# Editorial COMMENT

## Rule 204

Although the Interstate Commerce Commission's Rules, Standards and Instructions concerning signaling were issued in April, 1939, the exact meaning of Rule 204 is evidently not yet fully understood, and interpretations of the factors involved in compliance with this rule are not generally accepted. Therefore, a discussion of this rule based on comments from various sources, would appear to be in order. This rule reads as follows:

"Signals shall be spaced at least stopping distance apart or, where not so spaced, an equivalent stopping distance shall be provided by two or more signals arranged to display restrictive indications approaching signal where such indications are required."

This rule, in effect, is the same as item 4 in the A. A. R. Signal Section requisites for automatic block systems, which was approved by the Section in 1932 and appears in part 87 of the Manual. This requisite reads as follows:

"Signals spaced at least stopping distance apart or, where not so spaced, an equivalent stopping distance provided by two or more restrictive indications approaching signals requiring such indications."

### Sighting Distance and Service Brakes

Throughout the years, developments have been made to lengthen the distance that the aspects of a signal can be seen by an engineman of an approaching train, and wherever local conditions permit, signals are so located that they can be seen for the maximum distance. Many roads have rules to the effect that as soon as an engineman sees an aspect more restrictive than Clear, on the signal which he is approaching, he shall take action accordingly. On the other hand, it has been contended that the sighting distance to signals varies not only with local surroundings, but also with weather conditions, as well as with the presence of steam and smoke from locomotives of other trains. For these reasons, an engineman may not see the aspect of a signal until he approaches it quite closely, and for this reason, Rule 204 excludes the sighting distance from the train-stopping distance when determining the spacing of signals. Therefore, in order to comply with the first line of Rule 204, signals of the three-aspect type must be so spaced that an engineman who takes action at a signal displaying the Approach aspect, will have adequate distance in which to bring his train to a stop before arriving at the next signal. The sighting distance of a signal serves only as a margin of safety.

Furthermore, the Commission has taken the position that, in determining train stopping distances, the service application of the brakes, rather than the emergency application, is to be used. It is contended that enginemen do not ordinarily use the emergency brake application except when parts of a train are derailed or where the track is blocked or washed out within range of vision. In other words, when an engineman can see unoccupied track ahead, he ordinarily uses it to stop his train with the service application rather than taking the chances of making a rough stop and sliding the wheels on a passenger train, or causing a derailment due to the bunching of slack in a freight train. On some roads, especially on multiple track where a freight train might buckle and obstruct other tracks, the use of the emergency brake application is prohibited on freight trains except in cases of imminent disaster.

### Following the Word "Or"

The wording of that part of Rule 204 following "or" applies where signals of the three-aspect type cannot be spaced train stopping distance, as, for example, the signals at the two ends of a passing track, or for short blocks between interlockings, or between passing tracks. The word "restrictive," as used in this sense, applies to any aspect more restrictive than Clear, such as Approach or Stop,* as well as Advance-Approach, Advance-Approach-Medium, etc. In other words, if the desired result cannot be obtained with two-block three-aspect signaling, perhaps multiple-block signaling with signals displaying more than three aspects may be used, and so arranged that the first restrictive indication encountered will be located full train stopping distance from the signal at which a stop is required.

It is important also to consider the implications of the words "two or more signals." They do not suggest or prohibit the use of the same restrictive aspect on two or more successive signals; neither do they stipulate what restrictive aspects must be used, or specify the order of degrees of restrictiveness of the signals which are encountered successively as an engineman approaches.

With three-aspect, two-block signaling, and blocks shorter than train stopping distance, either of two procedures can be adopted. The controls can be changed to cause two or more successive signals to display the Approach aspect in approach to one displaying the Stop aspect. With this practice in effect, an engineman has the length of two Approach blocks in which to

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*In this discussion, for the sake of brevity, the word Stop is used to include either the Stop or the Stop-and-Proceed aspect.

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bring his train to a stop short of a signal displaying the Stop aspect. Also, where a block is less than braking distance, the home track circuit control of a three-aspect signal can be overlapped to include one or more track circuits in the next block. With the rear portion of a leading train occupying the overlap, two signals to the rear display the Stop aspect, and one signal the Approach. If the engineman of a second train does not bring his train to a stop in the Approach block, he can over-run the first Stop aspect the entire block length, and also over-run the second Stop aspect for the length of the unoccupied portion of the overlap, before striking the rear of the train ahead. When a leading train has passed beyond the end of an overlap section, the first signal to the rear continues to display the Stop aspect, but the aspect of the second signal changes from Stop to Approach. In this case, if the engineman of a second train does not get his train stopped in the Approach block, he can over-run the one Stop aspect the length of the overlap without striking the rear of the train ahead.

The use of two successive Approach aspects introduces train delays because rules, applying to the Approach aspect, require trains to run at half authorized speed and not to exceed 30 m.p.h. for two blocks, each of which is almost train-stopping distance. In some instances, several successive Approach aspects may be required, and trains may incur considerable delay, especially when approaching meeting points. With the overlap scheme, trains may or may not be required to make stops which otherwise would not be necessary. With either practice, following trains, or moves when entering or leaving a passing track, are spaced farther than otherwise necessary, and, therefore, track capacity is sacrificed and train operation is hampered. An important point, however, is that in all instances with either practice, adequate distance is provided, starting with the location of the first restrictive aspect, in which an engineman can stop his train before striking a train ahead.

### Equivalent and Duplicate

From the foregoing it would seem, at first consideration, that the practices previously explained would, to all intents and purposes, comply with Rule 204. This conclusion, however, overlooks the word "equivalent" which is correctly defined as "equal in value or dimension." Railroads using these arrangements may well contend that they are not only meeting, but are actually exceeding, the requirements of the rule in that they provide "more than" train stopping distance, and that if safety is thus provided, the Interstate Commerce Commission cannot criticize them for sacrificing track capacity as a necessary evil in compliance with Rule 204.

It might be contended in certain quarters, however, that as the years come and go, increased recognition must be given to the thought that the continued use of duplicate restrictive aspects on successive signals is not in accordance with sound basic principles of signal aspects for proper direction of train movements. It might be contended that if enginemen "get wise" to the fact that they are frequently encountering more than one Approach aspect at certain locations, they may be inclined to "crowd" the first one, and some day the second one will be red rather than yellow. Furthermore, it might be contended that aspects resulting from the overlap control may be confusing to enginemen, and sooner or later they may jump to a conclusion that over-running red signals is not hazardous, or in other instances, trains may be "spilled" in attempts to stop short of red signals.

### More Than Three Aspects

All this discussion leads to the important point that, where the blocks are shorter than train stopping distance, the railroads may find it necessary to use signals with more than three aspects. By using the aspect Advance-Approach on the signal in approach to one displaying the Approach aspect, which in turn is in approach to a signal displaying Stop, two shorter blocks totaling train stopping distance are available in which to stop a train short of a signal displaying Stop. On the basis of 7,000 ft. train stopping distance, the blocks can be 3,500 ft. long, rather than 7,000 ft. Based on the same trains, speeds and braking distances, and running normally under Clear aspects, the use of three-block, four-aspect signaling reduces the minimum "running spacing" between following trains 25 per cent, as compared with that necessary for two-block, three-aspect signaling. Based on a train-stopping distance of 8,000 ft., the reduction is from 16,000 ft. to 12,000 ft. What this means in reducing the number of train stops and unnecessary speed reductions may be explained in a later editorial.

### Advance-Approach and Approach-Medium

The reason for suggesting Advance-Approach rather than Approach-Medium as the fourth aspect requires some analysis. The A. A. R. Code, Rule 282, applying to the Approach-Medium aspect, reads, "Proceed approaching next signal at medium speed." The fact is that about two-thirds of the braking distance is traversed before the speed of a train can be reduced from a maximum of 80 or 90 m.p.h. to 30 m.p.h. Therefore, if the Approach-Medium aspect is used, and the signals are spaced so that an engineman can reduce speed to medium in one block, each block would be two-thirds of braking distance, and thus the desired result is not accomplished. The proper use of the Approach-Medium aspect is in approach to an interlocking home signal which is displaying a Medium-Clear aspect.

On the other hand, A. A. R. Code, Rule 282A, applying to the Advance-Approach aspect, reads, "Proceed preparing to stop at the second signal," and, therefore, each block can be one-half the total braking distance. Someone may ask, why tell an engineman what to do at a "second" signal, when ordinarily signals tell enginemen what must be accomplished at the "next" signal? The answer is that there is no use telling an engineman to bring his train down to medium speed in one-half braking distance, because this is impossible. The next question may be, why have a "next" signal if the engineman has his directions previously and is not to stop at the "next" signal but rather at the "sec-

ond" signal? The answer is that the "next" signal is there to complete the range of aspects of increasing restrictiveness from Advance - Approach, to Approach, and to Stop, and that this is one possible arrangement which permits the use of blocks which total the "equivalent" of train stopping—not "more than" such a distance. Furthermore, the "next" signal is there to give enginemen the advantage of information regarding a change in conditions by permitting the display of a "better" aspect at more frequent intervals.

### A Conclusion

In conclusion, therefore, consideration may well be given to the fact that, ultimately, signals with more than three aspects may be required where blocks are of necessity less than braking distance in length or where such blocks are an advantage between interlockings or passing tracks, as well as in approach to interlockings and passing tracks.

# Bureau of Safety Annual Report

The Interstate Commerce Commission has issued the annual report of the Director of the Bureau of Safety for the fiscal year ending June 30, 1940. Copies of this 51-page booklet can be secured for 10 cents each from the Superintendent of Documents, Washington, D. C.

Among other subjects, this report explains actions which were taken under paragraph (b) of Section 26 of the I. C. C. Act, as amended in 1937, otherwise known as the Signal Inspection Law. Table 5 of the report lists separate entries for each railroad and shows a total of 37,306 false restrictive failures, as compared with 38,123 for the previous year; 276 false proceed failures, as compared with 262 for the previous year; and 63 potential false proceed conditions, as compared with 53 for the previous year. Table 5a classifies the number of false restrictive failures, false proceed failures and potential false proceed conditions.

The section of the report devoted to highway-railroad grade crossings covers the calendar year 1939, and shows that for the year there were 3,476 accidents which resulted in the death of 1,398 persons and injury to 3,999 persons. These figures can be compared with those for 1938 which listed 3,494 accidents, 1,517 persons killed and 4,018 injured. Of the accidents in 1939, trains were derailed in 54 instances resulting in the death of 43 persons, as compared with 38 such accidents and 43 deaths in 1938, and 65 such accidents and 40 deaths in 1937.

TABLE 5a.—Causes of false proceed failures reported by carriers for the year ended June 30, 1940, as listed in table 5.

| Name of railroad | Sand or rust on rails | Failure of relays and similar devices | Wires broken, crossed, grounded, foreign current, etc. | Apparatus broken defective, or out of adjustment | Failure of apparatus due to sleet, ice, snow, wet track, weather, or lightning | Failure of apparatus due to obstruction | Errors in making connections or adjustments | Undetermined | Total |
|---|---|---|---|---|---|---|---|---|---|
| Atchison, Topeka & Santa Fe | 1 | | 1 | 3 | | | | 1 | 6 |
| Baltimore & Ohio | 4 | 3 | 2 | 6 | 2 | 1 | | 2 | 20 |
| Bangor & Aroostook | | | 2 | | 1 | | | 1 | 4 |
| Boston & Albany | | | | 2 | | | 1 | | 3 |
| Boston & Maine | | | 1 | 2 | | | | | 3 |
| Central of Georgia | | | | | 1 | | | | 1 |
| Central Railroad of New Jersey | 1 | | | 2 | | 1 | | | 4 |
| Chesapeake & Ohio | 1 | 1 | | | | | | 1 | 3 |
| Chicago & Erie | | | | | | | 1 | | 1 |
| Chicago & North Western | | | | | 1 | | | | 1 |
| Chicago, Burlington & Quincy | | | 7 | 2 | | | | | 9 |
| Chicago Great Western | | | 1 | 1 | | | | | 2 |
| Chicago, Indianapolis & Louisville | 1 | | | 2 | 1 | | | | 4 |
| Chicago, Milwaukee, St. Paul & Pacific | 1 | | 4 | 1 | 1 | | 1 | | 8 |
| Chicago, Rock Island & Pacific | 2 | | | 1 | 1 | | | | 4 |
| Chicago, St. Paul, Minneapolis & Omaha | | | 1 | | | | | | 1 |
| Chicago South Shore & South Bend | | | | | 1 | | | | 1 |
| Cincinnati, New Orleans & Texas Pacific | | 1 | 1 | | 1 | | | | 3 |
| Cleveland, Cincinnati, Chicago & St. Louis | | | | 1 | 1 | | | | 2 |
| Delaware & Hudson | | | 1 | | | | | | 1 |
| Delaware, Lackawanna & Western | 1 | 1 | 3 | 4 | 3 | | | | 12 |
| Erie | 1 | | | | | | | | 1 |
| Illinois Central | | 1 | | 2 | 1 | | | | 4 |
| Illinois Terminal System | | 1 | | | | | | | 1 |
| Lehigh Valley | | | | | 1 | 1 | | | 2 |
| Long Island | 1 | | | | | | | | 1 |
| Louisville & Nashville | 1 | | 1 | 3 | | | | 1 | 6 |
| Maine Central | | | | | 1 | | | | 1 |
| Minneapolis, St. Paul & Sault Ste. Marie | | | | | 1 | | | | 1 |
| Missouri & Illinois Bridge & Belt | | | | 1 | | | | | 1 |
| Missouri-Kansas-Texas of Texas | | 1 | | | | | | | 1 |
| Missouri Pacific | 1 | | | 2 | | | 1 | | 4 |
| New York Central (eastern lines) | | 1 | | | 1 | | | | 2 |
| New York, Chicago & St. Louis | 1 | | | 2 | | | | | 3 |
| New York, New Haven & Hartford | | | | | 1 | | 1 | | 2 |
| Norfolk & Western | | 1 | 5 | 1 | 2 | | 2 | | 11 |
| Northern Pacific | | 1 | 1 | | | | | | 2 |
| Oahu Railway & Land Co | 3 | | | | | | | 1 | 4 |
| Pennsylvania | 21 | | 6 | 7 | 1 | | 3 | 5 | 43 |
| Pennsylvania-Reading Seashore Lines | | | | 1 | | | | | 1 |
| Pere Marquette | | | 1 | 1 | | 2 | | | 4 |
| Pittsburgh & Lake Erie | | | | | | 1 | | | 1 |
| Pittsburgh & West Virginia | 1 | | | | | | | | 1 |
| Portland Electric Power | | 19 | 4 | 11 | 1 | 2 | | 1 | 38 |
| Reading | | | | 2 | | 3 | | | 5 |
| Richmond, Fredericksburg & Potomac | | | | 2 | | | | 1 | 3 |
| River Terminal | | | | 3 | | | | | 3 |
| St. Louis-San Francisco | | | | 2 | 1 | | | | 3 |
| Southern | | | | | 1 | | | | 1 |
| Southern Pacific | 3 | | 2 | 2 | 2 | 3 | 2 | 2 | 16 |
| Texas & New Orleans | | 1 | | | | | | | 1 |
| Union Pacific | | 1 | 1 | | | | | | 2 |
| Wabash | | | | 1 | | | | | 1 |
| Washington Terminal | 9 | | | | | | | 1 | 10 |
| Western Maryland | | 1 | | | 1 | | | | 2 |
| Youngstown & Northern | | | 1 | | | | | | 1 |
| Total | 54 | 34 | 46 | 70 | 29 | 14 | 12 | 17 | 276 |