Clear Zones for Local Agencies

WA-RD 194.1

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September 1989

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16. ABSTRACT

The reported study was used to investigate clear zone practices, policies and standards that are employed both within Washington State and throughout the United States. Emphasis was placed on those standards or guidelines that apply to local city and county roadways which are predominately low volume and low speed facilities.

The review of nationwide clear zone practices pointed to a need for a set of clear zone guidelines or standards that apply specifically to low volume, low speed facilities. The research also pointed to the need for guidelines or standards that could be easily applied by city or county agencies with limited staff and limited budgets.

One of the findings of the research is a step by step format for agencies to use in establishing a program to address existing clear zone deficiencies.

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CLEAR ZONES

FOR LOCAL AGENCIES

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DISCLAIMER

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SUMMARY

The Washington State Department of Transportation (WSDOT) has been requested by the cities and counties of the state to conduct research in the area of "Clear Zones" for local roads. This research required a state-of-the-art assessment and identification of clear zone practices, policies and standards that are employed throughout the United States. In order to facilitate this effort, a committee was formed with members from various city and county public works departments.

This research study represents the culmination of a thorough literature search for information relating directly to the clear zone requirements as applied to local, low speed, low volume roads. It was determined that there are no existing guidelines or standards that address clear zones for low volume, low speed roads.

This research has established that overall, in the past 21 years, a nationwide attempt has been made by all agencies to utilize the American Association of State Highway and Transportation Officials (AASHTO) standards and guidance when determining the best location or relocation of objects along the roadside. The WSDOT has also published a clear zone policy statement; however, because both of these publications (AASHTO/WSDOT) reflect more the safety needs of primary highways, their application to existing low volume, low speed roads is continually being questioned in a time when local highway agencies must spend a majority of their limited funds for highway maintenance.

It is clear that agencies should establish an on-going active program directed at reducing roadside obstacles and their placement in the clear zone area. The establishment of such a program would provide a safer roadway and reduce agency liability. A product of this research paper is a set of findings for agencies to use in establishing their clear zone program.

CONCLUSIONS

This report was intended to identify current practice by cities and counties in the state-of-the-art clear zone guidelines and standards for local low-volume, low-speed roads. Guidelines are intended to assist professionals in providing general uniformity and permit flexibility in determining design requirements in order to meet the diverse and changing needs of the traveling public.

Our research concludes that overall in the past 21 years, a nationwide attempt has been made by all agencies to utilize AASHTO standards and guidance when determining the best location or relocation of objects along the roadside. However, because these national guidelines reflect more the safety needs of primary highways, their application to existing local low-volume roads is continually being questioned in a time when local highway agencies must spend a majority of their limited funds for highway maintenance.

A cost effective (benefit-cost) analysis is an effective tool that can assist agencies in determining priorities for highway improvements. This is especially true when the location or relocation of fixed objects along the roadside is to be considered. The hazard model referred to on page 26 that was used applies the principles of probability. The analysis is quite involved and complex. Other methods of evaluating roadside safety improvements can be used.

Based on our research of agency practices, statewide and nationwide, it is clear that there is an inconsistency in design application of the clear zone guidelines or standards. Further, quantifiable research is needed in this area and should be the subject of further study in order to produce a tangible and reasonable set of clear zone standards that address *all* roadway classifications and not just the higher volume, higher speed highways.

The survey that was conducted for this report clearly points to the need for a clear zone policy which is something other than a set of lengthy and complicated tables as used by the WSDOT and AASHTO.

INTRODUCTION

BACKGROUND

Roadway accidents that involve only one motor vehicle account for 60 percent of the fatal accidents each year, and a greater percentage incur property damage and, bodily injuries. In approximately 70 percent of these accidents, the vehicle left the roadway (errant) and either overturned or collided with a fixed object. A majority of these fixed objects were man-made, such as: utility poles, traffic barriers, sign supports, and other roadside elements which are items controlled by highway agency personnel. An interesting statistic is that the number of fatalities caused by trees or shrubs was 2-1/2 times greater than those caused by utility poles, guardrails, embankments, or culverts and ditches (2)*.

Accidents involving roadside fixed objects and errant vehicles is a serious problem. The seriousness is demonstrated in human financial and emotional suffering brought on by accidents, injury, death, litigation, risk, and public and private liabilities. The ideal mitigation would involve a set of uniform design standards and cost-effective solutions that could be used by agency officials and utility officials when designing new roadways, new transmission lines, and reconstructing existing facilities. Perhaps it can be said, then, that similar standards should also apply to obstacles other than those having to do with utilities.

A majority of Washington's cities and counties feel that existing standards are too restrictive for local roads, such as residential streets, low-speed (25 miles per hour) neighborhood collectors, and low-volume roads. It is becoming more difficult to apply existing standards in areas of denser use (urban areas or residential plats) because of the unavailability or high cost of right-of-way.

There is currently a lack of control zone standards that deal directly with low-volume, low-speed roads. Nationwide, 80 percent of all highway miles are on rural, two-lane highways (3). In these situations, existing rights-of-way are often narrow and the

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* See reference listing, page 45.

potential benefit to roadway safety may not be equitable when considering the costs associated with acquisition of additional right-of-way.

STUDY OBJECTIVES

The objective of this study is to research and review clear zone applications for local governments in Washington State. To achieve these objectives, the following tasks were accomplished:

1. A city/county research steering committee was established in order to review and provide directional input to the study;

2. a survey of all counties and cities with a population of over 5,000 in the State of Washington was conducted on present clear zone practice and surrounding issues;

3. a literature search was conducted throughout the United States and the findings were summarized in the report;

4. a utilities perspective was included because of the direct relationship that the clear zone has with respect to the location of utility poles, etc.;

5. cost effectiveness was included as a consideration when implementing clear zone practices; and

6. the data from the literature search, interviews, and analysis were combined in this report to assist local agencies in developing their own clear zone policies and standards for their local roadway systems.

DEFINITIONS

Throughout this paper, reference will be made to *clear zone, control zone* and *recovery area*. All of the terms relate to the relatively flat area beyond the edge of the traveled way used for the recovery of errant vehicles. A brief description of each term follows:

1. Clear Zone. This term is most commonly used when referring to the American Association of State Highway and Transportation Officials (AASHTO) criterion for the placement, removal, or relocation of roadside obstacles.

2. Control Zone. This term is most commonly used when referring to the WSDOT Control Zone Policy, which was implemented formally in December of 1987.

3. Recovery Area. This term is used by both AASHTO and the WSDOT in their policies of clear and control zones. *Recovery Area* is a term that more adequately describes the area extending from the traveled way, used for the recovery of errant vehicles.

SURVEY OF CLEAR ZONE PRACTICES

INTRODUCTION

This section summarizes and evaluates the results of questionnaires, meetings, conversations, and visits with public works representatives from cities and counties throughout the State of Washington on the subject of clear zone practices. The purpose of the questionnaire, meetings, and contacts was to obtain current agency practices, ideas, and philosophies relating to their approach in establishing safe clear zone areas along their roadways. A questionnaire survey was prepared and mailed to 110 cities and counties throughout the State of Washington. The criteria used for cities was those with a population of over 5,000. All counties were solicited. This questionnaire was conducted because the research staff at CENTRAC felt that a strong compliment to the literature search would be a survey of the state's individual agency practices and philosophies as to the use of the WSDOT Control Zone Policy and the guidelines provided by the American Association of State Highway and Transportation Officials (AASHTO).

The response to the questionnaire was excellent. CENTRAC mailed 110 questionnaires and 60 were returned.

The questionnaire requested a response to seven questions:

1. *Does your agency presently have guidelines or standards for clear zones?* The agency was asked to attach a copy of their guideline or standard; or state the policies that they followed.

2. *Do you use WSDOT Control Zone Guidelines?*

3. *What are the major obstacles to your agency in implementing clear zone guidelines?*

4. *Does your agency presently have some form of accident tracking system? Please explain.*

5. *Does your agency have some form of hazard elimination program? Please explain.*

6. *What factors do you feel are important in identifying clear zone standards? (rated High, Medium, Low)*
   - *a) Classification of roadway*
   - *b) Area type (rural versus urban)*
   - *c) Abutting uses*
   - *d) Volume of cars*
   - *e) Mix of truck and buses*
   - *f) Terrain*
   - *g) Speed of traffic*
   - *h) Right-of-way availability*
   - *i) Other*

7. *As the official responsible for implementing clear zone guidelines, what do you feel are the major stumbling block in achieving standards for the following:*
   - *a) New construction*
   - *b) Existing facilities*

QUESTIONNAIRE RESULTS

The following information summarizes the responses to the questionnaire.

Question No. 1: Does your agency presently have guidelines or standards for clear zones?

Response: A majority of the agencies said they used the WSDOT Control Zone Policy or AASHTO guidelines. The questionnaire's results revealed that six (ten percent) of the agencies had their own guidelines or standards for clear zones. Of these six, however, four (67 percent) agencies also used the WSDOT Control Zone Guidelines. Twenty-nine (53 percent) of the

remaining 54 agencies that did not have their own guidelines or standards stated that they used WSDOT or AASHTO guidelines. Seven agencies said they used the WSDOT Control Zone Guidelines or AASHTO only when receiving federal funds or a project was on a state route. The remaining 18 agencies used "rule of thumb", "good engineering judgment", or they applied their current local zoning requirements to establish clear vision on intersection corners.

Question No. 2: **Do you use WSDOT Control Zone Guidelines?**

Response: Of the 60 respondents, 32 (53%) agencies said they did use the WSDOT Control Zone Guidelines.

Question No. 4: **Does your agency presently have some form of accident tracking system?**

Response: Out of the 60 agencies who responded to the questionnaire, 54 (90 percent) answered "yes" to the question, "Does your agency have a program to track accidents?" These "yes" responses used available city, county, or state patrol accident records. The method of tracking hit object accidents varied from pin maps to computer database records.

Question No. 5: **Does your agency have some form of hazard elimination program?**

Response: The hazard elimination programs of the responding agencies varied from "we have none" to computer database records that establish a priority array for hazard elimination. This array is then used to establish a budget for expenditure. A majority of the agencies do have a method by which to identify roadside obstacle hazards and eliminate them; however, 90 percent do not have a "formalized" computer database operation. These

90 percent use the accident records and reports to identify and eliminate hazards. Roadside obstacles such as utility poles are removed or replaced many times via maintenance crews that merely replace a knocked-down pole or obstacle in its original location. Some agencies feel their application for federal funds under the Hazard Elimination Program is their "*program*".

Question No. 6: What factors do you feel are important in identifying clear zone standards?

Response: This section deals with factors that agencies feel are important in identifying clear zone standards. These factors are summarized below. This table demonstrates those areas to be considered when determining the clear or "recovery area" for errant vehicles.

TABLE 1

CLEAR ZONE VARIABLES

	Variables	Response: High	Medium	Low	No Response
a)	Classification of roadway	30	20	9	1
b)	Area type (rural versus urban)	19	28	12	1
c)	Abutting uses	15	28	15	2
d)	Volume of cars	37	20	2	2
e)	Mix of truck and buses	12	23	24	1
f)	Terrain	22	30	7	1
g)	Speed of traffic	45	10	3	2
h)	Right-of-way availability	35	11	11	3
i)	Other				

Values were assigned to each category (High, Medium, Low, and No Response. The values ranged from zero to three, with zero being no response and 3 for a high rating (very important). The results are shown below in Table 2 in priority array:

TABLE 2

VARIABLE PRIORITY RATING

Priority	Factor	Point Value Total
1	Speed of traffic (g)	158
2	Volume of cars (d)	153
3	Classification of roadway (a)	139
4	ROW available (h)	138
5	Terrain (f)	133
6	Area type (rural vs. urban) (b)	125
7	Abutting uses (c)	116
8	Mix of trucks and buses	106

The results are not too surprising. They bear out the stated concerns from public officials and other professionals responsible for safe and efficient transportation. There appears to be natural groupings between priorities 1 and 2; 3 through 5; and 6 through eight. Speed, volume of cars, classification of roadway and available ROW rank at the top as factors to consider when establishing guidelines for a clear zone, or perhaps better termed "Recovery Area".

We also requested the agency to add any special considerations they felt were important. A list of other factors is shown in Table 3. It should be noted that this list represents 12 of the 60 agencies polled. These factors are certainly to be considered when making judgments about providing off-road recovery areas, but are not the major factors to consider.

Category i), "other," had a variety of responses.

TABLE 3

ADDITIONAL CLEAR ZONE FACTORS

- potential liability
- access control
- vegetation
- horizontal alignment
- roadside parking
- utilities
- geometrics
- turning movements

Question Nos. 3 and 7: What are the major obstacles or stumbling blocks for your agency in implementing clear zone guidelines?

Response: Of the 60 respondents, 48 (80%) agencies clearly stated that limited rights-of-way (ROW) and lack of funding to purchase that ROW were the main stumbling blocks. The remaining respondents (12) did not say *specifically* that ROW and funding were the problem, but their written responses leads one to believe that ROW and funds are the constraint.

Question No. 7 inquired about stumbling blocks during new construction and for existing facilities. The consensus was that agencies that can afford to purchase the needed ROW, will do so on new federal- or state-funded projects, and those who cannot afford it will use their monies to build longer projects in preference to short projects with wider clear zones. Also, new projects are considered by some agencies to be infrastructure improvements and would not involve the purchase of additional ROW. In an urban environment, some cities are saying that on low-volume, low-speed roads the WSDOT Control Zone Policy is too restrictive. A majority of the agencies surveyed feel that current clear zone requirements are adequate for major arterials, but not on collector or local urban streets.

The response to the effects of clear zone standards on existing facilities is basically the same as for new construction, only much more restrictive because of the relocation factor of utilities, existing curbed and sidewalk streets and again, ROW purchase. Also, some agencies feel that moving roadside obstacles which have been in place for many years without having a track record of causing problems is unreasonable.

SUMMARY OF PRESENT PRACTICES

INTRODUCTION

Agencies in the State of Washington currently utilize numerous standards and guidelines in establishing clear zone requirements for roadways under their jurisdictions. These guidelines range from AASHTO, Local Agency Guidelines, state or federal pending requirements, to a very few locally generated and adopted guidelines.

There are physical characteristics of roadway design which can influence traffic safety; and the utilities need to be made more cognizant of the nature of roadway design as it applies to placement of utilities in the clear zone area. These physical characteristics are summarized below:

- Pavement Conditions - Uneven pavement and slippery conditions can lead to loss of vehicle control.

- Signage (regulatory and warning) - The lack of or improper placement of signs can lead to unsafe traffic patterns. Regulatory signs inform highway users of traffic laws or regulations. Warning signs warn traffic of existing or potentially hazardous conditions on or adjacent to a roadway.

- Posted Speeds - Posted speeds play a major role in determining the control zone width and the location of fixed off-road objects according to the CZP.

- Horizontal and Vertical Roadway Alignments - Roadway slopes, curves, and super elevations (banking), if poorly designed, can lead to unsafe traffic patterns or compromise the traffic safety of fixed off-road objects. The exterior of a curve is generally a less safe location for fixed off-road objects than the interior.

- Side Slope Treatment - The slope, placement, and extent of embankments and location of ditches affect the width of the control zone.

- Fixed Off-Road Objects - The placement of any fixed object such as curbs, culverts, sign posts, guardrails, etc. in the surrounding right-of-way constitutes a risk of conflict with errant vehicles. The longer, more closely spaced and closer to the roadway the fixed objects are, the greater the risk to traffic safety. Fixed objects can also impair sight distance.

Most agencies consider the above factors and use engineering judgment in recommending clear zone requirements.

WSDOT CONTROL ZONE POLICIES

On December 1, 1987, WSDOT adopted the "Control Zone Guidelines for Utilities" referred to as the Control Zone Policy (CZP)(4). The CZP guidelines will be implemented until December 1, 1988 on a trial basis, after which the CZP will be reviewed with utilities. According to WSDOT officials, this review meeting will be held in the Spring of 1989. After this review, the CZP will be adopted in final form as part of the State Utilities Manual (M 22-87).

The CZP guidelines provide direction on how utilities may use the public highway rights-of-way. The guidelines were formulated through a joint effort of WSDOT and all the major utilities in the State of Washington under the auspices of the State Utility Coordination Council. The guidelines are in accordance with American Association of State Highway and Transportation Officials (AASHTO), National Research Council, Federal Highway Administration (FHWA), and WSDOT philosophies.

KING COUNTY ROAD STANDARDS, 1987

The following are extracts from the King County Road Standards, 1987:

> "Utility poles or other obstacles may be placed within the right-of-way and shall be as far back from the traveled way as practicable.
>
> On shoulder type roads, poles or obstacles shall be located back of ditches and in accordance with the criteria in Drawing

No. 15 on the next page, unless protected by guardrail, concrete barrier, or suitable impact attenuating devices.

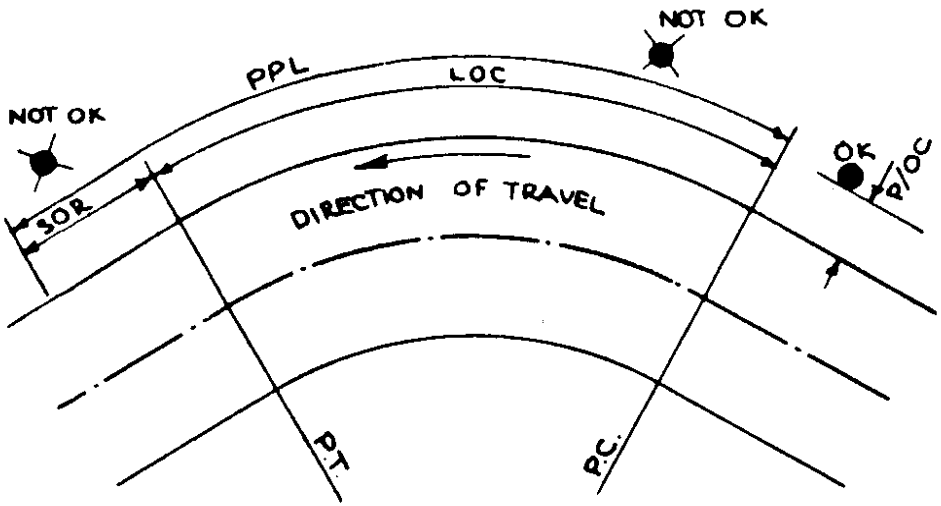
On curb type roads, poles or obstacles shall be placed clear of sidewalks and at least 8.5 feet from face of curb in business areas and 5.5 feet from curb face in residential areas, unless barricaded.

The above constraints on pole location will not apply to locations not accessible by moving vehicles, nor to "breakaway" structures whose break-off resistance does not exceed that of 4" x 4" wood post or a 1-1/2" standard (hollow) iron pipe.

Deviations from these pole clearance criteria may be allowed when justified by suitable engineering study considering traffic safety.

Locations of poles shall also be compatible with driveways, intersections, and other roadway features (i.e., they shall not interfere with sight distances, roadway signing, traffic signals, culverts, etc.). To the extent possible, utilities shall share facilities so that a minimum number of poles is needed.

All permits for new placement and replacement of existing utility poles and other utility structures above grade shall be accompanied by written certification from a Washington State professional engineer or from an agent authorized by the utility to certify that the installations conform to these standards and that the proposed work is in conformity with sound engineering principles relating to highway safety."



OUTSIDE OF CURVE 40 MPH & OVER

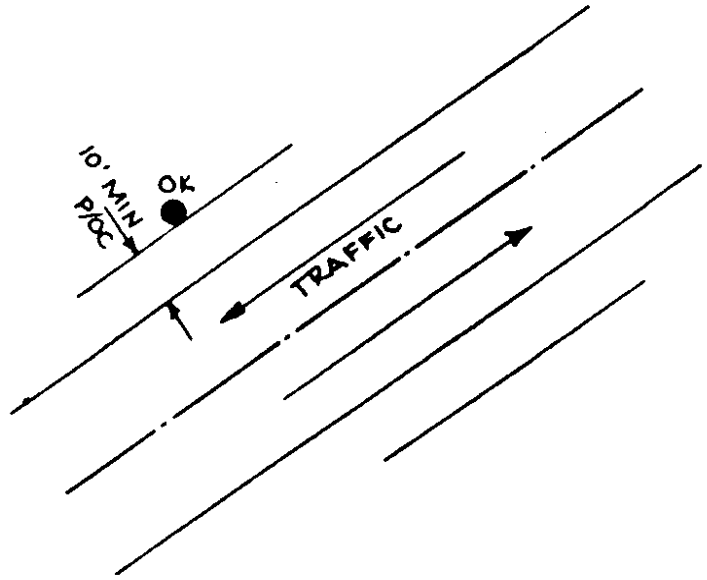
LOC: LENGTH OF CURVE (FEET) AT EDGE OF TRAVELED WAY FROM P.C. TO P.T.

SOR: SAFETY OVERRUN (FEET) BEYOND P.T.

PPL: PROHIBITED POLE LOCATION (FEET) (= LOC + SOR) WHERE POLES OR OBSTACLES MUST BE REMOVED OR BARRICADED.

PPL (FEET) ON OUTSIDE OF CURVES WITH POSTED SPEEDS 40 MPH & OVER.	
40 MPH	LOC + 220 (SOR)
45	LOC + 255
50	LOC + 290
55	LOC + 325

APPLIES TO ROADWAY WITH SHOULDER OR OR MOUNTABLE CURB ON OUTSIDE OF CURVE, WITH:
- RADIUS ≤ 3500', AND
- POSTED SPEED ≥ 40 M.P.H.



GENERAL CASE

P/OC: POLE/OBSTACLE CLEARANCE TO NEAREST FACE OF POLE/OBSTACLE.

APPLIES: TO ROADWAY WITH SHOULDER OR MOUNTABLE CURB ON:
1. TANGENT, OR
2. INSIDE OF CURB, OR
3. OUTSIDE OF CURVE, EITHER WITH
   - POSTED SPEED < 40 MPH OR
   - RADIUS > 3500' ON ROADWAY MEETING ALL CURRENT DESIGN STANDARDS.

NOTES:
1. DEVIATION FROM THIS CHART MAY BE ALLOWED WHEN JUSTIFIED BY SUITABLE ENGINEERING STUDY CONSIDERING TRAFFIC SAFETY.
2. SEE SECTIONS 5.11 & 8.026.

CLEARANCE OF ROADSIDE OBSTACLES ON SHOULDER TYPE ROAD	
KING COUNTY, WASHINGTON	DWG NO 15

SNOHOMISH COUNTY POLICY

The Snohomish County policy for locating utility poles is to allow the utilities to place their poles within 5 feet of the right-of-way. In addition to the five-foot criterion, Snohomish County has indicated its intention to adopt the WSDOT Control Zone Policy (CZP). Depending on the proportion of Snohomish County PUD (district) facilities on county road rights-of-way, this requirement may entail even more effort on the district's part than for state roads. The county may not be in a position to lend the same guidance as the WSDOT (CZP).

The CZP for the county will be administered by the county Department of Public Works. Discussions with the county indicate their intention to adopt the Control Zone definitions of the WSDOT CZP and to apply the CZP in cases of: (1) power line new construction or reconstruction, and (2) highway projects with a safety improvement component. To our knowledge, however, the county has not yet fully addressed the issue of the district's franchise.

AASHTO CLEAR ZONE GUIDELINES (GREEN BOOK)

Horizontal Clearance to Obstructions. The term *clear zone* is used to designate the unobstructed, relatively flat area provided beyond the edge of the traveled way for the recovery of errant vehicles.

The width of the clear zone is influenced by the type of facility, speed, horizontal alignment and embankment slopes. The AASHTO *Guide for Selecting, Locating, and Designing Traffic Barriers* discusses clear zone widths as related to speed and embankment slope. The *Guide* should be used for freeways, rural arterials and high-speed rural collectors. For low-speed rural collectors and rural local roads, a minimum clear zone width of 10 ft should be provided.

For urban arterials, collectors and local streets where curbs are utilized, a minimum distance of 1.5 ft should be provided beyond the face of the curb. Where shoulders are provided rather than curbs, a clear zone commensurate with rural conditions should be provided.

AASHTO BARRIER GUIDE

This was issued in 1977 and supplemented in 1980, and provided a major emphasis in the clear zone. This document provided detail criteria for selecting appropriate safety treatments within the clear zone. Heights of fill embankment, horizontal curves, vehicular speeds, and other factors were shown to affect the width of the roadside recovery area.

The significance of the barrier guide was profound. It provided tables, charts, and formulas for evaluation of specific circumstances. The barrier guide clearly states, however, that it was a significant change from previous guideline, and that strict adherence to its criteria might be impractical in many situations due to limited rights-of-way or other restrictive conditions (limited funding, etc.). This guide was the most complete guidance available to the highway engineer at the time it was published, and it was meant to be interpreted and applied with sound engineering judgment.

LOCAL UTILITY DESIGN PRACTICES AND OPERATIONAL REVIEW GUIDELINES

The electric utility industry relies heavily on the use of public rights-of-way to provide cost-effective service. Utility objects, such as poles and guy wires, located in public-right-of-way can limit the area available for errant vehicle recovery. The electric utilities are concerned over potential accident problems that may result from placement of fixed objects in the right-of-way. Also, they are concerned about keeping electric rates low and providing design of facilities which make good economic sense.

The electric utility industry generally locates its facilities at the edge of right-of-way to minimize the risk, subject to the design constraints imposed by the need to follow the right-of-way alignment.

Utilities construct their electric distribution facilities in two basic ways, underground or overhead.

Underground construction, while it presents minimal fixed object risk in the right-of-way, typically costs 3-10 times overhead construction alternatives. For this reason utilities, especially those serving rural areas, have not considered systemwide underground construction as economically feasible. Although methods of repair and maintenance of underground facilities are improving, underground systems are marginally less reliable than overhead facilities. When a fault occurs, say due to insulation failure, it is more difficult and time-consuming to locate and repair the fault than for an overhead line. It is more difficult and costly to inspect and maintain an underground cable system.

Overhead construction is typically carried on wood poles and frequently several circuits of different voltages are supported on the same pole, including communication circuits. Overhead facilities may have aesthetic disadvantages, but are readily accessible for maintenance, and costs significantly less than a comparable underground system.

The layout and design of overhead distribution facilities along county road rights-of-way is generally guided by a few simple rules, typified by the following from a Washington State utility whose construction standards mention:

- Several route selection considerations, one of which is "freedom from vehicular damage."

- Location of poles "adjacent to established lot line" for minimum infringement of property development.

- Location of poles normally 5 feet from property lines on public rights-of-way. This places the outer conductor of standard 10-foot cross-arm construction just inside the right-of-way line. This is consistent with typical county roadbed standards.

The use of county road rights-of-way is usually governed by stipulations in a franchise ordinance with the city and county. A typical franchise agreement requires

designs that are "in accordance with standard engineering practices" and conditions acceptance of the design on the written approval of the county engineer. Electric utilities endeavor to comply with these requirements which should present ample opportunity for design review and modifications to the county engineer's satisfaction. A typical franchise agreement is further subject to repeal, amendment, or modification by a county council or through public initiative in the public interest.

The location of utility objects in the road right-of-way is subject to the design constraints of a narrow and sometimes meandering easement. Once a design is complete, approved by all parties, and installed, it is difficult and expensive to remove or relocate utility objects. Single objects can seldom be moved without affecting adjacent structures. The wholesale relocation of utility objects to comply with new control zone guidelines could constitute an unbearable financial burden on the utility industry.

The discovery of accidents is problematic for utilities. If an accident results in an outage, customer complaints or system monitoring will alert the utility. If an accident results in personal injury or property damage and the involved parties are identified, police reports can be researched but are typically not automatically forwarded to the utility. When they are obtained they are often incomplete, making pole identification difficult. Utilities able and desiring to relocate identified hazardous fixed objects need more complete accident information forwarded to them automatically and traffic safety advice from road design experts.

The typical practice of utilities faced with a damaged pole is in site replacement. There are many compelling reasons why this is so, as cited below:

- The present location may be part of a line design which already fulfills the route selection guidelines and the accepted conditions of a State franchise or County road standard.

- Emergency situations do not allow time to study and resolve the potential impacts on line design and easements that relocation typically entail.

- Emergency situations do not allow time to call up DIAL-DIG to locate underground facilities.

- Relocation typically introduces or changes line angles, thereby requiring structure modification and/or guying to accommodate line tension loads.

- The location of the pole in question may not pose a noticeably greater traffic risk than the locations of adjacent poles.

- It may not be possible, without a detailed accident investigation using traffic engineering expertise, to determine if feasible relocations would improve traffic safety.

- Relocation is not possible due to lack of right-of-way or easement.

- Pole relocation is not considered by those initiating pole replacement or repair, partially because accident histories are not widely available to all engineers who might locate poles.

- Joint use of poles by electric utility and communication companies would make it difficult to coordinate significant design modifications under short notice.

Since the mid 1970s, considerable attention has been given to the study of accidents involving fixed off-road objects, including wood poles, and countermeasures to reduce these accidents. In one study, a comparative analysis of over 2,500 miles of urban and rural roads in four states, the factors found most associated with utility pole accidents were lateral pole offset, traffic volume, and pole density.

Power line design considerations, as they relate to improvements in lateral pole offset or pole density and design of lines within rights-of-way constraints, are discussed below.

- Improving Lateral Pole Offset - Right-of-way obstacles and buried facilities can preclude pole relocation. The relocation of a single pole in a tangent run can introduce line angles at that and adjacent poles. New guying or pushbraces may be required if adequate right-of-way is available. If no right-of-way is available, the entire section of tangent pole line would have to be moved and may be subject to guying requirements.

  Using a heavier class pole, pole reinforcement, or steel or concrete pole may be used at a significant cost premium to avoid the need to guy and obtain private easements.

Using offset, in-line guying in lieu of bisector guying could reduce the need for guy easements but would increase fixed objects in the right-of-way.

The 5-foot separation of poles from the edge of right-of-way can be reduced by using vertical narrow right-of-way construction, Hendrix cable, or wing (alley) arms. Vertical construction will generally require taller poles and make step-down taps more difficult to accomplish.

- Decreasing Pole Density/Increasing Spans - By increasing span length, pole density and risk exposure to errant vehicles will generally decrease. However, stronger and taller structures may be required to meet ground clearance needs and to resist heavier conductor loads. Stronger conductor, higher tension limits, vibration protection, and stronger support hardware could help reduce the height of structures required.

Poles which support secondary drops or pole-mounted equipment (e.g. transformers, switches, capacitors, regulators) are not easily relocated or eliminated without affecting service.

- Right-of-Way Limitations - Outside curves present the most desirable curve position for electric utility poles because of general guying

flexibility. However, outside curves are more vulnerable to errant vehicles than inside curves. On outside curves, guys fall away from the roadway and clear zone. Guardrails are sometimes installed to prevent errant vehicles from leaving the roadway.

Inside curves require either guys installed close to the roadway, guy stub poles across the roadway, or pushbraces. The WSDOT will not allow the installation of guys, pushbraces, etc. between the pole line and the roadway unless they fall outside the control zone. This involves more costly construction in most instances and an increase in fixed objects in the right-of-way.

The electric utility industry is sensitive to the shared liability they may incur in locating utility objects in road rights-of-way. Electric utilities have ample incentive to limit this risk exposure where financially and technically feasible. The response of utilities to the issue of risk management of facilities on public rights-of-way varies widely. One utility has devoted considerable energy and resources to tracking pole-car accidents, investigating relocation and other mitigation measures for duplicate hit poles, and planning a proactive hazard identification program. Other utilities assess risks and design alternatives on a case-by-case reactive basis. Both utilities and road agencies have found that demonstrating an active concern for traffic safety, in the form of programs and good faith efforts to identify and correct high risk fixed objects, has mitigated or avoided litigation damages.

We emphasize, however, that whatever any electric utility is willing to undertake in this regard is limited by the availability of its resources, both technical and financial. Utilities do not typically have expertise in matters of traffic safety or accident investigation. Historically, they have relied on the road agencies' standards and guidelines for the design of facilities on road rights-of-way, trusting that compliance with these terms constituted an acceptable measure of risk balanced against the public good served by joint use. Since utilities are not in a position to evaluate with confidence the relative traffic safety risks of alternative, but similar designs, they will continue to depend on road designers for traffic safety guidelines, clearly identified early in the planning and design phases for new construction.

SURVEY OF LITERATURE ON CLEAR ZONE PRACTICES

INTRODUCTION

This section highlights nine documents that influence the areas of clear zones and recovery areas (5). It also shares the findings of 36 states throughout the nation on their clear zone policy and practices. They represent a good cross-section of the philosophy of clear zones as well as some proposed solutions to better identify guidelines to be used in assisting agencies in establishing their own set of standards.

INDIVIDUAL CITATIONS

AASHTO Roadside Design Guide, October 1988

In considering clear zone needs, speed and volume of cars shall be a major factor. It is clear when reading the AASHTO Roadside Design Guide, that its tables and figures relate more to the higher volume and higher speed roadways.

The AASHTO document reiterates that "the use of the nomographs and tables are based on limited empirical data, which was then extrapolated to provide information for a wide range of conditions. The designer must keep in mid site-specific conditions, design speeds, rural versus urban locations and practicality."

The AASHTO document discusses the more "narrow" items that are generally found in the clear zone areas (i.e. traffic signals, motorist-aid callboxes, railroad warning devices, fire hydrants, and mailboxes.

There is no direct guidance on standard distances recommended by AASHTO for a majority of these "narrow objects". A general statement says "these objects shall be placed as far away from the roadway as practicable." The one exception to this generic statement is the mailboxes (6).

Case Study, Poles In The Urban Clear Zone, Daniel S. Turner, Department of Civil Engineering, The University of Alabama and Timothy Barnett, Huntsville Department of Transportation, January 25, 1989.

Research Objectives

This paper describes research conducted for the City of Huntsville, Alabama to design and implement a program for treatment of poles located in the roadside clear zone. The research staff used the results of the field investigation to provide a series of detailed recommendations for retrofitting a clear zone program to existing poles. At the same time, the literature review provided the basis for recommendations for ordinances and operating procedures to cover future poles in the clear zone.

Findings

The data revealed several interesting characteristics associated with urban pole collisions. For example, about 90% of the accidents occurred within 10 feet of the pavement edge, and the relationship between accidents and distance was linear in this range. The presence of a curb had a significant effect upon the lateral distance to the object, while the presence of a horizontal curve did not. Drivers were three times more likely to have collisions on the outside of horizontal curves than on the inside. Wet pavement was not a significant factor in these collisions.

Recommendations

1. In general, utility lines are to be placed to the maximum extent practicable at the outer limits of the right of way (or additional utility easement).

2. Where sufficient right of way is not available, an engineering analysis should determine whether purchase of additional easement is the best course of action.

3. Distribution lines would be best placed in underground conduit in new developments. Ancillary equipment should be constructed in compliance with lateral clearances for utilities.

4. Where construction of underground distribution lines is impractical or cost-prohibitive (for example, due to the cost of rock excavation), poles are to be located in the rear of the building lot wherever possible. This may call for the creation of a dedicated utility easement.

5. Where overhead lines must be located along the front of the lot, it is desirable to place them at least 10 feet behind the curb.

6. Where overhead lines are to be erected on streets having open drainage (no curb and gutter), poles are best placed outside the ditch line in flat or cut roadway sections and 10 feet outside the toe of the slope along tangent fill section.

7. Where utility poles are to be installed along curved sections (including 200 feet of tangent section adjacent to each end on the outside of horizontal curves) or roadway having open drainage systems, consideration should be given to locating poles along the inside of the curve, unless they can be placed outside a non-traversable ditch section on the outside of the curve.

8. Sign, signal and luminaire posts. In general, these types of posts should be placed as far from the edge of the roadway as practicable without critically reducing the visibility of the control device or the effectiveness of the lighting device. Care should be used in placing them on the outside of horizontal curves, and such use should be restricted to only those cases found to be necessary by an engineering study.

Effectiveness of Clear Recovery Zones, May 1982. National Cooperative Highway Research Program, Report 247

Research Objectives

The objectives of the National Cooperative Highway Research Program Project (NCHRP) was to determine the safety effectiveness of clear recovery zones of differing slopes and widths in reducing the number and severity of run-off-road accidents, and to

describe a framework based on clear zone effectiveness that can be used in design practice to assure cost-effective application of clear recovery zones. The study was not intended to consider criteria for the installation of guardrail at specific sites or blanket fixed object removal programs; rather it was intended to evaluate the safety effectiveness of providing clear recovery zones by flattening slopes and/or removing or treating fixed objects.

Findings

The major conclusion of this study is that there is a statistically significant relationship between single-vehicle run-off-road accident rate and the roadside design policy used outside of the highway shoulder. The study findings provide estimates of the single-vehicle run-off-road accident rates for highway sections with and without clear recovery zones and for clear recovery zones of varying slope and width.

Recommendations

The major recommendation resulting from the research is that roadside design policies should be flexible to provide a cost-effective roadside design for each highway section. The benefit-cost evaluation procedure used for the design examples in this study is suitable for the evaluation of roadside design policies. The maximum return will be obtained from roadside design improvements if a cost-effectiveness analysis is conducted for each individual highway section. It is recommended that the average accident rates developed in this study be used to determine the benefit of roadside design policy improvements, unless more site-specific data can be obtained. Particular attention should be paid to adjusting the measures of effectiveness for sites that have extremely high or extremely low roadside accident rates. Site-specific estimates of the construction costs for roadside design improvements should also be used. However, it is recognized that agencies may, for legal and administrative reasons, desire to adopt policies that use consistent designs for highways of similar functional class and traffic volumes. Such policies can be developed by each agency for classes of similar highways. It is recommended that sufficient flexibility should be retained in such policies to allow modified designs for locations with extremely high or extremely low values of construction cost and/or effectiveness.

Evaluation of Roadside Safety Improvements, by Hugh W. Miller, Jr., P.E., ITE Journal November 1980

Purpose of This Paper

The purpose of this paper is to describe a model which quantifies the accident potential of fixed objects, and a procedure for ranking and choosing alternates from the long list of improvements found in Safety Improvement Projects (SIP). John C. Glennon first proposed the "hazard model" and its use in the cost-effectiveness evaluation. Glennon's work concerns the allocation of funds to highway safety improvements on a state-wide basis. This paper contains a discussion of the same methodology applied to the specifics of a particular safety improvement project.

Safety Effects of Cross-Section Design For Two-Lane Roads, US DOT, FHWA, Vol. II: Appendices, June 1987, Report October, 1987

Study Objectives

The major objectives of this study were to:

1. Develop a method of quantifying roadside hazards.

2. Determine the effects of lane width, shoulder width, shoulder type, sideslope, and roadside condition on accidents.

3. Determine the benefits and costs of 3R improvements related to lanes, shoulders, and the roadside environment.

One of the original objectives of the research was to develop a rating system to quantify the hazard posed by a given section of highway roadside. Two alternative rating systems were given serious consideration: a hazard scale and frequency/severity system. To use the hazard scale, a judgment is made on the roadside according to the accident damage likely to be sustained by out-of-control vehicles on a scale from one (low

likelihood of off-roadway collision or overturn) to seven (high likelihood of accidents resulting in fatality or severe injury).

Findings

This study was intended to quantify the benefits and costs resulting from lane widening, shoulder widening, shoulder surfacing, sideslope flattening, and roadside improvements. The study included a review and critique of past accident research related to lane width, shoulder width and type, and roadside condition. The development of accident relationships involved the collection and analysis of detailed accident, traffic, roadway, and roadside data from 4,951 miles of two-lane roads in seven U.S. States. An accident predictive model and detailed statistical tests were used to determine expected accident reductions related to various geometric improvements. Construction cost data from several States were used to develop a cost model for such projects.

Geometric Design and Operational Effects, Transportation Research Record 1122, Washington D.C. 1987

Objectives

This paper presents a brief synopsis of current clear zone topics. It condenses and sets forth the overriding principles and gives several example applications. It might be considered as a primer for an Engineer interested in becoming familiar with the clear zone concept, or as a first step for an agency interested in developing its own clear zone policy.

As an example, one state transportation agency defines the clear zone as follows:

Clear Zone - The policy employed by the Department to increase safety, improve traffic operations, and enhance the appearance of highways by designing, constructing and maintaining highway roadsides as wide, flat and rounded as practical and as free as practical from physical obstructions above the ground, such as trees, drainage structures, massive sign supports, utility poles and other ground-mounted obstructions.

Design Safer Roads, Practice for Resurfacing, Restoration, and Rehabilitation Transportation Research Board, Special Report 214

This study recommends that highway agencies develop and apply their own procedures for identifying and selecting sideslope and clear zone width improvements on 3R projects. These procedures should encourage the following:

1. Flatten sideslopes of 3:1 or steeper at locations where run-off-road accidents are likely to occur.

2. Retain current slope widths when widening lanes and shoulders unless warranted by special circumstances; and

3. Remove, relocate, or shield isolated roadside obstacles.

Responsibility for Standards-Federal and State Roles

For road geometry, AASHTO policies recommend minimum (or maximum) design values for features such as:

1. Lane widths,
2. Shoulder widths,
3. Horizontal and vertical curves,
4. Superelevation at curves,
5. Sight distance,
6. Bridge widths,
7. Sideslopes and ditch drainage, and
8. Pavement cross slopes.

To increase flexibility and adaptability to a variety of nationwide conditions, AASHTO recommended different design values for variations in terrain, setting (urban versus rural), traffic volume, traffic characteristics (e.g., percentage of heavy trucks), and function (local, collector, arterial, etc.). The recommended values also vary with speed. For roads intended for high-speed driving, the values specify wider lanes and shoulders,

longer sight distances, and more gentle curves. AASHTO policies recommend design speeds based on function, setting, terrain, and traffic characteristics.

Methodology for Evaluation of Safety Improvement Alternatives for Utility Poles. By Patrick T. McCoy, Richard T. Hsueh, and Edward R. Post. Transportation Research Record 796, Highway Safety Appurtenances

Objectives

The object of this paper is to present a methodology for evaluation of safety improvement alternatives for utility poles. It is a total-annual-cost method of economic analysis, which features the calculation of expected annual accident and collision maintenance costs based on the probabilities and severities of single-vehicle collisions with utility poles and other fixed objects on the roadside. The probabilities and severities of these collisions are in turn computed from a definition of the speed and volume of traffic, distribution of vehicle sizes, and the numbers, types, and locations of utility poles and other fixed objects on the roadside.

Methodology

The methodology developed computes the total annual cost of an alternative, which includes its capital recovery and annual maintenance costs plus the expected annual cost of accidents between a single vehicle and a fixed object on the roadside. Based on a description of the speed and volume of traffic and the size, location, and type of fixed objects along the roadway, the probabilities and severities of single-vehicle collisions with the fixed objects are computed. The accident costs of these collisions are then computed and added to the capital recovery and annual maintenance costs of the improvement alternative. By comparing the total annual costs of the alternatives and the existing condition, the most economical course of action is identified. The methodology can be used to evaluate a specific case or it can be used to evaluate the total annual cost of various alternatives over a range of traffic and roadside conditions to identify the circumstances for which each would be most economical.

Conclusions

The methodology presented here indicates its applicability to a variety of improvement alternatives and various traffic and roadside conditions. Also, it illustrates the sensitivity to the selection of the best improvement alternative to traffic and roadside conditions. It must be remembered that these results were for only one vehicle size, one utility pole spacing, and one other type of fixed object, which was assumed to have the same collision properties as the nonbreakaway utility pole. Again, the purpose of the demonstration was not to identify the best alternatives for all conditions but to show the applicability of the methodology and some effects of traffic and roadside conditions on the relative economics of the alternatives.

Second International Conference on Low-Volume Roads, Transportation Research Record 702.

Objectives

This paper summarizes research that was undertaken to reevaluate the safety needs on low-volume rural (LVR) roads. Based on a series of functional analyses relating safety performance to specific design and operational elements, a set of revised guidelines was developed. The revised guidelines apply to total roadway width, horizontal curvature, roadside design, speed signs, curve warning signs, centerline markings, and no-passing stripes. These guidelines are proposed to supplement the existing national policies, with each revised guideline either replacing or clarifying the existing national guideline. The paper expresses that widespread application of the revised guidelines should provide for more consistent design and traffic control of low-volume rural roads consonant with a rational balance between highway investment, highway safety, and traffic service.

When considering safety on LVR roads, local highway agencies have been faced with a dilemma. On one hand, the agency would like to provide the same high-type design and operational features as on the primary highway system. On the other hand, the cost of providing this degree of safety often conflicts with the agency's philosophy of economic expediency. Because of this dilemma, LVR roads have historically been designed and operated at minimal cost with minimal overt attention to safety.

The tendency is for federal matching funds to require that highways, regardless of their functional classification, be redesigned to meet all current standards. Current standards tend more to reflect the needs of primary highways and, therefore, could require extensive and costly reconstruction of existing LVR roads. Highway agencies express increasing concern on this trend because it would force them to spend unreasonably large amounts of money for the rehabilitation of LVR roads. The alternative, which is more likely, however, is for the highway agencies to avoid these apparently unjustified costs by not implementing any LVR road improvements at all.

A Survey of State Utility Manual "Clear Zone Provisions", TRB paper No. 880360, Transportation Research Board, dated January 25, 1989

This paper has been written to provide a review of the applicable standards, a summary of the current clear zone practices by the states, and recommendations for future actions to promote uniformity between the states. As the first step in the search for solutions, several of the most difficult clear zone issues for utilities are identified and reviewed. Perhaps the most important contribution of this paper is its attempt to focus attention upon existing problem areas in the implementation of the clear zone concept.

States have pursued widely divergent paths in developing their independent clear zone policies. Approximately 36 state utility manuals were reviewed to assess this divergency. Page 35 highlights clear zone policies of these 36 states. The basis for this survey analysis was a review of responding state highway agency's and their utility manuals.

The paper points out that in the interest of fairness to the states that are discussed, the philosophy of the individuals who wrote the manuals or policies may not be reflected exactly as intended. The degree of enforcement of the states' clear zone policies is not known. Albeit to say, policy and practice might not coincide. Also, it is possible that omissions or errors have occurred in the preparation of the summary comments of the states' various policies and practices.

At least six states (Alabama, Massachusetts, Tennessee, Utah, Vermont and Washington) depend entirely upon duplicating the AASHTO accommodation guide wording to describe their clear zone and supply very little additional guidance. On the other hand, at least six states (Florida, Iowa, New Hampshire, North Dakota, Texas, and Virginia) have their own elaborate tables or figures to explain their clear zone policy.

References to State or AASHTO Manuals

At least eight states (Florida, Georgia, Indiana, Minnesota, Mississippi, North Dakota, Virginia and Wisconsin) have developed their own clear zone standards or have uniquely defined the clear zone in their design manuals. In several cases portions of these documents were appended to the utility manual provided by the states to illustrate the clear zone. These documents are not included in this report, but are available for review at WSDOT.

Two states (Colorado and Minnesota) included references to AASHTO provisions. Eight states chose to refer to the AASHTO barrier guide. These states were Colorado, Kansas, Kentucky, Minnesota, Mississippi, Nevada, New Hampshire, and Virginia.

Clear Zone Treatment Parameters

In reviewing the table, starting on page 35, it becomes apparent that several types of common criteria were utilized by many states. Examples include:

- Almost all states included a qualifying statement "if right-of-way is available" in describing horizontal clearances

- 21 states indicated that utilities were to be placed "as near as practical to the right-of-way line"

- 21 states varied the lateral clearance if curb and gutter were present

- 16 states distinguished between urban and rural locations

- 14 states indicated that their clear zone width was based upon categories of speed limits

- 6 states required that utilities be located within "10" feet of the right-of-way line

- 6 states described the clear zone with a statement similar to "no single dimension is always used for the clear zone..."

- 4 states had detailed instructions requiring frangible bases or breakaway treatments for utilities within certain locations of the clear zone

State utility engineers may wish to review the table to compare their own policy to that of neighboring states or to use ideas that may be beneficial for their own manual.

This TRB paper draws several conclusions that our research staff feels are important to share. These observations are not new or unexpected. However, there is solace in finding that there are many other agencies nationwide that share the same frustrations while trying to deal in a genuine and positive manner with the clear zone concept. The TRB paper concludes:

- There is no national consensus on the clear zone. It has emerged bit by bit from different agencies and in different publications.

- There are many documents (guidelines or standards) which might pertain to any individual obstacle in the clear zone. These documents are prepared by AASHTO, FHWA, and other authoritative bodies.

- The states have pursued widely divergent paths in developing their independent clear zone policies governing utilities.

- The clear zone has not been strongly and completely embraced by all state utility offices.

- The AASHTO barrier guide and the AASHTO accommodation guide are currently the most influential documents in shaping states feet clear zone policies.

- A survey of the states indicated that the most commonly used provisions were: (a) the term "as near to the right-of-way as practical", (b) varying horizontal clearances, depending upon whether a curb was present, (c) varying horizontal clearances, depending on whether the location was urban or rural, and (d) varying horizontal clearances based upon speed limits.

- Although many state manuals imply that there may be differences, very few state manuals treat new construction differently from 3-R projects or replacement projects. Such a distinction would appear to be almost necessary to cope with one of the major clear zone difficulties--the presence of many existing obstacles which do not comply with current standards.

National Survey of State Utility Manuals

State	Date	Adopted AASHTO Wording	Comments
Alabama	1976	xx	- Restate AASHTO Accommodation Guide requirements
Alaska	1986		- Alaska Administrative Code 15.171 & 181 - Urban = 2 ft behind curb - Rural =30 ft for >50 MPH, 20 ft for 40-50 MPH 10 ft for 30-39 MPH, 5 ft for <30 MPH
Arkansas	1970	xx	- No single minimum dimension, but if available 30 ft commonly used as safety guide
Colorado	1987	xx	- Generally use wordings found in AASHTO Green Book - Freeways, rural arterials, high-speed rural collectors, use 1977 AASHTO Barrier Guide - Low-speed rural collectors, local rural, use 10 ft minimum clear zone - Uncurbed urban arterials, collectors & local streets, use 1.5 ft minimum behind curb - Curbed urban arterials, collectors & local streets, use commensurate rural conditions - Where accident history or safety studies show existing...hazards,...(take) corrective action
Connecticut	1977	xx	- Rural = 30 ft from edge pavement (see Arkansas), - Urban = 8 ft from shoulder or 12 ft from edge pavement or 1 ft behind sidewalk
Delaware	1977	xx	- On horizontal curves if ROW >30 ft no installations on outside curve - Rural = 30 ft from travelway if ROW available - Urban = as close as possible to ROW - No cable, pipes, etc., within 5 ft of pavement

State	Date	Adopted AASHTO Wording	Comments
Florida	1979		- Good table of clear zone dimensions - => 50 MPH = 30 ft thru lanes, 18 ft aux lanes - <+ 45 MPH w/o curb = 18 ft if ROW permits, 14 ft min - <= 45 MPH with curb = 4 ft from face of curb - Signal strain poles, fire hydrants, phone pedestals, etc., treated as utility poles
Georgia	1982	xx	- Refers to State Geometric Design Standards - Rural = 30 ft commonly used as guide (see Arkansas) - Urban = 12 ft from face of curb or 6 ft if <= 35 MPH
Idaho	1986	xx	- Rural areas = outside clear zone unless circumstances warrant, not closer than other fixtures, use care if located on outside of horizontal curve - Urban => 35 MPH = controls dictated by roadside development. May not be practical to put too far beyond curb or protect with guardrail. If no curb, as far as practical beyond shoulder or parking area.
Indiana	1987 Draft		- Fed Aid & new construction = manual entitled "Indiana Dept. of Highways Clear Zone Requirements for Design of Highways ..." (complex details) - Rural/urban collectors, with shoulders & curb: < 50 MPH & ADT < 750 = 10 ft from traffic lane, => 50 MPH or ADT => 750 = 10 ft outside shoulder - Rural/urban arterials, with shoulders & curb: => 45 MPH = min of 20 ft or to ROW line < 45 MPH = min of 10 ft or to ROW line - All roads with curb: Curb => 6" and speed < 45 MPH = 1.5 ft behind curb, Curb = < 6" or speed => 45 MPH, use "shoulders" criteria
Illinois	1979	xx	- As near as practical to ROW - Urban = 2 ft min behind curb, or 4 ft min outside outer shoulder line if not curbed - Poles not permitted in any ditch line - For parallel lines, ground-mounted appurtenances must be located within one ft of ROW

State	Date	Adopted AASHTO Wording	Comments
Iowa	1985		Slope / ADT < 800 / 800-2000 / 2000-6000 / > 6000 > 3:1 / 59 ft / 64 ft / 70 ft / 80 ft 4:1 / 32 ft / 35 ft / 38 ft / 42 ft 6:1 / 24 ft / 26 ft / 28 ft / 32 ft 10:1 / 22 ft / 25 ft / 27 ft / 30 ft - Rural areas = outside of clear zone (above) - Suburban, rural type road, <= 45 MPH = 15 ft from pavement or beyond roadway slope limit - Urban curbed = 10 ft from travelway
Kansas	1986		- Rural = outside of clear zone (use AASHTO Barrier Guide Nomograph) - Suburban, rural type, => 45 MPH = 15 ft - Urban curbed = 6 ft min, 8 ft desired
Kentucky	1985		- For => MPH, clear zone at least 30 ft and defer to AASHTO Barrier Guide - Poles must be within 1.5 ft of ROW, except may use 5 ft if crossarms on pole - Curbed streets = behind sidewalk area - Not allowed to remain or relocate in clear zone if slope <= 4:1 (except with guardrail or other protection for motorists)
Louisiana	1986		- Speed => 50 MPH: if shoulders = 30 ft, if curb = 6 ft, if curb at parking lane = 2 ft - Speed < 50 MPH: if shoulders = 20 ft, if curb = 6 ft, if curb at parking lane = 2 ft - Light posts min of 15 ft from travel lane, except 6 ft behind barrier curb. Breakaway if within 40 ft
Maryland	1981	xx	- 30 ft commonly used guide (see Arkansas) - Conventional highways = min 30 ft, or 6 ft behind curb, or behind sidewalks - No trenches within 5 ft of pavement
Massachusetts	1972	xx	- Restate AASHTO Accommodation Guide requirements - Poles within 6 ft of travelway must have reflective markers

State	Date	Adopted AASHTO Wording	Comments
Minnesota	1987	xx	- Lighting and above-ground structures must be out of clear zone, except: (1) if breakaway poles, (2) poles of less than 50 sq. in. area, (3) if speed =< 40 MPH use 2 ft min behind curb & 10 ft min otherwise, (4) protected by barrier, and (5) base protrudes < 4 inches - Above-ground fixtures controlled by AASHTO Barrier Guide and AASHTO Green Book
Mississippi			- Low speed (< 50 MPH & ADT < 750): 30 ft desirable, 2 ft from curb or shoulder for aux lane, 4.5 ft from curb for outside traffic lane, or 10 ft from edge of through traffic lane - High Speed (=> 50 MPH or ADT => 750): 30 ft, 10 ft for through lanes & 4.5 ft for aux lanes
Missouri			- Parallel lines must be within 2 feet of ROW line - Existing poles, when relocated, within 5 ft of ROW
Montana	1987		- Rural = 30 ft where available, urban = as near as possible to ROW, 2 ft min behind curb
Nebraska	1987		- Rural = at least 30 ft from edge of pavement - Urban/suburban, rural type <=45 MPH = 15 ft from road - City/urban = back of sidewalk or 6 ft min from curb - Poles closer than (above) clearances must be breakaway
Nevada	1987 Draft	xx	- Defer to Accommodation Guide and AASHTO Barrier Guide
New Hampshire	1986	xx	- Good tables. Clear zone expanded or contracted according to modification tables in Barrier Guide. Many example calculations in manual.
New York	1974	xx	- Rural/suburban/urban > 35 MPH = min 30 ft from pavement - Rural/suburban/urban <= 35 mph = at ROW or if not feasible, behind sidewalk, or if not feasible 2 ft from curb - Poles must be in outer 2 ft of ROW

State	Date	Adopted AASHTO Wording	Comments
North Carolina	1976	xx	- No single dimension, but 30 ft used as safety guide (see Arkansas), curbed section (6 ft min)
North Dakota	1987		- Refers to clear zone table in appendix of its manual
Pennsylvania	1987	xx	- Clearances contained in 1982 State Code - Utilities not allowed in clear zone (up to 30 ft) - Allowed beyond ditches, at top of cut slopes, behind guardrail, 8 ft beyond toe of steep (2:1) fill slopes - Urban curbed, => 40 MPH no park lane = behind sidewalk - Urban curbed, < 40 MPH & parking lane = 1.5 ft min - Policy for relocation of existing noncomplying poles, locations for poles being replaced, etc. - Above-ground utilities not allowed in area which Dept engineers find to have high accident potential
South Carolina	1987	xx	- No single dimension, but 30 ft used as safety guide (see Arkansas) - Pipelines > 3 ft from edge of pavement
Tennessee	1987	xx	- Restate AASHTO Accommodation Guide requirements
Vermont		xx	- Restate AASHTO Accommodation Guide requirements
Texas	1975	xx	- Good tables - Rural areas or uncurbed urban areas, poles = 1 to 3 ft from ROW - 30 ft from roadway or 20 ft from shoulder - No poles in median - Specific exceptions for existing utilities
Utah		xx	- Restate AASHTO Accommodation Guide requirements
Virginia			- Refers to Section 700 of Department Road & Bridge Stds - Rural = if in clear zone use barrier or guardrail, defers to AASHTO Barrier Guide. Appendix of utility manual has clear zone guidelines - Urban = 8 ft min from pavement, 9.5 ft desired

State	Date	Adopted AASHTO Wording	Comments
Washington	1985	xx	- Restate AASHTO Accommodation Guide requirements
West Virginia	1986	xx	- Restate AASHTO Accommodation Guide requirements
Wisconsin	1972	xx	- Rural = Safety Section as defined by "Typical Sections" - Urban = 2 ft behind curb, or outside clear zone if not curbed - Utilities allowed in "Safety Section" only when: (1) no other location is feasible, and (2) breakaway construction or motorist protected by barrier

FINDINGS

Consistent application of geometric design standards for roads and streets provide motorists with an improved degree of safety. Design features such as shoulder width and prudent placement of obstacles, breakaway supports, lighting, barriers (guardrails), and crash cushions provide a margin of safety to motorists who inadvertently leave the roadway.

Good engineering judgment plays a significant role in the overall determination of the clear zone required for each specific case. Implementation of the clear zone philosophy could be greatly enhanced if a degree of standardization was obtained between agencies, and from document to document. This could be accomplished through an agency attended national forum. Until such time, however, individual agencies need to clearly establish an ongoing program that deals effectively with objects in the clear zone.

There are many factors that must be considered in determining clear zone requirements. The following findings are suggested for use by both city and county officials.

FINDING 1

Clear zone dimensions should conform to funding and jurisdictional requirements for roadway classification. If federal funds are used, then the design should conform to the Local Agency Guidelines (LAG) (1).

Of specific note, it is stated in the LAG that "for posted speeds of 35 miles per hour and less, the minimum clear zone distance is 10 feet from edge of travel lane in a shoulder section, or 18 inches (1.5 feet) beyond face of curb. For posted speeds above 35 miles per hour, see criteria detailed in Appendix IV-1A-6(1). This criteria should be combined with an economic analysis to ensure safety cost-effectiveness as well.

FINDING 2

There are many factors to consider when determining a clear zone area other than the speed and volume. It is important to include the following factors in your determination:

- Classification of roadway
- ROW available
- Terrain
- Area type (rural vs. urban)
- Abutting uses
- Mix of trucks and buses
- Potential liability
- Access control
- Vegetation
- Alignment
- Roadside parking
- Utilities
- Geometrics
- Turning movements

FINDING 3

It is recommended that the AASHTO Roadway Design Guide's benefit/cost analysis be used to prioritize how and where limited funds should be spent in order to achieve the greatest overall benefit. There are many other less empirical methods to analyze cost-effectiveness; however, the benefit/cost method is a straight forward approach that can account for: (1) encroachments, (2) roadside geometry, and (3) accident costs. It is recognized that dollar values vary when discussing benefits or nonbenefits; however, it is a method of analyzing cost-effectiveness and may be used as agencies desire.

FINDING 4

If a situation exists where it is impossible to provide the required or desired clear zone area, then mitigation measures can be taken to prevent errant vehicles from striking fixed objects or to reduce the effect of such collisions. These mitigations are usually intended to reduce the severity of the accident, not eliminate the possibility. Some mitigation measures can include: guardrail, crash cushions, barriers, breakaway poles or sign supports, better signage, roadway delineation, removal or relocation of obstacles.

FINDING 5

When utilities are to be located within existing or proposed right-of-way, they shall be constructed in accordance and compliance with current franchise and/or permit procedures established by the controlling agency. Each agency is encouraged to work closely with the utility industry when establishing clear zone guidelines as standards.

The utilities in Washington State have not directly participated in this research effort nor have they been consulted in the course of this study. This research paper does not speak for the utility industry.

We recommend that all permits for new placement and replacement of existing utility poles and other utility structures above grade should be accompanied by written certification from a Washington State professional engineer or from an agent authorized by the utility to certify, that the installations conform to the agency's standards relating to highway safety.

FINDING 6

It is extremely important when determining what poles or roadside obstacles warrant removal or relocation that a follow-up and tracking program for accidents be established. This relates to duplicate or multiple hit poles. A pole relocation review should be initiated after a duplicate hit has occurred. This review should involve a traffic or highway engineer's judgment when the decision is to be made to remove, relocate or protect duplicate hit poles.

The following is offered as a format for agencies to establish a clear zone procedural program. The most difficult part of developing an effective policy is determining how to treat existing deficiencies. It is important to concentrate first upon those areas having the most public accident exposure. Establishing and following a priority system is also very essential.

Step 1 Concentrate first upon known conditions of high hazard, using historical accident data.

Step 2 The second step should be to develop a strategy to inventory roadsides throughout the agency's jurisdiction.

Step 3 An inventory should then be conducted, using trained personnel to catalog existing fixed objects.

Step 4 Appropriate treatments should be identified for all fixed objects and locations identified during the inventory.

Step 5 Priorities should be established for correcting difficult situations. Budgets should be prepared and funding identified. It will take many years to treat all objects in the clear zone, and a priority list is essential to ensure that the most worthy locations are addressed first.

Step 6 Where necessary, the public should be warned until the location can be treated.

The steps in this procedure are only guidelines. It is up to each agency to establish a viable, working program for clear zone implementation. The benefits of such a program are:

1. Increasing the safety for the motoring public;
2. Reducing agency liability;
3. Possibly assisting in securing federal or state highway funds.

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