NATIONAL CONFERENCE ON STREET AND HIGHWAY SAFETY

Honorable ROBERT P. LAMONT
Secretary of Commerce, *Chairman*

Changes Proposed
by
American Engineering Council Committee
in Report on
Street Traffic Signs, Signals and Markings

Washington, D. C.
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FOREWORD

The report on Street Traffic Signs, Signals and Markings*, prepared by the American Engineering Council for the National Conference on Street and Highway Safety and published in January, 1929, has, in part or in whole, been put into effect in numerous cities and towns throughout the country. There has thus been considerable experience in the practical application of its recommendations.

As a result of this experience and in the light of further developments in traffic control measures it appears that certain modifications in the report are desirable. Accordingly, American Engineering Council's Committee, which prepared the original report, has now reviewed its previous findings and has proposed changes in the report as hereinafter set forth.

The report as modified has also been considered and approved by the Committee on Uniform Traffic Regulation of the National Conference on Street and Highway Safety.

The report as revised will be considered by the Third National Conference on Street and Highway Safety to be held in Washington, May 27-28-29, 1930.

Criticisms and suggestions regarding the report and the proposed changes are invited. They may be submitted prior to the National Conference by addressing A. W. Koehler, Secretary, National Conference on Street and Highway Safety, 1615 H Street, N. W., Washington, D. C. All such communications will be considered and the proposed changes finally reviewed by the American Engineering Council Committee and by the Committee on Uniform Traffic Regulation at a meeting immediately preceding the Conference.

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* Copies of this report can be obtained by addressing the National Conference on Street and Highway Safety, 1615 H Street, N. W., Washington, D. C.

Page 8. RECOMMENDATION 1.—*Material and Finish.*

Add a new item: (d) Use non-corrosive screws and washers for attaching sign to its support in order to avoid discoloration.

RECOMMENDATION 2.—*Shapes and Dimensions.*

In line 5 of the explanatory paragraph, change the word "slower" to "more slowly."

Page 9. RECOMMENDATION 4.—*Lettering and Wording.*

Add explanatory paragraph:

Letters and figures used on signs recommended in this manual are of standard proportions based on the alphabets issued by the U. S. Bureau of Public Roads. Full size drawings of these letters for sizes covering from 2″ to 8″, and for Series A to F in width, may be obtained by application to the Bureau.

Page 10. TOP OF PAGE—ITEMS UNDER RECOMMENDATION 5.—*Illumination.*

Change item (b) to read: (b) Illuminated by light within or behind sign.

In item (c), insert the word "adequately" after the word "illuminated."

RECOMMENDATION 7.—*Height and Location.*

Change section (a) to read:

(a) The center of a sign on a fixed post back of the curb shall be 8 feet above the road pavement, and no part of the sign shall be closer to the curb line than 12 inches.

Add a second explanatory statement as follows:

Signs should not unnecessarily be placed on, or within ten feet of, poles which have to be climbed.

Page 11. RECOMMENDATION 8.—*Railroad Crossing.*

Add after item (b), in parenthesis, the following phrase: "(unless inconsistent with state laws)."

Add new item (d): In case of multiple tracks, there shall be mounted below the crossbuck arms a sign indicating in black letters on a white background, the number of tracks.

RECOMMENDATION 9.—*Railroad Crossing Approach.*

Add to item (b): "or in case there is more than one track at the crossing, an additional horizontal line."

Page 12. *Top of Page.*

Add to item (d) "or in special cases at a line marked on the pavement for this purpose."

RECOMMENDATION 12.—*Dangerous Intersection.*

In line 2, change the words "Cross" and "Street" to "Dangerous" and "Corner."

Recommendation 12½ (New).—*Railroad Crossing.*

At a railroad crossing where a stop is mandatory, use the stop sign (Figure 1) bearing the words "Rail" and "Road" in the message space.

RECOMMENDATION 13.—*Dead End Street.*

Change the beginning of the first sentence to read: "At the end of a street which has no outlet."

RECOMMENDATION 15.—*Signs for Other Locations.*

In the 1st line, change "should" to "are required to."

RECOMMENDATION 16.—*General Specifications—Slow Signs.*

In the 3rd line, change "may" to "shall," making it read: "Corners *shall* be rounded," etc.

End item (c) with the words: "above the center line with the symbol below."

Page 13. RECOMMENDATION 18.—*Street Car Crossing.*

At the end of item (a) insert "special" before "caution."

RECOMMENDATION 19.—*Cross Street.*

Change the heading to "Dangerous Intersection" and the words "Cross Street" in the 1st line of item (a) to "Dangerous Corner."

(This sign is to be re-designed by the Drafting Committee to conform to the above change.)

RECOMMENDATION 21.—*Curve.*

Change the 1st line of item (a) to read: "At every curve having a radius of from 200 to 600 feet," etc.

Page 14. RECOMMENDATION 22½ (New).—*Reverse Curve.*

(a) At any irregular series of curves where conditions require

a reduction of speed, use the slow sign without lettering, bearing an arrow shaped so as to indicate the direction of the curves.

(This sign is to be illustrated.)

RECOMMENDATION 24.—*General Specifications—Caution Signs.*

Item (a) line 3, change "may" to "shall," making it read: "corners *shall* be rounded," etc.

Item (b). The size of the letters may be changed from 3-inch to 2-inch if the drafting committee finds this to be feasible after experimentation.

RECOMMENDATION 24½ (New).—*Cross Street.*

(a) The caution sign (Figure 7) with the words 'Cross Street' in 3½-inch letters in two lines in the message space and a symbol below to indicate the type of street intersection (symbols), shall be placed at every crossing which is hazardous and requires caution but does not warrant a stop or slow sign.

(b) The sign shall be illuminated at night.

Page 15. RECOMMENDATION 29.—*One-Way Street.*

Add at end of item (b): "or attached to it."

Page 16. RECOMMENDATION 34.—*Dead End Street.*

After the word "placed" near the end of the second line, insert the words "on each side."

RECOMMENDATION 35.—*Direction.*

Change item (c) to read: An arrow shall be placed in line with, and on the side of the message in the direction to be taken.

Page 17. RECOMMENDATION 39.—*General Specifications—Restriction Signs.*

In Section (e), item (1) after "No Parking," insert in parenthesis (No Standing, No Stopping).

Add after item (e) the following explanatory paragraph:

A reversal of the colors for background and lettering is permissible provided the code meaning of the colors is retained, namely, red for prohibited parking and green for permitted parking.

Page 19. SECTION 2.—*Reasons for the Installation of Signals.*

Beginning with the second paragraph under item (b) change rest of discussion to read:

Several jurisdictions have declared minimum limits of traffic volume below which signals shall not be installed or operated. The

Massachusetts Traffic Control Signal Code, promulgated by the Department of Public Works under statutory authority, requires total traffic through the intersection equaling at least 500 vehicles per hour of which at least 125 must be from the minor street; or total vehicular traffic of at least 500 vehicles per hour combined with total pedestrian traffic equalling at least 250 per hour; or, under certain conditions, a signal system may be installed to control speed; while in certain cases an individual signal will be authorized as part of a coordinated system even where the traffic at that point is below the minimum. Traffic actuated signals will sometimes be authorized regardless of these minimum requirements. Even with traffic above the minimum, local authorities must obtain approval of the state before making installations.

The Chicago standard is as follows:

"The City of Chicago measures the need for signals on the vehicular flow, although pedestrian movement is also counted and considered as an auxiliary factor. This established standard is that the intersection of two roadways each having two free lanes for movement in each direction must have at least 1,200 vehicles passing through it in the maximum hour and at least 25 per cent of this in the lighter travelled street to justify the installation of signals for use only in rush hours. If the intersection has this standard in rush hours and at least 16,000 vehicles in a 16-hour period, the signals may be operated all day. If the volume of traffic falls below 800 vehicles per hour the signals should not be operated for such periods and an illuminated "Stop" sign or "Caution" sign should be displayed.

"On the street of three free lanes in each direction the number of vehicles must be at least 25 per cent greater than on a street of two free lanes in order to meet the minimum requirement.

"Streets of more than three lanes in each direction need lane markings in order to get reasonable use of the street in proportion to the width.

"Signals are needed for the streets wider than six lanes (counting both directions) for a volume of traffic that is much lighter per lane than for narrow streets because the zone of confusion for the crossing vehicles and pedestrians is so much greater that safety cannot be created without signals or officers. Safety islands are highly desirable in such wide streets.

"Signals are sometimes needed at certain busy intersections that are perhaps a half-mile apart along a main thoroughfare and would not be necessary at the intersections with the lightly traveled intermediate streets from the standpoint of traffic volume. It would usually be desirable to connect up such signals as a system so controlled as to permit progressive movement for the through traffic. Then signals are not only justified, but highly desirable at the intermediate streets so as to control the speed along the main street to that for which

the system is set, to establish a definite safe time for the cross street travel and so to insure orderly safe operation throughout the system of control."

The adoption of such minimum limits will save the time of city authorities in making elaborate studies and debating with interested parties the installation of signals at points where they are obviously not desirable. Where the volume exceeds the established minimum, the authorities should still examine carefully the characteristics of the vehicular and pedestrian traffic, including type of vehicle, speed, turning movements, and the physical conditions of the intersection. No signal should be installed unless there is a practical certainty that the delays or hazards will be less after installation than before. Where expedition of traffic rather than safety is the paramount consideration care must be taken in installing traffic control signals, because an unwise regulation will retard rather than expedite traffic. Some traffic control signals that are installed to control the peak traffic, such as exists at certain hours of the day, or on Sundays and holidays, should not be operated at other times when the volume of traffic does not warrant such control.

The ideal condition would be realized if every vehicle could find the signal set in its favor so that it could pass without delay, and the nearest approach to this ideal has been offered by the recent development of traffic actuated control devices which pass traffic as it arrives and only operate on a fixed time limit when there is traffic waiting in both directions at the same time. These devices have been popularly called 'Demand Signals' and their successful operation is obviously a distinct advance in the art of traffic control signalling, because they are adaptable to a wide range of different conditions. Not only are they good for the operation of an independent signal, but they can be adapted for use in any of the coordinated systems. In addition they serve many special uses such as passing either pedestrian or vehicular traffic across a heavily traveled artery or the selective handling of many lines of traffic through a multiple or irregular shaped intersection. Their use is still in process of development and undoubtedly the scope of their application will be greatly widened as experience with them accumulates.

Page 20. DEFINITION OF TERMS.

Revised to read: The following definitions are used in this report and their general use is recommended for avoidance of confusion.

RECOMMENDATION 51.—*Types of Support.*

Insert a new item (c) "Mast Arm," changing present item (c) to (d).

RECOMMENDATION 52.—*Method of Operating Traffic Control Signals.*

Delete the word "Systems" in the title and first line of the text.

Add a new item (d) as follows:

"(d) Traffic Actuated . . . Controlled by mechanism actuated by impulse derived from vehicle or pedestrian."

Page 21. CLASSIFICATION OF TRAFFIC CONTROL SIGNAL SYSTEMS.

Change heading to: "Classification of Traffic Control Signals."

Replace introductory paragraph with the following sentence:

The use of the following classification of traffic control signals is recommended.

Page 21. RECOMMENDATION 53.—*Types of Systems.*

Change entire recommendation to read:

RECOMMENDATION 53..—*Types of Traffic Control Apparatus.*

Traffic control signals may be divided into two general classes designated as independent and coordinated. When a group of signals are coordinated they form a traffic control signal system, of which there are two general types, classified as simultaneous and progressive. The above mentioned signals and systems may be described as follows:

1. *Independent Signal.*—A signal not inter-connected with or related in its operation to any other signal.

2. *Simultaneous Signal Systems.*—All signals in the system change signal indications simultaneously:

(a) *Direct Simultaneous.* All signals show the same color in the same direction simultaneously.

(b) *Alternate Simultaneous.* Alternate signals or groups of signals show opposite colors in the same direction at the same time, thus allowing a measure of progressive movement.

3. *Progressive Signal Systems.*—Signal indications of all signals in the system change in accordance with a timing schedule to permit continuous traffic movement:

(a) *Flexible Progressive.* All signals are interconnected to a master controller which maintains the same total time period at each intersection and by which the period may be varied to meet changing traffic conditions. The master controller automatically insures that all signals be continually kept in their proper time relation. In addition, a different division of the period can be made at each intersection.

(b) *Limited Flexible Progressive.* Signals are operated by individual synchronous motors at each intersection. All signals have the same total time period, which cannot be readily varied, but a different division of the period can be made at each intersection.

Page 21. SELECTION OF METHOD OF OPERATION.

Change to read: "Selection of Type of System."

Page 21. FLEXIBLE PROGRESSIVE SYSTEM.

In the first sentence, strike out everything after "and is," and substitute: "particularly adapted to the control of signals on a number of adjacent streets that form a district, when the traffic at individual intersections is both unbalanced and variable as between different hours of the day."

Retain the remainder of the paragraph.

Page 22. Following the subsection on "Flexible Progressive System" insert the following subsection.

LIMITED FLEXIBLE PROGRESSIVE SYSTEM.

Where or when the cost of signal interconnection is unwarranted, the limited flexible progressive system is recommended. This condition may occur on a through highway where signals for the time being are desired primarily to promote orderly group traffic movement. Such signals would be best adapted to intersections about 1500 to 2000 feet apart.

While this system has some of the advantages of the Flexible Progressive system, it is subject to the following disadvantages not inherent in the Flexible Progressive:

(1) The total time period cannot be changed readily.

(2) The controllers require constant attention and supervision to insure that the signals keep the proper time relation.

Page 22. LIMITED PROGRESSIVE SYSTEM.

Change the heading "Limited Progressive System" to "Alternate Simultaneous System."

In the first line of text, change the word "synchronized" to "simultaneous."

SYNCHRONIZED SYSTEM.

In heading and first line of text, change the word "synchronized" to "simultaneous."

INDEPENDENT SIGNAL.

In next to last line of paragraph, omit "such as a 'through traffic street'"; and at end of paragraph, omit the parenthesis (See Rec. 64).

Page 23. Following the sub-section "Independent Signal," insert the following paragraph:

TRAFFIC-ACTUATED CONTROL

This type of control is often well adapted to irregular intersections, particularly where more than two streets cross. Its use is also worthy of consideration at intersections with intermittent or variable traffic. However, as traffic becomes heavier and more uniform on the intersecting streets, the signal intervals tend to approach those of signals with fixed periods. If this condition continues during any considerable portion of the day, the advantages of traffic actuated control diminish and it becomes less and less advantageous to install such apparatus if it is more costly.

If specifically arranged so that the signal may be actuated by pedestrians, it may be used where, at irregular intervals, pedestrians must cross a heavy traffic street.

Page 23. NEW RECOMMENDATIONS (*Replacing recommendations* 62, 63, 64).

Insert the following recommendation immediately preceding the heading "Use of Colors."

Recommendation 53½.—*Main Thoroughfare Traffic Control.*

(a) Where traffic is controlled continuously for a considerable distance, each intersection of a main thoroughfare with a cross street shall be protected.

(b) If the traffic on the cross street is heavy, the protection shall be by traffic signal.

(c) If the traffic on the cross street is light the protection shall be by "STOP" sign. (See Rec. 11.)

The practice of using a few widely separated traffic control signals on a main thoroughfare to control all intersections on that thoroughfare is exceedingly dangerous and is *not recommended*, unless Stop Sign protection is provided as recommended in item (c) above.

RECOMMENDATION 54.—*Three-Color System.*

Omit last sentence of explanatory text.

RECOMMENDATION 55.—*Meaning of Colors in Three-Color System.*

Insert after item (c) the explanatory paragraph following item (b) of Recommendation 57.

Change item (d) to read: Yellow alone shall not be used in traffic control systems as a special period for the turning of vehicles or the movement of pedestrians.

Substitute the following for the explanatory text appearing at the end of the Recommendation:

Pedestrians, due to their much slower speed, are often unable to complete their crossing of a street before the signal changes, causing either hazard to themselves or delay for the vehicles. At some intersections where pedestrian movement in all directions is heavy at times, especially if combined with complicated vehicular turns, it has been found necessary to set aside a time interval for exclusive pedestrian use of the intersection. As stated the use of yellow alone in such a case is *not recommended* because it would conflict with the standard significance of that color. Various expedients are being tried to meet this situation, as for instance the use of a special color or the combination of two of the regular colors, as in Boston, where the combination of yellow with red is used for the exclusive movement of pedestrians. Another attempt to solve this difficulty is in progress in Pittsburgh, where the pedestrian is warned when it is no longer safe for him to start across by displaying the yellow signal overlapping the green toward the end of the green interval, after which the yellow appears alone to indicate the usual clearance period for vehicles. As yet there has not been sufficient experience with any of these methods to warrant the establishment of a definite recommendation.

Page 24. RECOMMENDATION 59.—*Right and Left Turns.*

Add to section (b): While red is shown on regular signal to stop through traffic.

GENERAL SPECIFICATIONS.

Insert just before Recommendation 60, the heading, "General Specifications."

RECOMMENDATION 61.—*Location of Signals.*

Under item (b) revise the order of preference as follows:

1. Two-way signals with faces 90 degrees apart, on posts or brackets on each far right corner. (Three-way or four-way signals may be used to meet special conditions.)
2. One-way signals on posts or brackets on each far right corner.
3. Four-way signal suspended over center of intersection.
4. Four-way signals on posts or brackets on opposite diagonal corners.

In the first line of the explanatory text, change "Four-way" to "Two-way."

In the second paragraph, insert "One-way" at the beginning of the first sentence and delete the last sentence.

Replace paragraph five with the following, inserting it immediately after paragraph three:

Signals on two diagonally opposite corners should be placed on the

far side, near the curb, for vehicles on the more important street; they will then be on the near side (or the far left side) and some distance from the curb line, for vehicles on the cross street, which makes such installations less satisfactory than signals on all four corners.

RECOMMENDATIONS 62, 63, AND 64.

These three recommendations have been incorporated in the new Recommendation 53½, and hence are to be deleted.

Page 26. EMERGENCY CONTROL.—*Delete.*

CYCLE LENGTHS.

Delete the heading and insert the text following as an explanatory note under Recommendation 66, changing the first sentence to read: "The length of the total time period should be determined," etc.

RECOMMENDATION 66.—*Timing of Cycles.*

Change the heading to "Time Periods."

In item (a) change the words "cycle length" to "total period."

In item (b) change words "cycle lengths" at the beginning of the sentence to "total periods," and at end of sentence to "time periods."

At the end of the first sentence of item (b), add: "or to meet other street conditions, especially if centrally controlled."

In item (c) last line, omit the word "preferably."

Page 27. RECOMMENDATION 67.—*Train Approach Signals.*

Change paragraphs (a) and (b) to read as follows:

(a) A wigwag signal with a swinging target and red light.

(b) A flashing light signal with two red lights in a horizontal line 30 inches apart, flashing alternately.

RECOMMENDATION 69.—*Lighting of Traffic Officers.*

Change title to: "Illumination of Traffic Officers."

Page 28. RECOMMENDATION 71.—*Pavement Lines.*

Change section (k) to read: Directional lines consisting of series of arrows in center of traffic lane.

Add new section following (d): At all signal intersections and especially opposite safety zones.

Add a new section (l): Warning of Approach to Railroad Crossing.

Page 29. RECOMMENDATION 71½ (New).—*Railroad Crossing Pavement Markings.*

As a supplementary advance warning of approach to railway grade crossings on hard surface, heavily traveled highways where rail traffic is fast or frequent, pavement markings should be employed, using the standard form approved by the American Association of State Highway Officials."

RECOMMENDATION 72.—*Curb Markings.*

In the second paragraph change "Prohibited parking" to "Prohibited stopping."

Reverse the order of the items referring to loading zones and passenger zones.

Insert at the end of the Recommendation, the following explanatory paragraph:

This code is intended for use in places where there are frequent variations in the regulations in a comparatively short distance. Where a single regulation applies to a long distance, signs should be used instead of curb markings.

Page 30. RECOMMENDATION 79.—*Flexible Sign Inserts.*

Change title to: "Flexible Sign Markers."

In the 1st line, change the word "insert" to "marker" and omit the word "marker" after "alternative."

Beginning with the 4th line from the bottom, change to read: "comply with the standard colors for signs used for identical purposes. The base of the marker shall be attached to the pavement," etc.

Page 32. RECOMMENDATION 82.—*Positions of Safety Zones.*

Change section (a) to read: "Safety zones should be established at street-car stops where traffic is heavy," etc.

Change section (b) to read: "Safety zones should be established in crosswalks on wide heavily traveled streets or at any hazardous intersection."

Page 33. *Item (b), top of page.*

The distance "20 feet" in the last line is to be changed to "30 feet" to conform to the distance recommended in the Uniform Vehicle Code and Model Ordinance.

RECOMMENDATION 85.—*Raised Safety Zones.*

Insert "at least" before "4 feet wide" in the 1st line, and omit the

section of the sentence reading "shall have a clearance of 4 inches from the side of the street car."

Insert explanatory text: Because of the difference in widths of cars, no standard distance from the rail can be established. Platforms should be built to properly accommodate the narrowest car. If any cars are operated which would overhang the edge of the safety platform, warning of this fact should be given by a line marked at a safe clearance distance.

RECOMMENDATION 86.—*Protection of Safety Zones.*

Add after item (f) in parenthesis: (See Rec. 80).

Page 35. STOP SIGN.—*Figure 1.*

Shade of yellow shown on illustration to be changed to "Lemon" yellow.

Page 36. SAFETY ZONE SIGN.—*Figure 2.*

Arrow to be re-designed so as to have larger head.

Page 37. CROSS STREET SIGN.—*Figure 3.*

This sign is to be re-designed as a slow sign for a dangerous intersection to conform to Recommendation 19 as changed.

Page 39. CURVE SIGN.—*Figure 5.*

Design of arrow indicating curve to be changed.

Page 42. ONE-WAY AND DETOUR SIGN.—*Figure 8.*

Shape of arrow to be changed.

NEW SIGNS TO BE ILLUSTRATED:

Cross Street (Caution Sign—Rec. 24½).
Reverse Curve (Slow Sign—Rec. 22½).
Direction (Information Sign—Rec. 35).