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GUIDE SIGN VIEW SURVEY IN NEW JERSEY

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ABSTRACT

As part of a larger study to review large guide sign driver viewing difficulties or "interferences," on state highways in New Jersey, a survey from a fast moving car was performed. The survey covered over 1000 approaches to interchange exits in the 2000 mile New Jersey state system. More than 580 motorist view "interferences" were discovered using visual observations. The method was verified to be 94% accurate using a videotape method and a legibility formula with a sample of approaches. Sign view blockage by difficult and expensive to modify highway features and furniture represented 35% of the interferences. Computer graphic interchange modelling at an earlier design stage is recommended to help avoid view blockages in the future.

INTRODUCTION

At interchanges, guide signing plays an important part in the overall effectiveness and efficiency of the operation of the interchange. Although guide signing cannot totally make up for unexpected interchange design, it can serve to lessen confusion and smooth out traffic flow. This leads to more efficient and sometimes safer operation of interchanges and the road system as a whole.

At many interchanges, motorists are confronted with identification and reading difficulties concerning signs that have adequate target value, legend size, and legibility. However, due to the <u>physical design of interchanges or approaches to interchanges, the placement of signs, or the placement of other fixed physical objects</u>, absolute and unchanging interferences with the visibility of the signs to approaching motorists are created.

Since sign visibility interferences reduce motorist identification and reading time, sometimes considerably, this can create erratic vehicle movements, speed variances, and other safety problems.

The capital and maintenance investments in large guide signs is significant. A 200 square foot ground mounted sign with footings typically costs $16,000 and a sign bridge can cost more than $150,000. The return on investment is reduced when signs cannot perform their real functions. The design of interchanges are involved in the interference of sign views. Interchanges in New Jersey cost tens of millions of dollars. Landscaping and maintenance add to the cost.

It should be understood that purchasing right-of-way, removing rock formations, and linking with existing roads create practical problems that sometimes constrain optimal sign placement. It appears also that traffic engineers do not have a practical way to get a driver's view of tentative plans.

LARGER STUDY ACTIVITIES

The subject of this report, an interchange guide sign survey of view interferences from a moving car, was part of a larger study. The larger study also involved the use of a more detailed videotape review of a limited number of sites and the demonstration of 4D computer graphic modelling of interchanges to integrate sign placements and physical design.

The video tapes of approaches were analyzed using a legibility distance formula reported by Gerhart King (1) which includes consideration for the number of information elements on a sign. The accuracy of the moving car observations were checked by the videotape method at 19 interchange approaches. A 94% accuracy of the moving car observations of permanent sign blockages was found, based on the limited sample.

The videotape method can be useful for doing very accurate sign sight distance measurements and for making percentage statements of sign interference severity. The moving car observations, however, are faster, less expensive, and adaptable to large scale surveys of thousands of signs normally found in large highway systems.

SCOPE AND PROCEDURE

An interchange is defined as having one or more exits to a grade separated route. An approach is a section of roadway that ends with an interchange exit, exits, or upstream exit decision point.

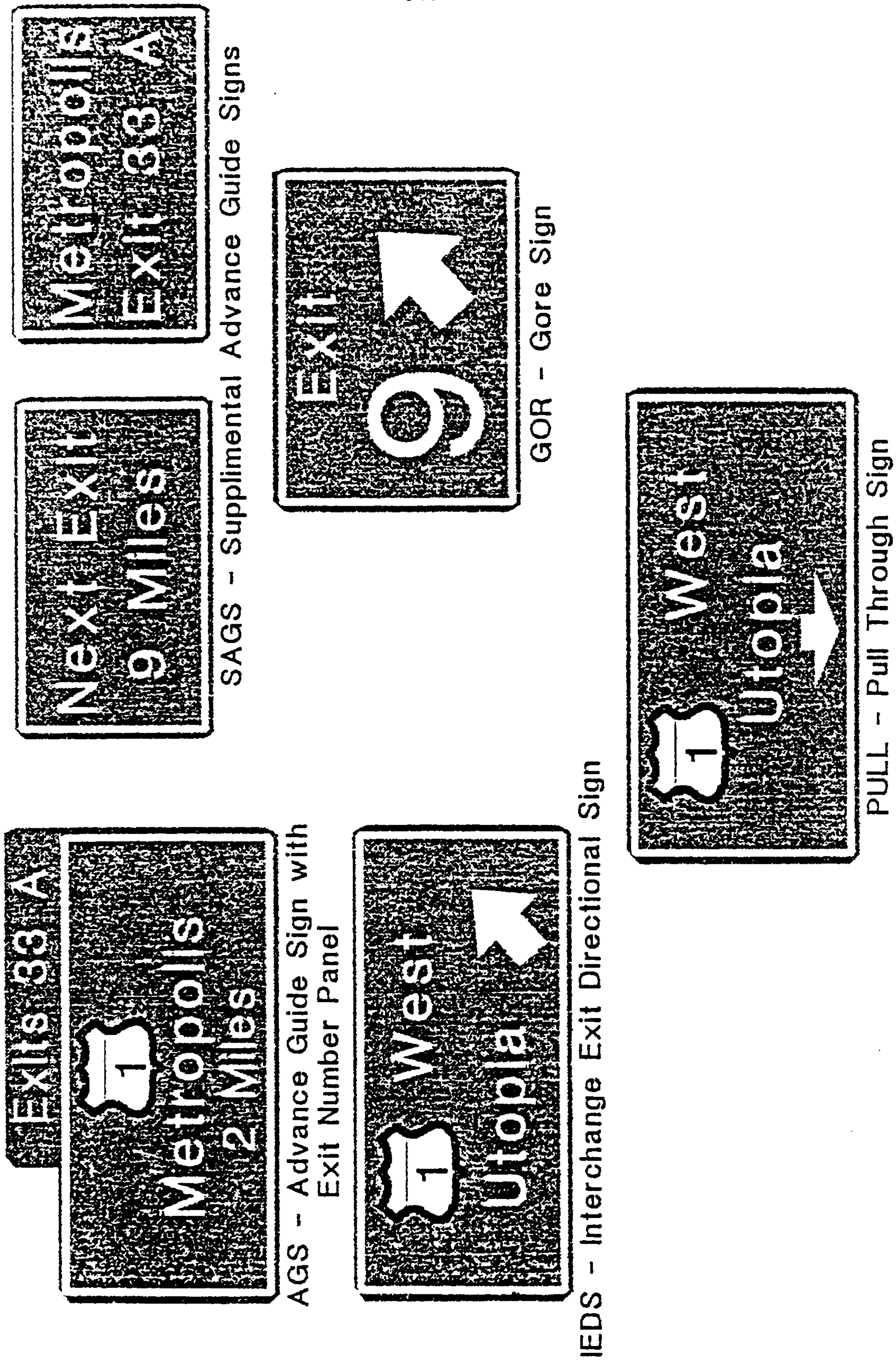
The number of interchanges in New Jersey was estimated to be 693. On the state system, interchanges have single, double, triple, and quadruple approaches. A random sample produced an estimate of 10% single and 90% double approach interchanges which yields 1317 approaches. The total number of approaches surveyed was 1012 or about 75%.

The survey was carried out in daylight during the summer and fall of 1987 from a 1986 Dodge Aries, to determine where the driver's view of a guide sign was less than maximum readability. The earliest point at which an interference was noted was established where the observer could clearly notice and read the entire message on the sign at a point downstream of where it should have been legible to their eyes. An assumption was made that the smallest legend used were adequate for current standards. Since some signs were probably inadequate for current standards, the percentage of interferences found might be conservative. However, it must be noted that the observers were young people with very good uncorrected vision, which would tend to make their judgement liberal.

The end purpose of the larger project was limited to sign placement and design method improvements. This survey was not intended to substitute in any way as a traffic engineering operation. Approaches involving isolated sites, tolls, and state border crossings were not surveyed. The value, ambiguity, or lack of transmissivity of the message were not evaluated. The effect of moving or parked vehicle blockage or the views

FIG. 1

SIGN TYPES



from other lanes were not surveyed. Undoubtedly many more interferences would have been found had these factors been accounted for.

The point of this report is to summarize an extensive preliminary investigation of sign view interferences by using a reasonably accurate, low cost, and fast methodology.

The following sign types were surveyed (Figure 1).

1. Advance;
2. Supplemental advance;
3. Exit direction;
4. Gore; and
5. Pull through, including both ground mounted and overhead signs.

RESULTS

Of the 1012 approaches surveyed, 583 interferences at varying severity were noticed that left the observers with less than maximum viewability within their readable range.

The interferences are classified and distributed by number and percentage on Table 1. The classification can be simplified into the following four main categories of interference, that do not include damaged or deteriorated signs:

A. Sign View Blockage - This represents 97% of the cases observed. The term means the approaching motorist's view is blocked by some fixed object. The method is

Figure 2: Tree Blockage, Rt. 21 North at Passaic Park

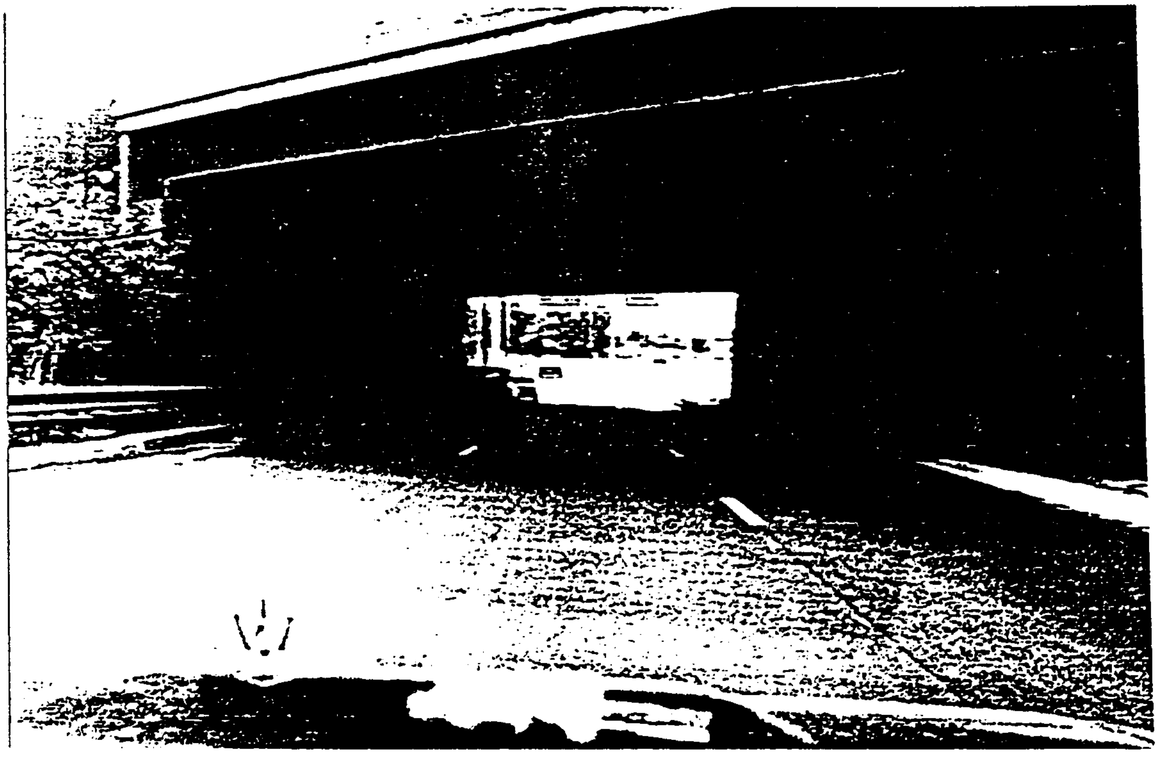


Figure 3: Bridge Span Blockage, Rt. 130 South at Rt. 295 & Rt. 42

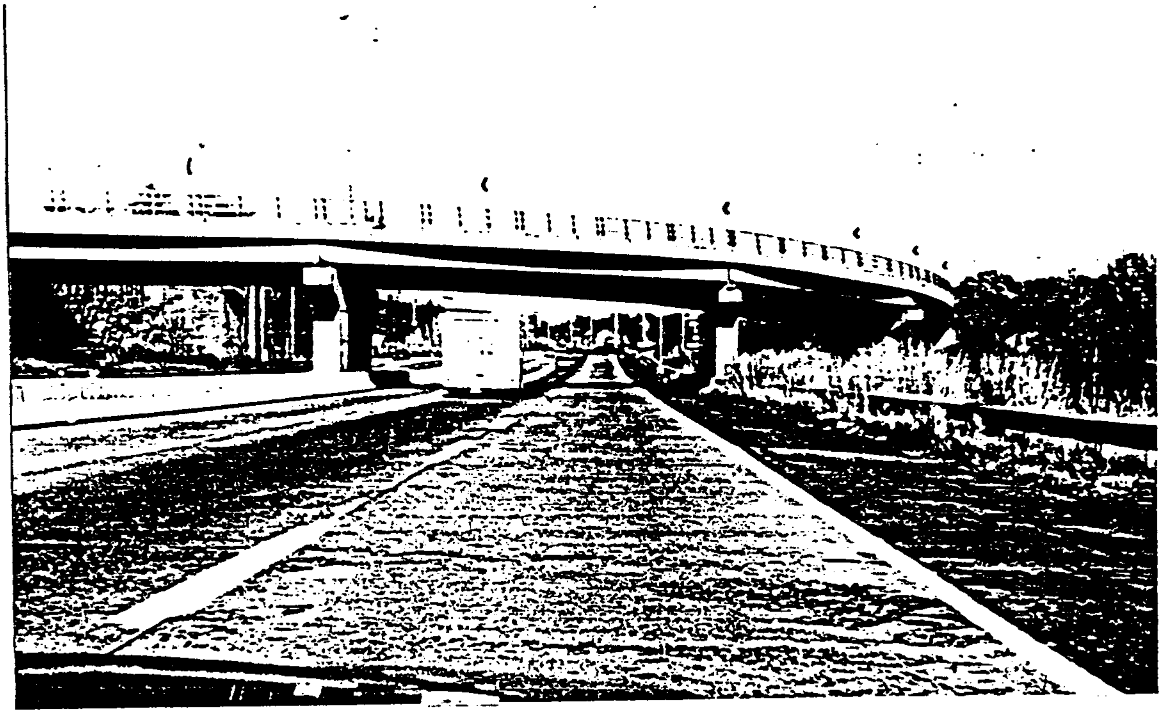


Figure 4: Bridge Pier Blockage, Rt. 21 North at River Rd.

Figure 5: Complex Environment, Rt. 1 North at Rt. 18

Figure 6: Parallel Roads, Rt. 295 South at Rt. 42

TABLE 1

DIRECTIONAL GUIDE SIGN

VIEW INTERFERENCES

Reason for view Interference	Frequency	Percentage of Total
Trees	309	53
Curves	86	15
Crests	32	5
Bridge spans	40	7
Telephone poles	32	5
Signs	39	6
Bridge abutments	11	2
Bridge parapets	10	2
Bridge piers	10	2
Complex environments	6	1
Ambiguous meaning: due to parallel roads	4	1
Buildings, information overloads, signs down, signs broken	4	1
	583	100

1. Trees - 53% (Figure 2)
2. Poles - 5%
3. Curves and crests - 20%
4. Other signs - 6%
5. Bridge spans, abutments, parapets, and piers - 13% (Figures 3, 4, & 6)

Some types of interferences were not found and they include:

A. Visual Cone - No signs were found to be outside the driver's 20^{o} cone of vision until the end of the approach.

B. Unexpected Location - No signs were observed to be located in a spot which is unexpected by the drivers, thus causing a noticeable decrease in the readable range.

The signs by type that were found to have one or more interferences are as follows by percentage:

Advance	- 48%
Exit Direction	- 36%
Gore	- 11%
Supplemental Advance	- 0%
Pull Through	- 3%
Miscellaneous	- 2%

DISCUSSION

The view blockage of highway signs has been reported before, recently by Hahn, McNaught, and Bryden in New York (2) who noted that, "The target value of many large guide signs is limited by high surrounding brightness, and by blockage by other highway features."

We found that a little more than half of the blockages were caused by trees. The maintenance of landscaping is normally an annual event when there are sufficient funds. Trees and shrubs are relatively inexpensive to modify. Apparently, when they were originally located in the design phase, the impact of this growth process was often not foreseen. They can be cut back or removed to correct the interferences at relatively low cost.

Poles are a bothersome interference, but the interference problem appears to be minor in most cases.

Small signs blocking large signs can be moved inexpensively. However, large signs, curves, embankments, walls, spans, parapets, and piers represent an estimated 35% of the problem. The correction of these interferences would require moving large signs, new road alignments, bridge replacement or the reconstruction of other features involving large capital investments. Some of this may be slowly correctable.

It is recommended that more attention be placed in testing scale models at an early design stage involving both signs and features prior to building new interchanges and alignments.

Three dimensional dynamic computer graphics can provide a practical way to test the driver's view at an early stage with a more effective input and review of traffic engineers (3).

The technical means for traffic engineering input with optimal sign placement for each unique interchange has been crude in comparison to the means that are available today.

The information for this presentation is primarily taken from a report by Roberts and Black (4).

The methodology in this survey may be used in other states to quickly assess the approximate number and location of sign view interferences without the need for specialized equipment. A rough, subjective assessment of the severity of the interference, such as a three point scale, should also be used.

ACKNOWLEDGMENTS

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