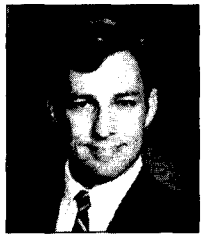
Evolution of the MUTCD: Early Standards for Traffic Control Devices

BY H. GENE HAWKINS, JR.

Seventy years ago, traffic control devices were a concern of relatively few individuals in the United States. Signs and markings were placed and maintained by auto clubs, local agencies, or state highway departments, with little regard for uniformity in appearance or consistency in use. As automobile use increased and drivers traveled greater distances from home, the need for an improved system of traffic control devices arose. Two national manuals, one on rural signing and the other on urban traffic control devices, were the first attempts to fill this need. These two manuals led the way for the publication of the *Manual on Uniform Traffic Control Devices* (MUTCD), which sets forth the basic principles that govern the design and use of traffic control devices. The MUTCD, first published in 1935, has always been one of the "bibles" of the profession and continues in that capacity today. Practitioners, administrators, researchers, and others use it on a daily basis and continually search for ways to improve traffic control devices.

The evolutionary nature of traffic controls has resulted in constant revisions to the standards for those devices. Since 1935, a new edition of the MUTCD has been published about every 10 years. The tendency of transportation professionals is to focus on the current edition of the MUTCD or on the preparation of the next edition. Prior editions are given little thought because the information in them is perceived as no longer relevant to everyday practice. Up until a few years ago, there were numerous individuals who had personal knowledge about the history of standards for traffic control devices. Unfortunately, most of the pioneers in setting standards and writing the early editions of MUTCD are gone, and there are very few copies of the early editions and little readily available documentation about their development.

Most transportation researchers are not aware of how the MUTCD evolved into its current form. Because a knowledge of the past is necessary to move into the future, this article (and its companion article, to be published in a subsequent issue of *ITE Journal*) will highlight the development of standards for traffic control devices and the evolution of the MUTCD. It is hoped that this information will lead to more effective use of the current MUTCD and a more thorough understanding of its principles.



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Early Efforts Toward Uniformity

Traffic control devices were starting to appear on streets and highways in the 1910s. The first center line was used in Michigan in 1911. Cleveland, Ohio, is generally credited with the first electric traffic signal installation (1914). The first stop sign was installed in Detroit in 1915, and Detroit was also first to use the three-color traffic signal (1920). There was, however, little coordination in the use of these devices among the different localities.

Prior to the early 1920s, little effort was made toward providing a system of uniform traffic control devices. Traffic volumes and speeds were relatively low, and drivers were expected to fend for themselves. After the end of World War I, automobile and truck travel began to increase, and the trucking industry established itself as an important means of

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transporting goods. Many travelers began driving in unfamiliar areas on roads with unknown characteristics. Traffic engineers and administrators began to realize that an efficient system of highways was necessary and that effective traffic control devices were an important part of that system.

The first effort to establish a basis for uniformity in signing and marking took place in the fall of 1922, when W. F. Rosenwald of Minnesota, J. T. Donaghey of Wisconsin, and A. H. Hinkle of Indiana made a trip through several states to try to work out some uniformity or standardization in the marking and signing of highways.[1] Their findings were reported at the 1923 annual meeting of the Mississippi Valley Association of State Highway Departments (MVASHD). That body agreed on a signing plan that used distinctive shapes for different danger conditions—the same sign shapes in use today (Figure 1).

The progression in shapes from a circle to a square was intended to indicate increasing levels of danger. Round and octagonal shapes were selected to indicate the most danger because they required the most cutting and wastage, and they would also have the fewest number of installations.[2] All signs were to have black letters or symbols on a white background.

It was about this time that hand painting of signs was being replaced by a process in which the sign message and border were embossed on sheet metal.[3] The sign was then dipped in paint to establish the sign background, and a black roller was used to paint the embossed border and message. This innovation greatly increased the number of signs that could be produced. The machinery used in this process, however, limited the sign size to 24 inches, so 24 in. was adopted as the standard size in MVASHD's plan.

Shortly after the MVASHD meeting, the Minnesota Department of Highways published the *Manual of Markers and Signs*, which is thought to be the first state manual for signing.[1] This manual used the sign shapes recommended by the MVASHD, but required a yellow background instead of a white background. Other states also developed standards for traffic control devices. Figure 2 illustrates standard signs used in Idaho and pavement markings used in Massachusetts in the early 1920s.

National Manuals on Traffic Control Devices

Between 1923 and 1927, several organizations were working to establish a national uniform system of signing and marking. The most significant of the activities were sponsored by the American Association of State Highway Officials (AASHO, now known as AASHTO, having added the word *transportation* to its name) and the National Conference on Street and Highway Safety (NCSHS). Each of these organizations published a manual of standards for signs and other traffic control devices.

Rural Signing Manual

At its 1924 annual meeting, AASHO adopted the MVASHD plan for sign shapes, but specified that all warning signs were to be black on yellow (warning signs at the time included round, octagonal, diamond, and square shapes). At that meeting, the use of red and green on signs was rejected on the basis of inadequate visibility at night. A light background (yellow or white) was recommended. At the time, signs were not normally illuminated or reflectorized; they depended completely on headlights for illumination. Red and green did not provide sufficient contrast in low light conditions. Another important action taken at the annual meeting was the cre-

Shape	Appearance	Purpose of Shape
Round	○	Used only to warn of a railroad crossing.
Octagon	⬡	Used only to signify a stop.
Diamond	◇	Used to indicate ordinary conditions of danger requiring precaution at all times.
Square	□	Used to indicate intermittent danger conditions requiring little more than ordinary care.
Rectangular	▯	Used to indicate regulatory or directional information.
Cut-Out	☆	Used a distinctive shape different from the above to identify highway routes.

Figure 1. Various sign shapes used to indicate different danger conditions. (Source: cited reference 1)

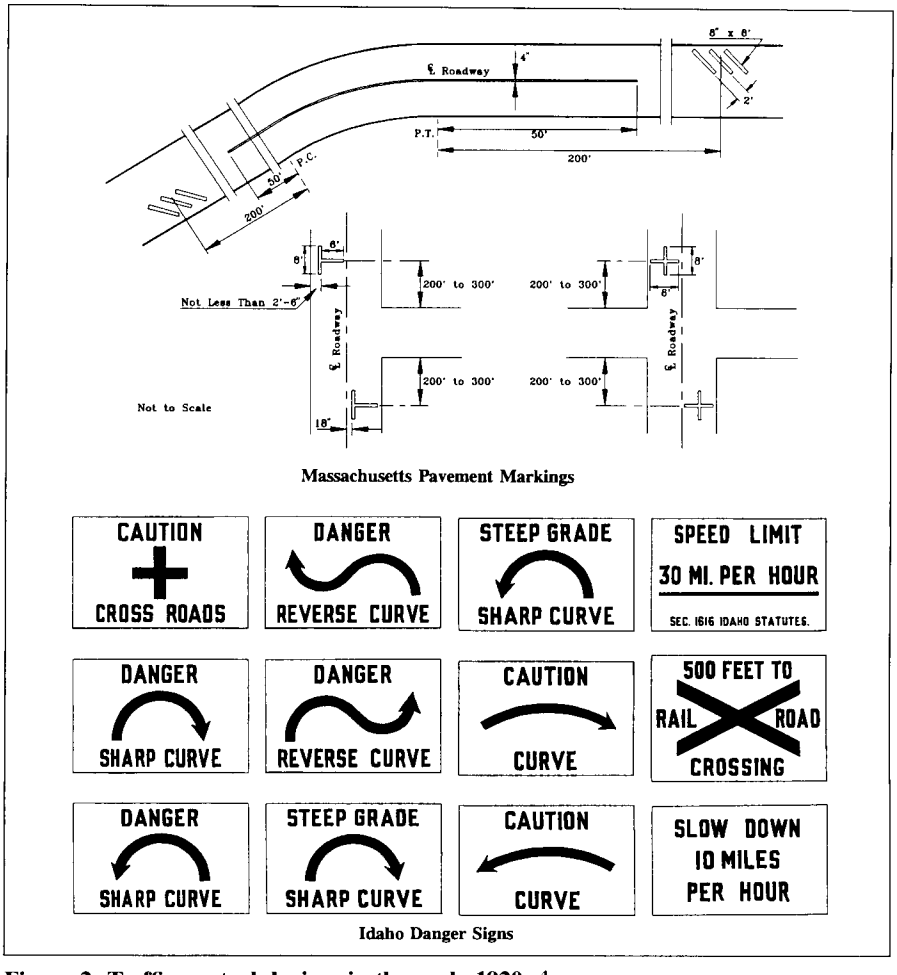

Figure 2. Traffic control devices in the early 1920s.[4]

ation of a Joint Board on Interstate Highways to formulate and promulgate a system of numbering and marking highways of interstate character.

The Joint Board first met in April 1925 and immediately began to work on its primary responsibility of determining routes for a nationwide road system and devising a uniform scheme for designating these routes. One of the first efforts involved the collection and study of current signing practices. A tabulation was made of the purpose, shape, color, height and stroke of letter, wording, position of wording, and other appropriate details of signs in several areas of the United States.[4] The information was used to incorporate into each sign a combination of four characteristics that would make its intent clear. The four characteristics were: a distinctive shape, a distinctive color, a descriptive word, and a descriptive symbol.

In November 1925, the secretary of agriculture (the Bureau of Public Roads was a part of the Department of Agriculture at the time) accepted the recommendations of the Joint Board, establishing a national system of official highway routes and a system of uniform signs and markers. The acceptance of the signing recommendations led to the publication of the first national signing manual in January 1927.[5]

The *Manual and Specifications for the Manufacture, Display, and Erection of U.S. Standard Road Markers and Signs* described the system of standardized signs and markers adopted by AASHO in November 1925.[5] It addressed only signing for rural highways. The designs for the signs were "based on definite principles calculated to produce uniformity of significance in the signs themselves, and make familiarity with them easy to acquire on the part of the most casual driver."[5] The design principles were based on shape, color, symbols, and uniformity of erection and application.

All warning and caution series signs were specified to have black designs on a yellow background. Warning series signs included the circular railroad sign and the octagonal stop sign. Caution series signs included diamond (slow) signs and square (caution) signs. All other signs used a black message on a white background, except that the "rest station" sign used a white message on a green background. Sign symbols used in the manual included the vertical cross (plus sign) with an "R" in the top quadrants for railroad signs, curve and turn arrows, and directional arrows for route markers (Figure 3). The U.S. Highway shield that was developed by the Joint Board in 1925 was also included in the rural manual. The AASHO sign manual also included information on the placement and erection of signs and provided specifications for the fabrication and finish of signs.

A second edition of the AASHO manual was published in April 1929. This edition contained a supplement on the use of luminous or reflecting elements with standard signs and markers, which authorized the use of a luminous element mounted below a standard sign or on a separate post in advance of the sign.[6] A revised second edition was released in December 1931, adding a number of new signs.[7]

Urban Traffic Control Devices Manual

The first National Conference on Street and Highway Safety was held in Washington, D.C., in December 1924. The conference was called by the secretary of commerce for "the devising of means and the making of recommendations toward the lessening of the numberless accidents which now kill and maim so many of our citizens."[8] The conference made many recommendations for improving highway safety, including recommendations addressing the use of signs, signals, and markings.

The Committee on Construction and Engineering made numerous recommendations for improving signs, signals, and markings, including a call for sign uniformity throughout the United States. The committee recommended adoption of a code of colors for signs and signals, as shown in Table 1.

The committee made no recommendations on sign shape, nor did they illustrate any signs. The committee recommended that the use of white center lines be confined to those locations where it

Table 1. Code of colors for signals and signs

Meaning of Indication	*Color of Luminous Signals*	*Color of Message/ Background of Nonluminous Signs*
Stop	Red	White on Red
Proceed	Green	White on Green
Caution	Yellow	Black on Yellow
Cross roads	Purple or other distinctive color	White on Purple

Source: Reference 8

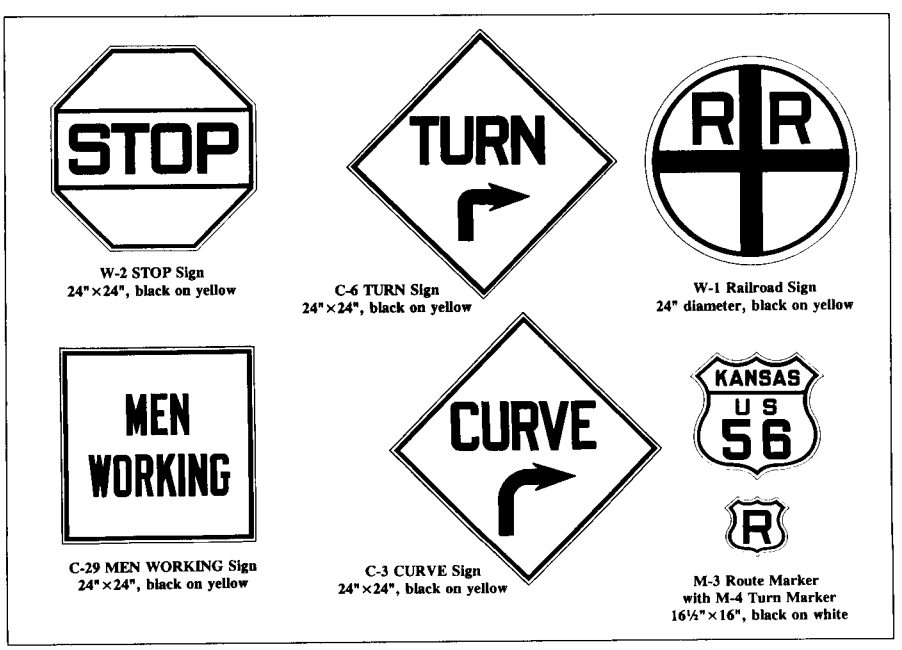

Figure 3. Signs from the 1927 AASHO rural signing manual. Note the symbols in the "turn" and "curve" signs have a similar appearance. An R or L in a smaller shield below the highway shield was used as an advance turn marker at intersections.[5]

was unsafe to be on the left-hand side of the road, primarily at curves, hill crests, intersections, and railroad crossings. White center lines were not to be used on two-lane straight and level sections of rural highway, except at intersections and railroad crossings. Black center lines were to be used instead to indicate the center of the road at locations where a white center line would be inappropriate.

The first national conference was so successful that a Second National Conference on Street and Highway Safety was held in March 1926. The recommendations of the conference did not directly address standards for traffic control devices, although the conference did accept an offer from the American Engineering Council to perform a national survey of traffic signs, signals, and markings and prepare a recommended practice for the use of these devices. Surveys were conducted in more than 100 cities in 35 states. In early 1929, a committee of the American Engineering Council submitted a draft manual on the use of traffic control devices in urban areas.[9] A number of cities and towns adopted the draft manual and it was widely distributed to several committees of the National Conference on Street and Highway Safety. The resulting experiences and comments were used to prepare the *Manual on Street Traffic Signs, Signals, and Markings*.[10] The new manual on traffic control devices for urban areas was submitted to, and accepted by, the third National Conference on Street and Highway Safety in May 1930.

The National Conference's urban manual was the first national standard for markings, signals, and safety zones (islands), items that were not addressed in the rural manual. Pavement markings could be buttons or paint. White or black paint was recommended for concrete pavement, and white or yellow paint for bituminous pavement. The three-color traffic signal (green, yellow, red) was recommended, although a two-color (red, green) signal with an all-red clearance interval was permitted. The signing standards of the urban manual conformed with the rural signing manual in virtually all respects, including sign shape and color.

There were, however, three differences in signing between the two manuals. The urban manual permitted the use of 18-in. signs as opposed to the 24-in. signs in the rural manual. The urban manual specified a red border and legend on a yellow background for the stop sign, as opposed to the black on yellow in the rural manual. And the urban manual contained the railroad crossbuck, which was not in the rural manual. Figure 4 illustrates some of the signs that appeared in the urban manual.

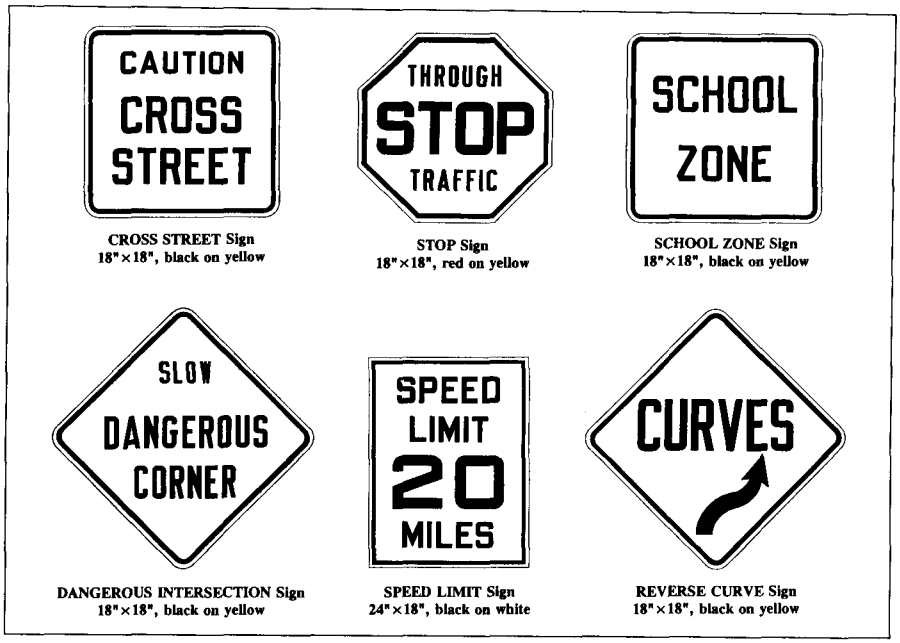

Figure 4. Signs from the 1930 *Manual on Urban Traffic Control Devices*.[10]

Summary

By the early 1930s, much progress had been made toward providing a national system of uniform traffic control devices. However, despite the pioneering efforts of AASHO and the National Conference on Street and Highway Safety, much more remained to be accomplished. For instance, the presence of two separate manuals, one for urban conditions and one for rural conditions, created conflicts that could not be easily resolved. A future article will look at how these two organizations combined their efforts and published the first edition of the MUTCD in 1935.

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