What's the Answer?

Smashboard Mechanisms

"Should smashboard mechanisms be designed so that, in the event of a power failure, the smashboard will be restored automatically to the Stop position by force of gravity? Or should the board be counterweighted so that it will remain in the exact position which it occupied when the power was cut off?"

Should Be Power Operated in Both Directions

H. E. Brashares
Assistant Superintendent of Signals, Great Northern, St. Paul, Minn.

A smashboard mechanism should not be designed to be restored automatically to the Stop position by force of gravity in the event of a power failure any more than a derail operating mechanism should be designed to open the derail automatically under similar circumstances. Smashboard mechanisms should be operated by power to their normal and reverse positions and should stay in any position at which power is cut off until power is again applied.

Before we were instrumental in getting a smashboard mechanism designed along the principles stated above we adjusted counterweighting so that, in case the smashboard should break loose from its connections, it would assume a position of approximately 30 deg. from the vertical toward the track which it was protecting. This indicated plainly an "out-of-order" condition without any disastrous results.

For those advocating its return to "Stop" position by gravity in case of power failure, I would suggest the simple convincing test of setting up this condition just as their finest passenger train is passing the smashboard location.

I would like to take exception to referring to this apparatus as a "smash signal." It should be called a "smashboard" and its positions designated as "normal" and "reverse" so that it may not in any way be confused with a "signal" or any of the terms used to designate signal positions or indications.

Board Should Not Move After Power Fails

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The advent of automatic interlocking has removed the operator as a witness of the observance of signals, and experience has shown that derails on main lines may be a cause of damage rather than a safety device. In some instances, smash signals have been used to furnish a tell-tale in the case of the non-observance of a Stop signal under circumstances which might result in a collision with another train. The smash signal is not a safety device and does not add to the safety of an automatic interlocking—unless it could be argued that their use has a psychological influence to improve obedience to signal indications.

When smash signals are used, the circuits should assure that before a signal is cleared for a route, the smash signals for all conflicting routes are in the Stop position and those for the route in question are clear. A power failure while a route is clear does not introduce any new element of danger to any trains on conflicting routes, and the route previously cleared should be held secure and safe including the smash signals, if the train should fail

To Be Answered in a Later Issue

(1) How can the lamps in color-light signals be tested quickly and reliably by one man? Is it necessary for him to climb to the signal head and check the filament visually? Must special methods be followed for double-filament lamps?

(2) What methods are suitable for laying cable under pavement?

(3) What schemes have been worked out for locking signal units such as switch circuit controllers, flashing-light signals, etc., without using padlocks?

(4) Where it is necessary to mount signals or other equipment on concrete walls, what are some suitable methods of securing the foundation bolts to the concrete?

(5) Where primary battery, exclusively, is used for the line and local control circuits in A. P. B. approach-lighted color-light signaling, is it possible to effect an appreciable saving in battery expense by arranging as many of the circuits as possible to operate on the open-circuit principle, that is, by changing the system from normal-clear to normal danger operation?

(6) What are the advantages of approach-lighting automatic signals from headblock to headblock, as compared with approach lighting from opposing signal to opposing signal?

(7) What are the advantages in having the lights on a track model in an interlocking tower normally out rather than normally lighted?

to stop at the signal or has just passed it when the failure of power occurs.

If the smash signal were to go to the Stop position in case of a power failure, it may do so immediately in front of a train or while the train is passing and thus would become a probable source of damage to the train or injury to persons on the train or in the vicinity. Furthermore, a "smashed" signal under these circumstances might give misleading testimony against the crew of the train involved.

When a route has been cleared for a train, by its entrance on the approach, the smash signals along the route of that train should remain clear until the whole of the train has passed by them or until there is assurance that the train has been stopped without passing the signal. In other words, smash signals should be controlled in a manner similar to derails or switches in the route, i. e., they should be power operated both ways and when involved in a route they should be approach and route locked in their respective positions.

The smash-signal mechanism should, therefore, be so designed and the smash-board so counterweighted that in case of a power failure the board will remain in the position which it occupied when the power was cut off.

Compares Smashboard With Derail

W. C. Johnson
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To begin with it is improper to refer to this apparatus as a "Smash Signal," as it is in no sense of the word a signal, and an engineman is not permitted to pass same, even though it is in the reverse position, if the governing signal indicates Stop, unless some other action equivalent to dispatcher's authority is taken. Therefore, it should be referred to as a smashboard and its positions designated as normal and reverse, in order that it will not be confused with a signal or any of the phrases designating signal positions or indications.

I am firmly of the opinion that a smashboard mechanism should not be designed so that it will be automatically restored to the normal position by force of gravity in the event of power failure, but instead it should be so designed that it will remain nearly in the position it occupies when the power is cut off. There would be no objections, however, to the board assuming a position not more than 30 deg. from the vertical in case of power failures, which would tend to clearly indicate an "Out of Order" condition and in such position would in no way create a dangerous condition. Would it be proper to design the operating mechanism of a derail or switch in such a manner that the derail would open up, or the switch move to a different position automatically, in case of a power failure? No. Then why should a smashboard mechanism be so designed?

If a smashboard mechanism was designed to be restored to normal position automatically, in case of power failure, and a train desired to pass it, it would mean that an engineman or train-man would have to crank the smashboard to the reverse position and hold it in that position until the entire train had passed same. In single-track territory it would require a man at each smashboard.

I assume there are signal engineers who are advocating the return of the smashboard to the normal position by gravity, in case of a power failure, and if so I fear they will be very much embarrassed when asked, by their management, to explain why apparatus so designed was permitted to be installed on their railroad, if a power failure should occur at the same time that one of their crack passenger trains is passing the smashboard. It is not only possible, but probable, that such a failure will occur.

Same As Derail

L. S. Werthmuller
Assistant Signal Engineer, Missouri Pacific, St. Louis, Mo.

The signal, of course, should return to its most restrictive indication, but the smashboard should certainly be in the position it occupied when the power was cut off. A smashboard, when used, should be treated in the same manner as a derail and it certainly would not be practical to permit a derail to travel to its derailing position when the power fails. The circuit arrangement of the smashboard should, of course, be such that in the event of a power failure it would be impossible to place the smashboard against the line for which the smashboard was formerly clear.

Vertical Position by Gravity

F. B. Wiegand
Signal Engineer, New York Central, Cleveland, Ohio

The American Railway Association's recommended practice relative to derails as outlined in the Signal Section Manual reads: "Derails should not be used in main tracks." Smashboards are a substitute for derails in main tracks and if derails should not be used, presumably because their use creates an undesirable condition, it would appear that smashboards likewise should not be used, but if used in compliance with the requirements of public authorities, they should be designed so far as possible as not to create a condition which may be classed as undesirable.

It has been stated that smashboards which assume the horizontal position by gravity, have broken windows in passenger trains and otherwise caused damage to the cars. They may, if designed in that manner, cause injury to enginemen if a failure occurs at the time the train is approaching the signal. Although the possibilities just stated are somewhat remote, it would seem proper that consideration should be given to counterweighting the signal so that it will assume the vertical position in case of a failure or interruption of its control circuit.

Counterweighting Not Desirable

R. A. Sheets
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Smash-signal mechanisms should be designed so that in the event of a power failure, or for any other reason, the smashboard will remain in the position which it occupied when the power was cut off. In other words, a smashboard should be so designed that it will not operate to any position without the application of some electrical power or some manual power. To arrange them otherwise would present complications in the normal operation of such devices produced by reason of the passage of a train where such smashboards are track circuit controlled, and would probably result in damage to the smashboard by reason of failure of contacts or other circuit troubles where electrically controlled but not track circuit controlled, and certainly would present complications in the event it was necessary to manually operate a smashboard that was electrically controlled.

An electrically-operated smashboard should not operate to either the clear or the stop position by means of counterweights, but rather the device should require power to move it to either position and it should remain in the last position by reason of brake action. The same specification should apply to pipe-connected smashboards. Of course, all smashboards should be sufficiently heavy on the blade end to insure that they will assume the Stop position in the event of any breakage of apparatus.

George Stanley, signal supervisor, Minneapolis & St. Louis, expresses his opinion briefly: "Smashboards should return to their most restrictive position when power fails. This would be in line with the standard practice of signaling. The smashboard is used as a check, and, to make that check complete, the board should show danger or stop when the plant is out of order, whether this failure is due to power failure or to any other cause."

Motor-Car Protection

"If signal maintainers are required to use motor-cars in mountainous territory where there are sharp curves and the signals are too far apart to provide adequate protection, what supplemental protection, such as special indicators, etc., can and should be provided?"

Indicators Advisable at a Few Points

W. H. Stilwell
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In mountainous territory where curves are numerous, it is impracticable to locate signals in such a manner as to provide adequate protection for signal maintainers and others operating motor cars. If no supplemental protection is provided, the maintainer must, at some points, be governed strictly by the information he has received from the dispatcher. The result is that he will go as far as he can under the protection of signals and then wait for the expected train. This brings about delays in the work and increases overtime.

Such situations can be corrected at small cost by the installation of special indicators at the "dark spots" to repeat the indication of the signals around the curve. Investigation will usually reveal that such supplemental protection is needed at only a very few points on a division, but where it is needed it is economical to provide it, as its cost can perhaps be saved in a few months.

Indicators Give Vital Protection

W. D. Cleveland
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We have a 9-mile branch line, on which there is a 2¾ per cent grade and upon which freight trains, exclusively, are operated. This branch has a passing track at about its mid-point and three spur tracks lead off at different places. This 9-mile branch has 24 automatic semaphore block signals using the A. P. B. circuit.

Twelve indicators are provided for the use of signal, track and bridge forces, provision being made at each indicator so that a track car can be taken off quickly. Six of these indicators are normally de-energized so that a car must be brought to a Stop and the indicator button pressed.

This branch track follows a narrow gulch, the cliffs being about 100 ft. high. The longest piece of tangent track is about 1,400 ft. long. A large majority of the curves are 8 deg. or more, several are 16 deg., and there are 12 reverse curves. Trains are double headed and quite often two trains are coupled together, one cutting off on the rear to use a spur track. About 75 movements are made daily, including light engines, a majority of these moves being made in daylight for about two months each year during the fruit (pineapple) season. The gage of this road is three feet, trains are short, and a great many more are operated than would be under like conditions on a standard gage railroad.

Train crews get their own orders providing signals are clear for a move. There is only one operator, who is located at the junction of the double-track main line and the branch line. Dispatchers have very little time to give lineups, and when given, they are good for only five minutes. Thus, it can readily be seen that indicators are a necessary safety factor in this part of the world.

Indicator Is Inexpensive

R. B. Workman
Signal Maintainer, Colorado & Southern, Trinidad, Colo.

The small cost of a warning device, working in connection with the signal system, is paid for by the time saved in delays to maintainers and to gangs of men flagging around such curves. The installation of an indicator is simple where line wires are used for signal control circuits. A switch indicator is perhaps the best but a tower indicator can be used if housed in a box. The indicator can be mounted on a pole of the pole line or on a cable post. The indication control circuit can be had by tapping either the home or the distant signal control circuits.

Not Necessary to Stop

A. G. Turner
Signal Maintainer, Union Pacific, McCammon, Idaho

The question implies that the territory under discussion already has automatic block signals and thoroughly competent maintainers but that the protection is inadequate for safe operation of motor cars. On obscure curves, where vision is short, the most practical protection is a series of indicators installed at frequent enough intervals and with long enough controls to insure that the fastest trains on the line will be indicated far enough in advance to provide the maintainer time to remove his car under any condition.

It frequently happens that the view is long enough so that a repeater signal installed at a strategic point will be more beneficial than several indicators, especially if the repeater signal is of the semaphore type so that its position can be seen from both directions.

I have a satisfactory method of protecting my motor car, in mountainous territory, under these particular conditions. Our line at this point is double track, signaled on the polarized-circuit plan. The blocks are about a mile long, and are maintained as one track section. I connect my voltmeter to the rails through the wheels and metal brake shoes of my motor car. By a slight application of the brakes, at any time, I can ascertain the voltage on the track from the moving car. Thus, if the voltage should drop to 0.2 or 0.3 volt, the meter indicates that a train has followed my car into the block I am occupying. If the meter shows current to be flowing in the opposite or reverse polarity, it indicates that the signal ahead is in