EFFECTIVENESS OF VARIOUS HIGHWAY SIGNS

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SYNOPSIS

This experiment was undertaken to determine the relative effectiveness of symbols, shape of signs, and words for warning or directing the vehicle driver The time required for the subject to react to a sign was used as the criterion of the effectiveness of the sign Twenty standard signs, some Wisconsin and some Pennsylvania, were used in the laboratory tests, the signs being placed 75 feet from the subject and the reaction time measured by a chronoscope reading to $\frac{1}{100}$ of a second A total of 160 drivers were tested Additional information was secured by a questionnaire concerning shape, symbol, color and lettering on Wisconsin signs

The tests indicated that a large symbol on any shape sign is more effective than any combination of words and symbol Words alone were least effective Shape of sign is of no value unless the motorist is familiar with its special meaning and many did not have such knowledge Repeated tests indicated that reaction time is lessened by familiarity

Contrary to general practice several states do not use a specified shape of highway sign to indicate a definite type of hazard It is claimed that a given shape of sign means nothing to the average motorist If the motorist upon seeing a diamond-shaped sign, for instance, does not receiving the warning that he is approaching a hazard requiring a diminished speed, then the shape of the sign can be said to be of no value

Since in the past, discussion of this problem has been largely based upon opinion, it seemed desirable to make an experimental determination of the actual effectiveness of various highway signs An investigation was conducted at the University of Wisconsin in which full-sized signs placed 75 feet from the subject were used The time required by a subject to react to a sign was measured by a chronoscope reading to approximately $\frac{1}{100}$ of a second The subject was seated behind a screen with one hand on a reaction lever, and the other on a button which opened a shutter in the screen and allowed him to view the sign He was told to react as quickly as possible, pulling the lever toward him for "Stop," moving it to the right or left for "Left Turn (or Curve)," and "Right Turn (or Curve)" respectively, or pushing it forward for cau-

tionary signs such as "Cross Road," "Side Road," and so forth The time of reaction of the subject was measured from the time that the shutter opened to the time that he moved the reaction lever The recorder noted whether or not the correct reaction had been made

Twenty signs were used, of which eight were standard Wisconsin "Curve," "Turn," "Stop," and cautionary signs, six were Pennsylvania "Curve," "Turn," and cautionary symbols, two were "Stop" and cautionary outlines only, without words, and four carried only words warning of "Cross Road," "Curve," "Turn," or arterial The Pennsylvania signs which were large symbols on a square plaque, were chosen to compare with similar standard Wisconsin signs which were on a diamond-shaped plaque, to determine the effect of the shape of the plaque Figure 1 shows typical signs used

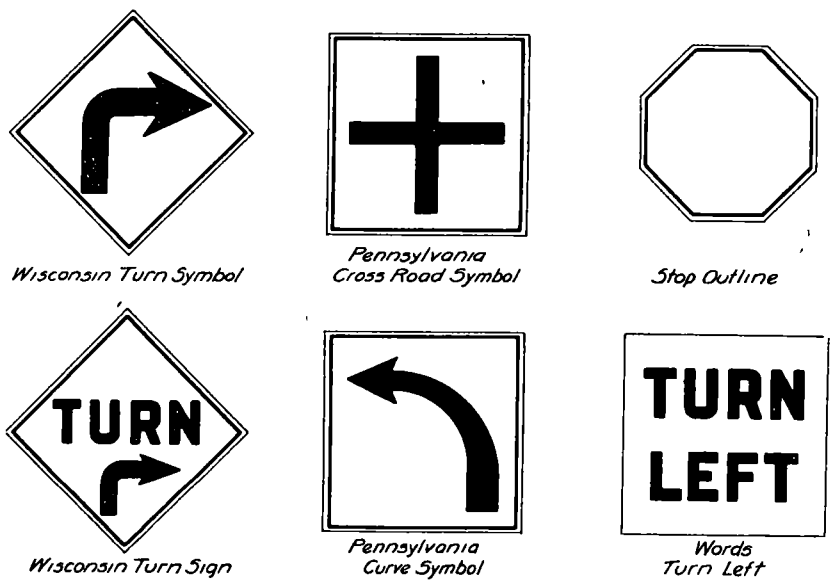

Figure 1 Typical Signs

In addition to laboratory tests, information was sought by means of a questionnaire concerning the shape, symbol, color and lettering on several of the common Wisconsin signs

A total of 160 drivers made observations on all of the signs, many of them taking more than one test Computation of the average time of reaction of all of the drivers to each of the signs disclosed unmistakable differences between the signs, which lead directly to two important conclusions

(1) The arrow symbol for indicating "Turn" and "Curve" is without doubt the most effective way of warning a driver of such a hazard In fact, a large arrow, regardless of the shape of the sign plaque, required a

shorter time of reaction than any other type of sign The standard Wisconsin "Turn" and "Curve" signs (having words and symbol on a diamond-shaped plaque) took slightly longer than signs having large arrows, although they took less time than signs which had only the words "Turn" or "Curve" Conversely, it may safely be said that words are the poorest way of conveying a message to the driver To

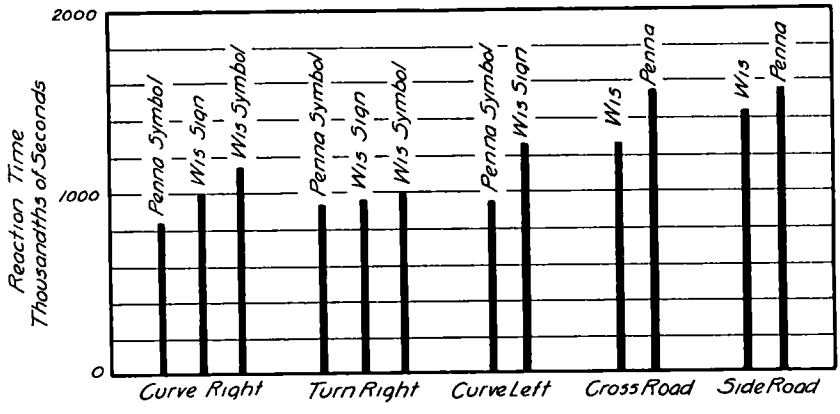

Figure 2. Comparison of Wisconsin and Pennsylvania Signs

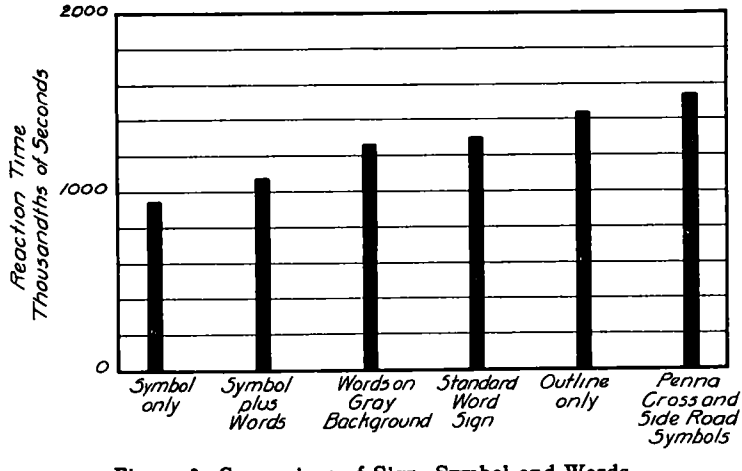

Figure 3 Comparison of Sign, Symbol and Words

illustrate this, the standard "Stop" sign required a much longer time of reaction than any of the arrow signs although it is probably the sign most familiar to the motorist (Figure 2)

(2) The outline of the sign plaque is of little value to the motorist in indicating the danger ahead This conclusion is supported by several observations, first, that the reaction times for the two outline signs were much greater on the first trial than the reaction times for any of the

standard Wisconsin signs, second, that large arrows on square plaques required just the same time as similar large arrows on diamond-shaped plaques, third, that more incorrect reactions were made to the pure outline signs than to any other type, and fourth, that about 21 per cent

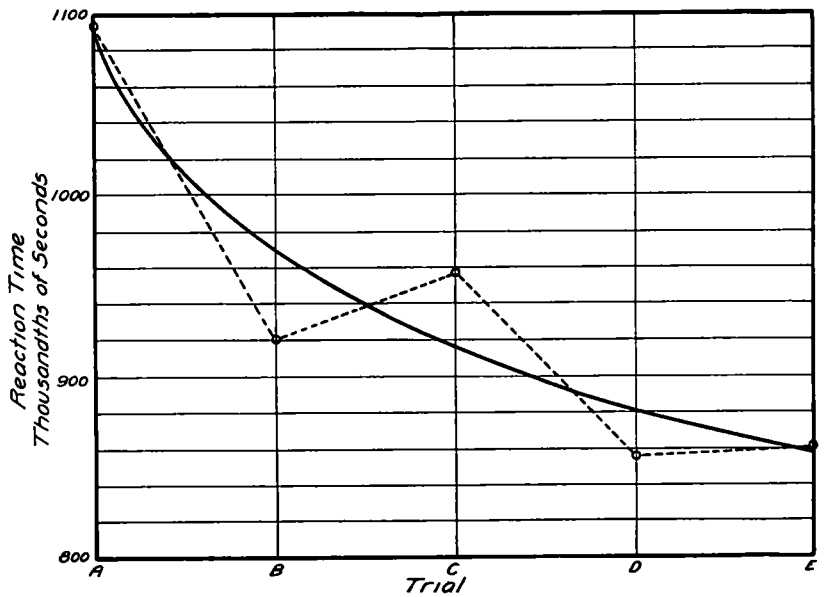

Figure 4. Learning Curve Produced by Five Successive Trials by Six Subjects

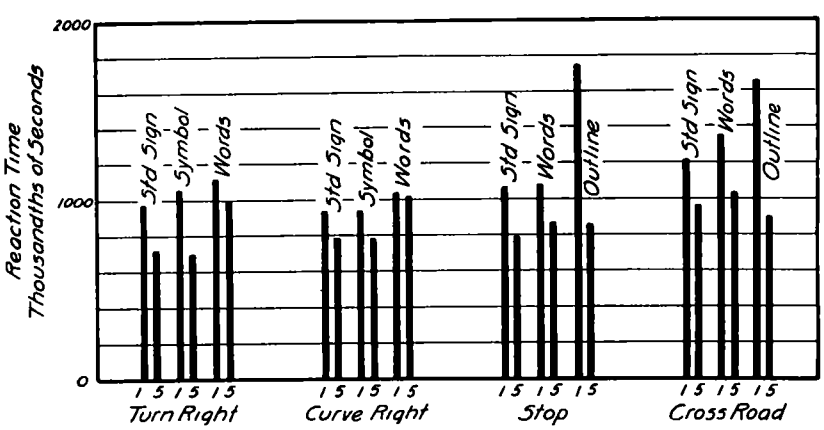

Figure 5. Comparison of Standard, Symbol and Word Signs of Wisconsin

of the questions in the questionnaire as to the shape of several common Wisconsin signs were answered incorrectly (Figure 3)

This ineffectiveness on the part of the outline of a sign may be either an indication of ignorance on the part of motorists or an indication that

the shape of a sign simply does not mean anything to the average motorist However, after the subject had been given the test five times, he improved his time of reaction to the outline signs so much that he was actually taking less time for them than for the corresponding standard signs This indicates that the true cause is ignorance on the part of the motorist, and suggests the possibility that the special outline (in

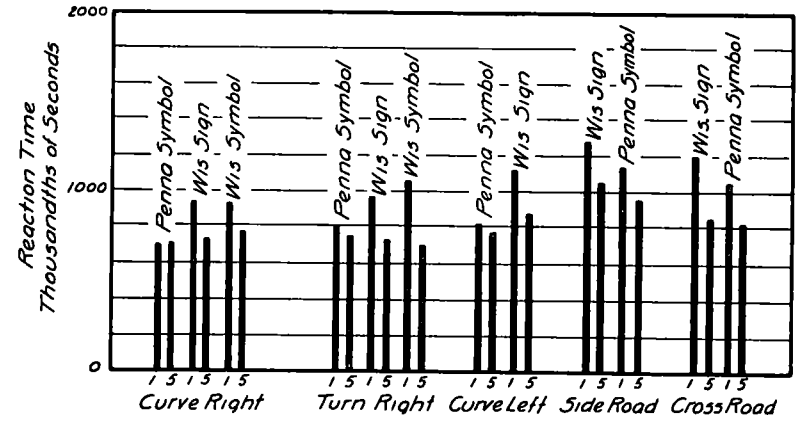

Figure 6. Comparison of Pennsylvania and Wisconsin Signs at First and Fifth Trials.

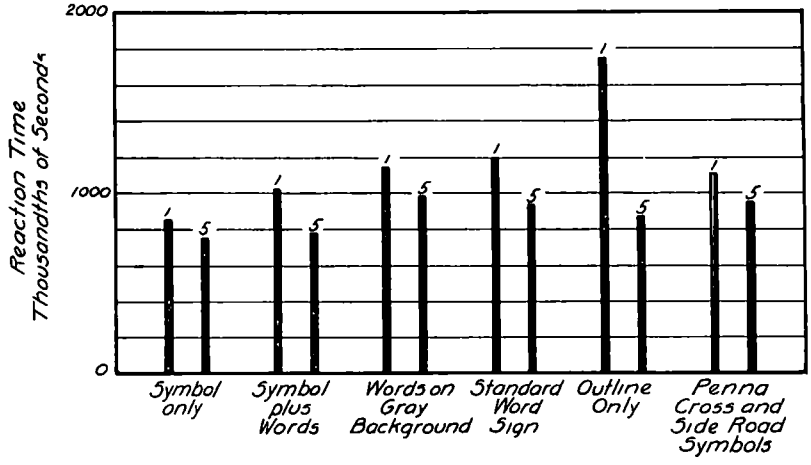

Figure 7 Comparison of Various Types of Signs at First and Fifth Trials

addition to a symbol) might prove helpful if motorists were properly informed as to their meaning (Figure 4)

Although the arrow has already been accepted as the best warning for a curve or turn, symbols for other hazards such as cross-roads, schools and the like have not met with general approval With regard to this, the tests show that the "Cross Road" and "Side Road" symbols being

used at present by the state of Pennsylvania are not so satisfactory on the first trial as standard Wisconsin signs However, after the subject had taken the test several times he was able to make a better score on the Pennsylvania symbols than on the standard Wisconsin signs, probably because of the superiority of symbols over words Of course, this does not mean that the Pennsylvania "Cross Road" and "Side Road" symbols are faultless, for they still required more time than the arrow signs, but it does indicate the possibility that satisfactory symbols can be developed for this type of hazard (Figures 5, 6, 7)

We may therefore sum up the results of this test by saying that it is definitely shown that:

(a) For certain hazards, at least, a large symbol on any convenient shape of plaque is more effective than any combination of words and symbol on a special shape of plaque

(b) The shape of the sign plaque is of practically no value in indicating the nature of a hazard to the motorist

Conclusion (a) leads at once to the exclusive use of symbols to indicate "Turn" and "Curve," with the possibility of developing symbols to indicate "Cross Road," and similar hazards Conclusion (b), however, does not necessarily lead to the discarding of the use of a definite shape for each type of hazard As the tests definitely show that with instruction, the subject was able to make very effective use of the shape, it seems logical to retain the special shapes for the good that they may do if the public comes to understand the system This conclusion is further strengthened by the fact that the special shapes cost no more to manufacture and place than the square signs, which eliminates the economic consideration.

DISCUSSION—EFFECTIVENESS OF VARIOUS HIGHWAY SIGNS

MR M G LLOYD, *National Bureau of Standards* There is one feature involving the shape of the sign that I think is entirely overlooked. That is, in conditions of seeing, when it is hard to tell what is on the sign, the outline of the sign can give a message, even if only a partial message, that would otherwise probably be lost entirely. I think that is one reason why the shape of the sign has value under conditions of poor seeing If you can see fully, the shape of the sign becomes valueless.

MR BURTON MARSH, *American Automobile Association* It seems to me that the sign shape was weak in that the border did not have enough thickness or width to make the shape stand out sharply Following along that same line of thought, the new manual of proposals for showing the buttons in the outline would have a deleterious value at night as Mr Vey pointed out