VISIBILITY STUDIES OF CHANNELIZATION SIGNING

A Report

by

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TABLES AND FIGURES

SIGN VISIBILITY STUDY

It is common practice to utilize the KEEP RIGHT sign in directing traffic around channelizing islands. The sign is commonly used in conjunction with painted and reflectorized curbs and some method of approach-end treatment to delineate and define the island. However, in some cases no additional delineation is provided or water and road film may obliterate the delineation materials used. Therefore, there is considerable dependency upon the proper function of the KEEP RIGHT sign.

First, due consideration must be given to the true function of the sign. Since it is so widely used and is of generally standard form, it is probably interpreted as a symbol rather than a printed message. Therefore, for this reason, it is considered that the recognition visibility distance is more important than the actual legibility of the KEEP RIGHT.

Since the time the KEEP RIGHT sign was first introduced, it has experienced many changes. The general form has remained standard as shown in Table A; however, different types of materials and construction techniques have been tried.

DESCRIPTION OF STUDY

In this phase of research, studies were conducted to analyze comparatively the legibility and visibility distances of the various KEEP RIGHT signs and sign arrangements currently being used. The different signs tested are described in Table A. These signs were

TABLE A

DESCRIPTION OF SIGNS USED IN VISIBILITY AND LEGIBILITY TESTS

Sign Number	Type of Sign by Material and Method of Illumination	Size of Sign	Size of Letters
1	Beads-on-Paint. Black letters on white background (Texas Highway Department Standard).	24" x 30"	5"
2	Reflective sheeting. Black letters on white background.	24" x 30"	5"
3	White letters and arrow inset with prismatic reflectors on black background.	24" x 30"	5"
4	Internally illuminated. Black letters on white opaque background (no arrow).	24" x 30"	5"
5	Same as Number 1 except black and white hashmark panel mounting below sign.	24" x 30" Panel 24" x 36"	5"
6	Same as Number 1 except externally illuminated.	24" x 30"	5"
7	Same as Number 2 except externally illuminated.	24" x 30"	5"
8	White reflective sheeting letters and arrow on black background.	24" x 30"	5"

selected because of their particular appeal in certain areas. The standard Texas Highway Department sign (Number 1) is used extensively throughout the state; however, some districts have gone to other types of signs or modifications of the standard type. In some areas the hashmark panel is used in conjunction with the standard type sign (Number 5) as described in Table A. Another modification of the standard sign includes the use of external illumination (Sign Number 6).

The internally illuminated sign has been used sparingly; however, there is much interest in the possible applications of this type of sign. The legend is the same as used in the construction of the standard Texas Highway Department sign and is described as Sign Number 4 in Table A.

The reflective sheeting type of sign construction is represented by Sign Number 2 of the selection. Sign Number 7 is of the same type but was tested with external illumination.

Sign Number 3 represents a type of construction that has been used favorably on high-type facilities. The letters and arrow are formed of prismatic reflectors. This type of construction has seen some application as a KEEP RIGHT sign.

The final selection, Sign Number 8 was selected to provide a materials comparison with Sign Number 3. It was constructed using white reflective sheeting in place of the prismatic reflectors for letters and arrow on a black background.

The visibility tests of the signs were conducted on the runways at the Texas A. & M. College Research and Development Annex. The test

site was ideal because such variables as grade, alignment, external light sources, and variable opposing headlights were eliminated, providing a more accurate evaluation of the visibility distances. The control of these variables at actual installations would have been impossible.

In designing the study, it was recognized that these idealized conditions would not yield actual visibility and legibility distances that would apply directly to field applications. However, the selected testing procedure and conditions were expected to yield a relative comparison of the visibility and legibility characteristics of the signs.

SELECTION OF CRITERIA

In the selection of criteria for measurement of the comparative performance of the signs, careful consideration was given to what is believed to be their two primary functions. As previously mentioned, the wide use of the KEEP RIGHT sign and its generally standard form makes it a symbol rather than a literal message. In other words, the sign has accomplished its purpose when its general shape and the shape of the arrow are visible to the driver. The driver can usually interpret these characteristics before the KEEP RIGHT becomes legible. For this reason, the distance at which the driver could interpret the sign by its general form and shape of arrow was selected as the primary criterion for comparison. The distance at which the sign became legible was selected as the secondary criterion for comparison.

Previous studies (2) conducted using some of these signs mounted at 3.5 foot and 7 foot mounting heights showed no difference in visibility or legibility distances due to mounting height. Therefore, this variable was not considered in this series of tests.

STUDY PROCEDURE

The "Test Car" technique was used in the sign tests. To facilitate the study, four drivers or observers were selected to drive the vehicle at uniform speed (15 MPH) through the test area and indicate the point at which they could recognize the general form of the sign. The distance at which the observer could read the message was also recorded.

Prior to beginning the study, trial runs of the tests were conducted to familiarize the observers with the different signs and sign arrangements. The trial runs were considered necessary to reduce variability due to increased familiarity with the signs, and thus, to obtain more consistent and reliable readings.

The test was designed to obtain three visibility observations and two legibility observations of each sign by each observer. Due to the time consuming nature of the study, the replications were performed on two separate nights. The order in which the signs were tested was selected randomly to reduce any effects on the data resulting from anticipation by the observer.

An effort was made to simulate the most critical visibility condition that would normally be expected at installations of KEEP RIGHT

signs. A vehicle was placed as if in the opposing lane and immediately adjacent to the sign. Previous research (1) found this position of the opposing vehicle to be the most critical. Both the opposing vehicle and the test vehicle displayed low-bean headlights.

The external lighting used on Sign Numbers 6 and 7 consisted of two 15-watt flourescent tubes mounted in a white reflector. The reflector was mounted 18 inches from the sign and parallel with the top of the sign.

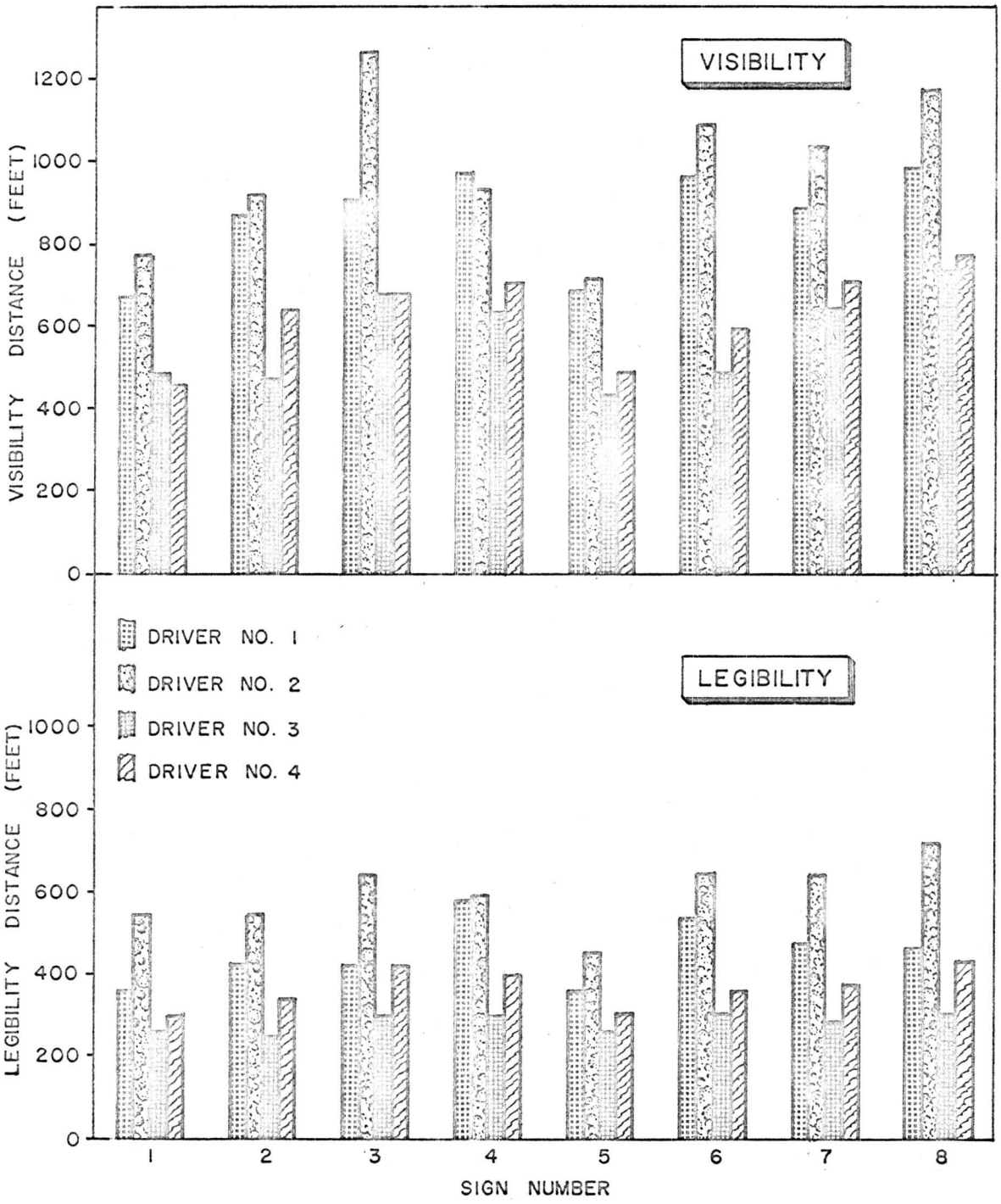
DISCUSSION OF RESULTS

The data collected in the study were analyzed by two statistical tests. To evaluate any significant differences in the various signs tested, the data was treated by an analysis of variance test. A multiple range test was applied to the average visibility and legibility distances to rank them according to their order of superiority.

Visibility Comparisons

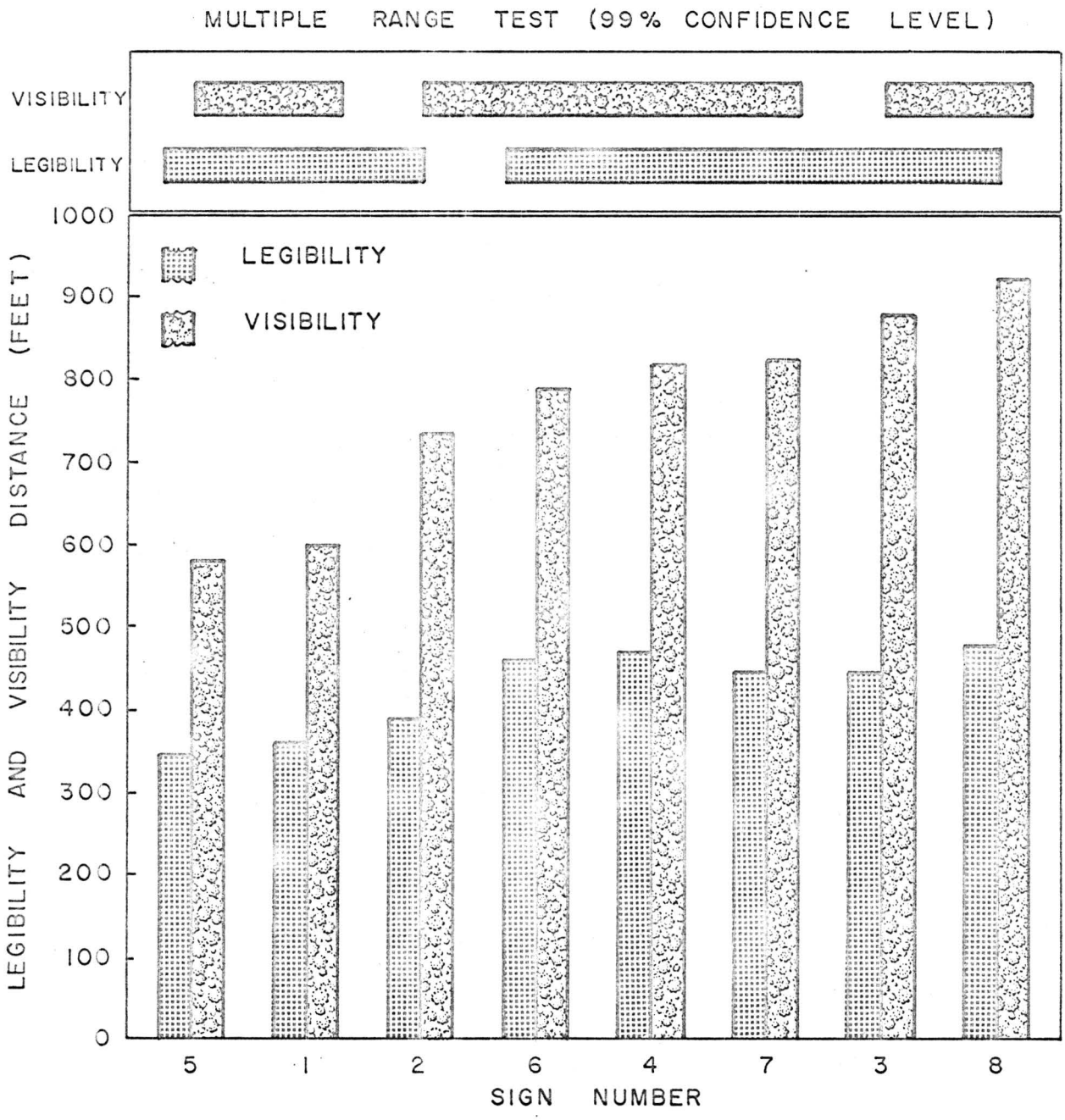
A comparison of the visibility distances of the various signs tested is shown in Figure 2. This comparison shows the average visibility distance for each of the signs and the results of the multiple range test in arranging the various signs in groups of significantly different visibility distances.

According to the comparison, the prismatic reflector sign (Number 3) and the reflective sheeting on black background sign (Number 8) show no significant difference. These two signs had the best visibility characteristics of all the signs tested.



COMPARISON OF LEGIBILITY AND VISIBILITY DISTANCE OF EACH DRIVER FOR EACH OF THE SIGNS

FIGURE 1



LEGIBILITY AND VISIBILITY DISTANCE OF SIGNS TESTED

FIGURE 2

The second group consisted of four signs. There was no significant difference among the internally illuminated sign (Number 4), reflective sheeting sign (Number 2), and the externally illuminated signs (Numbers 6 and 7). The lowest group in order of performance consisted of the Texas Highway Department standard beads-on-paint type (Number 1) and the same sign with the hashmark panel mounted below (Number 5).

Legibility Comparison

A comparison of the average legibility distances of each sign is also shown in Figure 2. The results of the range tests on the legibility distances differed slightly from the results of the visibility distances in that the signs were grouped into two groups instead of three.

The first group included the internally illuminated (Number 4), prismatic reflector (Number 3), reflective sheeting on black background (Number 8), and the two externally illuminated (Numbers 6 and 7) signs. The multiple range test indicated that there was no significant difference in the legibility distances of these signs. This is clearly shown in Figure 2.

The lowest group as far as legibility was concerned, again included the Texas Highway Department standard beads-on-paint type (Number 1) and the same sign with the hashmark panel mounted below (Number 5). In addition this group included the reflective sheeting sign (Number 2). There was no significant difference among the

legibility distances of these signs.

Evaluation of Results

According to the results of this study, there was no significant difference in the visibility and legibility distances of the prismatic reflector sign (Number 3) and the reflective sheeting on black background sign (Number 8). However, it should be noted that the prismatic reflector sign has been used successfully in high-type facility signing; whereas, the sign with reflective sheeting letters was developed for this research and has not seen general application in the field.

The internally illuminated sign was fourth in performance as far as visibility is concerned; however, it was second in the legibility tests. The brilliance of the sign seemed to wash out the arrow and letters at greater distances therefore reducing the visibility distance.

The externally illuminated signs showed no difference in their visibility or legibility characteristics. Performancewise, they were in the middle group of signs tested.

The Texas Highway Department standard beads-on-paint type (Number 1) and the same sign with the hashmark panel mounted below (Number 5) were in the bottom group. The hashmark panel made no difference in the visibility of the standard type sign.

REFERENCES

1. Rowan, Neilon J., "Approach-End Treatment of Channelization — Signing and Delineation", Paper presented at Annual Meeting of Highway Research Board, January, 1963.

2. Duncan, Acheson J., Quality Control and Industrial Statistics, Richard D. Irwin, Inc., 1959.

APPENDIX

T A B L E B

ANALYSIS OF VARIANCE SIGN VISIBILITY TEST

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	"F" Ratio
Driver (D)	3	16,074.4	5,358.1	127.3**
Signs (S)	7	5,651.1	807.3	19.2**
Replications (R)	2	455.2	227.6	5.4**
DS	21	1,379.7	65.7	1.6
DR	6	1,721.0	286.3	6.8**
SR	14	1,453.3	103.8	2.5*
Residual	42	1,767.9	42.1	

** 1% Level

* 5% Level

T A B L E C

ANALYSIS OF VARIANCE SIGN LEGIBILITY TEST

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	"F" Ratio
Drivers (D)	3	3,867.8	1,289.2	80.2**
Signs (S)	7	675.4	96.5	6.0**
Replications (R)	1	76.5	76.5	4.8*
DS	21	332.5	15.8	1.0
DR	3	178.2	59.4	3.7*
SR	7	145.8	20.8	1.3
Residual	21	337.5	16.1	

** 1% Level

* 5% Level