify two double locations of intermediate signals, spaced for two-mile blocks.

Frost Trouble

"What methods do you find to be most effective in minimizing frost troubles in semaphore signals and outlying electric switch machines as well as switch circuit controllers?"

Tests of New Absorbent

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The formation of frost in signal mechanisms, switch machines, switch circuit controller, instrument housings, and other signaling apparatus is one of the oldest forms of trouble that has beset signal engineers, and it is one that has not been satisfactorily solved even at the present time. Pre-frost moisture is undesirable, and the troubles multiply when this moisture freezes in the form of frost.

Frost is formed due to the fact that the metal parts of the mechanism are at or below the freezing temperature at the time that the case and the air about the parts are at a warmer temperature. Under such conditions the moisture contained in the air freezes in frost form on the metal operating parts which are colder. Thus frost trouble is usually experienced during the early stages of an external rise in temperature. Fundamentally the cause of frost is the presence of moisture in the air inside the housing, and conversely the remedy is to dry the air and keep it dry. Thus the purpose of any dryer is to absorb the moisture in the air before the air reaches the saturation point, and to retain this moisture until it is disposed of outside of the housing.

One method of preventing the formation of frost on signal apparatus is to use an absorbent material to absorb the moisture from the air in a signal housing or instrument case. Un-slacked lime has been used for this purpose, but is objectionable due to its corrosive effects and resultant damage to metal parts. Alcohol, another absorbent, is likewise corrosive. Chemically pure glycerin is a very good absorbent, but when used the containers overflow, and furthermore the use of glycerin is objectionable because it is a solvent of the rubber insulation on wires. In some instances absorbent cardboards, as well as blotters have been used to pick up moisture in signal cases.

In 1941, I found another type of dryer, and started tests during the winter of 1941-1942, this test being expanded during the winter of 1942-1943. These tests have shown desirable results, but due to the fact that only a small percentage of the total apparatus was equipped with dryers, a positive conclusion cannot be made at the present. However, knowing the universal frost problem, and the desire of every signal engineer to find an answer, I take this means of offering the information to date on my test as an addition to the data available on this subject.

The absorbent material which I used in these tests is Silica Gel, which is known chemically as dehydrated Silica Acid. There are two types of Silica Gel. One type, which is soluble in water is Ortho Silica Acid, H_4SiO_4. The other type which is not soluble in water, is chemically known as Meta Silica Acid, the formula being H_2SiO_3, and this type is the one used in the dryers.

The chemical is crystal in form, each dryer being made of a container filled with these crystals. The dryer containers are made in different shapes and sizes to be of maximum content and yet fit in the void spaces inside the covers of mechanisms without interfering with the operations of moving parts or wires.

The material for making the containers is No. 29 gage sheet copper which is plated with nickel or cadmium. The sheets are perforated with 179 holes to each square in., each hole being the size of a No. 60 drill. After the sheet has been formed into the required shape for a container, the edges are riveted, then the container is filled with Silica Gel crystals and riveted closed so that the contents are permanently enclosed.

Air-tight, metal boxes are used to ship the dryer to the various maintainers' headquarters, and the dryers are kept in these boxes until installed in the signals, so that a minimum moisture will have been absorbed prior to placing the dryers in service.

The Silica Gel, when dry, is grayish in color. It will absorb water equal to its own weight, and when saturated with moisture the color is bluish. When the Silica Gel in a number of dryers has become saturated, the dryers are removed from the signals and taken to the maintainer's tool house. The dryers are then placed on a stove and the fire regulated to maintain a temperature of 175 deg. to 200 deg. F, for four or five hours, thereby driving the moisture out of the Silica Gel crystals. When properly dehydrated, the chemical contains less than five per cent moisture, and will return to its original grayish color and appearance.

Likewise the chemical has its original properties of absorbing moisture. Apparently there is very little if any loss of the chemical, and the possible number of service and dehydrating cycles seems to be unlimited. The dehydrating process could be done in an oven, but the ordinary heating stove provided in maintainer's headquarters serves the purpose. The dryer containers should not be opened or the chemical removed for drying. At all times, when not in signal apparatus or when being dehydrated, the dryers should be kept in the shipping box with the cover closed airtight.

Two dryers are placed in each top-post semaphore signal mechanism. Care is taken to see that the gaskets are tight and that all wire inlets or other openings are sealed so that no additional moisture can enter from the outside of the mechanism case. Thus the dryers have a minimum volume of air from which the moisture is to be absorbed.

During the winter of 1941-1942, a total of 150 top post semaphore mechanisms were equipped with these Silica Gel dryers and frost trouble occurred in only two of these signals. Additional dryers were made so that a total of 500 signals were equipped during the 1942-1943 winter, and frost trouble occurred in only two of the total 500 signals during the winter. In these instances the cases may not have been sealed properly, or possibly the dryers had not been dehydrated thoroughly before being installed. In the same general territories, there were numerous cases of frost trouble in the signals which were not equipped with dryers.

Thus the results of the tests during the two past years show evidence that the new type dryers are effective in decreasing trouble due to frost, but no positive conclusions can be drawn as applying to all forms of signal apparatus or various climatic conditions. A definite conclusion, however, is that the dryers can be maintained easily, and that they cause no undesirable results or damage to the apparatus.