DEPARTMENT OF MAINTENANCE

Causes and Costs of Highway-Sign Replacement

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THE causes of sign replacement include natural deterioration, vandalism, damage by vehicles, and changes in laws or policies which make sign messages obsolete.

Opinions differ greatly as to the relationships of the various causes of replacement, the average life of signs, and the relative importance of certain factors in location and environment.

In order to secure reliable information on existing conditions, data was obtained from a representative sample of signs replaced during a period of one year. Using a questionnaire form, foremen of sign replacement crews recorded items of information about each replaced sign. These items included detailed information regarding age, location, and reasons for replacement. The mass of data was handled by punch card machine methods and the analysis was completed with the aid of accepted statistical procedures.

The paper includes a summary of the more interesting and significant findings, and makes interpretations of their meanings to signing problems.

● THE signs on our highways constitute an important, though impersonal, contact between highway departments and the driving public. Over the years signs have been used in an ever increasing number of locations. In Virginia, about 185,000 signs were in place on the rural state highway system in 1954.

How should signs perform if they are to fulfill their function? First, and most important, they must get the message to the driver. Second, they must resist all the damaging factors to which they are exposed so they may perform satisfactorily at an economical cost. Finally, the signs should present a good general appearance.

The Virginia Department of Highways in cooperation with the Bureau of Public Roads now has in progress a comprehensive study of highway signs. The scope of the project includes studies in legibility as well as field performance. Studies in legibility are concerned with letter design, brightness, glare, and other factors, all of which affect the ability of the sign to convey its message to the driver. The field performance studies deal with physical measurements, materials, and costs. It is hoped that it will be possible to tie together all of the findings in developing material specifications and design procedures for securing adequate signs at the least cost.

In order to have a better understanding of the problems connected with sign performance, it is pertinent to have information on the number of various types of signs in place on the highways, where they are located, and when and why old signs fail and are replaced. This information is desirable so that any proposed change in signing activity may be considered in the light of practical circumstances. Accurate and reliable information on when and why old signs fail and require replacement can not only pinpoint ways of improving their performance, but also assist in the formulation of policies affecting signs.

It became evident in interviews with various persons connected with the administration of the erection and maintenance of highway signs in Virginia and other states that there are widespread differences of opinion on the causes and costs of sign replacement. To get more precise information, a study was initiated which had as its prime source of data the men in the sign crews working on the road. They supplied detailed information on actual signs replaced.

This report summarizes the study and its findings.

Causes of Replacement

The four main reasons for cause of replacement are natural failure, vandalism, change in policy or law, and accidental vehicle damage. The photographs in Figures 1 through 6 show examples of signs which were replaced for various reasons indicated in the captions. Natural failure is defined as deterioration of the sign surface caused by weathering, including discolored appearance and dullness,

Figure 1. Example of natural failure—discolored and dull.

Figure 2. Example of natural failure—peeling of paint.

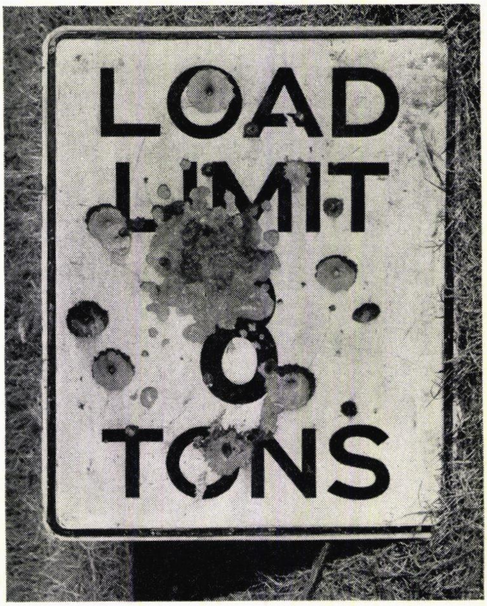

Figure 3. Example of vandalism—gunshot.

Figure 4. Example of vandalism—marked-up.

Figure 5. Example of change in policy or law—speed limit change.

Figure 6. Example of vehicle damage.

peeling of paint, peeling of sheeting, spalling of beads, failure of the black paint of the message, etc. Vandalism occurs when wanton damage is inflicted on signs. Examples are gunshot, scratched with hard object, bent by hand, and marked-up. A change in policy or law may cause a sign to be replaced because its message becomes obsolete, although its condition may be satisfactory in other respects. A change in policy regarding speed zoning or law affecting weight limits are examples. Vehicle damage includes cases where a sign is struck by a moving vehicle. This is different from vandalism because the occurrence is accidental in nature.

Classification of the various causes of failure together with a listing of items pertinent in describing location, etc. formed the basis for developing the instrument to collect data for the study.

COLLECTION OF DATA

The instrument used to collect data was a questionnaire form. The answers required by the form described the location, age, and many other things pertinent to sign performance, including specific reasons why the old signs were taken down. A trial questionnaire form was made up and used in the spring of 1953 for several hundred responses. As a result of this pilot study, several revisions were made in the form to overcome deficiencies which were pointed out by the persons supplying the data, or which showed up in the summary and analysis of the initial data. The revised form, shown in Figure 7, proved to be satisfactory and was used to collect the data reported here.

Four sampling periods (one in each season) were used to represent activity for an entire year. The sign crew foremen in each of Virginia's eight construction districts were asked to complete a questionnaire for each sign replaced during the sampling periods, each of which lasted about three weeks. The total number of questionnaires from each district was in proportion to the total number of signs in place in the district. The crews were instructed to proceed with regular signing activity and not to undertake any special work during the sampling periods. Regular supervision over the crews was exercised by the Landscape Superintendents who were made aware of the importance of the questionnaire and of the fact that care was required in its completion. A crew foreman is shown filling out a questionnaire in Figure 8. A total of 3,537 questionnaire forms were returned—about a six percent sample of the signs replaced from July 1, 1953 to June 30, 1954. Reports from the field indicate that the sign crews were interested in the study and took the time and trouble to do the best they could to supply the desired data. The fact that

VIRGINIA DEPARTMENT OF HIGHWAYS - SIGN STUDY

Virginia Council of Highway Investigation and Research, Thornton Hall, University of Virginia, Charlottesville

Please take a few minutes to fill out the following questionnaire each time you take down a sign. If you have any questions about how to fill out the forms, please ask the Landscape Superintendent.

This is an important part of a sign study being made all over the state and we need your cooperation.

(1) Today's date ________ 19 ____

(2) County number ________ 1 2 9 10

Route number ________

What is the name of the nearest town or city ________

About how many miles ________?

The town is in what direction ________?

INFORMATION ABOUT THE OLD SIGN WHICH HAS BEEN TAKEN DOWN:

(3) What is the code number of the old sign ________ 20

(4) What month and year was the old sign put up ________ 19 ____ 31

Was the date marked on the sign?
Yes ____
No ____

32 33

(5) What was the sign made of?
Steel ____
Aluminum ____
Wood ____
34

(6) Was the front surface of the sign reflectorized?
Yes ____
No ____
35

If so, what kind of reflecting material was used?
Prismo beads ____
Scotchlite ____
Reflector buttons ____
36

(7) How far was the sign from the edge of the pavement? ________ feet 37 38 39

(8) Where was the sign located?
Between the road and the ditch ____
On the other side of the ditch ____
Other location ________
40

(9) Was the sign near an intersection?
Yes ____
No ____
44

If yes, approximately how far? ________ feet 45 46 47

(1) In what type of neighborhood was the old sign?
Built up (many houses and business places nearby) ________
Open country (few or no houses or business places nearby) ________
49

(11) Is there a nearby public place?
Yes ____
No ____
50

If so, check one:
School bus stop ________
School ________
Picnic place or public park ________
General store or gas station ________
Drive-in theater ________
Other ________
51

Approximately how far in feet? ________ 52 53 54

(12) How high was the bottom of the sign above the ground surface? ________ feet 55 56 57

(13) In what direction did the sign face?
N ____ NE ____ E ____ SE ____
S ____ SW ____ W ____ NW ____
58

Was the sign shaded by trees?
Yes ____
No ____
59

WHY WAS THE OLD SIGN TAKEN DOWN? CHECK REASONS

(A) VANDALISM 60 61

1. Shot with gun ________
2. Marked up (crayon, tar, etc.) ________
3. Scratched with hard object ________
4. Bent by hand ________
5. Other (please explain) ________

____

(B) NATURAL FAILURE 62 63

1. Peeling of paint ________
2. Peeling of sheeting ________
3. Smoke or soot ________
4. Spalling of beads ________
5. Black paint on letters or symbol is not good ________
6. Discolored and dull ________
7. Splashed by mud ________
8. Other (please explain) ________

____

(C) VEHICLE DAMAGE 64 65

Was the sign hit by car or truck?
Yes ____
No ____

(D) CHANGE IN POLICY OR LAW 66 67

Was the sign still in good shape but taken down because of a new regulation?
Yes ____
No ____

IMPORTANT

★ Circle the one main reason above why the sign was taken down. 61 63 65 67

Signature of Foreman ________

THANK YOU VERY MUCH

Figure 7. Facsimile of questionnaire form used to collect data on sign replacement.

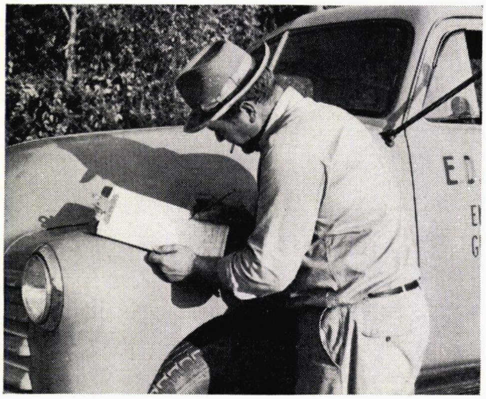

Figure 8. Sign crew foreman supplying data on a sign just replaced.

over 96 percent of the items on the questionnaire form were answered would confirm this. The map in Figure 9 shows the geographic distribution of the returns.

As a result of the care taken in the design and the execution of the questionnaire sampling, it is believed that the data accumulated is adequate to give an accurate and reliable account of sign replacement activity on Virginia's rural highway system (excluding towns and cities of 3,500 population or more).

Data on Age at Replacement

Important in a survey of this sort is reasonably reliable information on the ages of the signs replaced. For more than five years it has been the practice in Virginia to place the date on the back of each sign when it is erected. On over 66 percent of the signs in this survey the dates were still legible and were used to determine the exact age at replacement. In 22 percent of the cases the dates were not legible, but the sign crew foremen were able to estimate the date of erection from personal knowledge. In only 12 percent of the cases was data on the ages not available. An examination of the data showed that unavailable age information occurred in roughly the same percent of cases in each of the various classification breakdowns. Any bias which might have been introduced, therefore, would not only be small, but also would affect all classifications in the same amount. Thus, it is believed that the age information is entirely adequate.

Secondary Causes

In supplying data on the questionnaire in cases where more than one cause of failure contributed to the replacement, the foremen were requested to indicate the one most important cause together with secondary causes. Preliminary to the summary and analysis of the data for the whole year's sample, a study was made on about one-fourth of the data with regard to the number of causes specified for each case. In 66 percent of the cases, only one cause was named, and, of course, this was the principal cause. In about 34 percent of the cases a main reason plus one or more secondary causes were indicated. Separate summaries of

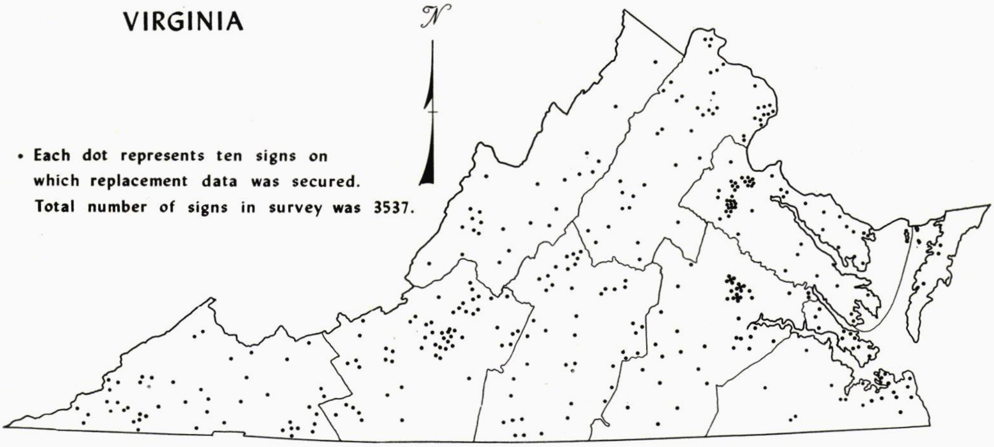

Figure 9. Map showing geographic distribution of questionnaire returns.

the main causes and the secondary causes were made, and it was determined that no additional information of any importance was gained by accounting for the secondary causes. Therefore, to avoid unnecessary work, only the one principal cause of failure indicated for each case was entered into the summary and analysis.

METHODS OF ANALYSIS

For ease in handling the mass of data, the items were coded, punched in IBM cards, and processed and tabulated by punched card machine methods. Approximately 116,000 individual items (examples: distance from the edge of the pavement to the sign; was the sign hit by car or truck?) were entered into the card deck. The number of combinations possible from the questionnaire form was an astronomical figure, approximately 2×10^{15}. To reduce the analysis to a reasonable amount of work, a systematic study was made to select only those simple summaries, or combinations of factors, which might supply information useful in practical signing activity. Where appropriate, these were processed using statistical methods which tested the significance of differences and relationships

The Chi-square test was used to scrutinize two-way combinations (example: cause of failure and height above the ground). The test examines the proportions of the various combinations and determines whether or not they are significantly different. In this way it was possible to establish whether a significant relationship existed between classifications.

Contingency tables were prepared and tested for overall significance and for significance of the rows and columns. Consistent with the conservative use of the Chi-square test, an individual cell was not tested unless both the row and column in which the cell was placed were significant. A one percent significance level was used to infer with certainty that a relationship existed, and a five percent significance level was interpreted as a tendency relationship. Differences which could be attributed to chance sampling fluctuations in more than five percent of the cases were not considered significant.

The age significance test was also made on all items which might have practical interpretations. The ages for different classifications were arranged in rank order and an overall

TABLE 1
SUMMARY OF CAUSE OF SIGN REPLACEMENT

Cause of Replacement	Percent of Cases		Average Age at Replacement (months)	
NATURAL FAILURE				
Discolored and dull	16.9		45.6	
Peeling of paint	8.0		47.5	
Peeling of sheeting	6.8		37.5	
Spalling of beads	4.4		46.5	
Black paint not good	3.3		40.5	
Other	1.3		43.3	
Total of all natural failure		40.7		44.3
VANDALISM				
Gunshot	18.9		32.8	
Scratched	4.9		31.7	
Bent by hand	3.9		34.3	
Marked up	2.5		30.0	
Other	2.3		25.1	
Total of all vandalism		32.5		32.1
CHANGE IN POLICY OR LAW		19.3		25.0
VEHICLE DAMAGE		7.5		24.5
	Total 100.0		Overall average 34.3	

significance test was made, using single-classification analysis of variance. If the overall test was significant, then a test was made on the gap between adjoining classifications. This gap test is a conservative way to determine the significance of age differences.

RESULTS AND APPLICATIONS

A summary is found in Table 1 of the percent of cases for each classified cause of failure and the corresponding average age at replacement. This information is useful in considering the relative importance of the various items causing replacement during the sampling periods. For example, the importance of gunshot damage is readily seen inasmuch as nearly one-fifth of the signs were victims of this kind of vandalism.

It is also possible to get a rough idea of the overall value of an assumed improvement to a particular item. For instance, if the physical properties of a new sign material were to be vastly improved so as to double the resistance to certain weathering it would not be correct to claim that the average sign life would be doubled. Some types of weathering effects, such as the deposit of a surface film, might still seriously affect reflective properties, although otherwise the material might be in good condition. However, regardless of the increased resistance to weathering, the factors

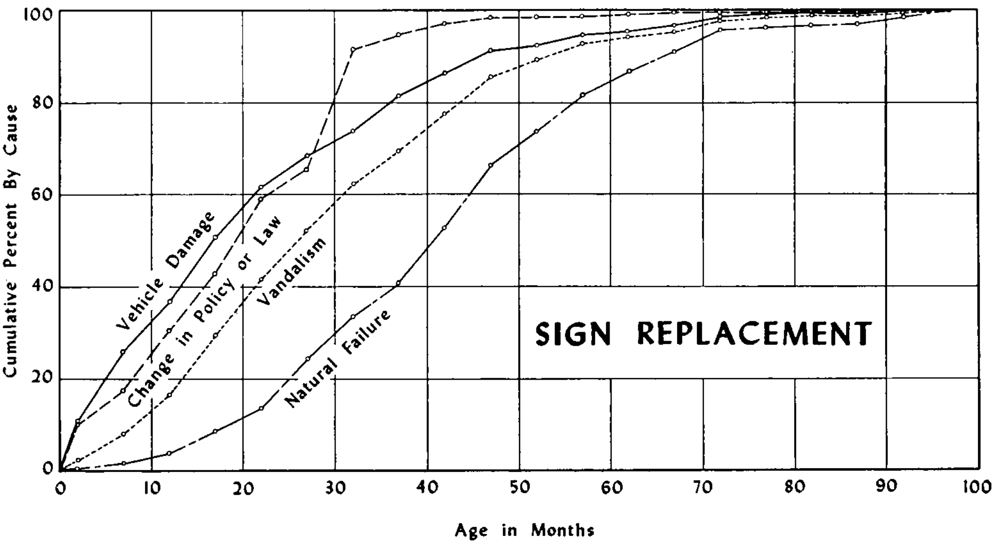

Figure 10. Cumulative frequency curves of ages for major causes of replacement.

of vandalism, change in policy or law, and vehicle damage will still be taking their toll early in sign life. Hence, substantially increasing the resistance to weathering might result in increasing the overall average life only a few percent.

Distribution of Ages

The data on the distribution of ages for the various major causes of replacement are shown in Figure 10 as cumulative frequencies. By the steep initial rise in the curve for vehicle damage it is seen that signs which were vulnerable to this type of damage tended to be struck at an early age. Twenty-six percent of this damage occurred by the time the signs were seven months old. The curve for change in policy or law is the most irregular since replacement due to this cause is often done in concentrated periods, as illustrated by the sudden break in the curve. The shapes of the curves for vandalism and natural failure are more typical of the S-shaped cumulative frequency.

Figure 11 is the cumulative frequency for all causes of failure. This curve is useful in estimating the average percent replacement which could be expected to occur at any given age. For example, if some change in material or standard were considered (such as adoption of a red stop sign), and it was desired to make the change in an orderly fashion only as old signs failed and needed replacement, the curve indicates that eighty percent of the signs would be replaced in about four years. Perhaps at that time a clean-up campaign might be put into effect whereby the remaining twenty percent of the signs would be replaced in a brief period regardless of condition, rather than wait during the additional four years for them to be replaced through normal activity.

Costs of Sign Replacement

During the fiscal year 1953–54 a total of about 63,500 signs were erected by the Virginia Department of Highways at a total cost for labor and materials connected with all of this signing activity of about $622,000. Of this, 74 percent was spent on the 8,141 miles in the primary system ($56.50/mile), and 26 percent on the 40,317 miles in the secondary system ($4.00/mile). The overall average cost per sign erected was about $9.80. Since the the average life in service is 34.3 months, the average cost per sign in place is 28.6¢ per month or approximately one cent per day of service as a rounded figure.

Depreciation was taken into account in computing the losses attributable to all causes of failure except natural failure since the average age of natural failure was taken as the basis for computation of costs. In any event,

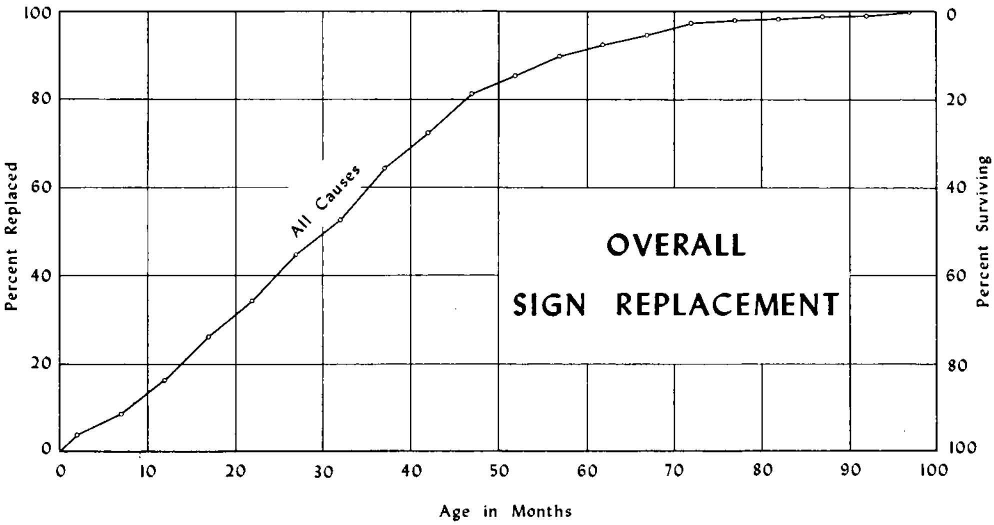

Figure 11. Cumulative frequency curve of age for all causes of replacement.

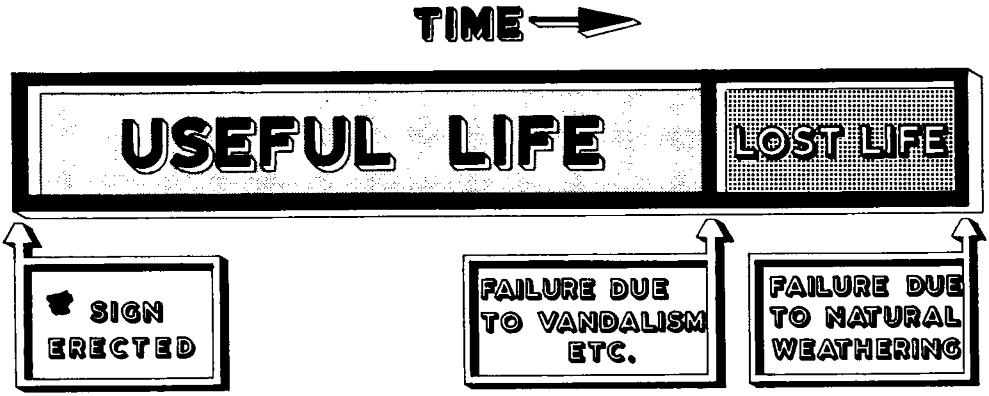

Figure 12. Illustration of basis for computing losses due to vandalism, etc.

the signs are subject to weathering, and if they were not replaced because of acts of vandalism, change in policy or law, or vehicle damage they lasted an average of 44.3 months. It is assumed, therefore, that a sign which fails and is replaced after being in place 44.3 months has given its full measure of service. If a sign was replaced at some earlier time, however, then the difference between 44.3 months and the age at replacement would represent the loss of service attributable to the cause of replacement. The general idea of this is shown graphically in Figure 12.

For a given classification, such as gunshot, the cost was computed by multiplying the number of cases (0.189 × 63,500) by the number of months loss of life (44.3 − 32.8) by the cost per month of a sign in place (28.6¢). This resulted in a figure of $39,500 which represents 6.4 percent of the total sign cost. Table 2 summarizes the cost for the various failure classifications. It should be noted that if the sign materials themselves were more resistant or less resistant to weathering, the losses due to vandalism, change in law or policy, and vehicle damage would be greater or smaller, respectively.

The costs which are attributable to the various causes of failure fix the relative importance of the items in more meaningful terms

TABLE 2
LOSSES PER YEAR
Assume Natural Failure as Basis

Cause of Replacement	Cost		Percent of Total Sign Cost	
VANDALISM				
Gunshot	$39,500		6.4	
Scratched	11,500		1.9	
Bent by hand	7,000		1.1	
Marked up	6,500		1.0	
Other	8,000		1.3	
Total of all vandalism		$72,500		11.7
CHANGE IN POLICY OR LAW		67,500		10.9
VEHICLE DAMAGE		27,000		4.4
		Total $167,000		Total 27.0

than percents of occurrences, and are more useful in planning appropriate action. If a campaign to reduce the occurrence of gunshot damage were considered, for example, an estimate of the cost of the campaign could be weighed against an estimate of the reduction in gunshot loss which might come about. This would indicate whether or not such a campaign could be economically justified.

FURTHER RELATIONSHIPS AND RECOMMENDATIONS

Natural Failure

The analysis of the data did not disclose any significant relationships between various types of natural failure and either the distance from the pavement or the height above the ground. This lack of relationship is illustrated in Figure 13 in which data for discolored and dull signs from each district for each season was plotted. While a slight tendency is suggested from the plot, the wide scatter of points shows that no marked relationship exists. The analysis showed that of all signs replaced, there is a slight indication that a higher proportion of low signs are also near the pavement. Otherwise no significant relationship existed between height and distance from pavement. Splash

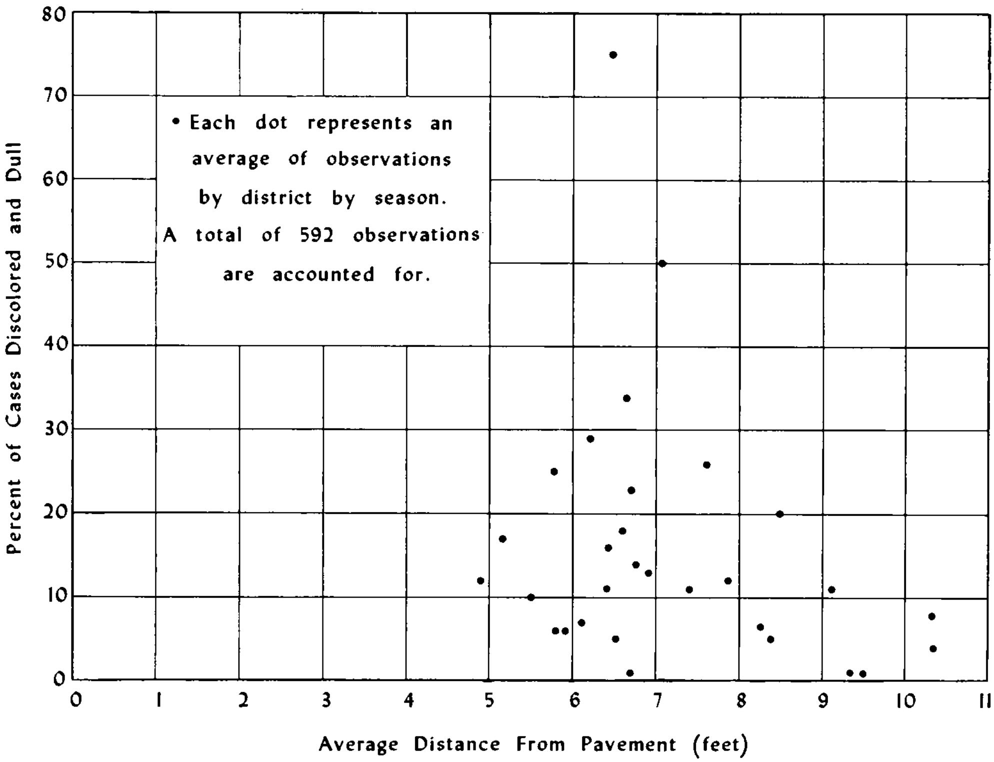

Figure 13. Per cent of total cases replaced because of discoloration and dullness versus average distance from pavement.

and spray problems in Virginia have not been considered serious. The analysis of data in this survey does not prove that no relationship exists between various types of natural failure (including discolored and dull) and placement of the sign with respect to the road, but it is concluded that no strong relationship exists. All of this would be interpreted as meaning that there is no justifying data for recommending a change in existing practices of placing the signs for reasons of improving resistance to natural failure.

Improvements in materials to resist weathing are always desirable. The importance of discoloration and dullness is demonstrated by the fact that this accounted for 16.9 percent of all sign replacements. The effects of oxidation and the deposit of a tenacious film of atmospheric impurities on the surface of signs are practically impossible to avoid. While they are very difficult to remove, periodic washing might help to reduce and delay the dulling effect. Some of the more recent developments in several types of plastic materials which resist dirt accumulation and which permit washing are helpful in this respect.

Black stencil paint. While losses are not large (3.3 percent of the replacements), some attention might be given to the failure of the black stencil paint used in screening messages on the signs. After considerable exposure the paint film becomes thin enough so that the reflectorized material underneath shows through at night, although daytime appearance may be all right. Increases in applied film thicknesses, or improvements in the durability of the paint itself would probably eliminate these failures.

Vandalism

Acts of vandalism of any sort are irritating and frustrating to deal with. It is hard to understand why irresponsible acts of wanton destruction of signs should be prevalent, but the fact is that vandalism accounted for nearly one-third of all signs replaced. Enforcement of existing laws is very rare because of difficulty in apprehending the violators. Perhaps more attention should be directed toward informing the public, in general, and certain groups, in particular, of the cost of acts of vandalism.

Gunshot. The most serious loss due to vandalism is damage from gunshot which accounted for 18.9 percent of total replacements. Of signs which were gunshot, 93 percent were in open country and 7 percent were in built up areas. Since 66 percent of existing signs were in open country and 34 percent were in built up areas (refer to Table A in the Appendix), the probability of a sign being shot was 6.84 times as great if it were located in open country. A sign was 3.3 times more likely to be shot if it were away from an intersection than if it were near one. Because of their prevalence in rural areas away from intersections, warning signs (curve symbols, maximum safe speed, etc.) were three times as likely to be shot as guide signs (route markers, destination signs) and regulatory signs (speed limit, reduce speed, stop, etc.).

Unfortunately, from the standpoint of control, shooting damage is thus clearly shown to be associated with widely scattered, unpopulated areas where enforcement of the law is practically impossible. Data from the four seasons in which the survey was made indicates that 20 percent of the sign replacements were due to gunshot during winter, spring, and summer, but that this figure jumped to 40 percent during the fall sampling period which was during and after the fall hunting season. Several other relationships were examined but none were found to be significant or enlightening.

Thus, the analysis did not produce very much useful information that would point to ways to reduce gunshot damage. One suggestion is to conduct an educational campaign directed particularly toward hunters, informing them that one shot at a sign will cause its replacement at a cost to Virginia taxpayers of $9.80. This cost is equivalent to a one cent a gallon tax on all the gasoline an average driver uses in one year, and is money which is spent on needless maintenance rather than on constructing better roads. Appropriate would be a plea that objects other than signs be used for target practice. There would be no need to explain involved useful life and lost life relationships. Perhaps an effective time to conduct a campaign would be just before hunting season and in conjunction with the issuing of hunting licenses.

Scratched, marked-up. Obviously, if a sign is to be scratched or marked-up it must be within reach. The analysis showed that the probability of a sign being scratched was more than three times as great if it were within six feet of the ground than if it were seven feet or more. There was no significant difference between this type of vandalism on signs from one to three feet and those from four to six feet above the ground.

To raise signs to seven feet or above would certainly reduce scratched and marked-up damage a great deal. However, the probabilities are small that a sign will be scratched or marked-up in a given year (about 1 in 40), and it would not be feasible to raise all signs on this account, especially since attention value and legibility at night would be affected.

Further analysis indicated that signs which were near schools, school bus stops, and picnic places (about six percent of all signs) were likely to be marked-up or scratched 2.8 times as often as signs located near general stores, gas stations and other types of public places. No other relationships were found to be statistically significant. Because of the locations where this type of vandalism is especially prevalent, it is assumed that most of it is done by school children. It is suggested, therefore, that any campaign against this kind of vandalism should be aimed directly toward school children. Besides working through the schools, it might be appropriate to affix to the back of the sign or to the post a sticker citing the cost of sign replacement and making a simple plea not to deface the sign. It might also be feasible to raise the height of a certain few signs near schools, school bus stops, and picnic places.

Bent by hand. The survey data indicated that the probability of a guide or a warning sign being bent by hand was nearly twice as great as the probability of a regulatory sign suffering the same damage. This is probably because the shape (proportion of width to height) and reinforcement of many guide and warning signs make them easier to bend than regulatory signs.

As in the case of scratched and marked-up, a sign must be within reach if it is to be bent. The data indicated that signs which are from one to six feet above the ground are more than four times as likely to be bent as those seven and more feet high. There was no significant difference between those from one to three feet and those four to six feet high. No significant relationships were found between bending and other items such as type of public place, type of neighborhood, location to ditch, or relation to intersection.

Again, in the interest of attention value and legibility, it is recommended that signs not be raised to reduce bending damage. Instead, it is recommended that the signs be made more resistant to bending.[1]

Change in Policy or Law

Much of the loss in useful sign life because of a change in policy or law is unavoidable. New policies concerning speed zoning or changes in standard sign messages are examples of adjustments necessary in keeping up with traffic development. During the survey period there were no unusual changes made; however, this item accounted for 19.3 percent of replacements, and for 10.9 percent of total sign costs. While many changes are unavoidable, every effort should be made initially to erect the right sign in the correct location.

Vehicle Damage

There is a tendency for signs between the road and the ditch to be struck more often than signs on the other side of the ditch (1.35 times as likely); however, this is not strong enough to influence average age (Table A in Appendix). The data is not convincing enough to support any recommendation for moving signs, especially since they would be in a less favorable position for legibility. Signs near intersections tend to be vulnerable, and those on traffic islands are likely to be hit about twice as often as those on the roadside. However, the locations on the islands are often necessary for the traffic conditions.

Other relationships between vehicle damage and various items in location were not found to be significant.

Hence, the data does not lead to any recommendations of ways to reduce vehicle damage. While no sign could be expected to

[1] As a result of this study, a further investigation was made on increasing bending resistance. After the forces strong young adult males could exert on signs were evaluated, an empirical design procedure was worked out which took into account the shape and size of the signs, together with yield strength and thickness of material. Commercially available aluminum alloy 61ST6 was chosen for its high yield strength and durability characteristics. An economical selection of three mill standard thicknesses (0.081, 0.102, and 0.125) was made for the various sizes and shapes of signs. The Virginia Department of Highways has recently adopted the use of alloy 61ST6 in the three design thicknesses, and although material costs will be more, the elimination of wooden reinforcing battens and the expected decrease in bending damage will result in substantial net savings.

resist the impact of a fast moving vehicle, much of the vehicle damage occurs when signs are brushed or bumped lightly.[2]

CONCLUSION

Virginia enjoys the reputation of having adequate and well maintained signs throughout the highway system. This is not by accident, but is the result of carrying out the long standing policy that any sign not properly located or not presenting a good appearance is to be replaced promptly. Hence, there is usually a minimum of delay between the time a sign fails and the time it is replaced. Because of the concerted efforts to hold to high standards, many deficiencies which might otherwise occur do not arise as problems. Hence, the number of significant relationships found in this survey which lead to recommendations for changes in practice are happily few in number.

One point should remain paramount in any interpretation of the findings; namely, that the most important function of a sign is to get the message to the driver. In considering erection and maintenance problems, it is a great temptation to direct most attention to ways and means of reducing costs without giving proper consideration to driver-sign relationships. It should be clearly the intent of signing activity to locate and maintain signs in the interest of the driver, and not to approach the problem only as a challenge to reduce maintenance costs. In some cases it will be necessary to pay higher costs to keep the signs in good condition and at the locations where they are needed. However, in the interest of economy, some of the causes of sign failures can be eliminated, and some of the costs substantially reduced.

While this report is necessarily based on data collected in Virginia, it is presented with the hope that persons concerned with signing problems in other states will also find the information of value.

ACKNOWLEDGEMENTS

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[2] It is expected that a good deal of the damage from light vehicle contact will be eliminated by the use of the aluminum alloy 61ST6 previously mentioned in footnote (1)

APPENDIX

TABLE A
INFORMATION ON SIGNS

Descriptive Item	Percent in Place at Time of Survey	Average Age at Replacement (months)
Message		
Guide	36	36.2
Regulatory	32	33.0
Warning	32	35.1
Sign backing		
Steel	60	
Aluminum	30	See (A) below
Wood	10	
Reflective material		
Not reflectorized	5	
Sheeting	83	See (A) below
Beads on paint	10	
Buttons	2	
Near intersection		
Yes	49	37.3
No	51	32.5
Type of neighborhood		
Built up	34	37.2
Open country	66	34.2
Near what type of public place		
None	61	33.3
General store or gas station	28	36.4
School	4	32.2
School bus stop	1	
Picnic place or park	1	See (B) below
Other	5	
Distance from pavement in feet		
1 to 4	12	31.8
5 to 8	61	36.1
9 to 12	25	32.6
13 and over	2	36.9
Height above ground in feet		
1 to 3	8	
4 to 6	83	34.7
7 and over	9	See (B) below
Location to ditch		
Between road and ditch	28	36.0
Other side of ditch	55	34.8
Other	17	32.3

Note (A): Average ages have no meaning because of changes in materials before and during the survey.
Note (B): No significant differences in ages were found. The age shown is the average.