Manual on Countermeasures for Sign Vandalism

U.S. Department of Transportation
Federal Highway Administration

Research, Development, and Technology

Turner-Fairbank Highway Research Center
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McLean, Virginia 22101

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Implementation Package

FOREWORD

This manual describes countermeasures for reducing highway sign vandalism and the costs associated with the repair and replacement of vandalized signs. Guidelines are also presented for planning, implementing, and evaluating antivandalism programs. The manual is intended for use by State and local personnel involved in sign system maintenance and others with an interest in reducing sign vandalism.

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16. Abstract

This manual describes countermeasures for reducing highway sign vandalism and the costs associated with the repair and replacement of vandalized signs. Guidelines are also presented for planning, implementing, and evaluating antivandalism programs. The manual is intended for use by State and local personnel involved in sign system maintenance and others with an interest in reducing sign vandalism.

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METRIC (SI*) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
in	inches	2.54	millimetres	mm
ft	feet	0.3048	metres	m
yd	yards	0.914	metres	m
mi	miles	1.61	kilometres	km
AREA				
in²	square inches	645.2	millimetres squared	mm²
ft²	square feet	0.0929	metres squared	m²
yd²	square yards	0.836	metres squared	m²
mi²	square miles	2.59	kilometres squared	km²
ac	acres	0.395	hectares	ha
MASS (weight)				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
VOLUME				
fl oz	fluid ounces	29.57	millilitres	mL
gal	gallons	3.785	litres	L
ft³	cubic feet	0.0328	metres cubed	m³
yd³	cubic yards	0.0765	metres cubed	m³

NOTE: Volumes greater than 1000 L shall be shown in m³.

TEMPERATURE (exact)

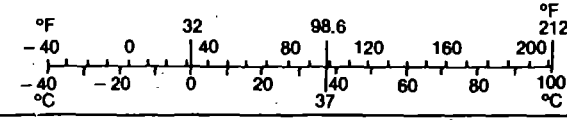
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
mm	millimetres	0.039	inches	in
m	metres	3.28	feet	ft
m	metres	1.09	yards	yd
km	kilometres	0.621	miles	mi
AREA				
mm²	millimetres squared	0.0016	square inches	in²
m²	metres squared	10.764	square feet	ft²
km²	kilometres squared	0.39	square miles	mi²
ha	hectores (10 000 m²)	2.53	acres	ac
MASS (weight)				
g	grams	0.0353	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams (1 000 kg)	1.103	short tons	T
VOLUME				
mL	millilitres	0.034	fluid ounces	fl oz
L	litres	0.264	gallons	gal
m³	metres cubed	35.315	cubic feet	ft³
m³	metres cubed	1.308	cubic yards	yd³

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



These factors conform to the requirement of FHWA Order 5190.1A.

* SI is the symbol for the International System of Measurements

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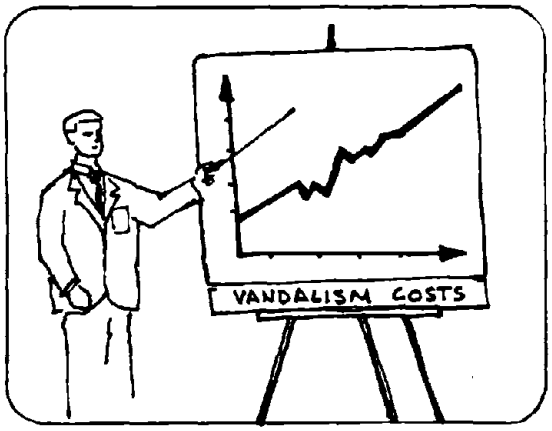
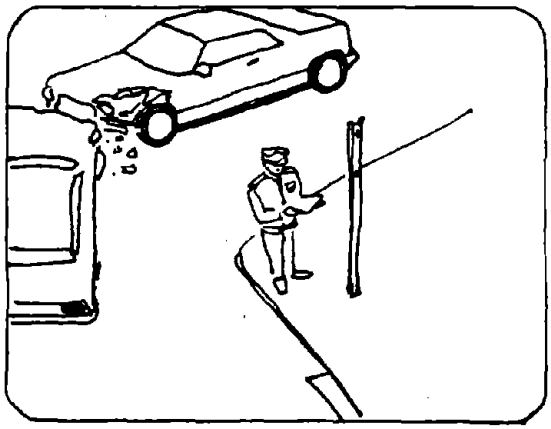
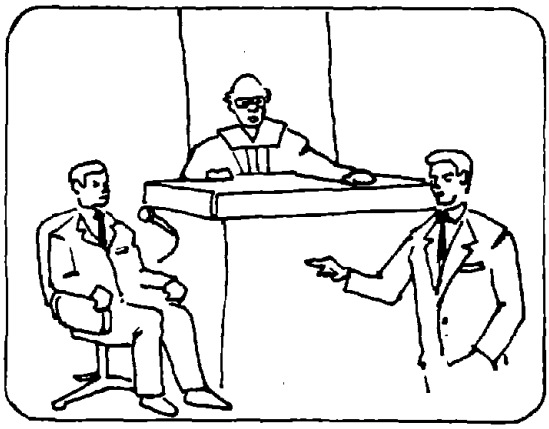


SIGN MAINTENANCE



HIGHWAY SAFETY



LIABILITY

INTRODUCTION

Sign vandalism in the United States costs taxpayers millions of dollars each year, and has been reported as a contributing cause in a number of serious traffic accidents. Sign vandalism occurs when highway signs are purposely altered, damaged, obscured, or stolen so that the intended purpose to regulate, warn, and guide is no longer served. It has been estimated that one of every ten signs is vandalized each year.[1]

Although traffic sign vandalism is perceived by many highway safety and maintenance professionals to be a costly and dangerous problem, it is difficult to define the full impact of vandalism in specific terms. It has been shown that a missing or vandalized traffic sign deprives the motorist of critical information that is needed for the driving task, thereby creating accident potential. Numerous reports and newspaper articles describe traffic accidents involving serious injury or death as a result of a missing or illegible sign. In addition to the accident itself, vandalism-related accidents may expose the highway agency or municipality to tort liability costs. From a sign maintenance cost perspective, national cost estimates of sign vandalism range from $50 million to $2 billion per year.[1,2] Surveys of State and local agencies indicate that an average of 30 percent of all sign replacement and repair is due to vandalism and that an average of 30 percent of a typical sign maintenance budget is needed for sign repair or replacement of vandalized signs. [3,4]

Background

The highway system respresents a significant national investment that warrants continuing upkeep and improvement. Highway statistics indicate that over $10 billion are expended annually by Federal, State, and local agencies on nearly 4 million miles of roadway in the United States. On a national basis, approximately 30 percent of all highway-related expenditures are for highway maintenance.[5]

Sign system maintenance represents a sizable portion of highway maintenance expenditures. Sign system maintenance involves repair and replacement of signs and supports due to traffic accidents, vandalism, adverse environmental conditions or natural aging, and normal upkeep. A nationwide survey conducted in the late 1970's indicates that nearly half of all city and county agencies and 20 percent of all State agencies expend over 20 percent of their annual roadway maintenance budgets on sign maintenance. [3]

A very large part of routine sign maintenance is necessitated by vandalism. One report on the subject indicates that it is not uncommon for an agency to spend over 30 percent of its sign maintenance budget on vandalism.[3] Several States including Georgia, New Jersey, Virginia, Pennsylvania and Wisconsin report costs in excess of $1 million per year on vandalized signs.[1,6]

In general, the sign vandalism problem has been characterized in terms of one or more of the following perspectives:

- Increased material, labor, and equipment costs for the repair or replacement of vandalized signs.
- Increased potential for death, personal injury, and property damage from traffic accidents that occur as a result of vandalism.
- Increased governmental liability for damages resulting from accidents where vandalized signs are determined to be a contributing factor in the accident.

Excessive maintenance costs and the potential for serious traffic accidents has resulted in the development of a wide range of remedial measures and programs. Most sign vandalism countermeasures fall into one or more of the following categories:

- Sign construction and installation techniques.
- Sign repair and replacement.
- Sign ownership identification.
- Enforcement measures.
- Legislative improvements.
- Public information and education.

While objective information on the effectiveness of many countermeasures is scarce, a consensus of opinion by those who have initiated various countermeasures suggests that the countermeasures have been successful in reducing specific types of vandalism. It should be remembered that the ultimate measures of success of antivandalism efforts is based on the reduction of costs, losses, and liabilities. In order to best accomplish those goals, the most appropriate countermeasures must be identified and implemented.

Purpose of the Manual

The purpose of this Manual is to:

- Describe the scope and magnitude of the sign vandalism problem and the associated impacts on sign system maintenance and repair costs, highway safety and governmental liability.
- Describe available sign vandalism countermeasures and their effectiveness.
- Guide state and local personnel to systematically plan, implement, and evaluate a program to reduce sign vandalism within their respective jurisdictions.

This manual is intended to guide state and local personnel in developing programs to reduce actual or potential losses resulting from the destruction, mutilation, and theft of traffic sign assemblies. The manual stresses the use of a systematic approach to identify specific sign vandalism problems, select and implement appropriate countermeasures, and conduct evaluations of countermeasure effectiveness. The manual may be used to develop a comprehensive program of physical, maintenance, enforcement, legislative, and public information to alleviate an identified problem. The manual may also be used by individual departments or agencies with more limited concerns of sign vandalism such as sign shops, police departments, or community groups.

Disclaimers

The information contained in this manual was assembled from journals and publications, suppliers, manufacturers, public officials, and other

professionals in the highway safety and maintenance fields. In this regard, the reader should recognize the following points when using the manual to develop specific sign vandalism programs:

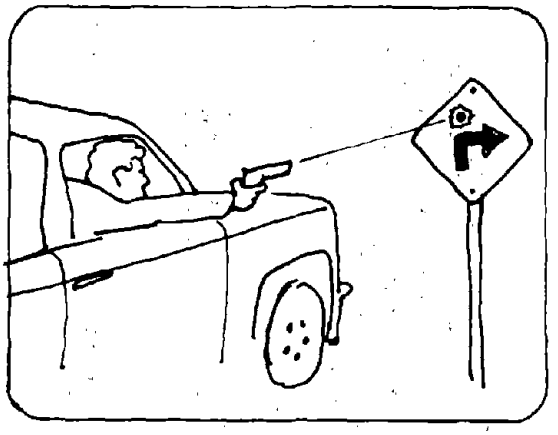
- Many products are mentioned by name in this manual, but the appearance of a brand name should not be construed as an endorsement nor as a recommendation for use. The use of any product or technique should include adherence to product instructions, cautions, and common sense. The majority of the products have been or are being used. It should also be recognized that products other than those described in the manual may be commercially available and should be considered for possible use.

- The descriptions of products and their effectiveness are, to the best of our knowledge, accurate, and represent manufacturer claims and user experiences. Information on the actual product use and effectiveness have been reported when available. However, testing each product was beyond the scope of the project.

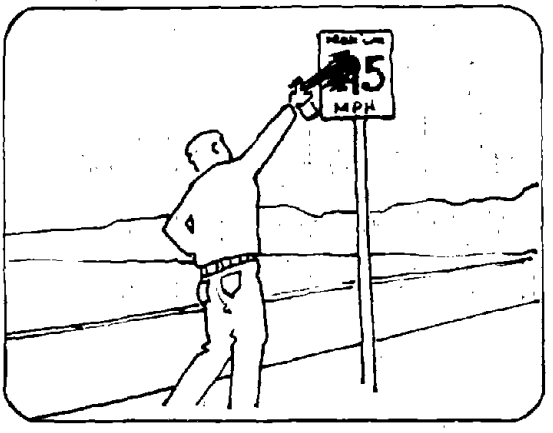
- Many products are routinely modified, removed, or added to the market in response to technological advancements and agency needs. The reader is advised to check with local dealers for information on recent product releases.

- Prices have not been provided in the manual due to substantial cost variation between dealers, discounts, and product supply and demand. The reader is advised to check with local dealers for current prices.

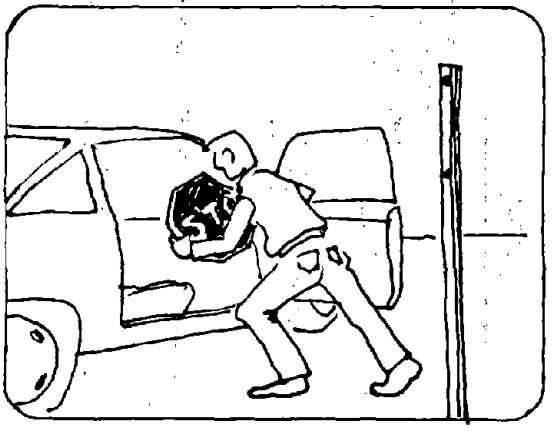
Scope and Magnitude of the Problem



DESTRUCTION



MUTILATION



THEFT

SCOPE AND MAGNITUDE OF THE PROBLEM

Many highway agencies do not maintain sign inventories or other record systems on sign vandalism. Therefore, the sign vandalism problem has been summarized based on information from many sources and the reader is cautioned that a portion of information is not founded upon "proven facts" or "statistical evidence." Therefore, the numbers associated with the magnitude and scope of the problem should be viewed within the context of the information sources. In spite of the absence of a reliable data base, the information presented in this chapter clearly indicates that significant amounts of time and money are being expended to correct the results of vandalism.

Problem Definition

The complex nature of sign vandalism makes problem definition extremely difficult. Sign vandalism may occur throughout the year, at any time of day, and at any location. In addition, a sign vandal may be from any economic strata, educational level, age group, or social status. Despite the nature of the problem, the experiences of highway agencies provide some useful insights into sign vandalism patterns, trends, and influences.

Acts of sign vandalism have been classified as destruction, mutilation, or theft. Each type of vandalism is described in this section with respect to trends and patterns as this information is contained in the literature or reported by highway maintenance personnel.

Destruction

Destruction occurs when the sign assembly (sign and/or support) is physically destroyed or damaged to the extent that it no longer serves the intended purpose. Examples of sign destruction are listed below and shown in figures 1, 2, and 3.

Figure 1. Example of destruction due to gunfire.

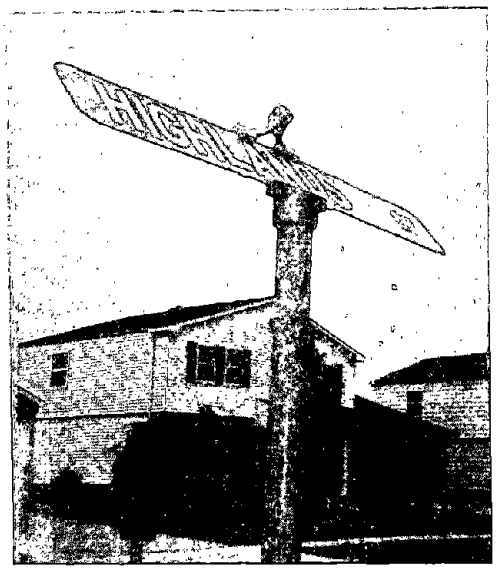


Figure 2. Example of destruction due to bending.

Figure 3. Example of destruction due to thrown rocks.

- Gunshot by pistol, rifle, or shotgun.
- Thrown missiles such as rocks, bottles, and bricks.
- Sign or support burning.
- Sign bending (especially narrow signs such as street name signs).
- Deliberate sign and support knockdown.
- Sign cutting with hacksaw or tinsnips.
- Support twisting that results in improper sign orientation to traffic.
- Support cutting.

Vandalism by gunfire is the most often reported type of destruction (See references 7,8,9,10,11,12) and thus rural areas, campgrounds, and hunting areas generally experience the highest rates of vandalism by destruction.[13,14] This is particularly true in rural areas which are near urbanized areas.[13,14] In Michigan, many counties with both highly urbanized and rural areas report sign vandalism costs on their road systems that exceed the expenditures on sign vandalism for the State road system.[6] Destruction is less severe in urban areas and on freeways than on rural, two-lane roads because higher lighting levels and traffic volumes generally do not create a conducive environment for vandalism by destruction and vandals are more likely to be seen by others.[6,9,13] However, sign bending and twisting is common in residential areas. Nettleton observed that signs located at the ends of long tangents and near pulloffs were especially susceptible to vandalism by destruction (and theft) on Forest Service campgrounds.[15]

The predominance of destruction by gunfire is indicative of a time pattern with the majority of destruction occurring during fall and winter hunting seasons.[10,11,12] High rates of destruction also occur during Halloween and following sporting events (See references 8,10,11,12).

In terms of susceptibility of destruction for different sign types, Wisconsin has observed that metal signs attract more gunfire than signs made of other materials.[9] The Forest Service reports that prohibitive, restrictive, and destination guide signs experience higher rates of damage by gunshot as compared to regulatory and warning signs.[14]

In addition, it has been observed that wooden supports provide a good source of firewood in many rural areas, and are more susceptible to destruction than metal posts near camping areas.[14]

Mutilation

Sign mutilation occurs when the sign installation is altered or defaced in a manner that renders the sign illegible or reduces nighttime reflectivity. Spray painting is reported to be the predominant type of mutilation.[19] Examples of sign mutilation are listed below and shown in figures 4 through 7.

- Spray painting.
- Brush painting.
- Application of unauthorized stickers or decals.
- Contamination by caustic substances such as eggs, tomatoes, and pumpkins.
- Alteration of the sign legend by crayon, lipstick, or ink markers.
- Graffiti.
- Reorientation of sign (upside down or sideways).
- Scratching the sign surface.
- Peeling or removing reflective sheeting.

Sign mutilation is more common in urban areas, particularly in residential areas, near schools, colleges, and areas of high pedestrian activity.[8,11,16] Time patterns for mutilation show higher than average vandalism during holiday periods (especially Halloween) and times when outdoor activities are more prevalent such as during the late spring, summer and early fall.[10,11,12] In addition, election years show high rates of mutilation by political stickers and decals.[9]

Generally, signs within easy reach of school-aged pedestrians are susceptible to mutilation by markers and crayons. Stop signs are considered the most often victimized sign type; however, speed limit signs and symbol signs are also prime candidates for defacement.

Figure 4. Example of mutilation due to spray paint.

Figure 5. Example of mutilation due to political stickers.

Figure 6. Examples of mutilation in areas of pedestrian activity.

Figure 7. Example of mutilation due to soiling, causing reduced legibility and nighttime reflectivity.

Theft

Theft is the unauthorized removal of a sign assembly or any of its component parts. Theft, as shown in figure 8, occurs for a variety of reasons including:

- Home decoration.
- Relationship of the sign legend to the an individual's name (figure 9).
- Relationship of the sign legend to an individual's interests (i.e., name of musical group, automobile, television/movie personality) (figure 10).
- Scrap value of aluminum or metal.
- Firewood.
- Uniqueness of sign legend (figures 11 and 12).
- Use of the aluminum signs or supports for other than their intended purpose.

Sign theft has been estimated to account for over one-third of all sign vandalism.[3] Theft is a major concern in urbanized areas, especially when critically important signs such as stop signs and warning signs are stolen.

Areas near college campuses and other educational institutions are the predominant location for sign theft.[8,11] Theft is also considered to be a problem near recreational areas and campgrounds.[14]

No specific time pattern was identified in the literature for sign theft.

Stop signs, symbol signs, street name signs, and road markers are the predominant types of stolen signs.[7,8,17] Nettleton concurs with this finding by observing high rates of theft for regulatory, warning, and recreation signs on Forest Service campgrounds.[14]

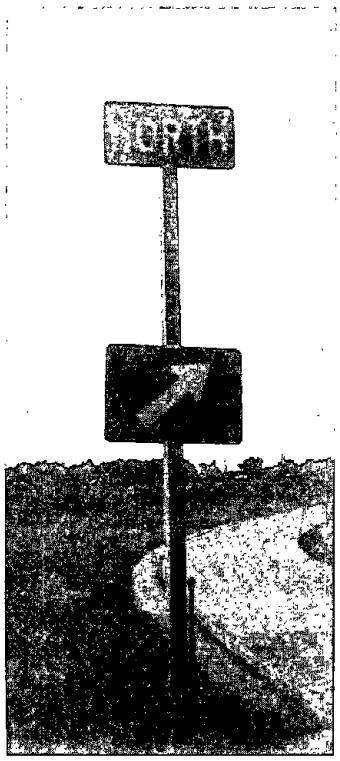


Figure 8. Stolen interstate route marker.

Figure 9. Street name signs containing person's name are often subject to theft.

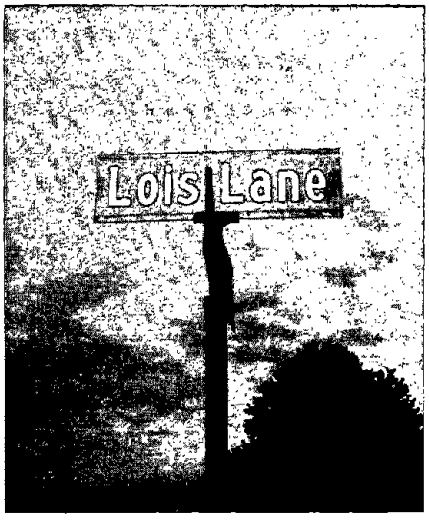


Figure 10. Street name signs relating to current events (movies) are often subject to theft.

Figure 11. Example of unique (nonstandard) sign that may be subject to theft.

Figure 12. Example of unique treatments to back of signs may be subject to theft.

Characteristics of Sign Vandals

It is difficult to characterize sign vandals, since statistical data on the typical sign vandal are not readily available. Driessen and Nettleton reported that a literature search conducted by the National Council on Crime and Delinquency failed to yield information on sign vandal characteristics in a search of over 80 references on the subject. [14] However, a review of the nature of the problem suggests that young people probably have a predominant participation in sign vandalism (especially sign mutilation). Chadda and Carter support this hypothesis and specifically identify teenagers, students, and unemployed youth as common sign vandals.[16] Further support is provided by data from the Wisconsin Department of Justice on the characteristics of those apprehended for all types of vandalism (not only signs). These data indicate that for all apprehended vandals, 94 percent are male and 92 percent are 19 years of age or under.

Magnitude of the Problem

Sign vandalism is considered to be a continuing and serious problem by many traffic, highway, and safety professionals. It is perceived as a problem for a variety of reasons, which can generally be categorized under one or more of the following perspectives:

- Material, labor, and equipment costs for the repair or replacement of vandalized signs.
- Potential for death, personal injury, and property damage from traffic accidents that occur as a result of vandalism.
- Governmental liability for damages resulting from accidents where vandalized signs are determined to be a contributing factor in the accident.

From the perspective of sign repair and replacement costs, the seriousness of the problem is a function of the number of signs that are vandalized in a particular jurisdiction. Vandalism from the perspectives of accident potential and governmental liability is not a function of the magnitude of vandalism. One stolen or twisted stop sign can result in

death, injury, or property damage and the associated liability to the agency if negligent maintenance activities can be proven. Thus, most professionals agree that vandalism has the potential for being a serious problem even when reported acts of vandalism are relatively infrequent.

The effects of sign vandalism from each of these perspectives is discussed further in the following sections.

Effects on Maintenance Costs

The repair and replacement of vandalized signs is one component of highway maintenance responsibilities borne by Federal, State and local agencies. Thus, it is important to place sign vandalism in its proper perspective with regard to the total highway system maintenance effort.

• Highway System Maintenance

The highway system represents a significant national investment that warrants continuing upkeep and improvement. Over $10 billion are expended annually on approximately 4 million highway miles within the United States as shown in table 1.[5] To illustrate the highway maintenance expenditures for individual agencies, a study conducted in 1978-79 shows that 56 percent of responding State agencies have annual maintenance costs in excess of $10 million, and 15 percent of city and county agencies spend over $1 million annually as shown in table 2.[3]

• Sign System Maintenance

The importance of sign system maintenance can be placed in proper perspective when the monetary investment in the sign system is considered. Based on an estimate of 250 million sign assemblies currently on U.S. roads, and that each assembly represents a $75 investment (considering time, labor and materials), the sign system represents nearly a $20 billion national investment.[2]

Table 1. Mileage and annual highway maintenance costs.

Jurisdiction	1980 Mileage (in thousand miles)	1979 Highway Maintenance Costs (in millions of dollars)
Federal	263	126
State	781	4,459
Local	2,813[1]	5,986
Nonpublic	99	Not available
Totals	3,956	$10,571

[1] Local road mileage consists of 1,714,000 miles for counties and 1,099,000 miles for cities and townships

Source: Highway Statistics 1980.[5]

Table 2. Annual highway maintenance expenditures.

Question and Type of Response	All Government Agency Respondents		State Agency Respondents		City and County Agency Respondents	
	Number	Percent	Number	Percent	Number	Percent
Total Annual Maintenance Expenditure?[1]						
Less than $1,000,000	33	30	3	6	28	53
$1,000,000 to $9,999,999	20	18	9	19	8	15
$10,000,000 to $49,000,000	19	17	17	35	0	0
$50,000,000 or more	11	10	10	21	0	0
No response	28	25	9	19	17	32

1 Expenditures for the immediate past fiscal year.

Source: State of the Practice in Supports for Small Highway Signs.[3]

The installation and maintenance of traffic signs represents a sizable portion of total highway maintenance expenditures. It is not uncommon for a State agency to spend over 20 percent of its maintenance budget on the sign system. The percentage of highway maintenance budgets expended by State and local agencies is summarized in table 3 for the total sign system, and specifically for the "small" sign system.[3] Although local agencies spend considerably fewer maintenance dollars than State agencies on a per mile basis (see table 1), a larger portion of the budget is devoted to the installation and maintenance of the sign system due to the typically greater density of signs at the local level.

- **Sign Maintenance and Repair**

A large portion of sign maintenance activities and expenditures is due to vandalism. The Federal Highway Administration estimates that one sign in every ten (10 percent) must be replaced annually because of vandalism.[1,19] Another perspective is provided by a 1981 National Safety Council survey on sign vandalism which reported an average of 28 percent of sign replacements were due to vandalism.[2] These figures indicate that sign maintenance for vandalism can result in large labor and material expenditures.

Several estimates have been made on the monetary costs of vandalism. The Federal Highway Administration estimates that approximately $50 million is expended annually on maintenance costs for vandalized signs.[16] Significantly higher estimates result from an analysis of the information presented thus far in the manual. That is, Ross, et al. found that on the average, 30 percent of total sign maintenance costs are due to vandalism (see table 4).[3] Given that approximately $3.2 billion is spent annually on sign maintenance, (assuming that approximately 30 percent of total highway maintenance costs are expended on the sign system from tables 1 and 3), Ross' findings suggest expenditures of nearly $1 billion each year on sign vandalism. Another estimate places the annual cost of sign vandalism at nearly $2 billion per year.[2]

Table 3. Percentage of annual maintenance costs devoted to signs.

Question and Type of Response	All Government Agency Respondents		State Agency Respondents		City and County Agency Respondents	
	Number	Percent	Number	Percent	Number	Percent
Percentage of Annual Maintenance Expenditure Devoted to Signs?						
Less than 20%	44	40	29	60	8	16
20% to 40%	22	20	7	15	15	28
40% to 60%	6	5	1	2	5	9
60% to 80%	3	3	1	2	2	4
80% or more	3	3	0	0	2	4
No response	33	30	10	21	21	39
Percentage of Annual Maintenance Expenditure Devoted to Small Signs [1]						
Less than 20%	42	38	27	57	9	17
20% to 40%	17	15	3	6	14	26
40% to 60%	2	2	1	2	6	11
60% to 80%	2	2	0	0	1	2
80% or more	15	14	3	6	11	21
No response	33	30	14	29	12	23
Total Respondents	111	100	48	100	53	100

[1] Signs having panel areas of 50 ft^2 (4.65 m^2) or less.

Source: State of the Practice in Supports for Small Highway Signs.[3]

Table 4. Percentage of sign maintenance cost due to vandalism, by type of sign and type of post.

Type of Sign/Post Material and Shape	Percentage of Maintenance Cost			Total Systems (Number)
	Percentile Value		Median Value	
	25th	75th		
	- - - - - - Percent - - - - - -			
Single Post Signs				
Steel				
"U" Single	10	75	40	(41)
"U" Back to Back	a	a	20	(1)
Square or Rectangular Tube	13	71	23	(11)
Round or Oval Pipe	15	80	30	(23)
Beam (I,S,W, or H)	23	40	32	(2)
Aluminum				
Square or Rectangular Tube	a	a	50	(1)
Round or Oval Pipe	15	71	30	(3)
Wood				
Square or Rectangular	20	70	40	(28)
Round	16	58	50	(3)
Multiple Post Signs				
Steel				
"U" Single	22	50	30	(17)
"U" Back to Back	75	95	85	(2)
Square or Rectangular Tube	10	75	22	(6)
Round or Oval Pipe	10	60	13	(6)
Beam (I,S,W, or H)	10	48	15	(13)
Aluminum				
Square or Rectangular Tube	a	a	10	(1)
Round or Oval Pipe	10	25	10	(3)
Wood				
Square or Rectangular	20	70	30	(25)
Round	5	39	5	(3)

[a] = Insufficient data.

Source: State of the Practice in Supports for Small Highway Signs.[3]

To gain greater insights into the maintenance cost associated with sign vandalism, the problem is described for federal, State, and local agency perspectives based on experiences contained in the literature.

Federal Agencies: In 1980, 263,000 road miles were under the jurisdiction of federal agencies.[5] The Forest Service (U.S. Department of Agriculture) had jurisdiction for more than 260,000 miles of roads in over 50,000 campgrounds and national parks nationwide (currently the Forest Service has jurisdiction for more than 300,000 road miles). The Forest Service has responsibility for 396,000 road and campground signs. The entire sign inventory is estimated to be worth approximately $29 million.[14]

The Forest Service has performed extensive studies of the scope and magnitude of sign vandalism on their road system. In 1978, they found that approximately 24,000 signs were vandalized beyond repair. This represents a 6 percent rate of vandalism per year. The monetary damages of sign vandalism was estimated to be $1.4 million, or approximately 28 percent of the total 1978 sign budget of the Forest Service. When the cost of labor, travel and materials is considered, the cost of sign vandalism was estimated to be over $3.25 million for 1978, which is an annual cost of $12.50 per mile.[14]

State Agencies: The annual percentage of state highway signs replaced due to vandalism was found to range from less than 10 percent to over 70 percent in the 1981 National Safety Council (NSC) survey.[4] Thus, there is some disparity of the perceived seriousness of the sign vandalism problem by State highway agencies. In a 1980 survey conducted by the Federal Highway Administration, about one-half of the responding states felt vandalism was a serious problem. Four States reported that vandalism was not a problem.[4,16]

Table 5 illustrates typical annual sign vandalism costs by State. The major source of table 5 was the 1980 FHWA survey, however, supplemental data were drawn from other sources as indicated. For the majority of survey responses summarized in table 5, it was not possible to determine in

Table 5. Estimated sign vandalism costs[1] reported by State agencies.

State	Cost (reporting year)	Comments	Predominant Type of Vandalism	Source
Idaho	$34,000 (1979)	-	Gunshot	(6)
Oregon	-	-	Theft	(6)
Washington	117,000 (1970)	-	21% Gunshot 50% Defaced 29% Stolen	(6)
Washington	270,000 (1976)	State system only	-	(6)
Illinois	230,000 (1979)	State system only	-	
Indiana	Low	State system only	-	(6)
Michigan	Less than 1% of total sign maint. costs	State system only	-	(6)
Alabama	No estimate given	10% of installed signs vandalized	Theft	(6)
Florida	250,000 (1976)	20% of sign replacements due to vandalism	-	(6),(4)
Georgia	1,084,655 (1979)	Materials - $545,271 Installation - $539,384	Gunshot 52% Paint 18% Rocks 19% Theft 9% Misc. 2%	(6)
Kentucky	No estimate given	-	Political Stickers Gunshot Paint Theft	(6)
Mississippi	$400,000 (annually)	-	Gunshot	(52)
N. Carolina	No estimate given	-	-	(6)
Tennessee	No estimate given	30% of sign replacement due to vandalism on state routes	-	(6)

[1] Material and/or labor costs for repair and replacement of vandalized signs.

Table 5. Estimated sign vandalism costs[1] reported by state agencies (continued).

State	Cost (reporting year)	Comments	Predominant Type of Vandalism	Source
S. Carolina	$500,000 (1979)	-	50% Gunshot 40% Painted 10% Stolen	(6)
Connecticut	No estimate given	-	Theft (1000 signs per year)	
Maine	No estimate given	5-10% of signs are vandalized	-	(6)
New York	No estimate given	No problem	-	(6)
Vermont	$28,000 (1979)	Material costs for vandalized signs (exceeding stolen signs)	Gunshot Defacement	(6)
Virginia	1,000,000 (1979)	400,000 signs vandalized annually	-	(6)
Arkansas	68,000 (1979)	10% of signs vandalized	-	(6)
New Mexico	200,000 (annually)	-	-	(6)
Louisiana	70,000 (1979)	5,400 signs vandalized annually	-	(6)
Colorado	500,000 (annually)	-	-	(6)
Montana	56,000 (1979)	-	-	(6)
N. Dakota	35,000 (annually)	State system only	-	(6)
New Jersey	1,000,000 (annually)	10% of all signs stolen	-	(50)
Oklahoma	700,000 (annually)	-	-	(51)

[1] Material and/or labor costs for repair and replacement of vandalized signs.

every case: (1) whether the data represented statewide vandalism costs or only State highway system costs (when this could be ascertained it has been noted in the "comments" column), (2) whether the cost data represents total damages, replacement costs and/or material losses, and (3) whether the costs reflect statistical data or "best guess" information. Caution should, therefore, be used when drawing conclusions from the survey results shown in table 5.[6]

The wide range of costs experienced by various states is illustrated in table 5. For example, these costs range from $28,000 in Vermont to $1 million in Virginia. The results of the FHWA survey are also supported by the 1981 NSC survey which observed a range of costs due to vandalism of $34,000 to $1.8 million per year. These costs reportedly include the cost of inspections, materials, labor, and liability settlements.[4]

Local Agencies: Considerably less detailed information is available on sign vandalism at the county, township and city levels. However, it can be assumed that the magnitude of the problem is probably greater than that experienced by state agencies. The reasons for this include:

- Increased opportunity for vandalism in urban areas as compared to rural areas. Local jurisdictions have 3 times as many road miles as State and Federal jurisdictions combined with a greater sign density (signs per mile). Also higher population densities and pedestrian activities exist for local roads.
- Conditions are more conducive to vandalism on county roads as compared to State roads. Generally, traffic volumes and lighting levels on county roads are lower than on State routes and thus present a better environment for vandalism.
- Several States, including Michigan and Indiana, indicated that vandalism at the local level was more severe than on the State highway system.[6]

Tables 6 and 7 illustrate examples of annual sign vandalism costs experienced by county and city agencies respectively. Although the examples are limited, it can be seen that sign vandalism costs approach and in some cases exceed the costs experienced by many States.

Table 6. Estimated sign vandalism costs[1] reported by county agencies.

County	Cost (reporting year)	Comments	Predominant Type of Vandalism	Source
60 counties in IL	$345,000 (1979)	Combined for all counties		(6)
Counties in TN	No estimate given	25-30% of replacements due to vandalism		(6)
King County, WA	40,000 (1978)	-		(17)
King County, WA	300,000 (1979)	-	-	(53)
York County, SC	7,500 (1978)	-	Bent Gunshot Painted	(49)

[1] Material and/or labor costs for repair and replacement of vandalized signs.

Table 7. Estimated sign vandalism costs[1] reported by cities.

Cities	Cost (reporting year)	Comments	Predominant Type of Vandalism	Source
Anchorage, AK	$100,000 (1979)	-	Gunshot	(6)
Portland, ME	No estimate given	10% of signs vandalized annually	-	(6)
Woodbridge, NJ	6,492 (1979) 6,312 (1978) 10,922 (1977)	Township estimates	-	(50)

[1] Material and/or labor costs for repair and replacement of vandalized signs.

Effects on Highway Safety

A potentially dangerous situation arises when the vandalized sign is a necessary source of driver information. When vandalism occurs to stop signs, advance warning signs for curves, railroad crossings and narrow bridges, advisory speed limit signs and delineators, a significant potential for traffic accidents is created.

Sign vandalism commonly deprives the motorist of a primary information source that is needed to successfully perform the driving task. Conditioning and driving practice have created driver expectancy levels, whereby vehicle operators anticipate receiving sufficient advance warning of impending hazards and necessary vehicle maneuvers. Sign vandalism violates this driver expectancy and may create motorist traps.[20]

Sign vandalism has been reported to be a major contributory factor in a number of traffic accidents. Unfortunately, the extent to which vandalism contributes to the nation's traffic accident experience cannot be fully determined. Few State and local jurisdictions maintain records on accidents attributable to sign vandalism. In a 1981 survey conducted by the National Safety Council, States were requested to provide information on the number of fatal accidents that were directly attributed to sign vandalism.[4] Only seven jurisdictions responded to the question and disclosed a total of 14 known fatal accidents during the previous five year period. All other respondents stated that information was not available. Table 8 presents several examples of traffic accidents in which sign vandalism was identified as a contributing factor.

Effects on Governmental Liability

Highway departments generally bear the responsibility for replacing or repairing vandalized signs and the issue of governmental liability for damages resulting from sign vandalism is an important issue. The issue of liability is particularly important given the increasing number of states where sovereign immunity no longer shields agencies from liability for negligence.[20,22]

Table 8. Accidents involving sign vandalism.

Fatalities	Injuries	Location	Contributory Factor (Related to Vandalism)	Source
3	Unknown	McHenry County IL	Stolen Stop Sign	(4)
1	Unknown	Kent WA	Stolen Stop Sign	(4)
1	1	Altoona PA	Stolen Stop Sign	(4)
1	3	Chencoteague VA	Painted Stop Sign	(4)
1	3	Reynoldsville WV	Missing Stop Sign	(4)
5	8	Franklin WV	Missing Stop Sign	(4)
0	4	Fairfax County VA	Missing Stop Sign	(4)
4	Unknown	Salem County NJ	Stolen Stop Sign	(50)
1	Unknown	Clark County WA	Twisted Sign	(17)
1	Unknown	Wisconsin	Painted Sign	(9)
1	Unknown	Fairfax County VA	Missing Stop Sign	(4)
1	Unknown	King County WA	Unknown	(4)
1	Unknown	Wisconsin	Missing Stop Sign	(4)

In 1946, Congress passed the Federal Tort Claims Act. Among other provisions, this Act made the Federal government liable for specific types of negligent acts by its employees when working under the scope of governmental authority. Prior to this time, sovereign or governmental immunity provided protection from tort claims brought against governmental units. Many States have passed similar tort claims acts or specific statutes that make the State and local government liable for certain types of negligence. The trend toward increased governmental liability is expected to continue as sovereign immunity is abolished through court decisions and legislative actions.[20,22]

Section 15-105 and 106 of the Uniform Vehicle Code (UVC) requires State and local authorities to place and maintain traffic control devices necessary to regulate, warn, and guide traffic.[23] In the absence of statute, the courts have found that there is no duty to install signs, signals, and markings unless a particular highway situation presents an unusual or dangerous condition. This is due to the discretionary nature of the placement and installation of traffic control devices. However, once a traffic control device is installed, the government implicitly establishes a need and has the duty to maintain the device in a state of reasonable repair, and therefore, must accept the liability for tort claims resulting from failure to maintain the devices.[20,22]

In 1981, the National Safety Council conducted a survey on sign vandalism in the United States which requested information on the number of tort liability cases brought against State or local jurisdictions during the previous 5 year period for traffic accidents resulting from sign vandalism. Seventeen States (out of 31 that responded to the survey) reported cases with one State (unidentified in the survey) reporting over 300 claims. Only 5 States reported that no sign-vandalism-related cases were filed (the absence of such cases may have been due to the existence of sovereign immunity or pending litigation).[4]

The significance of governmental liability is evident when specific court settlements for accidents caused by missing or illegible traffic signs are reviewed. Case examples are described below:

- Washington -- A traffic sign twisted by vandals contributed to a fatal accident. The legal and court costs of litigation were approximately $1.5 million. The tort liability settlement was $133,000.[17]

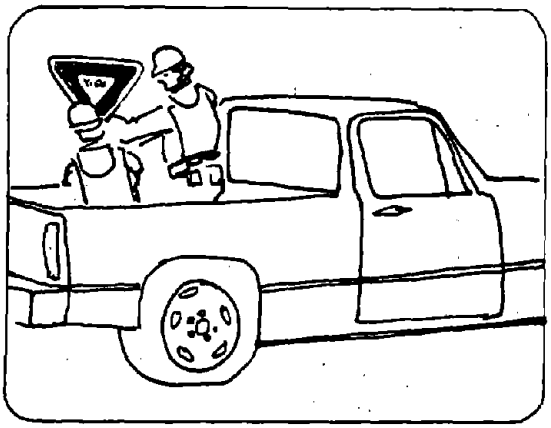
- Virginia -- A missing stop sign contributed to a fatal accident. The legal costs were over $1 million.[1]

- Illinois -- After the suit was filed, but before the trial, a township in Illinois paid $330,000 to settle out of court for a claim involving a 16 year old girl blinded in one eye and partially paralyzed in her arms and legs. The nighttime accident occurred when the vehicle crashed into an embankment located at the top of a "T" intersection. The plaintiff claimed lack of an advance warning sign and lack of stop sign at the intersection. Vandals had apparently removed the stop sign.[1]

- Louisiana -- A Louisiana case cost the state over $70,000 for failure to replace a warning sign which the Highway Department knew or should have known had been removed.[2]

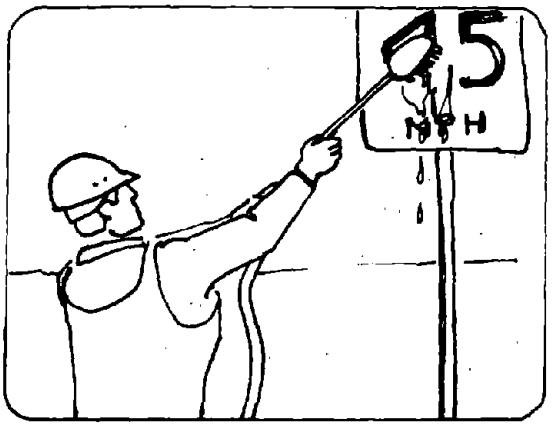
- Michigan -- Suit was brought against a county road commission for failure to replace a missing stop sign. The sign's absence had directly contributed to an accident resulting in personal injury and property damage. The settlement was in excess of $100,000. In this instance, the court ruled that it was the statutory duty of the road commission to keep highways in reasonable repair and in condition reasonably safe and fit for travel.[2]

Sign Vandalism Countermeasures

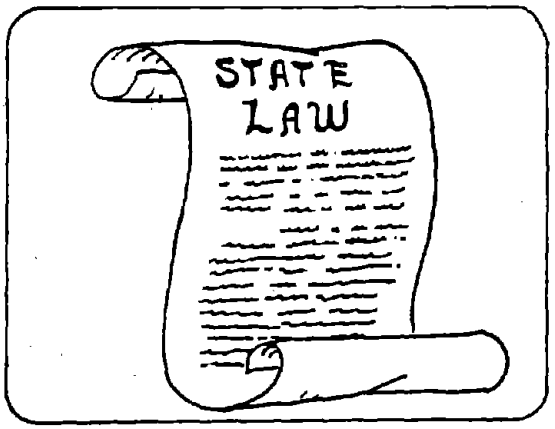


SIGN CONSTRUCTION AND INSTALLATION

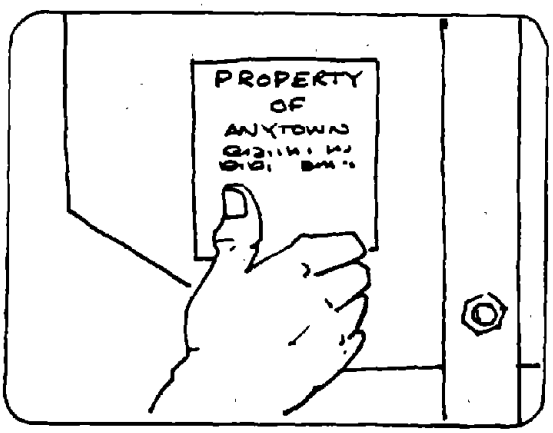
LAW ENFORCEMENT



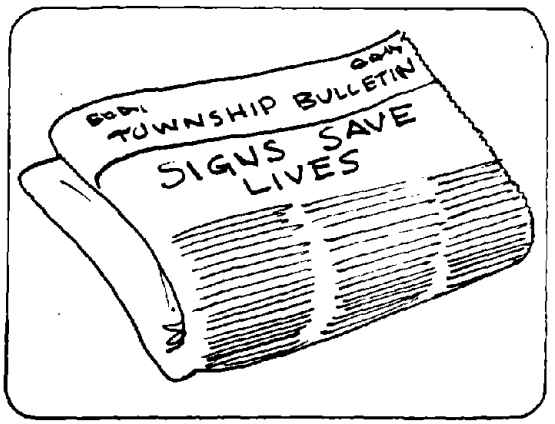
SIGN REPAIR AND MAINTENANCE



LEGISLATION



OWNERSHIP IDENTIFICATION



INFORMATION AND EDUCATION

SIGN VANDALISM COUNTERMEASURES

Many countermeasures have been used to reduce the negative impacts of sign vandalism. A wide range of successfully employed countermeasures are described in this chapter to provide a basis for countermeasure selection. The selection of countermeasures should, however, follow a systematic approach that consists of problem identification, selecting cost-effective countermeasures in response to the problems, and evaluating the effectiveness of the countermeasures following implementation. A recommended systematic approach to the sign vandalism problem is provided in the section entitled "Program Development Guidelines." To facilitate the description of these countermeasures, they have been classified into the following general categories:

- Sign construction and installation.
- Sign repair and maintenance.
- Sign ownership identification.
- Enforcement measures.
- Legislative improvements.
- Public education and information.

Sign Construction and Installation

This countermeasure category involves the use of products and installation techniques that are intended to prevent sign vandalism by reducing the opportunity for vandalism or minimizing the adverse effects of vandalism. Within this category, a variety of specific techniques and approaches have been employed by Federal, State and local agencies. The techniques contained in the following list that have been successfully employed in the past are described below.

The techniques are:

- Reduction of sign assemblies.
- Substrate materials.
- Sign face treatments.
- Sign supports.
- Sign, support, and mounting techniques.

Sign Assembly Reduction

This countermeasure consists of reducing the incidence and opportunity for sign vandalism by selectively reducing the number of signs and supports on the highway.

Three techniques for reducing or eliminating traffic signs are described below:

- Removal of Unnecessary Signs -- It has been estimated that 1 to 2 percent of existing highway signs are unnecessary.[39] Examples of situations where sign removal may be appropriate includes locations where signs (1) are placed more frequently than needed (e.g., no parking signs, bus stop signs); (2) provide unnecessarily redundant or reinforcing information (e.g., advance warning signs for a traffic signal when the signal is clearly visible on the entire approach); (3) "pacifier" traffic signs that fail to meet a regulatory, warning, or guidance purpose that are installed to appease property owners [e.g., a sign reading "shopping center entrance 500 feet (151 m) ahead"]; and (4) signs found to be ineffective in certain situations (e.g., stop signs in residential areas as a means of speed control, truck prohibition signs within residential areas, 25 mph (42 km/h) signs in residential areas).

- Comounting Needed Signs -- When sign removal is not possible, the judicious combining of signs on one support may be feasible. The Manual on Uniform Traffic Control Devices should be consulted to determine sign combinations that are permissible.[27] Comounting of signs should however consider the potential for creating excessive wind loads on sign supports.

- Maximimizing Use of Utility Poles -- Existing street light and utility poles, located in the highway right-of-way may be used as sign supports under certain conditions. Consideration should be given to possible adverse effects of utility pole mounted signs on utility workers (i.e., increased difficulty climbing poles). The city of Phoenix has designed a flexible sign that can be contoured to the utility pole and can be penetrated by the spikes used by climbers.[38]

The city of Phoenix, Arizona has initiated two programs to reduce or eliminate unnecessary traffic signs using the above described methods. The first program resulted in the removal of 3,000 sign posts with a salvage value of $25,000. In 1982, over 7,000 sign posts and many sign blanks were salvaged for future use.[38]

NOTE: The reader is referred to the section "Case Studies" for a case study description of the program initiated in Phoenix, Arizona.

Substrate Materials

This countermeasure consists of fabricating traffic signs using substrate materials that are less susceptible to specific types of vandalism.

The substrate materials and techniques listed below have been successfully applied to reduce sign vandalism.

- Thicker gauge sign blanks -- Agencies in Iowa and Virginia report the use of heavier than normal metal or aluminum signs to reduce vandalism by bending.[10,12]

- Less expensive substrate materials -- Agencies in California report the use of less expensive substrate materials with shorter expected life to reduce vandalism maintenance costs in areas of high vandalism.

- Plywood substrate -- The Forest Service suggests that plywood substrates are easier to repair (sign face repairs) when damaged and are less susceptible to damage by gunfire. Plywood signs have been shown to communicate the intended message even with numerous bullet holes. Aluminum signs, when struck with bullets, are indented over a 1/2-inch (1.25-cm) area per bullet hole resulting in severe chipping and loss of reflectivity and legibility.[15]

- Other nonmetallic substrates -- Nonmetallic substrate materials may have antivandalism applications because of increased resistance to bending and a lower scrap salvage value. Carsonite international, Carson City, Nevada, has developed a substrate material for street name signs that is an alloy of marble, glass fiber, and polymers that resists bending and other forms of vandalism.[40]

Information on the cost-effectiveness of alternative substrates is extremely limited although the Forest Service has conducted tests that have shown plywood substrates to be significantly more resistant to gunfire damage.[15]

Sign Face Treatments

This countermeasure consists of applying protective coatings to the sign face to enhance removal of contaminants and extend the useful life of the sign.

Some sign face types can be protected (to a degree) by applying clear coatings and film overlays. (Manufacturer's specifications should be consulted prior to using the techniques described below.)

- Clear coating -- Clear coating can extend the useful life of traffic signs with low reflectivity by 1 to 2 years.[21] The Forest Service suggests the use of clear coats following sign cleaning to avoid degradation of sign reflectivity. High intensity signs should not be clear coated.[21] Figure 13 demonstrates a procedure for clear coating reflective signs. Clear coating techniques are employed by the Forest Service and a limited number of public agencies to extend the useful life and nighttime reflectivity of traffic signs.[21]

- Transparent overlay film -- Transparent overlay film is commercially available and can be used to protect both new and in-place signs from loss of reflectivity and contamination by paint, crayons, and lipstick. "SCOTCHLITE" Brand Graphic Overlay Film (GOF), consists of a flexible, ultraviolet-stabilized, transparent film that is coated on one side with an adhesive. Many contaminants can be removed from the film, and the film itself may be removed for a period of up to 3 years.[41]

El Monte, California has used the 3M Company GOF as part of its program to upgrade and refurbish its traffic sign system. El Monte city personnel report that 12 of 300 signs were vandalized by "graffiti artists." The protective film allowed the graffiti to be removed with a strong solvent with no further refurbishing. An additional advantage was observed to be the preservation of reflectivity, which is normally reduced by direct application of strong solvents to the sign face.[34]

NOTE: The reader is referred to the section "Case Studies" for a case study description of the El Monte, California program.

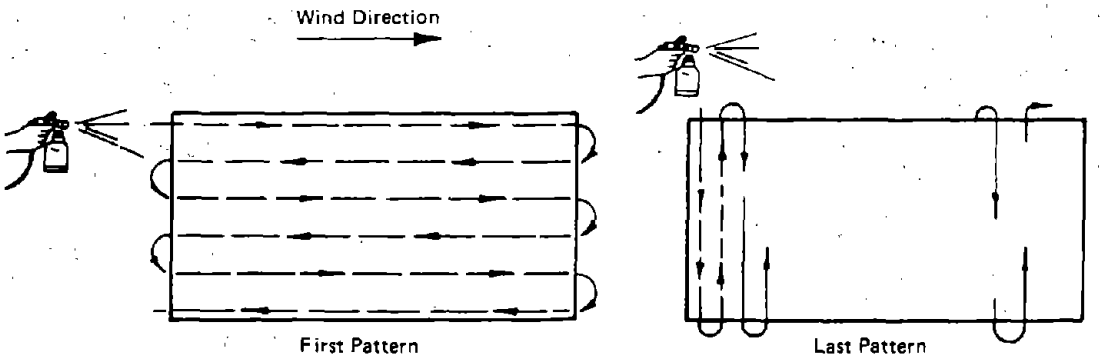
Clear Coating Reflective Signs

The useful life of a sign with low reflectivity can be extended 1 or 2 years by clear coating. For a large number of signs, spraying or hand rolling generally is most economical. Small signs can be brushed. Thoroughly wash and dry sign beforehand. Temperatures should be 50° F or above for best clear-coating results. Do not clear coat sign on excessively windy days or when raining. **Do not clear coat high-intensity sheeting.**

Spraying. A spray gun using a remote pressure pot is recommended for large signs. Fluid tips and air caps suitable for enamels are generally satisfactory. Start on upwind edge of sign. Wind carries spray onto the uncleared portion of the sign and as spraying proceeds, any overspray is flooded with a full glossy coating. For uniform coverage, spray sign with horizontal pattern, then vertical pattern.

Roll coating. Wash new rollers with detergent and water, then rinse and dry to remove loose fibers. Starting at the top and working down, roll back and forth across the sheeting to deposit an even, wet, glossy coat. A final roll in one direction with the roller perpendicular to the first application is helpful in obtaining even, clear distribution. On large signs, finish one section at a time and avoid rerolling an area that has started to dry. Extension handles, available at most paint stores, may eliminate the need for a scaffold.

Hand brushing. Small signs—brush evenly. Check light reflection from surface of clear coated sign to verify no skipped areas exist.



SIGN CLEARING CHART—ENGINEERING-GRADE SHEETING

	Spraying	Roll coating	Hand brushing
Equipment	Binks 18 or 19 gun fluid tip-63A air cap 63PH or 66PE or equivalent. Remote fluid pressure tank.	1/8"-1/4" nap mohair roller or lambs wool covered with cotton enameling sleeve or pressure fed roller extension handles.	3"-4" enameling brush
Clear (No. 731)[1]	finishing clear 731	finishing clear 731	finishing clear 731
Thinner (No. 711)[2]	thinner 711	thinner 711	thinner 711
Pints of thinner per gallon of clear[3] for air temperature:			
85°-100° F	1 pt/gal	1 pt/gal	2 pt/gal
65°-85° F	2 pt/gal	2 pt/gal	3 pt/gal
50°-65° F	3 pt/gal	3 pt/gal	3 pt/gal

[1]No. 731 is a 3M Co. product.

[2]No. 711 is a 3M Co. product.

[3]Do not add additional thinner until it is determined that atmospheric conditions require it. Once additional pint may be added if required.

Source: Signs Maintenance Guide.[21]

Figure 13. Procedure for clear coating.

Sign Supports

This countermeasure is intended to reduce vandalism costs through the use of sign support systems that resist vandalism or can be replaced in a timely and economical manner. The use of breakaway, yielding, and flexible sign supports has increased in recent years due to lower maintenance costs and the reduced potential for serious injury when involved in traffic accidents. These support types have also been employed as countermeasures for sign vandalism (see appendix B for product listings for sign support systems).

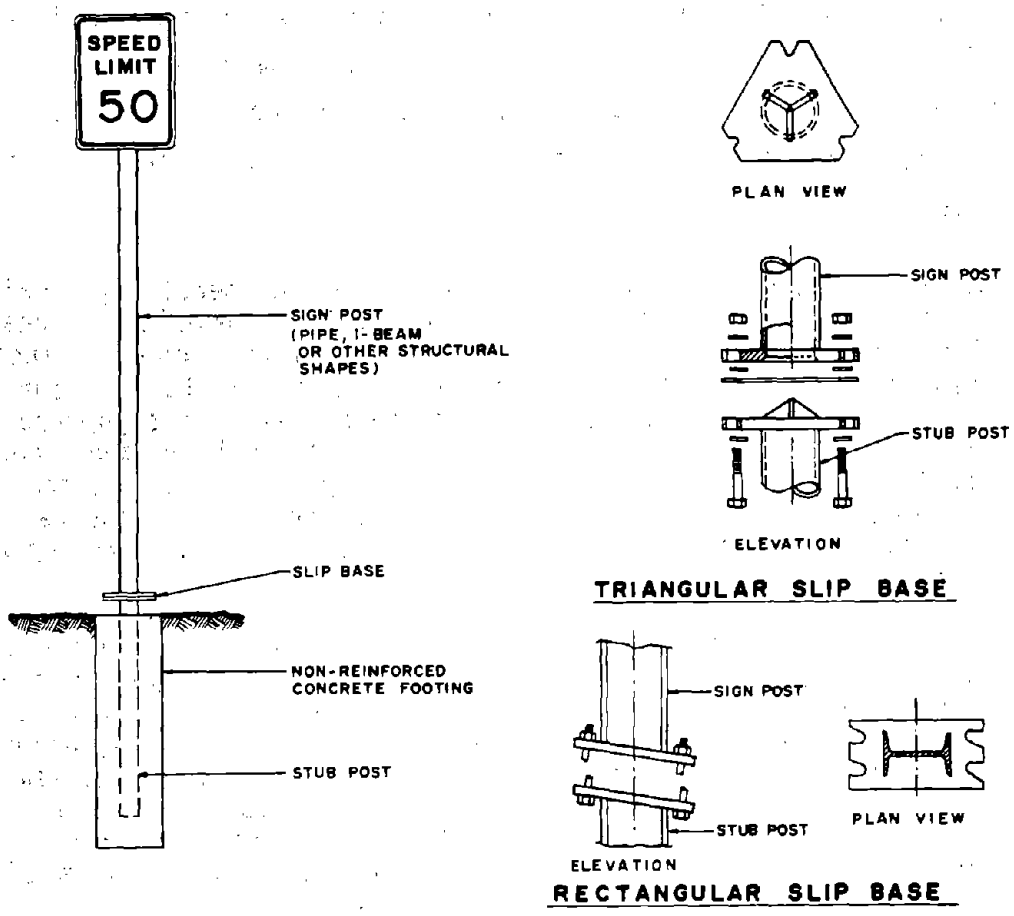
- Breakaway Supports -- Both wooden and commercially available metallic support systems can be installed to provide a breakaway func- tion. However, maintenance and vandalism cost savings are generally enhanced through the use of metal or aluminum supports. The Forest Service has adopted the use of metallic sign support in areas that experience high rates of destruction and theft of wooden supports.[15] Breakaway sign support systems are commercially available in round, channel, or square cross sections. Examples of each cross section type are shown in figures 14 through 16.

- Flexible Supports -- The development of nonmetallic materials for highway sign applications has given rise to lightweight flexible support systems. The major use for these systems is for delineators and markers. Carsonite International, Carson City, Nevada, is a distributor of various flexible sign support systems.[40] The Texas Department of Highways and Public Transportation has field tested over 500 flexible delineator posts and has set the level of performance for flexible delineator supports at 10 hits before replacement is necessary.[44]

Sign, Support, and Mounting Installation Techniques

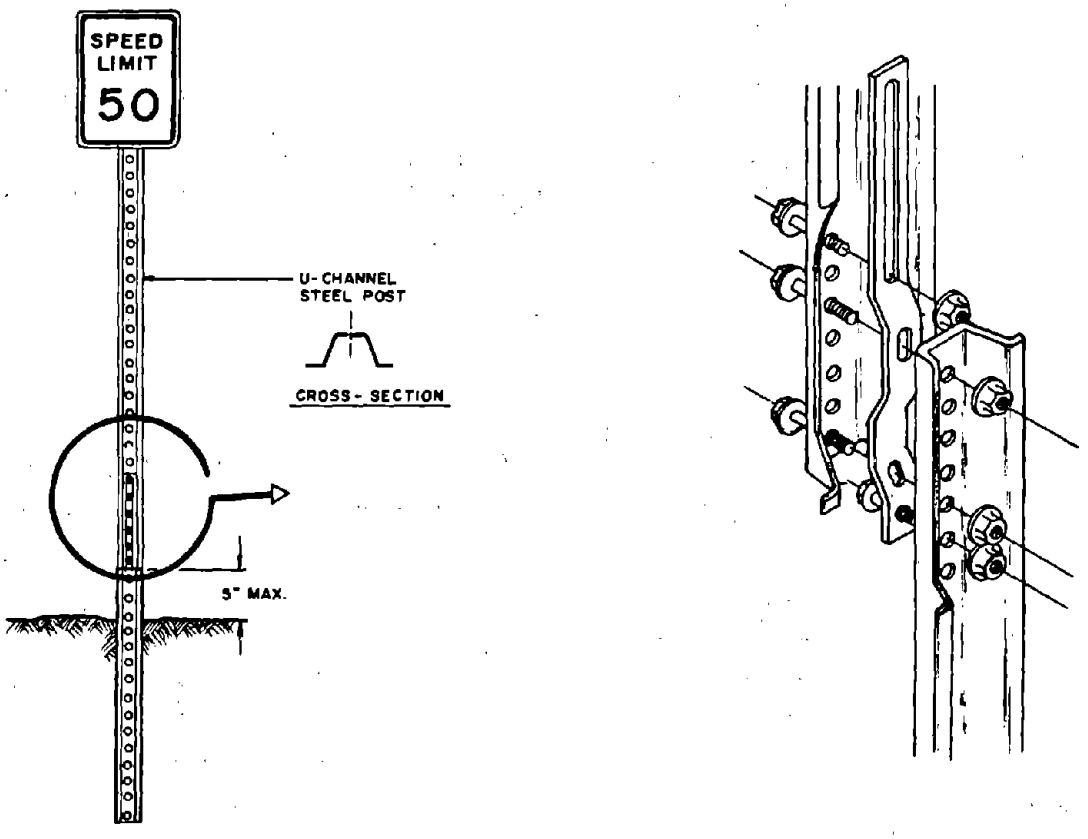
This countermeasure includes the utilization of special installation techniques and hardware to reduce the opportunity for vandalism. A wide range of special installation techniques and hardware have been used by numerous agencies. These countermeasures have been categorized as installation techniques for signs, supports, and mounting hardware.

Successful employed sign installation techniques include:



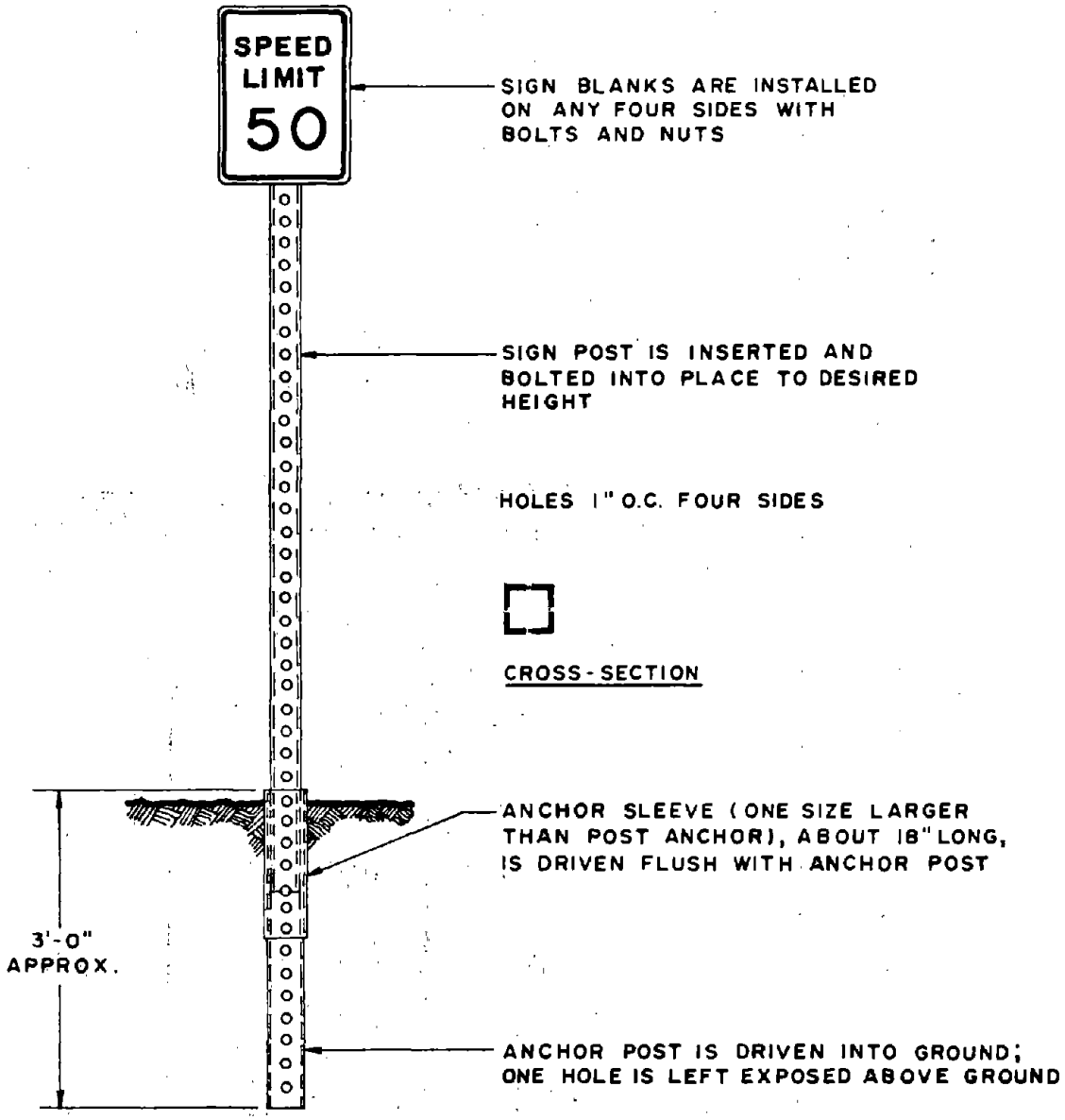
Source: Reference.[3]

Figure 14. Breakaway slip base support system.



Source: Reference.[3]

Figure 15. Bolted loose support system for channel sections.



Source: Reference.[3]

Figure 16. Breakaway support system for square tubing.

- Increase Sign Height -- The Manual on Uniform Traffic Control Devices (MUTCD) specifies minimum sign clearance heights of 7 feet (210 cm) in urban areas and 5 feet (150 cm) in rural areas.[27] Conformance to the 7-foot (210-cm) standard in urban areas is effective in placing signs out of the reach of young vandals.[11,12] Care should be taken, however, that moving the sign does not result in the driver's view being obscurred by trees or other obstructions.

- Increase Distance of Sign From Roadway -- Placement of signs at greater distances from the roadway and away from roadside turnouts has been reported to discourage vandalism in rural areas.[14] Studies by Williston indicate that signs located up to 26 feet (780 cm) from the pavement edge did not reduce sign legibility under clear weather conditions.[45] Again, care should be exercised to avoid reducing the visibility and conspicuity of the sign.

- Use of Double Signs and Battens -- Several States install back-to-back signs to resist sign twisting. Other States place a horizontal metal piece behind the sign blank to increase bending resistance.

- Local agencies in Michigan report reductions in the theft of street name signs containing persons' names by adding suffixes such as "St., Dr., Ave., Ct., etc., to the legends.

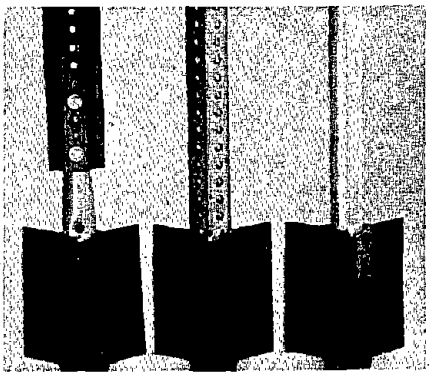
- Local agencies in Texas report reductions in street name sign thefts when the signs are directly mounted to square tab supports as opposed to round supports with sign brackets.

Support Installation Techniques -- These techniques generally consist of measures to prevent sign support twisting or removal. These include:

- Antitwist Devices -- Commercial devices to prevent support turning are currently available. For example, Foresight Industries, Inc., Cheyenne, Wyoming, developed the "V LOC SOCKETS" which meet the government change-of-momentum recommendation.[37] The product is illustrated in figure 17. Another technique is to drive anchor rods through the support below ground level or apply cleats such as those shown in figure 18.[21,36]

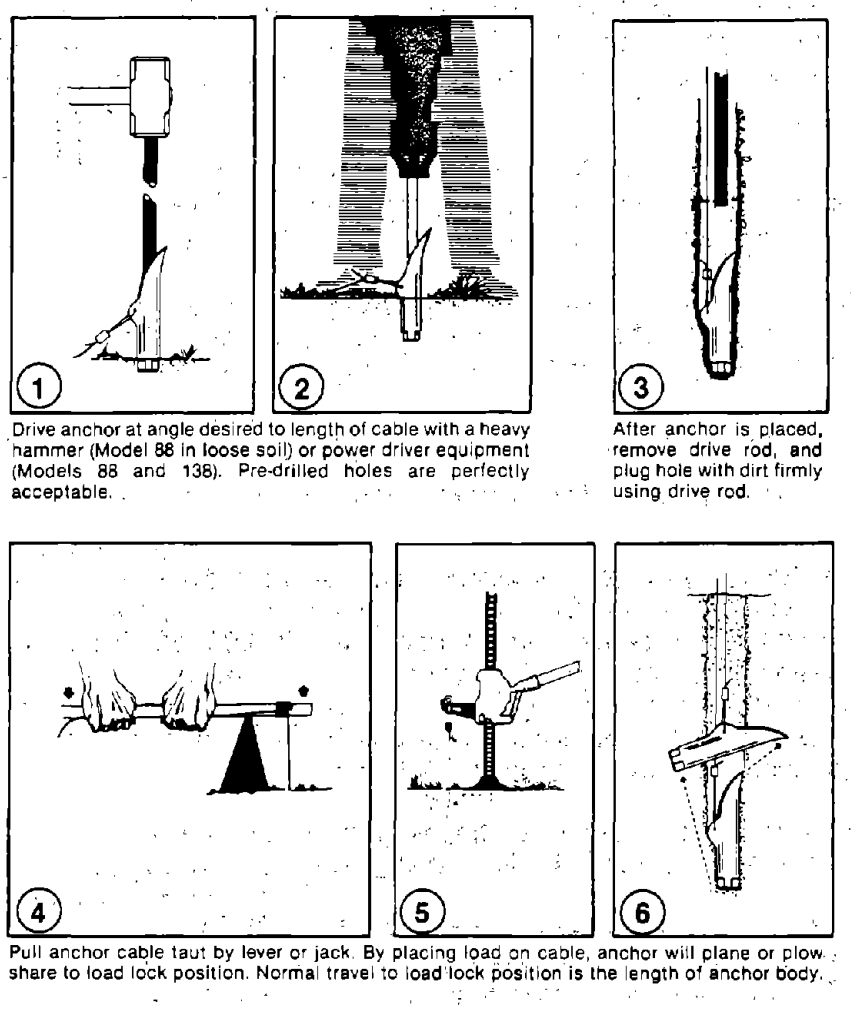
- Use of Post Drivers as Opposed to Drilling -- Driven sign supports are less susceptible to twisting.

- Use of Double Supports -- Back-to-back supports have been used to reduce twisting. However, care should be exercised to ensure that minimum change-of-momentum values are not exceeded.[1,35]



Source: Foresight Industries, Inc.

Figure 17. V-loc socket system yielding base post support.



Source: Foresight Industries, Inc.

Figure 18. Installation procedure for "duckbill" brand anchors.

Mounting Hardware -- Commercially available antitheft fasteners such as "TUFNUT", "TEENUT", aluminum fluted nuts, blind aluminum rivets, and "VANDALGARD-NUT Assembly" are shown in figures 19 through 21 respectively. Other techniques include the use of "LOC-TITE" (cement adhesive), bolt-bending, and thread stripping.[6] Portland, Maine employs a flexible innovative street name sign mounting bracket (figure 22) to reduce theft and prevent permanent bending.[54]

These techniques have proven to be effective in reducing specific types of vandalism. Several agencies have reported complete elimination of sign theft through the use of antitheft fasteners while others apply the fasteners on a more selective basis to reduce the theft of stop and yield signs.[3] Other agencies report cost efficiencies through the use of one antitheft fastener per sign.

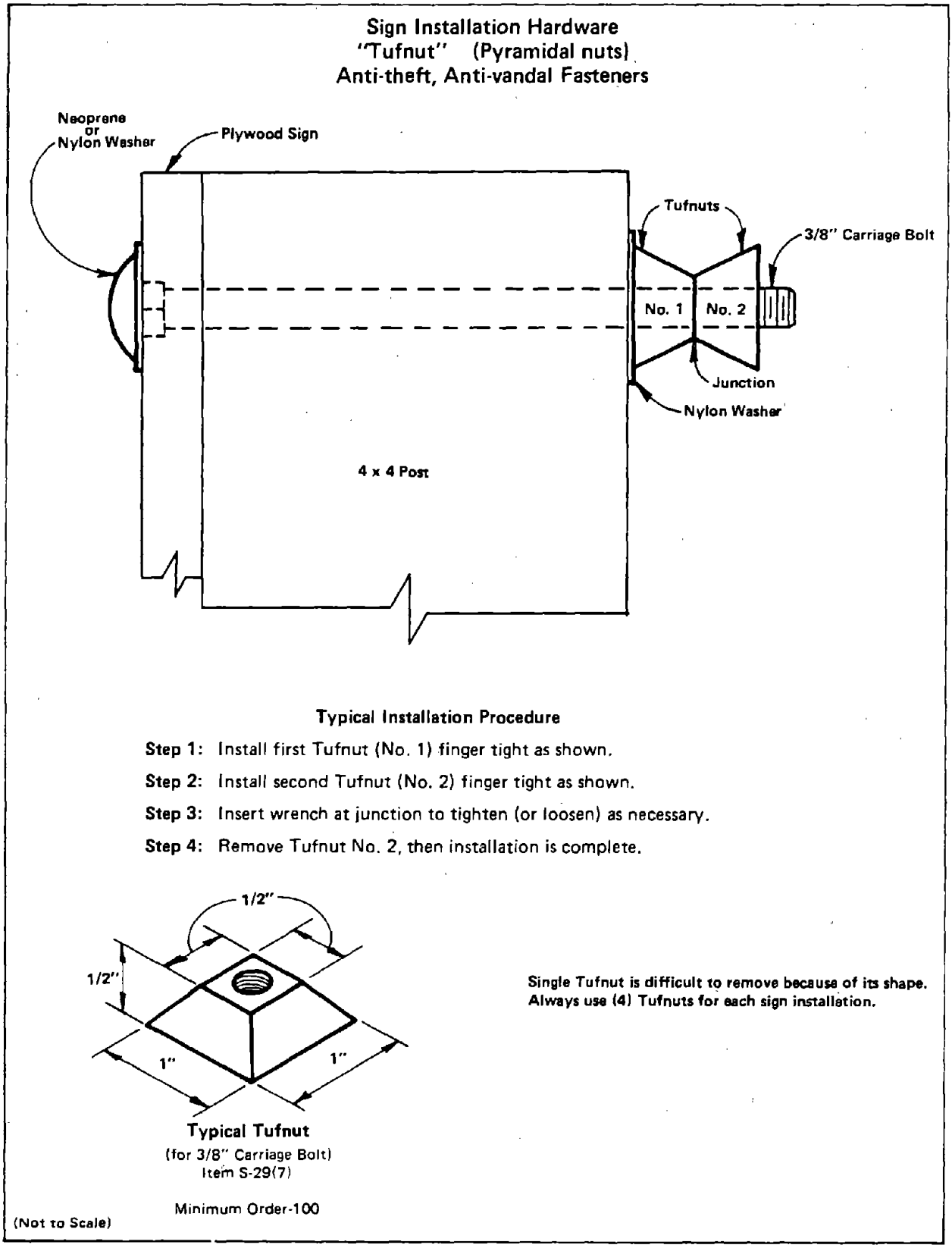
NOTE: Product listings are provided in appendix B.

Sign Repair and Maintenance

Repair or replacement of vandalized signs is a means to lessen the monetary impact of vandalism and not a preventative countermeasure for sign vandalism itself. Once a vandalized sign assembly is identified, consideration should be given to whether the sign should be replaced, repaired, left as is, or completely removed. The decision to repair the sign may also consider the use of a different construction/installation technique such as described in the previous section.

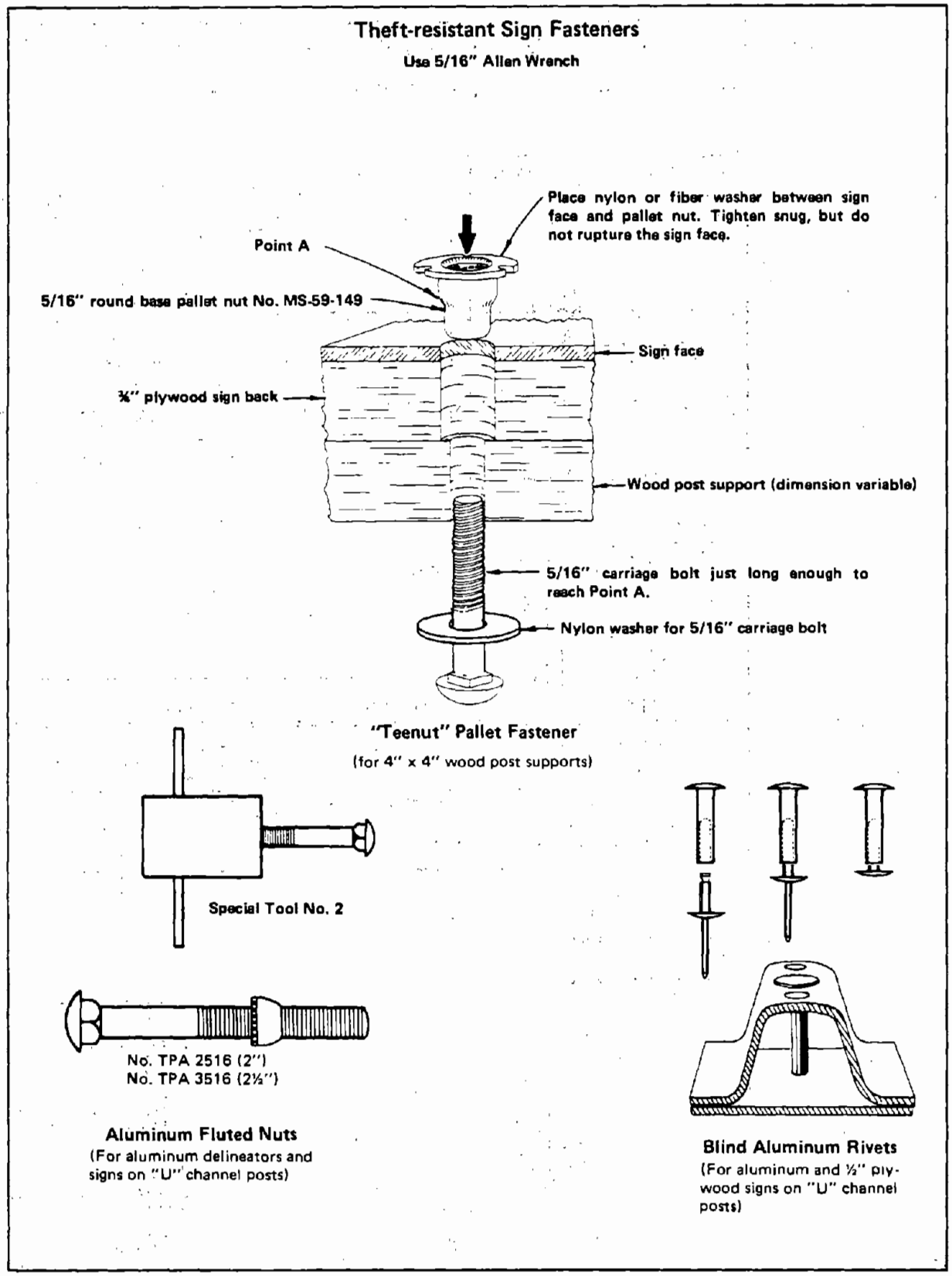
Several methods that have been employed in the repair and maintenance of vandalized signs are presented below. In general, the techniques are appropriate for use in restoring the legibility of damaged signs on a short-term basis (until more permanent actions can be taken) or when the cost of total replacement exceeds the cost of repairing the sign to an acceptable level of effectiveness.

The techniques available for sign repair and maintenance include:



Source: Signs Maintenance Guide.[21]

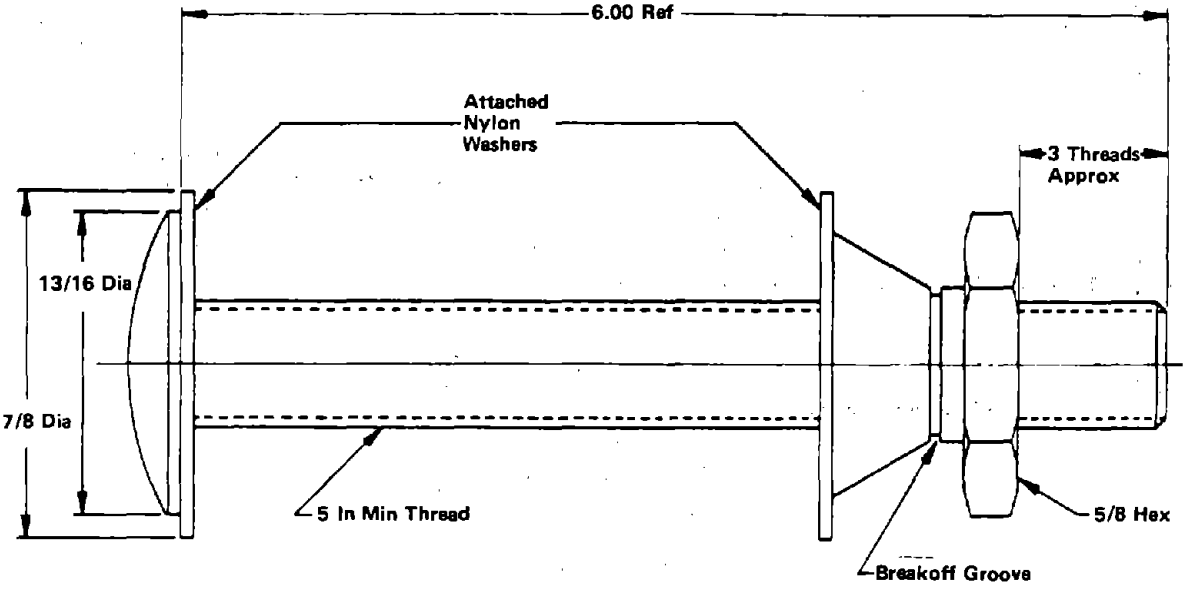
Figure 19. "Tufnut" sign fastener.



Source: Sign Maintenance Guide.[21]

Figure 20. "Teenut", aluminum fluted nut and blind aluminum rivet sign fasteners.

Vandlgard-Nut Assembly



HARDWARE ASSEMBLY

ASSEMBLY COMPONENTS	DESCRIPTION	MATERIAL	FINISH & COLOR
VCB 144	Bolt–5/16-18 x 6" Round head	C1018 Steel or equiv.	Cadmium plate per QQ-P-416 Type II Cl. 2 or zinc plate per QQ-Z-325 Type II Cl. 1 } Olive drab Dichromate
VCN 145-5	Nut–5/16-18 Vandlgard	Aluminum alloy QQ-A-430	Anodize per MIL-A-8625 Color: Green
VCW 146	Washer–5/16 I.D. x 7/8 O.D. x 1/16" thick	6/6 Nylon	Brown

VC147 Hardware assembly consisting of:

1 VCB144 bolt with attached VCW146 washer

1 VCN145-5 nut with attached VCW146 washer

NOTES: 1. Assembly supplied as illustrated.

2. To order individual components use the following part numbers:

Bolt:
VCB144–Bolt without washer
VCB144W–Bolt with attached washer

Nut:
VCN145-5–Nut without washer
VCN145-5W–Nut with attached washer

Washer:
VCW146–Washer only

Source: Signs Maintenance Guide.[21]

Figure 21. Vandlgard sign fastener.

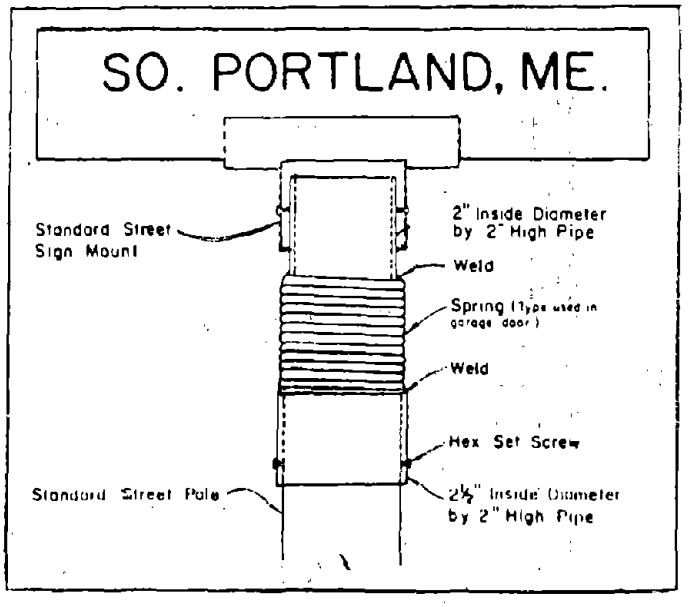


Figure 22. Springmounted street name sign bracked used in South Portland, Maine.

- Sign repair kits.
- Sign cleaning.
- Bent sign repair.
- Puncture repair.
- Sheeting and legend replacement.
- Sign overlays.
- Recycling of materials.

Sign Repair Kits

This countermeasure is intended to increase the efficiency and effectiveness of timely sign repair through the availability and use of necessary tools, materials, and equipment. Complete sign repair kits are commercially available or kits may be assembled to meet the specific sign repair needs of an agency. Figure 23 illustrates two commercially available sign repair kits. The contents shown in these kits may also be used as a guide for sign kit development. Many highway agencies do not emphasize the repair of signs (most simply replace signs). A sign repair kit may be useful for the repair of vandalized signs at field locations until such time as sign replacement or a longer-term countermeasure is possible. The Forest Service recommends that sign repair kits be available for use in field repair of damaged signs.[21]

Sign Cleaning

This countermeasure category is intended to restore or improve sign legibility through general cleaning and removal of foreign substances from the sign face. Sign cleaning techniques and products are commercially available for use in removing both common dirt and more severe contaminants such as paint, ink, or adhesives.

- General Sign Cleaning -- Mild, nonabrasive cleaners and detergents suitable for highway quality painted or enamaled surfaces are recommended or general sign cleaning (removal of dirt). Cleaners should be free of strong aromatic solvents or alcohols, and be chemically neutral (PH of 6 to 8 is recommended).[15,46,47]

3M Co.

The 3M Co. kit—BHK-1 Sign Patching Kit—is primarily for repairing reflective signs of aluminum. When ordering, specify brown engineering-grade reflective sheeting in place of the green normally stocked in this kit.

Description	Size	Unit	Quantity
No. 425 foil tape	1½" x 60 yd	Roll	4
No. 3271 Yellow	2½" x 10 yd	Roll	1
No. 3290 White	2½" x 10 yd	Roll	4
No. 3277 Green	2½" x 10 yd	Roll	1
No. 3290 silk screen with No. 712 stop sign red	2½" x 54"	Piece	7
No. 3655 Black	2½" x 10 yd	Roll	1
Scissors	--	Pair	1
Machinist hammer	16 oz	Each	1
No. 1454 fender dolly	2½ lb	Each	1
No. 700 clear	8 oz	Can	1
A-3 Activator	4 oz	Can	1
Squeegees	--	Each	5

NOTE: 3M is changing this kit for Forest Service use to:

2 rolls of white
2 rolls of brown, no green

Order from:

3M Co.
Reflective Products Division
St. Paul, Minn. 55101

The kit costs $89.95 plus shipping (1979 price).

Ojo Caliente Craftsmen, Inc.

Description	Size	Unit	Quantity
Brown reflective sheeting	6" x 10 yd	Roll	2
Silver reflective sheeting	6" x 5 yd	Roll	1
Black No. 3655 sheeting	9/16" x 50 yd	Roll	1
Yellow reflective sheeting	6" x 10 yd	Roll	1
Red reflective sheeting	6" x 6"	Sheet	20
Prespaced diecut 1 pkg. each alphabet (A-Z)	4-in, Series C	10/pkg	26
Prespaced diecut numerals (0-9) 1 pkg. each	4-in, Series C	10/pkg	10
Arrows	4" x 6"	5/pkg	3
Radius corners (for borders)	½" x ½"	25/pkg	1
Sign border material	½" x 50 yd	Roll	1
Transparent film No. 639	3" x 50 yd	Roll	1
Plastic applicator squeegee	--	Each	3
Aluminum tape	½" x 50 yd	Roll	1
Dauber can, No. 700 clear	8 oz	Can	1
Scissors	8 in	Each	1
Single edge razor blades	--	Pkg	1
Plywood cutting block	¾" x 6" x 6"	Each	1
Adhesive activator	1 pt	Each	1
Aerosol flat black paint	13 oz	Can	1
Flat dolly	--	Each	1
Ball peen hammer	--	Each	1

This kit is shipped in two steel tool boxes and costs $450 f.o.b. Ojo Caliente, N. Mex. To order, write:

Ojo Caliente Craftsmen, Inc.
P.O. Box 67
Ojo Caliente, N. Mex. 87549

Source: Signs Maintenance Guide.[21]

Figure 23. Commercial sign repair kits.

The list of cleaning products for general cleaning contained in appendix B represent laboratory tested products which have been reported to perform satisfactorily on SCOTCHLITE brand reflective sheeting, SCOTCHAL brand film, and SPRINT brand film.[46,47] Manufacturers' instructions for use of these products should be followed and products should be used on a test and approval basis.

The procedure recommended for general sign cleaning is provided in appendix A.

Special sign cleaning equipment is available for general cleaning activities. The "Highway Handyman" (available through the Highway Sign Cleaner Company of St. Paul, Minnesota) or equivalent is an example of a commercially available truckmounted sign cleaning system.[48] Systems can also be developed using commercially available scrub brushes, valves, and air compressors.

- Cleaning Severely Contaminated Signs -- Vandalism that results in severe contamination is often not correctable using general cleaning procedures and detergents. The removal of paint, ink, and adhesives requires stronger cleaners and special cleaning procedures.

Paint or ink -- Commercial paint removers, designed for removing paint from sign faces are available. Caution should be exercised in use of these chemicals, since they may affect the performance life of the sign sheeting. The products contained in appendix B have been tested and found to work satisfactorily on selected sheeting materials. However, the use of the products may not be appropriate for painted signs since the paint used in vandalism is often of higher quality than the paint used in the screening processes.

Lipstick, crayon, tar, oil, diesel smut and bituminous materials can often be removed with mild solvents such as mineral spirits, kerosene, keptane, or naptha. Sign should be cleaned with detergent and clean water rinse following the use of these solvents.

Pollen and fungus can be removed by washing the surface with 3 to 5 percent sodium hypochlorite solutions such as commercial bleach. This should be followed with detergent and clean water rinse.

The removal of adhesives from decals and stickers is possible with commercially available solvents. However, caution should be exercised and adhesive removers should be tested prior to use.

Other severe contamination that cannot be removed by these methods may be removed with a "SCOTCH-BRITE" pad, very fine steel wool, a plastic kitchen scourer or stronger solvents such as those listed in appendix B.

The use of techniques and cleaners for more severe contamination will reduce night reflectivity and therefore should be confined to the minimal area possible. If cleaning results are poor, it is recommended that the affected area may be covered with 3M Co. No. 425 UAL aluminum foil tape and a patch of reflective sheeting. If cleaning results are acceptable, rinse, dry, and clear coat to the affected area.[24]

The use of mild detergents and cleaning procedures are appropriate for general cleaning activities. When stronger solvents are necessary it should be recognized that sign reflectivity will be reduced. Therefore, it is essential that manufacturer's instructions be followed and that products are trial-tested prior to application on traffic signs.[9,15,34]

Bent Sign Repair

This countermeasure consists of repairing bent and damaged aluminum signs through sign straightening and legend replacement. The Forest Service recommends bent sign repair only when the time and cost of sign repair is less than that associated with total replacement.[21] Appendix A describes a procedure for repairing bent signs.

Puncture Repair

This countermeasure consists of repairing puncture damage to reflective aluminum and plywood signs. Puncture repair must be weighed against the cost of sign replacement. In most cases, the decision is based on the number of punctures and age of the sign. Procedures for puncture repair on aluminum and plywood signs are contained in appendix A.

Sheeting and Legends Replacement

This countermeasure consists of the repair of damaged sheeting and legends in the field. As in the repair of bent signs and puncture damage,

a tradeoff between repair and total replacement should be considered. Procedures for removing damaged sheeting, spot patching, repairing legends, borders and symbols, and sealing is contained in appendix A.

Sign Overlays

This countermeasure is intended to reduce maintenance costs due to vandalism through the application of ready-made sign overlays as an alternative to sign replacement. This countermeasure is appropriate in cases where the sign face has been damaged beyond repair but the sign substrate is usable. In these cases, sign overlays can be applied to the damaged sign face or to the sign blank following sign face removal. The "SCOTCH-LITE" Brand Reflective Sheeting Grade 800 System 5 developed by the 3M Company, is a high intensity sheeting material with a thin aluminum backing and very aggressive adhesive. This product can be overlaid on old signs and there is generally no need for stripping the existing sign face. The System 5 may be applied in the sign shop or in the field.[47]

The City of El Monte, California, used the 3M Company System 5 overlay to refurbish over 900 stop signs. City officials report that an average of 27 signs were upgraded per day with the overlay system. In comparison, complete sign replacement could be achieved at a rate of only 15 signs per day. An 80 percent increase in the number of signs that could be replaced per unit time was reported.[34] In a value engineering study performed by several state highway officials, however, it was determined that overlays offered minimal time savings when compared to complete sign replacement. A cost savings of $0.45 per square foot of sign face area was reported for the overlay. NOTE: The reader is referred to the section "Case Studies" for a case study description of the program initiated by the City of El Monte, California.

Recycling of Materials

This countermeasure is intended to minimize vandalism repair costs through recycling and reuse of sign and support materials. Recycling

techniques include cutting smaller signs from large vandalized signs as shown in figure 24 and stripping damaged sign faces to obtain reusable sign blanks, and sign support straightening.[37]

Removal of the sign face material generally requires methylene chloride base paint removers as cold strippers. Sandblasting may be used, but in general, it is not economical and may damage the application surface.[41,46,47] Chemical strippers that may be applied by brush or tank to remove sign face material are contained in appendix A. Most paint removers contain chemicals that are harmful to the skin and eyes. Manufacturer's safety precautions should be followed.

The economics of sign face stripping should be taken into consideration due to potentially high time and cost expenditures required for the procedure.[47] Sign recycling has been used by several agencies and found to be economical.

Sign Ownership Identification

Sign identification programs involve directly affixing or imprinting information on the sign for identification of ownership, penalties, reporting notices, and/or sign installation dates. The identification of sign ownership through the use of stickers, stamped imprints and silk-screening is considered to be one of the most cost-effective countermeasures to sign vandalism (See references 9,17,21,24). In addition to ownership identification, information on penalties, rewards, inventory numbers, installation dates, and vandalism hotlines (telephone number) have been incorporated on the identification decals.

Ownership identification is a key element to the prosecution of sign thieves. Even in the absence of laws relating to the unauthorized possession of signs, positive ownership identification may be used to prosecute vandals under "possession of stolen property" statutes.

Stickers and decals with adhesive backing are available through many sign manufacturers and can be easily and securely adhered to the sign.

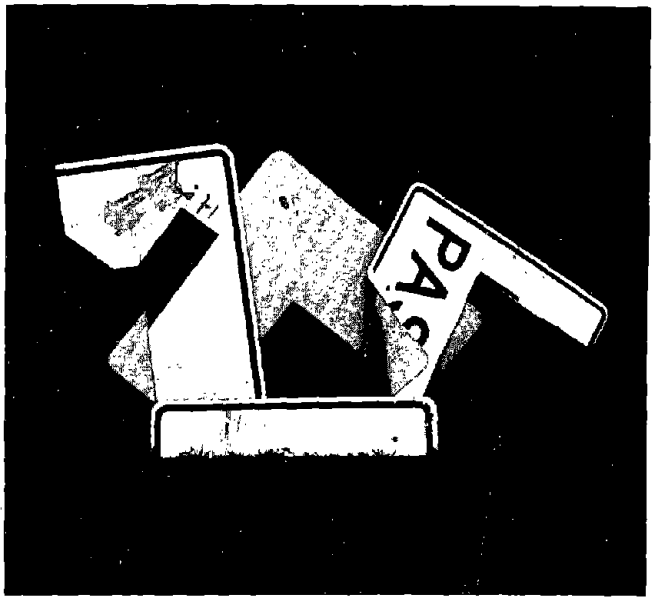


Figure 24. Recycling of vandalized signs.

These can be attached to either side of the sign but most agencies apply the stickers to the back of signs. Figures 25 and 26 are illustrations of stickers and decals currently used in Iowa, Wisconsin, and Virginia.

Ownership identification has gained widespread use primarily due to the demonstrated needs for ownership identification for prosecution of thieves and the relative inexpensive implementation of this countermeasure. While information on sign inventory number and date of installation are recognized as valuable data for sign system management, rewards and hotline telephone numbers for reporting stolen signs or sign vandals (see figure 27) are considered by many agencies to be of minimal value.[9, 10,11]

NOTE: The reader is referred to the section "Case Studies" for a case study description of the sign ownership identification program in the State of Virginia.

Enforcement Measures

Some have suggested that sign vandalism may be reduced by enlisting the assistance of the law enforcement community in the prevention and reporting of sign vandalism and the apprehension of vandals.

The results of a workshop attended by a national cross-section of law enforcement officials indicated that the enforcement community recognizes sign vandalism as a potential safety hazard as well as a potential source of tort liability. However, in the vast majority of political jurisdictions, little or no statistical information is available on the magnitude of the vandalism problem, the typical vandalism location and time patterns. Without such information, the law enforcement officials indicated that directed patrols, selective enforcement, or other operational enforcement techniques specifically for vandalism is impractical. Until such information can be made available, it is unlikely that effective enforcement operational procedures can be used as a deterent to sign vandalism (except for routine enforcement activities). Recognition of the problem during shift briefing and roll calls may, however, increase patrol officer awareness of the problem during routine patrol activities.

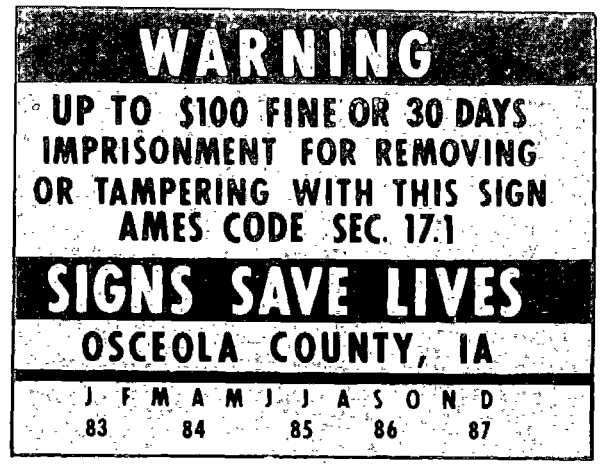


Figure 25. Ownership identification stickers used in Osceola County, Iowa, and Wisconsin.

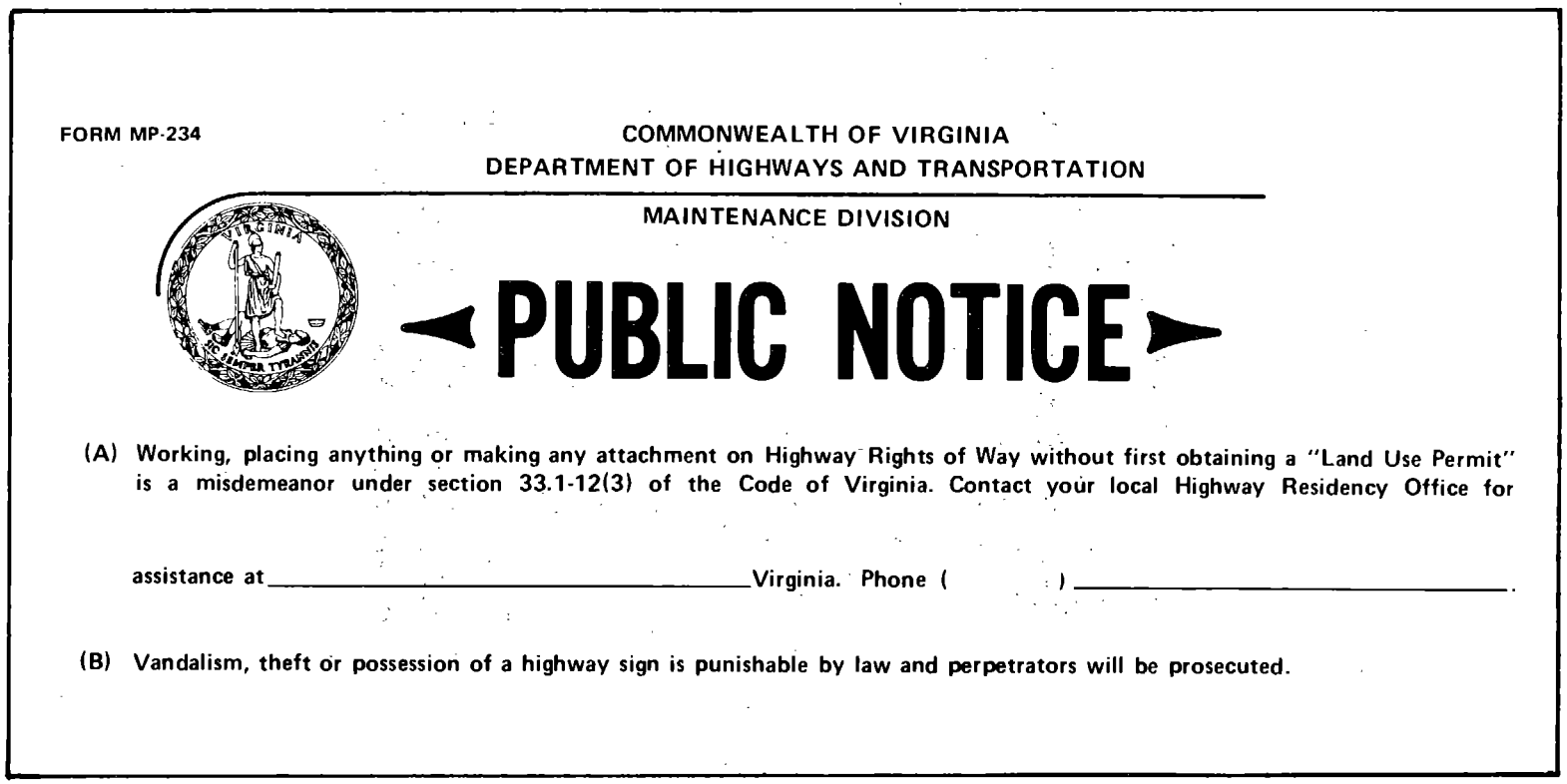


Figure 26. Ownership identification sticker used in Virginia.

Figure 27. Reward sticker used by the city of Bedford.

The most promising method of employing enforcement personnel that was suggested in the workshop involved public education through established police-community interaction. It was suggested that existing "Officer Friendly" programs in schools, involvement in juvenile delinquency adjudication, and involvement in local driver education programs may be used to provide information on the nature and potential dangers associated with sign vandalism.

Details of the workshop findings are provided in appendix C.

Legislative Improvements

Sign vandalism concerns have been addressed by an increasing number of states through the development and adoption of new laws and ordinances or the modification of existing legislation to enhance enforcement and prosecution efforts. The general law, as contained in the Uniform Vehicle Code (UVC), Section 11-206 (1975 revision) states:

> No person shall, without lawful authority, attempt to or in fact alter, twist, deface, injure, knock down, remove or interfere with the effective operation of any official traffic control device or any railroad sign or signal or any inscription shield or insignia thereon, or any other post thereof.[23]

A review of existing State laws covering sign vandalism indicates that most State laws have provisions that are comparable to Section 11-206 of the UVC or earlier versions of the law. With respect to individual vandalism acts, most State laws prohibit altering, defacing, injuring, knocking down, and removing traffic signs. Few States, however, address vandalism by twisting and interfering with the effective operation of a traffic control device.

Individual state vehicle codes should be consulted to determine the extent to which the above code is duplicated or supplemented. A summary of state vehicle code provisions is provided in table 9 for various acts of vandalism. Note that three States prohibit the unauthorized possession of an official traffic control device (Iowa, New Hampshire, and North Carolina). Wisconsin also prohibits unauthorized possession, although

Table 9. Summary of sign vandalism components prohibited by State laws.

	Altering	Twisting	Defacing	Injuring	Knocking Down	Removing	Interfering With Effective Operation	Prohibits Unauthorized Possession	See Appendix to Table
UVC	•	•	•	•	•	•	•		
Alabama	•		•	•	•	•			
Alaska	•		•	•	•	•	•		•
Arizona	•		•	•	•	•			
Arkansas	•				•	•			•
California			•	•	•	•			•
Colorado	•		•	•	•	•	•		
Connecticut			•		•	•			•
Delaware	•	•	•	•	•	•	•		
Florida	•		•	•	•	•			•
Georgia	•		•	•	•	•			
Hawaii	•		•	•	•	•			
Idaho	•	•	•	•	•	•	•		
Illinois	•		•	•	•	•			
Indiana	•		•	•	•	•			
Iowa	•		•	•	•	•		•	•
Kansas	•		•	•	•	•			
Kentucky	•		•						•
Louisiana						•			•
Maine			•			•			•
Maryland	•	•	•	•	•	•			•
Massachusetts			•	•		•	•		•
Michigan	•		•	•	•	•			
Minnesota	•		•	•	•	•			
Mississippi	•		•	•	•	•			
Missouri	•		•	•	•	•			
Montana	•		•	•	•	•			
Nebraska	•		•	•	•	•			•
Nevada	•		•	•	•	•			
New Hampshire	•		•	•	•	•		•	•
New Jersey			•	•		•			•
New Mexico	•		•	•	•	•			
New York	•		•	•	•	•			
North Carolina			•	•	•	•		•	•
North Dakota	•		•	•	•	•			
Ohio	•		•	•	•	•			
Oklahoma	•		•	•	•	•			
Oregon	•		•	•	•	•			
Pennsylvania	•	•	•	•	•	•	•		
Rhode Island	•		•	•	•	•			
South Carolina	•		•	•	•	•			•
South Dakota	•		•	•	•	•			
Tennessee	•		•	•	•	•			
Texas	•		•	•	•	•			
Utah	•		•	•	•	•			
Vermont	•		•	•	•	•			
Virginia			•	•	•	•			•
Washington	•		•	•	•	•			
West Virginia	•		•	•	•	•			
Wisconsin			•	•		•			•
Wyoming	•		•	•	•	•			
District of Columbia	•		•	•	•	•			
Puerto Rico									•
Totals	42	4	49	46	45	50	6	3	

Source: Reference.[23]

Table 9. Summary of sign vandalism components prohibited by State laws (continued).

1. Alaska -- Law gives state the right to recover damages caused by violating its law.
2. Arkansas -- Law covers "damaging" any device.
3. California -- Additionally includes shooting at devices and attaching any material or substance to any device. The law also covers damaging any inscription on the device.
4. Connecticut -- Law also covers destroying any sign or light. Law applies only if the acts are willful or malicious.
5. Florida -- Has a second law relating to barricades and detour signs.
6. Iowa -- Law applies only if acts are willful and intentional. Penalty is imprisonment for not more than 6 months and/or a fine of not more than $500.
7. Kentucky -- Law does include damaging any guideboard, milestones, or milepost. Law may no cover all signs and other traffic control devices.
8. Louisiana -- Bans tampering, damaging, destroying, or moving any sign, signal or barricade.
9. Maine -- Includes destroying or damaging any sign or signal.
10. Marryland -- Bans removal of any part of a traffic control device.
11. Massachusetts -- Violating must be willful and intentional. Law covers destroying any sign, light, marking, or device.
12. Nebraska -- Adds civil liability for a violation.
13. New Hampshire -- Excepts accidental damage to traffic control devices.
14. New Jersey -- Law applies only if act is willful or intentional.
15. North Carolina -- Law applies only to signs and authorizes payment of rewards for convictions.
16. Ohio -- Includes driving over freshly-painted lines.
17. South Carolina -- Provides a special penalty: Fine of not less than $1,000 and/or imprisonment from one to five years. If injury results, the penalty is a felony with the judge determining the penalty. If death results, it is a felony punishable by 2 to 30 years in prison.
18. Virginia -- Law applies only to signs.
19. Wisconsin -- Law applies only if act is willful or intentional.
20. Puerto Rico -- Bans damaging any device.

this provision is not a part of the State's vehicle code, and therefore, does not appear in table 9. Note that UVC Section 11-206 does not include unauthorized possession of traffic control devices. However, criminal code provisions do ban stealing or possession of stolen property.[23]

Several states have or are currently revising their laws related to sign vandalism. Of special note are the following:

- South Carolina provides particularly stiff penalties including fines of not less than $1,000 or imprisonment from 1 to 5 years. If death results from an accident related to a vandalized sign, 2 to 30 years of imprisonment is the possible sentence to the sign vandal.
- Alaska and Nebraska provide for civil liability for sign vandals.
- California adds specific reference to shooting and attaching any materials to a sign.

It is important to note that some States have more than one law on sign vandalism. The summary contained in table 9 was performed relative to "vehicle" code provisions. However, sign vandalism laws may also exist in the "criminal" or "highway" codes of particular States.

In general, legal consultants suggest that the development of an improved law covering sign vandalism should consider the following:

- As a minimum, every State should have UVC Section 11-206, Supplement III, 1979.
- In States where local authorities are not preempted from having ordinances on subjects covered by the State vehicle code, municipal authorities should have a local ordinance covering the State law.
- Provide for additional specific acts of vandalism (in addition to those in UVC Section 11-206) covering shooting at, applying material to, and placing paint upon a traffic control device.
- Ban unauthorized possession of a traffic control device.
- Provide a specific penalty. The recent trend in revised State laws is to increase fines and stiffen penalties. However, law enforcement personnel suggest that large fines are often considered by the judicial system to be excessive in relation to

other crimes and therefore tend to dismiss many cases (see appendix C for details on law enforcement perspectives of sign vandalism).

- Ensure that violations are crimes and not infractions.
- Add certain presumptions to discourage attaching stickers and advertisements on signs and supports.

Once an improved law has been developed, attention must be given to educating the public at large, elected officials, public officials in charge of maintaining our highway system, and the law enforcement community. A special effort should be given to bring the problem to the attention of State legislators as well as other organizations such as the local units of the International Association of Chiefs of Police, American Association of State Highway Officials, Institute of Transportation Engineers, National League of Cities, the National Association of County Officials, and the National Advisory Committee on Uniform Traffic Control Devices.

Examples of laws covering sign vandalism developed in the States of Wisconsin and New Jersey are provided in appendix D.

Information is not readily available on the effectiveness of improved legislation as a deterrent to sign vandalism. The trend in recent State legislative changes has been to stiffen monetary and imprisonment penalties. However, many enforcement personnel do not consider stiff fines or penalties as an effective countermeasure from an adjudication perspective, due to the reluctance of courts to impose extremely stiff penalties for sign vandalism.

Public Information and Education

Improved public perceptions about the costs and potential dangers of sign vandalism through public information and education efforts is considered by many to be an effective countermeasure as well as an essential supporting activity to other antivandalism efforts.

Public information and education should be an integral part of any effort to reduce sign vandalism. Several approaches have been used to inform and educate the public. They include:

- Press Releases -- Newspapers, periodicals and professional journals are commonly used to convey information on a variety of sign vandalism-related topics including (1) maintenance costs, (2) court settlements, (3) accidents attributed to sign vandalism, (4) examples of vandalism, and (5) vandalism programs and countermeasures. A sample news release developed in Wisconsin is shown in figure 28.

- Brochures -- Innovative antivandalism campaigns have been initiated in several States. Figures 29 and 30 are examples of brochures developed in Oklahoma; South Carolina; Baltimore, Maryland; and Clark County, Washington.

- Displays -- Exhibits of vandalized signs have been displayed to increase public awareness of the cost and potential danger. Examples of agencies who have developed such displays include Pine County, Minnesota and Hickory Township, Pennsylvania.[9,25] The Pine County and Hickory Township displays, developed in the early 1970's, illustrate the cost and danger of vandalism and contain examples of vandalized signs from the area. The displays were posted in prominent locations including county fairs and the township hall during periods which maximize attention to the display. Some traffic departments have initiated other campaigns to improve the public understanding of traffic control devices through display boards in schools and business offices. These have also been displayed at public facilities, trash receptacles and lamp posts.

- Amnesty -- In May of 1976, the State of Wisconsin declared "Highway Sign Amnesty Month" in conjunction with the introduction of sign vandalism legislation. Over 2,500 traffic signs, most of them recyclable, were returned to local jurisdictions.[26]

- Public Education -- Educational efforts through television, radio, and print have been directed toward various segments of the population. Many programs emphasize education to school-aged children and teens due to the high incidence of involvement in vandalism.[17,26,48] Seminars have also been offered to civic groups through representatives from local law enforcement agencies, traffic agencies, psychologists, and sociologists.[17] The suggestion has also been made to incorporate the subject of sign vandalism in driver education programs in high schools.

Little information is available on the effectiveness of public relations and education as a countermeasure for sign vandalism.[10,12,16] However, the State of Wisconsin has reported extremely favorable results in terms of statewide reductions in sign vandalism from a continuing public information campaign. It is generally accepted that most efforts to

Wisconsin Vandalism Program Revisited . . . . . .

In the September 1976 issue of this newsletter, we reported to you a positive approach to the vandalism problem being taken by the State of Wisconsin called "Warning Signs Save Lives."

The program is a successful one as the results are beginning to prove. The January issue of BETTER ROADS Magazine had the following comments: "Statewide highway sign vandalism may be on the decline because of WDOT efforts. A survey of highway district offices finds that the number of signs replaced last summer on the state trunk system is down, as much as 20 to 25%."

Wisconsin is going a step further in this program, as the February issue of BETTER ROADS reports:

"Effective January 1, 1977, the Wisconsin DOT is giving its highway sign vandalism program a 'personal'touch. Driver license examiners have instituted a program that takes the anti-vandalism message directly to all new drivers between 16 and 19, and their parents or guardians. As each person successfully completes the driver examination, he is handed an anti-vandalism brochure and asked to take the time to read it and discuss it with family or friends. The decision to take the message to teenagers stems from the fact that more than 90% of those arrested for all types of vandalism are below the ages of 19."

Similar campaigns have been launched by the Georgia Department of Transportation and the Mississippi Highway Department as more governmental agencies take positive steps to reduce the costly effects of vandalism in both money and lives. Propose such a program to your accounts in an effort to enhance motorist and pedestrian safety as well as reduce the "vandalism" objection to brighter, safer signing.

Figure 28. Sample news release by Wisconsin Department of Transportation.

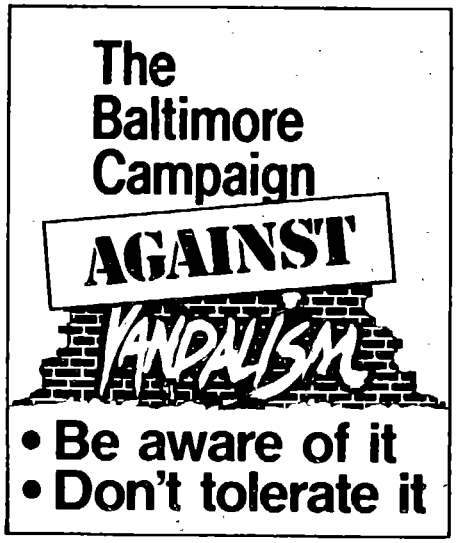
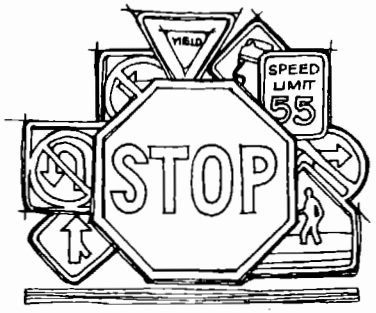


Figure 29. Example of public information brochures from Baltimore, Maryland; South Carolina; and Clark County, Washington.

Oklahoma Taxpayers are being VANDALIZED!



SIGN VANDALISM: EVERY OKLAHOMAN'S PROBLEM

Every year, over 10,000 Oklahoma road signs are being mutilated, stolen, or destroyed. At an average cost of $70.00 per sign, this costs you, the taxpayer, nearly three quarters of a million dollars each and every year.

Not only is sign vandalism expensive, but it can be very dangerous, as well. Accidents resulting in heavy property damage, personal injury, and even death frequently occur because traffic signs have been knocked over or stolen.

Here's what you can do!

Report any unusual tampering of road signs to your local authorities. Let them know immediately if you discover that any sign is missing, knocked down or vandalized in any manner. If you find a road sign, turn it into your local law enforcement agency.

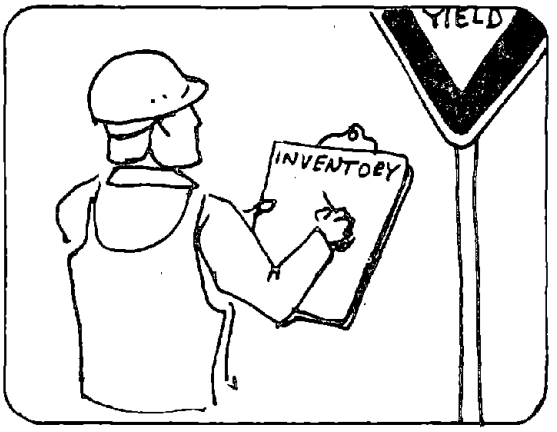
Check the facts:

1. Over 70% of all county road signs are damaged.
2. One sign per mile is vandalized on city streets in an average community.
3. It is a misdemeanor penalty and a $10 to $100 fine for interfering with a traffic sign.
4. It is a felony for a person to be in the unauthorized possession of a sign.
5. Parents of vandals can be held responsible for up to $1,500 (if their child is under 18 and living at home.)
6. Should an injury or death result because a sign is removed or altered, a person could face civil liability or manslaughter charges.

Figure 30. Oklahoma public information brochure on sign vandalism.

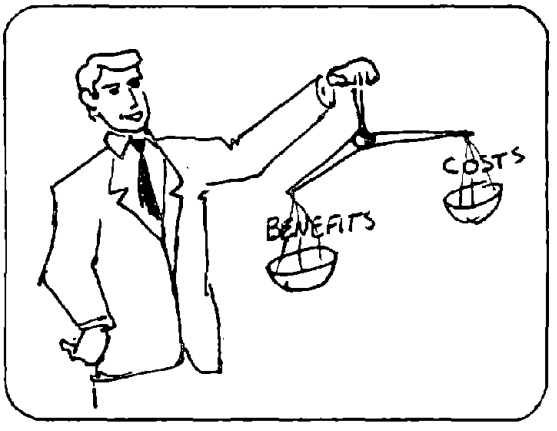
reduce sign vandalism can be enhanced through the attainment of public support and cooperation. NOTE: The reader is referred to the section "Case Studies" for a case study description of the public information and legislative improvement efforts in the State of Wisconsin.

Program Development Guidelines



PLANNING

IMPLEMENTATION



EVALUATION

PROGRAM DEVELOPMENT GUIDELINES

Agencies and municipalities that have sign system maintenance responsibilities should carefully weigh the potential benefits of initiating an antivandalism program. A well-planned and executed program may prove to be an effective means of achieving significant reductions in time and material costs associated with sign maintenance due to vandalism. If vandalism and associated costs are not considered to be problematic, adoption of selected antivandalism procedures may benefit the agency in terms of reducing the potential for tort liability and serious traffic accidents associated with a low rate of sign vandalism.

Two basic approaches have been employed by agencies in the development of antivandalism programs. The most common approach consists of the implementation of physical countermeasures (sign construction and installation techniques, sign repair and maintenance techniques, and ownership identification) by sign maintenance departments on an "as needed" basis. This approach has proven to be successful when used in response to specific types of vandalism. A less frequently used approach involves the implementation of a multifaceted program consisting of physical countermeasures in addition to nonphysical countermeasures, such as public information, legislative improvements, and/or law enforcement involvement.

The following sections present guidelines for planning, implementing, and evaluating a program to reduce sign vandalism costs and liabilities. The guidelines consist of commonly recommended procedures for reducing tort liability.[3,20,22] Guidelines are also provided for State and local officials for selecting, applying, and evaluating the sign vandalism countermeasures described in the section "Sign Vandalism Countermeasures." The guidelines should be applied in the context of agency goals, policies, and procedures, giving special consideration to existing resource and budgetary constraints within a particular jurisdiction. While relatively few agencies have taken such a comprehensive approach to reducing sign vandalism, as suggested in these guidelines, a review of past experiences suggests that significant benefits can be achieved through a comprehensive and systematic program.

Program Planning

The following five steps are recommended for the planning component of an antivandalism program. The relationships between the five planning steps are illustrated in figure 31.

- STEP 1 -- Coordinate Program.
- STEP 2 -- Identify the Problem.
- STEP 3 -- Review Existing Policies and Procedures.
- STEP 4 -- Develop Program Objectives.
- STEP 5 -- Select Countermeasures.

STEP 1 -- Coordinate Program

After the decision has been made to initiate an antivandalism effort, the first order of business is to establish coordination between various governmental and public units. Representatives should be sought in the areas of sign system maintenance, traffic engineering, law enforcement, highway safety, adjudication, as well as other public, private and civic groups with an interest in the subject. A brief meeting should be scheduled to establish communications and an understanding of the rationale and elements of the program. The major purposes of the meeting should include:

- To describe agency or governmental concerns over sign vandalism within the jurisdiction. A brief presentation should be made on the definition of sign vandalism and its negative impacts using information contained in the section "Scope and Magnitude of the Problem" of this manual. The presentation should also include examples of vandalism within the area, resultant negative impacts, and antivandalism activities undertaken to date (if any).

- To present an outline of the anticipated approach to planning, implementing and evaluating the program. A brief outline can be developed based on the guidelines presented in this chapter.

- To describe the benefits to be achieved from the program in terms of reducing maintenance costs, accidents, and liability.

- To establish a steering committee to oversee program activities and provide direction and communications in each individual's respective department or group. The committee should ideally have

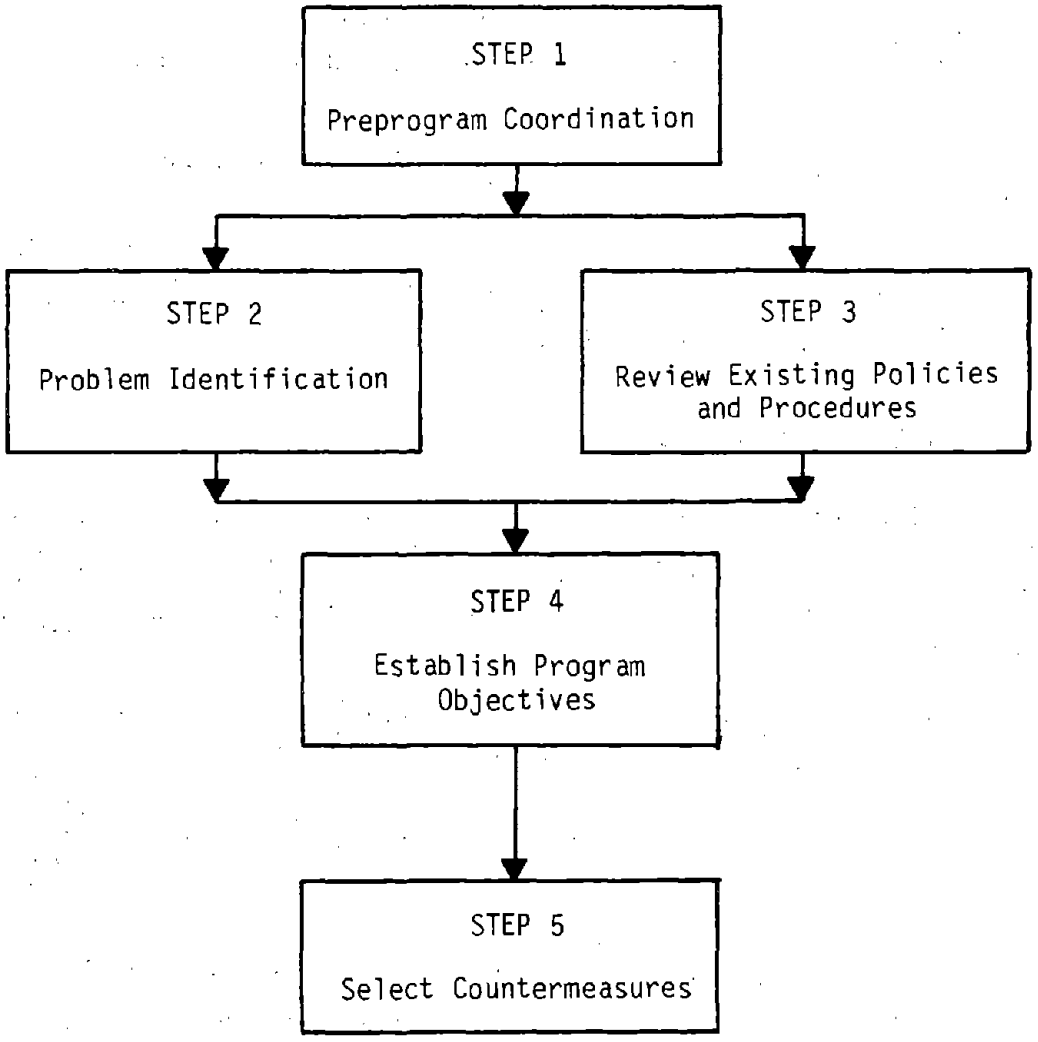


Figure 31. Antivandalism program planning steps.

representation from each public and private group. The committee should meet regularly to report and review program progress and achievements. Each member should be willing to take an active role in all phases of the program.

- To establish the overall goals of the program. Generally, one or more of the following goals should be adopted, depending on the concerns of the group and the knowledge of the existence of specific vandalism problems: (1) to reduce material, labor, and equipment costs associated with the repair and replacement of vandalized signs; (2) to reduce the potential for death, injury, and property damage from traffic accidents resulting from sign vandalism; and (3) to reduce governmental liability for accident damages and losses resulting from sign vandalism.

STEP 2 -- Identify the Problem

Problem identification must be performed to determine the scope and magnitude of sign vandalism within a particular jurisdiction. Careful problem definition will allow the selection of appropriate program objectives (see Step 4) and will often dictate the selection of countermeasures. In addition to being a prerequisite activity in the selection of appropriate vandalism countermeasures, problem identification methods also provide an effective means to manage and maintain the entire sign system.

Determination of the following statistics should be used to fully define the scope and magnitude of the vandalism problem within a jurisdiction:

- Number of vandalized signs repaired or replaced, stratified by sign type and type of vandalism.
- Sources reporting vandalism, such as sign crew, police, public or other sources.
- Percentage of the total inplace sign system vandalized per year.
- Costs of sign vandalism repair or replacement by material costs, time expended, labor and equipment costs.
- Percentage of total sign work due to vandalism.
- Time of vandalism by time of year and night/day.

- Location of vandalism by urban/rural, roadway type, and road name.
- Number of vandals apprehended by law enforcement officials.
- Number and severity of accidents in which sign vandalism was a contributing factor.
- Tort settlements resulting from vandalism-related damages and losses.

The above statistics should be based on sound data describing actual vandalism incidents. The statistics should be determined on an annual basis to facilitate comparison of vandalism changes and trends. Sources of input for problem definition includes sign inspection reports, traffic control device work orders, accident reports, sign inventories, police incident reports and public complaint logs, and newspaper articles. Unfortunately, most agencies do not maintain the type of information that is conducive to easy identification of the problem. For other agencies, the information is maintained, but not in a manner that can be easily retrieved and summarized. In these instances, statistics may be sampled for a portion of the year and expanded to provide annual estimates. In the majority of cases, however, existing methods of recordkeeping will have to be modified or procedures will have to be adopted to collect and maintain information necessary for problem definition.

The methods listed below are used by various agencies to assist in the management of the sign system and to facilitate definition and monitoring of the sign vandalism problem:

- Periodic sign inspections.
- Sign inventories.
- Sign maintenance recordkeeping.
- Improved communications between governmental units.
- Community involvement.

Existing agency procedures should be reviewed in the context of needed sign vandalism information using the guidelines presented below.

- **Periodic Inspections**

All traffic signs should be inspected by trained personnel on a regular basis. The Forest Service suggests that all signs be inspected once a year and signs on higher volume routes be inspected twice a year.[21] Signs should be inspected for:

- Legibility.
- Reflectivity.
- Overall condition.
- Minimum height above road surface or shoulder.
- Minimum setback from pavement edge.
- Proper location.

The Federal Highway Administration suggests the following sign-related information be recorded as a part of routine field inspections of the highway system:[28]

- Evaluate sign illumination, reflectivity, placement, visibility, adequacy, and maintenance.
- Determine whether driver clues in the form of signs provide enough advance information for nonlocal drivers to safely negotiate their intended route.
- Review installations to see if signs are placed outside the recovery zone and incorporate breakaway features. Decide whether the signs can be relocated onto nearby structures or to noncritical areas.
- Review breakaway sign features for proper installation, including panel heights, hinge points, buried slip bases, and overheight footings. Check to see if timber posts are drilled or notched to meet breakaway criteria.
- Check signs that are vulnerable to traffic in more than one direction to determine if they have a multidirectional breakaway feature.
- Review intersecting crossroads for adequate sight distance and advance warning.
- Determine whether advisory speed signs on ramps and curves provide enough advance warning. Check the signs to insure that they are

not blocked by light poles and/or other signs and that they are visible at night.

- Verify whether signs are in conformance with the Manual on Uniform Traffic Control Devices (MUTCD) with respect to size, height, reflectivity, and location.

Nighttime reflectivity is also an important element of sign inspection that should not be overlooked. The Highway Safety Program Manual (Standard 13) requires the inspection of reflectorized signs at night and during daylight conditions.[29] A procedure suggested by the Forest Service for conducting tests of nighttime reflectivity is shown in figure 32. [21]

All inspection findings should be documented to facilitate management of inspection reports, recommendations and corrective measures. The sign inspection sheet used by the Forest Service is shown in figure 33.

- **Sign Inventories**

In conjunction with regular sign inspections, inventories of in-place signs should be developed and updated as sign work is performed. A sign inventory can be a paper file or computerized information system that describes the location, sign type, support type, and condition of all sign installations. Figure 34 shows a data form developed by the Michigan Department of Transportation for use in developing manual sign inventories. Figure 35 illustrates a computerized inventory developed and maintained by the Washtenaw County, Michigan Road Commission.[30]

Sign inventories are useful in identifying areas of locations with high rates of vandalism, documenting sign locations in the event of sign theft or knockdown, and documenting past sign work histories in legal matters involving litigation of tort claims.[24] The city of San Jose, California, has developed a computerized sign inventory system, which has become the focal point of its highway risk management efforts. [31]

Inspecting Nighttime Reflectivity

- With masking tape, afix 10- by 8-inch sign inspection guide to clean section of the sign. Forest and District sign coordinators can obtain sign inspection kits from 3M Co., Reflective Products Division, St. Paul, Minn.

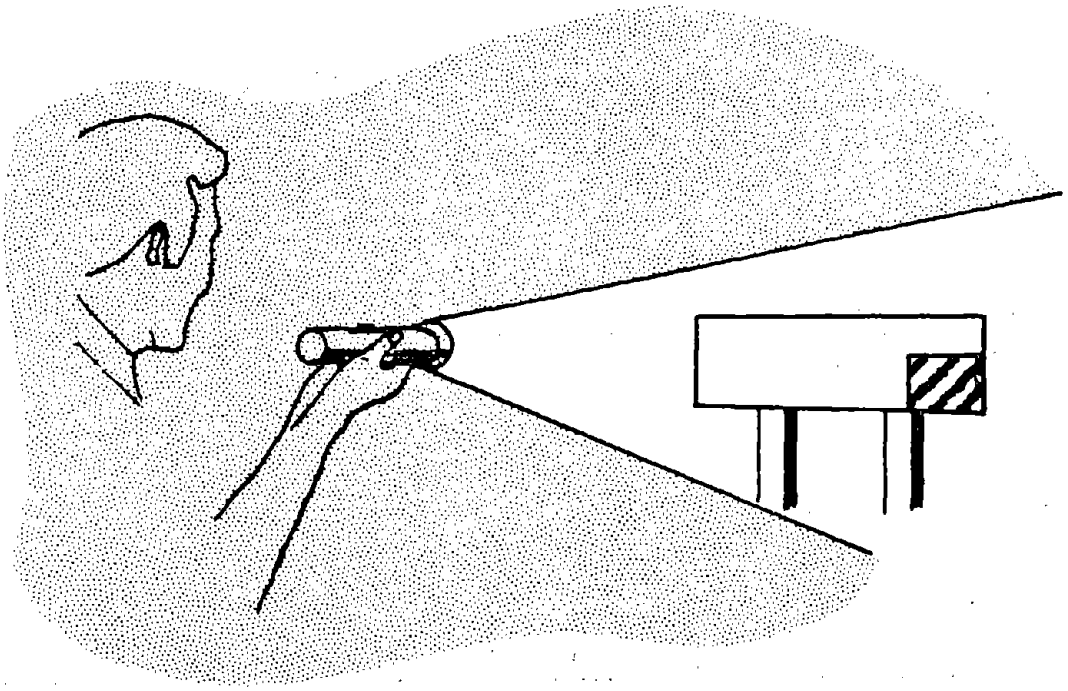
- Step back about 30 feet. Hold flashlight about 2 inches from your eyes and shine it at the sign. Do not use vehicle headlights.

- If the inspection guide is brighter than the sign, the sign should be replaced within the year.

- If the sign is brighter than the inspection guide, the sign will not have to be replaced for a number of years.

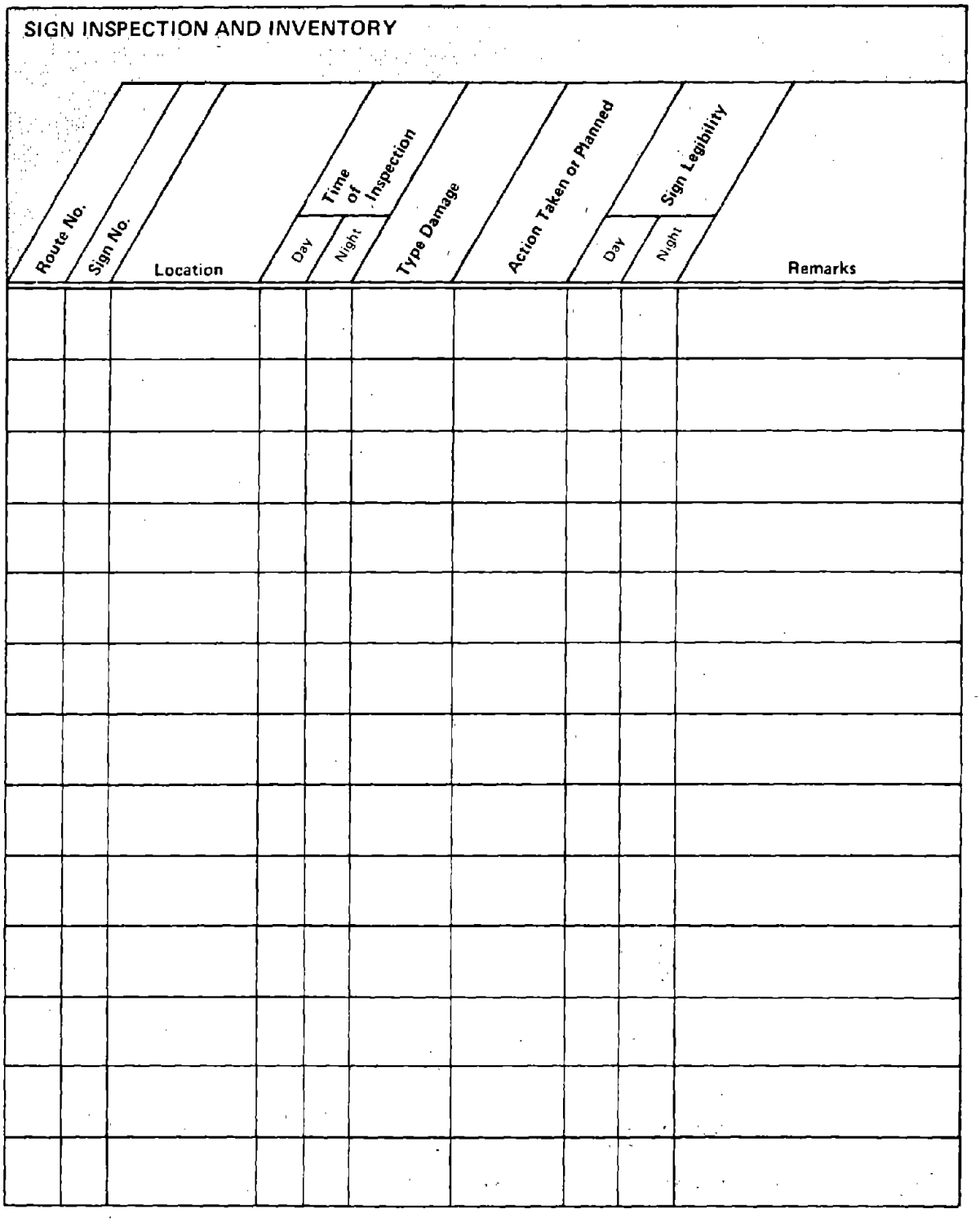
- If the sign and the inspection guide appear of equal brightness, the sign has from 1 to 2 years of useful life left.

As experience is gained in this test procedure, it becomes easier to evaluate reflective brilliance without using the inspection guide on each sign. With enough experience, the inspection guide is only needed for questionable cases.



Source: Signs Maintenance Guide.[21]

Figure 32. Procedure for inspecting nighttime sign reflectivity.



SIGN INSPECTION AND INVENTORY

Route No.	Sign No.	Location	Time of Inspection: Day	Time of Inspection: Night	Type Damage	Action Taken or Planned	Sign Legibility: Day	Sign Legibility: Night	Remarks

Signed By _____ *Date* _____

Source: Signs Maintenance Guide.[21]

Figure 33. Sign inspection and inventory form used by the forest service.

MICHIGAN DEPARTMENT OF TRANSPORTATION

1513 B (2/79)

TRAFFIC CONTROL DEVICES INVENTORY AND ANALYSIS
FIELD DATA SHEET

SHEET ____ OF ____

AGENCY

NAME

ROUTE

MUNICIPAL OR COUNTY NUMBER	FOOTAGE	- +	R L T O	OFFSET	EXISTING DEVICES / FAS NUMBER	WIDTH	HEIGHT	FT. IN.	TYPE POST	NO. OF POSTS	POST REPLACEMENT	DEFICIENCY	REMARK CODE	PROPOSED DEVICES / DIRECTION OF TRAVEL	WIDTH	HEIGHT	FT. IN.	REMARKS/MESSAGE
1 2 3 4 5	6 7 8 9	10	11	12 13	14 15 16 17 18 19 20 21 22 23 24 25	26 27	28 29	30 31	32 33	34 35	36 37 38	39 40	41	42 43 44 45 46 47 48 49 50 51 52 53	54 55	56 57	58	59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

Figure 34. Manual sign inventory sheet used by Michigan Department of Transportation.

ST	TOWNSHIP	MAIN STREET	SIGN LOCATION	REFERENCE CROSS STREET	DIR FACING	SOS	SIGN CODE	SIGN SIZE	DATE INST	DATE LAST WORK	SIGN COND	VIS	SUPPORT TYPE	SUPPORT COND	STD/NSTD
1	ANN ARBOR	MAPLE RD	0	SCIO-CHURCH RD	N	OVH	FLASHER	OX O	05-19-81	00-00-00	N/A	N/A	CABL	N/A	STD
2	YPSILANTI	MAPLEWOOD	179 E	ECORSE RD	W	S	R5-2	24X24	10-18-81	10-06-81	GOOD	GOOD	UPST	GOOD	STD
2	YPSILANTI	MAPLEWOOD	41 W	GLENWOOD ST	W	S	R1-1	30X30	04-02-82	05-07-82	GOOD	GOOD	UPST	GOOD	STD
2	YPSILANTI	MAPLEWOOD	56 E	OAKLAWN	S	N	D3-1	24X 9	10-18-81	00-00-00	GOOD	GOOD	PIPE	GOOD	STD
2	YPSILANTI	MAPLEWOOD	56 E	OAKLAWN	E	N	D3-1	24X 9	10-18-81	00-00-00	GOOD	GOOD	PIPE	GOOD	STD
2	YPSILANTI	MAPLEWOOD	61 E	ECORSE RD	E	N	R1-1	30X30	10-18-81	00-00-00	GOOD	GOOD	UPST	GOOD	STD
2	YPSILANTI	MARCUS	47 W	HARRIS RD	W	S	R1-1	30X30	08-03-82	08-03-82	GOOD	GOOD	UPST	GOOD	STD
2	YPSILANTI	MARCUS	15 E	EVELYN	E	N	D3-1	24X 6	10-14-81	00-00-00	GOOD	POBS	PIPE	GOOD	NSFD
2	YPSILANTI	MARCUS	15 E	EVELYN	S	N	D3-1	24X 6	10-14-81	00-00-00	GOOD	POBS	PIPE	GOOD	NSFD
2	NORTHFIELD	MARGARET	15 W	MAIN ST	W	S	R1-1	30X30	06-20-81	00-00-00	GOOD	GOOD	UPST	REPL	NSH
2	NORTHFIELD	MARGARET	48 E	WEST ST	W	S	R2-1-25	24X30	06-20-81	00-00-00	GOOD	GOOD	UPST	GOOD	NSH
2	NORTHFIELD	MARGARET	82 W	MAIN ST	E	N	R7-1	12X18	06-20-81	00-00-00	UNKN	POBS	UPST	REPL	NSHD
2	NORTHFIELD	MARGARET	183 W	MAIN ST	E	N	R7-1	12X18	06-20-81	00-00-00	GOOD	GOOD	UPST	GOOD	NSH
2	NORTHFIELD	MARGARET	394 W	MAIN ST	E	N	R7-1	12X18	06-20-81	00-00-00	GOOD	GOOD	UPST	GOOD	NSH
2	NORTHFIELD	MARGARET	452 W	MAIN ST	E	N	R7-1	12X18	06-20-81	00-00-00	GOOD	POBS	UPST	REPL	NSH
2	NORTHFIELD	MARGARET	663 W	MAIN ST	E	N	R2-1-25	24X30	06-20-81	00-00-00	GOOD	GOOD	UPST	GOOD	NSH
2	AUGUSTA	MARGARET OR	46 W	STONY CREEK RD	W	S	R1-1	30X30	04-30-82	04-30-82	GOOD	GOOD	UPST	GOOD	STD
2	AUGUSTA	MARGARET OR	40 E	LAWRENCE DR	S	N	D3-1	24X 9	10-08-81	00-00-00	GOOD	GOOD	PIPE	GOOD	STD
2	AUGUSTA	MARGARET OR	40 E	LAWRENCE DR	E	N	D3-1	30X 9	10-08-81	00-00-00	GOOD	GOOD	PIPE	GOOD	STD
2	AUGUSTA	MARGARET DR	42 E	ARTHUR DR	E	N	D3-1	24X 9	10-08-81	00-00-00	GOOD	GOOD	PIPE	GOOD	STD
2	AUGUSTA	MARGARET OR	42 E	ARTHUR DR	S	N	D3-1	24X 9	10-08-81	00-00-00	GOOD	GOOD	PIPE	GOOD	STD
2	YPSILANTI	MARGARITA	15 S	SHIRLEY AV	S	E	R1-1	24X24	10-14-81	00-00-00	GOOD	GOOD	UPST	GOOD	STD
2	YPSILANTI	MARGARITA	43 N	SHIRLEY AV	N	W	R1-1	24X24	10-14-81	00-00-00	GOOD	GOOD	UPST	GOOD	STD
2	YPSILANTI	MARGARITA	51 N	GROVE RD	N	W	R1-1	30X30	10-14-81	08-06-82	GOOD	GOOD	UPST	GOOD	STD

Figure 35. Washtenaw County, Michigan Road Commission computerized sign inventory.

- **Sign Maintenance Recordkeeping**

Sign maintenance recordkeeping is another important element of problem identification and risk management. Maintenance records, in the form of sign or traffic control device work orders, may be used for a variety of purposes which include:

- Summaries of sign work by location that may reveal areas with high rates of vandalism.
- Sign inventory updating.
- Historical records of sign work, materials, and labor for budgeting.
- Records for use in litigation of tort claims.
- Evaluation of antivandalism hardware/program effect.

Most highway agencies maintain work order records in the form of paper or computerized files. However, most work order forms do not contain information on the reason for sign work. The work order developed for Charleston, South Carolina, is an exception. Various purposes can be recorded for the sign work, including vandalism, accident knockdown, and general maintenance, as indicated in figure 36.[30]

- **Improved Communications Between Governmental Units**

Sign maintenance is generally the responsibility of highway departments, although police also have emergency signing responsibilities in some jurisdictions. However, increased involvement by other units of government has been shown to make a significant contribution toward problem identification and risk (liability) reduction. In some municipalities, public agency employees are trained to locate and report defective signs. Police, solid waste collection personnel, utility workers, and other personnel who regularly travel the street network can also play a major role in improving timeliness of reporting and response to vandalism.[20] Figure 37 illustrates the service request form used by various municipal departments in the city of Lake Forest, Illinois, to report various types of problem situations including vandalized street and traffic signs.

Department Of Traffic and Transportation
Charleston, S.C.

SIGN WORK ORDER

SITE DESCRIPTION

Rte. Type [City (1) / State (2) / Other (3)] [ ] Class [FAP (1) / FAU (2) / Non-FA (3)] [ ] Subdiv. [ ][ ][ ]

Location: On _____ (Street Name). [ ][ ][ ][ ] (Dist.) feet [N(1) / E(2) / S(3) / W(4)] [ ] from

centerline of _____ (X-Street) on the [N(1) OVHD(5) / E(2) CNTR(6) / S(3) ISLD(7) / W(4)] [ ] side,

facing [N(1) / E(2) / S(3) / W(4)] [ ]. Sign No. [ ][ ][ ][ ][ ][ ][ ][ ][ ]

WORK DESCRIPTION

Notes: _____

_____

_____

Req'd due to: Acc(1), Vand(2), Maint(3), Const(4), Upgr(5), Other(6) Compl(7) [ ]

Sign Type: _____ Sign Code: [ ][ ][ ][ ][ ][ ][ ]

Sign Size: Width (inches) [ ][ ][ ] Height (inches) [ ][ ][ ]

Face Type: Eng(1), H.Int(2), Non-Refl(3), Other(4)..... [ ]

Support Type: U-Ch(1), 2" Pipe(2), Util(3), Tele(4), Mast(5), Mtr Pst(6), Span Wire(7), Other(8)..... [ ]

Sign Work: Install(1), Replace(2), Repair(3), Remove(4), Relocate(5), Clean(6), Other(7), None(0)..... [ ]

Post Work: Install(1), Replace(2), Repair(3), Remove(4), Relocate(5), Other(6), None(0)..... [ ]

No. of Signs in Assembly..... [ ]

MANPOWER

Time Spent: Hours [ ][ ] Minutes [ ][ ] No. of Men [ ][ ]

AUTHORIZATION/VERIFICATION

Work Ordered By: _____ Date [ ][ ]-[ ][ ]-[ ][ ]

Work Completed By: _____ Date [ ][ ]-[ ][ ]-[ ][ ]

Figure 36. Sign work order form used by Charleston, South Carolina.

THE CITY OF LAKE FOREST

SERVICE REQUEST № 34401

To..... Date.....

From.....

Location.....

STREETS	HOLES	NEEDS CLEANING	POOR DRAINAGE		
SIDEWALKS	CRACKED	RAISED	POOR DRAINAGE		
TREES AND SHRUBBERY	CREATING TRAFFIC HAZARD		DISEASED	DEAD	
STREET LIGHTS	DAMAGED	OUT	NUMBER		
TRAFFIC LIGHTS	DAMAGED	OUT	OUT OF PHASE		
STREET AND TRAFFIC SIGNS	DIRTY	HIDDEN	DAMAGED	MISSING	TWISTED HEAD
PARKS	VANDALISM	LITTER	UNSAFE EQUIPMENT		
BUILDINGS	NO BUILDING PERMIT DISPLAYED				
FIRE HYDRANTS	DAMAGED	LEAKING	HIDDEN		

Remarks:.....

.....

Action Taken:.....

.....

Date..... Signature.....

IF EMERGENCY, REPORT AT ONCE! FORM 12.20 (2000)

Figure 37. Service request form used by governmental units in the city of Lake Forest, Illinois.

- **Community Involvement**

Several communities have encouraged public involvement in the reporting of sign vandals and vandalized signs. Educational programs and public information are key elements in obtaining public involvement. Many agencies have implemented hotlines and reward incentives for reporting vandalism. The example shown previously in figure 27 illustrates a sticker that has been placed on the back of signs to inform people of telephone numbers and rewards (provided by 3M Company, St. Paul, Minnesota). The use of reward incentives, however, has received mixed effectiveness ratings. [9,32]

STEP 3 -- Review Existing Policies and Procedures

Concurrent with problem identification, activities should be undertaken to identify and review current state and local activities relating to sign vandalism. This may be accomplished by requesting information on the following topics (via telephone or written correspondence):

- Antivandalism Legislation -- Information should be obtained on existing state laws and local ordinances relating specifically to sign vandalism. Legislation on the destruction, theft or vandalism of public property may also be obtained, since it also relates to vandalized highway signs. Possible information sources include the State Vehicular Criminal Code, the State Department of Justice, municipal attorney, or other legal council. Upon receipt of pertinent information, existing laws should be reviewed to determine (1) conformance or adoption of the Uniform Vehicle Code, (2) recognition of various types of vandalism, (3) whether unauthorized possession is banned, (4) whether violations are considered as crimes or civil infractions, and (5) whether local authorities are preempted of having ordinances covered by the state vehicle code. The above information can be compared with the legislation in other states using the information provided in the section "Sign Vandalism Countermeasures" to determine the adequacy of existing legislation, the need for improved legislation, or the need of adopting local ordinances on sign vandalism.

- Enforcement -- Discussions should be conducted with local, State and other police officials regarding departmental knowledge of and attitudes toward sign vandalism. Efforts should be made to obtain

information on (1) department awareness of a sign vandalism problem or high vandalism areas, (2) departmental knowledge of anti-vandalism legislation and appropriateness of penalties, (3) statistical information on the number of vandalism incidents or vandal apprehensions, and (4) opinions of judicial system responses to apprehended sign vandals.

- Judicial System -- Statistical and attitudinal information should be requested from representatives of the local judicial system (judges and juvenile court case workers) on the frequency of prosecutions, judgments, penalties, and disposition of sign vandalism incidents.

STEP 4 -- Establish Program Objectives

Program objectives are logical, straightforward statements of the specific achievements to be accomplished from the program. The objectives will thus provide a "yardstick" by which actual program achievements and effectiveness can be measured. Objectives should be based on the stated program goals (Step 1); the identified vandalism problem (Step 2); and deficiencies identified in the areas of legislation, enforcement and adjudication (Step 3). Objectives should be specific, attainable, and measurable.

For example, suppose that the reduction of accident potential and governmental liability were selected in Step 1 as major program goals and that a review of traffic control device work orders for the previous year revealed a few cases of stop sign and warning sign theft in Step 2. These findings may suggest the following program objectives: To reduce the potential for accidents and liability by reducing the number of stolen stop signs and warning signs including advance warning signs for curves, railroad crossings, pedestrian crossings, and intersections as well as chevrons and target arrows on the entire road system.

Key elements of the above stated objectives are:

- Specific. The rationale for the objective is stated (i.e., accident potential and liability reduction) as well as the specific elements of the sign system (i.e., all stated signs on the entire road system) to be considered.

- Attainable. The section "Sign Vandalism Countermeasures" and the appendixes suggest several feasible countermeasures for reducing sign theft (i.e., vandal-proof fasteners, increasing sign height and setback, and ownership identification).

- Measurable. Achievement of the objective can be measured by comparing the number of stolen signs of the types identified before and after implementation of a countermeasure.

As another example, suppose that Step 3 activities revealed that the current State laws do not prohibit the enaction of local ordinances on sign vandalism and that a more comprehensive law (than provided by State code) on the subject is warranted. A program objective for this may be stated as follows:

> To develop and adopt a comprehensive local ordinance covering all possible acts of sign vandalism and theft, unauthorized possession, penalties, fines, and responsibilities. A public information campaign should accompany the adoption of the ordinance.

STEP 5 -- Select Countermeasures

Countermeasure selection activities must be performed for each program objective developed in Step 4. The selection process should consider all available products, techniques, and programs that may be appropriate for achieving the stated objective. In many cases, countermeasure selection will be straightforward. However, when alternatives are available, it is important that the anticipated cost-effectiveness of the countermeasures options be used for countermeasure selection. Unfortunately, only limited statistical information is available on countermeasure effectiveness in terms of reducing vandalism frequency and costs. Therefore, judgment must be used along with the experiences of other agencies as reported in the section "Sign Vandalism Countermeasures" and the appendixes.

The selection of countermeasures should be based on an analysis of countermeasure applicability and cost-effectiveness. Failure to consider applicability and cost-effectiveness issues may result in excessive expenditures of time, money, and other resources with marginal impact on the identified sign vandalism problems.

- **Countermeasure Applicability**

Quantitative data regarding the effectiveness of countermeasures is limited due to a general lack of previous evaluation results. Thus, the effectiveness of various countermeasures in terms of reduced maintenance cost or frequency of vandalism is not known in specific terms. The information that is available is generally a subjective rating of effectiveness. However, the past experiences do suggest that the countermeasures presented in the section "Sign Vandalism Countermeasures" may be potentially effective when properly applied to specific problems and locations.

To facilitate the identification of possible countermeasures for identified vandalism problems and concerns, table 10 is provided to summarize the relationship between the countermeasures presented in the section "Sign Vandalism Countermeasures" and specific types of sign vandalism described in the section "Scope and Magnitude of the Problem." While table 10 does not provide a measure of the magnitude of countermeasure effectiveness, it does indicate alternative countermeasures that have been applied by other agencies for specific vandalism problems.

- **Countermeasure Cost-Effectiveness**

All feasible alternatives for a particular problem or program objective should be analyzed in terms of cost-effectiveness to ensure that the most appropriate actions are being taken.

Countermeasure cost-effectiveness can vary according to geographic area, purchase quantity, time of year, market supply and demand, staff and equipment requirements, and the desired scope of the program. Thus, the cost elements of various countermeasures should be determined by each agency. When considering physical countermeasures, the total cost over the complete life cycle should be considered when estimating the cost. Operating, maintenance, and disposal/replacement costs must be taken into account. The value engineering concept suggests that the following specific cost elements be considered:[33]

Table 10. Summary of countermeasures applicability for specific types of vandalism.

Countermeasures	Destruction								Mutilation							Theft	
	Gunshot	Thrown Missiles	Sign/Support Burning	Sign Bending	Deliberate Knockdown	Sign Cutting	Support Cutting	Support Twisting	Spray/Brush Paint, Ink, Etc.	Stickers/Decals	Caustic Substances	Graffiti	Sign Reorientation	Scratching	Peeling/Removing Sheeting	Sign Theft	Support Theft
Construction/Installation Techniques																	
Sign Removal/Elimination	○	◐	◐	◐	○	◐	◐	◐	●	●	●	●	◐	◐	◐	●	●
Substrate Material	◐			○		◐										●	
Sign Face Treatments									◐	◐	◐	◐					
Sign Supports			○		◐		◐										●
Sign Installation Techniques	◐	◐		◐	◐			◐	◐	◐	◐	◐	◐	◐	◐	◐	●
Support Installation Techniques					◐		◐	◐								●	●
Mounting Hardware													◐			●	●
Repair/Maintenance																	
Repair Kits	◐	◐		○	○				◐	●	◐	◐	◐	○	◐		
Sign Cleaning									○	○	◐	●	◐				
Overlays	○	○	○			◐			○	○	◐	○					
Bent Sign Repair				○	○												
Punctures Repair	◐	◐															
Sheeting/Legend Replacement	◐	◐	◐	●					●		◐	●		◐	○		
Ownership Identification																	
Stickers/Decals			○	◐		○	◐	○	◐	◐		○	○	◐	◐	●	●
Imprints																○	●
Enforcement Measures																	
Public Education		◐						○	○	◐	◐	○	●	◐	○	●	●
Legislative Measures																	
Law Review and Improvement	○	○	●	○	●	●	○	●	●	○	●	●	●	○	●	●	●
Public Education/Information																	
Press Releases	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	●	●
Brochures	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○
Displays	●	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○
Amnesty																●	●
Education	○	○	●	○	○	○	○	○	○	●	○	○	○	○	●	○	●

- Capital investment.
- Financing.
- Personnel and materials costs for implementation.
- Operating.
- Maintenance.
- Alterations.
- Replacement.
- Salvage.
- Denial of use (cost of not implementing a countermeasure).

These cost elements must be weighed against the anticipated effectiveness of alternative countermeasures to determine the most cost-beneficial approach to solving the problem within staff, resource, and budgetary limitations.

Program Implementation

Program implementation should include the following steps:

- STEP 1 -- Schedule and Initiate the Program.
- STEP 2 -- Monitor Program Achievements.
- STEP 3 -- Adjust Program Countermeasures.

STEP 1 -- Schedule and Initiate the Program

After the countermeasures have been selected, the program must be implemented in a manner that will optimize the impact on vandalism problems. This can be accomplished by (1) following a comprehensive implementation plan that attacks all identified vandalism problems and concerns, and (2) increasing public awareness of the vandalism efforts through public information activities.

Many antivandalism programs implemented to date tend to reflect the efforts of a single agency department or group. For example, the maintenance division may implement programs of physical countermeasures to reduce vandalism-related maintenance costs. In another agency, the public

affairs department may develop and implement a public information campaign. To the extent possible, these individual efforts should be combined and coordinated to maximize total program effectiveness.

It must be recognized that some countermeasure components of a program can be initiated in a much more timely manner than others. For instance, sign ownership identification can be implemented easily during routine maintenance activities whereas legislative improvements may take months to develop, publicize, and enact. Because of this, there is a tendency to "implement and forget" the easily implemented countermeasures and "lose interest" in the more time-consuming countermeasures. An implementation plan should be followed that considers the time and cost differences of various countermeasures. Specific schedules and milestones should be established and periodically reviewed by a steering committee to ensure conformance to a comprehensive implementation plan.

Public relations professionals emphasize the importance and need for public information to accompany any antivandalism effort. Thus public information may be a countermeasure itself or serve as a support activity for other countermeasures. The Wisconsin Department of Transportation used this approach to publicize the enactment of their improved 1976 law on sign vandalism (see the section "Case Studies," Case Study 3).

STEP 2 -- Monitor Program Achievements

During program implementation, it is extremely important to monitor achievements through a continuing recordkeeping effort. Records should be maintained on the following measures:

- Program startup costs.
- Countermeasure material costs.
- Time and cost to implement countermeasures.
- Number of vandalism incidents (i.e., taken from workorders and other maintenance records).
- Achievement of program objectives.
- Unexpected problems.
- Conformance to implementation milestones.

This information is necessary for program evaluation as well as for adjusting activities during implementation to ensure maximum benefits.

STEP 3 -- Adjust Program Countermeasures

The information recorded in STEP 2 should be periodically reviewed to identify possible implementation problems or unexpected changes in the vandalism problem that requires a new or modified countermeasure. The early identification of these problems allows for timely adjustment of countermeasures, objectives and schedules to meet the changing demands of the vandalism problem.

Program Evaluation

Program evaluation consists of measuring the effects of the anti-vandalism program against the stated program objectives. The steps that should be considered in the evaluation are listed below:

- STEP 1 -- Evaluate Program Effectiveness.
- STEP 2 -- Evaluate Administrative Issues.
- STEP 3 -- Document and Distribute Findings.

STEP 1 -- Evaluate Program Effectiveness

The ultimate success of the antivandalism program is measured by the extent to which sign vandalism is affected by the implemented countermeasures. This is accomplished by comparing sign vandalism measures before, during, and after (if the program is not adopted as an ongoing policy or procedure of the agency) the program activities. Comparisons of the following measures of effectiveness will provide necessary information to judge the value of the program. The specific measure(s) chosen to be evaluated should be related to the stated program objectives (see STEP 4 of Program Planning). Examples of possible evaluation measures are listed below:

- Total number of signs vandalized per year.
- Number of signs vandalized by type of sign, type of vandalism and location of sign.

- Number of reports of vandalism by department, public, police, etc.
- Number of accidents to which vandalism contributed.
- Number of apprehended vandals.
- Percentage of sign maintenance work, time, cost, materials due to vandalism.
- Percentage of sign system vandalized.
- Percentage of sign maintenance budget expended on vandalism.
- Others that are related to program objectives.

The above listed measures will provide information on the effectiveness of the overall program. In addition to the overall program effectiveness, individual countermeasure categories should be evaluated. This is accomplished by evaluating objectives related to the specific purpose of each countermeasure category. For example, appropriate effectiveness evaluation measures for the application of antitheft fasteners to stop, yield and warning signs may include:

- Number of stolen stop, yield, and warning signs.
- Cost of replacing stolen stop, yield, and warning signs.

Data used in the evaluation must be available for the periods before and following program initiation. Generally, "before" data will be available from problem identification activities (STEP 2 in Program Planning) and "after" data will be available from monitoring activities in implementation (STEP 2 - in Program Implementation).

Examination of the differences before and after program implementation should provide indications of the effectiveness of the program and its component countermeasures.

STEP 2 -- Evaluate Administrative Issues

In addition to evaluating program effectiveness, administrative aspects including program implementation costs and resource expenditures

should be evaluated. In this regard the following administrative measures should be evaluated before and after program implementation:

- Annual sign budget.
- Program implementation cost and resource requirements including start-up costs, material costs, installation costs and staff time requirements.
- Milestone achievements.
- Others deemed appropriate by agency needs.

These overall program measures should be evaluated in addition to those relating specifically to individual countermeasure categories. The data required for administrative issues will generally be more available since most agencies maintain records on material, time and cost expenditures or they may be easily obtained from invoices, billing statements, time cards, work orders, or work logs.

The availability of information on administrative issues will enable the agency to assess program cost-effectiveness. This involves comparing the benefits of the program as measured in STEP 1 (Program Effectiveness) with the cost and requirements associated with program implementation. This type of analysis will provide information on whether the cost of implementation was outweighed by the effectiveness of the program, regardless of the magnitude of effectiveness. Thus, it may be found that a particular countermeasure is highly effective in reducing certain types of vandalism, but the cost of implementation may prohibit future systemwide application.

STEP 3 -- Document and Distribute Findings

The majority of antisign vandalism efforts to date have not received formal evaluations of effectiveness or administrative issues. Therefore, the countermeasure selection process must rely heavily on subjective assessments. The absence of sound evaluation results seriously hinders the ability to select those countermeasures with the greatest likelihood of success.

Effectiveness and administrative evaluations will provide valuable information needed for countermeasure selection and program development. However, the full benefit of evaluation cannot be achieved unless the evaluation results are documented and distributed to those individuals who require such information.

Evaluation results should be documented in a brief but concise manner. All conclusions regarding program and countermeasure effectiveness should be fully supported by effectiveness and administrative data.

Once the data has been documented and conclusions on effectiveness developed, the findings should be distributed. The objectives of distribution include:

- Improve future decision-making in countermeasure selection activities by distribution to program planning personnel.
- Improve understanding of the vandalism problem and how various countermeasures impact the problem.
- Inform the public of the results of program efforts to reduce vandalism.
- Inform others in the profession of effective countermeasures and techniques and those found to be marginal, ineffective, or not cost-effective.

Case Studies

CASE STUDIES

CASE STUDIES

Many Federal, State and local agencies have successfully implemented sign vandalism countermeasures described in the manual. The experiences of several agencies have been selected as case studies to illustrate program planning and implementation techniques and the results of selected antivandalism activities.

The case studies included in this chapter include:

CASE STUDY 1 -- Simplified Procedure for Problem Identification (Washtenaw County Road Commission, Michigan).

CASE STUDY 2 -- Sign Ownership Identification Program (Virginia Department of Highways and Transportation)

CASE STUDY 3 -- Public Information and Legislative Improvement Program (Wisconsin Department of Transportation)

CASE STUDY 4 -- Stop Sign Refurbishing and Antivandalism Program (city of El Monte, California)

CASE STUDY 5 -- Sign Assembly Reduction Program (city of Phoenix, Arizona)

Each case study is described below.

CASE STUDY 1 -- Simplified Procedure for Problem Identification

Identification of the scope and magnitude of sign vandalism within a particular jurisdiction can be time consuming in the absence of a reliable data base. Unfortunately, very few agencies maintain such a data base. Most highway agencies do, however, maintain records on general sign system maintenance in the form of traffic control device work orders.

The Washtenaw County Road Commission has employed a procedure to estimate the magnitude and cost of sign vandalism on their road system, which contains in excess of 20,000 signs. The approach described in this

case study does not precisely establish the magnitude of the problem, but does provide useful decision-making information to determine the need for remedial action. The approach is based on conducting a detailed three-month tabulation of sign maintenance activities and using this information to obtain annual vandalism frequency and cost estimates. The approach requires relatively low levels of personnel involvement and time. A more detailed accounting of the sign vandalism problems may have proven impractical within the staff and time constraints of the agency.

Based on the results of a detailed review of sign activity reports filed during June, July, and August of 1980, it was determined that approximately 29 percent of sign work during the period was due to vandalism. The findings of the 3-month study are summarized in table 11.

Table 11. Reasons for sign work in Washtenaw County, Michigan (June - August, 1980).

Reason	Number	Percent
Replacement due to traffic accidents	167	33.3
Replacement due to old age	142	28.3
Relocation of existing sign to new location	46	9.1
Repair or replacement due to vandalism (destruction, mutilation, theft)	147	29.3
	502	100.0

Based on a review of all sign activity reports filed in 1981, it was determined that 3,621 traffic signs required repair or replacement. Assuming that the 29 percent vandalism figure from the 1980 study is representative of the magnitude of the annual vandalism problem, the County estimated that in 1981, 1,050 (3,621 x 0.29 = 1,050) signs were repaired or replaced because of vandalism. Based on the County's estimated cost of $112.50 per sign (estimate based on fabrication cost, materials, sign crew labor, post replacement and scrap value of the vandalized sign) plus an additional annual cost of $10,000 for inventory requirements, equipment

depreciation, sign crew supervision and sign activity report preparation and coding, the annual cost due to vandalism was placed at approximately $130,000 per year.

In response to this problem, the application of reflectorized sign stickers was initiated. Stickers were applied to the backs of new signs as they are installed in the course of routine sign replacement activities (figure 38).

At the time of the interview, countermeasure effectiveness data were unavailable. However, the subjective belief of county personnel was that sign vandalism had decreased since the initiation of stickers, even though no reward claims have been made to date.

NOTE: A more detailed stratification of the 147 vandalized signs shown in table 11 by type of vandalism, type of sign and location of sign would have provided additional useful information for problem identification. In addition, the use of "summer months" as a sample may bias the results since sign vandalism has been observed to increase during the summer. It would have been advisable to sample months throughout the year (i.e., February, June, October).

CASE STUDY 2 -- Sign Ownership Identification Program

The Virginia Department of Highways and Transportation estimates that vandalism costs exceed $500,000 per year on the State road system. The primary targets of vandalism were stop signs, yield signs, no parking signs, and small (30-inch, 75-cm) warning signs. In response to this loss, the department has been active in promoting antivandalism measures throughout the State.

One of the most effective means of reducing sign theft was reported to be the use of "LOC TITE" cement adhesive on sign mounting hardware (nuts and bolts) to increase the time and effort associated with sign theft, thereby reducing the frequency of stolen signs. Recycling of vandalized signs was also reported as a cost saving measure.

Figure 38. Example of ownership identification sign sticker used in Washtenaw County, Michigan.

In 1982, the State initiated a program to apply sign decals containing information on sign ownership, pertinent laws, penalties and telephone numbers for reporting sign vandalism (see figure 39). Program implementation consisted of communicating the rationale, objectives, application instructions and example application of the decals. The memorandum shown in figure 40 was issued to the district offices in Virginia regarding program initiation.

NOTE: Initiation of any program should also include details on monitoring the effectiveness of the countermeasures in reducing vandalism.

The effectiveness of the decals could not be determined at the time of the interview. However, reports of favorable impacts in terms of reducing destruction and theft has been received from field offices.

CASE STUDY 3 -- Public Information and Legislative Improvement Program

In 1975, the Wisconsin Department of Transportation reported that over 8,500 highway signs were vandalized on the 11,400 miles of State highways. In addition, at least two fatal traffic accidents were reported to have occurred as a result of vandalized signs.

In 1976, a program was conducted consisting of a statewide educational effort and the enactment of a new law on sign vandalism. The public information component of the program consisted of developing informational brochures, cartoons and slogans to illustrate the costs and consequences of sign vandalism. Examples of some of the literature is shown in figures 41 and 42. In addition, a "highway sign amnesty month" was granted to encourage the return of stolen signs. This effort resulted in the return of 2,500 signs, most of them being recyclable, some signs dating as far back as the 1930's.

In conjunction with the public relations campaign, a new law was enacted. Among other provisions, the new law made the possession of a traffic sign illegal and provided for penalties up to $10,000 or a jail term if the act of vandalism results in death. The 1976 Wisconsin statute is provided in appendix D.

FORM MP-234

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF HIGHWAYS AND TRANSPORTATION
MAINTENANCE DIVISION

PUBLIC NOTICE

(A) Working, placing anything or making any attachment on Highway Rights of Way without first obtaining a "Land Use Permit" is a misdemeanor under section 33.1-12(3) of the Code of Virginia. Contact your local Highway Residency Office for assistance at _____ Virginia. Phone ( ) _____.

(B) Vandalism, theft or possession of a highway sign is punishable by law and perpetrators will be prosecuted.

Figure 39. Example of sign ownership identification stickers used in Virginia.

VIRGINIA D ARTMENT OF HIGHWAYS & TRANS RTATION

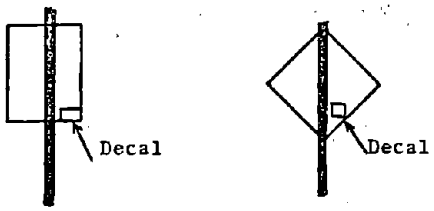
MAINTENANCE DIVISION

MEMORANDUM

GENERAL SUBJECT: Establishing Owner of Highway Signs	NUMBER: M-197-82
SPECIFIC SUBJECT:	DATE: August 15, 1982
	SUPERSEDES:
DIRECTED TO: District Engineers	SIGNATURE:

A large number of Highway signs are stolen and vandalized each year; and because individuals involved in these thefts can be prosecuted easier when the police agency can determine where the signs came from, it has become necessary to install a notification of ownership on highway signs. It has also become necessary to notify the general public that working on State Highway Rights of Way without a Land Use Permit issued by the Department is a misdemeanor.

Due to the large number of signs in the roadside inventory it would be impossible for existing manpower to attach decals to every sign; therefore, as new signs are installed by the sign crews, a decal will be attached to the lower right corner of the back of the signs as shown below.



There is a space provided on the decal for the Residency or District name and phone number. This will be helpful for the general public and scrap metal dealer in contacting the proper location when there are questions. This information can easily be added to the decal with either a No. 2 pencil or ball point pen. The decal can be pulled off when new, but after weathering will become extremely difficult to remove; and, scrap dealers can still handle unusable signs sold through the Department of Corrections Recycling Center when a bill of sale exists.

Additional decals can be obtained by contacting the sign shop co-ordinator in the Maintenance Division.

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF HIGHWAYS AND TRANSPORTATION
MAINTENANCE DIVISION

PUBLIC NOTICE

(A) Working, placing anything or making any attachment on Highway Rights of Way without first obtaining a "Land Use Permit" is a misdemeanor under section 33.1-12(3) of the Code of Virginia. Contact your local Highway Residency Office for assistance at ABINGDON Virginia. Phone (703) 628-7141.

(B) Vandalism, theft or possession of a highway sign is punishable by law and perpetrators will be prosecuted.

Figure 40. Memorandum on sign ownership identification by Virginia Department of Highways and Transportation.

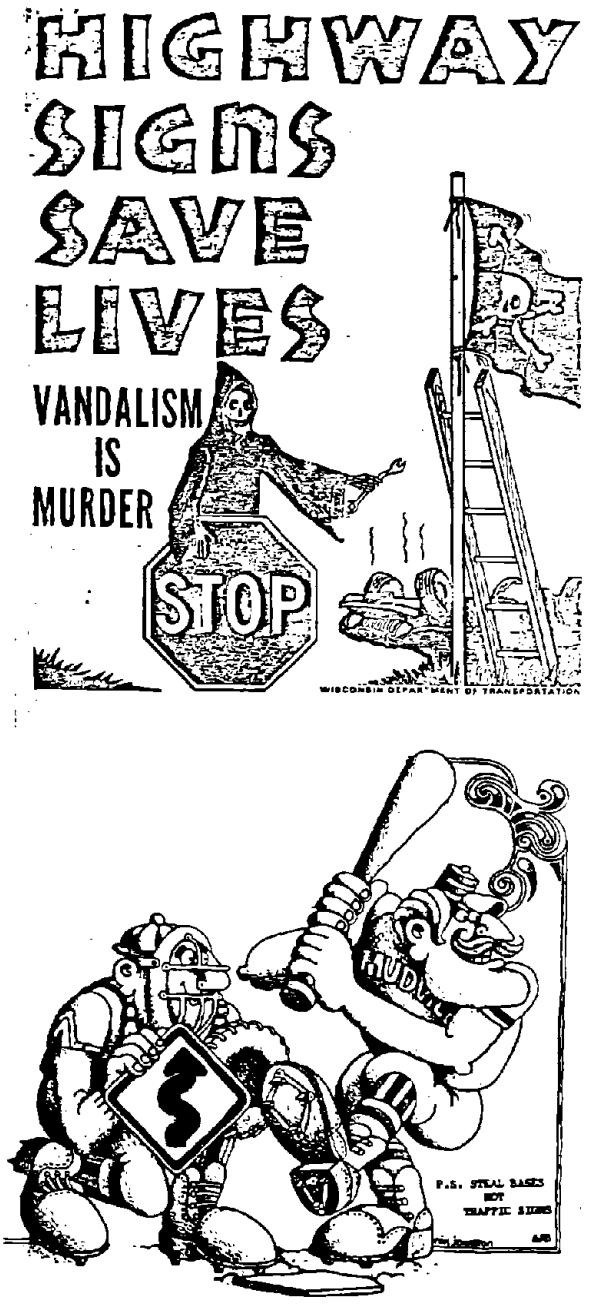


Figure 41. Public relations literature used in Wisconsin.

YOUR HELP IS NEEDED

Every property tax payer is aware of the skyrocketing cost of running local government. Certainly what we don't need in these inflationary times is to have to pay for repairing senseless damage to private and public property caused by vandals.

But where sign vandalism is concerned, it's human lives that are at stake, not just money.

Although the anti-vandalism and anti-possession law is a major step in reducing this senseless destruction, it is not enough. Without strong public support, it may become just another seldom-enforced law – unless YOU make it known – in your schools, clubs, community and in your home – that you view vandalism as a serious crime that your community must not tolerate.

Encourage the formation of vandalism prevention committees in your community, school, civic and professional associations. Discuss vandalism with your school administrators and your PTA, and encourage the exposure of students to educational programs about vandalism and its prevention.

WISCONSIN
Office FOR Highway Safety

P O Box 7910
Madison 53707

(608) 266-3581

WARNING

$25 to $10,000 fine or imprisonment for sign theft or possession.

SIGNS SAVE LIVES

FACTS YOU SHOULD KNOW ABOUT . . .

HIGHWAY SIGN VANDALISM

* THEFT
* MUTILATION
* POSSESSION

Sec. 86.192 of the Wisconsin Statutes establishes a $25 fine or 30 days imprisonment or both for a first violation, and $100 fine or 60 days in jail or both for a subsequent violation for injuring, defacing or removing any sign, guide board, mile post, signal or marker. It also makes it illegal, with the same penalties, to possess a highway sign, guide board, mile post, signal or marker unless it can be demonstrated that the sign was obtained legally.

If the act of vandalism results in death, the person shall be fined up to $10,000 or imprisoned up to two years, or both fined and imprisoned.

SOME QUESTIONS AND ANSWERS ABOUT VANDALISM . . .

Q. WHAT CONSTITUTES AN ACT OF SIGN VANDALISM?

A. Under Sec. 86.192 Wis. Statutes, vandalism includes the injury, defacement, removal or possession of highway signs, guide boards, mile posts, signals or markers erected for the warning, instruction or information of the public.

Q. WHO WOULD DELIBERATELY STEAL A HIGHWAY SIGN?

A. The Wisconsin Dept. of Justice reports that over 90 per cent of those arrested for all types of vandalism are 19 years of age or less, and 90 per cent are male. Arrests are highest in urban areas.

Q. ISN'T TAKING SIGNS MORE A PRANK THAN A CRIME?

A. Highway signs are carefully placed to give drivers sufficient information about the road and road conditions that he or she may drive safely. When someone subverts this system, the inevitable happens. People have been hurt and killed because others stole or defaced the signs of life. It's not a prank . . . it's murder.

Q. HOW MUCH DOES IT COST TO REPLACE A SIGN?

A. The Department of Transportation says it costs almost $70 to replace a missing or vandalized sign, and more if the post is broken off.

Q. WHAT ARE THE PENALTIES FOR SIGN VANDALISM?

A. $25 fine or 30 days imprisonment or both for a first violation, and $100 fine or 60 days in jail or both for a subsequent violation. In addition, the person may be required to replace the sign, or pay the cost of replacement or repair, which could add another $65-$70 to the penalty.

Q. WHAT IF SOMEBODY IS KILLED?

A. If the act of vandalism causes death, the penalty is up to $10,000 fine and up to two years in jail, or both.

Q. WHAT IS THE PENALTY FOR POSSESSING A SIGN?

A. A person convicted of possessing a sign faces the same penalties as for removing or defacing a sign or marker.

Q. WHAT IF I, OR SOMEONE I KNOW, HAS A SIGN?

A. Under the "possession" subsection, all who voluntarily notify a law enforcement officer of a sign or marker in their possession are exempt from prosecution. Therefore, you should notify your local law enforcement agency and make arrangements to relinquish the sign, and urge your friends to do the same.

Q. I HAVE A SIGN, BUT IT WAS GIVEN TO ME.

A. Under the vandalism law, possession of a sign is considered "rebuttable" evidence of an infraction, even though the possessor was not the one who originally removed it from its place on the roadway. In order to possess a sign, you must be able to prove that you purchased it from a manufacturer or otherwise obtained it legally.

Q. WHAT SHOULD I DO IF I SEE THAT A SIGN HAS BEEN STOLEN OR MUTILATED?

A. RUN, don't walk, to the nearest telephone and notify the police department or sheriff's office or highway agency. YOU COULD SAVE SOMEONE'S LIFE.

Figure 42. Public information brochure used in Wisconsin.

More recently, the second week of November, 1982, was observed in Wisconsin as Legislators Anti-Sign Vandalism Week. During this time, many public schools, universities, and adult educational and vocational institutions sponsored special educational efforts on sign vandalism using material developed in the earlier program. In addition, new ownership identification decals have been adopted for use on the state highway system (see figure 43).

Annual sign vandalism trends in Wisconsin have shown significant improvement since the initiation of the 1976 program. In 1975, prior to the program, 8,556 cases of sign vandalism were reported on the State highway system. Following the statewide educational program, law enactment and amnesty period, vandalism dropped to 3,661 cases in 1976; a 57.2 percent reduction. For the period 1977-1982, the number of vandalism incidents has averaged 2,738 per year, which is a reduction of 68.0 percent, compared to the 1975 level.

Figure 43. Example of sign ownership identification sticker used in Wisconsin.

Take a shortcut to good sign maintenance

Traffic signs that can't be seen can't be obeyed, but one town found a better way to rehabilitate them than laboriously removing them, hauling them back to the shop, renewing the faces, taking them back to the site, and reerecting them.

Maintenance Assistant Arnold Larsen overlays an El Monte stop sign with 3M high-intensity *System 5* sheeting without removing the sign from the pole.

The developers of even the most promising plans sometimes need an extra push to get them started toward fulfilling their ideas. It was that way with Maintenance Supervisor Terry Kempton of El Monte, California. Kempton had a project on his schedule, but had not yet started it when he attended a three-day seminar presented by the California Department of Transportation. At the seminar, Kempton listened to a lawyer's presentation on tort liabilities. One week later, Kempton's scheduled project was underway.

The project was traffic sign maintenance. The lawyer had pointed out how a municipality, as well as its individual employees, can be held responsible for failure to provide for the public safety through proper management of traffic control devices.

Kempton's project began with a traffic sign inventory. Kempton and his sign man, Arnold Larsen, divided El Monte's 117 miles of highway into eight areas. They started in November 1980 with an inspection and inventory of all stop signs in each area.

The job took five nights, working two hours per night. The inspection was done at night so that the two could determine whether the existing stop signs were still reflective.

"What looks like an acceptable sign in the daytime may be virtually invisible at night if it has lost its reflectivity," says Kempton.

Confirming the importance of reflectivity is a requirement in the *Manual on Uniform Traffic Control Devices* that stop signs must be either reflectorized or illuminated to show the same shape and color by night as by day.

To get the maximum benefit from the inspection tours, Kempton replaced the existing inventory system with a more informative one. A separate index card was prepared for each sign. On each card was posted the sign's location, face type, condition, and the date it was inspected. Space was left to note the dates of future inspections, repairs, and replacements.

The inspection immediately disclosed an interesting error. "We thought that we had about 600 stop signs," said Kempton, "but we found out differently. We actually had 909 stop signs, 90 percent of which measured 24 × 24 inches."

Kempton found that nearly one-third of his 909 stop signs were not reflective at night. With concerns about liability fresh in his mind, he held a nighttime demonstration for a number of city officials. This gained the support he needed to undertake the program he envisioned.

"We had always wanted to use a high-performance reflective sheeting that would last longer than the sheeting we currently were using. High-intensity sheeting retains much more reflectivity over a longer period of time. It is more expensive initially, but the extended durability and brightness retention justify the increased expense. In the long run, it is less costly.

"We selected 3M's *Scotchlite* brand reflective sheeting in high intensity grade *9800*. Data showed that this sheeting after ten years of use is nearly three times brighter than our previous sheeting when it was brand new! This fact certainly helped justify our program.

"Another selling point was an innovative signing concept called *System 5*. This system made it possible to refurbish our non-reflective signs on site without even removing them from the poles."

System 5 is a high-intensity sheeting with a thin aluminum backing that has a very agressive adhesive. It can be overlaid on old signs quickly and easily by simply wiping the old sign with a solvent, then positioning and applying the new sheeting. No stripping chemicals are involved.

Whether the overlaying is accomplished on-site or in the shop, the ability to upgrade signs with *System 5* eliminates the cost of new sign blanks. If the upgrading is done on-site, the time, labor, and fuel used to remove the signs, transport them to and from the shop, and then

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replace them is eliminated.

"Using *System 5* sheeting," says Kempton, "we can refurbish an average of 27 signs a day. When we were putting up new signs to replace old ones, we could only do about 15 a day. Using 3M's aluminum-backed high-intensity sheeting increased our productivity by 80 percent."

Assistant Director of Public Works Robert Pinniger agrees: "Terry's proposal clearly delineated a cost benefit — and the nighttime visual effect of the signs was dramatic."

When the city undertook the refurbishing program, it decided to add an aspect that has almost paid for itself already. This is the application over each upgraded sign of *Scotchlite* graphic overlay film, a clear, protective, pressure-sensitive film.

"We don't have a big vandalism problem," claims Kempton, "but the protective film makes our signs graffiti-proof."

Since the first 300 signs were upgraded, 12 were defaced by graffiti artists. Because they were covered with the protective film, the graffiti could be removed with a strong solvent, and the sign needed no further refurbishing.

The same solvent could be used on unprotected signs, and with no apparent effect on their daytime appearance. In fact, however, the solvent removes some of the reflectivity. Covering the sheeting with the protective film preserves its reflectivity.

The first phase of El Monte's sign upgrading program is now complete. All non-reflective stop signs have been overlaid with the new sheeting. The 600 remaining stop signs are scheduled to be similarly rehabilitated over the next two years, half each year. After all stop signs are upgraded, warning signs, speed limit signs, and other regulatory signs will be inventoried and rehabilitated.

Kempton receives daily reports on sign activities and uses these reports to update his records. "To be effective," he notes, "a sign system inventory must be kept up to date on a daily basis."

El Monte's sign program can be summarized in four steps:

- Inventorying and inspection;
- Upgrading signs with high-intensity sheeting;
- Protecting signs with clear graphic overlay film;
- Updating sign records on a daily basis.

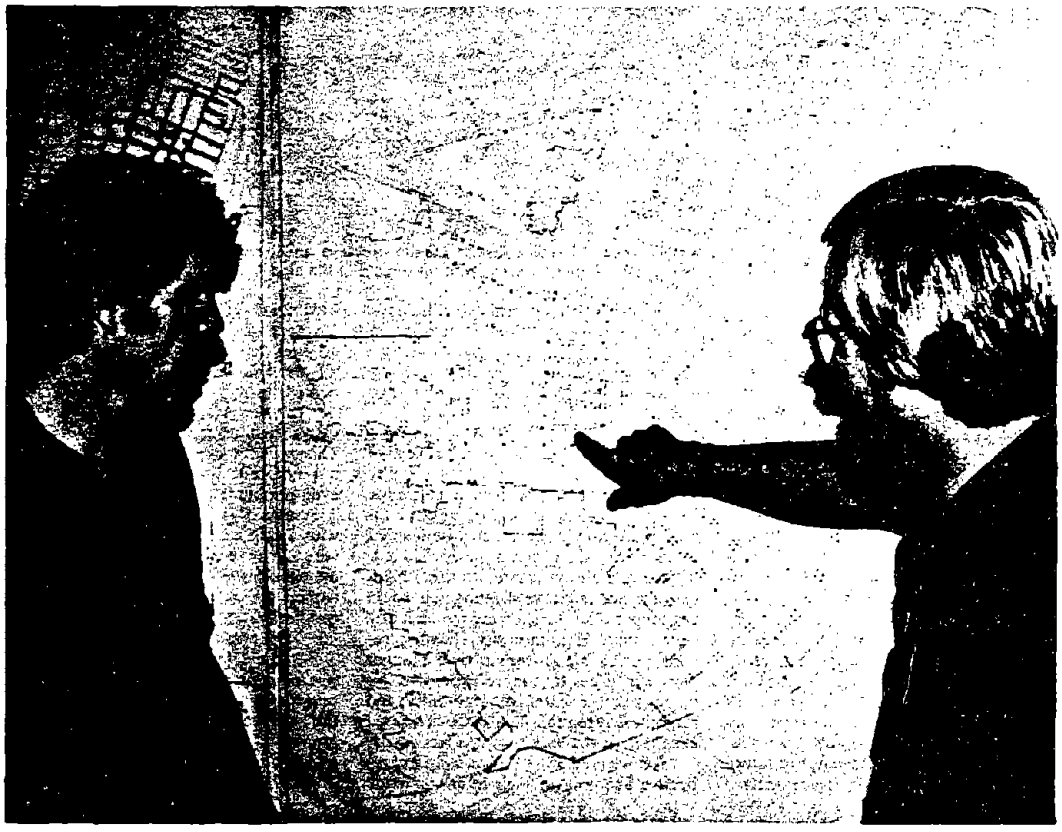
The program's simplicity and efficiency have increased productivity to the extent that the department now accomplishes more maintenance activities than it did before sign upgrading began. Public officials have been very pleased with the program.

"I've even heard from members of the community who complained about a bad sign and then called back to say how pleased they were with the 'replacement'," says Kempton.

"We have a large investment in our signing," he continued. "By applying a *System 5* facelift, we really are recycling signs that have already been paid for. It makes sense, and our citizens agree."

As for the system's financial bottom line, a concern for all communities these days, Kempton concludes, "the cost effectiveness of this program was carefully calculated and will prove out over a period of years." **ACC**

Maintenance Supervisor Terry Kempton (right) points out to Maintenance Superintendent Thomas Parker some of the 300-odd stop signs that unexpectedly were discovered when Kempton organized a sign inventory. Stop signs, warning signs, speed limit signs, and other regulatory signs will be inventoried and upgraded in that order.



Practical Traffic Engineering: The Phoenix Way

By James W. Sparks

The City of Phoenix Traffic Engineering Department has long been a pioneer in practical traffic engineering. Our goal has always included exploring different methods of optimizing traffic control effectiveness, while at the same time minimizing public expenditure. Economics have never been permitted to interfere with the placement of needed traffic control devices, but an assessment of field conditions has resulted in the substitution of less costly traffic control devices that are at least equally effective in attaining the intended goal.

Several years ago, the City of Phoenix canvassed its entire major/collector street system to try to minimize the number of sign posts in place. The idea was not only to salvage the existing steel channel, but also to eliminate unneeded roadside obstacles, reduce perpetual maintenance costs, and improve the aesthetic appearance of our city streets. The program was named "PRESS" ("Program to Remove and Eliminate Superfluous Sign Posts"). The program was given good media publicity and resulted in the removal of over 3,000 sign posts with a value of approximately $35,000. The steel sign posts were salvaged as a result of three concurrent efforts. They were:

1. Removal of signs no longer needed.
2. Co-mounting needed signs with other nearby signs.
3. Maximizing use of nearby steel utility poles.

Discussion

During fiscal year 1982 the City once again began a formal program for minimizing sign posts. The current program focuses on the same three methods of sign post removal listed above, but also uses an innovative new method of fastening traffic signs to *wooden* utility poles. The City initiated the concept of "flex" signs, which has made wooden utility poles more usable for sign mounting purposes. Already, more than 7,000 sign posts and many sign blanks have been salvaged for future use (see Figure 1).

Removal of Signs No Longer Needed

Unless we impose a particularly unpopular traffic regulation, citizens seldom call in to complain about extra sign posts being installed. Certainly, how-

Figure 1. *Salvaged Sign Posts and Sign Blanks.*

ever, they frequently call to request installment of additional signs. Consequently, our investigative staff (and most staffs nationwide) have historically concentrated their investigative effort on adding new signs where needed. Phoenix however, has recently begun a concentrated effort of giving almost equal time to the task of re-examining the street system to remove signs that are no longer applicable. The most frequent candidates for removal are LOADING ZONE signs, NO PARKING signs, BUS STOP signs, and pedestrian warning signs.

In most cases, either the signs were installed at more frequent intervals than needed, or the adjacent land uses had changed negating the need or warrant for such sign installations.

Additionally, Phoenix simultaneously reviewed existing policies regarding sign installation to reduce the number of new sign posts that will be installed in the future. Phoenix has historically installed, upon citizen request, residential speed limit signing of 25 MPH, which is the speed limit regardless of whether or not the signs are installed. Similarly, Phoenix often installed truck prohibition signs within residential areas upon request. After reassessment, we have determined that for the most part these signs provide little, if any, public benefit. Consequently, the criteria upon which we will install this type of signing has been drastically "tightened". Phoenix now only installs these signs if our investigative staff feels the signs might help either affect motorist's behavior or assist enforcement efforts. For example, truck prohibition signs are now installed to intercept traffic leaving major streets, rather than installed on the interior of neighborhoods, and only when adjacent industrial land uses exist or when our investigators note excessive truck usage. Residential speed limit signs are now only installed in the vicinity of schools, or where abnormal street widths make streets appear to motorists as other than local streets. Both of these procedural changes were coordinated with enforcement agencies, thus not impeding or hindering effective enforcement of existing ordinances.

Co-mounting of Needed Signs

The second strategy used to eliminate an extensive number of sign posts was the conept of judiciously combining signs. This effort was conducted with full cognizance of the following principles contained in the *Manual on Uniform Traffic Control Devices:*

- Giving drivers too much information at one time (Sections 2A-14 and 2A-6);
- Co-mounting of signs should normally be limited to only those types of signs that are associated with one another (Section 2A-21).

Phoenix judicially selected combinations of signs that would not interfere with the goal of communicating with drivers, yet looked hard at deciding which types of signs could be combined without having ill effects. For instance, Phoenix only combines warning or regulatory signs with other signs when the other sign is related (such as an advisory speed plate), or alternatively when the other sign is strictly a reminder or routine type of sign such as a NO PARKING or BUS STOP sign. In our judgment only motonsts seeking a parking place read or take note of parking regulation signs, and therefore in no way does co-mounting those signs with other signs interfere with the goal of communicating with motorists. In rare instances, dual regulatory devices (but only those that are repetitive in nature) can be mounted together as illustrated in Figures 2, 3, and 4.

Of principal concern to Phoenix early in the program was the wind load problem, and just how much total area of sign could be supported on a single sign post. Accordingly, limitations were imposed on the total square footage of signs permissible on a single sign post. Limitations were also imposed to gain substantial compliance with the co-mounting height requirements contained in the MUTCD (Section 2A-23). The largest permissible loading on a single sign post was selected to be 12 square feet, which is approached whenever speed limit signs (24" × 30") are co-mounted with two-way left-turn channel signs (24" × 36"). For aesthetic reasons, a special effort is always

Figure 2. Dual regulatory devices mounted together

Figure 3. Dual regulatory devices mounted together.

Figure 4. Dual regulatory devices mounted together.

made to install the largest sign on the top, and signs are mounted symetrically.

This program of combining signs obviously must be done with great care and it is imperative that all involved employees understand the intent of the program. If the program is not properly managed and controlled, the City could have liability problems. To avoid any possible confusion, Phoenix has written specific policies describing which types of signs may or may not be combined. This method was not only used to combine existing signs in the field, but is also incorporated into all new sign designs as well. If a new warning sign, for instance, is needed at a certain location and there are repetitive signs such as NO PARKING signs installed nearby (but not precisely where the warning sign is needed), the existing repetitive regulations are removed and co-mounted with the new warning sign, thus not increasing the total sign posts.

Maximizing Use of Utility Poles

The third primary method of reducing sign posts involved taking maximum advantage of existing utility poles such as light poles and telephone poles in the public right-of-way. The public has already made a substantial investment in these poles, and Phoenix specifically for the most part has all our one side lighting on most major streets and in some cases, two side lighting. The luminaire poles are positioned approximately 200 feet apart. Using ingenuity, the existing luminaire placement can frequently be used for sign mounting effectively.

Phoenix usually places warning signs at approximately seven times the posted speed limit (in feet) in advance of the condition. Obviously, this is somewhat fine tuned depending on the size of sign and lettering use, the condition that motorists are being warned about, and the frequency of intersections. This has worked well, but there is no reason signs cannot be placed at varying distances, particularly when the distance provided increases (but not too much) the warning distance provided to motorists. In actual practice, placement of warning signs approximately a distance (in feet) of six to ten times the speed limit in advance of the point of intended driver action, has provided excellent results for motorists within Phoenix. Thus, there is nearly a 160 foot range in which to place warning signs on our 40 MPH typical major streets. Our street light poles which are routinely spaced 200 feet apart thus in most cases make excellent sign supports.

Other regulatory signs, such as NO PARKING signs and speed limit signs normally have even less stringent placement requirements than do warning signs. Consequently utility poles can be used for these types of signs.

Several years ago the City was impeded in its efforts to use wooden luminaire, telephone, or power poles within the City for sign mounting purposes. Approximately 20% of the City's utility poles are wooden, and for yaars utility companies have forbidden the mounting of traffic control devices. The utility companies claimed that an industrial safety problem existed, since under emergency conditions their personnel still are required to climb these poles. The traffic signs in their judgment would interfere with that task and impose potential injury to the climbers. Preliminary meetings were held with the utility companies, but failed to yield written agreement on the use of their poles. The majority of the power companies indicated that since the need to climb poles was almost obsolete, they would "look the other way". But they did not sign written agreements. Phoenix gambled and began an aggressive program using wood poles to mount traffic signs. To minimize liability, the City attempted to appease the power companies by "curling" the aluminum signs as shown in Figure 5. After approximately 400 of these signs had been installed on City streets, the labor unions of one of the utility companies protested the use of metal on their wood poles claiming it interfered with climbing. The City of Phoenix then explored other methods of making sign placement acceptable to the utility companies.

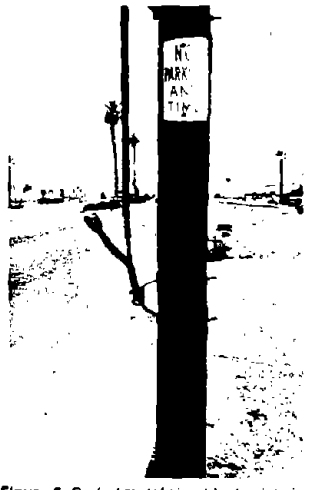


Figure 5. *Curled metal sign blank minimizes possible damage to pole climbers.*

This year, our stubborn Phoenix staff came up with a revolutionary type of design for signs in Phoenix. The power company no longer has a legitimate complaint. Several alternate designs of "flexible" signs were tried which not only would curve around the poles, but which could be penetrated by the spikes used by climbers. This persistent effort was continued because of a strong desire to recapture the investment the public already had in wood poles. Our sign manufacturing operation began experimenting with a variety of fabrics and durable types of paper to test which materials, if any, would accept reflective sheeting and provide the durability desired. The winner of the competition turned out to be a nylon mesh material that costs only 10¢ per square foot compared to the $1.30 per square foot cost of aluminum. The ink is still screened onto the reflective sheeting to give the signs reflective characteristics. However, once the screening process is completed, the reflective sheeting is baked in our vacuum applicators to adhere the reflective material to the mesh material. We have found the nylon mesh backing provides sufficient stability for the material, keeps it from crinkling, and prevents moisture from seeping into the sheeting from the wood pole. Once the sign manufacturing process is complete, the sign is directly adhered to wooden poles using an adhesive material. Initially we encountered problems with the adhesive used. Through experimentation we found a linoleum adhesive which works very well, induces no discoloration, and is durable in holding the signs for an expected five or six years of service life.

Conclusions

Our sign post reduction programs benefits Phoenix in five ways:

- Saves money by permitting re-use of the $12.00 sign posts and often the associated sign blank.
- Saves perpetual maintenance costs since signs are hit less often when fastened to large wooden poles rather than less visible sign posts.
- Improves safety by eliminating one

Figure 6. Sign Shop Supervisor and Dispatcher inventorying salvage sign blanks and posts.

more obstacle for bicyclists, motorists, pedestrians to hit.

- Improves safety by adding reflective sheeting to the wooden poles making their presence more obvious to motorists at night.
- Saves money when flex signs are used since aluminum blanks and mounting brackets cost $2-$3 apiece. The mesh and glue used cost less than 30¢ per sign.

In fiscal year 1982 alone it is estimated the City of Phoenix will save between $70,000 and $80,000 initially and will have recurring benefits. The only restraints determined to date on the use of the flexible signs, are distortions occurring whenever signs longer than 18" or wider than 12" are used. With normal diameter wooden power poles, signs that exceed these dimensions are elongated in appearance making them inappropriate for use. Thus NO PARKING signs, LOADING ZONE signs, NO STOPPING signs, etc., can all use the flexible design. Phoenix's standard BUS STOP sign is 18" by 24", which we miniaturized specifically for this program. It has worked well.

In summary, the program has had one other by-product effect which is healthy for a growing City and Traffic Engineering organizations. The program focused attention on the true intention of signing. Field crews now are encouraged to use two-way radio communication when they get to a field site for sign installation and feel an alternate is available to using sign posts, such as mounting directly on adjacent neighboring fences, etc. The program has resulted in a much better understanding by field crews, field investigators and engineers alike as to our goal in communicating with motorists, yet doing so with an aesthetically pleasing, well groomed traffic control network. Figure 6 shows our Sign Shop Supervisor and dispatcher proudly inventorying salvage sign blanks and posts, readying the material for future use.

Sparks (M) is Assistant City Traffic Engineer for Phoenix. He is a registered professional engineer in the State of Arizona and a member of American Public Works Association. Sparks has a Master's Degree in Civil Engineering from the University of Oklahoma and a Certificate from the Yale Bureau of Highway Traffic.

APPENDIX A -- Summary of Selected Sign Repair and Maintenance Techniques

Several step-by-step techniques for the repair and maintenance of vandalized signs are presented below. The techniques are recommended by the Forest Service and are contained in the Sign Maintenance Guide by Nettleton.[21]

Sign Cleaning

The procedure recommended for general sign cleaning consists of the following steps:[21,46,47]

1. Flush surface with clear water using a soft brush, rag, or sponge to remove loose dirt particles.
2. Wash surface with soft brush, rag, or sponge using suitable commercial detergent or cleaner (see list shown above). Wash from the top down and avoid abrading the surface with unnecessary scrubbing. Maintain a steady stream of water on the surface during cleaning.
3. Rinse with clear water and allow to dry. The surface must be thoroughly dry if the sign is to be clear coated (see section on clear coating).

Bent Sign Repair

The Forest Service recommends the following procedure for repairing damaged sign faces:[21]

1. Straighten the sign and remove all background sheeting and legend from an area slightly larger than that damaged.
2. Clean exposed surface with Xylol; then varnish maker's and painter's naptha.
3. Apply matching pressure-sensitive reflective background sheeting, extending it at least 1/2 inch (1.25 cm) beyond the damaged area.
4. Replace damaged legend with die-cut, pressure-sensitive, prespaced letters, borders, and symbols, and firmly squeegee in place.

5. Edge seal new background sheeting and legend with 3M Co. No. 700 edge sealer. If sign is subjected to snow burial and replacement sheeting extends to the top edge of sign, place 3M Co. transparent film (No. 639) along top edge.[24]

Puncture Repair

The Forest Service recommends the following procedures for repairing puncture damage:[21]

- For Reflective Aluminum Signs

  1. Remove all damaged background sheeting and legend.
  2. Straighten the sign using a hammer and flat dolly.
  3. Remove any additional sheeting damaged during straightening.
  4. Clean the entire area with Xylol; then VM&P naphtha.
  5. Patch the bullet hole or puncture on both sides using 3M Co. No. 425 UAL aluminum foil tape. Use your squeegee to apply firm pressure. Do this on both sides of the sign. On large holes, start placing the foil at the bottom of the hole, overlapping each strip shingle fashion as you move up.
  6. Apply reflective background sheeting, extending it at least 1/2 inch (1.25 cm) beyond the foil tape strips.
  7. Replace damaged legend with die-cut, pressure-sensitive, prespaced letters, borders, and symbols, and firmly squeegee in place.
  8. Seal edge of new background sheeting and legend with 3M Co. No. 700 edge sealer. If the sign is subject to snow burial and replacement sheeting extends to the top edge of sign, place 3M Co. transparent film (No. 639) along that top edge.

- For Reflective Plywood Signs

  1. Remove all loose wood on both sides of the sign and all damaged sheeting.
  2. Fill holes with wood filler if necessary and sand smooth.
  3. Wipe area with clean cloth.

4. Cover holes on both sides of sign with 3M Co. No. 425 UAL aluminum foil tape. Squeegee both sides of sign with firm pressure. On large holes, start placing the foil at the bottom of the hole, overlapping each strip.

5. Apply reflective background sheeting, extending it at least 1/2 inch (1.25 cm) beyond the foil tape strips on face of the sign.

6. Replace damaged legend with die-cut, pressure-sensitive, pre-spaced letters, borders, and symbols covered by the patching and firmly squeegee in place.

7. Seal edge of new background sheeting and legend with 3M Co. No. 700 edge sealer. If the sign is subjected to snow burial and replacement sheeting extends to the top edge of sign, place 3M Co. transparent film (No. 639) along top edge.

8. Using an aerosol can of flat black enamel, lightly spray the aluminum tape covering the holes on the sign back.[24] Keep paint off the sign face as this destroys reflectivity.

Sheeting and Legend Replacement

The Forest Service recommends the following procedure:[21]

- For Moving Damaged Sheeting

  1. Clean sign surface and area around the background or legend to be removed.

  2. Heat the section to be removed.

  3. Work putty knife under sheeting edge and strip the sheeting from the adhesive.

  4. Remove adhesive remaining on sign face with cloth dampened with Xylol.

- For Spot Patching Background

  1. Once sheeting is removed, clean any oil, grease, or dirt from the application surface by wiping with mineral spirits or naptha.

  2. After cleaning, wipe surface dry with clean rag.

3. Place sheeting face down on clean, dust-free surface and remove the liner. When temperature is below 50 °F, activate adhesive with 3M Co. A-3 Activator.

4. Position the sheeting on the application surface, overlapping surrounding sheeting by at least 1/2 inch (1.25 cm). Avoid any pressure on the sheeting to prevent premature sticking. Then tack the sheet in place by finger pressure at two points on the upper edge.

5. When sheeting is positioned, press it firmly to the surface with a squeegee, using overlapping strokes, starting at center and working out to edges.

6. Initial squeegee pressure must be very firm to avoid forming air pockets when nearing the upper corners. Lift these corners back beyond the points at which the sheet was tacked to the surface. This prevents wrinkles at the tack points as the application proceeds to the edges.

7. Resqueegee the edges using very firm pressure. Then wipe the face of the patch sheeting and the squeegee with a soft cloth to remove any surface dust.

8. For maximum durability, edge seal with 3M Co. No. 700 edge sealer. Apply with felt dauber or hand brush.

- For Repairing Legends, Borders and Symbols

1. As a guide for top alignment of the legend, border, or symbol, mark a straight, horizontal line on the sign.

2. Lay first character on a flat surface and carefully remove the protective liner.

3. Align top edge of tape with guide line; press edge down with thumb; then press remainder of character firmly to surface.

4. Squeegee character down firmly. Do not remove application tape at this time.

5. Repeat these steps for each remaining character. Align top edge with horizontal guide line. Put left edge of tape against right tape edge of last character. Check alignment of adjacent notches before pressing to surface.

6. When all legend characters are positioned, remove application tape. Starting at top left corner of each character, slowly and peel tape down and back, flat against itself to prevent loosening of legend.

- For Sealing Background and Legend

  1. If the replacement sheeting extends to the top edge of the sign at any point and the sign is subjected to snow burial, place 3M Co. transparent film (No. 639) along the top edge of the sign. Center the film so edges extend down the sign face and back. This prevents ice crystals from delaminating the sheeting during prolonged snow burial.

  2. For maximum durability, also apply a light coat of 3M Co. No. 700 edge sealer around edges of all new background sheeting and legend.

APPENDIX B -- Antivandalism Product Listing

Information on antivandalism products was requested from 25 companies that commercially distribute or manufacture traffic sign materials or products with antivandalism applications. A total of seventy-five products were identified as a result of these activities.

To facilitate the presentation of these products, the following major categories are used to group the products:

- Sign and Delineator Posts.
- Cleaners, Strippers, and Paint, Ink and Adhesive Removers.
- Sign Cleaning Systems and Equipment.
- Sign Repair Kits.
- Sign Fasteners and Mounting Hardware.
- Sign Face Overlay.

The company names, addresses, telephone numbers, and application comments are based on available information and reflect the time period during which the survey was conducted. The reader is advised that additional or similar products may be commercially available that are not included in the product listings. Therefore, these listings should be periodically updated.

Product Listing: Sign and Delineator Posts

Product	Manufacturer/Distributor	Comments
Telespar Sign Support System	Unistrut Corp. 4118 S. Wayne Rd. Wayne, MI 48184 (313) 721-4040	Square tubing with breakaway function
Telespar Slipbase and Telespar Sign Bracket	Unistrut Corp. 4118 S. Wayne Rd. Wayne, MI 48184 (313) 721-4040	For use with square tubing
EZE-Erect Sign Posts	Franklin Steel Co. P.O. Box 671 Franklin, PA 16323 (814) 676-8511	U-channel with breakaway functions
Break-Safe Support System	Transpo Industries, Inc. 111 Cedar St. New Rochelle, NY 10801	Breakaway function for "large" signs
Carsonite Roadmarker CRM-375	Carsonite International 2900 Lockheed Way Carson City, NV 89701 (800) 648-7974	Delineator post
Carsonite Curv-Flex Delineator Post	Carsonite International 2900 Lockheed Way Carson City, NV 89701 (800) 648-7974	Impactable delineator post
Carsonite Hazard Marker Unit CRM-1236	Carsonite International 2900 Lockheed Way Carson City, NV 89701 (800) 648-7974	For Type III object marker
Carsonite Non-Metallic Street Name Sign	Carsonite International 2900 Lockheed Way Carson City, NV 89701 (800) 648-7974	Bending resistant
Unknown	Carson Manufacturing Co. P.O. Box 125 Sausilito, CA 94965	Flexible delineator post
Unknown	Pacific Autopost 1755 E. Borchard Santa Ana, CA 92705	Flexible delineator post
Unknown	Potter Industries 350 NW Baker Dr. Canby, OR 97093	Flexible delineator post
Unknown	Proven Products 7560 SW Labien Dr. Portland, OR 97219	Flexible delineator post
Unknown	Safehit 1930 W. Winton Bldg. #11 Hayward, CA 94545	Flexible delineator post
Unknown	Traffic Control Signs Co. P.O. Box 11305 6709 Adams Tacoma, WA 98411	Flexible delineator post
Unknown	Traffic Safety Supply 2324 SE Umatilla Portland, OR 97202	Flexible delineator post

Product Listing: Cleaners, Strippers, Paint, Ink, and Adhesive Removers

Product	Manufacturer/Distributor	Comments
Tri-sodium Phosphate	Not Specified	For general cleaning
Sodium Hypochlorite (such as "Hilex" or "Clorox" Brand Bleach)	Not Specified	For general cleaning and removing fungus and pollen
"Diton" Brand Cleaner	Diversey Corporation Chicago, IL	For general cleaning
"N-1" Brand Concentrate	National Laboratories Toledo, OH	For general cleaning
"Emsol" Brand Cleaner	Dubois Chemical Company Cincinnati, OH	For general cleaning
"Duponal" Brand Cleaner	E.I. DuPont De Nemours & Company	For general cleaning
"Hi-Sign" Brand Cleaner WC-2320	Worth Chemical Company Fort Worth, TX	For general cleaning
"Oakite" Brand Cleaner 202 and 74-J for Fluorescent "Scotchcal"	Oakite Products, Inc. New York, NY	For general cleaning
"Spraytex" Brand Cleaner 8201	Texize Chemical Prod., Co. Birmingham, AL	For general cleaning
"Zepride" Brand Cleaner	Zep Manufacturing Co. Atlanta, GA	For general cleaning
"Fremont" Brand Cleaner	Fremont Ind., Inc. St. Paul, MN	For severely contaminated signs
"Oakite" Brand Cleaner	Oakite Products, Inc. New York, NY	For severely contaminated signs
"C & H" Brand Cleaner #200L	C & H Chemical Co., St. Paul, MN	For severely contaminated signs
"Rite-Off" Brand Cleaner	Rite-Off Products Hicksville, NY	For paint vandalized signs
"UL-126" Brand Cleaner	United Laboratories Bensenville, IL	For paint vandalized signs

Product Listing: Cleaners, Strippers, Paint, Ink, and Adhesive Removers (continued)

Product	Manufacturer/Distributor	Comments
"Protexem PR" Brand Cleaner	Wisconsin Laboratories, Inc. Dousman, WI	For paint vandalized signs
Graffiti Gobbler Paint Remover	Graffiti Gobbler Prod., Inc. Detroit, MI	For paint vandalized signs
Goodbye Graffiti 2	Amplack International Inc. San Francisco, CA (415) 871-0890	For paint vandalized signs
Graffiti Gobbler Ink Remover	Graffiti Gobbler Prod., Inc. Detroit, MI	For ink removal
Goodbye Graffiti 1	Amplack International Inc. San Francisco, CA (415) 871-0890	For ink removal
"Dupont" Brand Thinner T-3819	Not Specified	For adhesive removal from lacquer surfaces
"Cherokee" Brand Thinner 211	Not Specified	For adhesive removal
Xylol Sovent	Not Specified	For adhesive removal
Mixture 75% MEK (Methyl Ethyl Ketone) and 25% Toluol	Not Specified	For adhesive removal
"Electro" Brand Cold Stripper T-349	Allied Finishing Spec., Co. Chicago, IL	Brush-on stripper
"Deseal" Brand Cold Stripper 2L	Kelite Corporation Chicago, IL	Brush-on stripper
"Gruss" Brand Cold Stripper 47A	Gruss Industries, Inc. St. Paul, MN	Brush-on stripper
"Spazee" Brand Stripper	Wyandotte Chemical Corp. Wyandotte, MI	Brush-on stripper
"Oakite" Brand Stripper Vistrip, Composition No. 18 & No. 47 & No. 157	Oakite Products, Inc. New York, NY	Brush-on stripper
"Strypeez" Brand Stripper	The Savogran Co. Norwood, MA	Brush-on stripper

Product Listing: Cleaners, Strippers, Paint, Ink, and Adhesive Removers (continued)

Product	Manufacturer/Distributor	Comments
"Sno Flake" Brand Stripper	Sno Flake Products Co. Detroit, MI	Brush-on stripper
"Rapp" Brand Stripper 66T	Rapp Products, Inc. Bay City, MI	Brush-on stripper
"Solilax" APS 660 & 650 and 849-55-25	Economics Laboratories, Inc. St. Paul, MN	Brush-on stripper
"Strippit" Brand Cold Stripper - Magnus Chem.	Economics Laboratories, Inc. St. Paul, MN	Brush-on stripper
"Ceebee" Brand Stripper	Cee-Bee Chem., Co.	Brush-on stripper
"Omega" Brand Epoxy Stripper 3132T	Omega Chemical Co., Inc.	Brush-on stripper
"Aero-Raze" Brand Stripper	DuBois Chemicals, Inc.	Brush-on stripper
"Turco" Brand Stripper 2823	Turco Products, Inc. Los Angeles, CA	Brush-on stripper
"Electro" Brand Stripper T-342	Allied Finishing Specialties Co. Chicago, IL	Brush-on stripper
"Gruss" Brand Cold Stripper C-36	Gruss Industries, Inc. St. Paul, MN	Brush-on stripper
"Kelite" Brand Cold Stripper Formula	Kelite Corp. Chicago, IL	Brush-on stripper
"Turco" Brand Cold Stripper 3310	Turco Products, Inc. Los Angeles, CA	Tank stripper
"Strip-Fast" & "Brig-Et" Brand Cold Stripper	The Clarkson Lab., Inc. Camden, NJ	Tank stripper
"Chemstrip" Brand Cold Stripper	National Chemsearch Corp. Irving, TX	Tank stripper
"Wyandotte" Brand Cold Stripper P-1075	Wyandotte Chemical Corp. Wyandotte, MI	Tank stripper

Product Listing: Cleaners, Strippers, Paint, Ink, and Adhesive Removers (continued)

Product	Manufacturer/Distributor	Comments
"Texize" Brand Cold Stripper 879	Texize Chemicals, Inc. Greenville, SC	Tank stripper
"Zep" Brand Cold Stripper Formula 1262	Zep Mfg. Co. Atlanta, GA	Tank stripper
"Triflect" Brand Cold Stripper 4A	Trichem Industries Shreveport, LA	Tank stripper
"Oakite" Brand Cold Stripper SA and ANP	Oakite Products, Inc. Berkeley Heights, NJ	Tank stripper
"Magnus" Brand Cold Stripper 763 and UPS 460	Magnus Duv., Economic Laboratories Garwood, NJ	Tank stripper
"Octogon Process" Brand Stripper 4440 and X-3172	Octogon Process, Inc.	Tank stripper
"Fremont" Brand Stripper 55URZ and 550	Fremont Industries, Inc. Minneapolis, MN	Tank stripper

Product Listing: Sign Cleaning Systems and Equipment

Product	Manufacturer/Distributor	Comments
Highway Handyman Sign Cleaner	Highway Sign Cleaner Co. 810 Cromwell Ave. St. Paul, MN 55114	For sign, signal, and delineator cleaning, truck mounted
Long Handle Extension Scrub Brushes	Sears Robuck Co.	4 1/2 to 15 ft (11.25 to 37.5 cm) extension handle with detergent dispenser
Air Compressor	Brinks Mfg. Co. Chicago, IL and Devilbiss Co. Toledo, OH	

Product Listing: Sign Repair Kits

Product	Manufacturer/Distributor	Comments
Ojo Cliente Craftsmen Sign Repair Kit	Ojo Caliente Craftsmen, Inc. P.O. Box 67 Ojo Caliente, MN 87549	Kit supplied in two steel tool boxes
3M Co Kit BHK-1 Sign Patching Kit	3M Co. Reflective Products Div. St. Paul, MN 55101	Primarily for repair of reflective signs on aluminum

Product Listing: Sign Fasteners and Mounting Hardware

Product	Manufacturer/Distributor	Comments
Tufnut Theft-Resistant Nuts Tufnut Washers	The Tufnut Works 236 Montezuma St. Sante Fe, NM 87501 (505) 983-2522	For use with carriage bolt
The Tufscrew System	The Tufnut Works 236 Montezuma St. Sante Fe, NM 87501 (505) 983-2522	For wooded posts and structures
The Tufbolt System	The Tufnut Works 236 Montezuma St. Sante Fe, NM 87501 (505) 983-2522	For U-channel posts and Telespar tubing
Southco Drive Rivets	Southco, Inc.	For Telespar posts
Vandlgard-Nut Assembly	Voi-Shan P.O. Box 512 Culver City, CA 90230 (213) 202-8200 and Simi Corp. Simi, CA	
Teenut Pallet Fastener	Carr Fastener Co. Cambridge, MA	For 4- by 4-in (10- by 10-cm) wood post supports, requires Allen wrench
Aluminum Fluted Nuts	Carr Fastener Co. Cambridge, MA	For aluminum delineators and signs on U-channel posts
Blind Aluminum Rivets	Carr Fastener Co. Cambridge, MA	For aluminum and 1/2-in (1.25 cm) plywood signs on U-channel posts

Product Listing: Sign Face Overlay

Product	Manufacturer/Distributor	Comments
Scotchlite Reflective Sheeting High Intensity Grade 9800 System 5	3M Co. Traffic Control Material Oivision 223-3N 3M Center St. Paul, MN 55144	For sign shop or infield application
1100 Series Pressure Sensitive Polyester Film	3M Co. Traffic Control Materials Division 223-3N 3M Center St. Paul, MN 55144	Washable surface can be removed for up to 3 years

APPENDIX C -- Report on the Sign Vandalism Workshop for Law Enforcement Personnel

By
Roy E. Lucke
And
David D. Perkins

A one-day workshop was conducted to obtain the perspectives of law enforcement personnel on sign vandalism. The workshop was conducted on February 4, 1983 at The Traffic Institute of Northwestern University, Evanston, Illinois. A group of 23 individuals attended the workshop.

Workshop Objectives and Methods

The objectives of the workshop were:

- To describe to the participants the magnitude of the sign vandalism problem in terms of potential danger to the motoring public and the cost associated with replacement of vandalized signs.
- To define and describe the characteristics of sign vandalism in terms of what constitutes vandalism, time and location patterns, and who vandalizes.
- To obtain input from the participants on the following issues through workshop activities:

  Issue No. 1 -- Current impediments to increasing enforcement emphasis on sign vandalism.

  Issue No. 2 -- Methods for increasing recognition of the sign vandalism problem in the law enforcement community.

  Issue No. 3 -- Planning requirements and techniques for development of antivandalism programs (programs by police agencies alone and in cooperation with other governmental units, i.e., engineering, maintenance, public works, community groups).

  Issue No. 4 -- Patrol (field) techniques to increase emphasis on sign vandalism.

To achieve these objectives, workshop methods were established to encourage the exchange of information between and among the moderators and the participants. Initially, information was provided to the participants to establish a relatively uniform understanding of the subject matter and terminology. This was accomplished through presentations on (1) workshop objectives, (2) sign vandalism terminology, (3) available data, and (4) current state of the art on the sign vandalism problem. Next, workshop questions were posed to the participants that related to the four issues stated in the workshop objectives. Four workshop groups of 4-5 individuals each were formed and asked to discuss each workshop question. Each group, however, was assigned one specific question for which a solution was to be developed for presentation to the entire workshop contingent.

Workshop Participants

A total of 23 individuals attended the workshop. Invitations were extended to attendees at two current Traffic Institute programs: The Police Administration Training Program (PATP) and the Executive Institute for Suburban Police. The PATP is a full academic-year program for police middle managers from all types and sizes of law enforcement agencies from throughout the nation and some foreign countries. The Executive Institute is a monthly forum for police chiefs and deputies from the Chicago area. A total of ten individuals from these programs agreed to attend the workshop.

To balance the level of attendee experience, other agencies were specifically invited to send representatives. These included the Chicago Police Department and two districts of the Illinois State Police, one representing an urbanized area and the other a primarily rural area. Additionally, three members of The Traffic Institute staff with varying law enforcement backgrounds joined the panel.

Traffic engineering representatives of the state of Illinois, city of Chicago, DuPage County, The Traffic Institute and a representative of a firm that manufactures traffic control devices were also in attendance.

Workshop Results

Four issues related to the workshop objectives were presented to the entire group. Each of the four groups presented responses to one specific issue assigned to the group. The issues and a summary of the participant responses are provided on the following pages (the issues as presented to the groups are shown in bold type).

Summary of Responses to Issue No. 1

Issue No. 1: Most agencies do not target sign vandalism as a high priority enforcement issue. What are the major reasons for the relatively low priority given to sign vandalism?

Response: By far the most common response of police officers to the reasons for the apparent low priority given to sign vandalism is lack of information. None of the workshop attendees with a law enforcement background were aware of the extent or nature of the problem. One participant, the former head of a large state police force, said that in his entire tenure as a police executive, no one ever approached him to indicate that there was a sign vandalism problem in his jurisdiction. The members of the police community essentially agreed that their job had tended to be reactive rather than proactive. If no one reported a problem to them, the general assumption was that no problem existed.

Other reasons for the low priority given to sign vandalism are summarized below:

- A careful middle ground needs to be established in order to have laws that are workable as sign vandalism countermeasures. If laws are too stiff, the police officers themselves may perceive this and not make arrests. Similarly, the prosecutors and courts will be unwilling to prosecute or convict offenders if they perceive the penalty as being too harsh for the offense. Most participants believed that penalty levels on a par with traffic tickets would be about the proper severity. In fact, it was suggested that sign vandalism be treated as traffic offenses and affect the driver's license for those vandals having a license.

- Another legal issue that sometimes makes prosecution of those in possession of signs difficult is the problem of establishing the ownership of the sign. It was recommended that highway departments be required to permanently mark their signs and that mere possession of such a sign should be made prima facie evidence to prove the offense.

- Juveniles apparently comprise a large part of the offender population. A strong recommendation was made for handling juvenile-involved incidents locally, with a provision that parents be held financially responsible for damage caused by their children.

- Lack of visibility is another aspect of the problem. A single incident of vandalism does not attract much attention and if the problem is corrected without a police report being made, the police may never know that the incident occurred. It was stated that the police should not be expected to commit resources to a problem about which they have little hard information.

- The lack of visibility also bears directly on the generally low priority that law enforcement agencies give to sign vandalism. The police will allocate their resources based on a number of factors and this resource allocation becomes the criteria used for setting priorities. The perceived importance of a problem to the community-at-large will have a great effect on priority setting. Traffic-related problems in general, get a much lower priority than crime-related problems, even though the cost in lives and dollars lost may be higher for traffic incidents than crime in most communities. To further describe this point, the following example was provided: A crime against a person has a higher perceived negative value than a crime against property. Breaking into a house is worse than shoplifting and shoplifting is worse than speeding yet the speeding driver can be more likely to kill someone than the individual who committed the crime against a person. Except for isolated incidents, sign vandalism is perceived as "victimless." Until such time as the police agency or community-at-large perceives the problem as being serious, it likely will not be given a high priority.

Summary of Responses to Issue No. 2

Issue No. 2: Most police agencies are not aware of the existence of a sign vandalism problem due to insufficient information. What are the most effective ways of increasing awareness of the sign vandalism problem in the general enforcement community. Also identify the enforcement levels (political, administrative, patrol, etc.) who should receive the information and suggest the most effective ways of getting the information to the enforcement community.

Response: While there was substantial agreement that the lack of information on the sign vandalism problem was a major reason for its low priority, no specific means was identified to most effectively increase awareness. The consensus appeared to be that making information available to the general public on the nature and magnitude of the problem was more important than getting that information only to the police. The viewpoint seemed to be that if the community was aware of, and concerned about the problem, the police would have to become more aware of the problem in order to do something about it.

Other suggested methods of increasing police awareness are summarized below:

- The police department is seldom aware of civil suits that resulting from sign vandalism. These are normally handled by the street department, corporate attorneys, and insurance companies. Notifying the police of such suits should be routine, particularly if police action (such as prompt notification of a vandalized sign) could have made a difference in the suit.

- Even when the police are made aware of the costs of a civil suit, or simply the costs of routine vandalism repairs, they still may not demonstrate much interest in the problem because they may see the money as coming out of someone else's pocket. The concept of wasted money that could be put to better use in the state/community needs to be conveyed to the top levels of police management and then down through all ranks.

- It was largely agreed that there would be no hesitancy by the police in taking action on a sign vandalism incident when it is obvious that there is potential for a serious accident. In those cases, the police are prompt in notifying the proper authorities and will attempt to apprehend those responsible for the act.

Summary of Responses to Issue No. 3

Issue No. 3: Assume that sign vandalism has been targeted for increased enforcement emphasis in your police jurisdiction. What administrative concerns and planning requirements need to be considered when developing an "Antivandalism Enforcement Program."

Response: There was no question that community involvement is the most important aspect in establishing a vandalism countermeasure program. As was mentioned in the response to Issue #2, if the community is concerned about the problem, the police have to be concerned about it also. To be effective, a community-wide program must be administered through the office of someone with power, such as the City Executive or Chief of Police. Programs sponsored only by a civic group will probably not have a sufficiently broad base to be effective. It is necessary, however, to have as many groups as possible, both from the public and private sectors, represented in any program. While most of the workshop participants agreed that this would be the most effective way of making a countermeasures program work, several thought that it was unlikely that many communities would bother. Other matters would again be perceived as rating a higher priority for community involvement. Other specific program development needs that were discussed are:

- Community mass media (cable television and local newspapers) can be used effectively to inform the public of the problem, countermeasure programs, and solicit their support in reporting vandals and vandalism incidents. Another suggestion was to provide antivandalism inserts in utility bills or mass-distributed ad papers.

- Unless the community is experiencing a particularly significant vandalism problem, it is probably not realistic to assign specific resources to the vandalism problem. All officers should be informed of the problem and any particular problem areas. It was also stated that there would be little value in training officers in antivandalism procedures even if such procedures could be identified.

- The identification of high-incidence vandalism areas was also considered not to be a police role. It was felt that it is the responsibility of the street/highway department to advise the police about problem areas, or for the public to complain if they could identify a problem location.

Summary of Responses to Issue No. 4

Issue No. 4: Suppose that an "Antivandalism Enforcement Program" has been planned and adopted for immediate implementation. What operational techniques (at the patrol level) could be implemented on a short-

term basis with existing personnel and resource levels. What additional effective technqiues could be implemented with additional personnel and resources.

Response: Those at the workshop having law enforcement experience were unanimous in their opinion that the most effective role for the police in sign vandalism countermeasures would be proactive rather than reactive. The police have many opportunities to be in contact with the population that is most likely to commit acts of vandalism. Many law enforcement agencies have "Officer Friendly" programs that have frequent contact with elementary and junior high school students and can bring the message to these children. In addition, the police are also frequently involved in high school driver education programs. That age group is also learning to recognize the need and meaning of traffic signs and the problem of vandalism can be pointed out in this learning process.

The other suggested operational level techniques that can be used by police agencies to reduce sign vandalism include:

- Officers should be expected to report all vandalized signs as soon as possible. Specialized forms should be used by the agency for this purpose and activity in this area should be considered by the officer's supervisor when the officer is being evaluated.

- There was general agreement among the group at the workshop that the best method for reducing vandalism was to make the signs as vandal-proof as possible. While the cost of these measures is initially higher, it is possible that they will save money in the long run through lower replacement costs.

- The police considered it important that they receive some kind of feedback from the street/highway department that their reports are being acted upon and are of value. The police would also like frequent reports of where the problems are occurring.

- Another aspect of the problem that must be considered is whether or not there is a problem. It is possible that in a given jurisdiction there really is no problem. As one participant phrased it, "the police have plenty to do without creating problems where they do not exist."

Summary of Workshop Findings

The consensus of the group appeared to be that the police can do relatively little to solve the sign vandalism problem after the vandalism has taken place or during the act because it is difficult to anticipate where the problems will occur. Without information on vandalism patterns and occurrences, specific countermeasures such as selective enforcement would be impossible to implement.

The primary role for the police may be in the prevention of vandalism through proactive measures. Contacts with juveniles should be used to present an antivandalism message. The police should also take part in, or possibly, initiate community education programs, to increase awareness of the problem and seek public support in resolving it. The primary themes should be incident reduction and community cost reduction.

APPENDIX D -- State Laws on Sign Vandalism

Examples of state laws from Wisconsin and New Jersey are provided in this section. Each was a result of efforts to reduce sign vandalism through a more comprehensive coverage of the subject and stiffer penalties for convicted sign vandals.

STATE OF WISCONSIN

1975 Assembly Bill 889 Date published: March 10, 1976

CHAPTER 169, LAWS OF 1975

AN ACT to amend 86.192 (1) and (2); and to create 86.19(5) and 86.192 (1m) and(4) of the statutes, relating to the numbering of highway signs, the unauthorized possession of such signs increasing the penalties for the injury, defacement, removal or possession of such signs and requiring a notice of the penalties to be affixed thereto.

The people of the state of Wisconsin, represented in senate and assembly, do enact as follows:

SECTION 1. 86.19 (5) of the statutes is created to read,

86.19 (5) The department of transportation shall assign to each county and local authority responsible for the placement and maintenance of signs, guide boards, mile posts, signals or markers erected for the warning, instruction or information of the public a code number which the county or local authority shall place on each warning, instruction or information device at the time of replacement or new installation of such device.

SECTION 2. 86.192 (1) of the statutes is amended to read:

86.192 (1) No person shall may injure, deface or remove any sign, guide board, mile post, signal or marker erected by the state or by any municipality thereof for the warning, instruction or information of the public. The following warning shall be affixed to the front of each such sign, guide board, mile post, signal or marker "WARNING: $25 or $100 fine or imprisonment for removing or tampering with this sign."

SECTION 3. 86.192 (1m) of the statutes is created to read:

86.192 (1m) No person may possess any sign, guide board, mile post, signal or marker of the type erected by the state or by any municipality for the warning, instruction or information of the public unless he can demonstrate that he obtained it in a legal manner. Possession of such a sign, guide board, mile post, signal or marker creates a rebuttable presumption of illegal possession. In this subsection, "possession" means the presence of such a sign, guide board, mile post, signal or marker on premises owned or controlled by the person, including but not limited to a rented apartment, rented room or dormitory room. Persons who voluntarily notify a law enforcement agency of the presence on their premises of such a sign, guide board, mile post, signal or marker shall be exempt from prosecution under this subsection.

SECTION 4. 86. 192 (2) of the statutes is amended to read:

86.192 (2) Any person who violates this section shall be fined $25 for the first violation, $100 for a subsequent violation, or imprisoned not exceeding 30 days for the first violation, or 60 days for a subsequent violation, or both fined and imprisoned in the discretion of the court. The court may, in addition, order any such person either to restore or replace any such damaged sign, mile post,signal or marker, or to pay the cost thereof.

SECTION 4m. 86.192 (4) of the statutes is created to read:

86.192 (4) Any person who violates this section shall be fined up to $10,000 or imprisoned not more than 2 years, or both fined and imprisoned, if the injury, defacement or removal causes the death of a person.

SECTION 5. Effective date, Section 86.19(5) of the statutes, created by this act shall take effect one year after publication.

SENATE, No. 1016

STATE OF NEW JERSEY

INTRODUCED FEBRUARY 11, 1980

By Senators DWYER, HAMILTON and WEISS

Referred to Committee on Transportation and Communications

AN ACT to amend "An act concerning highway and traffic signs, amending section 39:4–141, supplementing chapter 4 of Title 39, and repealing article 18 of chapter 4 of Title 39 of the Revised Statutes," approved August 4, 1941 (P. L. 1941, c. 345).

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey:*

1. Section 6 of P. L. 1941, c. 345 (C. 39:4–183.5) is amended to read as follows:

6. No person shall willfully or intentionally deface, injure or remove an official traffic sign or signal *or a street name sign* [described in this act].

a. A person violating this act is guilty of:

(1) a disorderly persons offense if he causes pecuniary loss of $500.00 or less;

(2) a crime of the fourth degree if he causes pecuniary loss in excess of $500.00 but less than $2,000.00;

(3) a crime of the third degree if he purposely causes pecuniary loss of $2,000.00 or more, or a substantial interruption or impairment of public communication, transportation, supply of water, gas or power, or other public service, or contributes to an accident which results in bodily injury; or,

(4) a crime of the second degree if he contributes to an accident which results in death.

b. A person convicted of violating this act:

(1) shall have his driver's license revoked for a period of 3 years from the date of his conviction, if he possesses a valid driver's license at the time of his conviction;

(2) shall not be licensed to drive a motor vehicle in this State for a period of 3 years from the date of his conviction, if he does not possess a valid driver's license at the time of his conviction; or,

EXPLANATION—Matter enclosed in bold-faced brackets [thus] in the above bill is not enacted and is intended to be omitted in the law.

(3) shall not be licensed to drive a motor vehicle in this State until he is 20 years of age, if he is under the age of 17 at the time of his conviction.

2. This act shall take effect immediately.

STATEMENT

The purpose of this bill is to deter individuals from defacing, damaging, stealing or tampering with highway signs and signals. To accomplish this purpose, the bill stiffens the penalties for such offenses.

Due to the significant danger such offenses pose to the public safety and the individual well being of the citizens of the State, plus the great costs incurred by the State, counties and municipalities for sign repair and replacement, stiff penalties are not only warranted, but essential.

Under this bill, the penalties for such offenses are graded and classified by three factors: pecuniary loss, bodily injury and death.

VIOLATION (Grade/Classification)	PENALTY
1. Disorderly Persons Offense—Pecuniary loss of $500.00 or less.	A fine not to exceed $1,000.00.
2. Crime of the Fourth Degree—Pecuniary loss in excess of $500.00 but less than $2,000.00.	A fine not to exceed $7,500.00 or imprisonment not to exceed 18 months, or both.
3. Crime of the Third Degree—Pecuniary loss of $2,000.00 or more, or a substantial interruption or impairment of public communication, transportation or service, or contributing to an accident resulting in bodily injury.	A fine not to exceed $7,500.00, or imprisonment for a period of 3 to 5 years, or both.
4. Crime of the Second Degree—Contributing to an accident resulting in death.	A fine not to exceed $100,000.00, or imprisonment for a period of 5 to 10 years, or both.

In addition, the bill provides that a person convicted of a violation under this act shall have his driver's license and privileges revoked for a period of 3 years. A person under the age of 17 convicted of a violation is not eligible to apply for a driver's license until he is 20 years of age.

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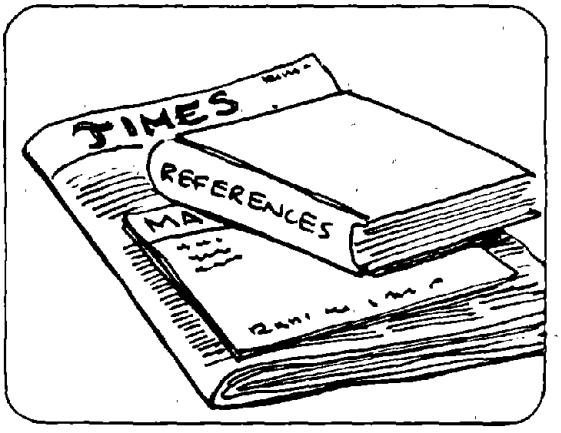

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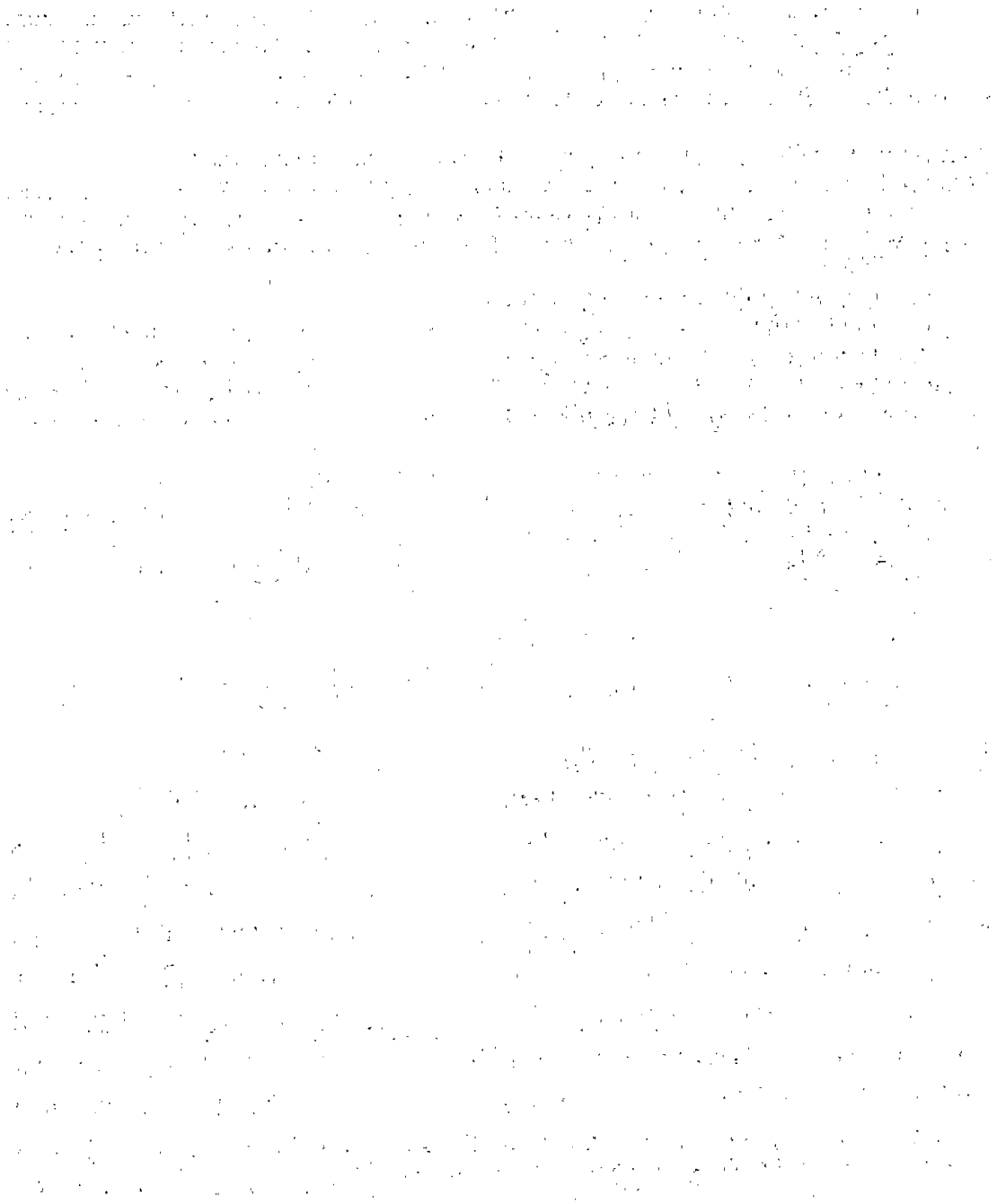

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