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16. Abstract The Surface Transportation Assistance Act mandates greater uniformity in truck size and weight, requiring some States to raise their limits, at least for trucks traveling on the National Network of Highways, comprised of the Interstate System and portions of the Federal-Aid Primary System. Part of the law allows the States to mark these routes with signs. This study evaluated six candidate symbolic signs which could be used for these truck routes.  A sample of the general public was used in tests of visibility, meaning, and preference. A sample of truck drivers participated in tests of recognition time, meaning, and preference.  The study findings indicate that a side-view, double-trailer sign had the best recognition time, and the best meaning scores. Even though in the visibility study it did not have the longest recognition distances, no other truck was labeled as an <u>oversized</u> truck as often as the double-trailer sign. A good possibility exists that the other candidate signs may be confused with the presently used NO TRUCKS sign. Finally, both truck drivers and the general public overwhelmingly preferred the double-trailer sign over the other candidate signs.		13. Type of Report and Period Covered Staff Study Final Report Sept. - Dec. 1984	
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## TABLE OF CONTENTS

	Page
INTRODUCTION	1
Background	1
Objective	1
Experimental Method and Measures	1
EXPERIMENT 1: Visibility, Meaning and Preference	2
Subjects	2
Apparatus	2
Signs	2
Procedure	2
Results	4
EXPERIMENT 2: Recognition Time, Meaning and Preference	11
Subjects	11
Apparatus	11
Procedure	12
Results	12
DISCUSSION	15
REFERENCES	17
APPENDIX A:	
Instructions for Experiment 1	A-1
Instructions for Experiment 2	A-2
Consent form for Experiment 1	A-3
Consent form for Experiment 2	A-4
Data Sheets for Experiment 1	A-5/A-7
Data Sheets for Experiment 2	A-8



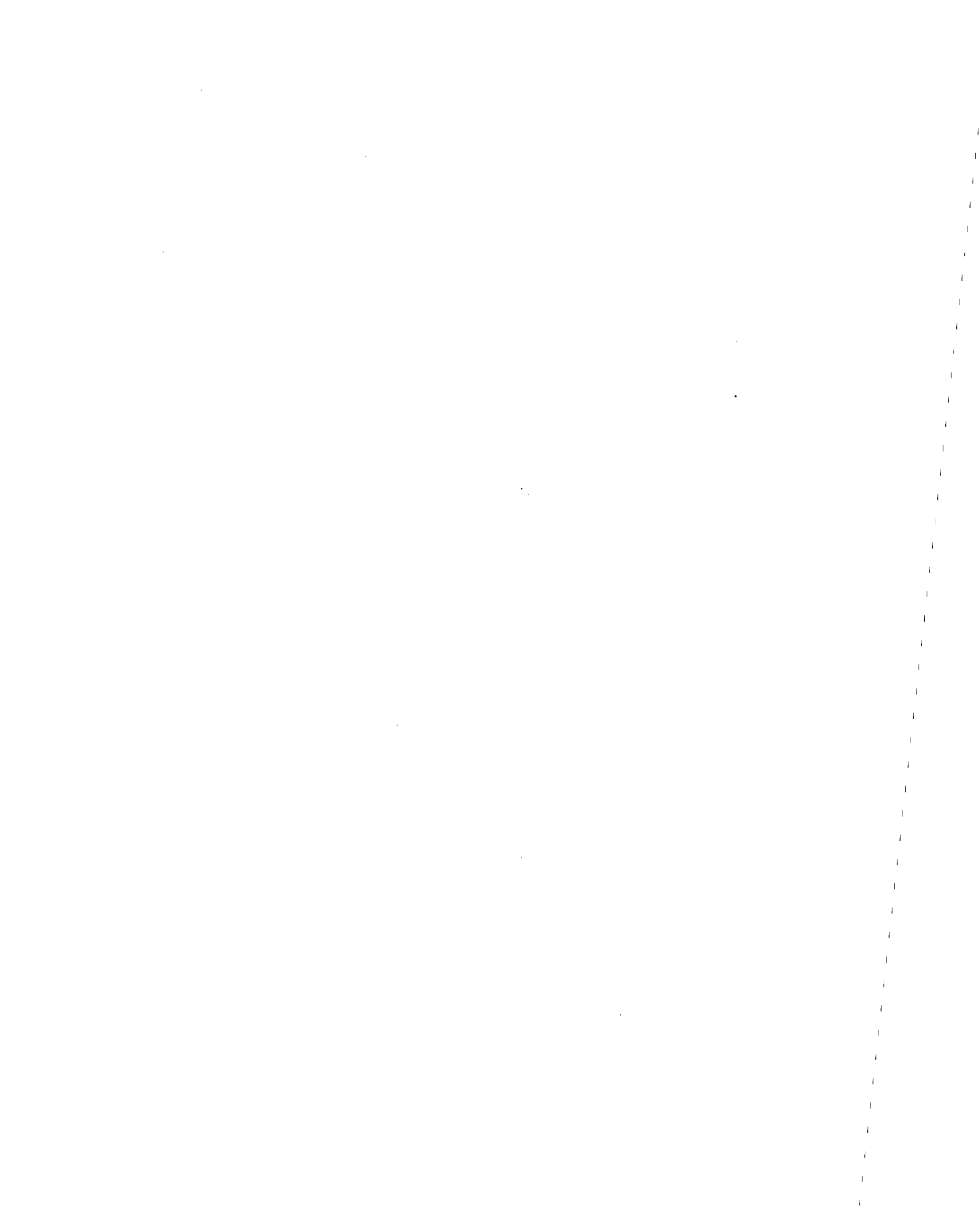
LIST OF TABLES

	Page
Table 1. Means and standard deviations of visibility data: Distance at which subjects identified a truck.	5
Table 2. Analysis of variance summary table for visibility data: Distance at which subjects identified a truck.	5
Table 3. Means and standard deviations of visibility data: Distance at which subjects identified the view of the truck (front, rear or side).	9
Table 4. Analysis of variance summary table for visibility data: Distance at which subjects identified the view of the truck (front, rear or side).	9
Table 5. Visibility data expressed categorically (seen at maximum distance, seen at less than maximum distance, or never seen) by feature to be detected, color, and type of sign.	10
Table 6. Breakdown of meanings across signs for the general public sample.	11
Table 7. Means and standard deviations of recognition times (in seconds).	14
Table 8. Analysis of co-variance summary table for recognition times.	14
Table 9. Meanings given to signs by truck drivers.	15



## LIST OF FIGURES

	Page
Figure 1. Stimuli used in Experiment 1.	3
Figure 2. Mean visibility distances at which subjects recognized sign as a truck.	7
Figure 3. Mean visibility distances at which subjects identified the view of the truck (front, rear or side).	8
Figure 4. Mean recognition times for candidate signs.	13





## INTRODUCTION

### Background

On January 6, 1983, the Surface Transportation Assistance Act (STAA) of 1982, Pub.L. 97-424, 96 Stat. 2097 (STAA) became law (1). The STAA and its amendment, which was passed April 6, 1983, standardized maximum widths, lengths, and weights for trucks operated on a highway system designated as the National Network. This system includes the National System of Interstate and Defense Highways (the Interstate System) and portions of the Federal-Aid Primary (FAP) System designated by the Secretary of Transportation. In addition, States are required to allow larger and/or heavier trucks "reasonable" access to terminals and services. Section 658.21, Identification of National Networks, allows signs to be used as route markers. However, there was no standardized regulatory sign to permit or prohibit operation of oversized trucks on the National Network. Accordingly, the FHWA Office of Traffic Operations asked the Office of Safety and Traffic Operations R&D to evaluate several candidate signs.

### Objective

The research objective was to select a sign to effectively inform truck drivers, and to lesser extent, the general driving public, that oversize trucks are either permitted or prohibited. The sign would be easily visible, quickly recognizable, inherently meaningful, and clearly different from existing signs.

### Experimental Method and Measures

Both laboratory and field test methods have previously been successfully used to evaluate sign alternatives. However, a field study to decide among the candidates would require erecting the signs in various parts of the country and observing which one led to the fewest accidents or erratic maneuvers, and most correct choices, at locations where the national network met other highways. Such a plan was not feasible from a time or money stand point.

Dewar and Ells (2, 3, 4), also faced with the problem of efficient evaluation of traffic signs, have developed a series of laboratory tests using MOE's which are economical yet well validated with on-the-road tests. They suggest tests for intrinsic meaning, reaction time, learning and memory and subjective meaning in one report (1974b). In their 1980 paper they also include legibility, although when referring to symbol signs, visibility might be a better term.

Due to requests for a "timely" study from several quarters, it was decided to compare the signs on visibility, intrinsic meaning, recognition time and preference in this study.

The study consists of two experiments with different subject populations and different tasks. Because the primary ultimate users of this sign will be truck drivers, truckers were utilized as subjects in Experiment 2 and were tested on sign recognition time, meaning and preference. Subjects for Experiment 1 were drawn from the general driving population and provided meaning and preference data. The methodology and results sections are presented separately for each population.

## Experiment 1

### Subjects

The experiment was administered to 62 subjects from the general population. (Data from two of the subjects were subsequently discarded because these subjects saw a seventh candidate sign that was dropped from the study in the first week.)

There were 38 females and 22 males in the final 60 subjects, ranging in age from 16 to 64 with an average age of 37.

### Apparatus

Each subject's vision was tested on an Ortho-Rater to ensure corrected visual acuity of 20/33 or better.

Candidate signs were developed on a computer graphics systems (New England Technologies). Graphics were photographed for 35 mm slides, and prints were developed from the slides. The slides were rear-projected onto a translucent screen by Kodak Ektagraphic III slide projectors, Model AT. The size of the projected image was 8-inches on each side.

### Signs

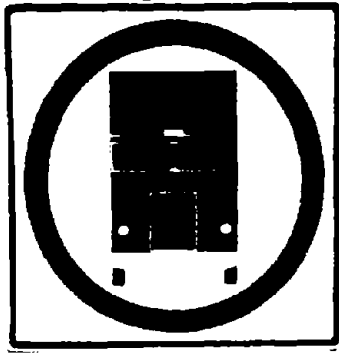
Six candidate symbolic regulatory signs were tested in the study (see Figure 1). Permissive version (Oversized Trucks Permitted) had a green ring and no slash, as shown in the figure; prohibitory versions of these signs (Oversized Trucks Not Permitted) had a red ring and slash like the current "No Trucks" symbol sign (R 5-2 in the MUTCD).

Besides a standard rear-view of a truck and the side-view of a double-bottom, four other sign candidates were evaluated. One was a variation of the rear view with only the wheels inset and the body wider to indicate an extra-wide truck. Two other signs were front-views instead of rear-views. One was of regular width while the other had a wider body. The final candidate was a side-view of a tractor-semi-trailer-combination with a vertical dotted line on the trailer to suggest a very long truck. Each slide was made in a prohibitory and permissive version.

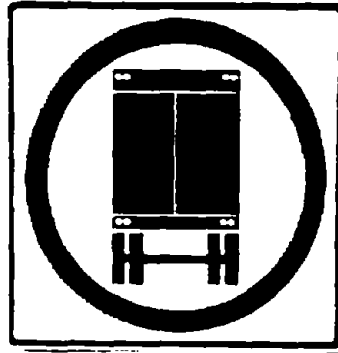
Six other standard signs selected from the MUTCD were used as distractors in the legibility task. These were, as shown in Figure 1, right curve, winding road, deer crossing, hospital, phone, and divided highway ahead.

### Procedure

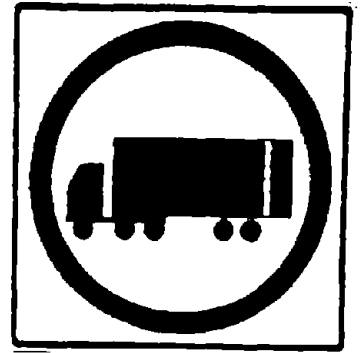
Subjects came to the Turner-Fairbank Highway Research Center (TFHRC), McLean, Virginia, where their vision was tested on an Ortho-Rater, biographical data were collected, and consent forms were signed. They were then taken to a vision tunnel which is approximately 12x12x120 feet, with fluorescent lights mounted on one wall. The first part of the instructions (Appendix A) was read to the subject, informing him/her to walk toward a projected sign until he/she could identify any feature on the sign.



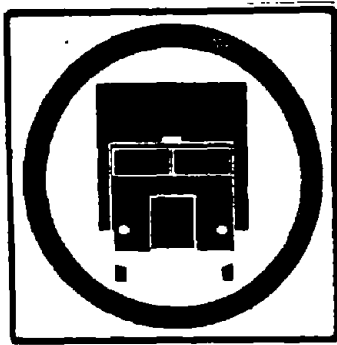
Front, Narrow  
(FN)



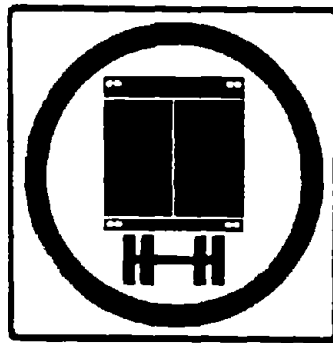
Rear, Narrow  
(RN)



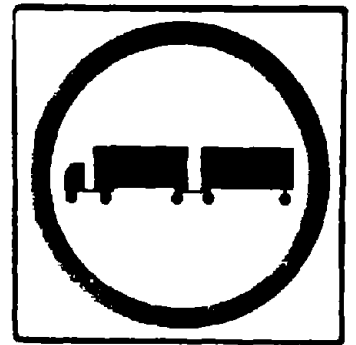
Side, Long  
(SL)



Front, Wide  
(FW)



Rear, Wide  
(RW)



Side, Double  
(SD)



W1-2R



W1-5R



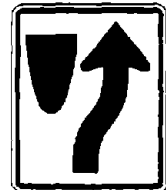
W11-3



D9-2



D9-1



R4-7

Figure 1. Stimuli used in Experiment 1. Shown are the permissive oversize truck symbols (black symbol on white background with green ring), and the six standard signs used as distractors. The prohibitive versions of the truck symbols had a red ring and slash.

Experimenters recorded subjects' recognition distances for 2 or 3 features for each candidate sign. The first feature was the distance at which the subject identified the figure as a truck, then next as the correct view of the truck (front, rear or side), then as a large, big or oversized truck. This third feature was only recorded for the front wide, rear wide, and side views since in the other two views the proportions were the same as on a normal trailer. If a subject did not identify the feature at all, a zero was recorded. The subjects viewed the slides one at a time, looking at 18 slides, including both permissive (6) and prohibitive (6) versions of each candidate sign plus the six distractor signs. Each subject saw a different random order of the 18 slides.

In the second part of Experiment 1, subjects were shown a single, color photograph of one of the permissive signs. The subjects then wrote down (a) what they thought the sign meant, and (b) what effect, if any, it would have on their driving.

Finally, they were told the intended meaning of the signs and given all six permissive photographs. They ranked the six signs on how well each sign conveyed the intended meaning.

### Results

Preliminary results found no relationship among the biographical data, such as sex and age or number of moving violations and number of years driving. These variables were therefore ignored in the subsequent analyses.

The major analyses were on the distances at which the subjects identified the signs as truck signs and on the distances at which they identified the view of the truck (front, rear or side). These analyses were 2 x 6 (message by type of sign) factorial designs with repeated measures on both factors. The computational formulas are from Bruning and Kintz (4). Other analyses were performed with the SAS statistical package (6). For feature "truck," the means and standard deviations are found in Table 1, and the summary table for the analysis is found in Table 2.

Table 1. Means and standard deviations of visibility data: distance (in feet) at which subjects identified a truck

Message		Type of Truck on Sign						Summary for Message
		Front Narrow	Front Wide	Rear Narrow	Rear Wide	Side Long	Side Double	
Permit (Green Ring)	M	62.80	59.92	72.30	72.37	73.30	69.12	68.31
	SD	35.19	31.12	36.77	38.29	36.30	33.81	35.47
Prohibit (Red Ring & Slash)	M	52.53	53.07	67.32	69.48	72.08	53.25	61.29
	SD	34.85	32.95	35.46	37.32	37.35	33.17	35.99
Summary for Signs	M	57.68	56.49	69.81	70.93	72.69	61.18	
	SD	35.26	32.10	36.06	37.68	36.72	34.29	

Table 2. Analysis of variance summary table for visibility data: distance at which subjects identified a truck

<u>Source</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>P</u>
Total	925,440.39	719			
Subjects	536,890.39	59			
Message	8,862.05	1	8,862.05	17.16	<.001
Sign	30,915.96	5	6,183.19	12.52	<.001
Mes. X Sign	44,097.69	5	8,819.54	20.25	<.001
Res:Mes.	30,468.94	59	516.42		
Res:Sign	145,728.04	295	493.99		
Res:MXS	128,477.31	295	435.52		

The summary table shows that there were significant differences between messages, among symbols, and a significant interaction effect between message and symbol.

Concerning message, permissive signs (with the green ring) were identified as trucks at a significantly greater distance than prohibitory signs (with the red ring and slash) ( $F = 17.16$ ,  $df = 1/59$ ,  $p < .001$ ). This is not surprising since the slash overlaid the truck symbol. On the average, subjects had to be 7 feet closer, or about 10 percent closer, in order to identify the symbol with the red ring and slash.

Concerning the type of truck used as the symbol, there were also significant differences ( $F = 12.52$ ,  $df = 5/295$ ,  $p < .001$ ). Further analysis with the Neuman-Keul's test showed there were two sets of signs which were significantly different from each other and within which there were no significant differences. The side-long (SL) symbol was most visible, followed closely by the rear wide (RW), and rear narrow (RN) symbols. The means for these three were significantly higher than the side-double (SD), front narrow (FN) and front wide (FW) symbols. This is evident from Figure 2. The difference between the extremes, SL and FW, was 16.2 feet, or a reduction of about 22 percent in visibility.

The interaction effect in the data ( $F = 20.25$ ,  $df = 5/295$ ,  $p < .001$ ) can be seen on Figure 2 in the side-double (SD) means. This was confirmed by computing interaction effects. The SD means show more difference between the permissive and prohibitory versions than any other sign. One possible interpretation is that the slash covers more of the symbol in the SD version.

Note that these results only apply to the distance where subjects identified the symbol as a truck. The next analysis deals with the distance at which the subjects identified the view of the truck (either side, front or rear). The means and standard deviations are given in Table 3, and the analysis of variance summary is given in Table 4. Once again, the prohibitory versions were less visible than the permissive ones ( $F = 24.46$ ,  $df = 1/59$ ,  $p < .001$ ) showing a 14 percent reduction in visibility.

The differences among the signs were again significant ( $F = 15.06$ ,  $df = 5/295$ ,  $p < .001$ ) and the order of the means was almost exactly the same. Analysis of the means showed the SL version was significantly more visible than the others; the group of RW, RN, and SD were not different from each other, but significantly more visible than FW or FN, which again were not significantly different from each other. The difference between the best (SL) and the worst (FN) symbols was 21 feet, a 29 percent reduction in visibility.

The interaction of message and sign was not significant in this analysis as shown by the more or less parallel lines in Figure 3.

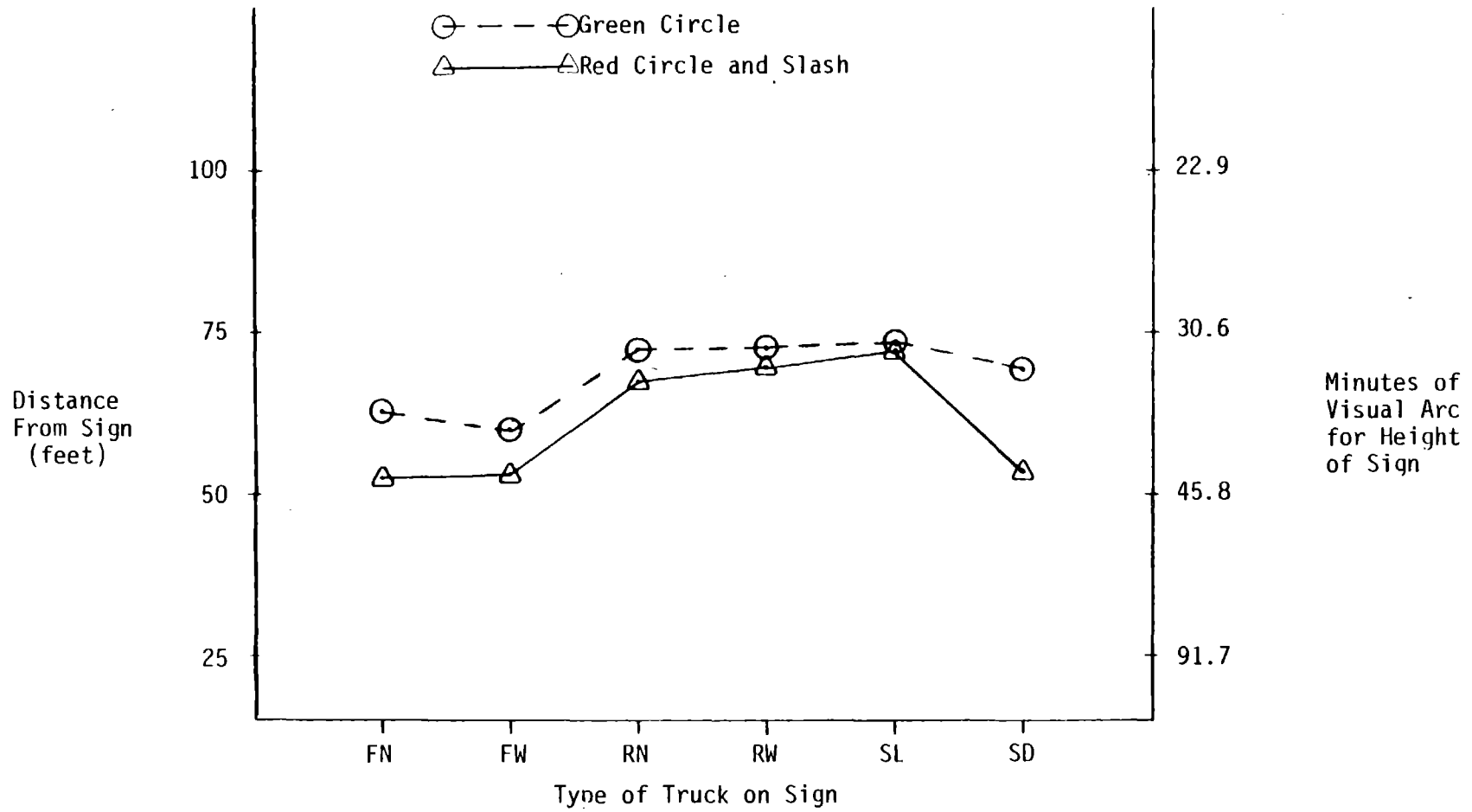


Figure 2. Mean visibility distances at which subjects recognized sign as a truck.

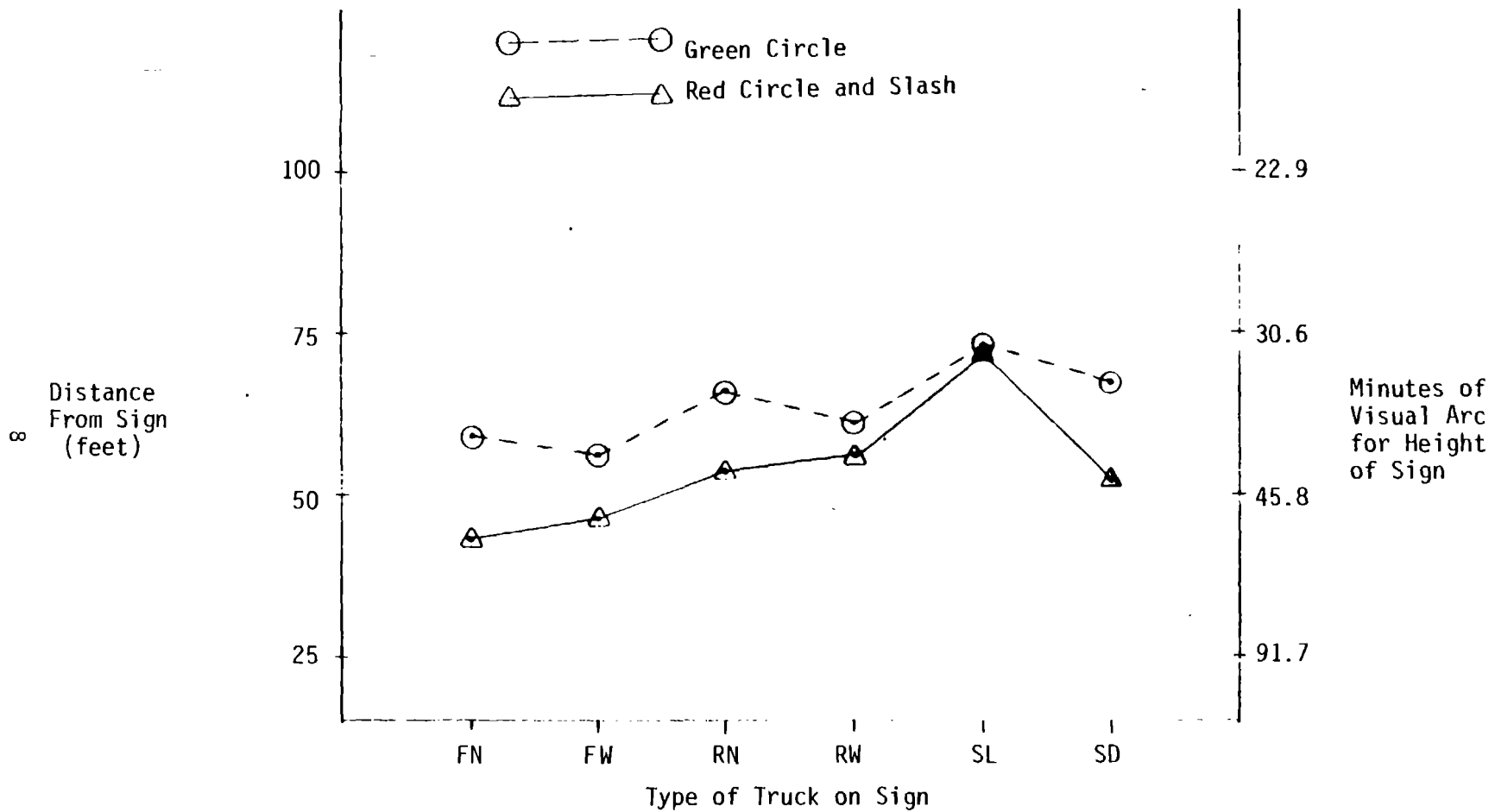


Figure 3. Mean visibility distances at which subjects identified the view of the truck (front, rear, or side).



Table 3. Means and standard deviations of visibility data: distances (in feet) at which subjects identified the view of the trucks (front, rear, or side)

Message		Type of Truck on Sign						Summary for Message
		Front Narrow	Front Wide	Rear Narrow	Rear Wide	Side Long	Side Double	
Permit (Green Ring)	M	58.98	56.02	65.97	65.93	72.93	67.03	64.48
	SD	32.30	28.43	35.18	36.48	36.25	34.57	34.20
Prohibit (Red Ring and Slash)	M	43.13	46.37	58.62	60.68	71.67	52.18	55.44
	SD	29.35	29.24	30.02	35.05	37.42	33.36	33.71
Summary for Sign	M	51.06	51.19	62.29	63.31	72.30	59.61	
	SD	31.74	29.12	32.77	35.72	36.69	34.64	

Table 4. Analysis of variance summary table for visibility data: distance at which subjects identified the view of the truck (front, rear, or side)

Source	SS	df	MS	F	P
Total	842,431.83	719			
Subjects	444,280.75	59			
Message	14,697.24	1	14,617.24	24.46	<.001
Sign	39,020.47	5	7,804.09	15.06	<.001
Mes. X Sign	4,744.47	5	948.89	1.85	n.s.
Res:Mes.	35,263.01	59	597.68		
Res:Sign	152,872.11	295	518.21		
Res:MXS	151,553.78	295	513.74		

A similar analysis could not be performed on the third feature (recognition as "large" or "oversize") recorded in the visibility data because so few of the subjects identified any of the stimuli with any term connoting "oversized." If a subject did not identify a particular feature, he/she was assigned a score of zero, and for this particular feature the distributions were very positively skewed, i.e., mostly zeroes. As a result these data were treated with a Chi-square test (see Table 5c). Comparing "seen" vs "never seen" for the total of red and green signs, the differences were significant, ( $\chi = 13.3$ ,  $df = 3$ ,  $p < .01$ ), with a much larger portion of the side-double (SD) responses being identified as a "large" or "oversized" truck.

This type of analysis was also computed on the other two features (truck and view of truck). Tables 5a and 5b show the results. Of note is the significantly large portion of subjects who never identified the RW as a truck, even though those who did recognize it did so at a long distance ( $\chi = 36.3$ ,  $df = 10$ ,  $p < .01$ ).

Table. 5. Visibility data expressed categorically (seen at maximum distance, seen at less than maximum distance, or never seen) by feature to be detected, message, and type of sign.

a. Feature correctly identified is "truck"

Type of Sign	Prohibitive			Permissive			Total, Both Messages		
	At 110'	At Less than 110'	Never Seen	At 110'	At Less than 110'	Never Seen	At 110'	At less than 110'	Never Seen
SD	11	45	4	17	42	1	28	87	5
SL	25	34	1	23	36	1	48	70	2
RW	20	35	5	23	32	5	43	67	10
RN	18	39	3	22	35	3	40	74	6
FW	8	50	2	11	48	1	19	98	3
FN	10	48	0	16	42	2	26	90	4

b. Feature correctly identified is "view of truck"

SD	11	45	4	16	43	1	27	88	5
SL	24	35	1	22	37	1	46	72	2
RW	12	42	6	16	39	5	28	81	11
RN	7	50	3	17	40	3	24	90	6
FW	4	54	2	7	52	1	11	106	3
FN	5	51	4	11	47	2	16	98	6

c. Feature correctly identified is "oversized truck"

SD	1	5	54	1	8	51	2	13	105
SL	0	3	57	0	3	57	0	6	114
RW	0	2	58	0	0	60	0	2	118
FW	0	3	57	0	3	57	0	6	114

In the second portion of the experiment, the meaning data were coded into "truck route," "route for oversized trucks," and "responses unrelated to truck route" by the experimenter. Note that only permissive versions of the signs were used in this part of the study. The distribution is shown in Table 6.

Table 6. Breakdown of Meanings across Signs for the general public sample

Meaning	SIGN						Totals
	Side Double	Side Long	Front Narrow	Front Wide	Rear Narrow	Rear Wide	
Unrelated to Truck Route	5	4	6	2	3	2	22
Truck Route, General	1	5	4	6	4	6	26
Truck Route, Oversized	4	1	0	2	3	2	12
TOTALS	10	10	10	10	10	10	60

Even though five people did not recognize it as a truck sign, the side-double had the greatest number of people identifying it as a route for oversized trucks. Perhaps as important, the side-double was confused the least with a route for regular trucks. This type of confusion is a short-coming of the side-long, front-wide, and rear-wide views. However, these differences are not statistically significant.

The differences among the preference rankings obtained in the final phase of the experiment were extremely significant ( $\chi^2_{ranks} = 118.1$ ,  $df = 5$ ,  $p < .001$ ) with the side-double symbol ranked first almost four times more often than its nearest competitor, the side-long sign. The front- and rear-narrow width trailer signs were least liked. Subjects often mentioned there was nothing about them that suggested oversize.

## Experiment 2

### Subjects

Truck drivers were recruited at a "trucks-only" rest area off the south bound lane of I-95 near Woodbridge, Virginia. A total of 123 drivers were tested although two were dropped since their primary employment was not truck driving. Compared to the sample from the general public, this sample was disproportionately male (115 vs 6 females).

### Apparatus

Subjects were tested in an FHWA step-van equipped with a gasoline-powered electric generator to power a slide projector (Kodak Ektagraph AF2) and timing equipment. Subjects sat in a chair facing a rear projection screen. The stimuli were identical to Experiment 1 except each driver only saw one oversized truck route sign, and two small, obscure signs (ranger station and railroad station) which were added to the series to ensure the subject was not merely reacting to the slide coming on, but to the recognition of the slide. The

timer, designed and fabricated by the FHWA Electronics Laboratory, was calibrated so that the clock started when the slide appeared, not when the "initiate" button was pressed. The clock stopped when the subject pressed a response button on a box resting on the table. The effective size of the stimuli, with the two exceptions noted, was much larger than in Experiment 1. The projected image was 6-inches square, with the subject about 2-feet from the screen. As in Experiment 1, photographs of the candidate signs were used in a subsequent preference section at the end of the session.

### Procedure

The primary purpose of Experiment 2 was to compare the candidate symbols for how long it took drivers to decide on a meaning for one of the symbols. The subjects pushed a button as soon as they decided what the message was. This time interval was defined as recognition time.

Subjects took a seat in front of the screen where they read and signed the consent form while the experimenter gathered most of the biographical data. He/she then listened to the first part of the instructions (see Appendix A) regarding recognition time, with emphasis on (1) being able to state what the sign meant before pressing the button; (2) pressing the button before saying the answer; and (3) guessing as quickly as possible when faced with an unfamiliar sign. After doing the task for the eight distractor signs, which gave the subject some practice, one of the 12 candidate signs (6 symbols by 2 messages) was presented. In addition to recording nine recognition times, the experimenter recorded a detailed answer about the interpretation of the candidate sign. Afterwards, the subject was told the intended meaning of the sign and did the preference task as in Experiment 1.

### Results

Figure 4 and Table 7 give the means of the recognition times. To statistically separate out some of the variance due to subjects, recognition times to four of the distractor signs were used as co-variates, resulting in a 2x6 analysis of co-variance. The analysis is summarized in Table 8.

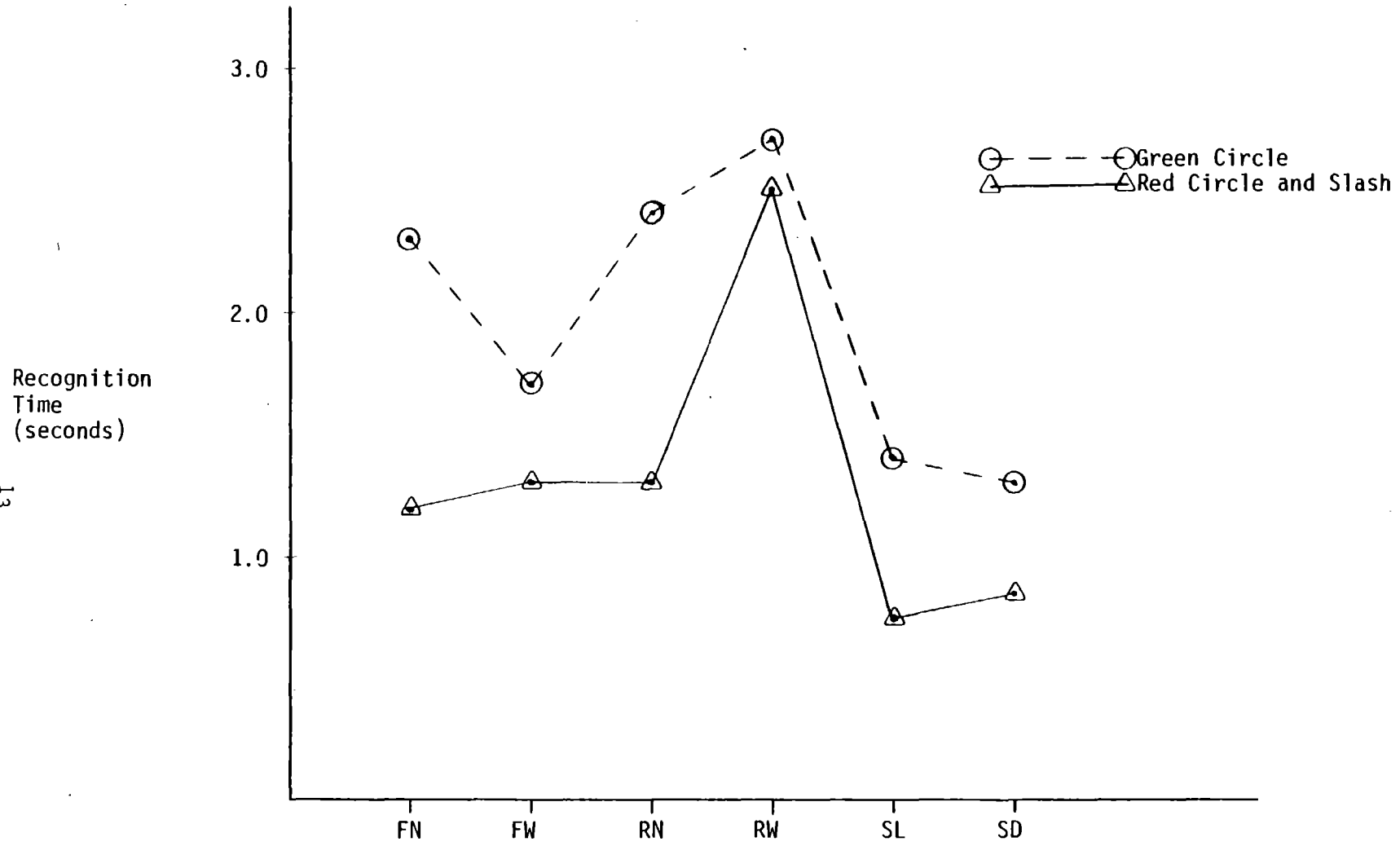


Figure 4. Mean recognition times for candidate signs.

Table 7. Means and standard deviations of recognition times  
(in seconds)

<u>Messages</u>		<u>TYPE OF TRUCK ON SIGN</u>						<u>Summary for Color</u>
		<u>Front Narrow</u>	<u>Front Wide</u>	<u>Rear Narrow</u>	<u>Rear Wide</u>	<u>Side Long</u>	<u>Side Double</u>	
Permit (Green Ring)	M	2.32	1.70	2.37	2.69	1.36	1.29	1.94
	SD	1.43	0.80	2.40	2.83	1.56	0.81	1.81
Prohibit (Red Ring and Slash)	M	1.22	1.31	1.31	2.55	0.74	0.85	1.37
	SD	0.71	0.67	0.86	2.97	0.31	0.55	1.38
Summary for Message	M	1.77	1.51	1.84	2.63	1.11	1.07	
	SD	1.23	0.75	1.84	2.82	1.23	0.71	

Table 8. Analysis of co-variance summary table  
for recognition times

<u>Source</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Total	3,244,001.81	112			
Message	120,652.33	1	120,652.33	7.00	<.01
Sign	336,845.73	5	67,369.14	3.91	<.01
Mes. X Sign	50,249.92	5	10,049.98	0.58	n.s.
Co-variates					
Railroad Station	699,913.46	1			
Deer Crossing	250,842.44	1			
Hospital	51,435.39	1			
Keep Right	61,548.36	1			
Error	1,672,514.17	97	17,242.41		

As in the second analysis in Experiment 1, there were significant effects for message ( $F = 7.0$ ,  $df = 1/112$ ,  $p < .01$ ) and type of sign ( $F = 3.91$ ,  $df = 5/112$ ,  $p < .05$ ) with no significant interaction of message and sign. Unlike Experiment 1, the red ring and slash were "recognized" or guessed more quickly than the green ring, even though the red ring obscured part of the symbol. On the sign factor, the SD version was guessed most quickly, and the RW least quickly. The differences among signs on recognition time were not as extreme as the differences with the visibility data, since the only significant differences that appeared in the Neuman-Keuls test was that the RW times were significantly more than SD, SL, and FW.

Meaning, coded as in Experiment 1, showed a similar but clearer pattern than the tunnel results. Over 75 percent of the responses to the sign presented had to do with truck routes in general, but the side-double sign was far more effective than the others when it came to adding "oversized" to the meaning. Note in Table 9 the lack of confusion between regular truck route versus oversized truck route for the side-double sign. Disregarding the "unrelated to truck route" answers, an analysis of the others is highly significant ( $\chi = 38.2$ , df = 5,  $p < .01$ ).

Table 9. Meanings given to signs by truck drivers

Meaning	SIGN						Totals
	Side Double	Side Long	Front Narrow	Front Wide	Rear Narrow	Rear Wide	
Unrelated to Truck Route	4	3	3	2	5	9	26
Truck Route, General	1	15	13	15	12	10	66
Truck Route, Oversized	15	4	4	3	3	0	29
TOTALS	20	22	20	20	20	19	60

During the study, several truckers confused the meaning of the green circle, so this problem was also studied. Of those drivers presented the red circle and slash, 98 percent interpreted it correctly. Thirty percent of those presented the green circle thought the green circle meant "no," and of those in this category who were asked what color the ring was, almost all replied "green." In other words, they perceived a green ring, but misinterpreted it. The remaining 36 percent gave an answer unrelated to route usage.

The preference data follows exactly the same pattern as the tunnel study results, viz. the side double was highest ranked; the front and rear narrow width trailer symbols were least preferred. The statistics are even more significant than those obtained in the tunnel study ( $\chi$  rank = 161.3, df = 5,  $p < .01$ ).

### Discussion

The side-view, double-trailer sign, on average, scored well on the measures utilized in the study. With both populations, it was the only sign which meant "over-sized" to the subjects, and was by far the most preferred. Although its visibility is somewhat less than some of the other signs (as measured by the "truck" identification and "view of truck" features), other signs that were more visible were not differentiated from a regular "No Trucks" sign. The fact that the SD symbol is differentiated from a regular truck contributes to its potential effectiveness in conveying an "oversize" information component to drivers. When truckers learn what the sign means, the long, thin shape of the symbol may

be the easiest of the candidate signs to differentiate from other regulatory signs. The preference scores indicate the SD will be easily accepted by both truckers and the general driving population, even if the latter will have an overly-specific definition for the sign.

Trying to make the rear or front views of the truck look oversized by extending the trailer beyond the cab on wheels was a failure. Nowhere was there a significant difference between narrow and wide versions. Even when holding the two photographs side by side, some truckers could not detect any difference. The same result happened when an attempt at a "long" truck was made. Several subjects remarked that it looked like a truck going down the road with its rear door open. The "doubles" was the only sign consistently perceived as oversized or big.

Considering the confusion over the green ring on the permissive signs, some study should be given to the value of retaining the ring. If it were not there, the truck image could be larger and more visible. At least some of the truckers seem to be reacting to any ring as if it were prohibitory. This suggests a major re-education campaign would be necessary if the green ring is ever adopted.

One note of caution: Some of the truckers mentioned they had seen the side-double sign in the southeast, and since this study was conducted only on the east coast, the trucker data may be biased. However, the subjects in Experiment 1, who were drawn from the greater Washington, D.C. area (and were less likely to have seen the signs), showed the same pattern as the truckers.

### Conclusions

The double-trailer sign is best understood and most preferred of all the candidate signs. Although the SL, FN and FW were identified at longer distances, they are more likely to be confused with the general NO TRUCK sign. It is concluded the double-trailer sign is the best candidate for a sign marking routes for oversized trucks.



## REFERENCES

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APPENDIX A



## INSTRUCTIONS FOR EXPERIMENT 1

This is a study to evaluate some proposed signs that may eventually be appearing on the highways. There are three parts to this study.

In the first part, you will be asked to view a series of 10 slides, one at a time. You will stand at one end of this corridor, and a slide will be projected on the screen at the other end. I would like you to walk slowly towards the screen until you can identify the symbol on the sign that is projected. At that point, I would like you to stop walking and tell me what the symbol on the sign is. Do not try to interpret the sign, or explain its meaning, merely identify the symbol on it. For example, if you see this sign (Gas) and can see that the symbol on it is a gas pump, you might respond "blue sign with a front view of a gas pump on it." Make this description as detailed as you can. You may want to include that the hose is on the right, or any other detail that you might notice. I want to know exactly what you see, so please be detailed in your description and include all aspects of the sign. Any questions?

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In the second part of the study, I would like you to look at a sign and tell me what it means to you. Please write your interpretation of the sign, and what effect it would have on your driving actions if you saw it on the road. For example, if you saw this sign (school crossing) you might respond "this means school crossing, I should drive carefully and watch for school children who might be crossing the road in this area." If you do not know what the sign means, please make as good a guess as you can to the meaning of the sign. Any questions?

---

In this third part of the study, I am going to give you six photographs of signs. One of these signs will be used to mark oversized truck routes, that is roads where trucks that are bigger than most trucks are allowed. I would like you to rank these signs from the one which best conveys the meaning oversized truck route to the one which least conveys this meaning. Please arrange these pictures, placing the most effective sign at the far left, then the next most effective sign, etc. The least effective sign should be to the far right. Remember to rank these signs according to how well they convey the meaning "oversized truck route." Any questions?

## INSTRUCTIONS FOR EXPERIMENT 2

### Instructions for Truckers

#### Part 1.

The purpose of this experiment is to measure your recognition time for certain highway signs. This machine will turn on a sign, and as soon as you think you know what it means, press the button. Then tell me what the sign means. Some of the signs will be familiar, some will be new, and some will be different sizes. In all cases, press the button as soon as you think you know what the sign means, and then tell me what it means to you. This would be not only the name of the sign, but also what effect it would have on your driving. For example, if you saw a school crossing sign, you might say, "That's a school crossing sign. I should slow down and watch for kids crossing the street around here." Remember, if you don't know the sign, make your best guess as quickly as you can.

Any questions?

-----

#### Part 2.

That last unfamiliar sign you saw was one of seven being considered by the Federal Highway Administration as route markers for oversized trucks such as double- or triple-bottom trucks, extra-long trucks, or wide loads. Now I am going to show you all seven signs and let you put them in order from best to worst as far as how well they convey that meaning.

-----

#### Closing.

Thanks for helping us. If you would sign this voucher, I will get your \$2.00. By the way, please don't tell any other truckers what the study was about, except to tell them it was about signs. We don't want anybody to know it is about truck signs until they have finished the first part of the experiment. I should be done by October 12, so it would be OK to talk about it after that.

Thanks again.

Record of Informed Consent

Part 46, Subtitle A to Title 45 of the code of Federal Regulations relating to the protection of Human Subjects in Research requires your informed consent for participation in a Federal Highway Administration study. Section 46.103(c) gives the following definition: "Informed consent means the knowing consent of an individual or his legal authorized representative, so situated as to be able to exercise free power of choice without undue inducement or any element of force, fraud, deceit, duress, or any other forms of constraint."

Your participation as a subject in a study to evaluate the intelligibility of certain symbolic road signs is requested. Please consider the following elements of information in reaching your decision whether or not to consent.

1. You will be given a basic eye examination to determine your corrected visual acuity and color vision.
2. You will be asked for a minimal amount of biographical information necessary to the study. All information provided is confidential, and the source of information will not be disclosed to the public.
3. You will view a series of slides from various distances, and answer questions regarding these slides. The test session will take approximately two and one-half hours.
4. You are free to decline consent, or withdraw consent and discontinue at any time.
5. Upon completion of the session, you will be paid \$20.00 for your participation.

The basic elements of information have been presented and understood by me and I consent to participate as a subject.

NAME: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

DATE: \_\_\_\_\_

RECORD OF INFORMED CONSENT

Part 46, Subtitle A to Title 45 of the Code of Federal Regulations relating to the Protection of Human Subjects in Research requires your informed consent for participation in Federal Highway Administration driving studies. Section 46.103(c) given the following definition: "Informed consent means the knowing consent of an individual or his legal authorized representative, so situated as to be able to exercise free power of choice, without undue inducement or any element of force, fraud, deceit, duress, or other form of constraint."

Your participation as a subject in a study to evaluate the intelligibility of certain symbolic road signs is requested. Please consider the following information in reaching your decision whether or not to consent.

1. You will be asked for a minimal amount of biographical information necessary to the study. All information provided is confidential, and your name will not be disclosed to the public.
2. You will view a series of slides, press a button as soon as you recognize each slide, and answer questions regarding these slides. The test session will take approximately 20 minutes.
3. You are free to decline consent, or withdraw consent and discontinue at any time.
4. Upon completion of the session, you will be paid \$2.00 for your participation.

The basic elements of information have been presented and understood by me, and I consent to participation as a subject.

NAME: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

DATE: \_\_\_\_\_



Sign Study, Fall 1984 (T-FHRC)  
Biographical Information

Date .../.../84 (1-6)  
Time ...:.... (7-10)  
Experimenter ..... (11)

Name: \_\_\_\_\_ ID Number ..... (12-14)

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone: \_\_\_\_\_ Age: ..... (15-16)

Female=1, Male=2 Sex: ..... (17)

Years Driving: ..... (18-19)

Average Miles Per Week: ..... (20-23)

Number of Accidents In Last Five Years: ..... (24-25)

Number of Moving Violations in Last Five Years: ..... (26-27)

Do You Drive the Same Route Repeatedly?: ..... (28)  
Yes=1, No=2

---

Acceptable = 1 Visual Acuity: ..... (29)

Unacceptable = 2 Color: ..... (30)

COMMENTS:

NAME: \_\_\_\_\_

ID #: \_\_\_\_\_

<u>ORDER</u>	<u>SIGN</u>	<u>1 Stop</u>	<u>2 Stop</u>	<u>3 Stop</u>
_____	1. Rear	_____	_____	<u>X</u>
_____	2. Dbl. Btm./P	_____	_____	_____
_____	3. Hospital	_____	<u>X</u>	_____
_____	4. Front	_____	_____	_____
_____	5. Phone	_____	_____	_____
_____	6. Rear/P	_____	_____	_____
_____	7. Deer	_____	_____	_____
_____	8. Side/P	_____	_____	_____
_____	9. W. Rear	_____	_____	_____
_____	10. L. Curve	_____	_____	_____
_____	11. Side	_____	_____	_____
_____	12. W. Front	_____	_____	_____
_____	13. Keep.R	_____	_____	_____
_____	14. Front/P	_____	_____	_____
_____	15. W. Rear/P	_____	_____	_____
_____	16. Wnd. Rd.	_____	_____	_____
_____	17. Dbl. Btm.	_____	_____	_____
_____	18. W. Front/P	_____	_____	_____

SIGN

- A \_\_\_\_\_
- C \_\_\_\_\_
- D \_\_\_\_\_
- E \_\_\_\_\_
- F \_\_\_\_\_
- G \_\_\_\_\_

Part Two

The meaning of this sign is: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

The effect this sign would have on my driving actions is: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

DO NOT LET SUBJECTS SEE THIS SHEET

Sign Study: Woodbridge

1. Name: \_\_\_\_\_ ID: \_\_\_\_\_ (1-3)

2. State: \_\_\_\_\_ 3. Female = 1 Male = 2 Sex: \_\_\_\_\_ (4)

4. Years Driving Experience: \_\_\_\_\_ (5-6)

5. Miles Driven in an Average Week: \_\_\_\_\_ (7-10)

6. How Many Accidents in Last 5 Years: \_\_\_\_\_ (11-12)

NOTE: Ask/How Many Over-Sized Trucks Did You Drive Last Year?  
After Data/ (Includes double or triple trailers, trailers  
Collection/ over 8 ft. wide, or trailers over 40 ft. long. \_\_\_\_\_ (13-15)

Do You Drive the Same Route Repeatedly? Yes = 1 No = 2 \_\_\_\_\_ (16)

Type of Sign: Prohibitive = 1, Permissive = 2 \_\_\_\_\_ (17)

Comments

Reaction Times:	Curve Left	_____	(18-20)
	Ranger Station	_____	(21-23)
	Keep Right	_____	(24-26)
	Phone	_____	(27-29)
	Winding Road	_____	(30-32)
	Train Station	_____	(33-35)
	Hospital	_____	(36-38)
	Deer	_____	(39-41)
	Truck Sign	_____	(42-44)
	(Letter:)	_____	(45)

Preference Rankings Sign:	A	_____	(46)
	C	_____	(48)
	D	_____	(49)
	E	_____	(50)
	F	_____	(51)
	G	_____	(52)

Meaning of Sign \_\_\_\_: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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